Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Trauma Care for the Patient with Obesity

CONFLICT OF INTEREST DISCLOSURE

In accordance with «EACCME criteria for the Accreditation of Live Educational Events», please disclose whether you have or not any conflict of interest with the companies:

If you don’t have any conflict, please delete the conflict of interest report points:

[X] I have no potential conflict of interest to report

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Learning Objectives

- Acknowledge the latest global trauma statistics and how these impact our patient demographic
- Understand the effect of obesity on morbidity and mortality in trauma
- Review the most common mechanisms of injury
- Discuss logistical challenges to medical evaluation and treatment in trauma patients with obesity
- Highlight comorbidities and complications to consider
- Target appropriate resuscitation goals

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Global Trauma Statistics 2021

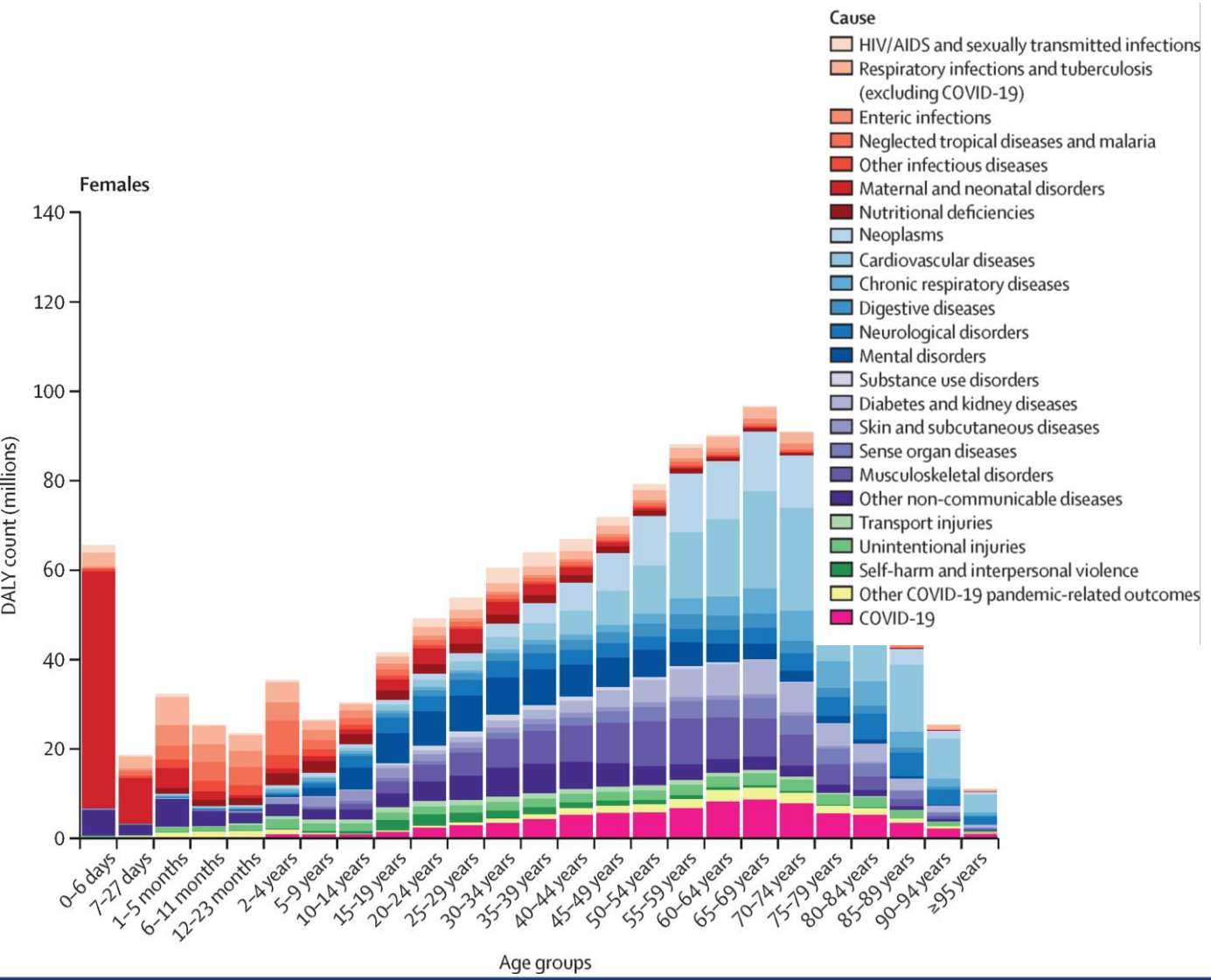
- Leading causes of DALYs (disability-adjusted life years)
  - #10 Road Injuries (65.1M)
  - #22 Falls (43.8M)
  - #26 Self-harm (33.5M)
  - #30 Interpersonal violence (26.8M)

