How should adults with cancer be managed by general dental practitioners if they need dental treatment?

Prepared by UK Medicines Information (UKMi) pharmacists for NHS healthcare professionals

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Summary

Dental infections

♦ Dentists should be alert for the possibility of neutropenic sepsis in any patient with a dental infection who is currently receiving chemotherapy, or received chemotherapy in the previous three months, or received total body irradiation in the last six months (e.g. before or after a stem cell/bone marrow transplant) – if suspected, urgently contact the patient’s oncology or haematology team and specialist dental care.

♦ For a patient who is currently receiving chemotherapy, or received chemotherapy in the previous three months or total body irradiation in the last six months who does not have neutropenic sepsis, dental infections may be treated in primary care but dentists must get advice from the patient’s oncology or haematology team. Infections should be managed aggressively with close monitoring. Treatment choice often depends on whether the patient is immunosuppressed or at risk of bleeding. Obtain the patient’s blood test results taken within the last 48 hours and check with the patient’s oncology or haematology team whether treatment in primary care is suitable or if special precautions are needed.

♦ In all other patients with cancer, treat infections the same as those in patients who do not have cancer, but be extremely vigilant about follow-up and monitoring for deterioration.

♦ Before prescribing or using medicines, the dentist should consider the possibility of interactions with the patient’s current cancer treatments.

Dental procedures

♦ Do not provide emergency dental treatment to a patient currently receiving chemotherapy or radiotherapy to head or neck, or who received chemotherapy or radiotherapy to head or neck in the previous three months, or total body irradiation in the previous six months, before contacting the patient’s oncology or haematology team to find out whether treatment can be carried out safely. If this is not possible, refer the patient urgently to specialist dental care.

♦ Do not provide elective invasive dental treatment to a patient currently receiving chemotherapy or radiotherapy to head or neck, or to those who received chemotherapy or radiotherapy to head or neck in the previous three months, or total body irradiation in the last six months, without taking advice from the patient’s oncology or haematology team.

♦ Non-invasive dental treatment may be provided in primary care to all patients with cancer, except non-essential work should be avoided during the six months after total body irradiation. If the patient is currently receiving cancer treatment, liaise with the patient’s oncology or haematology team, who is responsible for arranging or carrying out active dental treatment during this time.

♦ Invasive dental treatment may be provided in primary care without taking advice from a specialist to patients who:
  o are currently receiving radiotherapy to areas other than head or neck, or
  o received chemotherapy and/or radiotherapy more than three months ago, or
  o are receiving biological or hormonal therapies for their cancer.

However, the dentist should be aware of the possibility of oral adverse effects from cancer treatment, including risk of osteonecrosis (see below). Also, confirm patients with blood cancer are in remission.

Osteonecrosis risk

♦ Patients who have received intravenous bisphosphonates, denosumab, total body irradiation or radiotherapy to head or neck will be at risk of osteonecrosis of the jaw (in some cases lifelong). Refer to specialist dental care if oral or periodontal surgery is needed or dental infections do not respond to treatment.
Background

Patients with cancer could have received or may still be taking a variety of different treatments, which are associated with a range of adverse effects that may affect dental treatment. Decisions about dental treatment should be handled individually, taking into account the patient’s medical and cancer history, the treatments they have received or are still taking, and their ability to tolerate dental treatment. There is no UK guideline for primary care dentists on providing dental care to patients with cancer that discusses all possible cancer therapies and their consequences for dental treatment.

This Medicines Q&A provides advice on what to consider when providing dental treatment, and information about the main adverse effects of cancer therapies that could cause problems when dental health professionals provide treatment.

This advice relates primarily to general dental practitioners

Dentists working in community dental services have experience providing care to patients with more complex medical conditions and health needs, and may have competence and experience to provide dental treatment to patients with cancer that a general dental practitioner would not.

Answer

Advice on providing dental treatment

- To a patient having an invasive* dental procedure – see Appendix 1
- To a patient having a non-invasive dental procedure – see Appendix 2
- To a patient with a dental infection – see Appendix 3
- To all cancer patients after cancer treatment finishes (general advice) – see Appendix 4

For advice on what information is needed to help make decisions about dental treatment in a patient with cancer, see Appendix 5.

For a list of cancer drug treatments including cytotoxics, biological therapies, hormonal therapies, bisphosphonates and other bone metabolism therapies, see Appendix 6.

* An invasive dental procedure includes extraction, incision and drainage of intra-oral swellings, full periodontal examination, root surface instrumentation, scaling and restoration (filling) below the gum-line, flap raising procedures such as periodontal (gum disease) surgery and dental implants, gingival re-contouring and biopsy [1].

Adverse effects of cancer therapies

Chemotherapy (treatment with cytotoxic drugs [2]) often impairs function of bone marrow, suppressing formation of white blood cells, red blood cells and platelets (myelosuppression) [3]. Some biological therapies may also cause myelosuppression, whilst hormone therapies and bisphosphonates are very unlikely to affect blood cells [4]. Some cytotoxic drugs are described as stomatotoxic because they have toxic effects on oral tissues [3]. Oral complications of cancer treatment arise in various forms and degrees of severity, depending on the individual and the cancer treatment [3].

