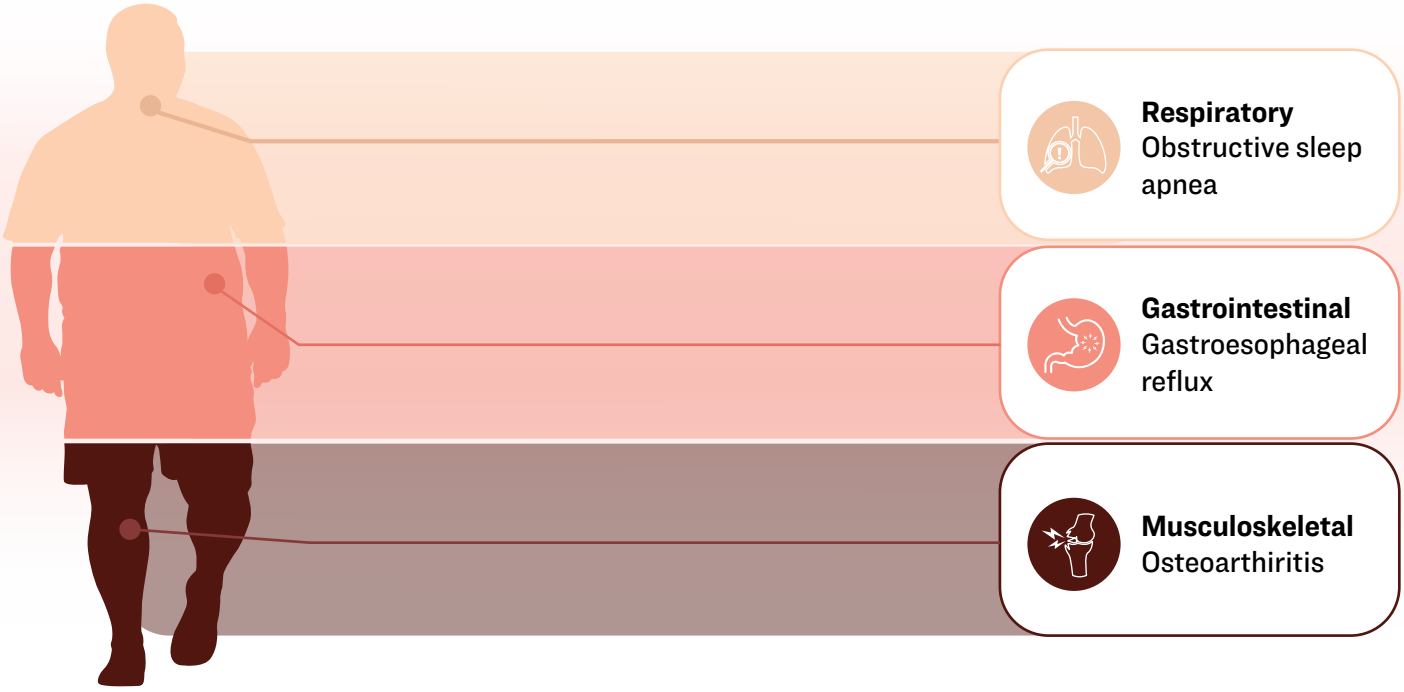
Understanding Obesity's Role in Mechanical Comorbidities

Obesity causes anatomic changes that lead to mechanical stress on multiple body systems, including the connective tissues, intra-abdominal organs, and upper airway. The increased adipose mass stresses musculoskeletal structures by altering skeletal alignment, causing muscular deconditioning, and increasing mechanical load.[1]

Mechanical Complications of Obesity[2]



Pathophysiology of Mechanical Complications in Obesity

OSA Pathophysiology[3-5]

- Altered mechanical properties
  - Decreased muscle airway tone
- Anatomic compromise of upper airway patency
  - Alterations in craniofacial structure
  - Enlarged tonsils
  - Upper airway edema
  - Decreased lung volume
  - Fat deposition

