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MEDICAL POLICY – 6.01.528

Whole-Body Dual X-Ray Absorptiometry and Bioelectrical Impedance Analysis to Determine Body Composition

BCBSA Ref. Policy:	6.01.40	
Effective Date:	Dec. 1, 2024	RELATED GUIDELINES / POLICIES:
Last Revised:	Nov. 11, 2024	6.01.521 Bone Mineral Density Studies
Replaces:	6.01.40	

Select a hyperlink below to be directed to that section.

POLICY CRITERIA | 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

Service	Investigational
DXA body composition scans or bioelectrical impedance analysis	**The use of whole-body dual energy x-ray absorptiometry or bioelectrical impedance analysis for body composition studies are considered investigational for all indications.**

Coding

CPT	
0358T	Bioelectrical impedance analysis whole body composition assessment, with interpretation and report
76499	Unlisted diagnostic radiographic procedure

Note: CPT codes, descriptions and materials are copyrighted by the American Medical Association (AMA). HCPCS codes, descriptions and materials are copyrighted by Centers for Medicare Services (CMS).

Related Information

N/A

Evidence Review

Description

Using low-dose x-rays of two 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 applications 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).[1] 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., bodybuilding, edema).

A variety of techniques have been researched, including most commonly, anthropomorphic measures, bioelectrical impedance, and 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 anthropomorphics, 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.[1,2] 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. Skinfold thickness measurement precision and utility can also be affected by operator experience and a lack of applicable reference data for specific patient populations or percentile extremes.

Bioelectrical Impedance

Bioelectrical impedance analysis is based on the relation between 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.[1,2] The technique involves attaching surface electrodes to various locations on the arm and foot. Alternatively, the individual can stand on pad electrodes. 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. These measures are calculated based on device manufacturer-specific regression models, which are generally proprietary. Bioelectrical impedance measures can be affected by fat distribution patterns, hydration status, ovulation, and temperature.

Underwater Weighing

Underwater weighing requires the use of a specially constructed tank in which the subject is seated on a suspended chair.[1] The subject is then submerged in the water while exhaling; the difference between weight in air and weight in water is used to estimate total body fat percentage. 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/cm^3, and lean body mass (i.e., muscle and bone), with a density of 1.1 g/cm^3. 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.[1,2] 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. Systematic reviews with meta-analyses exploring the clinical validity of DXA measurements against reference methods for the quantification of fat mass indicate strong overall agreement between these modalities but raise concerns regarding precision and reliability in some populations, particularly those without existing clinical conditions for which risk of adverse outcomes is influenced by abnormal visceral adiposity. 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 the technology results in an improvement in the net 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.

For individuals who have a clinical condition associated with abnormal body composition or who have a clinical condition managed by monitoring changes in body composition over time who receive bioelectrical impedance analysis, the evidence includes peer reviewed literature that does not establish its accuracy. Studies evaluating the diagnostic accuracy and clinical utility of these devices are lacking. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Ongoing and Unpublished Clinical Trials

Some currently ongoing trials that might influence this review is listed in **Table 1**.

Table 1. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT03621306	Precision and Reliability of Dual X-ray Absorptiometry (DXA) Testing	400	Aug 2028
NCT05639556	Strength and Muscle Related Outcomes for Nutrition and Lung Function in CF	300	Dec 2028
NCT05879692	Response of Irritable Bowel Syndrome to Abdominal Fat Reduction	60	Dec 2023
NCT05699863	A Multidisciplinary Approach to Screening for Obesity Complications - The MULTISITE Study	90	Jan 2036
NCT05885672	A Multi-Modal Approach to Improving the Early Detection of Cardiometabolic Disease Risk	200	Jul 2024

NCT: national clinical trial.

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 policy conclusions.

