Gene Expression Profiling for Uveal Melanoma

Introduction

Uveal melanoma is a rare cancer of the eye that often spreads to other parts of the body. A special type of genetic testing called “gene expression profiling” (GEP) looks at the activity of many genes at once to give a broad picture of cellular function in a tumor. It has been used to help determine the prognosis of a person with uveal melanoma. This policy describes when gene expression profiling may be medically necessary in cases of uveal melanoma.

Note: The Introduction section is for your general knowledge and is not to be taken as policy coverage criteria. The rest of the policy uses specific words and concepts familiar to medical professionals. It is intended for providers. A provider can be a person, such as a doctor, nurse, psychologist, or dentist. A provider also can be a place where medical care is given, like a hospital, clinic, or lab. This policy informs them about when a service may be covered.

Policy Coverage Criteria

<table>
<thead>
<tr>
<th>Service</th>
<th>Medical Necessity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gene expression profiling, uveal melanoma</td>
<td>Gene expression profiling for uveal melanoma with DecisionDx-UM® is medically necessary for patients with primary, localized uveal melanoma.</td>
</tr>
</tbody>
</table>
Examples of commercial tests include:
- DecisionDx-UM® test (Castle Biosciences Inc., Phoenix, AZ)

Gene expression profiling for uveal melanoma that does not meet the above criteria is investigational.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>CPT</td>
<td></td>
</tr>
<tr>
<td>81599</td>
<td>Unlisted multianalyte assay with algorithmic analysis</td>
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</table>

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Related Information

N/A

Evidence Review

Description

Uveal melanoma is associated with a high rate of metastatic disease, and survival after the development of metastatic disease is poor. Prognosis following treatment of local disease can be assessed using various factors, including clinical and demographic markers, tumor stage,
tumor characteristics, and tumor cytogenetics. Gene expression profiling (GEP) can be used to
determine prognosis, and gene expression profile testing is commercially available.

**Background**

**Uveal melanoma**

The uveal tract is the middle layer of the wall of the eye, and has 3 main parts: the choroid (a
tissue layer filled with blood vessels), ciliary body (muscle tissue that changes the shape of the
pupil and the lens), and the iris (the colored part of the eye). Uveal melanoma arises from
melanocytes in the stroma of the uveal tract. Approximately 90% of uveal melanomas arise in
the choroid, 7% in the ciliary body, and 3% in the iris.¹

Uveal melanoma, although rare, is the most common primary intraocular malignancy in adults.
Mean age-adjusted incidence of uveal melanoma in the United States is 6.3 per million people
among whites, 0.9 among Hispanics, and 0.24 among blacks.¹ Uveal melanoma has a
progressively rising, age-specific, incidence rate that peaks near age 70. Host susceptibility
factors associated with the development of this cancer include white race, fair skin, and light eye
color.

**Treatment**

Treatment of primary, localized uveal melanoma can be by surgery or radiotherapy. In general,
larger tumors require enucleation surgery and smaller tumors can be treated with radiotherapy,
but specific treatment parameters are lacking. The most common treatment of localized uveal
melanoma is radiotherapy, which is preferred because it can spare vision in most cases. For
smaller lesions, randomized controlled trials (RCTs) have shown that patients receiving
radiotherapy or enucleation progress to metastatic disease at similar rates after treatment.²,³
Radiotherapy can be delivered by various mechanisms, most commonly brachytherapy and
proton beam therapy.¹,²Treatment of primary uveal melanoma improves local control and
spares vision. However, the 5-year survival rate (81.6%) has not changed over the last 3 decades,
suggesting that life expectancy is independent of successful local eye treatment.⁴

Uveal melanomas disseminate hematogenously, and metastasize primarily to the liver and lungs.
Treatment of hepatic metastases is associated with prolonged survival and palliation in some
patients. Therapies directed at locoregional treatment of hepatic metastases include surgical and
ablative techniques, embolization, and local chemotherapy.
Metastatic Disease

It is unusual for patients with uveal melanoma to have distant metastases at presentation, with less than 1% presenting with metastases when they are treated for their intraocular disease. However, they are at risk for distant metastases, particularly to the liver, for years after presentation.\(^5\) The prospective, longitudinal Collaborative Ocular Melanoma Study (COMS) followed 2320 patients with choroidal melanoma with no melanoma metastasis at baseline who were enrolled in RCTs to evaluate forms of radiotherapy for choroidal melanoma for 5 to 10 years.\(^6\) During follow-up, 739 patients were diagnosed with at least 1 site of metastasis, of which 660 (89%) were liver. Kaplan-Meier estimates of 2-, 5-, and 10-year metastasis rates were 10% (95% confidence interval [CI], 9% to 12%), 25% (95% CI, 23% to 27%), and 34% (95% CI, 32% to 37%), respectively.

