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REVIEW

Recommendations for Cost-Conscious Treatment of Basal Cell Carcinoma

Palak V. Patel · Jessica N. Pixley · Hannah S. Dibble · Steven R. Feldman

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ABSTRACT

Background: Basal cell carcinoma (BCC) affects 3.3 million Americans annually. Treatment modalities for BCC include many surgical and nonsurgical options. The cost of BCC treatment can pose a substantial burden to patients and the healthcare system. Cost can be an important consideration in BCC treatment planning.
Objective: We present an approach to the management of BCC when cost reduction is a priority.

Methods: A PubMed literature search identified studies on effectiveness of current BCC therapies. Treatment prices were obtained from the Medicare National Fee Schedule, GoodRx, and pharmaceutical companies. The American Academy of Dermatology's (AAD) guidelines for treating BCC were used to develop recommendations for cost-reductive treatment.
Results: The cost of treating a primary superficial BCC < 0.5 cm arising on Area M (cheeks, forehead, scalp, neck, jawline, pretibial surface) was $143 with curettage and electrodesiccation (C&E), $143 with cryosurgery, $210 with standard excision and simple reconstruction (SE), $1221 with Mohs Micrographic Surgery (MMS) and simple reconstruction, $472 with imiquimod, $186 with 5-fluorouracil (5-FU), and $354–$371 for photodynamic therapy (PDT). The cost of treating a primary nodular BCC 1.1–2 cm arising on Area L (trunk and extremities, excluding pretibial surface, hands, feet, nail units and ankles) was $183 with C&E, $183 with cryosurgery, $251 with SE and simple reconstruction, $1163–1351 with MMS and simple reconstruction, $472 with imiquimod, $186 with 5-FU, and $354–$371 for photodynamic therapy (PDT). The cost of treating a giant BCC (BCC > 10 cm with aggressive behavior) was $465–3311 with radiation, $139,560 with vismodegib, $144,452 with sonidegib, ~ $44.5 with cisplatin (medication cost only), and at least $184,836 with cemiplimab-rwlc.
Conclusions: For a primary superficial BCC < 0.5 cm arising on Area M, the cost-

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P. V. Patel (✉) · J. N. Pixley · H. S. Dibble · S. R. Feldman
Center for Dermatology Research, Department of Dermatology, Wake Forest University School of Medicine, 4618 Country Club Road, Winston-Salem, NC 27104, USA
e-mail: palpatel@wakehealth.edu

S. R. Feldman
Department of Pathology, Wake Forest University School of Medicine, Winston-Salem, NC, USA

S. R. Feldman
Department of Social Sciences & Health Policy, Wake Forest University School of Medicine, Winston-Salem, NC, USA

conscious algorithm prioritizes C&E or cryosurgery. For a primary nodular BCC 1.1–2 cm arising on Area L, the cost-conscious algorithm prioritizes C&E, cryosurgery, or 5-FU. For a giant BCC, the cost-conscious algorithm identifies superficial radiation therapy as first line.

Keywords: Dermatology; Basal cell carcinoma; Cost of nonmelanoma skin cancer

Key Summary Points

Why carry out this study?

SThe cost of treating non-melanoma skin cancers increased by 60% between 2006 to 2011.

Basal cell carcinoma (BCC) treatment costs can burden both patients and the healthcare system.

We aimed to develop a treatment algorithm for BCC when cost-reduction is a priority.

What was learned from the study?

For a primary superficial BCC <0.5 cm arising on Area M, the cost-conscious algorithm prioritizes curettage and electrodessication (C&E) or cryosurgery. For a primary nodular BCC 1.1-2 cm arising on Area L, the cost-conscious algorithm prioritizes C&E, cryosurgery, or 5-fluorouracil (5-FU). For a giant BCC, the cost-conscious algorithm identifies superficial radiation therapy as first line, and the efficacy algorithm is inconclusive.

