# Quality Resource Guide

## Management of Oral Complications Associated with Cancer Therapy

### Author Acknowledgements

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### Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Understand basic therapies utilized to manage oral cavity and oropharyngeal carcinoma.
2. Recognize the potential major acute and chronic oral complications associated with cancer therapy.
3. Understand the importance of providing appropriate dental therapy prior to initiation of cancer therapy.
4. Understand oral supportive care interventions provided during cancer therapy.
5. Understand the need to implement appropriate post-cancer therapy strategies to maintain oral health.

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The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.



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The content of this Guide is subject to change as new scientific information becomes available.

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## Introduction

Oral cavity cancer (OCC) and cancer of the oropharynx (OPC) is estimated to affect 54,000 patients (38,700 men and 15,300 womean) in the United States during 2022.[1] Medical therapies to address these cancers often lead to debilitating changes affecting the oral cavity and oropharynx. In addition, the use of chemotherapy (CT) for a host of other malignancies may adversely affect the oral health of the patient. All cancer patients entering a healthcare system undergo a comprehensive medical assessment to determine the stage of their disease. For OCC and OPC, the T (tumor size), N (regional lymph node involvement), M (distant metastasis) staging system is used, with lower stages of disease having a better prognosis.[2,3] To maintain prognostic fidelity, the TNM staging algorithm for OPC was recently revised to reflect the increasing occurrence of HPV-associated OPCs.[4] HPV-associated OPCs are more responsive to treatment and carry a better prognosis than OPCs attributable to tobacco and alcohol exposure.

Therapy to manage a patient with cancer is multidisciplinary and takes into account the location and stage of the cancer, the patient's comorbidities, the patient's emotional status, the experience of the oncology team, and the resources of the treatment facility and the patient. Where feasible, surgery remains an essential therapeutic intervention for most cancers. Radiation therapy (RT) and/or CT may be prescribed as primary interventions for non-resectable disease or used in combination with surgery to improve cancer control.[2,3]

From a dental perspective, the oral management of the patient with cancer can be divided into three stages: 1) oral assessment and therapy prior to initiation of cancer therapy, 2) oral supportive care during cancer therapy, and 3) oral care following completion of cancer therapy. This guide reviews the commonly encountered adverse effects associated with cancer therapy that impact the oral cavity and the three stages of oral care and support for patients with cancer.

## Overview of Common Oral Complications with Cancer Therapies

Surgery continues to be a front-line therapy to treat OCC, OPC and numerous other tumors. It may be the sole therapy necessary to cure small, easily accessible lesions such as lower lip cancer.[2] Surgical intervention to manage more advanced disease often results in extensive functional impairment (trismus, dysphagia, speech impairment) and disfigurement, necessitating extensive reconstruction and/or rehabilitation.

RT and/or CT may be used as either primary or adjunctive therapy to treat OCC and OPC and often causes predictable oral complications (see **Table 1**).[5-7]

In addition, CT protocols capable of inducing myelosuppression (*e.g.*, leukemia therapy, bone marrow stem cell transplantation) also result in predictable oral complications. The occurrence of these complications is attributed in large part to the rich and diverse oral microflora, the high cellular turnover rate of the oral mucosa, and the rather common occurrence of oral trauma during normal function.[8] Although both CT and RT regimens are associated with oral complications, there are important differences between the two. Oral complications associated with CT regimens tend to be acute and resolve following discontinuation of therapy. In contrast, RT often incurs site-specific irreversible damage to structures "within the beam", leading to several persistent complications.

### Mucositis

Mucositis remains the most problematic acute oral complication of RT and/or CT. The etiopathogenesis involves a complex interplay of therapy-induced tissue insult and subsequent inflammatory responses by the patient.[5-8] The risk of developing mucositis is dependent on patient and treatment variables. The most commonly affected sites are those with high epithelial turnover, such as the labial mucosa, buccal mucosa, floor of mouth, tongue, and soft palate. Approximately 70% - 80% of patients subjected to myelosuppressive CT experience mucositis and almost all RT patients experience some degree of mucositis. For patients undergoing a combined CT-RT protocol to treat OCC or OPC, the occurrence of mucositis is virtually assured.[5]

Some commonly implicated CT agents are listed in **Table 2**.[7] Concurrent immunosuppression likely contributes to the exacerbation of mucositis through oral microflora colonization and secondary infection. Onset typically occurs within the first two weeks of CT and full resolution usually occurs within 2-4 weeks of CT cessation.

