Value of BIA in the Nutritional Care of Oncology Patients

Allison Cazenave, RDN, CSO, LDN, ONC, IFNCP, CLT, CNGS

Disclosures

- Allison Cazenave RDN, CSO, LDN, ONC, IFNCP, CLT, CNGS is employed by Ochsner Health System.
  - Allison is an InBody Academy Certificate holder.

Objectives

- The participant will be able to name two nutritional challenges unique to oncology patients.
- The participant will be able to understand the value of BIA in oncology patients compared to other available methods.

Nutritional Status of Oncology Patients

- **Influences**
  - Disease prognosis & risk of reccurrence
  - Treatment tolerance
  - Quality of life

Excess Adiposity

- The World Cancer Research Fund and American Institute for Cancer Research report that multiple types of cancers have been determined to have sufficient, convincing/probable evidence associated with having excess adiposity.

Disease sites include

- Postmenopausal breast
- Endometrial
- Esophagus: adenocarcinoma
- Colon and rectum
- Corpus uteri
- Gallbladder
- Gastric cardia
- Kidney: renal cell
- Liver
- Meningioma
- Mouth, larynx, pharynx
- Multiple myeloma
- Ovary
- Pancreas
- Prostate
- Thyroid

Oncology Nutrition for Clinical Practice. 2021; pg 38

Adiposity-Related Mechanisms

- Pathological features contributed with obesity can promote
  - Tumor growth
  - Metabolic syndrome
  - Hormonal imbalances
  - Chronic low-grade inflammation

There may be individuals with an elevated BMI who are metabolically healthy.

There may be individuals with an elevated BMI who are metabolically unhealthy.

Oncology Nutrition for Clinical Practice. 2021; pg 38

Malnutrition

- Malnutrition is defined as
  - A state of nutrition in which deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measurable adverse effects on tissue/body from (body shape, size, and composition) and functional and clinical outcome.
  - May or may not be associated with cancer cachexia syndrome

- **Consequences of malnutrition within oncology:**
  - Impaired immune response
  - Reduced muscle strength
  - Increased fatigue
  - Impaired wound healing
  - Reduced quality of life
  - Reduced response to prescribed oncology treatment
  - Potential increase in the cost of health care and length of hospital stay

Oncology Nutrition for Clinical Practice. 2021; pg 59

Nutrition-Related Conditions

- Malnutrition
  - Acute and chronic
    - Moderate
    - Severe
- Cachexia
  - Pre-cachexia
  - Cachexia
  - Refractory cachexia
- Sarcopenia
  - Sarcopenic obesity

Malnutrition, sarcopenia, and cachexia can be **present in patients with any BMI**, including obesity.

- They have been associated with cancer-specific poor outcomes such as poor performance status, increased treatment toxicity from chemotherapy and shorter time of tumor control.

Oncology Nutrition for Clinical Practice. 2021; pg 45

Monitoring more than just a “total weight” is important in **all patient populations.**

This includes individuals with excess adiposity along with individuals experiencing weight loss due to malnutrition.

The “total weight” isn’t able to tell you the whole story.

Methods Used to Monitor Body Composition

- **BMI**
- **Nutrition-Focused Physical Exam**
  - Can support diagnosis of moderate or severe protein-calorie malnutrition by assessing multiple criteria points
- **Body circumference**
  - Waist-hip ratio
  - Waist circumference
  - Skinfold thickness
- **Imaging Techniques**
  - CT (Computed Tomography)
  - DEXA (Dual Energy X-ray Absorptiometry)
  - BIA (Bioelectrical Impedance Analysis)

What is BIA?
(Bioelectrical Impedance Analysis)

- Bioelectrical impedance analysis (BIA) assesses a person's weight by breaking it down into fat, protein, and water by use of electrical current.

- Body composition analysis can measure specific indicators such as total body water, body fat mass, lean muscle mass, and body fat percentage.
  - When assessed together, these results can provide more **comprehensive, individualized** assessment of the patient's body composition and body health.

Use of BIA in Oncology

- When tracking a patient's weight trend with a generic scale, it is impossible to differentiate what changes are really occurring.
  - Is your patient gaining/losing muscle mass?
  - Is your patient gaining/losing fat mass?
  - Is your patient retaining fluid?

Using BIA within oncology care provides the ability to assess for loss of muscle mass and fluid changes. Both of which can also impact delivery of chemotherapy and other anti-cancer drugs.

Medical Grade BIA Options

Opportunities For Use in Oncology

Prevention

- Can be used at preventative screenings.
- Can be used in high-risk clinics.
- Can be partnered with GLP1 medications for risk reduction.

Before/During Treatment

- Can be used for cancer types with a high risk of weight loss prior to treatment (H&N, lung, esophageal, gastric, pancreatic, etc.).
- Can make individualized nutrition recommendations/goals during treatment based on body composition changes.

After treatment

- Can use post-treatment to help monitor body composition trends in patients who will need to transition from enteral nutrition, to oral nutrition supplements, and ultimately to a whole food diet.
- Can be used in to help monitor & improve body composition post-treatment with the goal of improving QOL.
- Can pair with a physical fitness program and/or PT.

Opportunities For Use in Oncology

Surgery

- Can be used as a part of an ERAS protocol to monitor muscle-related changes.
- Use before and after surgery to help promote optimal health and improved healing.

Survivorship/Integrative Oncology

- Can be used in patient populations who have a higher risk for recurrence with increased body weight (breast, prostate, colorectal, endometrial, etc.)
- Can be partnered with comprehensive weight management program (GIP & GLP-)
    - Weight gain/challenges associated with hormone therapy (AI's, SERM, ADT, etc.)
    - GIP & GLP-1 medications can support meaningful weight loss to help improve survivorship
        - Aiming for </=1-2# weight loss per week.
            - Goal to support body fat loss while preserving lean muscle mass

Research

- Can be used to assist with clinical studies correlated to patient's physical changes.

How to Conduct BIA Test

- Remove socks & shoes.
- Wipe the bottom of feet and hands with an electrical conductivity tissue to improve conductivity.
- Step onto the scale, aligning feet with electrodes.
- Stand still allowing weight to be measured. Do not hold handles.
- Enter height, age, and gender onto the keypad.
- Reach for handles. Place your thumb on the electrode.
- Ensure proper positioning. Arms should not be touching the side of the body.
- Avoid distractions while the assessment is taking place. Try to minimize talking and moving.
- Step off scale.
- Place socks & shoes back on.

InBody Academy; InBody 270

Suggestions For Use

DO maintain your normal fluid intake the day before.

DO stand upright for at least 5 minutes.

DO remove any socks or pantyhose.

DO remove all heavy accessories like jewelry, watches, and jackets.

DO warm yourself up for 20 minutes in cold weather.

DO use the restroom.

DON'T eat or exercise for at least 3 hours.
DON'T consume alcohol or excess caffeine for at least 24 hours.
DON'T shower or use a sauna.
DON'T use lotion or ointment on your hands and feet.

InBody Academy; InBody 270

Limitations

- **Patient population**
  - It is strongly advised that you **avoid** BIA testing in patients who have a **pacemaker, defibrillator, or other similar devices**.
    - Unless you have prior approval from their cardiologist.
  - It is not recommended to complete tests on individuals who are pregnant.

- **Frequency**
  - Is not recommended to use it sooner than every 2 weeks.