BCCs vary greatly, and no single treatment is optimal for every tumor in every patient. Good clinical judgment is needed in BCC management; cost can be an important consideration at times. We present an approach where cost is a priority, but we recognize that there are many other priorities to consider when treating BCCs, and hence many other appropriate treatment approaches besides the one presented in this article.

INTRODUCTION

Basal cell carcinoma (BCC) affects 3.3 million Americans annually and requires substantial resources to treat [1]. The cost of treating nonmelanoma skin cancers increased by 60% between 2006 and 2011 [2]. BCC treatment costs can burden both patients and the healthcare system. In some situations, cost may be an important factor to consider in planning BCC treatment. This analysis presents an algorithm for treating BCC when cost is a priority. This algorithm is not intended to drive clinical decision making or encourage clinicians to treat on the basis of cost alone. However, fiscal resources are not unlimited, and our algorithm provides guidance for BCC management when resources are limited and cost becomes an important consideration.

Management of BCC depends on the severity of disease, and clinical and pathologic assessments (i.e., tumor size, location, and growth pattern) are used to determine which treatments are indicated. For small, uncomplicated BCC on low-risk sites (e.g., trunk or extremities [excluding hands, feet, ankles, and pretibial surface]), surgical treatment with either simple excision or curettage and electrodesiccation may be the first-line therapy [3]. Nonsurgical, second-line options include cryosurgery, imiquimod, 5-fluorouracil, photodynamic therapy, and radiotherapy [4]. According to the Mohs appropriate use criteria (AUC), Mohs micrographic surgery (MMS) is appropriate for all tumors in the mask areas of the face (central face, eyelids [including inner/outer canthi], eyebrows, nose, lips [cutaneous/mucosal/vermillion], chin, ear and periauricular skin/sulci, temple), genitalia (including perineal and perianal), hands, feet, nail units, ankles, and nipples/areola. Mohs is also the appropriate therapy for tumors of the cheeks, forehead, scalp, neck, jawline, and pretibial face, except for very small superficial tumors in healthy patients. Mohs is only appropriate for tumors on the trunk and extremities if the tumor is large, recurrent, aggressive, or if the patient is immunosuppressed [5]. Treatment options for locally advanced or metastatic BCC that cannot

be excised include hedgehog pathway inhibitors and immunotherapy, along with radiation therapy and platinum therapy, although data are limited by a lack of high-power studies [4].

Surgical techniques (i.e., Mohs micrographic surgery) and advanced nonsurgical treatments (i.e., hedgehog pathway inhibitors) may have lower tumor recurrence rates than simpler, lower cost treatment options. However, overuse of these techniques can reduce healthcare value and burden patients with high treatment costs. In some cases, patients' out-of-pocket costs might be minimal, but the overall cost to the healthcare system can be excessive. In some situations, cost may be a factor to prioritize in determining a treatment plan. We review the treatment modalities available for BCC and associated costs to develop a cost-conscious treatment algorithm, which may be useful in resource-limited settings.

METHODS

This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors. We reviewed treatment modalities indicated for BCC and their associated costs. To identify the evidence up to September 1, 2022, a literature search was conducted in PubMed using key words including: basal cell carcinoma, basal cell carcinoma cost reduction, basal cell carcinoma treatment, cryosurgery, curettage and electrodesiccation, excision, Mohs micrographic surgery, imiquimod, fluorouracil, photodynamic therapy, radiotherapy, hedgehog pathway inhibitors, platinum therapy, and immunotherapy. Of the 248 papers identified, papers were excluded because they conducted no novel cost analysis on BCC treatment (n = 179), were not available in English (n = 20), did not study non-melanoma skin cancer or BCC (n = 17), studied a treatment modality not included in the American Academy of Dermatology's guidelines for management of BCC (n = 5), or the complete text form was not available in an indexed journal (n = 1). The remaining 26 articles were included [4].

