6.01.40 Whole Body Dual X-Ray Absorptiometry to Determine Body Composition

Original Policy Date: April 5, 2007  Effective Date: November 1, 2017
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Policy Statement

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

Policy Guidelines

This service should be billed using the following unlisted CPT code:

- 76499: Unlisted diagnostic radiographic procedure

Description

Using low-dose x-rays of 2 different energy levels, whole body dual 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 evidence review addresses potential applications in clinical care rather than research use of the technology.

Related Policies

- Vertebral Fracture Assessment With Densitometry

Benefit Application

Benefit determinations should be based in all cases on the applicable contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control. Please refer to the member’s contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

Some state or federal mandates [e.g., Federal Employee Program (FEP)] prohibits plans from denying Food and Drug Administration (FDA)-approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of FDA-approved technologies on the basis of medical necessity alone.

Regulatory Status

Body composition software for several bone densitometer systems have been approved by the U.S. Food and Drug Administration through the premarket approval process. They include the Lunar iDXA systems (GE Healthcare, Madison, WI), Hologic DXA systems (Hologic, Bedford, MA), and Norland DXA systems (Norland, at Swissray, Fort Atkinson, WI).

Rationale

Background

Body Composition Measurement

Measurements of body composition have been used to study how lean body mass and body fat change during health and disease and have provided a research tool to study the metabolic effects of aging, obesity, and various wasting conditions such as occur with AIDS or after bariatric surgery. A variety of techniques has been researched, including most commonly,
anthropomorphic measures, bioelectrical impedance, and dual x-ray absorptiometry (DXA). All of these techniques are based in part on assumptions regarding 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 anthropomorphic, 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 commonly used 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 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 patient can stand on 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 obviously not suitable for routine clinical use. This technique is based on the assumption that the body can be divided into 2 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 X-Ray Absorptiometry**

While the cited techniques assume 2 body compartments, DXA can estimate 3 body compartments consisting of fat mass, lean body mass, and bone mass. DXA systems use a source that generates x-rays at 2 energies. The differential attenuation of the 2 energies is used to estimate the bone mineral content and the soft tissue composition. When 2 x-ray energies are used, only 2 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 also can 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.

**Literature Review**

**Dual X-Ray Absorptiometry as a Diagnostic Test to Detect Abnormal Body Composition**

Most of the literature on dual x-ray absorptiometry (DXA) as a diagnostic test to detect abnormal body composition involves the use of the technology in the research setting, often as a reference test; studies have been conducted in different populations of patients and underlying disorders. In some cases, studies have compared other techniques with DXA to
identify simpler methods of determining body composition. In general, these studies have shown that DXA is highly correlated to various methods of body composition assessment. For example, a 2014 study compared 2 bioelectrical impedance devices with DXA for the evaluation of body composition in heart failure.1 Another 2014 study compared bioelectric impedance analysis with DXA for evaluating body composition in adults with cystic fibrosis.2 Whether or not a DXA scan is considered the reference standard, the key consideration regarding its routine clinical use is whether the results of the scan can be used in the management of the patient and improve health outcomes.

As a single diagnostic measure, it is important to establish diagnostic cutoff points for normal and abnormal values. This is problematic because normal values will require the development of normative databases for the different components of body composition (i.e., bone, fat, lean mass) for different populations of patients at different ages. Regarding measuring bone mineral density (BMD), normative databases have largely focused on postmenopausal white women, and these values cannot necessarily be extrapolated to men or to different races. DXA determinations of BMD are primarily used for fracture risk assessment in postmenopausal women and to select candidates for various pharmacologic therapies to reduce fracture risk. In addition to the uncertainties of establishing normal values for other components of body composition, it also is unclear how a single measure of body composition would be used in patient management.

DXA as a Technique to Monitor Changes in Body Composition
The ability to detect a change in body composition over time is related in part to the precision of the technique, defined as the degree to which repeated measurements of the same variable give the same value. For example, DXA measurements of bone mass are thought to have a precision error of 1% to 3% and, given the slow rate of change in BMD in postmenopausal women treated for osteoporosis, it is likely that DXA scans would only be able to detect a significant change in BMD in the typical patient after 2 years of therapy. Of course, changes in body composition are anticipated to be larger and more rapid than changes in BMD in postmenopausal women; therefore, precision errors in DXA scans become less critical in interpreting results.

