MEDICAL POLICY – 6.01.40

Whole Body Dual X-Ray Absorptiometry to Determine Body Composition

BCBSA Ref. Policy: 6.01.40

Effective Date: Jan. 1, 2023
Last Revised: Dec. 12, 2022
Replaces: N/A

RELATED GUIDELINES / POLICIES:
6.01.521 Bone Mineral Density Studies

Select a hyperlink below to be directed to that section.

COVERAGE GUIDELINES | CODING | RELATED INFORMATION | REFERENCES | HISTORY

∞ Clicking this icon returns you to the hyperlinks menu above.

Introduction

Dual energy x-ray absorptiometry (DEXA, or DXA) body composition scans use two beams of low-dose x-rays to measure the amount of lean tissue, body fat, and bone in the body. Bones and soft tissue absorb a higher-energy x-ray beam. Muscle and fat absorb a lower energy x-ray beam. The difference between the x-ray absorption rates is meant to give a thorough analysis of a person’s body composition. DXA body composition scans are unproven (investigational). Studies are needed to see if this testing can be used to manage medical conditions or to improve health outcomes.

Note: The Introduction section is for your general knowledge and is not to be taken as policy coverage criteria. The rest of the policy uses specific words and concepts familiar to medical professionals. It is intended for providers. A provider can be a person, such as a doctor, nurse, psychologist, or dentist. A provider also can be a place where medical care is given, like a hospital, clinic, or lab. This policy informs them about when a service may be covered.

Policy Coverage Criteria
Dual x-ray absorptiometry body composition scans

Dual energy x-ray absorptiometry body composition studies are considered investigational.

Coding

CPT

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<td>76499</td>
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Related Information

N/A

Evidence Review

Description

Using low-dose x-rays of 2 different energy levels, whole body dual-energy x-ray absorptiometry (DXA) measures lean tissue mass, total and regional body fat, as well as bone density. DXA scans have become a tool for research on body composition (e.g., as a more convenient replacement for underwater weighing). This policy addresses potential application in clinical care rather than research use of the technology.

Background

Body Composition Measurement
Body composition measurements can be used to quantify and assess the relative proportions of specific body compartments such as fat and lean mass (e.g., bones, tissues, organs, muscles). These measurements may be more useful in informing diagnosis, prognosis, or therapy than standard assessments (e.g., body weight, body mass index) that do not identify the contributions of individual body compartments or their particular relationships with health and disease. While these body composition measurements have been most frequently utilized for research purposes, they may be useful in clinical settings to:

- Evaluate the health status of undernourished individuals, those impacted by certain disease states (e.g., anorexia nervosa, cachexia), or those undergoing certain treatments (e.g., antiretroviral therapy, bariatric surgery).
- Evaluate the risk of heart disease or diabetes by measuring visceral fat versus total body fat.
- Assess body composition changes related to growth and development (e.g., infancy, childhood), aging (e.g., sarcopenia), and in certain disease states (e.g., HIV, diabetes).
- Evaluate individuals in situations where body mass index is suspected to be discordant with total fat mass (e.g., body-building, edema).

A variety of techniques has been researched, including most commonly, anthropomorphic measures, bioelectrical impedance, and dual-energy x-ray absorptiometry (DXA). All of these techniques are based in part on assumptions about the distribution of different body compartments and their density, and all rely on formulas to convert the measured parameter into an estimate of body composition. Therefore, all techniques will introduce variation based on how the underlying assumptions and formulas apply to different populations of subjects (i.e., different age groups, ethnicities, or underlying conditions). Techniques using anthropometrics, bioelectrical impedance, underwater weighing, and DXA are briefly reviewed below.

**Anthropomorphic Techniques**

Anthropomorphic techniques for the estimation of body composition include measurements of skinfold thickness at various sites, bone dimensions, and limb circumference. These measurements are used in various equations to predict body density and body fat. Due to its ease of use, measurement of skinfold thickness is one of the most common techniques. The technique is based on the assumption that the subcutaneous adipose layer reflects total body fat, but this association may vary with age and sex.
Bioelectrical Impedance

Bioelectrical impedance analysis is based on the relation among the volume of the conductor (i.e., human body), the conductor's length (i.e., height), the components of the conductor (i.e., fat and fat-free mass), and its impedance. Estimates of body composition are based on the assumption that the overall conductivity of the human body is closely related to lean tissue. The impedance value is then combined with anthropomorphic data to give body compartment measures. The technique involves attaching surface electrodes to various locations on the arm and foot. Alternatively, the individual can stand on the pad electrodes.

Underwater Weighing

Underwater weighing requires the use of a specially constructed tank in which the subject is seated on a suspended chair. The subject is then submerged in the water while exhaling. While valued as a research tool, weighing people underwater is typically not suitable for routine clinical use. This technique is based on the assumption that the body can be divided into two compartments with constant densities: adipose tissue, with a density of 0.9 g/cm³, and lean body mass (i.e., muscle and bone), with a density of 1.1 g/cm³. One limitation of the underlying assumption is the variability in density between muscle and bone, e.g., bone has a higher density than muscle, and bone mineral density varies with age and other conditions. Also, the density of body fat may vary, depending on the relative components of its constituents (e.g., glycerides, sterols, glycolipids).