Dentists need to consider the possibility of increased risks of bleeding and infection, and oral complications in patients who have received treatment for cancer. Risks change depending on which treatment the patient received, and when they received it. Patients currently receiving chemotherapy or radiotherapy to head or neck, and those who received therapy within the last three months, and those who received total body irradiation in the last six months, should not be given dental treatment unless advised by their oncology or haematology team because their mouth may be very sore and there is a risk of systemic infection and bleeding – patients currently receiving treatment for cancer should be referred to specialist dental care if they need urgent treatment wherever possible. Advice should be sought from the patient’s oncology or haematology team, as they are responsible for arranging or carrying out active
dental treatment in patients undergoing treatment for cancer [5]. Patients taking biological therapies or hormonal treatments can receive treatment from their general dental practitioner.

**Bleeding**
- Thrombocytopenia (platelet count less than 150 x 10^9/L [6]) is fairly common in patients receiving most cytotoxic drugs; anaemia is less common [7].
- Onset, duration and severity of thrombocytopenia vary considerably with different cytotoxic drugs [7].
- Thrombocytopenia commonly occurs seven to ten days after cytotoxic drug administration, but is delayed for certain drugs, such as carmustine, lomustine, and melphalan [8]. With most drugs, platelet count recovers within 14 to 26 days [9].
- Total body irradiation before a bone marrow transplant or a stem cell transplant and some biological therapies can also cause thrombocytopenia [8,10].
- The main effect of a reduced platelet count is an increased risk of bleeding, but this rarely occurs until it is less than 100 x 10^9/L [11].

**Infection**
- All cytotoxic drugs except vincristine and bleomycin cause bone-marrow suppression [8]. It commonly occurs seven to ten days after administration, but is delayed for certain drugs, such as carmustine, lomustine, and melphalan [8]. With most drugs, white cell count recovers within 14 to 26 days [9].
- Radiotherapy sometimes causes white cell count to fall low. It is more likely when large areas of the body or bones of the legs, chest, abdomen or pelvis are treated [10].
- Risk of infection is assessed by measuring white cell count, particularly neutrophil count. The normal range for neutrophils is 2.5 to 7.5 x 10^9/L [12]. As the neutrophil count falls, especially once neutrophils are less than 1 x 10^9/L, a patient becomes at risk of serious infections [12].
- In immunosuppressed patients, infections can be life-threatening [13] and they may deteriorate more rapidly than someone with normal immune function [14].
- Patients who have previously been exposed to, or are currently undergoing, radiotherapy to head or neck may be susceptible to local infection as a result of reduced blood supply to the irradiated area. This risk increases with time. Careful assessment of patients prior to radiotherapy and maintenance of good oral health is important [13].
- In patients who have had a bone marrow or stem cell transplant, the increased risk of infection may last for up to a year even though blood test results may be normal [3].
- Reactivation of herpes simplex virus commonly occurs in a patient who is immunosuppressed [15].

**Oral complications**
- Oral complications may be caused directly by cancer or by cancer treatment [5].
- Oral complications occur in virtually all patients receiving radiotherapy to head or neck, in about 80% of stem cell transplant recipients, in more than two-thirds of patients with leukaemia, in one-third of patients with non-Hodgkin lymphoma, and in nearly 40% of patients receiving chemotherapy [3,17]. They are more likely to occur, and are usually more severe, if chemotherapy and radiotherapy are both given [16,17].
- Oral complications caused by cytotoxic drugs result from a direct effect on the oral mucosa (primary stomatotoxicity), the patient’s inability to contain local, minor oral disease during myelosuppression (secondary stomatotoxicity), or a combination of the two [17].
- Risk for oral complications can be classified as low (with minimally myelosuppressive or non-myelosuppressive cytotoxic drugs) or high (with stomatotoxic cytotoxic drugs that also cause prolonged myelosuppression, stem cell transplant, and radiotherapy to head or neck) [3].
- Some complications occur only during treatment; others, such as dry mouth (xerostomia), may persist for years [3] or develop months or years later [16]. Most people find that adverse effects of radiotherapy have noticeably improved six to eight weeks after therapy has ended [16].
Oral complications common to both chemotherapy and radiotherapy include:

- **Oral mucositis** (inflammation and ulceration of mucous membranes) can increase the risk for pain, oral and systemic infection, and nutritional compromise [3]. It begins five to ten days after chemotherapy starts (two weeks after radiotherapy starts and one week after bone marrow transplant), and usually gradually clears up three to four weeks after drug treatment ends (six to eight weeks after radiotherapy ends) [5,16,18]. Some biological therapies can cause oral complications (including mucositis and dry mouth) [18]. However, monoclonal antibodies appear not to exacerbate mucositis, dry mouth, dysphagia or pain caused by radiotherapy [19].
- **Xerostomia** (dry mouth due to thickened, reduced or absent salivary flow) increases risk of infection and compromises speaking, chewing and swallowing [3]. Medicines other than chemotherapy (e.g. biological therapies and hormone therapies [18]) can also cause salivary gland dysfunction. It usually resolves two months after chemotherapy ends but can be permanent after radiotherapy and bone marrow transplant [5,16]. Persistent dry mouth increases the risk for dental caries [3].
- **Infection** (viral, bacterial and fungal) results from myelosuppression, dry mouth and/or damage to the mucosa from chemotherapy or radiotherapy [3].
- **Functional disabilities** (impaired ability to eat, taste, swallow and speak) because of mucositis, dry mouth, trismus and infection [3].
- **Taste alterations**, ranging from unpleasant to tasteless, which may take weeks or months to recover [3,16,18].
- **Poor nutrition** from eating difficulties caused by mucositis, dry mouth, dysphagia and loss of taste [3].
- **Abnormal dental development** due to radiotherapy or high-dose chemotherapy before age nine [3].

Other complications of chemotherapy include:

- **Neurotoxicity** (persistent, deep aching and burning pain that mimics a toothache, but for which no dental or mucosal source can be found) is a side effect of certain classes of drugs, such as vinca alkaloids [3].
- **Oral bleeding** from decreased platelets and clotting factors [3].
- **Mouth ulcers**, which can be extremely painful (causative drugs include alemtuzumab, doxorubicin, capecitabine, epirubicin, fluorouracil, methotrexate, vinristine) [20,21].

Other complications of radiotherapy include:

- **Radiation caries** (lifelong risk of rampant dental decay) may begin within three months of completing radiotherapy if changes in either quality or quantity of saliva persist [3] or if diet does not return to normal.
- **Trismus/tissue fibrosis** due to loss of elasticity of masticatory muscles [3].
- **Osteonecrosis** (blood vessel compromise and necrosis of bone exposed to high-dose radiotherapy) results in decreased ability to heal if traumatised [3].

Limitations

- The advice in this Medicines Q&A relates primarily to general dental practitioners. Dentists working in community dental services have experience providing care to patients with more complex medical conditions and health needs, and may have competence and experience to provide dental treatment to patients with cancer that a general dental practitioner would not.
- The advice in this Medicines Q&A that general dental practitioners should contact the patient’s oncology or haematology team for up to six months after cancer treatment finishes before providing dental treatment is based on expert opinion, but it is always the dental health professional’s individual decision whether they feel competent to provide treatment:
  - A specialist in special care dentistry has advised that a three-month post-cancer treatment window ensures patients who have received chemotherapy or radiotherapy to head or neck are managed safely and will encourage primary care dentists to consider their actions before providing treatment. It is excessive for patients who have only received radiotherapy to areas other than head or neck.
  - Christie NHS Foundation Trust patient information booklets state that non-essential dental work should be avoided approximately six months following stem cell transplant, and the period of highest risk of infection is the first six months after treatment [23,24].
References


Quality Assurance

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Search strategy (conducted February 2016)
- Embase via NICE Evidence (exp *NEOPLASM/ + [exp *DENTAL PROCEDURE/ or DENTIST/]; Limit to English Language and (Publication Types Review).
- Medline via NICE Evidence (exp *NEOPLASMS/ + [exp *DENTISTRY/ or exp DENTISTS/]; Limit to Document type Review) and (Language English]).
- Cochrane Library (cancer + [dentist* or dental]
- In-house database/ resources
- Internet Search www.google.co.uk (dental cancer patient; dentist guidelines cancer patient; neutropenic sepsis)
- Scottish Dental Clinical Effectiveness Programme www.sdcep.org.uk
- Cancer Research UK www.cancerresearchuk.org
- Macmillan Cancer Support www.macmillan.org.uk
- National Institute for Health and Care Excellence www.nice.org.uk (dental; neutropenic; cancer)
- Northern England Strategic Clinical Networks www.nescn.nhs.uk

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Comments from clinicians (received September 2013)

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- Nicholas Fabbri, General Dental Practitioner, Altmore Dental Practice, London.
- Dr Vicki Jones. Senior Community Dentist. Aneurin Bevan University Health Board.
- Andrew Kwasnicksi. Consultant in Special Care Dentistry. Liverpool University Dental Hospital.
- Tara Madhok, General Dental Practitioner, Longfield Lodge Dental Practice, Manchester.
- Sarah Mosedale, General Dental Practitioner, Stockland Green Dental Practice, Birmingham.
- Professor Simon Rogers. Consultant Maxillofacial Surgeon. University Hospital Aintree.
- Dr Michele Seager. Assistant Clinical Director and Specialist in Special Care Dentistry. North Wales Community Dental Service.
- Dr P Vaughan-Williams, Consultant in Special Care Dentistry, Lancashire Care NHS Foundation Trust.

