MEDICAL POLICY Capital BLUE

POLICY TITLE	WHOLE BODY DUAL X-RAY ABSORPTIOMETRY (DEXA) TO DETERMINE BODY COMPOSITION
POLICY NUMBER	MP-5.037

Original Issue Date (Created):	**April 26, 2011**
Most Recent Review Date (Revised):	**September 24, 2013**
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I. POLICY

Dual x-ray absorptiometry (DEXA) body composition studies are considered **investigational.** There is insufficient evidence to support a conclusion concerning the health outcomes or benefits associated with this procedure.

Cross-reference:
MP-5.046 Vertebral Fracture Assessment with Densitometry
MP-5.001 Bone Mineral Density

II. PRODUCT VARIATIONS

[N] = No product variation, policy applies as stated
[Y] = Standard product coverage varies from application of this policy, see below

[N] Capital Cares 4 Kids
[N] PPO
[N] HMO
[Y] SeniorBlue HMO*
[Y] SeniorBlue PPO*
[N] Indemnity
[N] SpecialCare
[N] POS
[Y] FEP PPO**

* Refer to Centers for Medicare and Medicaid (CMS) National Coverage Determination (NCD) 150.3. Bone (Mineral) Density Studies and Medicare Benefit Policy Manual, Chapter 15, section 80.5 of Pub. 100-02, Bone Mass Measurements (BMMs). Also see chapter 13, section 140 of Pub. 100-04, Medicare Claims Processing Manual, Bone Mass Measurements (BMMs).

** Refer to FEP Medical Policy Manual MP-6.01.40 Whole Body Dual X-Ray Absorptiometry (DEXA) to Determine Body Composition. The FEP Medical Policy manual can be found at: http://bluewebportal.bcbs.com/landingpagelevel3/504100?docId=23980

III. DESCRIPTION/BACKGROUND

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 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 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, 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 two 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 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 cited techniques assume two body compartments, DEXA can estimate three body compartments consisting of fat mass, lean body mass, and bone mass. DEXA 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 the 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 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.)

IV. RATIONALE

This policy is updated regularly with searches of the MEDLINE database. The most recent literature search was performed for the period through October 2012. Key studies are described below.

Several different clinical roles for whole body dual x-ray absorptiometry (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 (UWW) 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 UWW. 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

UWW may reflect the lack of accuracy of UWW, as opposed to any deficiency in the DEXA technique. Furthermore, two diagnostic techniques may be highly correlated but produce different values of body composition, i.e., compared to UWW, 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 UWW, bioelectrical impedance, or skin-fold thickness in different populations of patients, i.e., different age groups, ethnicities, and underlying disorders. (1-4) 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. (5-9) 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 cut-off 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 BMD, 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 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 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 body mass index (BMD) in postmenopausal women treated for osteoporosis, it is likely that DEXA 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 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 BMD. 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.

Additional Studies

The literature reflects extensive use of whole body DEXA to determine body composition in research. Active research areas are comparison of established clinical measures of body composition (body mass index or BMI, anthropomorphic measurements, and bioelectrical impedance analysis) with results using DEXA, 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 DEXA estimates of fat mass and fat-free mass, for routine clinical use, BMI is considered to provide satisfactory accuracy. (10)

For many clinical indications, DEXA is being used as the reference standard for the development of simpler methods of determining body composition. (11-14) For example, one study found that the Slaughter equation with skin-fold measurements was the closest to DEXA for assessing the body composition of children with cystic fibrosis. (15) In another study, bioelectrical impedance was considered to be a valid diagnostic alternative to DEXA in women with amenorrhea.(16) In patients with human immunodeficiency virus (HIV)-associated lipodystrophy, bioelectrical impedance was found to measure body composition with good precision in comparison with DEXA. (17) 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. (18)

DEXA measurements of body mass continue to be included as outcomes measures in various trials. A few reports suggest that DEXA 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 (GFR) in dialysis patients. (19-24) In another study, investigators hypothesized that DEXA would provide more accurate measurement than other methods in conditions, such as chronic obstructive pulmonary disease (COPD), with altered fluid balance. (25) Research in these specific clinical applications of DEXA is at an early stage, and studies have not shown if use of this test in clinical care improves outcomes.

Summary

DEXA (dual x-ray absorptiometry) has emerged as a new reference standard for body composition 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. Periodic literature searches have not identified 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 the impact of body composition measurement on health outcomes. The technique is considered investigational.

Technology Assessments, Guidelines and Position Statements

No guidelines or technology assessments on DEXA to determine body composition were found.

V. DEFINITIONS

BODY COMPOSITION is the relative percentage of bony minerals, cell mass, lean body mass, body fat, and body water in an organism, and their distribution through the body. Determination of the specific gravity of the body is done to estimate the percentage of fat. This may be calculated by various methods, including underwater weighing, which determines the density of the individual; use of radioactive potassium, measuring the total body water by dilution of tritium; and use of various anthropometric measurements such as height, weight, and skin fold thickness at various sites.

BONE DENSITY OR BONE MINERAL DENSITY (BMD) is the average mineral concentration of a specimen of bone; skeletal mass. Bone mineral density is reduced in osteopenia and osteoporosis.

BODY FAT also called adipose tissue is connective tissue that has been specialized to store fat

LEAN TISSUE MASS is the weight of the body minus the fat content. It includes bones, muscles, and internal organs.

VI. BENEFIT VARIATIONS

The existence of this medical policy does not mean that this service is a covered benefit under the member's contract. Benefit determinations should be based in all cases on the applicable contract language. Medical policies do not constitute a description of benefits. A member’s individual or group customer benefits govern which services are covered, which are excluded, and which are subject to benefit limits and which require preauthorization. Members and providers should consult the member’s benefit information or contact Capital for benefit information.

VII. DISCLAIMER

Capital's medical policies are developed to assist in administering a member's benefits, do not constitute medical advice and are subject to change. Treating providers are solely responsible for medical advice and treatment of members. Members should discuss any medical policy related to their coverage or condition with their provider and consult their benefit information to determine if the service is covered. If there is a discrepancy between this medical policy and a member's benefit information, the benefit information will govern. Capital considers the information contained in this medical policy to be proprietary and it may only be disseminated as permitted by law.

VIII. REFERENCES

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IX. CODING INFORMATION

Note: This list of codes may not be all-inclusive, and codes are subject to change at any time. The identification of a code in this section does not denote coverage as coverage is determined by the terms of member benefit information. In addition, not all covered services are eligible for separate reimbursement.

Investigational when used to report a DEXA body composition study as noted in the policy guidelines above; therefore, not covered:

CPT Codes®								
76499	78350	78351						

X. POLICY HISTORY

MP 5.037	**CAC 4/26/11** New Policy Adopt BCBSA. Information related to dual x-ray absorptiometry (DEXA) to determine body composition was extracted from MP 5.001 and a separate policy created. Added investigational policy statement.
	CAC 6/26/12 Consensus References updated, no change to policy statements
	7/29/13 Admin coding review complete--rsb
	CAC 9/24/13. Consensus. No change to policy statements. References updated. Rationale section added. Changed FEP variation to reference FEP policy manual.

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