Table 1 - Oral Complications of Cancer Therapy[5,6]

| Acute | Chronic |
|---|---|
| • mucositis<br>• salivary dysfunction<br>• pain<br>• infection<br>• altered taste | • compromised mucosa<br>• salivary dysfunction<br>• infection<br>• altered taste<br>• pain<br>• osteonecrosis |

Table 2 - Common Chemotherapy Agents Associated with Mucositis[7]

| | |
|---|---|
| Cytotoxic agents | Cytarabine Doxorubicin Etoposide<br>Melphalan Fluorouracil Methotrexate |
| Molecular target agents | Afatinib Cetuximab Dacomitinib Erlotinib Everolimus<br>Infigratinib Lenvatinib Mobocertinib Niraparib Palbociclib<br>Regorafenib Sorafenib Sunitinib Temsirolimus |

RT induced mucositis appears to result from direct tissue ionization and is dependent on the type of radiation utilized, the total dose administered, the field size and fractionation. While RT-induced mucositis may heal within a few weeks after the cessation of therapy, there is invariably some degree of permanent damage resulting in mucosa that is atrophic, less pliable and more prone to future irritation and ulceration.[5-8]

### Salivary Dysfunction

Impaired salivary function due to CT toxicity is usually short-lived and of little long-term consequence. However, salivary hypofunction associated with RT is often permanent and remains one of the most problematic long-term complications.[5,8-10] The extent of impairment is dependent on the radiation dose and the volume of gland radiated. Cumulative radiation doses as low as 26Gy - 39Gy may incur permanent damage.[11] While all salivary gland tissues are at risk, the parotid gland appears to be the most susceptible. It should be noted that $I^{131}$ radioablative therapy to treat thyroid disease (carcinoma, Grave's disease) may also lead to salivary dysfunction.[12]

Salivary hypofunction not only results in oral dryness (xerostomia), but also decreased oral clearance, remineralization activity, antibacterial activity, and buffering capacity.[9,10] A drop in the salivary pH creates an acidic environment that promotes the rapid growth of acidophilic organisms such as mutans streptococci, lactobacillus and candida. The end result is a dramatically increased risk of developing dental carious lesions (radiation caries).

### Infection

In scenarios of CT-induced myelosuppression, the risk of developing an oral-sourced systemic infection (bacterial, viral, fungal) remains a serious concern.[5,6,8] Patients undergoing RT to the head and neck frequently develop oral candidosis, especially when hyposalivation is present.

### Altered Taste

Both CT and RT may result in alterations in taste (dysgeusia) or loss of taste (ageusia), which may persist following radiation therapy.[5,6,8] Cancer therapy may directly damage the taste buds, and salivary hypofunction reduces the solubilization of food for presentation to the taste buds.

### Pain

Pain is a frequently observed complication of cancer therapy. It may be caused by the malignancy itself, as an adverse effect of therapy (mucositis), or resulting dental disease.[8] Pain during therapy may hinder the patient's ability to comfortably eat, speak, and swallow, which may ultimately require an interruption of the scheduled cancer therapy. Even after cessation of cancer therapy, some degree of pain or discomfort often persists, and negatively impacts the patient's quality of life.[5]

### Osteoradionecrosis (ORN)

ORN is considered the most serious oral complication of RT for OCC and OPC. RT doses in excess of 65Gy result in fibro-atrophic bone changes and microvascular dysfunction.[13] These changes result in permanent impairment of normal bone homeostasis and the ability for wound healing to progress, increasing the risk for ORN. ORN presents as exposed necrotic bone. Other potential signs and symptoms of ORN include diminished or lost sensation, fistula development, and infection. The pain and inflammation may vary from mild to severe. The most commonly affected site is the posterior region of the mandible and the increased risk as a result of RT is considered life-long and estimated to be 2%-15%.[8,14] ORN may develop spontaneously, with known contributing factors including oral infection, trauma, diabetes, collagen vascular disease, tobacco/alcohol abuse and poor nutrition.[5]

## Oral Assessment and Care Prior to Initiation of Cancer Therapy

The presence of poor oral health going into cancer therapy increases the patient's likelihood of developing oral complications associated with RT and/or CT, both in terms of incidence and severity. Whenever possible, efforts to stabilize the oral status of the patient should be undertaken prior to the initiation of the necessary cancer therapy.[8,9] The dental treatment plan is predicated on correlating the results of a thorough dental examination with the planned cancer therapy. Necessary dental care should be accomplished as early as possible, ideally one month, before the initiation of cancer therapy.

