

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

Prepared by a UK Medicines Information (UKMi) team for NHS healthcare professionals  
Before using this Q&A, read the disclaimer at <https://www.sps.nhs.uk/articles/about-ukmi-medicines-qas/>  
Date prepared: November 2019

### Summary

#### This advice relates primarily to general dental practitioners

Dentists working in community or hospital dental services may 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.

#### 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 six months, or had a stem cell/bone marrow transplant in the last six months – if suspected, call 999 and urgently contact the patient's oncology or haematology team and secondary dental care.
- For a patient who is currently receiving chemotherapy, or received chemotherapy in the previous six months, or had a stem cell/bone marrow transplant 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

Ideally, the patient's oncology or haematology team is responsible for arranging or carrying out all active dental treatment while the patient is currently receiving cancer treatment, so always liaise with them before starting a dental procedure during this time.

- 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 six months, or had a stem cell/bone marrow transplant in the previous six months, **ONLY** after 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 secondary 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 six months, or had a stem cell/bone marrow transplant 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 a stem cell/bone marrow transplant. If the patient is currently receiving chemotherapy or radiotherapy to head or neck (or received it in the last six months) or had a stem cell/bone marrow transplant in the last six months, contact the patient's oncology or haematology team before proceeding.

*Summary continued on page 2*

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

Confirm with patients who have received chemotherapy that their blood tests are normal prior to providing invasive dental treatment. If patients are not sure, consult their oncology or haematology team. Also confirm patients with blood cancer are in remission/blood tests are normal. The dentist should be aware of the possibility of oral adverse effects from cancer treatment, including risk of non-healing.

### **Osteoradionecrosis risk**

- High doses of radiation to the head or neck carry a lifelong risk of osteoradionecrosis. In a patient who has received radiotherapy to head or neck, refer to secondary dental care if oral or periodontal surgery is needed or dental infections do not respond to treatment. Do not extract teeth involving irradiated bone due to risk of osteonecrosis.

### **Medication-related osteonecrosis of the jaw risk**

- Patients who are receiving or have received bisphosphonates will be at higher risk of medication-related osteonecrosis of the jaw (in some cases lifelong). Patients who have received denosumab in the last nine months will be at higher risk of medication-related osteonecrosis of the jaw. Patients currently receiving anti-angiogenic biological therapies (e.g. bevacizumab, sorafenib or sunitinib) will also be at higher risk.
- Assess whether the patient is at low or higher risk of osteonecrosis of the jaw – see [SDCEP Risk Assessment Flowchart](#):
  - Patients being treated with a bisphosphonate, denosumab or an anti-angiogenic drug (e.g. bevacizumab, sorafenib or sunitinib) as part of the management of cancer are always considered to be at higher risk.
  - Patients taking bisphosphonates for osteoporosis or other non-malignant bone diseases for less than five years and not also concurrently being treated with systemic glucocorticoids are at low risk of osteonecrosis. If they are also on a systemic glucocorticoid or have taken a bisphosphonate for more than five years, they are at higher risk of osteonecrosis.
  - Patients who have taken a bisphosphonate at any time in the past and those who have taken denosumab in the last nine months should be allocated to a risk group as if they are still taking the drugs.
- For patients at higher risk of osteonecrosis of the jaw in whom an extraction is indicated, explore all possible alternatives where teeth could potentially be retained, e.g. retaining roots in the absence of infection. Consider seeking advice from secondary dental care.
- If an extraction or any procedure that impacts on bone is required, discuss the risks and benefits of treatment with the patient to ensure valid consent before proceeding.
- Do not prescribe antibiotics or antiseptic prophylaxis unless required for other clinical reasons.
- Refer to secondary dental care if the socket has not healed at eight weeks.

## **Background**

Patients who have had cancer or are living 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.

## Answer

### The advice in this Medicines Q&A relates primarily to general dental practitioners

Dentists working in community or hospital dental services may 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.

### Advice on providing dental treatment

For advice on providing dental treatment, click on the links below:

Appendix 1 <i>including algorithm</i>	<a href="#">Patient having an <b>invasive*</b> dental procedure</a>  * An <b>invasive dental procedure</b> 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].
Appendix 2	<a href="#">Patient having a <b>non-invasive dental procedure</b></a>
Appendix 3	<a href="#">Patient with a <b>dental infection</b></a>
Appendix 4	<a href="#">All cancer patients after cancer treatment finishes (general advice)</a>

### Information to help when providing dental treatment

For information that can help when making decisions about dental treatment, click on the links below:

Appendix 5	<a href="#">Information needed to help make decisions about dental treatment in a patient with cancer</a>
Appendix 6	<a href="#">List of cancer and other drug treatments</a>  Includes cytotoxics (chemotherapy), biological therapies such as targeted therapies and immunotherapies, hormonal therapies, and bisphosphonates.