The rate for physician payment of dermatologic procedures is determined by procedure-specific codes using the Current Procedural Terminology (CPT) guidelines. These codes are modified by the place of service where the procedure was performed. The Medicare Physician Fee Schedule (MPFS) was used to identify the CPT codes for cryosurgery, curettage and electrodesiccation (C&E), standard surgical excision, Mohs micrographic surgery, photodynamic therapy with methyl aminolevulinate (MAL-PDT) and 5-aminolevulinic acid (ALA-PDT), and radiotherapy. We reported non-facility reimbursement rates, as these were generally more cost-minimizing than facility rates.

The GoodRx and Drugs.com databases along with list prices provided by pharmaceutical companies were searched between December 2022 and March 2023 to determine medication prices. The GoodRx area search was set to North Carolina, zip code range: 27587–27588. Average retail prices for each drug were reported as well as the lowest overall coupon price and the range coupon prices from four national pharmacies. The included pharmacies were Walgreens, CVS, Walmart, and Costco. Recommendations for management of BCC were determined using treatment costs and efficacy data.

To allow for better cost comparison between treatment modalities, we priced three example lesions for the modalities that may be used to treat them. These lesions were chosen because (1) they represented a diversity of tumors and (2) were areas of uncertainty in the appropriate use criteria. The example lesions selected were: (1) primary superficial BCC < 0.5 cm arising on the jawline in healthy patients; (2) primary nodular BCC 1.1–2 cm arising on left forearm in healthy patient; and (3) BCC > 10 cm with aggressive behavior. We refer to these example tumors as "< 0.5 cm jaw BCC," "1.1–2 cm forearm BCC," and "Giant BCC" in the text, respectively.

RESULTS

Destruction of BCC Lesions

Curettage and electrodesiccation is a destructive treatment for BCC [4]. C&E is generally indicated for low-risk tumors in non-terminal hair-bearing locations, can be performed easily in-office, and has excellent cure rates [6]. However, the procedure is associated with longer healing times and at times worse cosmesis than standard excision [7]. Outcomes of C&E vary depending on operator experience and the location of the lesion [8, 9]. The highest 5-year recurrence rate reported in the literature is 19.6% [10].

Cryosurgery is indicated for low-risk BCC when more effective therapies are impractical or contraindicated [4]. This technique uses a freezing agent to mechanically damage cells and induce vasoconstriction, which results in ischemic tissue necrosis [11]. Cure rates are higher with more freeze–thaw cycles (single cycle: 79.4%, double cycle: 95.3%), but so is associated morbidity [12]. Cryosurgery poses little risk to underlying structures such as blood vessels, nerves, and cartilage and can be easily performed in-office [13, 14]. However, this technique can be associated with slower healing times and poorer cosmesis than other surgical techniques [4]. Recurrence rates are 6.3% at 1 year but increase to 39% by 2 years [4].

Cost of BCC destruction varies with lesion location and lesion size, but not by destruction modality. Non-facility reimbursement for destruction via either C&E or cryosurgery ranges from \$102.43 (< 0.5 cm lesion) to \$241.21 (> 4 cm lesion) for lesions on the trunk, arms, or legs, \$152.27 (< 0.5 cm) to \$291.04 (> 4 cm) for lesions on the scalp, neck, hands, feet, and genitalia, and \$143.27 (< 0.5 cm) to \$361.64 (> 4 cm) for lesions on the face, ears, eyelids, nose, lips, and mucous membranes.

Excision of BCC Lesions

Standard excision with 4-mm clinical margins and histologic margin assessment is primarily recommended for low-risk primary BCC, although it may be considered for certain high-risk tumors [4]. Cosmetic outcomes with standard excision were more favorable than with C&E or cryosurgery [15, 16]. Five-year recurrence rates after surgical excision of nonaggressive head and neck BCC were 8.2% [10].