Guidelines or position statements will be considered for inclusion if they were issued by, or jointly by, a US professional society, an international society with US 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 Association of Clinical Endocrinology et al

The American Association of Clinical Endocrinology (AACE) and American College of Endocrinology (ACE) clinical practice guideline on obesity was updated in 2016.[37] **Table 2** describes relevant recommendations for the diagnosis of overweight and obesity from the AACE/ACE guideline. The authors also state that "The DEXA [dual x-ray absorptiometry] scan also allows for calculation of the fat mass index (total body fat mass [kg] divided by height [m2]), which is a physiologic relevant measure of adiposity. The clinical utility of these measures is limited by availability, cost, and lack of outcomes data, but they have been applied extensively in research settings. Body fat percentage cut points for obesity have been proposed by the World Health Organization (WHO) to be 25% for men and 35% for women."

Table 2. American Association of Clinical Endocrinology/American College of Endocrinology Recommendations for Diagnosis of Overweight and Obesity

Recommendation	Quality of evidence[a]	Grade of recommendation[b]
All adults should be screened annually using a BMI measurement; in most populations a cutoff point of ≥25 kg/m2 should be used to initiate further evaluation of overweight or obesity.	2 (upgraded due to high relevance)	A
BMI should be used to confirm an excessive degree of adiposity and to classify individuals as having overweight (BMI 25 to 29.9 kg/m2) or obesity (BMI ≥30 kg/m2), after taking into account age, gender, ethnicity, fluid status, and muscularity; therefore, clinical evaluation and judgment must be used when BMI is employed as the anthropometric indicator of excess adiposity, particularly in athletes and those with sarcopenia.	2 (upgraded due to high relevance)	A

Recommendation	Quality of evidence[a]	Grade of recommendation[b]
When evaluating patients for adiposity-related disease risk, WC should be measure in all patients with BMI <35 kg/m2.	2 (upgraded due to high relevance)	A
In many populations, a WC cutoff point of ≥94 cm in men and ≥80 cm in women should be considered at risk and consistent with abdominal obesity; in the US and Canada, cutoff points that can be used to indicate increased risk are ≥102 cm for men and ≥88 cm for women.	2 (upgraded due to high relevance)	A
Other measurements of adiposity (e.g., bioelectric impedance, air/water displacement plethysmography, or dual-energy X-ray absorptiometry [DEXA]) may be considered at the clinician's discretion if BMI and physical examination results are equivocal or require further evaluation.	2 (downgraded due to evidence gaps)	C
However, the clinical utility of these measures [listed in the above recommendation] is limited by availability, cost, and lack of outcomes data for validated cutoff points.	2	B

BMI: body mass index; WC: waist circumference.

[a]Evidence quality 2 indicates intermediate-level evidence, including meta-analyses of nonrandomized prospective or case-controlled trials, nonrandomized controlled trials, prospective cohort studies, and/or retrospective case-control studies.

[b]Grade A, B, and C indicate strong, intermediate, and weak recommendations, respectively.

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 patients.[38] 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.

American Society for Parenteral and Enteral Nutrition

The American Society for Parenteral and Enteral Nutrition (ASPEN) published clinical guidelines on the validity of body composition assessment in clinical populations in 2019, as a complement to the Global Leadership Initiative on Malnutrition (GLIM) criteria for malnutrition (described below).[4] The systematic review with meta-analysis used to develop these guidelines is described above. The target population of the guideline was adults "with a potentially inflammatory condition or pathological end point associated with a specific disease or clinical condition such as cancer, cardiovascular disease (CVD), cardiac failure, diabetes, hepatic or renal disease, human immunodeficiency virus, or possessing a condition that requires surgical intervention." The target population did not include healthy individuals or those with obesity, except when "linked to a clinical condition such as metabolic syndrome, hypertension, etc." Studies evaluated for guideline development involved specific body composition assessment methodologies (DXA, bioelectrical impedance analysis, or ultrasound) and were required to use a more precise comparator; for studies evaluating DXA, these included computed tomography, magnetic resonance imaging, or multicompartment models. Anthropometric measurements "were not included since these are considered surrogate measures of body composition." **Table 3** describes relevant recommendations from the ASPEN guideline.

