Whole Body Dual X-Ray Absorptiometry (DXA) to Determine Body Composition

Policy Number: 6.01.40  
Origination: 4/2005  
Last Review: 4/2017  
Next Review: 4/2018

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will not provide coverage for Whole Body Dual X-Ray Absorptiometry (DXA) to Determine Body Composition. This is considered investigational.

When Policy Topic is covered
Not Applicable

When Policy Topic is not covered
Dual x-ray absorptiometry (DXA) body composition studies are considered investigational.

Description of Procedure or Service

<table>
<thead>
<tr>
<th>Populations</th>
<th>Interventions</th>
<th>Comparators</th>
<th>Outcomes</th>
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</table>
| Individuals:  
  • With a clinical condition associated with abnormal body composition | Interventions of interest are:  
  • Dual x-ray absorptiometry body composition studies | Comparators of interest are:  
  • Another method of body composition analysis (eg, anthropomorphic techniques, underwater weighing, bioelectrical impedance)  
  • Standard care only | Relevant outcomes include:  
  • Symptoms  
  • Change in disease status |
| Individuals:  
  • With a clinical condition managed by monitoring changes in body composition over time | Interventions of interest are:  
  • Dual x-ray absorptiometry body composition studies | Comparators of interest are:  
  • Another method of body composition analysis (eg, anthropomorphic techniques, underwater weighing, bioelectrical impedance)  
  • Standard care only | Relevant outcomes include:  
  • Symptoms  
  • Change in disease status |

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

The evidence for DXA body composition studies in patients who have a clinical condition associated with abnormal body composition includes several cross-sectional studies comparing DXA to other techniques. Relevant outcomes are symptoms and change in disease status. The available studies are 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. 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.

The evidence for DXA body composition studies in patients who have a clinical condition managed by monitoring changes in body composition over time 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.

**Background**
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 occurs with acquired immune deficiency syndrome (AIDS) or post-bariatric surgery. A variety of techniques has been researched, including most commonly, anthropomorphic measures, bioelectrical impedance, and dual x-ray absorptiometry (DEXA) scans. 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. Anthropomorphic, bioimpedance, and DXA techniques are briefly reviewed as followed.

**Anthropomorphic Techniques**
Anthropomorphic techniques for the estimation of body composition include measurements of skin-fold 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 skin-fold 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 relationship between the volume of the conductor (i.e., the 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 (UWW) has generally been considered the reference standard for body composition studies. This technique 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, UWW is obviously not suitable for routine clinical use. UWW is based on the assumption that the body can be divided into 2 compartments with constant densities, i.e., adipose tissue with a density of 0.9g/cm3 and lean body mass (i.e., muscle and bone) with a density of 1.1g/cm3. One limitation of the underlying assumption is the variability in density between muscle and bone; for example, bone has a higher density than muscle, and bone mineral density (BMD) varies with age and other conditions. In addition, the density of body fat may vary, depending on the relative components of its constituents, e.g., glycerides, sterols, and glycolipids.

**DXA**

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 has the ability to determine body composition in defined regions, i.e., in 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 67–85% and can be variable in certain disease states. Other assumptions used to derive body composition estimates are considered proprietary by DXA manufacturers (i.e., Lunar, Hologic, and Norland.)

**Rationale**

This evidence review was originally created in July 2003 and has been updated regularly with searches of the MEDLINE database. Most recently, the literature was reviewed through November 5, 2015. The key literature is described next.
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 compare 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, one study published in 2014 compared 2 bioelectrical impedance devices with DXA for the evaluation of body composition in heart failure. Another 2014 study compared bioelectric impedance analysis with DXA for evaluating body composition in adults with cystic fibrosis. Regardless of whether 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 to 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 (ie, bone, fat, lean mass) for different populations of patients at different ages. In terms of measuring bone mineral density (BMD), normative databases have largely focused on postmenopausal white women, and these values cannot necessarily be extrapolated to either 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 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. For example, in 2014, Franzoni et al published a prospective study evaluating body composition in adolescent...
females with restrictive anorexia nervosa. Patients underwent DXA at baseline and 12 months after treatment for their eating disorder. A total of 46 of 79 patients (58%) 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 was significantly correlated with change in BMI.

Ongoing and Unpublished Clinical Trials
A search of ClinicalTrials.gov in November 2015 did not identify any ongoing or unpublished trials that would likely influence this review.

Summary of Evidence
The evidence for dual x-ray absorptiometry (DXA) body composition studies in patients who have a clinical condition associated with abnormal body composition includes several cross-sectional studies comparing DXA to other techniques. Relevant outcomes are symptoms and change in disease status. The available studies are 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. 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.

The evidence for DXA body composition studies in patients who have a clinical condition managed by monitoring changes in body composition over time 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.

Practice Guidelines and Position Statements
In 2013, the International Society for Clinical Densitometry (ISCD) issued a statement on use of DXA for body composition. The statement included the following ISCD official positions regarding 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
The U.S. Preventive Services Task Force (USPSTF) does not recommend DXA for body composition analysis. In 2012, USPSTF recommended screening all adults for obesity with body mass index (BMI). Its 2010 recommendation on obesity in children and adolescents recommends screening all children older than 6 years old using BMI. As of November 2015, the 2010 recommendation is in the process of being updated.

Medicare National Coverage
There is no national coverage determination (NCD). In the absence of an NCD, coverage decisions are left to the discretion of local Medicare carriers.

References

**Billing Coding/Physician Documentation Information**

**76499**  Unlisted diagnostic radiographic procedure

Category III code, 0028T (Dual energy x-ray absorptiometry (DXA) body composition study, one or more sites), was deleted effective 12/31/2008.

**Additional Policy Key Words**

DEXA

**Policy Implementation/Update Information**

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