### Adverse effects of cancer therapies

Nearly all cytotoxic drugs impair bone marrow function to some degree, suppressing formation of white blood cells, red blood cells and platelets (myelosuppression) [2,3]. Some biological therapies 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 chemotherapy depend on the drugs used, dosage, length of treatment course, degree of dental disease and concurrent use of radiation [5].

Dentists need to consider the possibility of increased risks of bleeding and infection, and oral complications in patients who have received or are receiving treatment for cancer. Risks change depending on which treatment the patient received, and when they received it. Ideally, the oncology or haematology team is responsible for arranging or carrying out active dental treatment in patients undergoing treatment for cancer [6]. Patients currently receiving chemotherapy or radiotherapy to head or neck, and those who received therapy within the last six months, and those who have had a stem cell/bone marrow transplant (usually involving high-dose chemotherapy with or without 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 secondary dental care, wherever possible, if they need urgent treatment. Patients taking biological therapies or hormonal treatments can receive treatment from their general dental practitioner.

## Bleeding

- Thrombocytopenia (platelet count less than  $150 \times 10^9/L$  [7]) is fairly common in patients receiving most cytotoxic drugs; anaemia is less common [8].
- Onset, duration and severity of thrombocytopenia vary considerably with different cytotoxic drugs [8].
- Thrombocytopenia commonly occurs seven to ten days after cytotoxic drug administration, but is delayed for certain drugs, such as carmustine, lomustine, and melphalan [2]. With most drugs, platelet count recovers within 14 to 26 days [9].
- Total body irradiation before a stem cell/bone marrow transplant and some biological therapies (e.g. intravenous aflibercept, bevacizumab, ibrutinib and trastuzumab emtansine) can also cause thrombocytopenia, as can marrow infiltration by malignancy (e.g. leukaemia, lymphoma, myeloma or metastases) [2,7,10].
- The main effect of a reduced platelet count is an increased risk of bleeding, but this rarely occurs until it is less than  $100 \times 10^9/L$  [11].

## Infection

- All cytotoxic drugs except vincristine and bleomycin cause bone marrow suppression [2]. It commonly occurs seven to ten days after administration, but is delayed for some drugs (e.g. carmustine, lomustine, and melphalan) [2]. With most drugs, white cell count recovers within 14 to 26 days [9].
- Radiotherapy sometimes causes white cell count to fall. It is more likely when large areas of the body or bones of the legs, chest, abdomen or pelvis are treated [10].
- High-dose dexamethasone (20-40mg daily), used to treat multiple myeloma, commonly causes bone marrow suppression, especially when used in combination with other cancer drugs [12].
- Risk of infection is assessed by measuring white cell count, particularly neutrophil count. The normal range for neutrophils is  $2.5$  to  $7.5 \times 10^9/L$  [13]. As the neutrophil count falls, especially once neutrophils are less than  $1 \times 10^9/L$ , a patient becomes at risk of serious infections [13].
- In immunosuppressed patients, infections can be life-threatening [14] and they may deteriorate more rapidly than someone with normal immune function [15].
- 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 [14].
- In patients who have had a stem cell/bone marrow transplant, the increased risk of infection may last for up to a year as the patient's immune system will be very immature even though blood test results may be normal [3,16].
- Reactivation of herpes simplex virus commonly occurs in a patient who is immunosuppressed [17].

## Oral complications

- Oral complications may be caused directly by cancer or by cancer treatment [6].
- 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 [3,19]. They are more likely to occur, and are usually more severe, if chemotherapy and radiotherapy to the head and neck are both given [18,19].
- 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 [19].
- 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, bone marrow/stem cell transplant, and radiotherapy to head or neck) [3].
- Some complications occur only during treatment; others, such as dry mouth (xerostomia) and osteoradionecrosis after radiotherapy for head and neck cancer, may persist for years [3] or develop months or years later [18]. Most people find that oral adverse effects of radiotherapy have noticeably improved six to eight weeks after therapy has ended [18].
- Some biological therapies cause oral side effects – targeted therapies such as everolimus can cause oral aphthous ulcers, and some types of immunotherapy can cause mucositis and salivary gland changes [20].