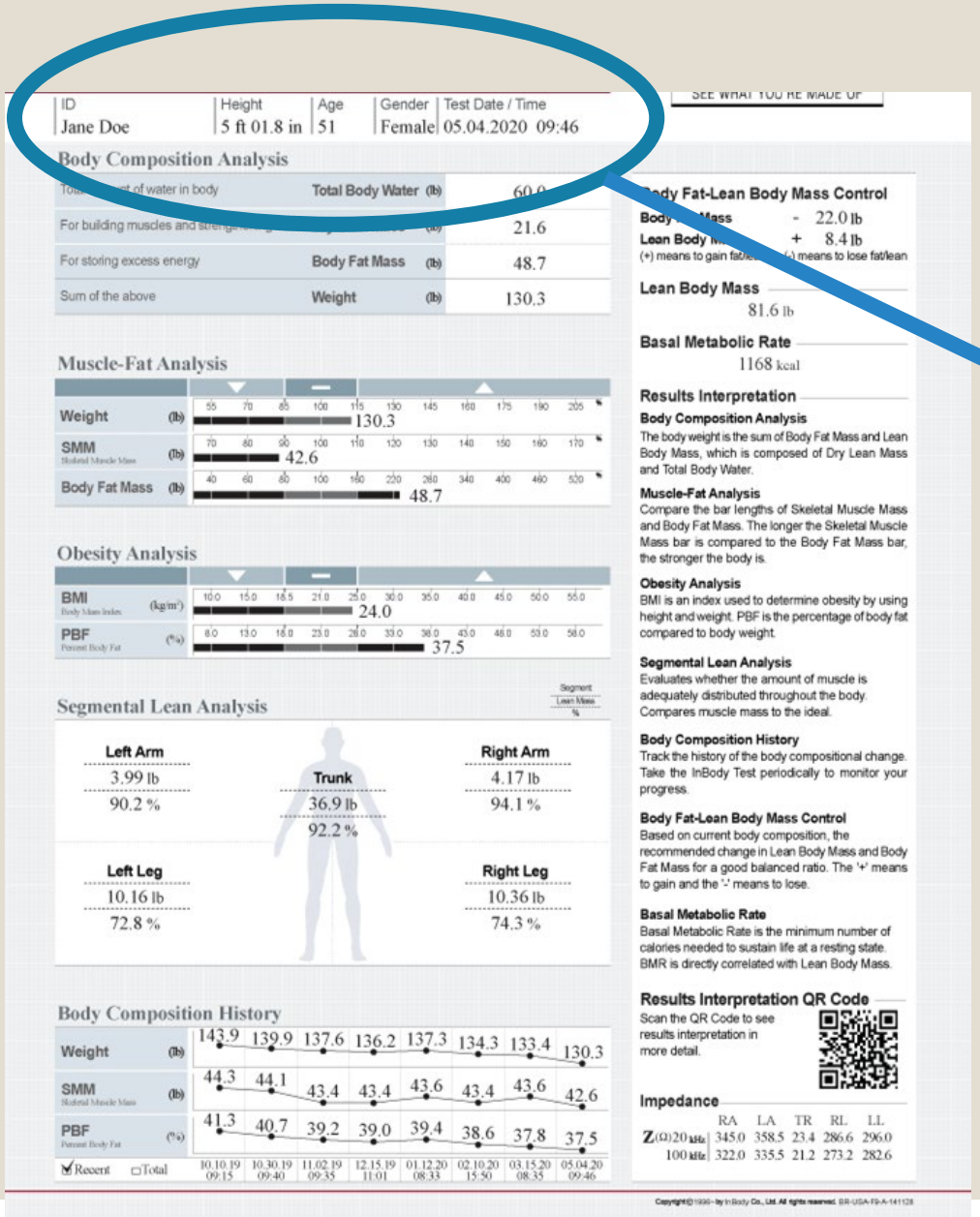
- **Physical capability**
  - The patient must stand on the scale for >/=1 minute.
    - It is not possible to complete BIA testing on individuals who have amputees or on individuals who cannot stand steadily.
  - The patient must be able to take socks and shoes off.

InBody Academy; InBody 270

Special Cases

- May experience skewed results with:
  - **Individuals on their menstrual cycle**
    - May have skewed results due to changes in the patient's body water weight.
    - You may still use the test to monitor over time.
  - **Individuals with breast implants**
    - The currents that are used within the BIA assessment are typically unable to penetrate the casing of breast implants.
      - This weight will then be added on to an individual's body fat mass.
    - Since this may be consistent from test to test, you may still use the test to monitor over time.
  - **Individuals with metal implants**
    - Metal is highly conductive which can cause an increase in lean muscle mass in the area where the metal is located.
    - Since this will be consistent from test to test, you may still use the test to monitor over time.

Interpreting Results



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SEE WHAT YOU RE MADE OF

Body Composition Analysis

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For building muscles and strengthening			21.6
For storing excess energy	Body Fat Mass	(lb)	48.7
Sum of the above	Weight	(lb)	130.3

Muscle-Fat Analysis

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Obesity Analysis

BMI (Body Mass Index)	(kg/m²)	24.0
PBF (Percent Body Fat)	(%)	37.5

Segmental Lean Analysis

Left Arm	3.99 lb	90.2 %
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Body Fat-Lean Body Mass Control

Body Mass - 22.0 lb
Lean Body Mass + 8.4 lb
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Lean Body Mass

81.6 lb

Basal Metabolic Rate

1168 kcal

Results Interpretation

Body Composition Analysis
The body weight is the sum of Body Fat Mass and Lean Body Mass, which is composed of Dry Lean Mass and Total Body Water.

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Personal Information:
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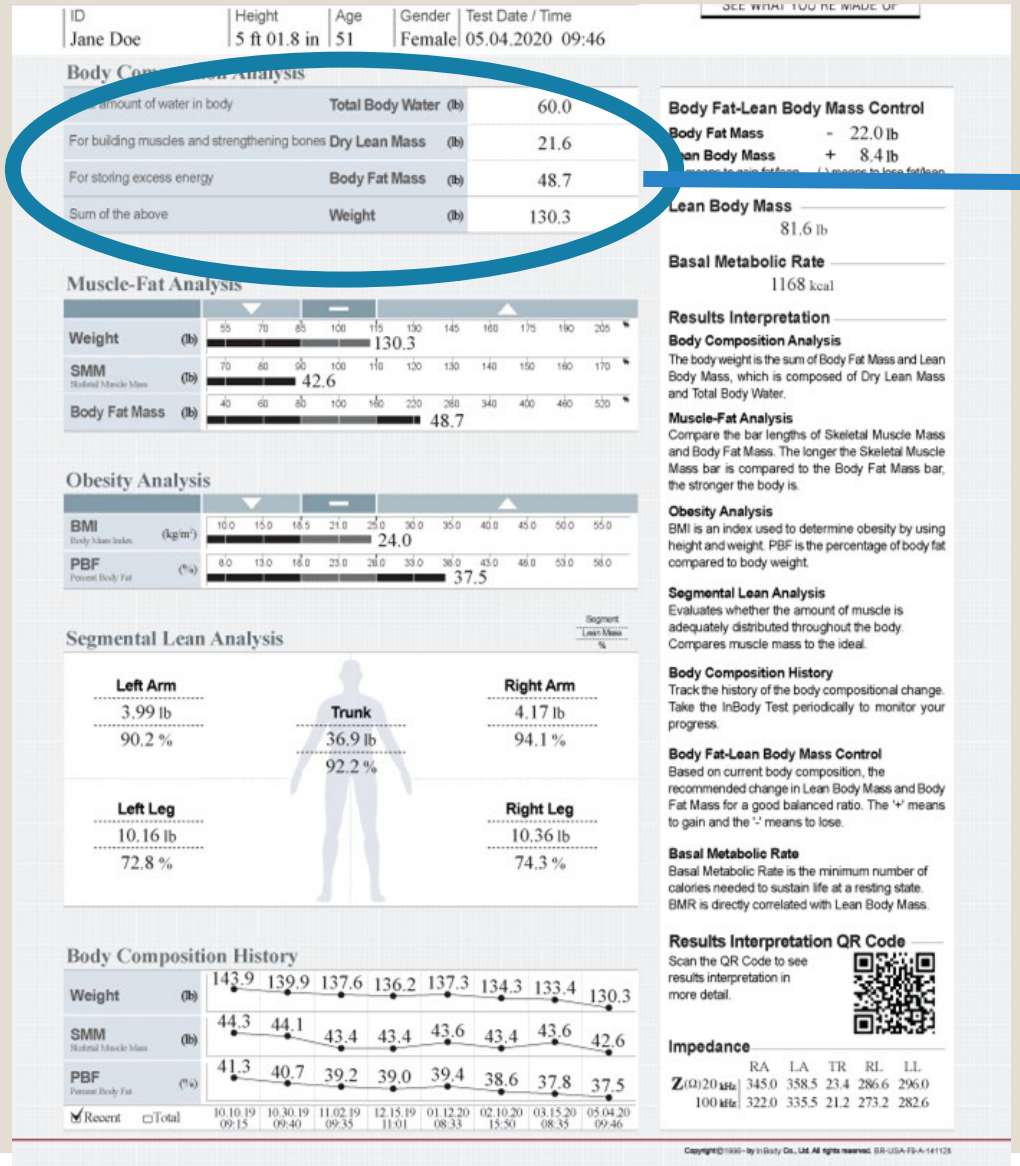
Height
Age
Gender
Date/Time

