DISCLOSURES

- Primary Care Sports Medicine Advisory Board for DonJoy Orthopedics
- NFL Charities Research Grants
- Chair; Big Ten-Ivy League TBI CIC Research Committee
OBJECTIVES

- Identify at least 4 methods of measuring body fat %
- Know advantages & disadvantages of various methods of measuring body fat %
- Clinical applications
  - Wrestling
  - Weight management
Body Composition: Why?

Athletic community thinks body fat % is important for performance.
- Use it to guide training
- Assessment of fitness level
- Inefficient to carry extra fat for endurance events
  - Ultradistance marathons: women outperform men

Medical Community: Uncertain
- Too low/ high \(\rightarrow\) Health problems
- Essential fat is important
- Doesn’t predict medal winners
- Misperceptions
Body Fat % Measurement

Direct vs Indirect

Direct

Solvent Extraction

- Weigh the subject
- Grind up the subject
- Mix the puree
- Use solvent to remove all of the fat
- Weigh the fat
- Calculate the true % fat
- Any volunteers??
What is the best test?

- There is NO CURRENT GOLD STANDARD
- Underwater weighing was the old gold standard
Indirect Measures: Lab

- **Hydrostatic weighing (HW)**
  - Old Gold Standard: +/- 2%
  - Technician skill
  - Comfort with H₂O & exhale ability

- **DXA**
  - Small radiation exposure / Tech skill

- **BodPod**
  - Air displacement
  - Wear swimsuit
  - 5 min
Indirect Measures: Lab

- MRI
  - Expense
  - Timing consuming
- CT
  - Radiation
- Ultrasound
- Lipometer
- Whole body K+
- Others
Indirect Measures: Field

- **Bio-impedance**
  - Fluid dependent
  - Premeasurement protocol
  - Conflicting results in athletes

- **Skin Calipers**
  - Poor inter-rater reliability
  - Uncomfortable
  - Does not measure deep fat
Indirect Measures: Field

- Near Infra-red
  - Fast
  - Not fluid dependent
  - No pretest protocol
  - Fat is not pinched
  - Older models may overestimate in athletes
BMI in Athletes

- Not recommended by the IOC
- Numerous studies showing discrepancy between BMI & Body fat %
  - Athletes weigh more
CLINICAL APPLICATIONS
1997: 3 college wrestling deaths due to cutting weight

http://www.ncaa.org/about/resources/media-center/news/wrestling-away-troubled-past

NCAA finally changes wrestling rules

Minimal wrestling weight

Weight when body fat % = 5% & urine SG is < or = 1.020

Certified wt class: determined early

Many State HS have followed suit
WT MANAGEMENT

Athlete needs to lose or gain weight

Who determined this?
Is it true?
How much?
Performance vs Health issues
Weight is easy to manipulate
Body composition is more meaningful
Limitations of BMI in athletes
Co-morbid conditions
What is a good body fat%?

- Avg Body Fat % by DXA in 45 female D1 athletes = 25.8 +/- 5.6%  
  Esco J Strength Cond Res Oct 2014

  - 20 sports males & females
  - DXA body fat %, BMI, Ht & Wt etc
  - Some # are small or zero (ie female soccer)
  - Tanner V & workout 10 hrs or >/wk
  - X-country & sprinters are combined
20 yo healthy female swimmer w/ high BMI per coach. “She needs to lose weight.”

- Wt 165 lbs
- Ht 5 ft 6 in
- BMI: 26.6
- Body fat % by DXA = 15%

Recommendation?
CASE 2

19 yo female distance runner wants to lose wt to run faster

- Ht 5 ft 4 in  Wt 110 lbs  BMI= 18.9
- Body fat % bod pod = 10%

What is your recommendation?
THANKS!!