Policy Statement

Devices using bioimpedance (bioelectrical impedance spectroscopy) are considered investigational for use in the diagnosis, surveillance, or treatment of patients with lymphedema, including use in subclinical secondary lymphedema.

Policy Guidelines

There is a CPT code for bioelectrical impedance testing:
- **93702**: Bioimpedance spectroscopy (BIS), extracellular fluid analysis for lymphedema assessment(s)

Description

Secondary lymphedema may develop following surgery for breast cancer. Bioimpedance, which uses resistance to electrical current to compare the composition of fluid compartments, could be used as a tool to diagnose lymphedema.

Related Policies

- Pneumatic Compression Pumps for Treatment of Lymphedema and Venous Ulcers

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

Devices that have been cleared for marketing by the U.S. Food and Drug Administration through the 510(k) process to aid in the assessment of lymphedema are summarized in Table 1.

**Table 1. Food and Drug Administration-Cleared Bioimpedance Spectroscopy Devices for Lymphedema**

<table>
<thead>
<tr>
<th>Year</th>
<th>Device</th>
<th>Manufacturer</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>MoistureMeterD</td>
<td>Delfin Technologies (Stamford, CT)</td>
<td>To aid informing a clinical judgment of unilateral lymphedema in women</td>
</tr>
<tr>
<td>2007</td>
<td>ImpediMed L-Dex™ U400</td>
<td>ImpediMed (Carlsbad, CA)</td>
<td>To aid clinical assessment of unilateral lymphedema of the arms in women</td>
</tr>
</tbody>
</table>

FDA product code: OBH.
Bioimpedance Devices for Detection and Management of Lymphedema

Rationale

Background

Lymphedema

Lymphedema is a chronic accumulation of fluid and fibrous tissue that results from the disruption of lymphatic drainage. Secondary lymphedema of the upper extremity may develop following surgery for breast cancer; it has been reported in approximately 25% to 50% of women following mastectomy. Lymphedema can be a disfiguring condition. It results from lymphatic dysfunction or disruption and can be difficult to diagnose and manage accurately. At least one systematic review has found that early detection of secondary lymphedema in breast cancer improves outcomes. The challenge is identifying the clinically significant limb swelling through simple noninvasive methods. Many techniques have been used for documenting lymphedema including measuring differences in limb volume (volume displacement) and limb circumference.

The detection of subclinical lymphedema (i.e., the early detection of lymphedema before clinical symptoms become apparent) is another area of study. Detection of subclinical lymphedema (referred to as stage 0 lymphedema) is problematic. The subclinical disease may exist for months or years before overt edema is noted. This approach generally involves comparison of preoperative (i.e., baseline) with postoperative measurements, because existing differences between upper extremities (like the effects of a dominant extremity) may obscure subtle differences resulting from the initial accumulation of fluid.

Diagnosis

Bioimpedance spectroscopy is based on the theory that the level of opposition to the flow of electric current (impedance) through the body is inversely proportional to the volume of fluid in the tissue. In lymphedema, with the accumulation of excess interstitial fluid, tissue impedance decreases.

Bioimpedance has been proposed as a diagnostic test for this condition. In usual care, lymphedema is recognized clinically or via limb measurements. However, management via bioelectrical impedance spectroscopy has been proposed as a way to implement early treatment of subclinical lymphedema to potentially reduce its severity.

Literature Review

Evidence reviews assess whether a medical test is clinically useful. A useful test provides information to make a clinical management decision that improves the net health outcome. That is, the balance of benefits and harms is better when the test is used to manage the condition than when another test or no test is used to manage the condition.

The first step in assessing a medical test is to formulate the clinical context and purpose of the test. The test must be technically reliable, clinically valid, and clinically useful for that purpose. Evidence reviews assess the evidence on whether a test is clinically valid and clinically useful. Technical reliability is outside the scope of these reviews, and credible information on technical reliability is available from other sources.

Bioimpedance spectroscopy for Lymphedema

Clinical Context and Test Purpose

The purpose of using bioimpedance spectroscopy in patients who have known, or suspected lymphedema, is to inform a diagnosis subclinical lymphedema to initiate treatment sooner than with other diagnostic methods.