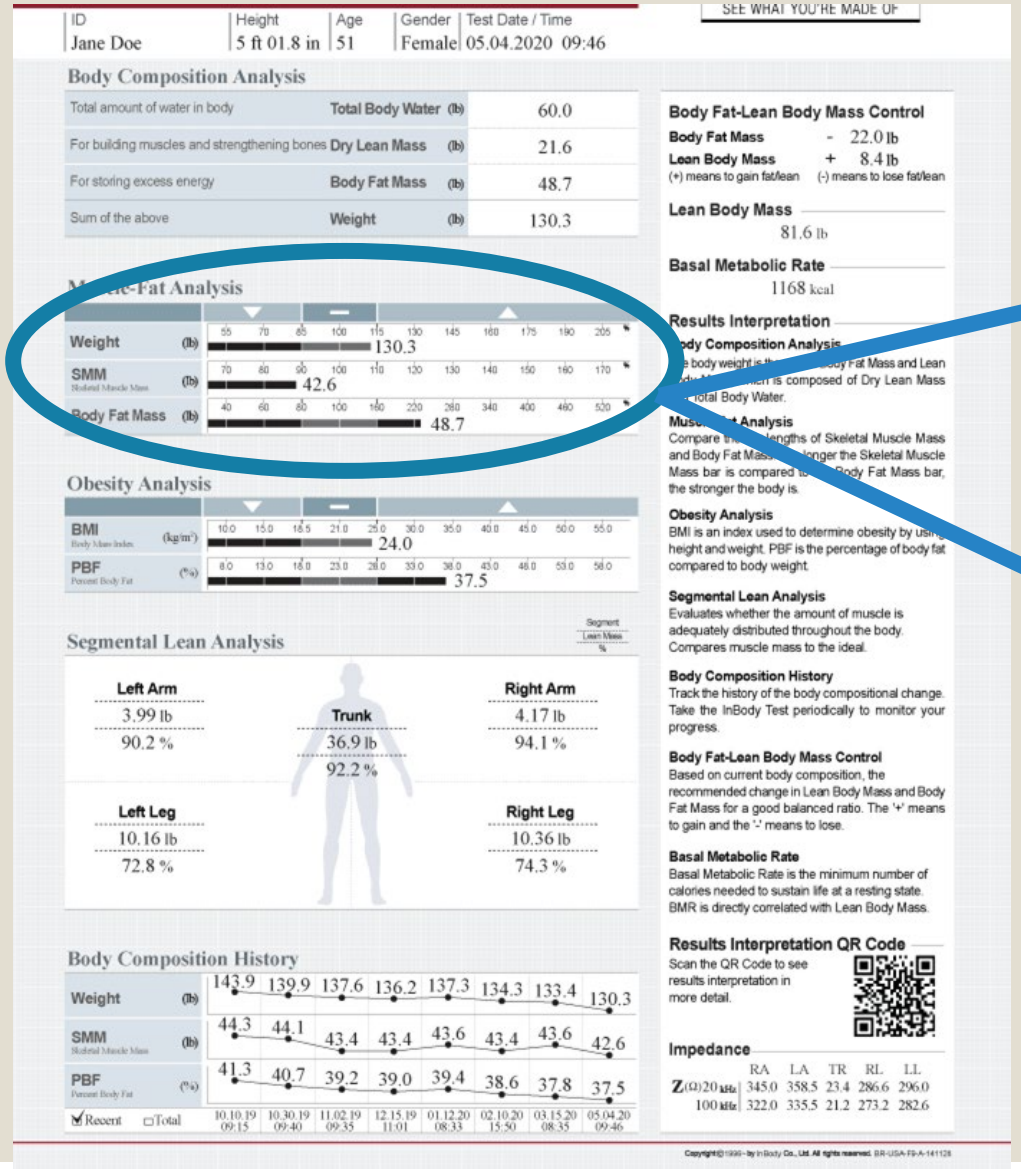


Body Composition Analysis

- **Total body water** – Pounds of water within the body
- **Dry Lean Mass** – Body weight that consists of protein, minerals, & muscles.
- **Body Fat Mass** – Total pounds of body fat within the body

When added together, these indicators equal the patient's total body weight.

InBody Academy; InBody 270



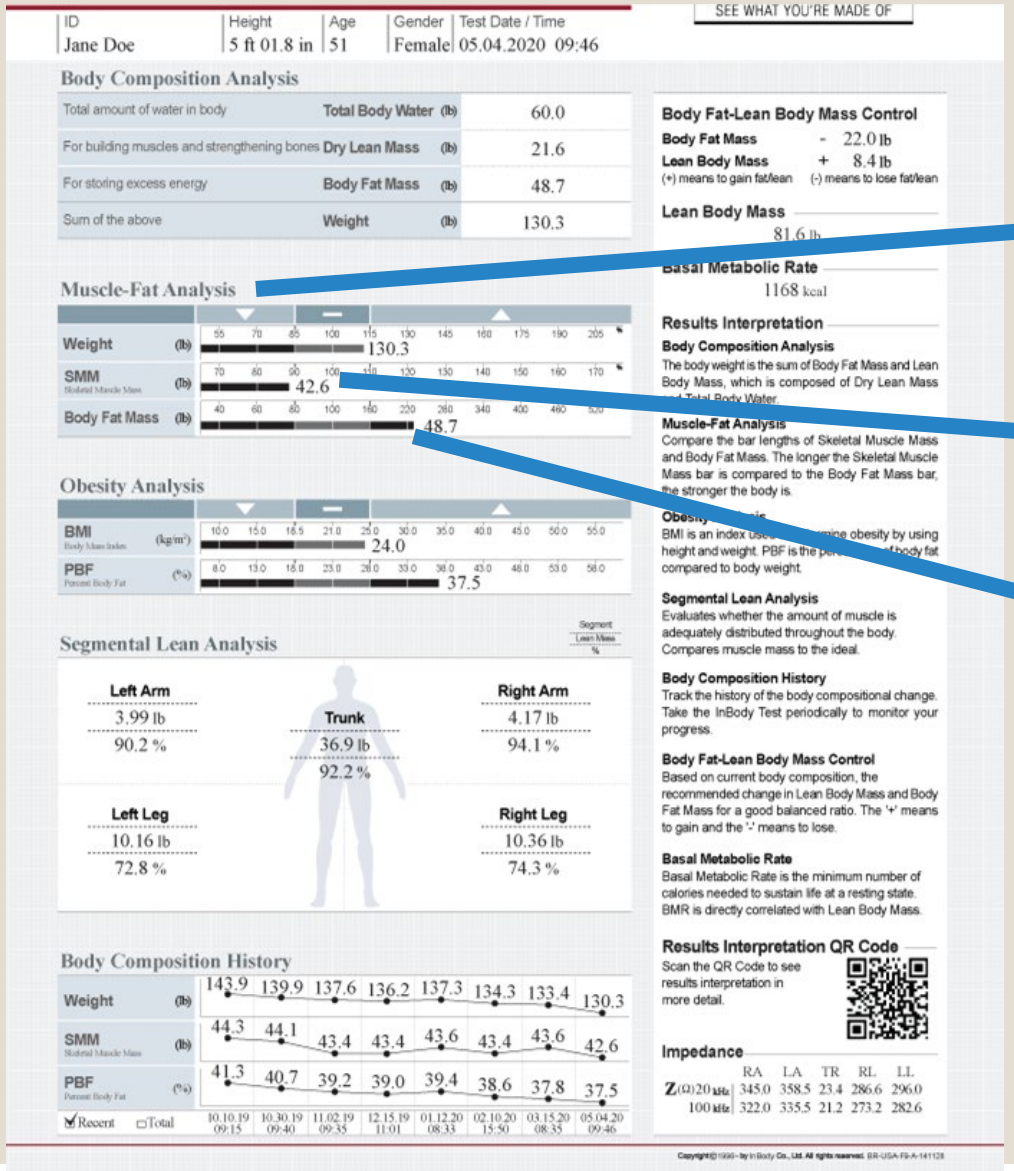
Muscle-Fat Analysis:
Shows the weight, skeletal muscle mass, and body fat mass in a chart form.

- **Weight** – The patient's total body weight.
- **Skeletal Muscle Mass** –The patient's muscle mass that is responsible for movement. This type of muscle can increase/decrease based on the patient's exercise and nutrition.
- **Body Fat Mass** – Total pounds of body fat.

InBody Academy; InBody 270

Muscle Fat Analysis:

- Reference ranges are based on the "average" for an individual of the same height and gender.