### Radiation therapy to treat cancer of the oral cavity and oropharynx

Due to the aforementioned potential life-long oral complications associated with head and neck RT, the goal of dental therapy is to not only eliminate existing oral disease, but also to reduce the likelihood of future complications. In addition to eliminating active oral disease, the clinician must realistically assess the patient's ability and commitment to follow necessary preventive regimes to reduce their risk for acute as well as chronic complications (radiation caries and ORN) associated with RT (**Table 3**).[15]

### Table 3 - Caries Risk Reduction Protocol[15]

- Avoid drinking cariogenic liquids (*e.g.* soft drinks, carbonated drinks, including citrus flavored drinks or carbonated water, any liquid containing sugar)
- Avoid using sugar-containing mints or gums
- Avoid frequent between meal snacks that contain large amounts of sugar
- Understand the difference between sugar-free and sugar-less products. Only the former do not contain sugar and should be used by dry mouth patients
- Avoid using mouth moistener agents with an acidic pH
- Do use products containing xylitol (mints, gums, and/or drinks)
- Perform thorough oral hygiene measures using a soft/medium toothbrush and floss or a proxy-brush (if sufficient space exists), and a fluoridated toothpaste (1100 ppm fluoride ion) at least twice per day
- Brush teeth after every meal or snack
- Use a prescription topical fluoride gel daily
- Commit to regular and periodic follow-up dental examinations on a schedule determined by your clinician

Topical prescription fluoride therapy should be started as early as possible in the dental regime. It is best accomplished using carrier delivery trays (see **Table 4**) to deliver either a 1.1% neutral fluoride gel (preferred) or a 0.4% stannous fluoride gel on a daily basis.[15] Alternatively, a brush on technique may be used to deliver the fluoride. In office fluoride applications (rinses, varnishes) should be administered on a regularly scheduled basis. OTC fluoride rinses are less effective than prescription fluoride gels and rinses.

The decision to extract teeth prior to RT must consider the reality that RT is likely to create some degree of compromised oral health. In addition to nonrestorable teeth, teeth at significant risk for future infection and/or breakdown that would necessitate aggressive or invasive intervention during or after RT should be considered for pre-therapy extraction.[8,9] A minimum of two to three weeks healing time is desirable prior to the initiation of RT. There are no firmly established guidelines addressing when to extract, but the following conditions should prompt consideration to extract::

- Teeth with large carious lesions encroaching upon the pulp
- Teeth with periradicular involvement evident on radiograph
- Teeth with periodontal pockets > 5mm and evidence of active disease (bleeding on probing)
- Teeth with excessive mobility or furcation involvement
- Partially erupted teeth (third molars)
- Lack of patient motivation/concern, or the ability to regularly clean their teeth

## Chemotherapy Associated Direct Mucosal Toxicity and/or Myelosuppression

Since the oral complications associated with CT and/or myelosuppression tend to resolve after the cessation of CT, the goal of dental therapy is to teach the patient effective oral hygiene techniques and eliminate, or stabilize, oral disease that may contribute to the anticipated oral complications.[8] Sources of infection (deep caries, pulpal exposures, active periodontal disease) should be managed

Table 4

**Fluoride Gel Instructions[15]**

- Place a ribbon of the prescribed fluoride gel in the carriers
- Insert both the upper and lower carrier
- Gently bite several times to “pump” gel between the teeth
- Leave the carriers in place for 5 to 10 minutes
- Remove carriers and expectorate the gel but do not rinse
- Rinse and lightly brush the carriers - store them as directed by your clinician
- Do not eat or brush for at least 30 minutes (optimal time to use is prior to bedtime)

