BlueCross BlueShield of Alabama

Name of Policy:

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

Policy #: 194
Category: Radiology

Latest Review Date: January 2013
Policy Grade: A

Background/Definitions:

As a general rule, benefits are payable under Blue Cross and Blue Shield of Alabama health plans only in cases of medical necessity and only if services or supplies are not investigational, provided the customer group contracts have such coverage.

The following Association Technology Evaluation Criteria must be met for a service/supply to be considered for coverage:

1. *The technology must have final approval from the appropriate government regulatory bodies;*
2. *The scientific evidence must permit conclusions concerning the effect of the technology on health outcomes;*
3. *The technology must improve the net health outcome;*
4. *The technology must be as beneficial as any established alternatives;*
5. *The improvement must be attainable outside the investigational setting.*

Medical Necessity means that health care services (e.g., procedures, treatments, supplies, devices, equipment, facilities or drugs) that a physician, exercising prudent clinical judgment, would provide to a patient for the purpose of preventing, evaluating, diagnosing or treating an illness, injury or disease or its symptoms, and that are:

1. *In accordance with generally accepted standards of medical practice; and*
2. *Clinically appropriate in terms of type, frequency, extent, site and duration and considered effective for the patient's illness, injury or disease; and*
3. *Not primarily for the convenience of the patient, physician or other health care provider; and*
4. *Not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient's illness, injury or disease.*

Description of Procedure or Service:

Using low dose x-rays of two different energy levels, whole body dual x-ray absorptiometry measures lean tissue mass and total and regional body fat as well as bone density.

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 AIDS or post-bariatric surgery. A variety of techniques have 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 how the underlying assumptions and formulas apply to different populations of subjects, i.e., different age groups, ethnicities, or underlying conditions. Anthropomorphic, bioimpedance, and DEXA 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, a 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 gender.

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 0.9gm/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 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.

DEXA
While the above techniques assume 2 body compartments, dual energy X-ray absorptiometry can estimate 3 body compartments consisting of fat mass, lean body mass, and bone mass. DEXA 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 where no bone is present. DEXA also has the ability to determine body composition in defined regions, i.e., in the arms, legs, and trunk. DEXA 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 DEXA manufacturers (i.e., Lunar, Hologic, and Norland.)

Literature did not identify any controlled studies in which DEXA body composition measurements were actively used in patient management. Precision of all DEXA measurements is excellent but varies with the region under investigation. The accuracy of DEXA measurements, however, can be problematic. Marked systematic differences in bone and soft tissue values are found between the three commercial systems due to differences in calibration, bone edge detection, and other factors. At present, DEXA cannot be regarded as a "gold standard" for body composition.

Policy:

Dual x-ray absorptiometry (DEXA) body composition studies do not meet Blue Cross and Blue Shield of Alabama's medical criteria for coverage and is considered **investigational**.

Blue Cross and Blue Shield of Alabama does not approve or deny procedures, services, testing, or equipment for our members. Our decisions concern coverage only. The decision of whether or not to have a certain test, treatment or procedure is one made between the physician and his/her patient. Blue Cross and Blue Shield of Alabama administers benefits based on the members' contract and corporate medical policies. Physicians should always exercise their best medical judgment in providing the care they feel is most appropriate for their patients. Needed care should not be delayed or refused because of a coverage determination.

Key Points:

Several different clinical roles for whole body DEXA scans to assess body composition have been suggested. Each clinical application requires different data for analysis.

DEXA as Reference Standard for Body Composition Assessment
In general, reference standards for diagnostic tests, often used primarily in research settings, serve to evaluate and verify the use of simpler and more convenient alternative tests that measure the same diagnostic parameter. For body composition studies, underwater weighing has been historically considered the reference standard. The emergence of DEXA as a potential new reference standard reflects its ease of use and the fact that it provides a 3-compartment model of

body density, i.e., lean body mass, bone mass, and fat mass, compared to the 2-compartment model of underwater weighing. More recently, a 4-compartment model has been suggested as the reference standard, consisting of measurements of bone/mineral, protein, water, and fat. Studies to evaluate different techniques of measuring the same parameter typically consist of correlation studies that compare values between the 2 techniques. However, correlation studies do not provide information on which diagnostic technique more closely represents the true value. For example, a lack of correlation between DEXA and underwater weighing may reflect the lack of accuracy of underwater weighing, as opposed to any deficiency in the DEXA technique. Furthermore, 2 diagnostic techniques may be highly correlated but produce different values of body composition, i.e., compared to underwater weighing; DEXA may identify different groups of patients as abnormal and normal.