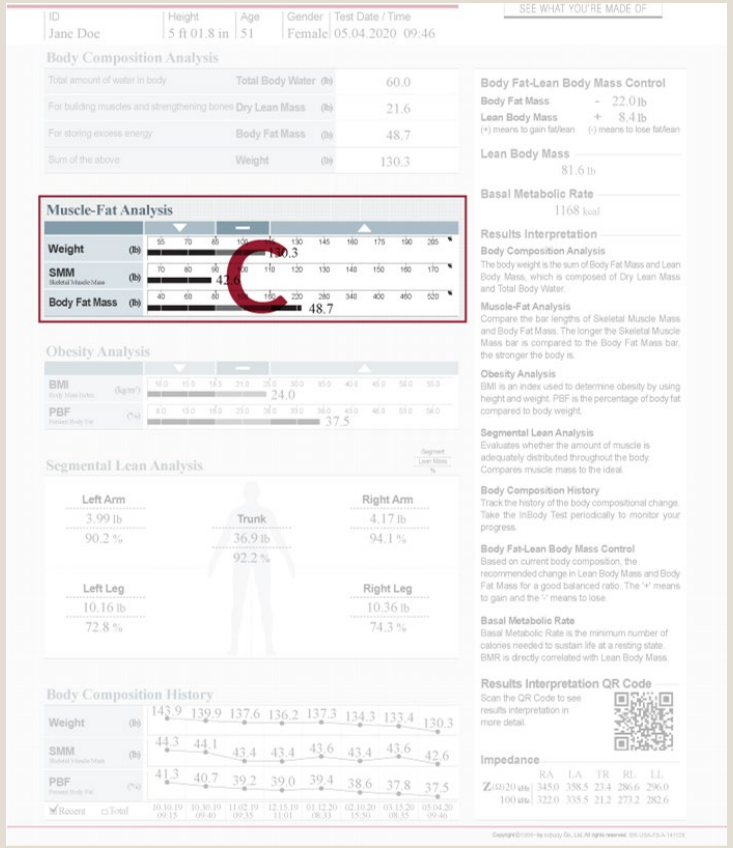
Below recommendation

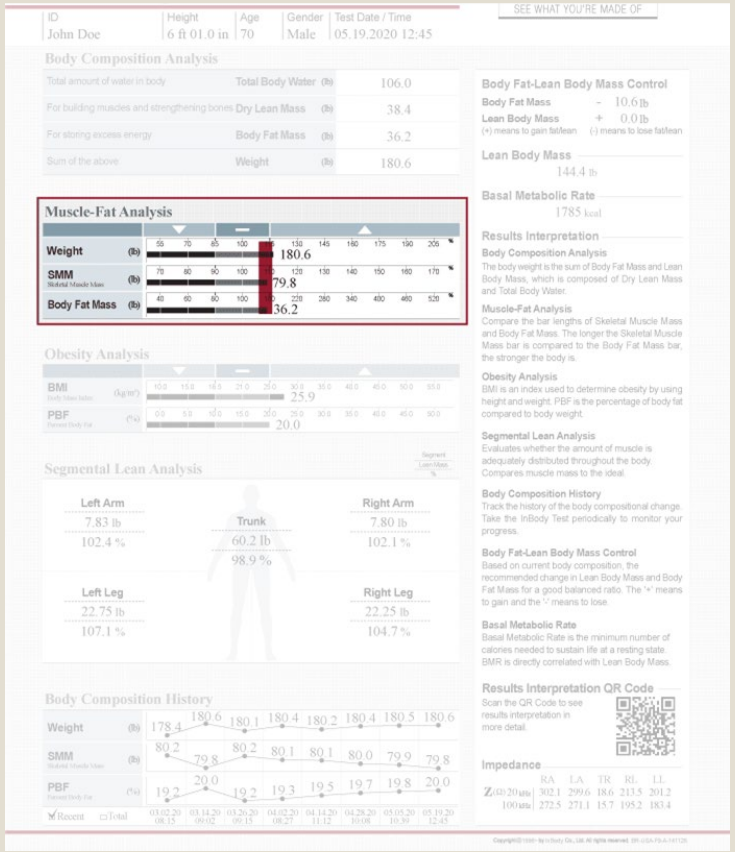
Within recommendation

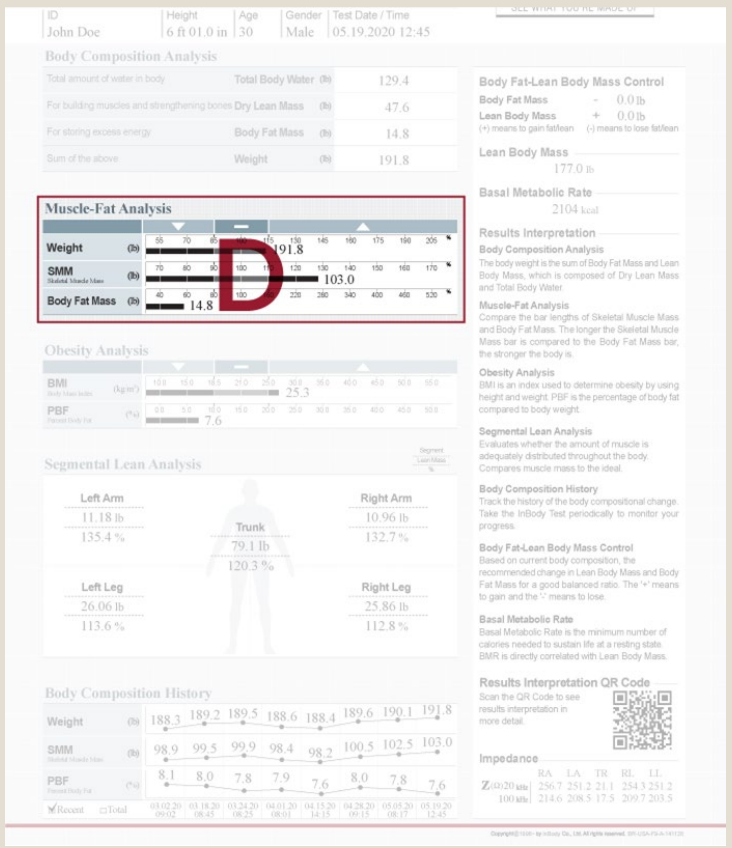
Above recommendation

InBody Academy; InBody 270

C, I, D Curve







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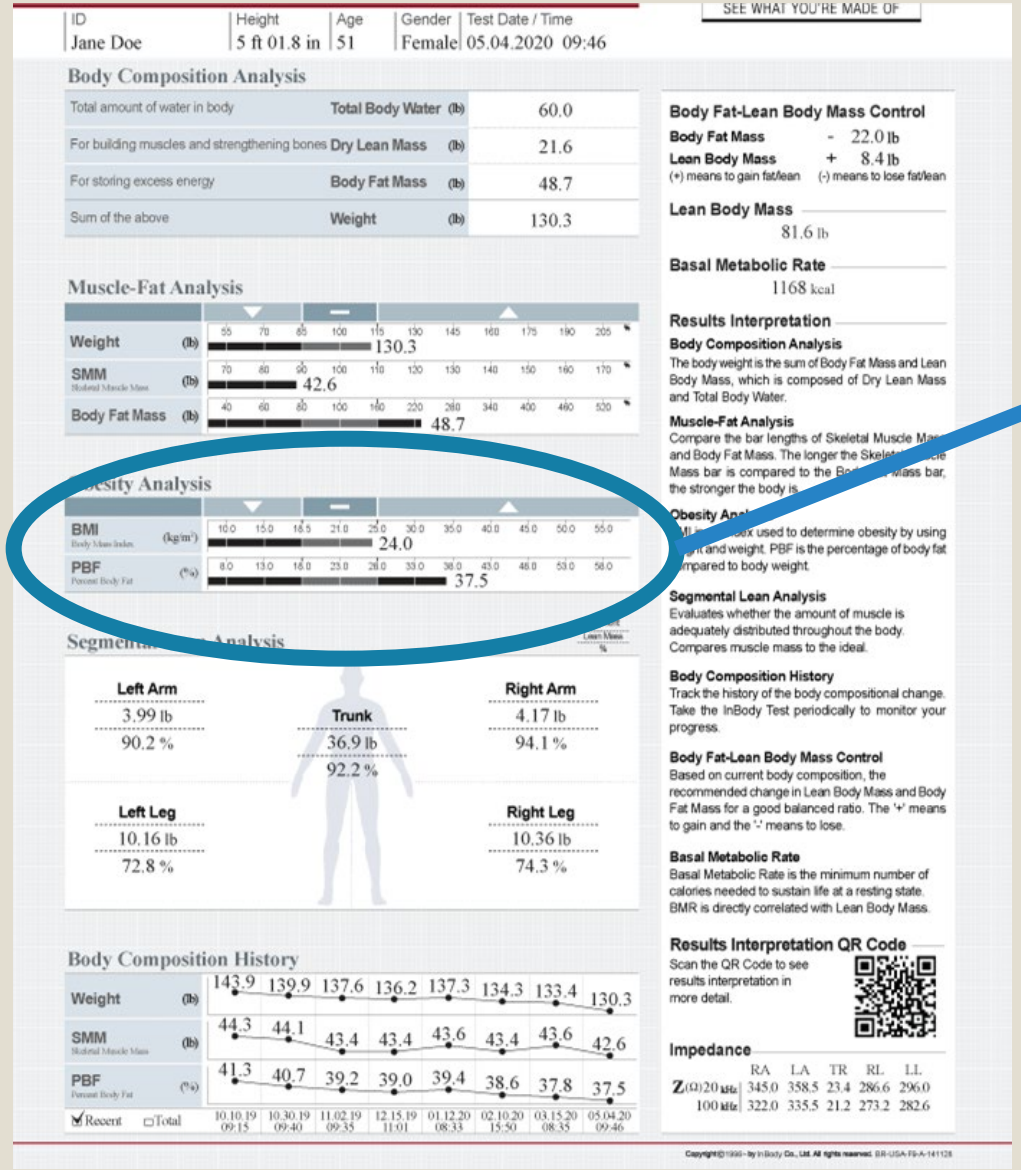
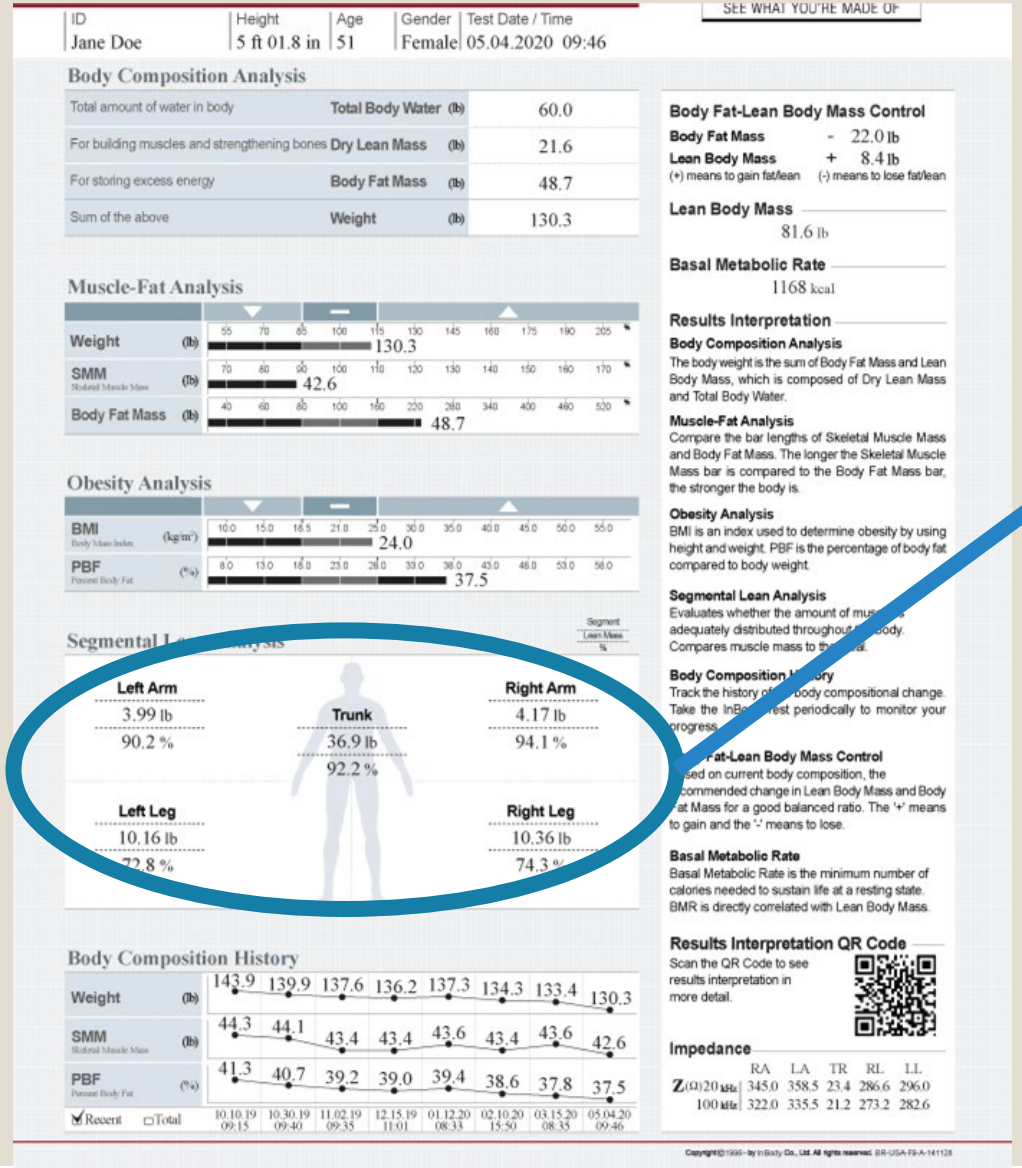


Obesity Analysis:

- **BMI (Body Mass Index)**– Determined via equation - total body weight divided by height squared.