The CPT code for excised lesions is based on the location and the "excised diameter," which is the sum of the lesion's longest diameter plus the narrowest excised margin. Non-facility reimbursement ranges from \$204.52 (< 0.5 cm) to \$459.57 (> 4 cm) for lesions on the trunk, arms, or legs, \$205.22 (< 0.5 cm) to \$418.74 (> 4 cm) for lesions on the scalp, neck, hands, feet, or genitalia, and \$210.06 (< 0.5 cm) to \$519.09 (> 4 cm) for lesions on the face, ears, eyelids, nose, and lips (Table 1). The cost of an excision includes a simple (non-layered) closure. If an intermediate closure is performed, this would be billed separately, and the cost would be calculated based on the size of the final wound. For an intermediate closure of the scalp, neck, axillae, external genitalia, trunk, or extremities, the non-facility reimbursement ranges from \$268.39 (< 2.5 cm wound) to \$493.06 (> 30.0 cm wound). For wounds of the face, ears, eyelids, nose, lips, and mucous membranes, the cost of an intermediate repair ranges from \$289.4 (< 2.5 cm wound) to \$621.83 (> 30.0 cm wound) (Table 1).

Mohs Micrographic Surgery

Mohs micrographic surgery is indicated for high-risk BCCs, which are stratified by location-dependent size, growth pattern, and clinical picture, including history of immunosuppression [4]. Defect sizes for nodular BCC are smaller after MMS (116.6 mm^2) than after standard excision (187.7 mm^2) ($p < 0.001$) [17, 18]. The 5-year cure rate of primary BCC treated with MMS is 99% [19, 20]. The 10-year recurrence rates of primary and recurrent facial BCCs after MMS are 4.4% and 3.9%, respectively [21].

The cost of Mohs surgery varies widely depending on the location of the tumor, the number of stages and tissue blocks, and the intricacy of the reconstruction. For lesions on the trunk, arms, or legs, non-facility

Table 1 Efficacy and Medicare reimbursement of BCC treatment modalities

Treatment	Efficacy	Medicare reimbursement[a]
C&E	The highest 5-year recurrence rate reported in the literature is 19.6%	< 0.5 cm jaw BCC: $143.27 1.1–2 cm forearm BCC: $183.41; giant tumor: n/a
Cryosurgery	Recurrence rates are 6.3% at 1 year but increase to 39% by 2 years	< 0.5 cm jaw BCC: $143.27 1.1–2 cm forearm BCC: $183.41; giant tumor: n/a
Standard excision with 4-mm margins	5-year recurrence rates after surgical excision of nonaggressive head and neck BCC were reported at 8.2%	< 0.5 cm jaw BCC: $210.06 + reconstruction ($0 if simple up to $289.40 for an intermediate closure) 1.1–2 cm forearm BCC: $251.24 + reconstruction ($0 if simple up to $309.39 for an intermediate closure); giant tumor: n/a
Mohs[b]	The 10-year recurrence rates of primary and recurrent facial BCC after MMS are 4.4% and 3.9%, respectively	< 0.5 cm jaw BCC: $1106.71 + reconstruction ($114.54 if simple to $315.49 if intermediate) 1.1–2 cm forearm BCC: $1047.19 + reconstruction ($115.89 for a simple repair, up to $303.39 for an intermediate repair); giant tumor: n/a
Imiquimod	The 5-year clinical clearance rates range from 85% to 87% for superficial BCC	< 0.5 cm jaw BCC: $472.32 1.1–2 cm forearm BCC: $472.32; giant tumor: n/a
5-FU	The 5-year recurrence rate is 18.8% in primary BCCs treated topically with 5-FU	Average retail price (40 g tube) is $185.60; coupon price is as low as $45.95; < 0.5 cm jaw BCC: $185.60 1.1–2 cm forearm BCC: $185.60; giant tumor: n/a
MAL- or ALA-PDT	The 5-year recurrence rate is reported to be as high as 25% for ALA-PDT and 22% with MAL-PDT	< 0.5 cm jaw BCC: $354.21 (MAL), $371.21 (ALA) 1.1–2 cm forearm BCC: $354.21 (MAL), $371.21 (ALA); giant tumor: n/a
Radiation	Although 5-year cure rates with radiotherapy (> 90%) are comparable to surgical treatment, there is substantial concern for poor margin control. Post-radiation recurrence rates in non-melanoma skin cancers are 15.8% at 18.4 months	Giant tumor: superficial radiation therapy 5 fractions- $465.11 superficial radiation therapy 12 fractions- $635.56 skin surface high dose rate EBT 8 fractions- $1954.02 skin surface high dose rate EBT 10 fractions- $2342.72; orthovoltage radiation 20 fractions- $3311.21
Hedgehog pathway inhibitors	The 3-year recurrence rate is reported at 36% for vismodegib. Long-term recurrence rates have not been reported for sonidegib	Giant tumor: vismodegib- $139,560 sonidegib- $144,452
Platinum-based chemotherapy	A review of 53 patients with progressive BCC reported complete remission in 37% of patients and partial remission in another 46%	No cost data specifically for BCC treatment. Extrapolation from costs of cervical cancer treatment suggest medication cost ~ $44.5 for 3 cycles of cisplatin. Other chemotherapy costs (administration, etc.) not included