The question addressed in this evidence review is: Does the use of bioimpedance spectroscopy devices detect lymphedema for individuals with known or suspected lymphedema?

The following PICOTS were used to select literature to inform this review.
Patients
The relevant population of interest are individuals with known or suspected lymphedema.

Interventions
The relevant intervention of interest is bioimpedance spectroscopy.

Comparators
The relevant comparators of interest are volume displacement and circumferential measurement.

Outcomes
The general outcomes of interest are test validity, symptoms, and quality of life.

Timing
The time frame for outcomes varies from months to years after the onset of lymphedema symptoms.

Setting
During a physical exam conducted by a physician in an inpatient or outpatient setting.

Simplifying Test Terms
There are three core characteristics for assessing a medical test. Whether imaging, laboratory, or other, all medical tests must be:

- Technically reliable
- Clinically valid
- Clinically useful.

Because different specialties may use different terms for the same concept, we are highlighting the core characteristics. The core characteristics also apply to different uses of tests, such as diagnosis, prognosis, and monitoring treatment.

Diagnostic tests detect the presence or absence of a condition. Surveillance and treatment monitoring are essentially diagnostic tests over a time frame. Surveillance to see whether a condition develops, or progresses is a type of detection. Treatment monitoring is also a type of detection because the purpose is to see if treatment is associated with the disappearance, regression, or progression of the condition.

Prognostic tests predict the risk of developing a condition in the future. Tests to predict response to therapy are also prognostic. Response to therapy is a type of condition and can be either a beneficial response or adverse response. The term predictive test is often used to refer to the response to therapy. To simplify terms, we use prognostic to refer both to predicting a future condition or to predict response to therapy.

Technical Reliability
Assessment of technical reliability focuses on specific tests and operators and requires review of unpublished and often proprietary information. Review of specific tests, operators, and unpublished data are outside the scope of this evidence review and alternative sources exist. This evidence review focuses on the clinical validity and clinical utility.

Clinically Valid
A test must detect the presence or absence of a condition, the risk of developing a condition in the future, or treatment response (beneficial or adverse).

A technology assessment on the diagnosis and treatment of secondary lymphedema, performed for the Agency for Healthcare Research and Quality (AHRQ), was published in 2010.² The AHRQ assessment identified eight studies that reported the sensitivity and specificity
of tests to diagnose secondary lymphedema. Reviewers noted there is no true criterion standard to grade severity of lymphedema and that limb volume and circumference are used as de facto criterion standards. Two of the eight selected studies evaluated bioimpedance devices.\(^3,4\) Overall, reviewers concluded that, due largely to heterogeneity among studies, the evidence did not permit conclusions on the optimal diagnostic test for detection of secondary lymphedema.

After the AHRQ review, several other studies have evaluated the diagnostic performance of bioimpedance devices for detecting lymphedema. Prospective studies that compared bioelectrical impedance analysis to a reference standard are described next.

A study by Barrio et al (2015) enrolled 223 women with newly diagnosed breast cancer and a plan for unilateral axillary surgery.\(^5\) Thirty-seven patients were excluded due to ineligibility or withdrawal, leaving a sample size of 186. Prior to surgery, participants received baseline volumetric measurements with a bioimpedance device (L-Dex) and volume displacement (the reference standard). Patients then had follow-up volumetric measurements every three to six months for three years. At the last follow-up (median, 18.2 months), 152 (82%) patients had no lymphedema, 21 (11%) had an abnormal L-Dex, and no lymphedema by volume displacement, 4 (2%) had an abnormal L-Dex and lymphedema by volume displacement, and 9 (5%) had lymphedema without prior L-Dex abnormality. In an analysis including only patients with at least 6 months of follow-up, L-Dex had a sensitivity of 31% (4/13) and a specificity of 88% (129/147) for predicting subsequent lymphedema development. Also, the correlation between changes in volume displacement and changes in L-Dex results were in the low-to-moderate range at 3 months (r=0.31) and 6 months (r=0.21). However, at the time of lymphedema diagnosis, the L-Dex ratio was abnormal in 12 of 13 patients (diagnostic sensitivity, 92%).