- The BMI **does not allow** for a differentiation between fat or muscle mass content.

- **Body Fat Percent** – This assesses weight by showing muscle-to-fat ratio.
- This is **a better reflection** of a person's weight, body composition, and metabolic health.

InBody Academy; InBody 270



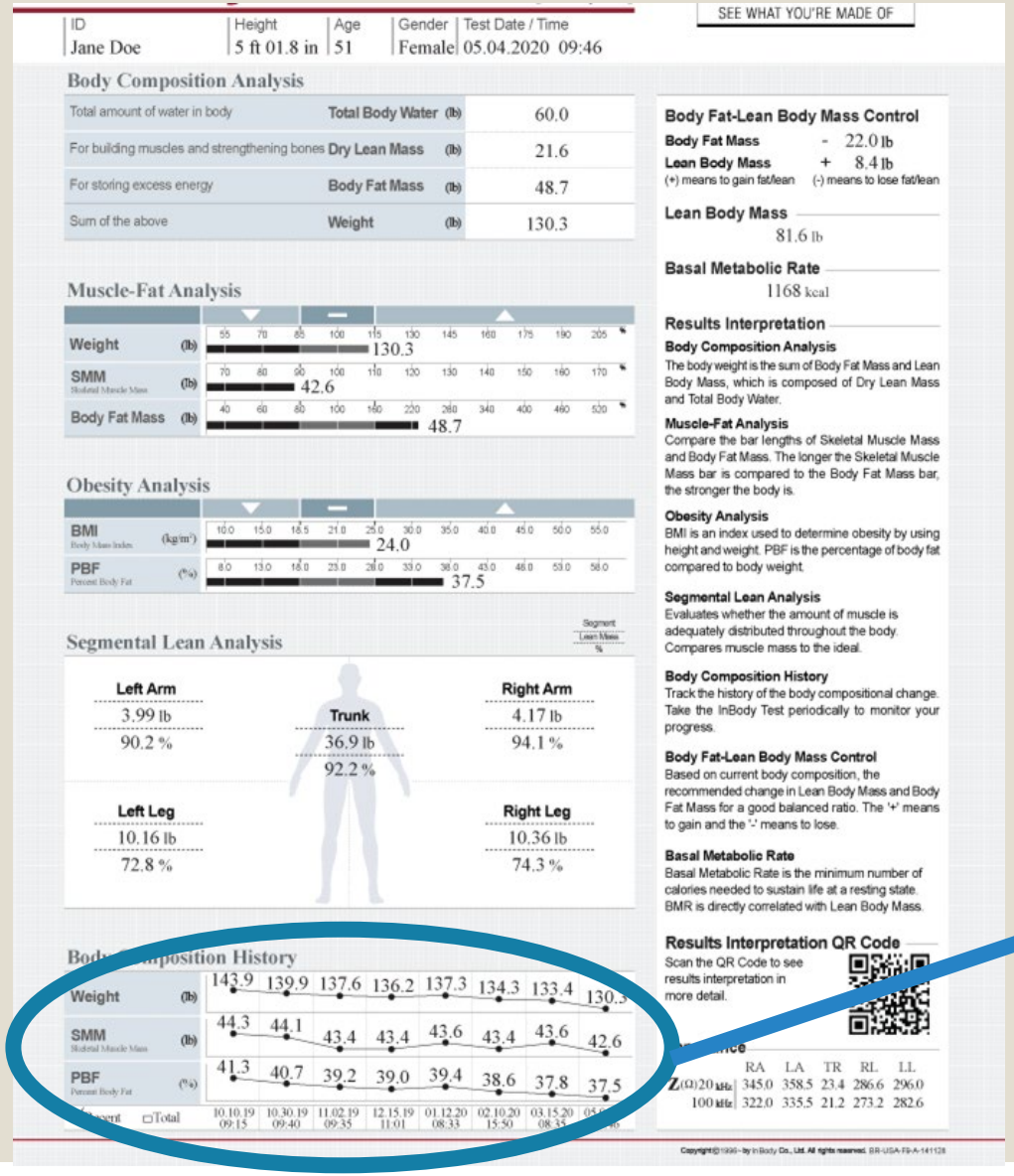
Segmental Lean Analysis:

Displays the lean body mass analysis in each segment of the body.

- **Top value** – Shows pounds of lean body mass is within each segment of the body.

