Electronic Brachytherapy for Nonmelanoma Skin Cancer

Policy Number: 8.01.62
Origination: 01/2016
Last Review: 1/2020
Next Review: 1/2021

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will not provide coverage for Electronic Brachytherapy for Nonmelanoma Skin Cancer. This is considered investigational.

When Policy Topic is covered
n/a

When Policy Topic is not covered
Electronic brachytherapy for the treatment of nonmelanoma skin cancer (see Considerations section) is considered investigational.

Considerations
Nonmelanoma skin cancer refers to squamous cell carcinoma and basal cell carcinoma. There are other less common types of skin cancer, such as T-cell lymphoma or Merkel cell tumor, which may have specific treatment options that are different from basal and squamous cell carcinomas and may need to be considered on an individual basis.

Description of Procedure or Service

<table>
<thead>
<tr>
<th>Populations</th>
<th>Interventions of interest are:</th>
<th>Comparators of interest are:</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals:</td>
<td>Electronic brachytherapy</td>
<td>Surgery</td>
<td>Relevant outcomes include:</td>
</tr>
<tr>
<td>With nonmelanoma skin cancer</td>
<td></td>
<td>External beam radiotherapy</td>
<td>• Overall survival</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard brachytherapy</td>
<td>• Disease-specific survival</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Change in disease status</td>
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<td></td>
<td></td>
<td></td>
<td>• Treatment-related morbidity</td>
</tr>
</tbody>
</table>

Electronic brachytherapy is a form of radiotherapy that is designed to deliver high-dose rate (HDR) brachytherapy for the treatment of nonmelanoma skin cancer. This technique focuses a uniform dose of x-ray source radiation to the lesion with the aid of a shielded surface application.
For individuals who have nonmelanoma skin cancer who receive electronic brachytherapy, the evidence includes a systematic review and case series. Relevant outcomes are overall survival, disease-specific survival, change in disease status, and treatment-related morbidity. No controlled trials were identified that have compared electronic brachytherapy with alternative treatment options. A 2016 systematic review of case series found local control rates ranging from 83% to 100% and recurrence rates ranging from 0% to 17%. In most studies, the recurrence rate was less than 5%. In the absence of controlled studies, conclusions cannot be drawn about the efficacy and safety of electronic brachytherapy compared with other treatments for nonmelanoma skin cancer. Controlled trials are needed in defined populations that compare electronic brachytherapy with alternatives, specifically other forms of radiotherapy or surgical approaches. The evidence is insufficient to determine the effects of the technology on health outcomes.

**Background**

**Nonmelanoma Skin Cancer**

Nonmelanoma skin cancer consists primarily of squamous cell carcinoma and basal cell carcinoma, with other types (eg, T-cell lymphoma, Merkel cell tumor, basosquamous carcinoma, Kaposi sarcoma) being much less common. Basal and squamous cell carcinoma are the most common types of malignancy in the United States, affecting between 1 and 3 million people per year and increasing at a rate of 3% to 8% per year. The primary risk factor for nonmelanoma skin cancer is sun exposure, with additional risk factors such as toxic exposures, other ionizing radiation exposure, and immunosuppression playing smaller roles. Although these cancers rarely cause mortality, they can impact quality of life, functional status, and physical appearance.

**Treatment**

In general, the most effective treatment for nonmelanoma skin cancer is surgical. If surgery is not feasible or preferred, cryosurgery, topical therapy, or radiotherapy can be considered, though the cure rate may be lower. When considering the most appropriate treatment strategy, recurrence rate, preservation of function, patient expectations, and potential adverse events should be considered.

**Surgical**

The choice of surgical procedure depends on the histologic type, size, and location of the lesion. Patient preferences can also play a factor in surgical decisions due to cosmetic reasons—as well as the consideration of comorbidities and patient risk factors, such as anticoagulation. Local excisional procedures, such as electrodesiccation and curettage or cryotherapy, can be used for low-risk lesions, while surgical excision is indicated for lesions that are not low risk. Mohs surgery is an excisional procedure that uses microscopic guidance to achieve greater precision and sparing of normal tissue. In patients who meet criteria for Mohs surgery, 5-year cure rates for basal cell cancer range from 98% to 99%, making Mohs surgery the preferred procedure for those who qualify.
Radiotherapy is indicated for certain nonmelanoma skin cancers that are not amenable to surgery. In some cases, this is due to the location of the lesion on the eyelid, nose, or other structures that make surgery more difficult and which may be expected to have a less desirable cosmetic outcome. In other cases, surgery may be relatively contraindicated due to clinical factors such as bleeding risk or advanced age. In elderly patients with a relatively large tumor that would require extensive excision, the benefit/risk ratio for radiotherapy may be considered favorable. The 5-year control rates for radiotherapy are in the range of 80% to 92%, which is lower than for surgical excision.\(^4\) A randomized controlled trial published in 1997 reported that radiotherapy for basal cell carcinoma resulted in greater numbers of persistent and recurrent lesions compared with surgical excision.\(^5\)