Comments from clinicians (received March/April 2016)

- Daniel Collins. Lead Pharmacist, Cancer Services. Royal Liverpool and Broadgreen University Hospitals NHS Trust.
- Andrew Kwasnicksi. Consultant in Special Care Dentistry. Liverpool University Dental Hospital.
- Tara Madhok, General Dental Practitioner, Longfield Lodge Dental Practice, Urmston.
- Sarah Mosedale, General Dental Practitioner, Stockland Green Dental Practice, Erdington.
- Dr Nikolaus A Palmer, Clinical Advisor in Dental Education and Research Fellow in Primary Care. Health Education North West.
- Rhiannon Walters-Davies, Medicines Safety Pharmacist, The Clatterbridge Cancer Centre NHS Foundation Trust.
Appendix 1. Patient having an invasive dental procedure

Advice algorithm on whether to provide invasive dental treatment in primary care

Could the patient have sepsis? Are they unwell?

Early symptoms of sepsis include temperature >38°C or <36°C, chills, shivering, a fast heartbeat and fast breathing. Symptoms of more severe sepsis include feeling dizzy or faint, confused or disorientated, diarrhoea, nausea, vomiting, slurred speech, severe muscle pain, severe breathlessness, producing less urine than normal (e.g. not urinating for a day), and cold, clammy, pale or mottled skin.

Yes

Refer urgently to the oncology or haematology team and/or specialist dental care. (See Appendix 3)

No

Are they currently receiving chemotherapy, radiotherapy, or another drug treatment for cancer?

Yes

Chemotherapy or radiotherapy to head or neck
Contact the oncology or haematology team for advice. If emergency dental treatment is needed but treating in primary care is not safe, refer urgently to specialist dental care.

Check manufacturer’s prescribing information for any drugs to be used. Look at contraindications, precautions, adverse effects and interactions.

Give dental treatment as normal. Consider increased risks of bleeding and infection. Check for oral adverse effects.

In patients who have received IV bisphosphonates or denosumab, there is a risk of osteonecrosis. Refer to specialist dental care if oral or periodontal surgery is needed.

Radiotherapy to areas other than head or neck, or other drug treatment
e.g. biological therapies (erlotinib, trastuzumab), hormonal treatments (goserelin, tamoxifen) or bisphosphonates.

Chemotherapy, other cancer drugs, or radiotherapy to areas other than head or neck

Refer to specialist dental care if oral or periodontal surgery is needed.

There is a risk of osteoradionecrosis. Refer to specialist dental care if oral or periodontal surgery is needed.

Otherwise, treat as normal. Consider increased risks of bleeding and infection. Check for oral adverse effects.

No

Treatment has not started yet.
Make sure the patient is dentally fit prior to cancer treatment starting. Liaise with the oncology or haematology team.

Treatment finished more than three months ago (or six months ago if total body irradiation).

Confirm patients with blood cancer are in remission

Radiotherapy to head or neck, or total body irradiation

If treatment is urgent, contact the oncology or haematology team before starting treatment.

If not urgent, consider delaying treatment until three months after treatment is complete (six months after total body irradiation). Otherwise, contact the oncology or haematology team.

Treatment finished less than three months ago (or six months ago if total body irradiation).

Otherwise, treat as normal.

Check for oral adverse effects.

In patients who have received IV bisphosphonates or denosumab, there is a risk of osteonecrosis. Refer to specialist dental care if oral or periodontal surgery is needed.
Appendix 1 continued. Patient having an invasive dental procedure

**Invasive dental procedures include** extraction, incision and drainage of intraoral swellings, full periodontal examination, root surface instrumentation, scaling and restoration (filling) below the gum-line, flap raising procedure such as periodontal (gum disease) surgery and dental implant, gingival re-contouring and biopsy [1].