- **Bottom Value (%)** –
- Assesses if the patient has enough lean body mass to support a healthy body weight. Shows if strength (#) in that segment able to support body weight.
- Can show imbalances – upper/lower and/or right/left

InBody Academy; InBody 270



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Current Total

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Lean Body Mass
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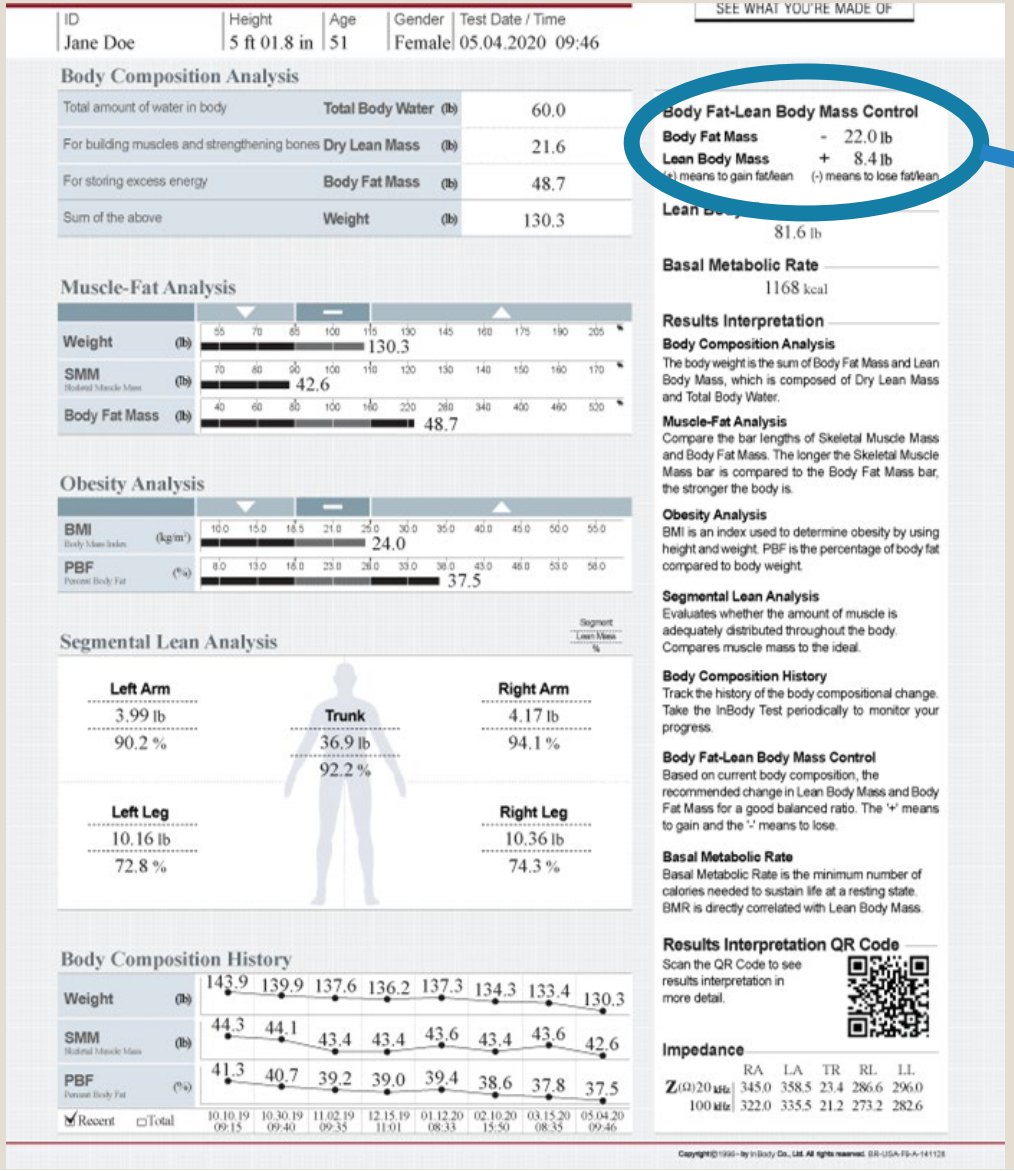
100 kHz	322.0	335.5	21.2	273.2	282.6

Body Composition History:

- Trends total body weight, skeletal muscle mass, and percent body fat.
- Quickly assesses body composition changes over the last 8 tests completed.

InBody Academy; InBody 270



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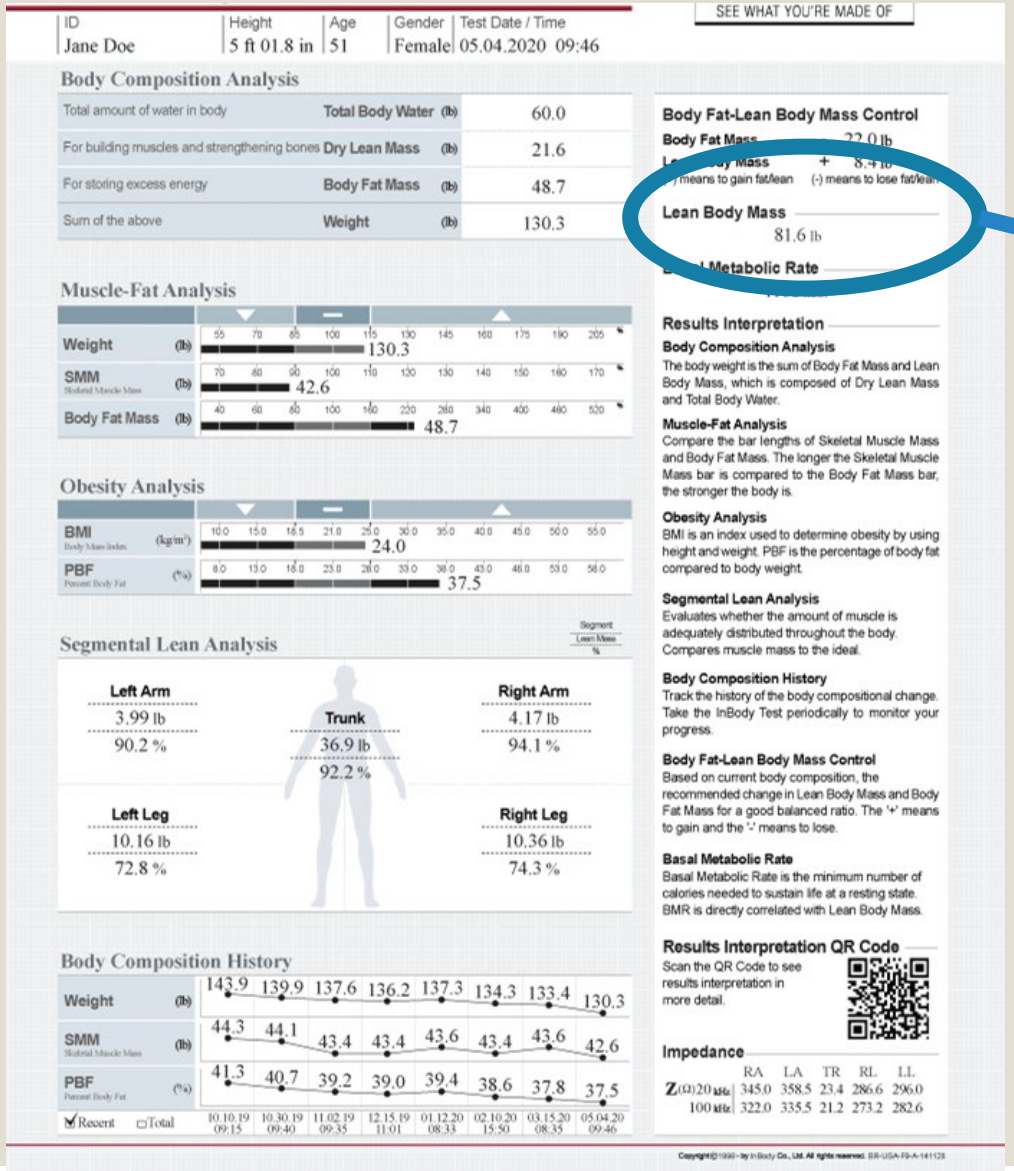
Body Fat-Lean Body Mass Control:

- This is a "goal guide".
- You can use this to provide **general** guidelines to help educate your patients on ways to achieve optimal body composition.