When radiotherapy is used for nonmelanoma skin cancer, the primary modality is external beam radiation. A number of different brachytherapy techniques have also been developed, including low-dose rate systems, Iridium-based systems, and HDR systems.\(^4\)

**Electronic Brachytherapy**

Electronic brachytherapy is a form of radiotherapy delivered locally, using a miniaturized electronic x-ray source rather than a radionuclide-based source. A pliable mold, constructed of silicone or polymethyl-methacrylate, is fitted to the tumor surface. This mold allows treatment to be delivered to nonflat surfaces such as the nose or ear. A radioactive source is then inserted into the mold to deliver a uniform radiation dosage directly to the lesion.\(^4\) Multiple treatment sessions within a short time period (typically within a month) are required.

This technique is feasible for well-circumscribed, superficial tumors because it focuses a uniform dose of x-ray source radiation on the lesion with the aid of a shielded surface application. Advantages of this treatment modality compared with standard radiotherapy include a shorter treatment schedule, avoidance of a surgical procedure and hospital stay, less severe side effects because the focused radiation spares healthy tissue and organs, and the avoidance of radioisotopes.

**Regulatory Status**

Electronic brachytherapy systems for the treatment of nonmelanoma skin cancers are designed to deliver high-dose rate brachytherapy to treat skin surface lesions. This technique focuses a uniform dose of x-ray source radiation to the lesion with the aid of a shielded surface application. The Superficial X-Ray Radiation Therapy System (Sensus Healthcare), Esteya® Electronic Brachytherapy System (Nucletron BV), and the Xoft® Axxent® Electronic Brachytherapy System (iCAD) are systems that have been cleared for marketing by the U.S. Food and Drug Administration through the 510(k) process. Food and Drug Administration product code: JAD.
Rationale
This evidence review was created in May 2015 and has been updated regularly with searches of the MEDLINE database. The most recent literature review was performed through May 29, 2019.

Evidence reviews assess the clinical evidence to determine whether the use of a technology improves the net health outcome. Broadly defined, health outcomes are length of life, quality of life, and ability to function—including benefits and harms. Every clinical condition has specific outcomes that are important to patients and to managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of a technology, 2 domains are examined: the relevance and the quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

Electronic Brachytherapy for Nonmelanoma Skin Cancer

Clinical Context and Test Purpose
The purpose of electronic brachytherapy in patients who have nonmelanoma skin cancer is to provide a treatment option that is an alternative to or an improvement on existing therapies.

The question addressed in this evidence review is: Does the use of electronic brachytherapy improve the net health outcome in patients with nonmelanoma skin cancer?

The following PICOs were used to select literature to inform this review.

Patients
The relevant population of interest is patients with nonmelanoma skin cancer. Nonmelanoma skin cancer refers to squamous cell carcinoma and basal cell carcinoma. There are other less common types of skin cancer, such as T-cell lymphoma or Merkel cell tumor, which may have specific treatment options that
differ from basal and squamous cell carcinomas and may need to be considered on an individual basis.

**Interventions**
The therapy being considered is electronic brachytherapy. Electronic brachytherapy is a form of radiotherapy delivered locally, using a miniaturized electronic x-ray source rather than a radionuclide-based source. Multiple treatment sessions within a short time period (typically within a month) are required.

**Comparators**
The following therapies are currently being used: surgery (excision or Mohs surgery), external-beam radiotherapy, and standard brachytherapy.

The diagnosis of nonmelanoma skin cancer involves a detailed review of medical history, a clinical exam, and a skin biopsy. Information from the diagnostic process can assess the risk of recurrence, which informs the choice of treatment. Location and size of the skin cancer are also factors in choosing the treatment strategy. Brachytherapy is considered when lesions are located on anatomic curves or are near critical organs.