Oral complications common to both chemotherapy and radiotherapy to head or neck 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 stem cell/bone marrow transplant), and usually gradually clears up three to four weeks after drug treatment ends (six to eight weeks after radiotherapy ends) [6,18,21]. Oral mucositis occurs in at least 45-50% of patients receiving chemotherapy or biological therapy to treat a solid tumour, and over 95% having a stem cell transplant, or radiotherapy to head or neck [22].
- **Xerostomia** (dry mouth due to altered, 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 [21]) can also cause salivary gland dysfunction. It usually resolves two months after chemotherapy ends but can be permanent after radiotherapy and stem cell/bone marrow transplant [6,18]. 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 [3,18,21].
- **Poor nutrition** from eating difficulties caused by mucositis, dry mouth, dysphagia and loss of taste [3]. This can often lead to patient's being reliant on dietary supplements, such as *Build-up* drinks, which are highly cariogenic.
- **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 very painful (causative drugs include bleomycin, cisplatin, fluorouracil, methotrexate) [23,24].

Other complications of radiotherapy to head or neck 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].
- **Osteoradionecrosis** (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 or hospital dental services may 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 six-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. [UK]
  - The Faculty of General Dental Practice (UK) states that it is best to delay routine dental care until the patient is in the stable post-transplant phase, usually six months after surgery [14]. [UK]
  - Christie NHS Foundation Trust patient information booklet states that non-essential dental work should be avoided for approximately six months following autologous stem cell transplant, and the period of highest risk of infection is the first six months after treatment [25]. [UK]
  - The Memorial Sloan Kettering (MSK) Cancer Center advises that if patients who have had an autologous stem cell transplant need extensive dental work, they should ask their local dentist to call a dentist at MSK before treating them. The patient's transplant doctor will tell you when it's safe to resume all dental care with your dentist [16]. [US]
  - The National Institute of Dental and Craniofacial Research advises that, except for emergency dental care, patients who receive organ or stem cell transplants should avoid dental treatment for at least three months [26]. Once the graft has stabilised (which typically occurs within three to six months of the transplant procedure), and the medical team clears the patient for dental treatment, patients can be treated in the dental office with proper precautions. [US]

## References

1. Scottish Dental Clinical Effectiveness Programme. Management of dental patients taking anticoagulants or antiplatelet drugs [Internet]. 08/2015 [cited 01/11/19]. Available from: [www.sdcep.org.uk/wp-content/uploads/2015/09/SDCEP-Anticoagulants-Guidance.pdf](http://www.sdcep.org.uk/wp-content/uploads/2015/09/SDCEP-Anticoagulants-Guidance.pdf)
2. Baxter K (ed). Joint Formulary Committee. British National Formulary [Internet]. London: BMJ Group and Pharmaceutical Press. Last updated 10/12/2019 [cited 10/12/2019]. Available from: [www.medicinescomplete.com](http://www.medicinescomplete.com)
3. National Institute of Dental and Craniofacial Research. Dental team. Oral complications of cancer treatment: What the dental team can do [Internet]. 09/2009 [cited 01/11/2019]. Available from: [www.nidcr.nih.gov/sites/default/files/2017-09/oral-complications-cancer-dental-team.pdf](http://www.nidcr.nih.gov/sites/default/files/2017-09/oral-complications-cancer-dental-team.pdf)
4. Cancer Research UK. Your blood, bone marrow and cancer drugs [Internet]. Last reviewed 07/09/2017 [cited 01/11/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/cancer-drugs/side-effects/your-blood-and-bone-marrow](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/cancer-drugs/side-effects/your-blood-and-bone-marrow)
5. National Institute of Dental and Craniofacial Research. Dental provider's oncology pocket guide. Prevention and management of oral complications [Internet]. 09/2009 [cited 01/11/2019]. Available from: [www.nidcr.nih.gov/sites/default/files/2017-09/oncology-guide-dental-provider\\_0.pdf](http://www.nidcr.nih.gov/sites/default/files/2017-09/oncology-guide-dental-provider_0.pdf)
6. Royal College of Surgeons of England/The British Society for Disability and Oral Health. The oral management of oncology patients requiring radiotherapy, chemotherapy and/or bone marrow transplantation. Clinical Guidelines [Internet]. 2018 [cited 01/11/19]. Available from: [www.rcseng.ac.uk/-/media/files/rcs/fds/publications/rcs-oncology-guideline-update--v36.pdf](http://www.rcseng.ac.uk/-/media/files/rcs/fds/publications/rcs-oncology-guideline-update--v36.pdf)
7. Tidy C. Thrombocytopenia and platelet function disorders [Internet]. Last updated 14/01/2015 [cited 10/12/2019]. Available from: <http://patient.info/doctor/thrombocytopenia-and-platelet-function-disorders>