InBody Academy; InBody 270



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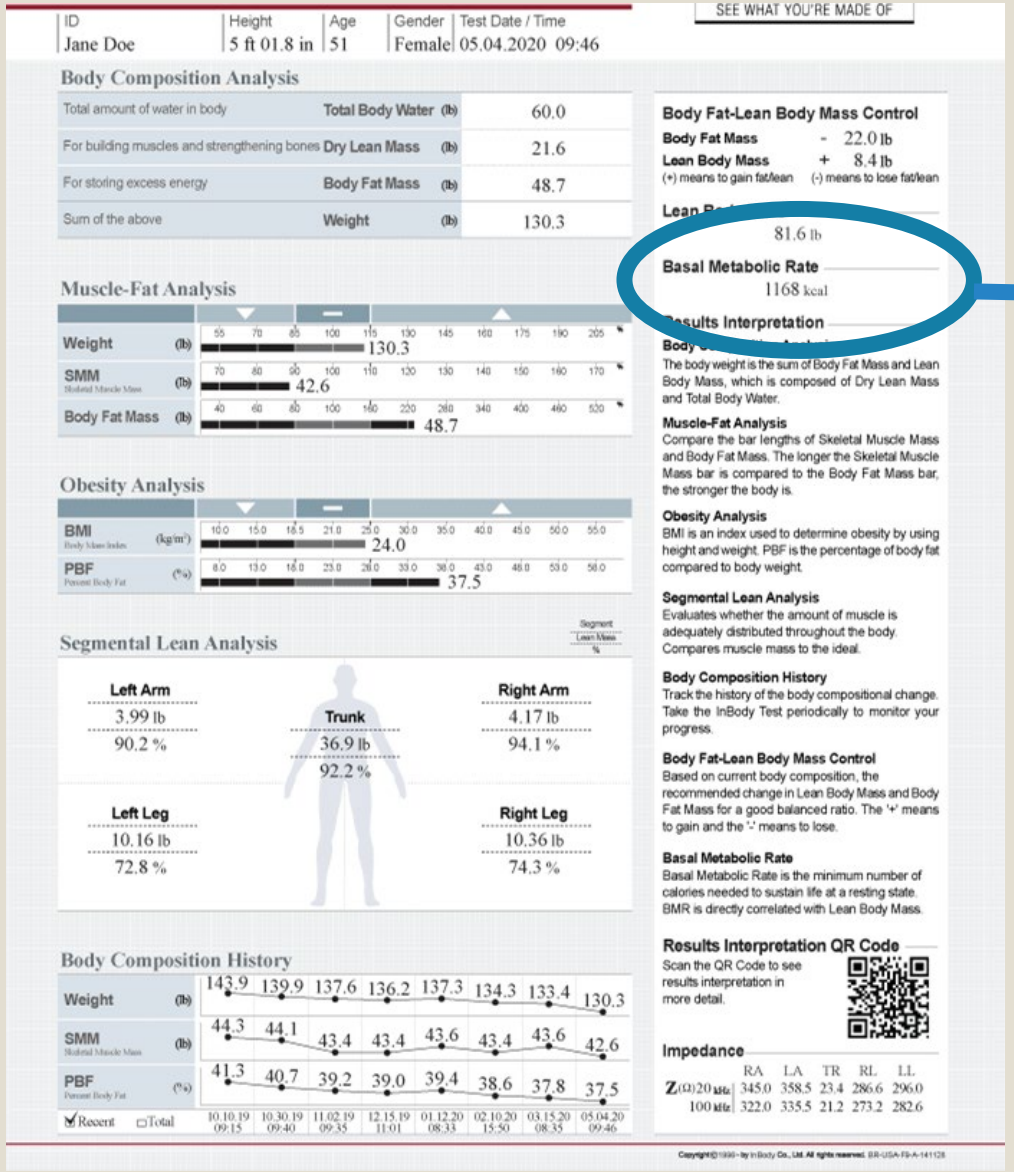
	RA	LA	TR	RL	LL
Z(Ω) 20 kHz	345.0	358.5	23.4	286.6	296.0
100 kHz	322.0	335.5	21.2	273.2	282.6

Lean Body Mass:

- This is the sum of total body water & dry lean mass.

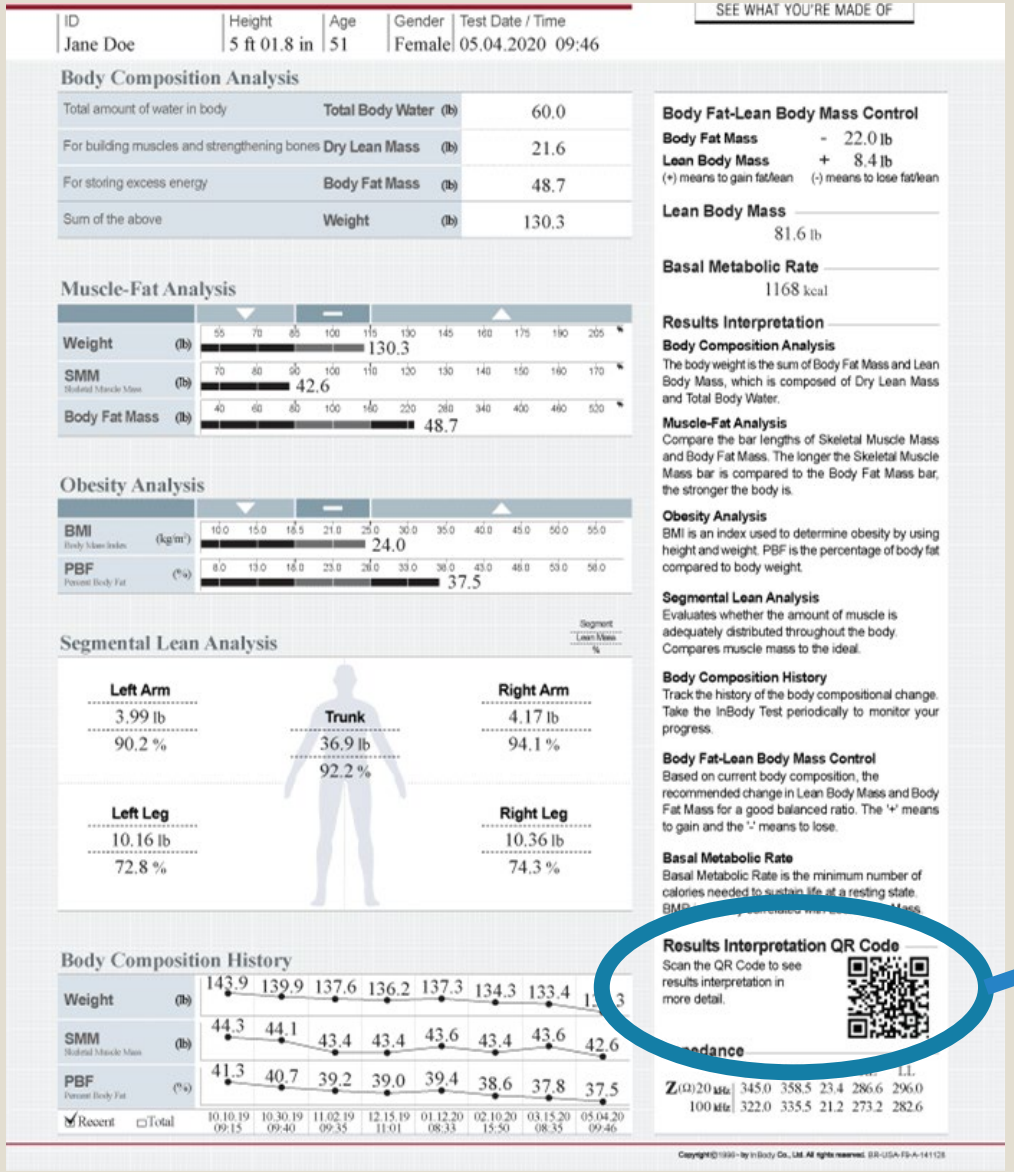
InBody Academy; InBody 270



Basal Metabolic Rate:

- This is the **minimum** amount of calories needed in a 24-hour period to perform essential functions at rest.
- The BMR does not include calories burned from daily activity.
- Is based on body composition, therefore is more accurate than predictive equations when estimating nutritional needs.