Prognosis

Metastatic disease is the leading cause of death in patients with uveal melanoma, and approximately 50% of patients will develop distant metastasis. A number of factors may be used to determine prognosis, but the optimal approach is uncertain.\(^7,8\) The most important clinical factors that predict metastatic disease are tumor size measured in diameter or in thickness, ciliary body involvement, and transscleral extension. Clinical staging according to the American Joint Committee on Cancer (AJCC) recommendations allows risk stratification for metastatic disease.\(^9\) In a retrospective study of 3377 patients with uveal melanoma, in which staging was performed using AJCC classifications, the rate of metastases-free survival at 5 years was 97% for stage I, 89% for stage IIA, 79% for stage IIB, 67% for stage IIIA, 50% for stage IIIB, and 25% for stage IIIB.\(^10\)

Genetic Analysis

Genetic analysis of uveal melanoma can provide prognostic information for the risk of developing metastatic disease. In 1996, Prescher et al showed that monosomy of chromosome 3 correlated strongly with metastatic death, with a 5-year survival reduction from 100% to 50%.\(^11\) Subsequent studies reported the initial idea that, based on genetic analysis, there were 2 distinct types of uveal melanomas—those with monosomy chromosome 3 associated with a very poor prognosis and those with disomy 3 and 6p gain associated with a better prognosis.\(^1\) The BAP1
gene has been identified as an important marker of disease type. In 1 study, 89% of tumors with monosomy 3 had a BAP1 mutation, and no tumors without monosomy 3 had a BAP1 mutation.\textsuperscript{12}

Gene expression profiling (GEP) determines the expression of multiple genes in a tumor and has been proposed as an additional method to stratify patients into prognostic risk groups.

**Summary of Evidence**

For individuals who have localized uveal melanoma who receive a GEP test for uveal melanoma (DecisionDx-UM), the evidence includes cross-sectional studies of assay validation and clinical validity. Relevant outcomes are overall survival, disease-specific survival, test accuracy and validity, other test performance measures, functional outcomes, health status measures, and quality of life. One commercially available test identified (DecisionDx-UM) has published data related to its clinical validity, and is the focus of this review. Three studies of clinical validity identified used the GEP score to predict melanoma metastases and melanoma-specific survival. All three reported that GEP classification correlated strongly with metastatic disease and melanoma mortality. Two studies compared GEP classification with other prognostic markers, and GEP class had the strongest association among the markers tested. GEP classification appears to be a strong predictor of metastatic disease and melanoma death. There are no studies directly showing clinical utility. Absent direct evidence, a chain of evidence can be constructed to determine whether using the results of GEP testing for management decisions improves the net health outcome of patients with uveal melanoma. Aaberg et al (2014) have shown an association between GEP classification and treatment, reporting that patients classified as low-risk were managed with less frequent and intensive surveillance and were not referred for adjuvant therapy. It is uncertain whether stratification of patients into higher risk categories has the potential to improve outcomes by allowing patients to receive adjuvant therapies through detection of metastases earlier. However, classification into the low-risk group would support a reduction in the burden of surveillance without apparent harm. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

**Ongoing and Unpublished Clinical Trials**

Some currently unpublished trials that might influence this review are listed in Table 1.
### Table 1. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
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<tr>
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<tr>
<td>NCT02376920</td>
<td>5 Year Registry Study to Track Clinical Application of</td>
<td>2800</td>
<td>Oct 2020</td>
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<tr>
<td></td>
<td>DecisionDx-UM Assay Results and Associated Patient Outcomes (CLEAR)</td>
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</table>

NCT: national clinical trial.

### Practice Guidelines and Position Statements

**National Comprehensive Cancer Network**

In its guidelines on melanoma (v.1.2018), the National Comprehensive Cancer Network (NCCN) states: “Mucosal and uveal melanomas differ significantly from cutaneous melanoma in presentation, genetic profile, staging, response to treatment, and patterns of progression. Ideally, mucosal and uveal melanoma should be treated as diseases distinct from cutaneous melanoma, with care tailored to the individual.”