Several studies have reported on DXA measurement of body composition changes over time in clinical populations; none of these studies used DXA findings to make patient management decisions or addressed how serial body composition assessment might improve health outcomes.10,11 For example, in 2014, Franzoni et al published a prospective study evaluating body composition in adolescent girls with restrictive anorexia nervosa.11 Patients underwent DXA at baseline and 12 months after treatment for their eating disorder. A total of 46 (58%) of 79 patients completed the study. Mean total fat mass was 21% at baseline and 25% after 1 year, and this increase was statistically significant in all body regions. Change in fat mass percentage correlated significantly with change in BMD.

Summary of Evidence
For individuals who have a clinical condition associated with abnormal body composition who receive DXA body composition studies, the evidence includes 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 used DXA body composition studies as a reference standard; these studies do not permit conclusions about the accuracy of DXA for measuring body composition. More importantly, no studies were identified in which DXA body composition measurements were actively used in patient management. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have a clinical condition managed by monitoring changes in body composition over time who receive DXA body composition studies, the evidence includes several prospective studies monitoring patients 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 patient management decisions or addressed how serial body composition assessment might improve health outcomes. The evidence is insufficient to determine the effects of the technology on health outcomes.

Supplemental Information

Practice Guidelines and Position Statements

In 2013, the International Society for Clinical Densitometry issued statements on the use of dual x-ray absorptiometry (DXA) for body composition. The following statements were made on the use of DXA total body composition with regional analysis:

- To assess fat distribution in patients with HIV who are using antiretroviral agents known to increase the risk of lipoatrophy. The statement noted that, although most patients who were taking medications known to be associated with lipoatrophy switched to other medications, some remain on these medications and DXA may be useful in this population to detect changes in peripheral fat before they become clinically evident.
- To assess fat and lean mass changes in obese patients undergoing bariatric surgery when weight loss exceeds approximately 10%. The statement noted that the impact of DXA studies on clinical outcomes in these patients is uncertain.
- To assess fat and lean mass in patients with risk factors associated with sarcopenia, including muscle weakness and poor physical functioning.

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. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

Ongoing and Unpublished Clinical Trials

A search of ClinicalTrials.gov in August 2017 did not identify any ongoing or unpublished trials that would likely influence this review.

References

7. Bedogni G, Agosti F, De Col A, et al. Comparison of dual-energy X-ray absorptiometry, air displacement plethysmography and bioelectric impedance analysis for the assessment...

### Documentation for Clinical Review

- No records required

### Coding

This Policy relates only to the services or supplies described herein. Benefits may vary according to product design; therefore, contract language should be reviewed before applying the terms of the Policy. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement.

**IE**

The following services may be considered investigational.

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### Policy History

This section provides a chronological history of the activities, updates and changes that have occurred with this Medical Policy.

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<td>BCBSA Medical Policy adoption</td>
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<td>01/07/2011</td>
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<tr>
<td>06/30/2015</td>
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**Definitions of Decision Determinations**

**Medically Necessary:** A treatment, procedure, or drug is medically necessary only when it has been established as safe and effective for the particular symptoms or diagnosis, is not investigational or experimental, is not being provided primarily for the convenience of the patient or the provider, and is provided at the most appropriate level to treat the condition.

**Investigational/Experimental:** A treatment, procedure, or drug is investigational when it has not been recognized as safe and effective for use in treating the particular condition in accordance with generally accepted professional medical standards. This includes services where approval by the federal or state governmental is required prior to use, but has not yet been granted.

**Split Evaluation:** Blue Shield of California/Blue Shield of California Life & Health Insurance Company (Blue Shield) policy review can result in a split evaluation, where a treatment, procedure, or drug will be considered to be investigational for certain indications or conditions, but will be deemed safe and effective for other indications or conditions, and therefore potentially medically necessary in those instances.

**Prior Authorization Requirements (as applicable to your plan)**

Within five days before the actual date of service, the provider must confirm with Blue Shield that the member's health plan coverage is still in effect. Blue Shield reserves the right to revoke an authorization prior to services being rendered based on cancellation of the member's eligibility. Final determination of benefits will be made after review of the claim for limitations or exclusions.

Questions regarding the applicability of this policy should be directed to the Prior Authorization Department. Please call (800) 541-6652 or visit the provider portal at www.blueshieldca.com/provider.

**Disclaimer:** This medical policy is a guide in evaluating the medical necessity of a particular service or treatment. Blue Shield of California may consider published peer-reviewed scientific literature, national guidelines, and local standards of practice in developing its medical policy. Federal and state law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over medical policy and must be considered first in determining covered services. Member contracts may differ in their benefits. Blue Shield reserves the right to review and update policies as appropriate.