Table 3. American Society for Parenteral and Enteral Nutrition Clinical Guideline Recommendations for Body Composition Assessment in Adult Clinical Populations

Recommendation	Quality of evidence	Strength of recommendation
We recommend the use of DXA for assessing fat mass in patients with clinical conditions.	Low	Strong
No recommendation can be made at this time to support the use of ultrasound in a clinical setting for assessing body composition.	Very low	Weak
No recommendations can be made regarding the validity of using bioelectrical impedance analysis in clinical populations.	Low	Weak

DXA: dual-energy x-ray absorptiometry.

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.[39] 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.

US Preventive Services Task Force Recommendations

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

Medicare National Coverage

There is no national coverage determination.

Regulatory Status

Body composition software for several bone densitometer systems has been approved by the US 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.

Several body composition analyzers that use bioelectrical impedance analysis have been approved by the FDA through the premarket approval process. They include the BC1 Body Composition Analyzer (Stayhealthy Inc.) and the Bodystat 1500 Body Composition Monitoring Unit (Bodystat LTD).

FDA product code MNW.

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History

Date	Comments
10/16/03	Add to Radiology section - New Policy

Date	Comments
03/08/05	Replace policy. Policy updated with literature review; policy statement unchanged; references added.
12/13/05	Replace policy. Policy updated with literature search; policy statement unchanged.
06/30/06	Update Scope and Disclaimer - No other changes.
06/12/07	Replace policy. Policy updated with literature review; references added; policy statement unchanged.
07/08/08	Replace policy. Policy updated with literature search; no change to the policy statement. References added.
12/08/09	Replace policy. Policy updated with literature search; no change to the policy statement.
04/13/10	Replace policy. Policy updated with literature search; no change to the policy statement. References added.
08/09/11	Replace policy. Policy updated with literature review, some references renumbered or removed, no changes in policy statement. ICD-10 codes added to policy.
02/14/12	Replace policy. Policy updated with literature review through October 2011, references added and reordered, policy statement unchanged.
08/15/12	Remove Related Policies: 6.01.40, it has been archived.
09/25/12	Update Coding Section – ICD-10 codes are now effective 10/01/2014.
02/13/13	Replace policy. Policy updated with literature review through October 2012. No new references added. Policy statement unchanged.
02/24/14	Replace policy. Policy updated with literature review through October 25, 2013. References 25 and 27 added. Policy statement unchanged.
02/25/15	Annual Review. Policy updated with literature review through October 15, 2014. References 1-2, 7-9, 12-13 added. Policy statement unchanged.
02/09/16	Annual Review. Policy updated with literature review through November 5, 2015; reference 9 added. Abbreviation in policy statement changed to DXA.
01/01/18	Archive policy due to low utilization, approved December 12, 2017. Policy updated with literature review through July 20, 2017; no references added.
02/01/21	New Policy, approved January 12, 2021. Policy previously archived in 2017 and now reinstated. Policy updated with literature review through June 19, 2020; references added.
12/01/21	Interim Review, approved November 2, 2021. Policy updated with literature review through July 23, 2021; no references added. Policy statement unchanged.
01/01/23	Annual Review, approved December 12, 2022. Policy updated with literature review through July 21, 2022; references added. Policy statement unchanged. Changed the wording from "patient" to "individual" throughout the policy for standardization.

Date	Comments
12/01/23	Policy renumbered, approved November 14, 2023, from 6.01.40 to 6.01.528. Title changed from "Whole Body Dual X-Ray Absorptiometry to Determine Body Composition" to "Whole Body Dual X-Ray Absorptiometry and Bioelectrical Impedance Analysis to Determine Body Composition" Policy statement changed to: "The use of whole body dual energy x-ray absorptiometry or bioelectrical impedance analysis for body composition studies are considered investigational for all indications"; references added. Added CPT code 0358T.
12/01/24	Annual Review, approved November 11, 2024. Policy updated with literature review through August 7, 2024; reference added. Policy statement unchanged.

Scope: Medical policies are systematically developed guidelines that serve as a resource for Company staff when determining coverage for specific medical procedures, drugs or devices. Coverage for medical services is subject to the limits and conditions of the member benefit plan. Members and their providers should consult the member benefit booklet or contact a customer service representative to determine whether there are any benefit limitations applicable to this service or supply. This medical policy does not apply to Medicare Advantage.