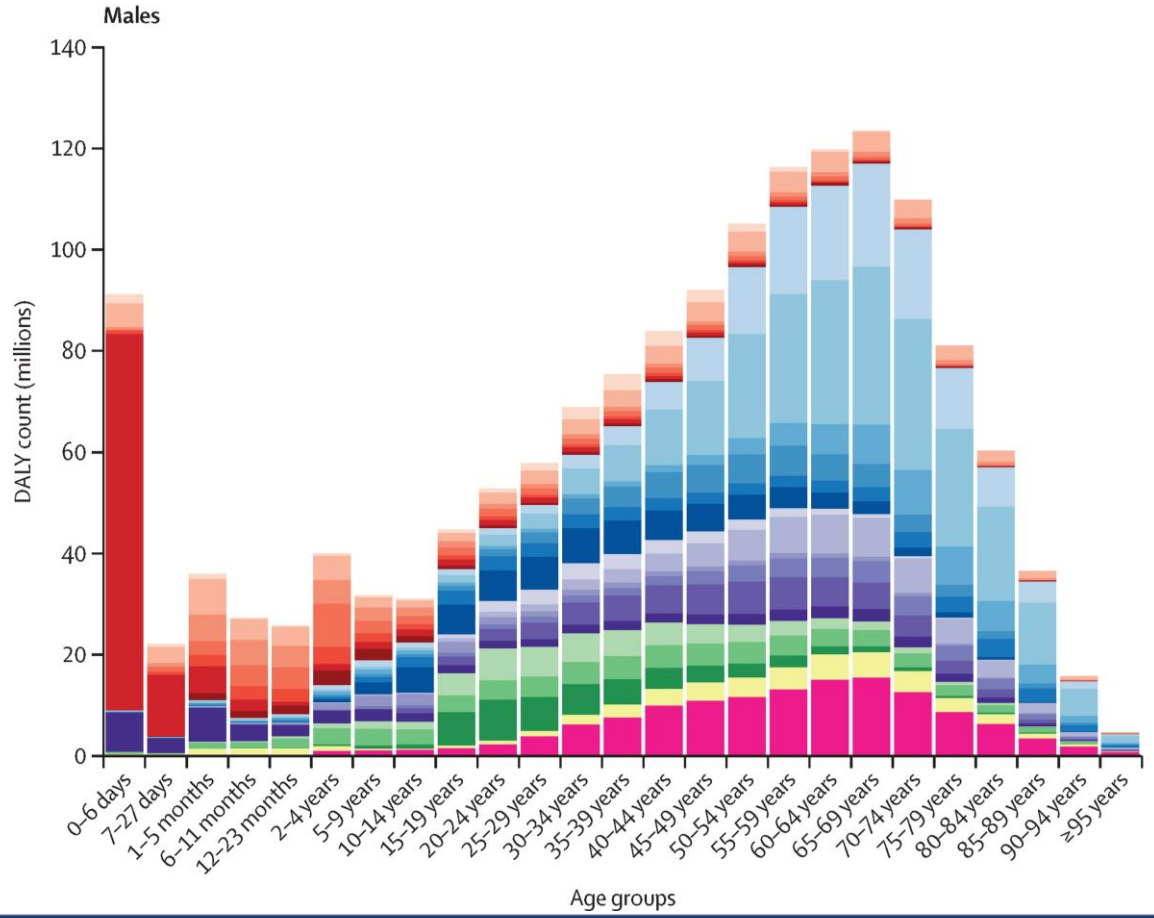
(GBD 2021 Diseases and Injuries Collaborators, Lancet 2021)