Table 5 - Chemotherapy Management Recommendations†[8]

| Consideration | Recommendation |
|---|---|
| Patients with chronic indwelling venous access lines | Antimicrobial prophylaxis not recommended; consult oncologist |
| **Neutrophils** | |
| >2,000/mm$^3$ | Antimicrobial prophylaxis not recommended |
| 1,000 - 2,000/mm$^3$ | Antimicrobial prophylaxis (AHA regimen)* |
| <1,000/mm$^3$ | Amikacin 150 mg/m$^2$ 1h presurgery; ticarcillin 75 mg/kg IV ½h presurgery. Repeat both 6 h postoperatively.* |
| **Platelet count**** | |
| >60,000/mm$^3$ | No additional support recommended |
| 30,000 – 60,000/mm$^3$ | Consider administering platelets preoperatively and 24 h later for surgical treatment (e.g., dental extractions). Additional transfusions are based on clinical course. Platelet transfusions are optional for noninvasive treatment.* |
| <30,000/mm$^3$ | Platelets should be transfused 1h before procedure; obtain an immediate postinfusion platelet count; transfuse regularly to maintain counts >30,000–40,000/mm$^3$ until initial healing has occurred. In some instances, platelet counts >60,000/mm$^3$ may be required. Consider adjunctive measures such hemostatic agents (microfibrillar collagen, topical thrombin, chitosan). Aminocaproic acid may help stabilize nondurable clots.* |

* Coordinate with managing physician
** Assumes all other coagulation parameters are within normal limits
† When invasive dental procedures are scheduled to be performed

and potential sources of irritation (rough edges of restorations, chipped teeth) should also be corrected. Orthodontic brackets and appliances should be removed prior to therapy and the wearing of removable prostheses should be avoided during therapy. Denture use should be restricted to eating and holding medications as necessary during therapy. All care should be coordinated with the managing physician and patients in poor health may need to be managed in a hospital setting. Surgical recommendations for patients with potential preexisting considerations (indwelling access line, thrombocytopenia, and/or neutropenia) are summarized in **Table 5**.[8]

## Oral Assessment and Care During Cancer Therapy

The primary goal of dental therapy during cancer therapy is to maintain oral hygiene and address acute complications as necessary. Specific protocols vary among institutions, with the management of oral complications most often under the purview of the oncology nurse. Since the patient undergoing cancer therapy may choose to seek outpatient dental care from their family dentist, all providers should be familiar with the following information.

### Oral Hygiene

Meticulous toothbrushing with a moist, soft nylon-bristled brush (foam toothbrushes are not generally recommended) and atraumatic flossing is encouraged.[8,12] Toothbrushing should occur 2-3 times per day using a patient tolerated dentifrice and flossing should occur daily. A prescribed fluoride gel should be applied daily. The liberal use of a bland oral rinse (0.9% normal saline, sodium bicarbonate solution, 0.9% saline/sodium bicarbonate solution) helps ameliorate discomfort and assists with cleansing.

### Mucositis

The use of low-level energy laser and light therapy (Photobiomodulation [PBM]), is recommended for the prevention of oral mucositis in the patient undergoing head & neck RT with or without CT.[16] For the patient with oral mucositis, a stepped approach is recommended to provide traumatic cleansing, maintain lubrication, and control discomfort. The patient should be counseled to avoid spicy, acidic, rough, and hot foods. Ameliorating topical agents, including the bland rinse agents noted above, mucosal coating agents, lubricating agents, topical anesthetics, and coating agents (see **Table 6**) should be used as necessary.[8] Solutions containing varying amounts of diphenhydramine, viscous lidocaine, and corticosteroid mixed into carrier vehicle such as bismuth subsalicylate (Pepto-Bismol®) may assist in managing mild to moderate mucositis.[6] The use of hydrogen peroxide (3% diluted 1:1 with water) may be useful to remove hemorrhagic debris but its use should be restricted to 1-2 days as it may delay wound healing.[8]

The keratinocyte growth factor-1 agent, palifermin, is Food and Drug Administration (FDA) approved to decrease the incidence and duration of severe oral mucositis in patients undergoing high-dose chemotherapy with or without radiation therapy (to be followed by bone marrow transplant) for hematologic cancers.[16] The use of palifermin to manage the mucositis associated with OCC and OPC therapy has yet to be approved by the FDA.