<table>
<thead>
<tr>
<th>Patient:</th>
<th>Contact the patient’s oncology or haematology team [22]. Before starting an invasive dental procedure, obtain blood test results taken within the last 48 hours [5] and check with the oncology or haematology team whether treatment in primary care is suitable or special precautions are needed.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Managing risk of bleeding</strong></td>
<td><strong>Managing risks of infection and osteonecrosis</strong></td>
</tr>
<tr>
<td><strong>For a patient needing emergency dental treatment.</strong></td>
<td><strong>For a patient needing elective dental treatment.</strong></td>
</tr>
<tr>
<td>• Follow the advice of the patient’s oncology or haematology team. If no advice is available, urgently refer the patient to specialist dental care.</td>
<td>• In a patient who has received radiotherapy to head or neck, total body irradiation, intravenous bisphosphonates or denosumab, refer to specialist dental care if oral or periodontal surgery is needed [5,13]. <strong>Do not extract teeth involving irradiated bone due to risk of osteonecrosis</strong> [5,13].</td>
</tr>
<tr>
<td><strong>Consider delaying treatment [5] until three months after chemotherapy or radiotherapy to head or neck finishes (six months after total body irradiation [23,24]).</strong></td>
<td>• In a patient who has received chemotherapy or total body irradiation: ▪ Treatment must wait until neutrophils are more than 1 x 10⁹/L [25]. ▪ If neutrophil count is more than 2 x 10⁹/L, treat as normal [5].</td>
</tr>
<tr>
<td>• In a patient who has received chemotherapy or total body irradiation: ▪ Confirm platelet count is more than 100 x 10⁹/L – if not, refer to specialist dental care or delay treatment. ▪ Confirm all coagulation results (other than platelet count) are normal [5]. ▪ Provide dental treatment but be prepared to manage bleeding using local measures [25].</td>
<td>• If the patient has mucositis, avoid dental treatment if possible as there is a risk of systemic infection [5].</td>
</tr>
<tr>
<td>• Treat as normal (unless there is a risk of osteonecrosis – see above).</td>
<td>• Do not give antimicrobial prophylaxis, unless there is another indication for prophylaxis [8]. There is no clear evidence that immunosuppressed patients are at risk of infections as a result of dental procedures [13].</td>
</tr>
<tr>
<td><strong>Patient:</strong></td>
<td>• Confirm patients with blood cancer are in remission [22].</td>
</tr>
<tr>
<td>• is receiving radiotherapy to areas other than head or neck, or</td>
<td>• Be prepared to manage increased risks of bleeding and infection with current cancer treatments, although these should be minimal. Ask the patient about their general wellbeing, and if they bruise or bleed easily.</td>
</tr>
<tr>
<td>• is taking medicines to treat cancer other than chemotherapy, or</td>
<td>• Consider possibility of oral adverse effects and drug interactions.</td>
</tr>
<tr>
<td>• received chemotherapy or radiotherapy to head or neck more than three months ago, or</td>
<td>• Do not give antimicrobial prophylaxis. The British Society of Antimicrobial Chemotherapy and National Institute for Health and Care Excellence advise that the magnitude and frequency of bacteraemias resulting from normal oral function (e.g. chewing, toothbrushing) is greater than that from dental procedures [13].</td>
</tr>
<tr>
<td>• received total body irradiation more than six months ago.</td>
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Q&A 70.1 How should adults with cancer be managed by general dental practitioners if they need dental treatment? March 2016

Available at www.sps.nhs.uk
### Appendix 2. Patient having a non-invasive dental procedure

**Non-invasive dental procedures** include oral hygiene advice, simple dressing, atraumatic restorative treatment, constructing dentures, placing crowns, local anaesthetic injection, basic periodontal examination, root canal work, and scale and polish above the gum-line [1].

<table>
<thead>
<tr>
<th>Patient:</th>
<th>Contact the patient’s oncology or haematology team [22] to confirm arrangements for dental care.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- is currently receiving chemotherapy or radiotherapy to head or neck, or</td>
<td>- Treat all patients as normal, including if the patient has received radiotherapy to the head or neck, except <strong>non-essential work should be avoided for six months after total body irradiation</strong> [23,24].</td>
</tr>
<tr>
<td>- received chemotherapy or radiotherapy to head or neck in the last three months, or</td>
<td>- Consider and be prepared to manage increased risks of bleeding and infection with current cancer treatments and radiotherapy, although these should be minimal with non-invasive procedures.</td>
</tr>
<tr>
<td>- received total body irradiation in the last six months.</td>
<td>- Ask the patient about their general wellbeing, and if they bruise or bleed easily.</td>
</tr>
<tr>
<td>Patient:</td>
<td>- Ask if the patient has received intravenous bisphosphonates or denosumab. Be aware of the increased risk of osteonecrosis in patients who have received intravenous bisphosphonates, denosumab or radiotherapy to the head, neck or total body.</td>
</tr>
<tr>
<td>- is receiving radiotherapy to areas other than head or neck, or</td>
<td>- Consider the possibility of oral adverse effects and drug interactions.</td>
</tr>
<tr>
<td>- is taking medicines to treat cancer other than chemotherapy, or</td>
<td>- received chemotherapy or radiotherapy to head or neck more than three months ago, or</td>
</tr>
<tr>
<td>- received chemotherapy or radiotherapy to head or neck more than three months ago, or</td>
<td>- received total body irradiation more than six months ago.</td>
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</tbody>
</table>

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## Appendix 3. Patient with a dental infection

- It is important to maintain good dental care and treat dental infections aggressively [13].
- Recognising and managing dento-alveolar infections early are critically important, because immunosuppressed patients can become systemically ill within a short time. If untreated, local infections can spread, giving rise to serious life-threatening sequelae [13].

<table>
<thead>
<tr>
<th>Patient:</th>
<th>All suspected infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>is currently receiving chemotherapy, or received chemotherapy in the last three months, or received total body irradiation in the last six months.</td>
<td>Always contact the patient’s oncology or haematology team for advice.</td>
</tr>
<tr>
<td></td>
<td>If the patient is unwell, suspect neutropenic sepsis [26]. This can be life-threatening – urgently contact the oncology or haematology team and specialist dental care.</td>
</tr>
<tr>
<td></td>
<td>Early symptoms of sepsis include fever (temperature higher than 38°C) or a low body temperature (less than 36°C), chills, shivering, a fast heartbeat and fast breathing. Symptoms of more severe sepsis include feeling dizzy or faint, confused or disoriented, diarrhoea, nausea, vomiting, slurred speech, severe muscle pain, severe breathlessness, producing less urine than normal (e.g. not urinating for a day), and cold, clammy, pale or mottled skin [27].</td>
</tr>
<tr>
<td></td>
<td>Obtain blood test results taken within the last 48 hours and check with the patient’s oncology or haematology team whether treatment in primary care is suitable or if special precautions are needed. If neutropenic sepsis can be confidently ruled out, manage as below, taking into account advice from the oncology or haematology team.</td>
</tr>
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</table>

### Dental abscess

Treat patients with cancer the same as those who do not have cancer, but be extremely vigilant about follow-up and monitoring for deterioration. Confirm patients with blood cancer are in remission.