**Melanoma Focus**

Melanoma Focus, a British medical nonprofit that focuses on melanoma research, published guidelines on uveal melanoma in 2015. These guidelines, which were created using a process accredited by the National Institute for Health and Care Excellence, contained the following statements on prognosis and surveillance.

### 3.5.1 Prognostic factors/tools

1. Prognostic factors of uveal melanoma are multi-factorial and include clinical, morphological and genetic features. The following features should be recorded:
   - Age
   - Gender
   - Tumour location
o Tumour height
o Tumour Largest [sic] basal diameter
o Ciliary body involvement
o Extraocular melanoma growth (macroscopic)

2. The following features should be recorded if tissue is available:

o Cell type (modified Callender system)

o Mitotic count (number/40 high power fields in H&E [hematoxylin and eosin] stained sections)

o Presence of extravascular matrix patterns (particularly closed connective tissue loops; enhanced with Periodic acid Schiff staining). Grade A

o Presence of extraocular melanoma growth (size, presence or absence of encapsulation). [GRADE A]

3.5.2 Prognostic biopsy

1. There should be a fully informed discussion with all patients, explaining the role of biopsy including the benefits and risks. The discussion should include:

o Risk of having the biopsy

o Limitations of the investigation

o Benefits for future treatments (including possible recruitment to trials)

o Impact on quality of life

o Recruitment to trials

o Follow-up [GPP]

2. Use of the current (ie, 7th) Edition of the TNM staging system for prognostication is highly recommended. Grade A

3. Use of multifactorial prognostication models incorporating clinical, histological, immunohistochemical and genetic tumour features - should be considered. Grade D
3.6 Surveillance

1. Prognostication and surveillance should be led by a specialist multidisciplinary team that incorporates expertise from ophthalmology, radiology, oncology, cancer nursing and hepatic services. [GPP]

2. Prognostication and risk prediction should be based on the best available evidence, taking into account clinical, morphological and genetic cancer features. [GPP]

3. All patients, irrespective of risk, should have a holistic assessment to discuss the risk, benefits and consequences of entry into a surveillance programme. The discussion should consider risk of false positives, the emotional impact of screening as well as the frequency and duration of screening. An individual plan should be developed. [GPP]

4. Patients judged at high-risk of developing metastases should have 6-monthly life-long surveillance incorporating a clinical review, nurse specialist support and liver specific imaging by a non-ionising modality. [GPP] ...

5. Liver function tests alone are an inadequate tool for surveillance. Grade C”

Note: Melanoma Focus defined GPP as: recommended best practice based on the clinical experience of the guideline development group.

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.

Regulatory Status

Clinical laboratories may develop and validate tests in-house and market them as a laboratory service; laboratory-developed tests must meet the general regulatory standards of the Clinical Laboratory Improvement Amendments. The DecisionDx-UM® test (Castle Biosciences, Phoenix, AZ) is available under the auspices of the Clinical Laboratory Improvement Amendments. Laboratories that offer laboratory-developed tests must be licensed by the Clinical Laboratory Improvement Amendments for high-complexity testing. To date, the U.S. Food and Drug Administration has chosen not to require any regulatory review of this test.


**History**

<table>
<thead>
<tr>
<th>Date</th>
<th>Comments</th>
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<tbody>
<tr>
<td>08/11/14</td>
<td>New Policy. Policy created with a literature review through March 11, 2014. Gene expression profiling for uveal melanoma is considered investigational.</td>
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<tr>
<td>07/14/15</td>
<td>Annual Review. Policy updated with literature review through April 28, 2015; no references added. Policy statement unchanged.</td>
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<tr>
<td>10/01/16</td>
<td>Annual Review, approved September 13, 2016. Policy updated with literature review through April 29, 2016; references 2-4, 6-9, 11, 14, and 16-18 added. Policy statement unchanged.</td>
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<td>05/01/17</td>
<td>Annual review, approved April 11, 2017. Policy updated with literature review through February 2, 2017; references 5-7, 22, and 24 added. Policy statement changed from investigational to medically necessary for patients with primary, localized uveal melanoma.</td>
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<tr>
<td>09/22/17</td>
<td>Policy moved to new format; no change to policy statements.</td>
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<tr>
<td>05/01/18</td>
<td>Annual Review, approved April 3, 2018. Policy updated with literature review through December 2017; no references added. Policy statement unchanged.</td>
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U.S. Department of Health and Human Services
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