8. Buckingham R (ed). Martindale: The Complete Drug Reference [Internet]. London: Pharmaceutical Press. Last updated 10/12/2019 [cited 13/11/2019]. Available from: [www.medicinescomplete.com](http://www.medicinescomplete.com)
9. Alldredge BK, Corelli RL, Ernst ME et al., (eds). Koda-Kimble and Young's Applied Therapeutics. The clinical use of drugs. Tenth edition. Philadelphia: Wolters Kluwer Health/Lippincott, Williams and Wilkins; 2013, page 2111.
10. Cancer Research UK. Radiotherapy effects on your blood [Internet]. Last reviewed 29/01/2019 [cited 01/11/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/radiotherapy/side-effects/general-radiotherapy/blood](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/radiotherapy/side-effects/general-radiotherapy/blood)
11. Netdoctor. Thrombocytopenia (reduced platelet count) [Internet]. Last updated 04/11/2012 [cited 10/12/2019]. Available from: [www.netdoctor.co.uk/conditions/heart-and-blood/a1177/thrombocytopenia-reduced-platelet-count/](http://www.netdoctor.co.uk/conditions/heart-and-blood/a1177/thrombocytopenia-reduced-platelet-count/)
12. Aspire Pharma Ltd. Neofordex 40mg tablets – Summary of product characteristics. Last revised 16/03/16 [cited 20/01/20]. Available from: [www.medicines.org.uk](http://www.medicines.org.uk)
13. Tidy C. Neutropenic patients and neutropenic regimes [Internet]. Last updated 03/05/2016 [cited 12/12/2019]. Available from: <http://patient.info/doctor/neutropenic-patients-and-neutropenic-regimes>
14. Faculty of General Dental Practitioners. Antimicrobial prescribing for general dental practitioners. Second edition. London: Faculty of General Dental Practice (UK) and The Royal College of Surgeons of England; 2012, multiple pages. Updated 06/2016 [Internet] [cited 13/12/19]. Updates available from: [www.fgdp.org.uk/guidance-standards/antimicrobial-prescribing-gdps](http://www.fgdp.org.uk/guidance-standards/antimicrobial-prescribing-gdps)
15. Scottish Dental Clinical Effectiveness Programme. Management of acute dental problems [Internet]. First edition, 03/2013 [cited 01/11/19]. Available from: [www.sdcep.org.uk/published-guidance/management-of-acute-dental-problems-madp/](http://www.sdcep.org.uk/published-guidance/management-of-acute-dental-problems-madp/)
16. Memorial Sloan Kettering Cancer Center. Returning Home After Your Autologous Stem Cell Transplant [Internet]. 22/07/2019 [cited 05/12/2019]. Available from: [www.mskcc.org/pdf/cancer-care/patient-education/returning-home-after-your-autologous-stem-cell-transplant](http://www.mskcc.org/pdf/cancer-care/patient-education/returning-home-after-your-autologous-stem-cell-transplant)
17. American Dental Association. ADA Guide to dental therapeutics. Second edition. Chicago: ADA Publishing; 2000, pages 483-9.
18. MacMillan Cancer Support. Possible side effects of radiotherapy [Internet]. Last reviewed 31/07/2018 [cited 20/01/2020]. Available from: <https://www.macmillan.org.uk/information-and-support/head-and-neck-cancers/treating/radiotherapy/radiotherapy-explained/possible-side-effects.html#300080>
19. Sonis ST, Costa JW Jr. Oral complications of cancer chemotherapy [Internet]. In: Kufe DW, Pollock RE, Weichselbaum RR et al., (eds). Holland-Frei Cancer Medicine. 6th edition. Hamilton (ON): BC Decker. 2003 [cited 11/11/2019]. Available from: [www.ncbi.nlm.nih.gov/books/NBK13131/](http://www.ncbi.nlm.nih.gov/books/NBK13131/)
20. Cancer.Net. Dental and oral health [Internet]. 06/2019 [cited 05/12/2019]. Available from: [www.cancer.net/coping-with-cancer/physical-emotional-and-social-effects-cancer/managing-physical-side-effects/dental-and-oral-health](http://www.cancer.net/coping-with-cancer/physical-emotional-and-social-effects-cancer/managing-physical-side-effects/dental-and-oral-health)
21. Cancer Research UK. Your mouth and cancer drugs [Internet]. Last reviewed 08/09/2017 [cited 01/11/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/cancer-drugs/side-effects/your-mouth](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/cancer-drugs/side-effects/your-mouth)
22. UK Oral Management in Cancer Care Group. Oral care guidance and support in cancer and palliative care. Third edition, 06/2019 [cited 22/01/2020]. Available from: [www.ukomic.co.uk/documents/UKOMIC-Guidelines-3rd-Edition.pdf](http://www.ukomic.co.uk/documents/UKOMIC-Guidelines-3rd-Edition.pdf)
23. Cancer Research UK. Types and causes of mouth problems [Internet]. Last reviewed 29/08/2019 [cited 01/11/2019]. Available from: [www.cancerresearchuk.org/about-cancer/coping/physically/mouth-problems/types-and-causes](http://www.cancerresearchuk.org/about-cancer/coping/physically/mouth-problems/types-and-causes)
24. Jinbu Y and Demitsu T. Oral ulcerations due to drug medications. Jpn Dent Sci Rev 2014; 50: 40-46.
25. The Christie Patient Information Service. Going home and the future after chemotherapy or an autologous stem cell transplant [Internet]. 06/2015 [cited 05/12/2019]. Available from: [www.christie.nhs.uk/media/2505/legacymedia-4653-763.pdf](http://www.christie.nhs.uk/media/2505/legacymedia-4653-763.pdf)
26. National Institute of Dental and Craniofacial Research. Dental management of the organ or stem cell transplant patient [Internet]. 07/2016 [cited 11/11/2019]. Available from: [www.nidcr.nih.gov/sites/default/files/2017-09/organ-stem-cell-transplant-mouth.pdf](http://www.nidcr.nih.gov/sites/default/files/2017-09/organ-stem-cell-transplant-mouth.pdf)
27. NHS. Health A-Z: Sepsis [Internet]. Last reviewed 18/07/2019 [cited 11/11/2019]. Available from: [www.nhs.uk/conditions/sepsis/](http://www.nhs.uk/conditions/sepsis/)
28. Lockhart PB. Dental care of the medically complex patient. Fifth edition. Edinburgh: Elsevier Limited; 2014, pages 54-63.
29. Rothstein JP. Cancer chemotherapy and oral care. 01/12/2004 [cited 11/11/2019]. Available from: [www.dentistrytoday.com/oral-medicine/377-cancer-chemotherapy-and-oral-care](http://www.dentistrytoday.com/oral-medicine/377-cancer-chemotherapy-and-oral-care)
30. Janssen-Cilag Ltd. Summary of Product Characteristics – Imbruvica 140m mg Film-Coated Tablets. Last revised 5/12/2019 [cited 3/2/2020]. Available from: [www.medicines.org.uk](http://www.medicines.org.uk)