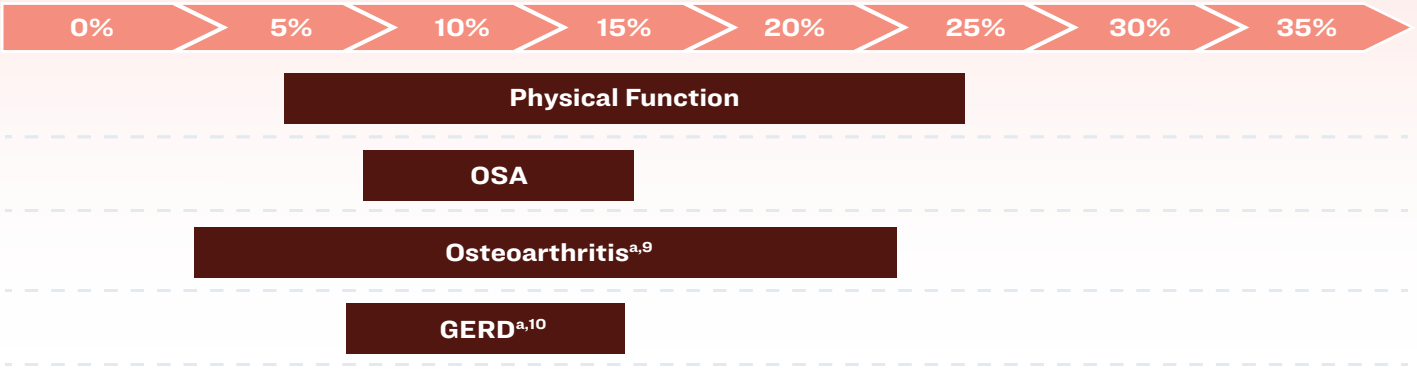
OA Pathophysiology[6]

- Relatively low skeletal muscle mass
- Joint compressive forces and malalignment
- Excessive fat accumulation
- Intramuscular fat infiltration

GERD Pathophysiology[7]

- Hyposalivation: worse esophageal clearance
- Increased thoracic pressure
- Higher transdiaphragmatic pressure gradient
- Acid pocket: postprandial reflux
- Increased abdominal pressure
- Altered esophageal body motility
- Hiatal hernia
- Overfeeding: gastric distention and increased number of TLESR

Impact of Different Percentages Weight Loss on Mechanical Complications[8-10]



- A loss of ≥10% of body weight has shown increased odds of significant improvements in OSA clinical symptoms[11-12]
- In knee osteoarthritis, losing every extra half kilogram of weight reduces the burden on the knee by four-fold with each step taken during daily activities[9,11-12]
- There is a dose-response relationship between the degree of body weight loss and resolution of GERD symptoms[10,12]

Obstructive Sleep Apnea:
Weight reduction improves the Apnea-Hypopnea Index[11]

Osteoarthritis:
Weight reduction improves knee functionality, speed, walk distance, and reduces pain, while greater weight loss also improves inflammatory markers such as IL-6 and CRP[11]

Gastroesophageal Reflux:
Weight loss can improve the clinical symptoms of GERD. A 5%-10% weight reduction in women and >10% in men is associated with improvement in clinical symptoms of GERD[10-11]

Summary

- Obesity is defined as an abnormal or excessive accumulation of adiposity that presents a risk to health[13-14]
- Clinical benefits of weight loss are progressive and can be seen with as little as 2%-5% weight loss[11]
- Modest weight loss achieved early in the disease trajectory can prevent and/or reverse some obesity-associated comorbidities[11]

[a]This range is depicted according to the data available.
CRP=C-reactive protein; GERD=gastroesophageal reflux disorder; IL=interleukin; OA=osteoarthritis; OSA=obstructive sleep apnea; TLESR=transient lower esophageal sphincter relaxation.

1. Chaves SFN, et al. *Obes Med*. 2024;52(100572):100572. 2. Sarma S, et al. *Diabetes Obes Metab*. 2021;23(suppl 1):3-16. 3. Gottlieb DJ, Punjabi NM. *JAMA*. 2020;323(14):1389-1400. 4. Chang JL, et al. *Int Forum Allergy Rhinol*. 2023;13(7):1061-1482. 5. Javaheri S, et al. *J Am Coll Cardiol*. 2017;69(7):841-858. 6. Bliddal H, et al. *Obes Rev*. 2014;15(7):578-586. 7. Nadaleto BF, et al. *Surgery*. 2016;159(2):475-486. 8. Garvey WT. *J Clin Endocrinol Metab*. 2022;107(4):e1339-e1347. 9. Kolasinski SL, et al. *Arthritis Care Res (Hoboken)*. 2021;73(5):764. 10. Singh M, et al. *Obesity (Silver Spring)*. 2013;21(2):284-290. 11. Ryan DH, Yockey SR. *Curr Obes Rep*. 2017;6(2):187-194. 12. Garvey WT, et al. *Endocr Pract*. 2016;22 Suppl 3:1-203. 13. Gupta H, Garg S. *Z Gesundh Wiss*. 2020;28(2):211-218. 14. Lin X, Li H. *Front Endocrinol (Lausanne)*. 2021;12:706978.