**Outcomes**
The general outcomes of interest are survival, recurrence rates, and treatment-related morbidity. Follow-up to adequately detect nonmelanoma skin cancer recurrence should be at least 5 years.

**Systematic Reviews**
Delishaj et al (2016) published a systematic review of studies on high-dose rate brachytherapy, including electronic brachytherapy, for the treatment of nonmelanoma skin cancer. A literature review conducted through May 2019 identified 10 case series with sample sizes of 20 patients or more that reported on nonoverlapping patients. Findings were reported for 1870 patients (N=1870 lesions). Most lesions (65%) were basal cell carcinoma and the second largest group (35%) was squamous cell carcinoma. Reviewers did not pool study findings, reporting that the rates of local control ranged from 83% to 100%. After median follow-up ranging from 9 months to 10 years, recurrence rates ranged from 0% to 17%. Seven of the 10 studies reported recurrence rates of less than 5%, 2 had recurrence rates of 8% to 9%, and 1 study had a recurrence rate of 17%. The 2 studies with recurrence rates in the 8%-to-9% range used Leipzig applicators and the study with a 17% recurrence rate used high-dose rate brachytherapy with surface applicators or custom-made surface molds.

**Prospective Cohort Study**
Patel et al (2017) published preliminary results from a multi-center prospective matched pair cohort study comparing clinical outcomes of nonmelanoma skin cancer treated with electronic brachytherapy (EBT) or Mohs micrographic surgery (MMS). Patients from four treatment centers who had already received treatment for NMSC with EBT and met eligibility criteria were
invited to participate. A retrospective chart review was used to individually match patients with patients who had received MMS for NMSC based on patient age (±15 years), lesion size, type and location, and treatment dates. All MMS treated subjects treated in the same time-frame were considered for matching and the final pair was selected based on the closest match of demographics and lesion characteristics. A total of 369 patients were included for study representing 208 matched lesion pairs. Additional eligibility criteria included:

- completion of EBT or MMS for NMSC ≥3 years prior
- age > 40 yrs
- diagnosis of squamous cell carcinoma (SCC) or basal cell carcinoma (BCC)
- cancer stage 0-2

Exclusion criteria included:

- target area adjacent to burn scar
- surgical resection of the cancer prior to EBT
- presence of actinic keratosis
- known metastatic disease

Patients were evaluated for follow-up at 2.3 to 5.0 years post-treatment. Treatment with EBT was performed with a miniature, HDR electronic X-ray source using standard surface applicators. A dose of 40.0 Gy in 8 fractions (5 Gy twice weekly) was used to delivered to a depth of 2-3 mm but in some cases a customized dose, depth, or schedule. MMS was performed by clinicians according to guidelines of the American College of Mohs Surgery. Matching of patients based on lesion characteristics was based on histopathology of basal cell carcinoma (BCC) or squamous cell carcinoma (SCC), cancer staging (Stage 0, Stage 1, Stage 2), size (≤ 1 cm, >1 cm and ≤ 2 cm, > 2 cm and ≤ 3 cm), and location (head, ear, eyelid, face/neck, lip, scalp, nose, torso, lower extremity, upper extremity). The mean follow-up length was 3.3 years for the EBT group and 3.5 years for the MMS group. The primary outcome was absence of NMSC recurrence at follow-up. Secondary outcomes included late toxicities, cosmetic outcomes, and patient satisfaction with treatment. All patients completed all evaluations.

The main characteristics and results are summarized in Table 1.