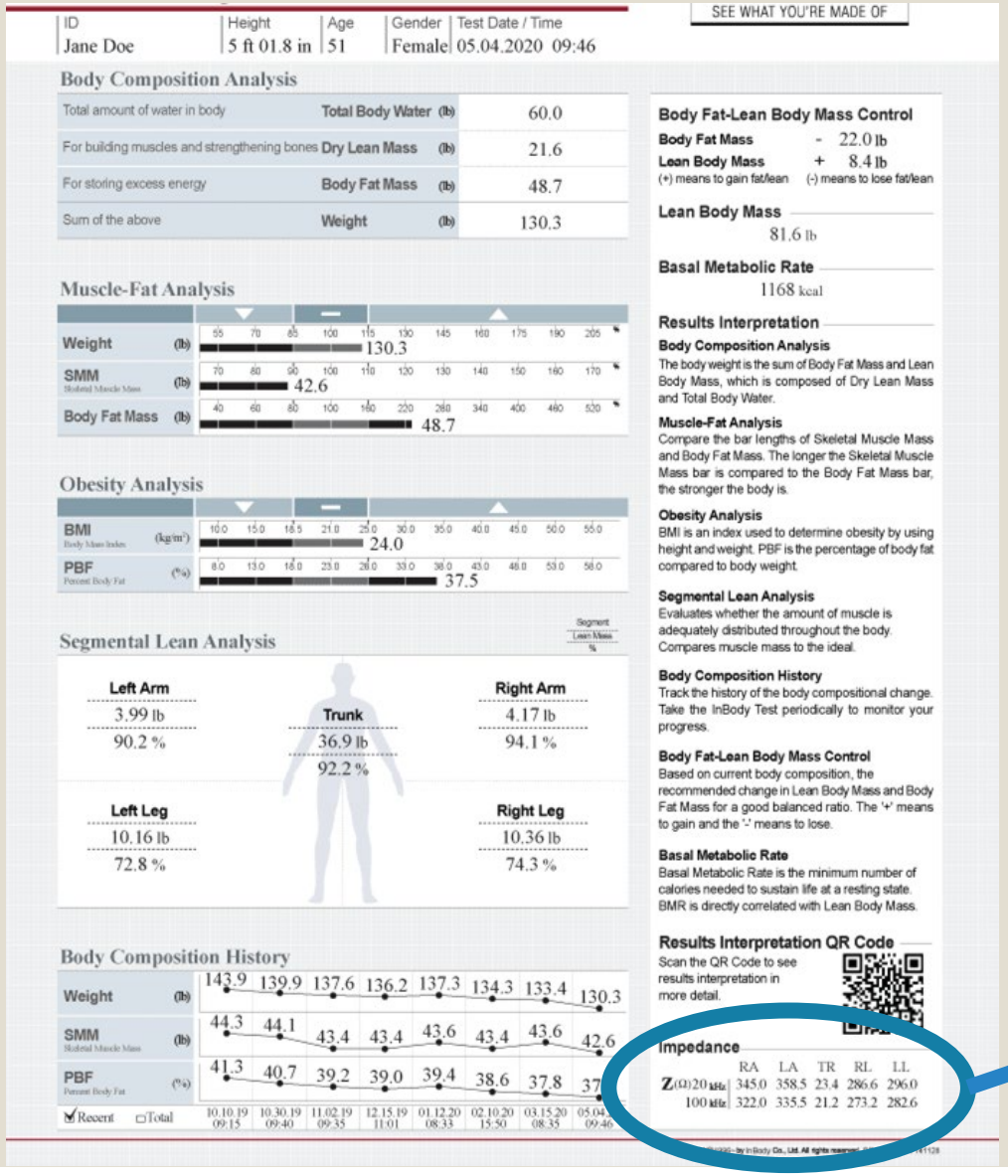
InBody Academy; InBody 270



Results Interpretation QR Code:

- This QR code brings the patient to the website to receive generalized guidance on results interpretation.

InBody Academy; InBody 270



Impedance Values:

- This section shows all measurements that are taken when completing a BIA assessment.
- If needed, it can be used to identify and confirm errors.

InBody Academy; InBody 270

Recap:

- Our goal as oncology dietitians is to provide nutrition support and guidance before, during, or after treatment to help the patient manage nutrition-related symptoms and maintain optimal health.

- When incorporating BIA into our nutrition assessments and nutrition interventions, the patient and the patient's care team have a better understanding of body composition changes taking place.
  - With this knowledge, we are better able to provide individual nutrition recommendations to help the patient minimize negative body composition changes.
    - If we can help minimize negative body composition changes, this will allow the patient to have a better chance of tolerating the prescribed treatment and receive their full treatment.

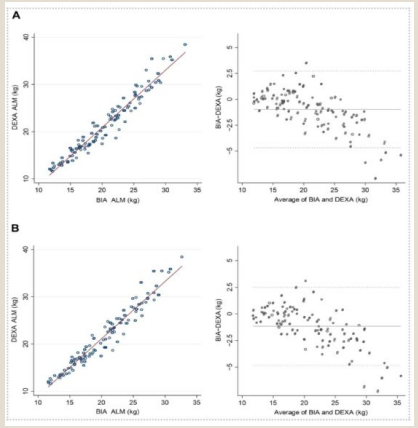
References

- Coble Voss, A., & Williams, V. (2021). *Oncology nutrition for clinical practice*. Academy of Nutrition and Dietetics.

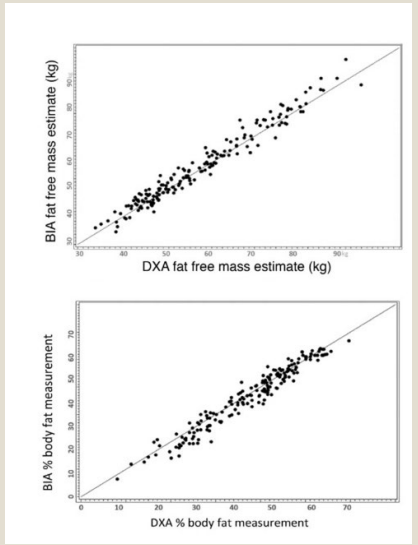
- InBody Academy; InBody 270 Lesson Plan

Validity Studies

- Study 1:
  - "Life journal in a July 2022 publication evaluated the newest InBody devices compared to dual-energy X-ray absorptiometry (DEXA) in a cohort of 109 individuals."
    - Findings: They found that high-frequency body composition devices (such as InBody) showed a "**high correlation with the DEXA results."**



- Study 2:
  - "Researchers from the Mayo Clinic compared InBody technology to DEXA, a body composition gold standard, for estimating fat-free mass and percent body fat in a 2020 study."
    - Findings: They showed that InBody had a **"98% correlation to DEXA and overall had good agreement amongst all BMI categories**."



- Study 3
  - "A 2020 publication from Nutrition in Clinical Practice evaluated the accuracy and reliability of InBody compared to computed tomography (CT) to assess skeletal muscle mass (SMM) in colorectal cancer patients."
    - Findings: They found that "**InBody SMM has very significant correlation to CT even after adjusting for age, weight, and BMI."**

- Study 4
  - "A 2019 study from the Journal of Functional Morphology and Kinesiology compared InBody 770 and DEXA for body composition changes in exercise-trained men and women after a 4-week program."
    - Findings: The study showed that the a high-frequency BIA device can **"predict changes in body composition similar to a DEXA."**
    - They suggested that the InBody's multiple point frequencies **"may be less subject to error and likely a superior method for the estimation of total body composition."**

- Study 5
  - "In a 2018 study published by the Journal of Sports Medicine and Physical Fitness, a team investigated the validity in an InBody device for predicting resting metabolic rate (RMR)."
    - Findings: The study found that InBody **"provides valid measurements of RMR when compared to gas analysis, the current standard."**
    - They stated that **"RMR values based on the InBody analysis was a valid, more practical, and less time-intensive alternative to determine RMR in a clinical setting."**

References

Validity References

Study 1

- Yi, Y.; Baek, J.; Lee, E.; Jung, H.; Jang, I. (July 2022). "A Comparative Study of High-Frequency Bioelectrical Impedance Analysis and Dual-Energy X-ray Absorptiometry for Estimating Body Composition". Life 2022, 12(7), 994; https://doi.org/10.3390/life12070994

Study 2

- Ryan T. Hurt; Jon O. Ebbert; Ivana Croghan; Sanjeev Nanda; Darrell R. Schroeder; Levi M. Teigen; Saketh R. Velapati; and Manpreet S. Mundi. The Comparison of Segmental Multifrequency Bioelectrical Impedance Analysis and Dual-Energy X-ray Absorptiometry for Estimating Fat Free Mass and Percentage Body Fat in an Ambulatory Population. Journal of Parenteral and Enteral Nutrition. 00.0, 1-8 (2020). 10.1002/jpen.1994

Study 3

- Eun Young Kim, MD,; Seong Ryong Kim,; Daeyoun David Won;Moon Hyung Choi; and In Kyu Lee. Multifrequency Bioelectrical Impedance Analysis Compared With Computed Tomography for Assessment of Skeletal Muscle Mass in Primary Colorectal Malignancy: A Predictor of Short-Term Outcome After Surgery. Nutrition in Clinical Practice 35.4, 664-674 (2020). https://doi.org/10.1002/ncp.10363

Study 4

- Antonio, J.; Kenyon, M.; Ellerbroek, A.; Carson, C.; Burgess, V.; Tyler-Palmer, D.; Mike, J.; Roberts, J.; Angeli, G.; Peacock, C. Comparison of Dual-Energy X-ray Absorptiometry (DXA) Versus a Multi-Frequency Bioelectrical Impedance (InBody 770) Device for Body Composition Assessment after a 4-Week Hypoenergetic Diet. J. Funct. Morphol. Kinesiol. 2019, 4, 23. https://doi.org/10.3390/jfmk4020023

Study 5

- Salacinski, A. J., Howell, S. M., & Hill, D. L. (2018). Validity of the InBody 520TM to predict metabolic rate in apparently healthy adults. Journal of Sports Medicine and Physical Fitness, 58(9), 1275–1280. https://doi.org/10.23736/S0022-4707.17.06719-6

Additional Questions