Body Composition In Clinical Practice

THE ADDED VALUE OF BODY COMPOSITION AT DIAGNOSIS AND FOLLOW-UP IN CHRONIC DISEASE

C. Prado (CA)
The added value of body composition at diagnosis and follow-up in chronic disease

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Disclosures

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Learning Objectives

• Discuss the advantages of body composition over body weight or BMI
• Discuss the clinical indications of abnormal body composition (including sarcopenic obesity)
• Discuss their use and importance for follow-up and outcome
BMI vs. Body Composition
BMI Limitations
BMI vs. Body Composition

- BMI is an easy, simple assessment
- Generally accepted as an overall predictor of morbidity and mortality
- Its main limitation is due to differences in body composition
Summary

BMI, as the traditional tool for assessing malnutrition and obesity, is not appropriate to accurately differentiate between important body weight components and therefore should not be used for making clinically important decisions at the individual patient level.
KEY POINTS

• BMI has a good correlation with % body fat at the population level, but the predictive value at the individual level is very limited.

• BMI use in clinical practice may jeopardize the nutritional diagnosis, in particular of malnutrition.

• BMI less than 30 kg/m² does not exclude the presence of metabolic risks associated with the excess of adiposity.

• BMI at least 30 kg/m² does not exclude the presence of low muscle mass (sarcopenic obesity), mainly in some clinical situations as in elderly, cancer, chronic diseases and critically ill patients.
Relevance of Body Composition Assessment
Benefits of assessing body composition in chronic disease

Monitor disease progress

Monitor treatment efficacy

Monitor body fat/muscle mass

Predicting risk and allowing timely interventions to halt/correct abnormal BC

Improve patient outcomes

Predict risk or outcome

Tailor nutrition
E.g. energy requirements, fluid requirements

Tailor treatment
E.g. dialysis dose, drug dose

Adapted from: Wells and Fewtrell. Arch Dis Child. 2008;93(2);168-172.
Skeletal muscle mass: an important metabolic organ

Strength & Power

Mobility

Posture & Balance

Regulates Blood Glucose

Stores Proteins

Inter-organ crosstalk
Loss of Muscle Mass - Trajectory

10% Loss
Physical impairment
No wound healing

20% Loss
Impaired immunity
↑ infection

30% Loss
Weakness
↓ Healing

40% Loss
Death

No wound healing
Trajectory
Impaired immunity
No wound healing
Weakness
↓ Healing
Death
Low Muscle in Individuals with Obesity (Sarcopenic Obesity)

The worst case scenario “the confluence of two epidemics”
R. Roubenoff

*BMI: Body Mass Index
Selected examples
Abnormal body composition is present across the continuum of care

Population Health

Long-Term Care

Primary Care

Chronic Disease

Acute Setting

Low muscle mass in a cohort of people seeking obesity treatment

• Individuals with obesity (Class II/III)

• Initial visit to the Obesity Specialty Clinic (Edmonton, AB)

  • N = 120
  • Age = 46 ±11 years
  • BMI = 44.7 ± 6.3 kg/m^2

Variable body composition

![Graph showing the relationship between lean mass (kg) and body mass index (kg/m²) for females and males. The graph is based on data from Johnson-Stoklossa et al. J Nutrition and Metabolism, 2017: 7307618.](image-url)
Low muscle mass in a cohort of people seeking obesity treatment

- Low muscle mass: ~25%

- Low muscle mass:
  - Higher triglycerides
  - Use of anti-hypertensive medications
  - Inactivity
  - Greater self-reported difficulty with ADL

ADL: Activities of daily living.

Items for difficulty with activities of daily living

- No Difficulty
- 1. Transfers*
- 2. Falls*
- 3. Wash Body
- 4. Skin Problem
- 5. Wipe Self
- 6. Dress Self*
- 7. Tired-Housework
- 8. Tired-Leisure*
- 9. Excess Skin*
- 10. Access Rooms
- 11. Footwear

* p<0.005

Low muscle
Normal
Low Muscle Mass in Chronic Pancreatitis

- Prospective cohort study
- Chronic pancreatitis outpatients (n=182)
- 17% sarcopenia
- During follow-up, sarcopenia was associated with:
  - ↑ number of in-hospital days

Low Muscle Mass in Chronic Pancreatitis

HR 6.7 [95% CI; 1.8-25.0]; p=0.005

ABNORMAL BODY COMPOSITION & SURVIVAL


- N=3276, stage I–III CRC, ages 18-80

68% Excess body weight
40% Low muscle mass
Explaining the Obesity Paradox: The Association between Body Composition and Colorectal Cancer Survival (C-SCANS Study)

Cancer Epidemiol Biomarkers Prev. 2017; 26:1008-1015

Survivor Function Estimate

Overall log-rank p=0.01

31% increased risk of death

#At risk:

Normal

- 1882
- 1786
- 1647
- 986
- 320
- 0

Low muscle mass

- 1394
- 1246
- 1109
- 654
- 236
- 0

Cancer from [Epidemiol Biomarkers Prev. 2017; 26:1008-1015]
Kaplan-Meier curves for body composition phenotypes and all-cause mortality.