**Table 1. Prospective Cohort Study of Electronic Brachytherapy for Nonmelanoma Skin Cancer**

<table>
<thead>
<tr>
<th>Population</th>
<th>N</th>
<th>MFU, years (median; range)</th>
<th>Treatment</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients receiving EBT for NMSC</td>
<td>188</td>
<td>EBT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesions receiving EBT for NMSC (number of lesions, %)</td>
<td>Absence of Local Recurrence at Follow-Up (number of lesions, %, 95%CI)</td>
<td>Cosmesis Grade at Follow-Up (number of lesions, %, CI)a</td>
<td>Long-term Toxicities Present at Follow-Up (number of lesions, %)</td>
<td>Results of Patient Satisfaction Questionnaire at Follow-Up (mean ± SD; median, [10-60])b</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>208</td>
<td>3.3 ± 0.4 (3.2; 2.6-4.3) EBT</td>
<td>207 (99.5%, 97.4-100%)</td>
<td>Clinician Cosmesis Grade: <em>Excellent/ Good (203, 97.6%, 94.5-99.2%)</em> <em>Excellent (133, 63.9%)</em> <em>Good (70, 33.7%)</em> <em>Fair (1, 0.5%)</em> <em>Poor (4, 1.9%)</em> Subject Cosmesis Grade: <em>Excellent (140, 67.3%)</em> <em>Good (48, 23.1%)</em> <em>Fair (15, 7.2%)</em> <em>Poor (5, 2.4%)</em></td>
<td>• No changes, relatively invisible scar (138, 66.7%) • Late toxicities: o Hypopigmentation (124, 59.6%) o Hyperpigmentation (11, 5.3%) o Erythematous scar (6, 2.9%) o Telangiectasia (65, 31.4%) o Hair loss (8, 3.9%) o Fibrosis (3, 1.4%) o Atrophy (12, 5.8%) o Loss of subcutaneous tissue (7, 3.4%) o Hypertrophy (excessi...</td>
</tr>
</tbody>
</table>

- Lesions with BCC (113, 54.3%)
- Lesions with SCC (95, 45.7%)
<table>
<thead>
<tr>
<th>Patients receiving MMS for NMSC</th>
<th>181</th>
<th>---</th>
<th>MMS</th>
<th>Outcome</th>
</tr>
</thead>
</table>

- Since treatment, embarrassed about appearance of treated site (4.6 ± 0.9)
- Since treatment, depressed about appearance of treated site (4.5 ± 1.1)
- Treatment prevented me from participating in daily activities (4.6 ± 0.9)
- Treatment made it hard to work or do what I enjoy (4.7 ± 0.7)
- Would recommend treatment to others (4.4 ± 1.3)
- Always followed instructions related to care of treated area (4.9 ± 0.4)
<table>
<thead>
<tr>
<th>Lesions receiving MMS for NMSC (number of lesions, %)</th>
<th>208</th>
<th>3.5 ± 0.5 (3.4; 2.3-5.0)</th>
<th>MMS</th>
<th>Absence of Local Recurrence at Follow-Up (Number of lesions, %, 95% CI)</th>
<th>Cosmesis Grade at Follow-Up (Number of lesions, %, 95% CI)</th>
<th>Long-term Toxicities Present at Follow-Up (Number of lesions, %)</th>
<th>Results of Patient Satisfaction Questionnaire at Follow-Up (mean ± SD; median [10-60])</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Lesions with BCC (113, 54.3%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>56.0 ± 5.3; 59.0</td>
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<tr>
<td>- Lesions with SCC (95, 45.7%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Treatment was convenient (4.7 ± 0.6)</td>
</tr>
<tr>
<td></td>
<td>208</td>
<td>3.5 ± 0.5 (3.4; 2.3-5.0)</td>
<td>MMS</td>
<td></td>
<td></td>
<td></td>
<td>• Satisfied with how well treatment worked (4.8 ± 0.5)</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>• Satisfied with appearance of the treated area (4.6 ± 0.7)</td>
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<td></td>
<td>• No changes, relatively invisible scar (143, 68.8%)</td>
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<td></td>
<td>• If another cancer, would use same treatment (4.6 ± 0.7)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Late toxicities:</td>
<td></td>
<td></td>
<td>• Have not had any skin problems with treated area (4.7 ± 0.6)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Hypopigmentation (109, 52.4%)</td>
<td></td>
<td></td>
<td>• Since treatment, frustrated about appearance of treated site (4.6 ± 1.0)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Hyperpigmentation (4, 1.9%)</td>
<td></td>
<td></td>
<td>• Since treatment, embarrassed about</td>
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<td></td>
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<td></td>
<td>- Erythema tous scar (15, 7.2%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Telangiectasia (23, 11.1%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Hair loss (7, 3.4%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Fibrosis (2, 1%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Atrophy (9, 4.3%)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Loss of subcutaneous tissue (6, 2.9%)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Hypertrophy (excessive fibrosis)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clinician Cosmesis Grade
- Excellent/Good (199, 95.7%, 92.0-98.0%)
- Excellent (142, 68.3%)
- Good (57, 27.4%)
- Fair (9, 4.3%)
- Poor (0, 0.0%)
- Subject Cosmesis Grade
- Excellent (148, 71.1%)
- Good (50, 24.0%)
- Fair (10, 4.8%)
- Poor (0, 0.0%)
No statistically significant difference was found between EBT (97.6%) and MMS (95.7%) groups for local recurrence absence (p = 1.000). However, one recurrence was reported in the EBT group at 1 year post-treatment. No recurrences occurred in the MMS group. No statistically significant differences were noted for secondary endpoints of cosmesis (p = 0.277) and patient satisfaction with both groups demonstrating predominantly excellent cosmesis grades and high patient satisfaction scores. Late toxicities appeared at similar rates with
telangiectasia being reported slightly more in the EBT vs MMS group (31.4% vs 11.1%).