Blaney et al (2015) reported on a prospective study with 126 women with stage I, II, or III unilateral breast cancer.\(^6\) A total of 115 women underwent baseline assessment with an L-Dex and circumferential measurement. The circumferential measurement was used as the reference standard, although the authors noted the test is an imperfect criterion standard. Postsurgical follow-up assessments were planned every three months for a year. The number of women completing these assessments was 109 (95%) at 3 months, 89 (77%) at 6 months, 79 (69%) at 9 months, and 71 (62%) at 12 months. Over 12 months, 31 participants were identified as having lymphedema by at least 1 of the assessment methods. Twenty-eight (90%) of 31 were identified by circumferential measurement and 11 (35%) by bioimpedance spectroscopy. There was no statistically significant correlation between bioimpedance analysis and circumferential measurement.

**Section Summary: Clinically Valid**

A 2010 AHRQ technology assessment identified few studies on bioimpedance analysis for diagnosing lymphedema. A few prospective studies, published after the AHRQ review, found suboptimal correlations between bioimpedance analysis and the reference standard. In the study that reported measures of diagnostic accuracy, bioimpedance analysis had low sensitivity and specificity for predicting lymphedema development.

**Clinically Useful**

A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, or more effective therapy, or avoid unnecessary therapy, or avoid unnecessary testing.

The ideal study design is a randomized controlled trial comparing health outcomes in patients managed with and without the use of bioimpedance devices. No randomized controlled trials were identified. However, a controlled observational study has compared clinical lymphedema rates in patients managed with and without bioimpedance analysis. This study, by
Soran et al (2014), involved prospective detection of subclinical lymphedema in 186 women with breast cancer managed with L-Dex or tape measurement of limb circumference. Measurements were obtained at baseline and 3- to 6-month intervals for five years. Subclinical lymphedema was defined as an L-Dex value outside the normal range, or that increased at least ten units from baseline. Patients diagnosed with subclinical lymphedema were treated with, e.g., short-term physical therapy, compression garments, and received education on exercise and limb elevation. A total of 180 women were included in the analysis. Seventy-two women had both preoperative and postoperative bioimpedance and tape measurements (preoperative group). Forty-four women had preoperative bioimpedance and tape measurements but only had tape measurements postoperatively (control group). The remaining 64 women had postoperative bioimpedance and tape measurements, but no preoperative measurements (no preoperative group). The authors compared the demographic and clinical characteristics of the preoperative and control groups and the preoperative and postoperative groups; they did not identify any statistically significant differences.

In the preoperative group, 28 (36%) of 72 women were diagnosed with subclinical lymphedema and referred for treatment; 2 women progressed to clinical lymphedema. In the control group, 16 women (36%) developed clinical lymphedema during follow-up. Limitations of the study included a lack of an alternative method for detecting subclinical lymphedema in women in the control group so that they could receive treatment early; a lack of randomization to a treatment group; and incomplete data on pre- and postoperative measures of lymphedema except in a subset of the total population.

Laidley et al (2016), in a retrospective cohort study conducted at 2 surgical practices, reported on the feasibility and outcomes for postoperative bioimpedance monitoring in women following axillary lymph node surgery for breast cancer. Of 1113 patients, 326 patients who had undergone some form of axillary staging and preoperative and at least 2 postoperative bioimpedance measurements met the study’s eligibility criteria. The cumulative incidence of subclinical breast cancer-related lymphedema was 12.3%.

**Section Summary: Clinically Useful**

One prospective comparative study has compared rates of clinical lymphedema in women managed with and without bioimpedance analysis. This study had several limitations, including nonrandomized design, lack of blinding, lack of complete data on a substantial proportion of enrolled patients, and lack of a systematic method for diagnosing lymphedema in the control group. The authors reported a significantly lower rate of clinical lymphedema in patients managed with bioimpedance analysis and who received treatment for subclinical lymphedema. An additional retrospective analysis suggested that postoperative bioimpedance monitoring is feasible but provided limited information on its efficacy. Additional studies to confirm these findings are needed, especially randomized controlled trials and trials that include an alternative method for early or subclinical lymphedema detection.