Trauma Care for the Patient with Obesity

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

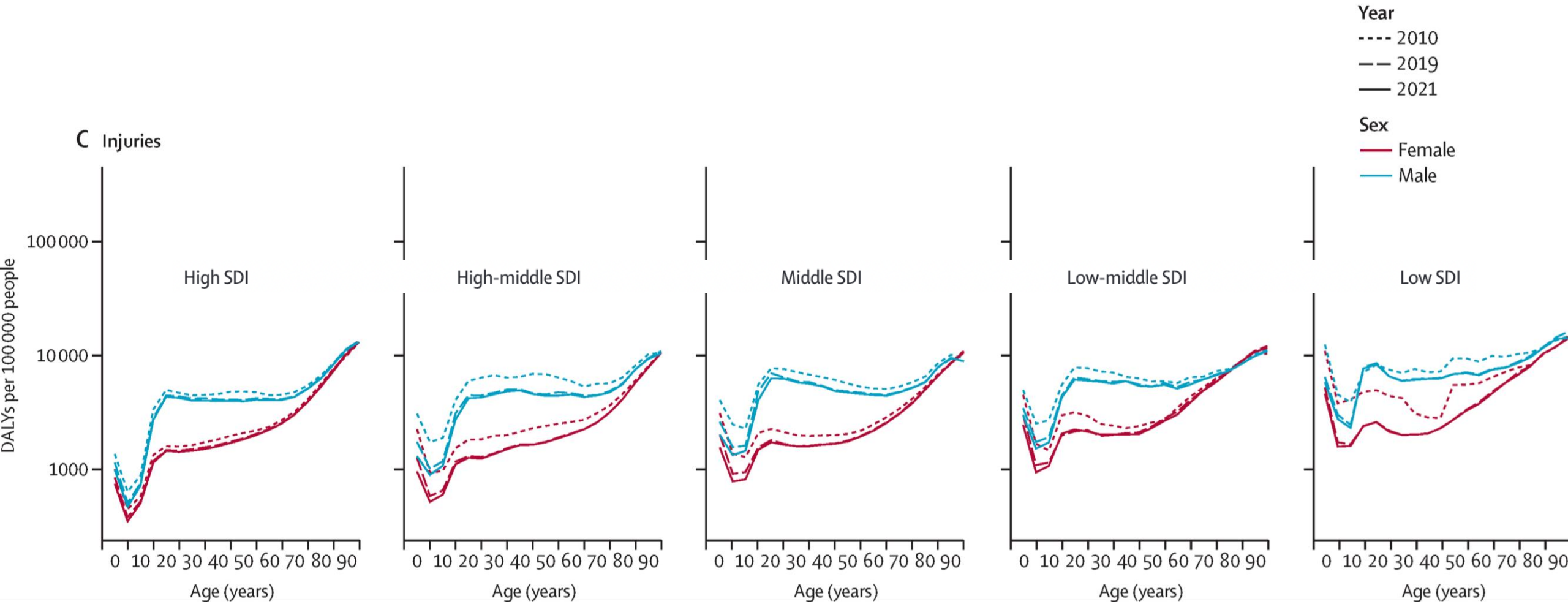
(GBD 2021 Diseases and Injuries Collaborators, Lancet 2021)





Trauma Care for the Patient with Obesity

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA



(GBD 2021 Diseases and Injuries Collaborators, Lancet 2021)

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Obesity + Trauma = Worse Outcomes

- Increased Morbidity (Morris JA Jr 1990, Milzman DP 1992)
  - Injury severity
  - Hospital LOS
  - ICU admission
  - Pulmonary complications
  - Multiorgan failure
- Increased Mortality (Morris JA Jr 1990, Milzman DP 1992, Smith-Choban P, 1991, Neville A, 2004, Ditillo M 2014)