Table 1 continued

Treatment	Efficacy	Medicare reimbursement[a]
Cemiplimab-rwlc	Objective response rate of 21% and 29% for patients with metastatic and locally advanced BCC, respectively	Giant tumor: $184,836 before benefit is seen

Prices are calculated using non-facility reimbursement rates. Costs of reconstruction are estimated based on a final wound 3 times the size of the original lesion

BCC basal cell carcinoma; *C&E* curettage and electrodesiccation; *5-FU* 5-fluorouracil; *MAL* methyl aminolevulinate; *ALA* aminolevulinic acid; *PDT* photodynamic therapy; *EBT* external beam therapy

[a]Based on National Median Physician Fee Schedule for 1 course of treatment (USD)

[b]Costs for two stages

reimbursement is $646.10 for the first tissue block, $401.09 for blocks 2–5, and $78.56 for any additional blocks. For lesions on the head, neck, hands, feet, genitalia, or with any involvement of muscle, cartilage, bone, tendon, major nerves, or major vessels, the non-facility reimbursement rate is $687.63 for the first tissue block, $419.08 for blocks 2–5, and $78.56 for any additional blocks (Table 1). According to the Center for Medicare Services (CMS), the national mean number of Mohs stages required to obtain tumor-free margins in 2017 was 1.7 stages [22]. The cost of MMS for a 2-stage lesion removal would be $1047.19 on the trunk/arms/legs and $1106.71 on more sensitive or challenging areas. Repair costs can range from $95.90 (the non-facility price for a simple repair of the scalp, neck, axillae, external genitalia, trunk, or extremities < 2.5 cm) to $505.60 (the non-facility price for a complex repair of the eyelids, nose, or ears between 2.6 to 7.5 cm). These estimates do not include the cost of a graft or flap (Table 1).

Imiquimod

Imiquimod is indicated when surgical therapy is not feasible or preferred or when tumors are low risk, with the understanding that the cure rate may be lower than with surgery [4]. Imiquimod is a toll-like receptor 7 agonist and immune system modulator that is applied topically for 6 weeks for superficial BCCs and 12 weeks for nodular BCCs [23]. Adverse effects include local skin reactions and post-treatment hypopigmentation and scarring [24–26]. The 5-year clinical clearance rates range from 85 to 87% for superficial BCC [27, 28].