Dual Energy X-Ray Absorptiometry (DXA)

While the cited techniques assume two body compartments, DXA can estimate three body compartments consisting of fat mass, lean body mass, and bone mass. DXA systems use a source that generates x-rays at two energies. The differential attenuation of the two energies is used to estimate the bone mineral content and soft tissue composition. When two x-ray energies are used, only two tissue compartments can be measured; therefore, soft tissue measurements (i.e., fat and lean body mass) can only be measured in areas in which no bone is present. DXA can also determine body composition in defined regions (i.e., the arms, legs, and trunk). DXA measurements are based in part on the assumption that the hydration of fat-free mass remains constant at 73%. Hydration, however, can vary from 67% to 85% and can vary by disease state. Other assumptions used to derive body composition estimates are considered proprietary by DXA manufacturers. The use of DXA for bone mineral density assessment in
individuals diagnosed with or at risk of osteoporosis is addressed in a separate medical policy. (See Related Medical Policies)

Summary of Evidence

For individuals who have a clinical condition associated with abnormal body composition who receive DXA body composition studies, the evidence includes systematic reviews and several cross-sectional studies comparing DXA with other techniques. Relevant outcomes are symptoms and change in disease status. The available studies were primarily conducted in research settings and often use DXA body composition studies as a reference standard; these studies do not permit conclusions about the accuracy of DXA for measuring body composition. A systematic review exploring the clinical validity of DXA against reference methods for the quantification of IAAT raised concerns regarding precision and reliability. More importantly, no studies were identified in which DXA body composition measurements were actively used in individual management. The evidence is insufficient to determine that results in an improvement in the net technology on health outcome.

For individuals who have a clinical condition managed by monitoring changes in body composition over time who receive serial DXA body composition studies, the evidence includes several prospective studies monitoring individuals over time. Relevant outcomes are symptoms and change in disease status. The studies used DXA as a tool to measure body composition and were not designed to assess the accuracy of DXA. None of the studies used DXA findings to make individual management decisions or addressed how serial body composition assessment might improve health outcomes. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Ongoing and Unpublished Clinical Trials

A currently ongoing trial that might influence this review is listed in Table 1.

Table 1. Summary of Key Trials

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Practice Guidelines and Position Statements

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Guidelines or position statements will be considered for inclusion if they were issued by, or jointly by, a U.S. professional society, an international society with U.S. representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American College of Radiology et al

The American College of Radiology (ACR), the Society for Pediatric Radiology (SPR), and the Society of Skeletal Radiology (SRR) (2018) issued a collaborative practice parameter to assist practitioners in providing appropriate radiologic care for their individuals. Dual x-ray absorptiometry (DXA) was described as a “clinically proven, accurate and reproducible method of measuring bone mineral density (BMD) in the lumbar spine, proximal femur, forearm, and whole body,” that “may also be used to measure whole-body composition, including nonbone lean mass (LM) and fat mass (FM).” DXA measurement of BMD, LM, or FM is indicated whenever a clinical decision is likely to be directly influenced by the test result. In particular, LM and FM may be useful in assessing conditions such as sarcopenia and cachexia. Specifically, DXA may be indicated as a tool for the measurement of regional and whole-body FM and LM in individuals afflicted with conditions such as malabsorption, cancer, or eating disorders.
International Society for Clinical Densitometry

The International Society for Clinical Densitometry (2019) updated its statements on the use of dual x-ray absorptiometry (DXA) for body composition.\textsuperscript{31} Use of DXA for measurement of body composition was suggested for use in the following clinical conditions:

- To assess fat distribution in individuals with human immunodeficiency virus (HIV) who are using antiretroviral agents known to increase the risk of lipoatrophy.
- To assess fat and lean mass changes in obese individuals undergoing bariatric surgery (or medical, diet, or weight loss regimens with anticipated large weight loss) when weight loss exceeds approximately 10%. The statement noted that the impact of DXA studies on clinical outcomes in these individuals is uncertain.
- To assess fat and lean mass in individuals with muscle weakness and poor physical functioning. The impact on clinical outcomes is uncertain.

Of note, pregnancy is a contraindication to use of DXA to measure body composition. The statement also adds that the clinical utility of DXA measurements of adiposity and lean mass (e.g., visceral adipose tissue, lean mass index, fat mass index) is uncertain. Furthermore, while the use of DXA adiposity measures such as fat mass index may be useful in risk-stratifying individuals for cardio-metabolic outcomes, specific thresholds to define obesity have not been established.

International Conference on Sarcopenia and Frailty Research Task Force

Evidence-based clinical practice guidelines for the screening, diagnosis, and management of sarcopenia were developed by the International Conference on Sarcopenia and Frailty Research task force in 2018.\textsuperscript{32} The following recommendations were made:

- Screening for sarcopenia can be performed using gait speed analysis or SARC-F questionnaire.
- Individuals screened as positive for sarcopenia should be referred for further assessment to confirm the presence of the disease.
- DXA imaging should be used to determine low levels of lean body mass when diagnosing sarcopenia.
The recommendation regarding the diagnostic use of DXA received a conditional (weak) recommendation. The certainty of the evidence for DXA assessment was ranked low due to:

- DXA studies featuring populations from low-middle income countries are lacking.
- DXA measurement of lean body mass rather than muscle mass may potentially misclassify body composition in certain individuals.
- Incorporation of DXA measurements of lean body mass may have limited additional benefit for the prediction of relevant health outcomes (e.g., falls, fractures, lowered physical performance, mobility).

**U.S. Preventive Services Task Force Recommendations**

No U.S. Preventive Services Task Force recommendations for whole body DXA have been identified.

**Medicare National Coverage**

There is no national coverage determination (NCD).

**Regulatory Status**

Body composition software for several bone densitometer systems has been approved by the U.S. Food and Drug Administration (FDA) through the premarket approval process. They include Lunar iDXA systems (GE Healthcare), Hologic DXA systems (Hologic), Mindways Software, Inc. systems (Mindways Software, Inc.), and Norland DXA systems (Swissray).

FDA product code: KGI.

**References**


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