### Xerostomia

Intratherapy xerostomia is primarily managed with palliative saliva substitutes (lubricating agents and ice chips). The main measure to reduce the long-term risk of xerostomia associated with RT is the use of parotid sparing intensity-modulated radiation therapy (IMRT) when possible.[8,17,18] Other measures that may be attempted include surgical transfer of one submandibular gland to an area outside the radiation portal.[10]

### Infection

With the exception of oral candidiasis, which occurs frequently during RT, most oral infections appear to occur as a consequence of CT-induced neutropenia. The risk and severity of infection rises significantly when the absolute neutrophil count falls below 1,000/mm$^3$.[8] Adherence to pre-clearance protocols and the use of prophylactic antibiotic measures when indicated are thought to reduce the risk of intratherapy infection. Any suspicion of infection such as fever of unknown origin must be thoroughly investigated by the oncology team to determine the specific etiology and appropriate therapeutic intervention.

Table 6 - Available Agents for Mucositis Management[8]

| Bland Rinses | Topical Anesthetics |
|---|---|
| • 0.9% saline solution<br>• Sodium bicarbonate solution<br>• 0.9% saline/sodium bicarbonate solution | • Lidocaine (viscous, ointments, sprays)<br>• Benzocaine (sprays, gels)<br>• Dyclonine HCl (0.5% or 1.0%)<br>• Diphenhydramine solution |
| **Mucosal Coating Agents** | **Analgesics** |
| • Amphojel®<br>• Kaopectate®<br>• Hydroxypropyl methylcellulose film-forming agents<br>• Gelclair®<br>• Use of mixtures (topical anesthetics with mucosal coating agents) may be beneficial | • Opioid drugs (oral, intravenous [bolus, continuous infusion, patient-controlled analgesia], patches, transmucosal)<br>• Benzydamine HCl rinse* |
| * Not FDA approved for use in United States | |

### Pain

The level of pain experienced by the patient during therapy appears to correlate with the severity of the mucositis that develops. Unfortunately, cancer therapy-related pain is often undertreated. Currently recommended management protocols for cancer therapy pain follow the three-step ladder approach set forth by the World Health Organization (**Table 7**).[8,10,19] Adjuvants may be prescribed to calm fears and anxiety. To maximize efficacy, drugs should be given "by the clock", rather than "on demand."

Table 7 - Pain Management Protocol[19]

| Therapy | Pain Level | | |
|---|---|---|---|
| | 1 Mild | 2 Moderate | 3 Severe |
| Topical (bland rinses, anesthetics, analgesics) | X | X | X |
| Non-Pharmacologic Pain Therapy (physiotherapy, relaxation, counseling, cognitive-behavioral therapies) | X | X | X |
| Adjuvant Drugs (muscle relaxants, anti-inflammatories, anxiolytics, antidepressants, anticonvulsants) | X | X | X |
| Non-Opioid Drugs (aspirin and paracetamol/ acetaminophen) | X | | X |
| Mild Opioid Drugs (codeine) | | X | |
| Strong Opioid Drugs (morphine) | | | X |

## Oral Assessment and Care After Therapy

Patients who have undergone successful cancer therapy should be strongly encouraged to continue obtaining necessary dental care. It is often after medical care that the general practitioner encounters the cancer therapy patient for the first time. While some patients experience no long- term complications related to their cancer therapy, many do. In 2019, the number of OCC and OPC survivors in the United States exceeded 410,000 and most had undergone RT as part of their treatment.[20] As such, the majority of patients experience some degree of chronic oral compromise that adversely affects their quality of life.

An overarching goal in managing the post- RT patient is to maintain all teeth within the radiation field.[8,9] Such an approach reduces the risk of ORN. The patient should be placed on a frequent maintenance recall schedule (every 3-4 months for the first two years post-therapy) to assess patient commitment and compliance with home care (see **Tables 3** and **4**) Monitoring for complications (compromised mucosa, salivary dysfunction, infection, altered taste, pain, and osteonecrosis) should be part of each periodic exam.