The average retail price for one standard prescription (12 packets of 5% imiquimod) is $118.08. Coupon prices range from $5.99 to $69.29, with the lowest coupon price on GoodRx being $5.99 [29]. Patients with superficial BCCs applying a single packet of imiquimod daily would have to purchase four of these standard prescriptions to complete their 6-week treatment regimen (average retail price: $472.32, lowest GoodRx price: $23.96). Patients with nodular BCCs applying a single packet daily would have to purchase seven standard prescriptions to complete a 12-week treatment regimen (average retail price: $826.56, lowest GoodRx price: $41.93) Some lesions may require larger volumes of imiquimod or more frequent application, increasing treatment cost (Table 1).

5-Fluorouracil

Topical 5-fluorouracil (5-FU) is indicated for low-risk tumors or when surgery cannot be performed, with the understanding that cure rates may be lower [4]. 5-FU is an antimetabolite cream that inhibits DNA synthesis [30]. Adverse effects are largely limited to local skin reactions, and cosmesis is good [31]. Mean time to clinical cure is 10.5 weeks in patients using 5-FU for BCC, with a clearance rate of 93% [32]. [30] The 5-year recurrence rate is 18.8% in primary BCCs treated topically with 5-FU [33].

Treatment with 5-FU involves application of a thin layer of cream twice a day [23]. The average retail price for a 40-g tube of 5-FU cream was $185.60. Coupon prices range from $54.99 to $80.07, with the lowest GoodRx coupon price being $35.00 [34]. Some lesions may require larger volumes of 5-FU or more frequent application, which increases the cost of treatment (Table 1).

Photodynamic Therapy

Photodynamic therapy (PDT) is used off label in patients unwilling or unable to receive surgery, radiation, and topical treatments, with the understanding that cure rate may be lower [4, 24, 35]. PDT generates a cytotoxic reaction which preferentially destroys malignant cells [36, 37]. The two commonly used photosensitizing agents are methyl aminolevulinate (MAL) and 5-aminolevulinic acid (ALA). PDT can effectively treat large body surface areas or multiple tumors with good cosmetic outcomes [38, 39]. Adverse effects include pain and burning [40].

Complete response rates with MAL-PDT and ALA-PDT average at 79% for superficial BCC treated for 12 weeks [41]. Five-year recurrence rates of 25% and 22% were reported for ALA- and MAL-PDT, respectively [42]. BCC treatment usually involves a single cycle of PDT, although treatment can be repeated. Regardless of lesion location or size, the reimbursement for a single cycle of MAL- or ALA-PDT is $241.21 for the procedure (Table 1). Assuming the amount of ALA and MAL used for identical lesions is equal, the average cost of MAL cream is $113 and the average cost of ALA cream is as low as $130 [43, 44].

Radiation Therapy

Radiation therapy is indicated for low-risk tumors and is an effective non-surgical treatment for BCC [19, 45–47]. External beam radiation (EBT) is typically delivered as fractionated doses of electron-beam or superficial X-rays. Although 5-year cure rates with radiotherapy (> 90%) are comparable to surgical treatment, there is substantial concern for poor margin control [19, 45, 47, 48] .In a study of 448 non-melanoma skin cancers (72% BCC, 28% SCC) treated with radiotherapy, the recurrence rate was 15.8% at a median follow-up of 18.4 months [49]. There have been no similarly powered studies of post-radiotherapy recurrence in BCC alone. Short-term adverse effects include pruritus and alopecia, while long-term reactions include depigmentation and radionecrosis [50]. The initial cosmesis is good, but worse than surgery, as scars tend to worsen over time [26, 45, 48, 51–53]. Radiotherapy also conveys an increased risk of subsequent BCC, other skin cancers, and sarcomas [54, 55]. Due to these adverse effects, radiotherapy is typically reserved for patients who cannot tolerate surgery, have a decreased life expectancy, or have a large BCC [3, 26, 51].