There is extensive literature comparing DEXA to other techniques for assessing body composition, most commonly underwater weighing, bioelectrical impedance, or skin-fold thickness in different populations of patients, i.e., different age groups, ethnicities, and underlying disorders. In general, these studies have shown that DEXA is highly correlated to various methods of body composition assessment. Detailed review of this extensive literature is beyond the scope of this discussion; however, it is apparent that many authors would consider a DEXA body composition study the reference standard. For example, in various research studies, the results of DEXA body composition have been included as an intermediate outcome in studies of nutrition and various metabolic disorders. Regardless of whether a DEXA scan is considered the reference standard, the key consideration regarding its routine clinical use is if the results of the scan can be used in the management of the patient to improve health outcomes.

DEXA as a Diagnostic Test to Detect Abnormal Body Composition

As a single diagnostic measure, it is important to establish diagnostic cutoff points for normal and abnormal values. This is problematic, since normal values will require the development of normative databases for the different components of body composition (i.e., bone, fat, and lean mass) for different populations of patients at different ages. In terms of measuring bone mineral density, normative databases have largely focused on postmenopausal white women, and these values cannot necessarily be extrapolated to either men or to different races. DEXA determinations of bone mineral density are primarily used for fracture risk assessment in postmenopausal women and to select candidates for various pharmacological 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 the management of the patient.

DEXA as a Technique to Monitor Changes in Body Composition

Changes in body composition over time may provide useful information. The ability to detect changes 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, DEXA measurements of bone mass are thought to have a precision error of 1%–3%, and given the slow rate of change in bone mineral density in postmenopausal women treated for osteoporosis, it is likely that DEXA scans would only be able to detect a significant change in bone mineral density in the typical patients after 2 years of therapy. Of course, changes in body composition are anticipated to be larger and more rapid than changes in bone mineral density in postmenopausal

women; therefore, a precision error in DEXA scans become less critical in interpreting results. Many studies have used DEXA to monitor changes in body composition, and the precision is similar to that estimated for DEXA measurements of bone mineral density. While measuring changes in body composition is widely used in athletes for training purposes, it is still unclear how monitoring changes in body composition could be used in the medical management of the patient.

2007 Update
A literature search of the MEDLINE database was performed for the period of April 2005 through November 2006. Dual-energy x-ray absorptiometry (DEXA or DXA) appears to be the reference standard for whole body composition analysis in research studies. Active research areas are comparison of established clinical measures of body composition (body mass index or BMI, anthropomorphic measurements, and bioelectrical impedance analysis) with this "gold standard" and improvement of equations for more accurate clinical assessment of lean and fat body mass. Although refinement of equations may lead to closer agreement with DXA estimates of fat mass and fat free mass, for routine clinical use BMI is considered to provide satisfactory accuracy.

A few reports suggest that DXA may have clinical utility for diagnosis of lipodystrophy in patients with HIV, for predicting metabolic insulin sensitivity in older men and women, and for predicting glomerular filtration rate in dialysis patients. Research in these specific clinical applications of DXA is at an early stage and studies have not shown if use of this test in clinical care improves outcomes. Therefore, the policy statement is unchanged.