A summary of the EBT study relevance limitations is provided in Table 2.

**Table 2. EBT Study Relevance Limitations**

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Population</th>
<th>Intervention</th>
<th>Comparator</th>
<th>Outcomes</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patel et al (2017)</td>
<td>2 - Rationale for inclusion and exclusion criteria unclear</td>
<td>2 - Version used unclear</td>
<td>6 - Clinical significant difference not supported</td>
<td>1 - Not sufficient duration for benefit</td>
<td></td>
</tr>
</tbody>
</table>

- **Population** key: 1. Intended use population unclear; 2. Clinical context is unclear; 3. Study population is unclear; 4. Study population not representative of intended use
- **Intervention** key: 1. Not clearly defined; 2. Version used unclear; 3. Delivery not similar intensity as comparator; 4. Not the intervention of interest
- **Comparator** key: 1. Not clearly defined; 2. Not standard or optimal; 3. Delivery not similar intensity as intervention; 4. Not delivered effectively
- **Outcomes** key: 1. Key health outcomes not addressed; 2. Physiologic measures, not validated surrogates; 3. No CONSORT reporting of harms; 4. Not established and validated measurements; 5. Clinical significant difference not prespecified; 6. Clinical significant difference not supported
- **Follow-Up** key: 1. Not sufficient duration for benefit; 2. Not sufficient duration for harms

A summary of the EBT study design and conduct limitations is provided in Table 3.

**Table 3. EBT Study Design and Conduct Limitations**

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Allocation</th>
<th>Blinding</th>
<th>Selective Reporting</th>
<th>Data Completeness</th>
<th>Power</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patel et al (2017)</td>
<td>3 - Allocation concealment unclear in matching procedure</td>
<td>3 - Outcome assessed by treating physician</td>
<td>2-3 - Evidence of selective reporting and publication</td>
<td>5 - Unclear whether patients with metastatic disease should be excluded or whether age exclusion is clinically relevant</td>
<td>1,2 - Power calculations not reported or reported for primary outcome</td>
<td></td>
</tr>
</tbody>
</table>

- **Allocation** key: 1. Participants not randomly allocated; 2. Allocation not concealed; 3. Allocation concealment unclear; 4. Inadequate control for selection bias
- **Blinding** key: 1. Not blinded to treatment assignment; 2. Not blinded to treatment outcome; 3. Outcome assessed by treating physician
Major limitations of this study include the presence of selective publication and lack of blinding as patients were clinically evaluated for follow-up by the physician who had administered EBT or MMS. The study is registered but result submissions have been canceled twice and have not been submitted as of January 2019. Since some patients received customized treatments, all intervention characteristics are unclear. Eligibility and exclusion criteria seemed to introduce bias with regard to age and low tumor stage. No statistically significant outcomes were reported for the use of EBT compared to MMS in NMSC.

**Case Series**

Evidence also includes uncontrolled studies. The main characteristics and results of published case series are summarized in Table 4.