Reimbursement calculations for radiotherapy are complex, and encompass the cost of treatment simulation, radiation dosimetry calculations, and medical radiation physics consultations in addition to the cost of treatment delivery [56]. Reimbursement for dermatologic office-based superficial radiation therapy (SRT) is $465.11 for 5 fractions (number of doses in which the treatment is delivered), and $635.56 for 12 fractions. These values include the cost of treatment simulation, dosimetry, and delivery of SRT. Reimbursement for skin surface high dose EBT is $1954.02 for 8 fractions and $2342.72 for 10 fractions, and includes simulation, medical radiation physics consultation, and delivery of EBT. Reimbursement for 20 fractions of hospital-based orthovoltage radiation ≥ 250 kV is $3311.21, and includes dosimetry, simulation, and delivery of SRT. These values represent the total treatment cost for treatment of one lesion (Table 1).

Treating Advanced or Locally Metastatic BCC

Metastatic BCC is extremely rare but is associated with a poor prognosis [57]. Due to the low incidence of metastatic BCC, there are few approved therapies, and most studies are limited to small case series [58]. The most well-

Table 2 An approach to treating BCC when cost is and is not prioritized

	< 0.5 cm BCC on Area M[a]		1.1–2 cm BCC on Area L[b]		Giant BCC	
Approach to management	When efficacy is prioritized	When low-cost is prioritized	When efficacy is prioritized	When low-cost is prioritized	When efficacy is prioritized	When low-cost is prioritized
1st line treatments	Mohs	C&E & cryosurgery	Mohs	C&E, cryosurgery, and 5-FU	Limited data	Superficial radiation therapy
2nd line treatments	Imiquimod	5-FU	Imiquimod	Standard excision or PDT	Limited data	Skin surface high dose rate EBT

BCC basal cell carcinoma; *C&E* curettage and electrodesiccation; *5-FU* 5-fluorouracil; *PDT* photodynamic therapy; *EBT* external beam therapy

[a]Area M: cheeks, forehead, scalp, neck, jawline, pretibial surface

[b]Area L: trunk and extremities (excluding pretibial surface, hands, feet, nail units and ankles)

studied therapies are the hedgehog pathway inhibitors (HPIs), with two U.S. Food and Drug Administration (FDA)-approved drugs to date, vismodegib and sonidegib. Both drugs are associated with substantial toxicity, including muscle spasms, alopecia, and dysgeusia. Of patients with locally advanced BCC treated with vismodegib, 31% responded completely, while 65% had a complete or a partial response [59]. Of patients with metastatic BCC treated with vismodegib, 4% had a complete response, while 34% had a complete or partial response [59]. Patients treated with sonidegib had response rates of 44–58% in locally advanced BCC and 8–17% in metastatic BCC [60]. The 3-year recurrence rate is 36% for vismodegib [61]. Long-term recurrence rates have not been reported for sonidegib. Vismodegib costs $465.20 per capsule and a typical course of treatment is 10 months, costing upward of $139,560. Sonidegib costs $13,132 for a 30-day supply and is typically administered for 11 months, costing patients $144,452 (Table 1) [62].

Platinum-based chemotherapy has historically been used for advanced BCC and can be used when HPIs are not appropriate, accessible, or are cost prohibitive [58]. While platinum-based treatment has not been studied in randomized control trials and is not FDA-approved, this chemotherapy is associated with substantial tumor response [32, 63]. In a review of 53 patients with progressive BCC, the rate of complete remission was 37% and partial remission was 46% [58]. Major adverse effects of platinum therapy include ototoxicity, neurotoxicity, and nephrotoxicity [64]. To our knowledge, there are no systematic studies reporting cost of platinum treatment for BCC. However, studies using platinum agents have reported a median of 3 courses of cisplatin ± another chemotherapeutic agent [58]. The medication cost of 6 cycles of cisplatin (doses ranging 40–75 mg/m^2) in cervical cancer patients was $89 [65]. This approximates to a medication cost of $44.5 for 3 cycles of cisplatin (doses in the literature range 50–75 mg/m^2) for BCC [58]. This estimate does not include costs of administration (Table 1).