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Traumatic Injuries

- Motor Crash
  - Increased odds ratio for death (Jehle 2012, Jehle 2014)
  - Normal weight drivers more likely to wear seatbelt (Elkbuli A, 2018)
  - Standard crash test dummy 5’10” and 170 lbs
  - Cushion Effect (Ryb 2008)
- Penetrating injuries
- Falls

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Logistical Challenges

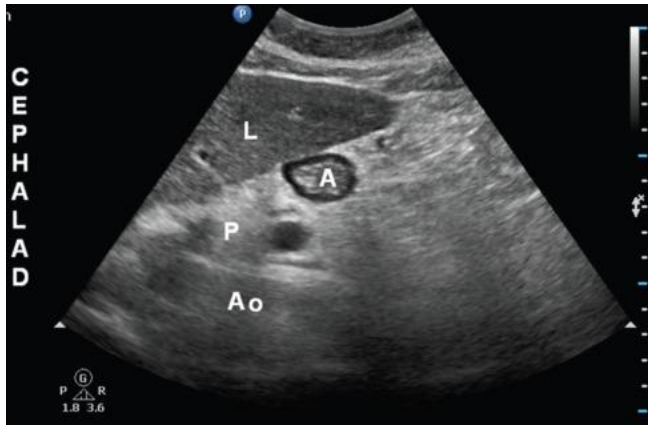
- Difficult extraction from MVs (Ziglar 2006)
- Improper fit of equipment
- Stretcher weight limit
- Safety regulations
- Size limits in CT and MRI
- Poor quality images on FAST and CT
- Difficult line placement

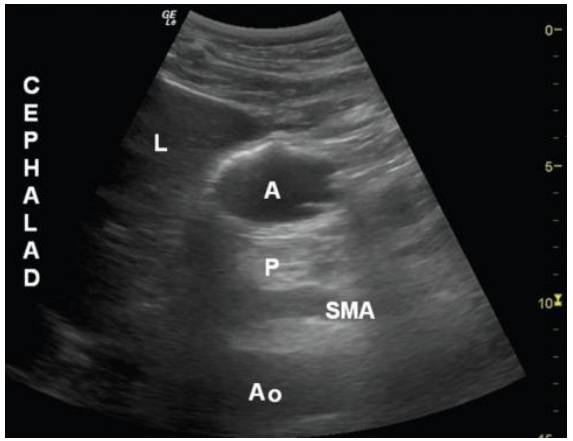
(Carucci 2013)

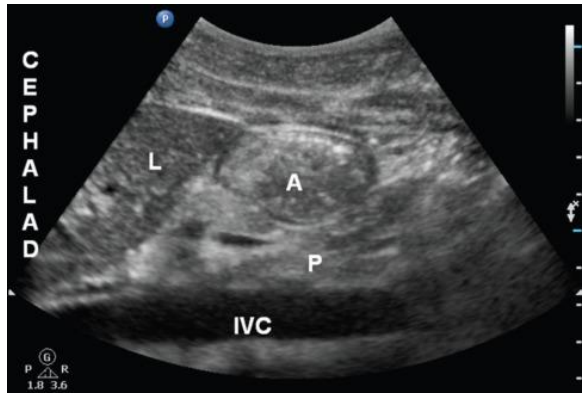
Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Comorbidities and Complications to Consider

- Hypertension and diastolic heart failure
- OSA and OHS
- Pulmonary hypertension
- GERD and aspiration
- Non-alcoholic liver disease
- Renal insufficiency
- DVT/PE

