Local Coverage Determination (LCD): MolDX: EndoPredict® Breast Cancer Gene Expression Test (L37295)

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**Contractor Information**

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Created on 12/02/2019. Page 1 of 11
LCD Title
MolDX: EndoPredict® Breast Cancer Gene Expression Test

Proposed LCD in Comment Period
N/A

Source Proposed LCD
DL37295

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CMS National Coverage Policy

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Title XVIII of the Social Security Act, §1862(a)(1)(A). Allows coverage and payment for only those services that are considered to be reasonable and necessary.


CMS Internet-Only Manual, Publication 100-02, Medicare Benefit Policy Manual, Chapter 15, §§80.0, 80.1.1, 80.2 Clinical Laboratory services.

**Coverage Guidance**

**Coverage Indications, Limitations, and/or Medical Necessity**

This Medicare contractor will provide limited coverage for the EndoPredict® breast cancer gene expression test (Myriad Genetic Laboratories Inc., Salt Lake City, UT) for the management of post-menopausal women diagnosed with early-stage (TNM stage T1-3, N0-1) estrogen-receptor (ER) positive, Her2-negative breast cancer, who are either lymph node-negative or who have 1-3 positive nodes, and for whom treatment with adjuvant endocrine therapy (e.g., tamoxifen or aromatase inhibitors) is being considered. The test is used by physicians in the management of these patients by identifying those who have sufficiently low risk of distant recurrence (DR) at 10 years and may safely forego chemotherapy.

**Summary of Evidence**

In 2016, approximately 247,000 cases of breast cancer were diagnosed in the United States.\(^1\) Approximately 54% of early-stage breast cancers are estrogen receptor (ER)-positive and HER2-negative, leading to treatment with adjuvant endocrine therapy (e.g., tamoxifen or aromatase inhibitors) that significantly improves prognosis.\(^2,3\) Determining which patients with ER+/Her2- breast cancer will have a low enough risk of DR after 5 years of endocrine therapy to forgo adjuvant chemotherapy is a priority for physicians who manage these patients.

A 2012 meta-analysis by the Early Breast Cancer Trialist’s Collaborative Group demonstrated that all clinical risk groups of patients with early breast cancer experience a ~30% benefit from chemotherapy, in terms of decrease in DR rate.\(^4\) Therefore, patients with a low underlying risk of DR will have a lower absolute benefit from chemotherapy, compared to patients with a high underlying risk of DR. For each patient, the expected absolute benefit of chemotherapy needs to be weighed against the 2-3% chance of treatment-related toxicity and long-term side effects.

Tumor size, grade, and nodal status are currently used for assessment of a patient’s distant recurrence risk to make decisions about the addition of chemotherapy to endocrine therapy. However, molecular tests have been shown to improve prognostic accuracy compared to standard clinical features and have become increasingly important for patients with ER+/Her2- breast cancer. These assays have become standard of care in the treatment of early stage breast cancer, to identify patients who have a low risk of DR such that chemotherapy would not provide an overall benefit, to directly predict chemotherapy benefit, and to help curtail costly overtreatment.

In determining the cutoff to identify low risk patients, breast cancer prognostic tests commonly use a threshold of a
10% risk of DR at 10 years. Patients with a risk under 10% are categorized as low risk. This 10% cutoff is a well-accepted standard used by many currently available breast prognostic tests and accepted by the American Society of Clinical Oncology (ASCO).

Test Description and Intended Use

EndoPredict was developed in a training cohort of 964 ER-positive and HER2-negative breast tumor samples. The EndoPredict test is composed of a 12 gene molecular score as well as clinicopathological features (tumor size and nodal status). Eight genes were selected as relevant for therapeutic decision making; they include proliferation-associated genes as well as estrogen receptor signaling-associated genes. The signature also includes three RNA normalization genes and one DNA contamination control gene. The 12 gene molecular score is calculated by the weighted expression of the 8 target genes, as normalized by the 3 normalization genes, as measured in formalin-fixed paraffin-embedded (FFPE) breast tumor tissue. The 12 gene molecular score is then combined with clinicopathologic features including tumor size and lymph node status to produce the EndoPredict (EPclin) score. Patients with an EPclin score of ≤3.3 are classified as low risk and those with an EPclin score >3.3 are classified as high risk. In addition to a clear bimodal result (low- or high-risk), the test report includes the personalized risk of 10-year distant recurrence based on each patient’s individual tumor.