31. Scottish Dental Clinical Effectiveness Programme. Oral Health Management of Patients at Risk of Medication-related Osteonecrosis of the Jaw. First edition, 03/2017 [cited 01/11/2019]. Available from: [www.sdcep.org.uk/published-guidance/medication-related-osteonecrosis-of-the-jaw/](http://www.sdcep.org.uk/published-guidance/medication-related-osteonecrosis-of-the-jaw/)
32. National Institute for Health and Care Excellence. Neutropenic sepsis: prevention and management in people with cancer. Clinical Guideline 151 [Internet]. 19/09/2012 [cited 11/11/2019]. Available from: [www.nice.org.uk/guidance/CG151](http://www.nice.org.uk/guidance/CG151)
33. National Institute for Health and Care Excellence. Sepsis: recognition, diagnosis and early management. Clinical Guideline 51 [Internet]. Last updated 09/2017 [cited 05/12/2019]. Available from: [www.nice.org.uk/guidance/ng51](http://www.nice.org.uk/guidance/ng51)
34. Nutbeam T, Daniels R on behalf of the UK Sepsis Trust. Decision support tool for primary dental care for adults and children and young people 12 years and over [Internet]. Undated [cited 05/12/2019]. Available from: [www.sepsistrust.org/professional-resources/clinical](http://www.sepsistrust.org/professional-resources/clinical)
35. Scottish Dental Clinical Effectiveness Programme. Drug prescribing for dentistry [Internet]. Third edition, 01/2016 [cited 01/11/2019]. Available from: [www.sdcep.org.uk/published-guidance/drug-prescribing/](http://www.sdcep.org.uk/published-guidance/drug-prescribing/)
36. Pfizer Limited. Summary of Product Characteristics – Diflucan 50mg hard capsules. Last revised 03/2019 [cited 23/03/2020]. Available from: [www.medicines.org.uk](http://www.medicines.org.uk)
37. Walsh LJ. Clinical assessment and management of the oral environment in the oncology patient. Aust Dent J 2010; 55 (1 Suppl): 66-77.
38. Petrovic I, Uddin Ahmed Z, Matros E, et al. Endosseous (dental) implants in an oncologic population: a primer for treatment considerations. Quintessence Int 2019; 50(1): 40-48.
39. Eliyas S, Porter R, Briggs P, et al. Effects of radiotherapy to the jaws I: The scale of the problem. Eur J Prosthodont Rest Dent 2013; 21(4): 161-69.
40. Cancer Research UK. What is chemotherapy? [Internet] 15/11/2017 [cited 10/12/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/chemotherapy/what-chemotherapy-is](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/chemotherapy/what-chemotherapy-is)
41. Cancer Research UK. What is immunotherapy? [Internet] 04/11/2017 [cited 10/12/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/immunotherapy/what-is-immunotherapy](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/immunotherapy/what-is-immunotherapy)
42. Cancer Research UK. What are targeted cancer drugs? [Internet] 31/10/2017 [cited 10/12/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/targeted-cancer-drugs](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/targeted-cancer-drugs)
43. Cancer Research UK. Hormone therapy [Internet]. 20/08/2019 [cited 10/12/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/hormone-therapy](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/hormone-therapy)
44. Cancer Research UK. Bisphosphonates and cancer [Internet]. 27/11/2019 [cited 10/12/2019]. Available from: [www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/bisphosphonates/bisphosphonates-cancer](http://www.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/bisphosphonates/bisphosphonates-cancer)
45. Cancer Research UK. Denosumab (Prolia, Xgeva) [Internet]. 05/08/2019 [cited 10/12/2019]. Available from: <https://about-cancer.cancerresearchuk.org/about-cancer/cancer-in-general/treatment/cancer-drugs/drugs/denosumab>