Table 8 - Measures to Manage Xerostomia[10, 15, 24]

| Measure | Examples | Comments |
|---|---|---|
| Topical stimulation of salivation | • Sugar-free gum<br>• Sugar-free mints | • Xylitol containing products should be used |
| Moisturizers | • Sip water<br>• Water mist<br>• Saliva substitutes | • Formulations vary<br>• Liberal use<br>• Variable patient acceptance<br>• Avoid products with pH < 6 |
| Sialagogues | • Pilocarpine (Salagen®)*<br>• Cevimeline (Evoxac™)**<br>• Bethanechol (Urecholine®)** | • Common side effects include sweating, headache, nausea, gastrointestinal upset, urinary frequency, rhinitis, flushing<br>• Allow 7 days between dosing changes to determine overall effect and tolerance. Allow up to 8 weeks to establish effect. |

* FDA approved indication
** Off-label indication

### Compromised Mucosa

Post-radiotherapy healed mucosa is less pliable and more prone to future irritation and ulceration. The presence of oral dryness further aggravates discomfort; with some patients complaining of a burning or scalded sensation.[5] Fabrication of removal prostheses that may "rub" the tissues should be deferred for a minimum of 3-4 months. The use of implants to restore form and function remains controversial but may be considered for select patients.[21-23] In these cases, consideration of the radiation dose to the potential implant site can be the deciding factor influencing the decision to place an implant.

### Salivary Dysfunction

Measures to relieve xerostomia are sum-marized in **Table 8**. There is no "one size fits all" formula and each patient should actively participate in determining what works best.[10,13,24] The use of a room humidifier to increase room humidity, especially during sleep, may improve comfort.

**Infection**

Managing the life-long increased risk of infection in this patient cohort represents a serious challenge for the dental clinician.[5,6,8] The challenge emanates from the fact that active periodontal disease, as well surgical interventions, place the patient at risk for ORN. The progression of radiation caries also can be profound and place the patient at risk for needing extraction, potentially triggering ORN. Oral candida infections occur commonly, particularly in the patient with oral dryness. Oral candida infections may present as erythematous candidiasis, pseudomembranous candidiasis, as well as angular chilitis.[5]

Increased infection risk is largely attributable to compromised salivary function and subsequent changes in the oral microflora. Even when the patient meticulously follows the protocols in **Tables 3** and **4**, dental disease may occur.[15] Additional measures to consider in those situations include:

- More frequent recall
- An antimicrobial protocol consisting of -
  - two week course of 0.12% chlorhexidine rinse (½ ounce rinse) for one minute, twice daily
  - followed by ½ ounce rinse for one minute twice daily, one or two days per week. This regime is postulated to significantly reduce the burden of *mutans streptococci*
- Use of remineralization products such as casein phosphopeptide-amorphous calcium phosphate (Recaldent™) and the calcium, phosphorous, fluoride product Enamelon®
- Antifungal therapy may be used as necessary. Due to the presence of oral dryness, topical therapies may be poorly tolerated, and the following approach is recommended:

  Rx: Fluconazole (Diflucan®) 100 mg tablets

  Disp: 15 tablets

  Sig: 2 tablets on day 1, then 1 tablet daily

**Altered Taste**

The post-radiotherapy patient may experience persistent taste diminution.[5,6] Efforts to improve altered taste are limited. They include:

- Efforts to improve salivation and oral cavity wetness
- The use of flavoring agents with foods
- Zinc supplements

**Pain**

Some degree of mucosal discomfort may persist as a consequence of mucosal damage and persistent oral dryness. For some patients there are no fully satisfactory therapies to alleviate this complaint. Primary management strategies include dry mouth therapies noted above. Irritating substances such as spices, alcohol, and rough foods should be avoided.

**Osteonecrosis**

Efforts to reduce risk for ORN focus on maintaining oral health and avoiding, when possible, surgical interventions and oral infections.[5,8,9] Endodontic therapy and crown amputation should be considered to avoid tooth extraction, and should be performed as atraumatically as possible with minimal amounts of local anesthetic containing epinephrine.

If ORN does occur, referral of the patient to an oral and maxillofacial surgeon is recommended. Management strategies are patient specific and vary from simple measures to optimize oral hygiene, combined with simple sequestrectomy, to extensive resective surgery to remove devitalized bone followed by osseous reconstruction.

## Summary

Medical therapies to treat OCC, OPC, and some extraoral cancers may cause debilitating acute and chronic complications affecting the oral cavity and oropharynx. The oral healthcare provider plays a central role in the multidisciplinary approach to address both the prevention and management of these complications in at-risk patients. Management of these patients is divided into three stages:

1) oral assessment and therapy prior to initiation of cancer therapy,
2) oral supportive care during the cancer therapy, and
3) oral care after the completion of cancer therapy.

Implementation of these management protocols is vital in assisting the patient maintain a high quality of life before, during and after cancer therapy.