EndoPredict is intended for use in FFPE breast tumor tissue from postmenopausal women diagnosed with early-stage (TNM stage T1-3, N0-1) ER-positive, Her2-negative breast cancer, who are either lymph node-negative or who have 1-3 positive nodes, and for whom treatment with adjuvant endocrine therapy (eg, tamoxifen or aromatase inhibitors) is being considered. The test is used by physicians in the management of early-stage breast cancer by identifying those patients with a low-risk EPclin score, for whom the absolute benefit of adjuvant chemotherapy is unlikely to outweigh the risks.

Analytical Validation

This assay’s analytical validation is consistent with industry standards and MolDX criteria.

Clinical Validation

The prognostic ability of EndoPredict has been validated by prospectively designed-retrospective studies in three different cohorts from phase III trials [The Austrian Breast & Colorectal Cancer Study Group (ABCSD)-6 and-8, and Arimidex, Tamoxifen, Alone or in Combination (ATAC)] involving more than 2,600 patients, satisfying a 1B level of evidence according to the classification for prognostic biomarkers proposed by Simon et al. These studies collectively demonstrate the ability of EndoPredict to predict the primary endpoint of distant metastases in both early and late time periods, to accurately classify patients into a low or high risk group, and to identify a low risk group with excellent 10 year outcomes after treatment with 5 years of endocrine therapy only. EndoPredict was determined to provide independent prognostic information compared to clinical and pathologic features alone. Filipits et al. (2011) described the initial development and clinical validation of the 12 gene molecular score and EPclin scores. The 12 gene molecular score and EPclin scores were developed in a training cohort of 964 ER-positive, HER2-negative tumors from both node-positive and -negative patients treated with adjuvant endocrine
therapy only. The design and calculation of the 12 gene molecular score and EPclin scores was prespecified. The threshold for EPclin to discriminate patients into low and high risk of distant recurrence was pre-defined at 3.3 which corresponded to a 10% DR risk at 10 years. Scores were then independently validated on 1702 patients from two large randomized phase III trials (ABCSG-6 and -8 trials), with ER+, HER2- breast cancer who received endocrine therapy only for 5 years, and included both node-positive and node-negative patients. In Kaplan-Meier analysis, EPclin low risk patients had a 4% distant recurrence rate (both ABCSG cohorts), while EPclin high risk patients had a 28% (ABCSG-6) or 22% (ABCSG-8) rate of distant recurrence (HR= 7.97 (ABCSG-6) or 4.27 (ABCSG-8), both P<0.001), demonstrating the ability of EPclin to accurately classify patients into low and high risk groups.

Buus et al. (2016) published a clinical validation study of EndoPredict in a third cohort of patients using the same pre-defined EPclin threshold of 3.3 to discriminate low risk from high risk patients (as described in Filipits et al.).7 The study included 928 women from the ATAC trial who had ER-positive, HER2-negative breast cancer, both node-negative and node-positive, chemotherapy-naïve, treated with endocrine therapy. The EPclin score classified high and low risk patients with both node negative disease (5.9% DR for low risk vs. 20.0% DR for high risk, HR=3.9 (2.33-6.52) p<0.001) and node positive disease (5.0% vs. 36.9%, HR=9.49 (2.33-38.75) p<0.001). Overall, the EPclin score classified 58.8% of patients as low risk in this study. The authors concluded that the superior performance of EPclin compared with another widely used breast cancer prognostic test was partly due to the inclusion of clinical variables (nodal status and tumor size) in the EPclin score, but also due to an improved molecular signature that better predicts late events in years 5-10 (x2=59.3, p<0.001).