**First [13]:**

- check for fever, malaise, fatigue, dizziness or other debility,
- measure pulse and temperature (normal axillary temperature 36.3°C to 37°C),
- define nature, location and extent of the swelling,
- identify cause of the infection.

The dentist should then decide whether they can provide treatment in primary care or the patient needs to be referred to specialist dental care; for example, if there is/are [13]:

- signs of sepsicaemia, e.g. grossly elevated temperature (i.e. above 39.5°C), lethargy, tachycardia,
- spreading cellulitis,
- swellings that may compromise the airway, or cause difficulty swallowing or closing the eye,
- dehydration,
- significant trismus associated with a dental infection,
- failure to respond to previous treatment,
- an uncooperative patient.

Treat with local measures first [13,28]:

-...
if pus is present in a dental abscess, drain by extracting the tooth (unless the patient has received radiotherapy to head or neck, or total body irradiation) or through the root canals,
if pus is present in any soft tissue, attempt to drain by incision.

Prescribe a first-line antibiotic (amoxicillin 500mg three times daily for five days, or metronidazole 200mg three times daily for five days for penicillin-allergic patients) if [13,28]:
- the patient is immunosuppressed [14] (more likely if neutrophil count <1 x 10^9/L [12]),
- local measures prove ineffective [28],
- there is cellulitis, spreading infection (to face or neck [14]) or systemic involvement (fever or lethargy) [13,28],
- definitive treatment has to be delayed due to referral to specialist services (e.g. inability to establish drainage in an uncooperative patient who requires sedation or general anaesthesia for treatment, or the patient needs to be treated in hospital due to comorbidities) [13].

When prescribing antibiotics [13]:
- ensure fluid balance is maintained,
- follow-up the patient two to three days after draining and removing the cause of infection (sooner if necessary),
- if the infection resolves and temperature is normal, stop antibiotics,
- failure of the infection to resolve is usually caused by inadequate drainage, poor host resistance, poor patient compliance or the wrong diagnosis. Re-establish drainage or refer for specialist advice.

Necrotising gingivitis or periodontitis
- These conditions are more common in immunosuppressed patients than those with normal immune function [14].
- Prescribe metronidazole 200mg three times daily for three days [13,14,28].
- Scale teeth as effectively as symptoms allow – local anaesthesia may be required [13,14]. Refer also to the Advice algorithm if scaling is required below the gum-line (in Appendix 1).
- Prescribe chemical plaque control (hydrogen peroxide and 0.2% chlorhexidine mouthwashes) [14].

Fungal dental infections
- Refer an immunosuppressed patient to their oncology or haematology team, or their general medical practitioner [14,28]. Fungal infections in immunosuppressed patients are likely to need intravenous antifungals [28].
- If the patient is not immunosuppressed, treat as normal. If antifungal drug treatment is required, prescribe fluconazole 50mg once daily for seven days, or miconazole oromucosal gel four times daily, continuing for seven days after lesions have healed. If these are contraindicated (for example, because of interactions with warfarin or statins), prescribe nystatin oral suspension 1mL four times daily, continuing for 48 hours after lesions have healed [28].
- Prescribe a patient with dentures antifungal drug treatment for at least two weeks [5].

Viral dental infections
**Herpes simplex**

Treat with local measures first [28]:
- Advise the patient to avoid dehydration and alter their diet (include soft food and adequate fluids).
- Give analgesics regularly to minimise oral discomfort, e.g. benzydamine hydrochloride mouthwash or oromucosal spray.
- Prescribe an antimicrobial mouthwash (chlorhexidine 0.2% 10mL twice daily, or hydrogen peroxide 6% 15mL diluted in half a tumbler of warm water three times daily) [28].

In addition, prescribe an antiviral agent if:
- the patient is immunosuppressed – use oral aciclovir 400mg five times daily for five days [8].
- the patient is not immunosuppressed but the infection is severe – use oral aciclovir 200mg five times daily for five days; the dose may be doubled if necessary [28].
- the patient is not immunosuppressed and the infection is not severe – use aciclovir 5% cream five times daily for five days [28].

Refer an immunosuppressed patient with severe herpes simplex infection to hospital [28].