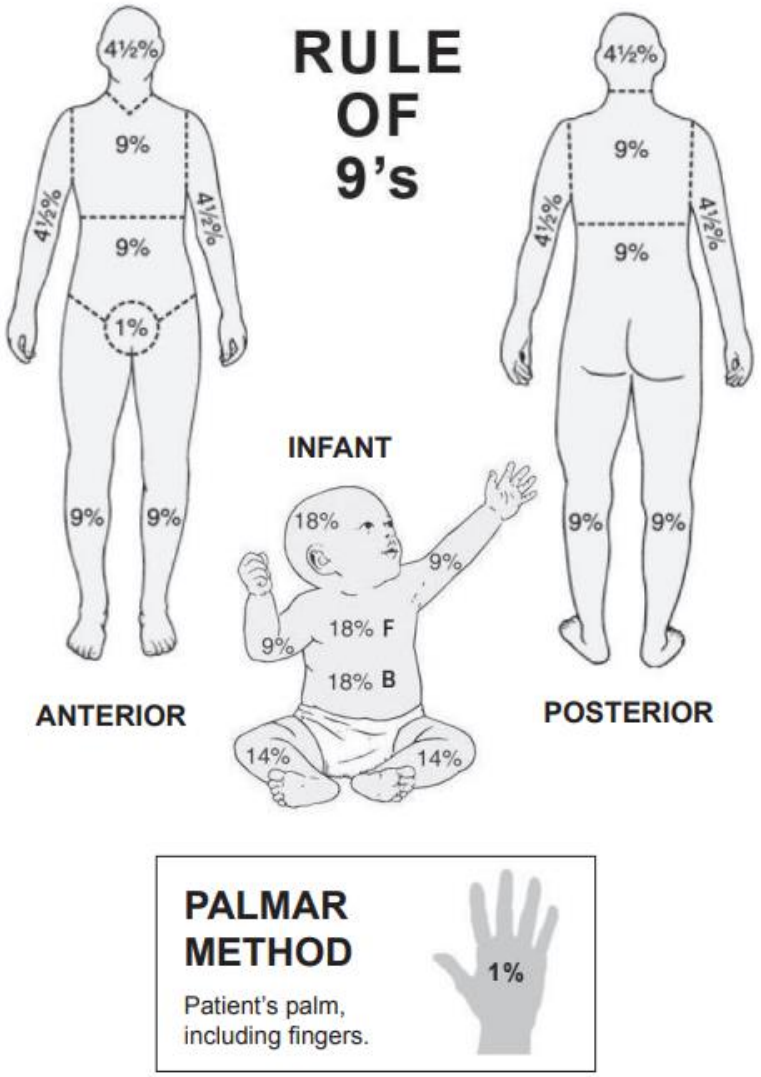






(Van de Putt, 2014)

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA



Burn Resuscitation

- Parkland Formula (Guilabert 2016)
  - Fluid replacement in 24 hours = 4 mL x % BSA burned x TBW (kg)
  - Half of volume in first 8 hours, second half in next 16 hours
- Obese burn patients (Livingston 2000)
  - Lower extremity BSA underestimated
  - Head and arm BSA overestimated
  - Adipose tissue less vascular
  - Resuscitation by TBW may lead to hypervolemia
- Goal-directed resuscitation

Take Aways

- Trauma is a leading cause of death worldwide
- Trauma patients with obesity have unique prehospital and in-hospital challenges
- Remember common comorbidities and complications
- Utilize goal-directed volume resuscitation