Dubsky et al. conducted two secondary analyses to evaluate the performance of EndoPredict in different subsets of the 1702 ER-positive, HER2-negative breast cancer patients from the ABCSG-6 and ABCSG-8 phase III trials.12-13 The EPclin score improved the classification of breast cancer compared to the prognosis assigned by standard guidelines that use clinical and pathological features (i.e., NCCN, German S3 and St. Gallen).12 Using clinical guidelines, 6-19% of patients were classified as low risk; however, EPclin classified 63% of all patients as low risk. Furthermore, 58-61% of patients classified as high- or intermediate-risk according to clinical guidelines were reclassified by EPclin as low risk; this group of patients had a 5% rate of distant metastasis at 10 years, confirming the accuracy of EndoPredict’s assessment of risk. Finally, EndoPredict was compared to standard clinical parameters for predicting distant metastases in both early (0-5y) and late (5-10y) time periods, which is an important consideration based on the fact that 50% of recurrences in women with ER+, Her2- breast cancer occur after 5 years.13 The EPclin low risk group had significantly improved clinical outcomes compared to the EPclin high risk group in both the early (0-5y; HR 4.82, p<.001)) and late (5-10y; HR 6.25, p<.001) timeframes. The EPclin score identified 64% of patients at risk after 5 years into a low-risk subgroup with an absolute 1.8% risk of late distant metastasis at 10 years.

Clinical Utility

A retrospective analysis of the prospective use and impact of the EndoPredict assay in a clinical setting was published in 2013 by Müller et al.14 Samples from 167 women with primary invasive ER+, HER2- breast cancer were analyzed by EndoPredict performed at the molecular pathology laboratory (Institute of Pathology) at the Charité´ University Hospital in Berlin. The impact of EndoPredict on changes in therapy decisions was evaluated for 130 of the 167 patients, of whom 47.7% had low EPclin scores and 52.3% had high EPclin scores. There was a change in pre-test versus post-test therapy for 37.7% of patients with most of the changes due to reduction from combination therapy (chemotherapy plus endocrine) to endocrine therapy alone. Before the EndoPredict assay, 47 (36.2%) of patients had been scheduled for endocrine therapy alone and 83 (63.8%) had been scheduled for a combination of endocrine therapy and chemotherapy. After the EndoPredict results were available, the number of patients with endocrine therapy alone increased to 67 (51.5%). Changes in therapy were directionally aligned with the EPclin result as low or high risk.
A 2013 meta-analysis of Oncotype DX decision data determined that the test changed adjuvant chemotherapy treatment decisions in 33.4% of patients (8 studies, 1,437 patients).\textsuperscript{16} The observed change in treatment recommendations for 37.7% and 35.8% of patients after use of EndoPredict is therefore consistent with the expected clinical utility of similar established tests.

**Summary of Analytical and Clinical Performance**

**General**

EndoPredict is intended for use in FFPE breast tumor tissue from postmenopausal women diagnosed with early stage (TNM stage T1-3, N0-1) ER-positive, Her2-negative breast cancer, who are either lymph node-negative or who have 1-3 positive nodes, and for whom treatment with adjuvant endocrine therapy (e.g., tamoxifen or aromatase inhibitors) is being considered.

**Intended Use**

Invasive primary female breast cancer FFPE tissue.

**Analytical Performance**

**Description**

Intermediate precision (between run precision) 12 samples (2 low, 10 high, score range 2.1-5.9) were run 3 times for the inter-batch reproducibility. Each set of 12 samples was run on different days, in batches of 2 samples. Each time a set of 12 samples was run, the samples were randomly assigned into the batches of 2 samples. Thus, 6 batches were run for each set of samples, for a total of 18 batches. 2 QuantStudio instruments (for qRT-PCR) and 7 technicians (3 within the anatomic pathology laboratory and 4 within the RNA extraction and qRT-PCR laboratory) were involved. These samples were tested over a 17 day period, with each sample replicate tested on a different day than the other replicates for that sample. Two different lots of 96-well plates and positive control were utilized, and a single lot of mastermix and extraction reagents were utilized.

**Results (with 95% Confidence Intervals if applicable)**

Qualitative: 100% (36/36; 95% CI = 90.3-100%)

Quantitative: Standard deviation = 0.06 EPclin score units (upper 95% CI: 0.07)

**Reproducibility (between sites)**

N/A. This test is only performed in one laboratory.

There is no minimum RNA concentration required for testing as determined by UV spectroscopy. Instead, a functional quantification of the RNA is performed by measuring the average Ct values of the 3 housekeeper genes. This average value must be between 19.0 and 27.0 for an EPclin score to be generated.

**Limit of blank (LOB)**

Not empirically determined.
Limits of quantitation (LOQ)

There is no pre-specified upper or lower limit for Ct values for any target or housekeeper gene. However, there is both an upper and lower limit for the averaged Ct value of the housekeeper genes (19.0-27.0).