**Herpes zoster (shingles)**

- Treat herpes zoster infection with oral aciclovir 800mg five times daily for seven days [28].
- Refer all patients with herpes zoster to their oncology or haematology team, or their general medical practitioner [28].
### Appendix 4. General advice for all cancer patients after cancer treatment finishes

<table>
<thead>
<tr>
<th>All patients with cancer.</th>
<th>Dentures may need to be reconstructed if treatment altered oral tissues. Some people struggle to tolerate dentures because of friable tissues and dry mouth [3].</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Malignancy</strong> may recur in patients with oral and head or neck cancers. Dentists should thoroughly examine all oral mucosal tissues at every recall appointment [3]. Confirm patients with blood cancer are in remission before treating.</td>
</tr>
<tr>
<td></td>
<td><strong>Mucositis</strong> treatments (e.g. Caphosol, MuGard) are usually started by specialists. If mucositis is a problem, contact specialist dental care for advice. Mucosal protectants cannot be prescribed on an NHS dental prescription [8].</td>
</tr>
<tr>
<td></td>
<td><strong>Oral hygiene</strong> and good nutrition are important for patients with salivary gland dysfunction [3]. Consider lifelong use of high-strength fluoride toothpaste daily, or fluoride varnish application, in affected patients [3,5].</td>
</tr>
<tr>
<td></td>
<td><strong>Orthodontic treatment</strong> should not be given until 12 months after cancer treatment finishes [5].</td>
</tr>
</tbody>
</table>
|                          | **Osteonecrosis**  
|                          | - Ask if the patient has received a bisphosphonate or denosumab; be aware the patient may not know they have received a bisphosphonate. Patients will be at increased risk of osteonecrosis even after treatment has stopped [29].  
|                          | - Avoid extractions, oral surgery or procedures that may impact on bone (i.e. dento-alveolar, periodontal, periapical, deep root planing, complex restorations, implants). If procedures that may impact on bone are thought to be necessary, contact specialist dental care about whether to treat in primary care or refer, and provide full written details of the patient’s medical and dental history [29]. |
|                          | **Xerostomia** can be managed with saliva substitutes. Selected substitutes can be prescribed on an NHS dental prescription – see Medicines Q&A. |

| Patients who have received chemotherapy. | Once all complications of chemotherapy have resolved, patients may be able to resume their normal dental care schedule [3].  
|                                          | However, if immune function continues to be compromised, check the patient's blood test results before starting an invasive dental procedure and contact the oncology or haematology team (or general medical practitioner) for advice. This is particularly important to remember for patients who have had a stem cell/bone marrow transplant, who may be at an increased risk of infection for up to a year [3]. |

| Patients who have received radiotherapy to head or neck, or total body irradiation. | Keep in mind that oral complications can continue or emerge long after radiotherapy has ended. Patients who have received total body irradiation may be at an increased risk of infection for up to a year [3].  
|                                                                                   | High doses of radiation, total body irradiation and radiotherapy to head or neck carry a lifelong risk of dry mouth, dental caries and osteonecrosis [3,5,16,30].  
|                                                                                   | Dental implants placed in irradiated bone can have a significantly lower survival rate and decisions about implant placement need to be based on a risk-benefit analysis for each patient [31].  
|                                                                                   | Because of the risk of osteonecrosis, which can occur in all areas of the jaws [30], patients should avoid invasive surgical procedures, including extractions that involve irradiated bone [3]. If an invasive procedure is required, patients should be referred to a specialist [16], who may consider using antibiotics and hyperbaric oxygen therapy before and after surgery [3]. |
### Appendix 5. Information needed to help make decisions about dental treatment

<table>
<thead>
<tr>
<th>Information needed</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>About the patient and their cancer</strong></td>
<td></td>
</tr>
<tr>
<td>What cancer does the patient have?</td>
<td>Ask for exact diagnosis.</td>
</tr>
<tr>
<td>When was the cancer diagnosed?</td>
<td></td>
</tr>
<tr>
<td>How is their general health?</td>
<td>Assess the patient’s ability to tolerate dental treatment. Patients with cancer may have impaired liver function due to metastases, which can affect bleeding risk and ability to metabolise medicines.</td>
</tr>
<tr>
<td>Does the patient have contact details for their keyworker (clinical nurse specialist, oncologist or haematologist)?</td>
<td>You may need to contact the patient’s keyworker to get more information or advice.</td>
</tr>
<tr>
<td><strong>About the treatment</strong></td>
<td></td>
</tr>
<tr>
<td>Has treatment started and when?</td>
<td></td>
</tr>
<tr>
<td>What is the treatment regimen?</td>
<td>Ask about chemotherapy, radiotherapy, other cancer drugs such as hormonal therapies, and additional treatments including IV bisphosphonates and denosumab. The patient may be unsure, so contact their keyworker.</td>
</tr>
<tr>
<td>Is the treatment part of a clinical trial? At which hospital?</td>
<td>You will also need to contact the primary investigator or research nurse. Clinical trials often have strict criteria about concomitant use of drugs and required monitoring.</td>
</tr>
<tr>
<td>What adverse effects do they currently have from their cancer treatment?</td>
<td>Specifically ask about oral adverse effects.</td>
</tr>
<tr>
<td>When did the treatment finish? Or when is the treatment due to finish?</td>
<td>Consider that the patient may be receiving cycles of chemotherapy, with a gap of days or weeks between doses.</td>
</tr>
<tr>
<td>How often does the patient have their blood taken?</td>
<td>Monitoring will be more frequent if adverse effects are likely.</td>
</tr>
</tbody>
</table>
| What are the patient’s blood test results? | Establish the patient’s blood test results, taken within the last 48 hours, especially neutrophils and platelet count, if they are:  
  • currently receiving chemotherapy or radiotherapy, or  
  • received it in the last three months, or  
  • received total body irradiation in the last six months. Remember to also check other clotting results and kidney/liver function, if available. |
### Appendix 6. List of cancer drug treatments