Joy Lo Chen, MD, FASA, FCCM, UT Southwestern Medical Center, Dallas, Texas, USA

Thank You

References

- GBD 2021 Diseases and Injuries Collaborators. Global incidence, prevalence, years lived with disability (YLDs), disability-adjusted life-years (DALYs), and healthy life expectancy (HALE) for 371 diseases and injuries in 204 countries and territories and 811 subnational locations, 1990-2021: a systematic analysis for the Global Burden of Disease Study 2021. Lancet. 2024 May 18;403(10440):2133-2161. doi: 10.1016/S0140-6736(24)00757-8. Epub 2024 Apr 17. PMID: 38642570; PMCID: PMC11122111.
- Centers for Disease Control and Prevention. (2020). Prevalence of Obesity and Severe Obesity Among Adults: United States, 2017–2018. Retrieved from https://www.cdc.gov/nchs/data/databriefs/db360-h.pdf
- Centers for Disease Control and Prevention. (2020). 10 Leading Causes of Death by Age Group, United States – 2018. Retrieved from https://www.cdc.gov/injury/wisqars/pdf/leading_causes_of_death_by_age_group_2018-508.pdf
- Gray S, Dieudonne B (July 22, 2018) Optimizing Care for Trauma Patients with Obesity. Cureus 10(7): e3021. DOI 10.7759/cureus.3021
- Morris JA Jr, MacKenzie EJ, Edelstein SL: The effect of preexisting conditions on mortality in trauma patients. JAMA. 1990, 263:1942-1946. 10.1001/jama.1990.03440140068033
- Milzman DP, Boulanger BR, Rodriguez A, Soderstrom CA, Mitchell KA, Magnant CM: Preexisting disease in trauma patients: a predictor of fate independent of age and injury severity score. J Trauma Acute Care Surg. 1992, 32:263-244
- Smith-Choban P, Weireter LJ Jr, Maynes C: Obesity and increased mortality in blunt trauma . J Trauma. 1991, 31:1253-1257
- Neville A, Brown CV, Weng J, Demetriades D, Velmahos GC: Obesity is an independent risk factor for mortality in severely injured blunt trauma patients. Arch Surg. 2004, 139:983-987.10.1001/archsurg.139.9.983
- Ditillo M, Pandit V, Rhee P, et al.: Morbid obesity predisposes trauma patients to worse outcomes: a national trauma data bank analysis. J Trauma Acute Care Surg. 2014, 76:176-179.10.1097/TA.0b013e3182ab0d7c

References

- Kent R, Trowbridge M, Lopez-Valdes FJ, *et al*. How many people are injured and killed as a result of aging? Frailty, fragility, and the elderly risk-exposure tradeoff assessed via a risk saturation model. Ann Adv Automot Med. 2009;53:41-50.
- Elkbuli A, Dowd B, Spano PJ II, *et al*. The association between seatbelt use and trauma outcomes: does body mass index matter? Am J Emerg Med. 2018; 37:1716-1719.
- Arbabi S, Wahl WL, Hemmila MR, *et al*. The cushion effect. J Trauma. 2003;54:1090-1093.
- Ryb GE, Dischinger PC. Injury severity and outcome of overweight and obese patients after vehicular trauma: a crash injury research and engineering network (CIREN) study. J Trauma. 2008;64:406-411.
- Pal C, Tomosaburo O, Vimalathithan K, *et al*. Effect of weight, height and BMI on injury outcome in side impact crashes without airbag deployment. Accid Anal Prev. 2014;72:193-209
- Carter PM, Flannagan CA, Reed MP, et al. Comparing the effects of age, BMI and gender on severe injury (AIS 3+) in motor-vehicle crashes. Accid Anal Prev. 2014;72:146-160.
- Osborne Z, Rowitz B, Moore H, et al. Obesity in trauma: outcomes and disposition trends. Am J Surg. 2014;207:387-392; discussion 391-392.
- Nash N, Kimbrough CW, Mackowski M, et al. Is obesity protective in thoracoabdominal penetrating trauma? Am Surg. 2019;85:34-38.
- Ziglar MK. Obesity and the trauma patient: challenges and guidelines for care. J Trauma Nurs. 2006;13:22-27.
- VanHoy SN, Laidlow VT. Trauma in obese patients: ipmlications for nursing practice. Crit Care Nurs Clin North Am. 2009;21:377-389;vi-vii.

References

- Twaij A. Sodergren MH, Pucher PH, et al. A growing problem: implications of obesity on the provision of trauma care. Obes Surg. 2013;23:2113-2120.
- McCluskey G. Doherty-Allan R, McCarron P, et al. Meta-analysis and systematic review of population-based epidemiological studies in idiopathic intracranial hypertension. Eur J Neurol. 2018;25:1218-1227.
- Mulla Y, Markey KA, Wooley RL, et al. Headache determines quality of life in idiopathic intracranial hypertension. J Headache Pain. 2015;16:521.
- Pandey A, LaMonte M, Klein L, et al. Relationship between physical activity, body mass index, and risk of heart failure. J Am Coll Cardiol. 2017;69:1129-1142.
- Packer M. The conundrum of patients with obesity, exercise intolerance, elevated ventricular filling pressures and a measured ejection fraction in the normal range. Eur J Heart Fail. 2019;21:156-162.
- Marik PE, Cavallazzi R. does the central venous pressure predict fluid responsiveness? An updated meta-analysis and a plea for some common sense. Crit Care Med. 2013;41:1774-1781.
- Derichard A, Robin E, Tavernier B, et al. Automated pulse pressure and stroke volume variations from radial artery: evaluation during major abdominal surgery. Br J Anaesth. 2009;103:678-684.
- Messina A, Montagnini C, Cammarota G, et al. Tidal volume challenge to predict fluid responsiveness in the operating room: an observational study. Eur J Anaesthesiol. 2019;36;583-591.
- Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. Lancet. 2004;364:937-952.