For the EPclin score, the reportable range of scores was determined in a cohort of 1,324 samples and is from 1.1 to 6.2.10

Reportable range

Contamination of ≤70% normal tissue did not significantly alter the EPclin score. Additionally, there are no known PCR inhibitors in breast resection tissue.

Archival FFPE samples were tested in the validation studies of this assay, with samples over 10 years old tested and producing passing results.

Interfering substances

Specimen stability, primary (FFPE)

Archival FFPE samples were tested in the validation studies of this assay, with samples over 10 years old tested and producing passing results.

Specimen stability, intermediate (Isolated RNA)

6 samples (1 low risk, 5 high risk; score range 2.0 to 6.8) were tested over 4 weeks when stored at -80 °C, acceptance criteria = ±0.6 EP score units

Reagent closed/shelf-life stability

4 reagents are considered critical: Versant Tissue Prep Kit (Siemens Healthcare Diagnostics); TaqPath 1-step RT-qPCR Master Mix (ThermoScientific); Positive control RNA (Agilent Technologies); and EndoPredict 96-well plate (Myriad GMBH). Manufacturer’s guidelines are followed for all reagent expirations.

Reagent open/in use stability

Specimen stability, intermediate (Isolated RNA) 6 samples (1 low risk, 5 high risk; score range 2.0 to 6.8) were tested over 4 weeks when stored at -80 °C, acceptance criteria = ±0.6 EP score units

The prognostic ability of EndoPredict has been validated in three different cohorts from phase III trials (ABCSG-6 and-8, and ATAC), involving more than 2,600 patients with ER-positive, HER2-negative, node-positive and -negative invasive breast cancer treated with endocrine therapy only.

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<td>1324</td>
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HR and p-value

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ATAC7 928 5.8% (4.0 – 8.3) 59% 28.8% (24.3 – 33.9) 5.99 (3.94-9.11) p<0.001

ABCSG-6&8* 1165 5% (2.5 – 6.8) 78% 16% (10.0 – 22.8) 3.92 p<0.001

Node Negative

ATAC7 680 5.9% (4.0 – 8.6) 73% 20.0% (14.6 – 27.0) 3.90 p<0.001

ABCSG-6&8* 527 5.2% (1.0 – 9.2) 30% 28% (21.1 – 34.4) 4.70 (2.16-10.22) p<0.001

Node Positive

ATAC7 248 5.0% (1.2 – 18.9) 19% 36.9% (30.2 – 44.5) 9.49 (2.33-38.75) p<0.001

*Subset analysis from Filipits et al. 2011

Analysis of Evidence
(Rationale for Determination)

Level of Evidence

Quality of Evidence – Moderate

Strength – High

Weight - Moderate

The EndoPredict assay is reasonable and necessary to assist physicians in the management of early stage breast cancer by identifying those patients with a sufficiently low risk of 10-year distant recurrence who may safely forgo chemotherapy. The assay is covered for women with T1-3, N0-1 breast cancer when the following criteria are met:

- Patient is post-menopausal, and
- Pathology (excisional or biopsy) reveals invasive carcinoma of the breast that is ER-positive, Her2-negative, and
- Patient is either lymph node-negative or has 1-3 positive lymph nodes, and
- Patient has no evidence of distant metastasis, and
- Test result will be used to determine treatment choice between endocrine therapy alone vs. endocrine therapy plus chemotherapy.

Note: The EndoPredict test should not be ordered if a physician does not intend to act upon the test result.
Bibliography


8. Package Insert, Prosigna Breast Cancer Prognostic Gene Signature Assay


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**Revision History Information**

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**Associated Documents**

**Attachments**

N/A

**Related Local Coverage Documents**

**Article(s)**

A57607 - Billing and Coding: MolDX: EndoPredict® Breast Cancer Gene Expression Test
A55793 - Response to Comments: MolDX: EndoPredict® Breast Cancer Gene Expression Test

**LCD(s)**

DL37295
- (MCD Archive Site)

**Related National Coverage Documents**

N/A

**Public Version(s)**

Updated on 11/22/2019 with effective dates 11/01/2019 - N/A
Updated on 11/11/2019 with effective dates 11/01/2019 - N/A
Updated on 05/09/2019 with effective dates 01/10/2019 - 10/31/2019
Updated on 08/16/2018 with effective dates 01/30/2018 - 01/09/2019
Updated on 11/30/2017 with effective dates 01/30/2018 - N/A

**Keywords**

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