<table>
<thead>
<tr>
<th><strong>Cytotoxic drugs</strong> – treatments that kill cells [8]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkylating drugs</strong></td>
<td>Bendamustine, busulfan, carmustine, chlorambucil, cyclophosphamide, estramustine, ifosfamide, lomustine, melphalan, thiopeta, treosulfan</td>
</tr>
<tr>
<td>** Anthracyclines &amp; other cytotoxic antibiotics**</td>
<td>Bleomycin, dactinomycin, daunorubicin, doxorubicin, epirubicin, idarubicin, mitomycin, mitoxantrone, plexantrone</td>
</tr>
<tr>
<td><strong>Antimetabolites</strong></td>
<td>Azacitidine, capecitabine, cladribine, clofarabine, cytarabine,decitabine, fludarabine, fluorouracil, gemcitabine, mercaptopurine, methotrexate, nelarabine, pemetrexed, raltitrexed, tegafur with gimeracil and oteracil, tioguanine</td>
</tr>
<tr>
<td><strong>Platinum compounds</strong></td>
<td>Carboplatin, cisplatin, oxaliplatin</td>
</tr>
<tr>
<td><strong>Taxanes</strong></td>
<td>Cabazitaxel, docetaxel, paclitaxel</td>
</tr>
<tr>
<td><strong>Topoisomerase I inhibitors</strong></td>
<td>Irinotecan, topotecan</td>
</tr>
<tr>
<td><strong>Vinca alkaloids &amp; etoposide</strong></td>
<td>Etoposide, vinblastine, vincristine, vindesine, vinflunine, vinorelbine</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Arsenic, bexarotene, crisantaspase, dacarbazine, eribulin, hydroxy carbamide, mitotane, pentostatin, porfimer, procarbazine, temoporfin, temozolamide, trabectedin, tretinoin</td>
</tr>
</tbody>
</table>

### Immunomodulators – medicines affecting immune response [8]

| **Immunosuppressants** | Antithymocyte immunoglobulin ATG (rabbit), azathioprine, basiliximab, belatacept, ciclosporin, mycophenolate, sirolimus, tacrolimus |
| **Other immunomodulators** | Aldesleukin, interferon, lenalidomide, milafamuridine, pomalidomide, thalidomide |

### Biological therapies – treatments that act on processes in cells [9,32,33]

| **Blood cell growth factors** | Filgrastim, lenograstim, pegfilgrastim |
| **Cancer vaccines** | BCG |
| **Hedgehog pathway inhibitor** | Sonidegib, vismodegib |
| **Histone deacetylase inhibitors** | Belinostat, entinostat, panobinostat, vorinostat |
| **Monoclonal antibodies** | Alemtuzumab, atezolizumab, bevacizumab, brentuximab, catumaxomab, cetuximab, durvalumab, ipilimumab, nivolumab, obinutuzumab, ofatumumab, panitumumab, pembrolizumab, pertuzumab, rituximab, trastuzumab |
| **Proteasome inhibitor** | Bortezomib, carfilzomib, ixazomib |
| **Protein kinase inhibitors** | Afatinib, alectinib, axitinib, bosutinib, cabozantinib, cediranib, ceritinib, cobimetinib, crizotinib, dabrafenib, dasatinib, erlotinib, everolimus, gefitinib, ibrutinib, idelalisib, imatinib, lapatinib, nilotinib, nintedanib, osimertinib, pazopanib, ponatinib, regorafenib, rociletinib, ruxolitinib, sorafenib, sunitinib, temsirolimus, trametinib, vandetanib, vemurafenib |

### Hormonal therapies [8]

| **Androgens** | Testosterone |
| **Hormone antagonists** | Breast cancer |
| **Antiestrogens** | Anastrozole, exemestane, fulvestrant, letrozole, tamoxifen, toremifene |
| **Gonadorelin analogues and gonadotrophin-releasing hormone antagonists** | Abiraterone, bicalutamide, busserelin, cyproterone, degarelix, enzalutamide, flutamide, goserelin, leuprolrelin, triptorelin |
| **Somatostatin analogues** | Lanreotide, octreotide, pasireotide |
| **Oestrogens** | Diethylstilbestrol, ethinylestradiol |
| **Progestogens** | Medroxyprogesterone, megestrol, norethisterone |

### Bisphosphonates [8]

| **Oral** | Alendronic acid, clodronate, etidronate, ibandronic acid, risedronate |
| **Intravenous** | Ibandronic acid, pamidronate, zoledronic acid |

### Other bone metabolism therapies [8]

| **Monoclonal antibody** | Denosumab |