**Summary of Evidence**

For individuals who have known or suspected lymphedema who receive bioimpedance spectroscopy, the evidence includes several prospective studies on diagnostic accuracy and a controlled observational study evaluating clinical utility. The relevant outcomes are test validity, symptoms, and quality of life. Recent diagnostic accuracy studies have found a poor correlation between bioimpedance analysis and the reference standard (volume displacement or circumferential measurement). There are no randomized controlled trials evaluating the clinical utility of bioimpedance devices in the management of patients with lymphedema or at high-risk of developing lymphedema. The single prospective comparative study found a significantly lower rate of clinical lymphedema in patients managed with bioimpedance devices. Limitations of this study included its retrospective design, lack of randomization or blinding, and lack of a systematic method for detecting early or subclinical lymphedema in the control group. An additional retrospective analysis suggested that postoperative bioimpedance monitoring is...
feasible but provides limited information about its efficacy. The evidence is insufficient to
determine the effects of the technology on health outcomes.

**Supplemental Information**

**Clinical Input From Physician Specialty Societies and Academic Medical Centers**

While the various physician specialty societies and academic medical centers may collaborate
and make recommendations during this process, through the provision of appropriate reviewers,
input received does not represent an endorsement or position statement by the physician
specialty societies or academic medical centers, unless otherwise noted.

In response to requests from Blue Cross Blue Shield Association, input was received from 2
specialty societies and 2 academic medical centers in 2011. Three of four reviewers agreed that
bioimpedance devices are considered investigational for diagnosis, surveillance, and treatment
of patients with lymphedema. The fourth reviewer, from an academic medical center,
considered the use of the technology a reasonable alternative, especially in situations in which
minor lymphedema can have a large impact on a patient. One specialty society supported
further research into the effectiveness of this technology and recommended reimbursement in
the context of relevant clinical trials.

**Practice Guidelines and Position Statements**

No relevant guidelines or statements were identified.

**U.S. Preventive Services Task Force Recommendations**

Not applicable.

**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 November 2017 did not identify any ongoing or unpublished trials
that would likely influence this review.

**References**

   2016;5(6):1154-1162. PMID 26993371
2. Oremus M, Walker K, Dayes I, et al. Technology Assessment: Diagnosis and treatment of
   secondary lymphedema. Rockville, MD: Agency for Healthcare Research and Quality;
   2010.
   choice of measure influences diagnosis, prevalence, and identifiable risk factors.
5. Barrio AV, Eaton A, Frazier TG. A prospective validation study of bioimpedance with
   volume displacement in early-stage breast cancer patients at risk for lymphedema. Ann
   related lymphedema in the first-year post-surgery: feasibility and comparison of
7. Soran A, Ozmen T, McGuire KP, et al. The importance of detection of subclinical
   lymphedema for the prevention of breast cancer-related clinical lymphedema after

### 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 codes does not constitute or imply member coverage or provider reimbursement.

**IE**

The following services may be considered investigational.

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<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Description</th>
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<td>CPT®</td>
<td>93702</td>
<td>Bioimpedance spectroscopy (BIS), extracellular fluid analysis for lymphedema assessment(s)</td>
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<td>HCPCS</td>
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<td>None</td>
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<td>ICD-10</td>
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<td>Procedure</td>
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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.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Action</th>
<th>Reason</th>
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<tr>
<td>07/02/2010</td>
<td>BCBSA Medical Policy adoption</td>
<td>Medical Policy Committee</td>
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<tr>
<td>08/04/2010</td>
<td>Administrative Review</td>
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<td>10/07/2011</td>
<td>Administrative Review</td>
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<td>07/24/2013</td>
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<td>Medical Policy Committee</td>
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<td>01/30/2015</td>
<td>Policy title change from Bioimpedance for Assessment of Lymphedema</td>
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<td>Policy revision without position change Coding Update</td>
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<td>03/01/2016</td>
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<tr>
<td>04/01/2019</td>
<td>Policy revision without position change</td>
<td>Medical Policy Committee</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.