January 2009 Update
A literature search of the MEDLINE database for the period of December 2006 through May 2008 did not identify any evidence that would alter the conclusions reached previously. The literature consists primarily of studies comparing the accuracy of other measures of body composition with DEXA as a reference standard. One study (60 patients) reported that in comparison with body composition measurements by DEXA, standard anthropometrical measurements (BMI, arm muscle circumference, or triceps skin fold) were not reliable measures of malnutrition in women with rheumatoid arthritis. A number of other reports describe the validity of leg-to-leg bioimpedance as a measure of body composition in various populations. Evidence remains insufficient to permit conclusions concerning the effect of body composition measurement by DEXA on health outcomes. Therefore, whole body dual-energy x-ray absorptiometry is considered investigational.

June 2010 Update
A literature search found that most studies compare the accuracy of various methods of body composition measurement. Two studies compared a variety of measures in healthy children and adults, and a third study in obese subjects. In one study which measure the accuracy of skin fold measurements for assessing the nutritional status of children with cystic fibrosis, DEXA was the "gold standard" comparator. In another study, investigators hypothesized that DEXA would provide more accurate measurement than other methods in conditions, such as COPD, with altered fluid balance. None of the studies report data demonstrating the impact of body composition measurement on health outcomes.

2011 Update
There are no new studies in the peer-reviewed literature that demonstrate the use of the DEXA test in clinical care improves health outcomes. The DEXA test remains investigational.

January 2012 Update
For many clinical indications, DEXA is being used as the reference standard for the development of simpler methods of determining body composition. In one study, bioelectrical impedance was considered to be a valid diagnostic alternative to DEXA in women with amenorrhea. In patients with human immunodeficiency virus (HIV)-associated lipodystrophy, bioelectrical impedance was found to measure body composition with good precision in comparison with DEXA. Another study reported that a linear regression model incorporating age, weight, height, waistline, and hipline, predicted DEXA body composition with good accuracy and might be developed as a screening method to identify individuals with metabolic dysfunction. None of the studies report data demonstrating the impact of body composition measurement on health outcomes. The policy statement is unchanged.

January 2013 Update
There are no new studies in the peer-reviewed literature that demonstrate the use of the DEXA test in clinical care improves health outcomes. The DEXA test remains investigational.

Summary
DEXA body composition studies have emerged as a potential new reference standard for body studies, replacing underwater weighing. While DEXA scans have become a valued research tool, it is unclear how information regarding body composition could be used in the active medical management of the patient to improve health outcomes. Literature searches did not identify any controlled studies in which DEXA body composition measurements were actively used in patient management nor has the utility of DEXA been compared to the use of other simpler techniques of body composition assessment, i.e., bioelectrical impedance or skin-fold thickness, in a clinical setting. None of the studies reported data demonstrating impact of body composition measurement on health outcomes. The technique is considered investigational.

Key Words:
Dual X-ray absorptiometry (DEXA), body composition assessment, anthropomorphic techniques, skin-fold thickness, body composition, DXA, Total Body DEXAscan

Approved by Governing Bodies:
Not applicable

Benefit Application:
Coverage is subject to member's specific benefits. Group specific policy will supersede this policy when applicable.

ITS: Home Policy provisions apply
FEP contracts: FEP does not consider investigational if FDA approved. Will be reviewed for medical necessity.
Pre-certification/Pre-determination requirements: Not applicable

Current Coding:

CPT:	**76499**	Unlisted diagnostic radiographic procedure

Previous Coding:

	0028T	Dual energy x-ray absorptiometry (DEXA) body composition study, one or more sites **(Code deleted effective January 1, 2009)**

References:

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Policy History:

Medical Policy Group, August 2004 **(4)**
Medical Policy Administration Committee, August 2004
Available for comment August 24-October 7, 2004

Medical Policy Group, August 2006 **(1)**
Medical Policy Group, January 2007 **(2)**
Medical Policy Group, January 2009 **(1)**
Medical Policy Panel, February 2010
Medical Policy Group, June 2010 **(2)**
Medical Policy Group, June 2011; Added Key Word
Medical Policy Group, July 2011; Updated Key Points and References
Medical Policy Group, February 2012 **(2)**: 2012 Update-Key Points & References
Medical Policy Group, January 2013 **(2)**: 2013 Update to Key Points & References; policy statement remains unchanged

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