<table>
<thead>
<tr>
<th>Body composition phenotypes</th>
<th>Normal</th>
<th>1251</th>
<th>239</th>
<th>HR (1.10, 1.61)</th>
<th>Referent</th>
<th>134</th>
<th>HR (1.13, 1.88)</th>
<th>Referent</th>
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<tbody>
<tr>
<td>Low muscle</td>
<td>925</td>
<td>272</td>
<td>1.33</td>
<td></td>
<td>144</td>
<td>1.46</td>
<td>(1.01, 1.64)</td>
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<tr>
<td>High adiposity</td>
<td>925</td>
<td>221</td>
<td>1.21</td>
<td></td>
<td>123</td>
<td>1.28</td>
<td>(1.00, 1.64)</td>
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<tr>
<td>Low muscle and high adiposity</td>
<td>161</td>
<td>56</td>
<td>1.40</td>
<td>(1.03, 1.90)</td>
<td>32</td>
<td>1.79</td>
<td>(1.20, 2.67)</td>
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</table>
Low skeletal muscle mass has become a well-defined factor for adverse clinical outcomes pre- and post-liver transplantation.

Emerging evidence has suggested the prognostic significance of myosteatosis in predicting mortality and overt hepatic encephalopathy in patients with cirrhosis.
COPD

• The prevalence of low muscle mass in stable COPD was reported to be 15% to 25% in previous studies and 25% in a Korean study.  

  Kim et al. J Bone Metab. 2019;26:65-74

• Among N=2548 participants with COPD (ECLIPSE study), those with sarcopenic obesity had worse physical performance and higher systemic inflammatory burden.

Abnormal body composition is independently associated with Cardiorespiratory fitness & muscle strength in heart failure

Coexistence of Abnormalities

CHD: Coronary heart disease
CVD: Cardiovascular disease

Osteoarthritis

Pre-existing deficits in hip muscle strength were accentuated over 12-months.

Lower extremity lean mass (p < 0.01), thigh muscle area (p = 0.03), and thigh muscle density (p < 0.01) were lower in hip OA compared to controls.

Low muscle mass

- Physical impairment / disability
- Greater length of hospital stay
- Need for rehabilitation
- Post-operative complications
- Poor QoL
- Tumor progression / toxicity
- Shorter survival

QoL: Quality of life.
Going forward: relevance to clinical setting
Body Composition in Clinical Settings

- Health Outcomes
- Improvements in Practice (e.g.: nutritional intervention)
- Prevention & Treatment
- Body Composition Analysis

Management pathway for identifying, assessing, and managing abnormal body composition

Screen and assess nutritional status:
- Utilize tools e.g.
  1. Malnutrition Universal Screening Tool (MUST)
  2. Subjective Global Assessment (SGA)
  3. Mini Nutritional Assessment (MNA)

Assess/estimate muscle loss:
- Measure muscle mass e.g.
  1. Bioelectrical impedance analysis (BIA)
  2. Dual energy X-ray absorptiometry (DXA)
- Muscle function and strength tests

Implement management strategies:
- Nutritional support: adequate energy and high protein
- Oral nutritional supplement (ONS): HMB, Vit.D, omega-3
- Exercise: resistance training, adaptation needed

Monitor/intervene
Muscle mass can be changed. Anabolism is similar to healthy young adults.

Low muscle mass is reversible even in older adults with deconditioning, inflammation and concurrent comorbid conditions.

Muscle mass assessment in clinical setting: new perspectives

- Availability of body composition techniques → still limited
- Emerging value of assessing muscle mass and mitigating muscle loss → recognition for adequate patient assessment, monitoring and treatment

“a surge of technological developments and financial investments is anticipated”

Summary

• Low muscle mass with and without obesity is a hidden condition.
• BMI does not depict body composition and should not be used for making clinically important decisions at the individual patient level.
• Abnormalities in body composition are independent and strong prognostic indicators for a variety of chronic conditions.
• Body composition assessment is an evolving field. Recognition for adequate patient assessment, monitoring and treatment is evident and so is the need for a change in clinical practice.