**Table 4. Case Series of Electronic Brachytherapy for Nonmelanoma Skin Cancer**

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>N</th>
<th>MFU, mo</th>
<th>Treatment</th>
<th>Outcomes</th>
<th>Recurrence</th>
<th>Toxicity, %</th>
</tr>
</thead>
</table>
| Paravati et al (2015)  | Basal, squamous, or basosquamous cell carcinoma | 127| 16.1    | • Axxent Xoft system  
  • Total dose: 40 Gy in 8 fractions delivered 2 times weekly | 1.2%$^c$  
  (2/154)               | Acute:  
  • Grade 0-1=53  
  • Grade 2=34.4  
  • Grade 3=13  
  Late:  
  • Grade 0-1=94  
  • Grade 2=6     |            |          |
  • Total dose: 40 Gy in 8 fractions               | 0%                                |            |            |
<p>| | | | | | | | |
|                        |                                                  |    |         |                                                 |                                    |            |            |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>N</th>
<th>MFU, mo</th>
<th>Treatment</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tormo et al (2014)</td>
<td>Basal cell carcinoma</td>
<td>32</td>
<td>47</td>
<td>• Valencia applicator&lt;br&gt;• Total dose: 42 Gy in 6-7 fractions</td>
<td>3.1%</td>
</tr>
<tr>
<td>Bhatnagar (2013) a</td>
<td>Nonmelanoma skin cancer</td>
<td>122</td>
<td>10.0</td>
<td>• Axxent Xoft system&lt;br&gt;• Total dose: 40 Gy in 8 fractions delivered twice weekly</td>
<td>0%</td>
</tr>
<tr>
<td>Gauden et al (2013) b</td>
<td>Small nonmelanoma skin cancers</td>
<td>200</td>
<td>66 b</td>
<td>• Leipzig applicator&lt;br&gt;• Total dose: 36 Gy in 12 fractions delivered daily</td>
<td>2% c (4/236)</td>
</tr>
<tr>
<td>Giux et al (2000)</td>
<td>Basal or squamous cell carcinoma</td>
<td>136</td>
<td>60</td>
<td>• Brock applicator&lt;br&gt;• Total dose: 60-65 Gy in 33-36 fractions</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

Gy: gray; MFU: mean follow-up; NR: not reported.

* Overlapping case series; results from larger, more recent publication reported.

b Median.

c Calculated based on number lesions not patients.

The largest series was published by Gauden et al (2013) and included 200 patients with 236 lesions (121 basal cell, 115 squamous cell). Brachytherapy was the primary treatment modality in 69% of the lesions, while in the remaining 31% (74/236) brachytherapy was a follow-up treatment to surgery when there were positive margins. Outcomes included treatment efficacy, as measured by local recurrence rate, skin toxicity measured using Radiation Therapy Oncologic Group criteria, and cosmetic outcome using the Radiation Therapy Oncologic Group Cosmesis Scale. After a median follow-up of 66 months, there were recurrences in
2% (4/236) of treated lesions. Cosmetic outcome was judged to be excellent or
good in 88% (208/236) of treated lesions. Grade 1 skin toxicity was common
(71% of treated lesions); grade 2 toxicity was less common (34%); and no
instances of grade 3 or higher toxicities were noted. Late hypopigmentation of
treated skin was reported in 5.5% (13/236) of treated lesions.

Bhatnager (2013) published a case series using a commercially available device
(Axxent eBx System).1, The series included 122 patients with 171 nonmelanoma
skin lesions. Most patients had either basal cell carcinoma (53%) or squamous cell
carcinoma (41%); 10 (5.8%) patients had other types of cancer. Outcome
measures included recurrence rates, adverse events using version 3.0 of the
Common Terminology Criteria for Adverse Events, and cosmetic results using a
standardized Cosmesis Scale. After a mean 10-month follow-up, there were no
local recurrences. Dermatitis and pruritus were common early adverse events,
occurring in 83% and 18% of the treated lesions, respectively. Skin
hypopigmentation was the most common late adverse event, occurring in 10.9%
of lesions at 1 year. Other late complications included rash (6.5%), alopecia
(2.2%), and dry desquamation (2.2%). All patients had their cosmetic outcomes
rated as good or excellent.

**Summary of Evidence**
For individuals who have nonmelanoma skin cancer who receive electronic
brachytherapy, the evidence includes a systematic review, a prospective cohort
study, and case series. Relevant outcomes are overall survival, disease-specific
survival, change in disease status, and treatment-related morbidity. One trial was
identified comparing electronic brachytherapy to Mohs surgery. Only 1 recurrence
was reported in the study in the EBT group with no recurrences in the surgery
group. Patient satisfaction and cosmesis scores were high in both groups.
However, many evidence gaps were identified which limit its ability to support the
efficacy and safety of electronic brachytherapy compared with Mohs surgery. A
2016 systematic review of case series found local control rates ranging from 83%
to 100% and recurrence rates ranging from 0% to 17%. In most studies, the
recurrence rate was less than 5%. In the absence of controlled studies,
conclusions cannot be drawn about the efficacy and safety of electronic
brachytherapy compared with other treatments for nonmelanoma skin cancer.
Controlled trials are needed in defined populations that compare electronic
brachytherapy with alternatives, specifically other forms of radiotherapy or
surgical approaches. The evidence is insufficient to determine the effects of the
technology on health outcomes.