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# POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **Which of the following adverse oral complications associated with radiation therapy for oral cavity cancer is characterized solely as chronic?**
   a. Mucositis
   b. Osteonecrosis
   c. Infection
   d. Pain

2. **Upon healing, radiation-induced mucositis is likely to manifest all of the following features in the mucosa except one. Which one is the exception?**
   a. More prone to ulceration
   b. More thickened
   c. Less pliable
   d. More atrophic

3. **Salivary dysfunction attributed to RT may be permanent and typically is only observed after the cumulative radiation dose to the salivary tissues exceeds 50Gy.py**
   a. The first part of the statement is true, but the second part of the statement is false.
   b. The first part of the statement is false, but the second part of the statement is true.
   c. Both parts of the statement are true.
   d. Both parts of the statements are false.

4. **Concerning ORN, which of the following statements is incorrect?**
   a. ORN is considered the most serious complication associated with radiotherapy.
   b. ORN presents as exposed necrotic bone and the posterior mandible is the most commonly affected site of occurrence.
   c. The over-all risk of occurrence is 2% - 15%.
   d. ORN only occurs after inappropriate dental manipulation of the osseous tissues (*e.g.*, extraction, periodontal therapy).

5. **Of the available home-use fluoride agents, which are considered most effective?**
   a. 1.1% neutral fluoride gel
   b. 0.4% stannous fluoride
   c. OTC fluoride rinses
   d. a & b
   e. a, b & c

6. **Your patient presents for pre-treatment dental assessment and therapy prior to undergoing mucositis-inducing chemotherapy. You determine the patient has a deep carious lesion in an otherwise restorable tooth. This tooth should be extracted.**
   a. True
   b. False

7. **The decision to remove teeth prior to the initiation of cancer therapy is based on the findings of a thorough oral examination. Examples of conditions that should prompt consideration for extraction include:**
   a. Evidence of radiographic periradicular involvement without symptoms
   b. Periodontal pockets < 2mm
   c. Erupted third molars
   d. a & c
   e. a, b, c

8. **For the patient undergoing immunosuppressive chemotherapy, and needing an urgent extraction, the AHA antimicrobial prophylaxis regimen is appropriate if the neutrophil count is:**
   a. > 2,000/$mm^3$
   b. 1,000 – 2,000 $mm^3$
   c. < 1,000 $mm^3$
   d. a & b
   e. a, b, c

9. **Oral infection creates the greatest risk in which of the following cancer therapy scenarios:**
   a. Immunosuppressive chemotherapy to a manage leukemia
   b. Combined chemoradiation therapy to manage a base of tongue cancer
   c. Surgical resection of a small lower lip cancer
   d. Surgical resection of a soft palate cancer with follow-up IMRT

10. **Which sialagogue is specifically approved for use in the patient who has post-RT oral dryness (xerostomia)?**
    a. Bethanachol
    b. Pilocarpine
    c. Cevimeline
    d. Xylitol

## Registration/Certification Information (Necessary for proper certification)

Name (Last, First, Middle Initial): _____

PLEASE PRINT CLEARLY

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City: _____ State: _____ Zip: _____

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Date of Birth: _____ Email: _____

State(s) of Licensure: _____ License Number(s): _____

Preferred Dentist Program ID Number: _____ ☐ Check Box If Not A PDP Member

AGD Mastership: ☐ Yes ☐ No

AGD Fellowship: ☐ Yes ☐ No Date: _____

Please Check One: ☐ General Practitioner ☐ Specialist ☐ Dental Hygienist ☐ Other

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## Evaluation - Management of the Oral Complications Associated with Cancer Therapy 4th Edition

Providing dentists with the opportunity for continuing dental education is an essential part of MetLife's commitment to helping dentists improve the oral health of their patients through education. You can help in this effort by providing feedback regarding the continuing education offering you have just completed.

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| | 1 = POOR 1 | 2 | 3 | 4 | 5 = Excellent 5 | |
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| 2. How would you rate the quality of the content? | ☐ | ☐ | ☐ | ☐ | ☐ | |
| 3. Please rate the effectiveness of the author. | ☐ | ☐ | ☐ | ☐ | ☐ | |
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| 5. The use of evidence-based dentistry on the topic when applicable. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ N/A |
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| 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
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| extremely likely | | | | | neutral | | | | | not likely at all |

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