Cemiplimab-rwlc was FDA approved as the first monoclonal antibody for the treatment of BCC. Cemiplimab-rwlc is indicated for patients with advanced BCC previously treated with a hedgehog inhibitor or for whom a hedgehog inhibitor is not appropriate [66]. FDA approval came after the phase II trial response rates were 21% and 29% for patients with metastatic and locally advanced BCC, respectively [67]. The most common adverse effects (incidence ≥ 20%) were fatigue, diarrhea, rash,

pruritus, and musculoskeletal pain [66]. Cemiplimab is administered as a 350-mg infusion every 3 weeks [68]. Mean time to response is 4.2 months [68]. Each infusion costs $10,128, which translates to an average medication cost of $184,836 before benefit is seen (Table 1) [69].

DISCUSSION

The management of BCC depends on tumor size, location, and growth pattern. For primary tumors that are very small, arise in cosmetically non-sensitive areas, or exhibit a non-aggressive growth pattern, Mohs may not be the most appropriate treatment choice — particularly when cost is a priority [5].

For a primary superficial BCC < 0.5 cm arising on Area M (cheeks, forehead, scalp, neck, jawline, pretibial surface), the cost-conscious algorithm prioritizes C&E or cryosurgery. Second-line therapy would be a round of 5-FU. If efficacy was prioritized over cost, Mohs would be first line and imiquimod second line (Table 2).

For a primary nodular BCC 1.1–2 cm arising on Area L (trunk and extremities, excluding pretibial surface, hands, feet, nail units, and ankles), the cost-conscious algorithm prioritizes C&E, cryosurgery, or 5-FU. Second-line therapy would be standard excision or PDT. If efficacy was prioritized over cost, Mohs would be first line and imiquimod second line (Table 2).

For a giant BCC (BCC > 10 cm with aggressive behavior), the cost-prioritized algorithm identifies superficial radiation therapy as first line, and skin surface high dose rate EBT as second line. While the medication costs of cisplatin therapy are low, the drug has significant systemic toxicity, making it a less favorable treatment choice for giant BCC. The lack of large trials precluded us from making an efficacy-prioritized recommendation.

A limitation of our study is that the reimbursement values are applicable for a single lesion, and thus costs may differ for multiple BCCs addressed in the same visit. In addition, the reimbursement prices used in our study for surgical repairs do not incorporate the additional cost of grafts or flaps or when more than five tissue blocks are used for Mohs. Simpler treatments may have higher recurrence rates, ultimately requiring Mohs. The combined cost for retreating the residual/recurrent tumor with Mohs plus the cost of the original therapy may lead to a higher cost than if Mohs was used first line. Our calculated treatment costs only apply to dermatologists practicing in the United States.

There were variables that factor into cost that we were not able to consider due to a lack of available data in the literature (e.g., cost of revisionary procedures secondary to bad cosmesis). Most practitioners do not treat with cost as the primary priority, nor do we encourage them to. However, when fiscal resources are limited, cost can become an important factor in therapy selection. We provide guidance for BCC management when resources are limited, and cost is a driving factor in therapy selection. The usefulness of our algorithm is limited to assisting with consideration of cost in BCC treatment, rather than dictating clinical decision making.

CONCLUSIONS

For small, uncomplicated lesions, simple treatments are effective and less costly; even an initial biopsy might cure the lesion such that no additional treatment would be needed. Larger tumors on cosmetically non-sensitive areas can be treated with C&E, cryosurgery, or 5-FU, if cost is a priority. For Giant BCC, superficial radiation therapy is the cost-minimizing choice.

BCCs vary greatly, and no one treatment is appropriate for all tumors in all patients. Clinical judgment is needed in BCC management; cost can be an important consideration in resource-limited settings.

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Data Availability. The data used to support the findings of this study are included within the article.

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