References

- Singh M, Liao P, Kobah S, et al. Proportion of surgical patients with undiagnosed obstructive sleep apnoea. Br J Anaesth. 2013;110:629-636.
- Mokhlesi B, Masa JF, Brozek JL, et al. Evaluation and management of obesity hypoventilation syndrome. An Official American Thoracic Society Clinical Practice Guideline. Am J Respir Crit Care Med. 2019;200:e6-e24.
- Ismail K, Roberts K, Manning P, et al. OSA and pulmonary hypertension: time for a new look. Chest.2015;147:847-861.
- Lai HC, Lai HC, Wang KY, et al. Severe pulmonary hypertension complicates postoperative outcome of non-cardiac surgery. Br J Anaesth. 2007;99:184-190.
- Zalar A, Haddouche B, Antonietti M, et al. Lack of correlation between morbid obesity and severe gastroesophageal reflux disease in candidates for bariatric surgery: results of a large prospective study. Obes Surg. 2013;23:1939-1941.
- Kruisselbrink R, Gharapetian A, Chaparro LE, et al. Diagnostic accurae of point-of-care gastric ultrasound. Anesth Analg. 2019;128:89-95.
- Krinsley JS. Association between hyperglycemia and increased hospital mortality in a heterogeneous population of critically ill patients. Mayo Clin Proc. 2003;78:1471-1478.
- Investigators N-SS, Finfer S, Liu B, et al. Hypoglycemia and risk of death in critically ill patients. N Engl J Med. 2012;367:1108-1118.
- Yendamuri S, Fulda GJ, Tinkoff GH. Admission hyperglycemia as a prognostic indicator in trauma. J Trauma. 2003;55:33-38.
- Krinsley JS, Fisher M. The diabetes paradox: diabetes is not independently associated with mortality in critically ill patients. Hosp Pract (1995). 2012;40:31-35.

References

- Investigators N-SS, Finfer S, Chittock DR, et al. Intensive versus conventional glucose control in critically ill patients. N Engl J Med. 2009;360:1283-1297.
- Meizoso JP, Ray JJ, Karcutskie Cat, et al. Admission hyperglycemia is associated with different outcomes after blunt versus penetrating trauma. J Surg Res. 2016;206:83-89.
- Byrnes MC, McDaniel MD, Moore MB, et al. The effect of obesity on outcomes among injured patients. J Trauma. 2005;58:232-237.
- Brown CV, Neville AL, Rhee P, et al. The impact of obesity on the outcomes of 1,153 critically injured blunt trauma patients. J Trauma. 2005;59:1048-1051; discussion 1051.
- Wattanakit K, Lutsey PL, Bell EJ, et al. Association between cardiovascular disease risk factors and occurrence of venous thromboembolism. A time-dependent analysis. Thromb Haemost. 2012;108:508-515.
- Guilabert P, Usua G, Martin N, et al. Fluid resuscitation management in patients with burns: update. Br J Anaesth. 2016;117:284-296.
- Livingston EH, Lee S. Percentage of burned body surface area determination in obese and nonobese patients. J Surg Res. 2000;91:106-110.
- Van de Putte P, Perlas A. Ultrasound assessment of gastric content and volume. Br J Anaesth. 2014 Jul;113(1):12-22. doi: 10.1093/bja/aeu151. Epub 2014 Jun 3. PMID: 24893784.
- Carucci LR. Imaging obese patients: problems and solutions. Abdom Imaging. 2013 Aug;38(4):630-46. doi: 10.1007/s00261-012-9959-2. PMID: 23008055.