**SUPPLEMENTAL INFORMATION**

**Practice Guidelines and Position Statements**

**National Comprehensive Cancer Network**
National Comprehensive Cancer Network guidelines on basal cell carcinoma
(v.1.2018)15/(v.1.2019) [X] and squamous cell skin cancer
(v.2.2019)16. /(v.2/2019)[X] both contain the following statement on electronic
brachytherapy: "There is insufficient long-term efficacy and safety data to support the routine use of electronic surface brachytherapy."

**American Academy of Dermatology**
The American Academy of Dermatology (2018) published guidelines on the management of basal cell carcinoma and the management of squamous cell carcinoma. Electronic brachytherapy was rated as a C recommendation, with the level of evidence of II and III. By comparison, surgery, cryosurgery, topical therapies, and photodynamic therapies are rated as A and B recommendations.

**U.S. Preventive Services Task Force Recommendations**
Not applicable.

**Medicare National Coverage**
There is no national coverage determination. In the absence of national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

**Ongoing and Unpublished Clinical Trials**
Some currently unpublished trials that might influence this review are listed in Table 2.

**Table 2. Summary of Key Ongoing Trials**

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT03024866a</td>
<td>Electronic Brachytherapy: A Multi-Center Retrospective-Prospective Matched Pairs Cohort Study to Assess Long Term Clinical Outcomes of Nonmelanoma Skin Cancer Patients Treated with eBx Compared to Nonmelanoma Skin Cancer Patients Treated with Mohs Surgery</td>
<td>500</td>
<td>Jan 2018 (ongoing)*</td>
</tr>
<tr>
<td>NCT01016899a</td>
<td>Xoft Electronic Brachytherapy Clinical Protocol for the Primary Treatment of Non-Melanoma Skin Cancer</td>
<td>100</td>
<td>Feb 2018 (ongoing)**</td>
</tr>
<tr>
<td>NCT02131805</td>
<td>Electronic Skin Surface Brachytherapy for Cutaneous Basal Cell and Squamous Cell Carcinoma</td>
<td>26</td>
<td>May 2018 (ongoing)***</td>
</tr>
</tbody>
</table>

NCT: national clinical trial.

* Denotes industry-sponsored or cosponsored trial.

*=Last updated clinicaltrials.gov January 2019 (status: unknown; preliminary results published but not submitted)
REFERENCES

Billing Coding/Physician Documentation Information
0394T High dose rate electronic brachytherapy, skin surface application, per fraction, includes basic dosimetry, when performed
77767 Remote afterloading high dose rate radionuclide skin surface brachytherapy, includes basic dosimetry, when performed; lesion
diameter up to 2.0 cm or 1 channel
Remote afterloading high dose rate radionuclide skin surface brachytherapy, includes basic dosimetry, when performed; lesion diameter over 2.0 cm and 2 or more channels, or multiple lesions

ICD-10 Codes
Codes for basal cell and squamous cell carcinomas of the skin (C44.00-C44.99) are dependent on the anatomic location of the lesion. There are too many to list here so the following codes are just examples.

- **C44.211-** Basal cell carcinoma of skin of ear and external auricular canal code range
- **C44.219**
- **C44.221-** Squamous cell carcinoma of skin of ear and external auricular canal code range
- **C44.229**
- **C44.310-** Basal cell carcinoma of skin of other and unspecified parts of face code range (includes nose)
- **C44.319**
- **C44.320-** Squamous cell carcinoma of skin of other and unspecified parts of face code range (includes nose)
- **C44.329**
- **C44.41** Basal cell carcinoma of skin of scalp and neck
- **C44.42** Squamous cell carcinoma of skin of scalp and neck

**Additional Policy Key Words**
N/A

**Policy Implementation/Update Information**
1/1/16 New Policy; considered investigational.
1/1/17 No policy statement changes.
1/1/18 No policy statement changes.
1/1/19 No policy statement changes.
1/1/20 No policy statement changes.

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