## Quality Assurance

### Prepared by

Joanne McEntee. Senior Medicines Information Pharmacist.  
North West Medicines Information Centre, 70 Pembroke Place, Liverpool, L69 3GF.

### Date Prepared

November to December 2019

### Checked by

Christine Randall (Senior Medicines Information Pharmacist) and Helen Edmondson (Medicines Information Technician). North West Medicines Information Centre.

### Date of check

December 2019 to March 2020

### Contact details

[joanne.mcentee@liverpoolft.nhs.uk](mailto:joanne.mcentee@liverpoolft.nhs.uk)

Available through Specialist Pharmacy Service at  
[www.sps.nhs.uk](http://www.sps.nhs.uk)



### Search strategy (conducted November 2019)

1. Embase via NICE Evidence (exp \*NEOPLASM/ + [exp \*DENTAL PROCEDURE/ or DENTIST/]; Limit to English Language and (Publication Types Review).
2. Medline via NICE Evidence (exp \*NEOPLASMS/ + [exp \*DENTISTRY/ or exp DENTISTS/]; Limit to Document type Review) and (Language English)].
3. Cochrane Library (cancer + [dentist\* or dental]
4. In-house database/ resources
5. Internet Search [www.google.co.uk](http://www.google.co.uk) (dentist cancer patient; dentist guidelines cancer patient; neutropenic sepsis)
6. Scottish Dental Clinical Effectiveness Programme [www.sdcep.org.uk](http://www.sdcep.org.uk)
7. National Institute for Health and Care Excellence [www.nice.org.uk](http://www.nice.org.uk)
8. Faculty of General Dental Practice (UK) [www.fgdp.org.uk](http://www.fgdp.org.uk)
9. British Dental Association [www.bda.org](http://www.bda.org)
10. Cancer Research UK [www.cancerresearchuk.org](http://www.cancerresearchuk.org)
11. Macmillan Cancer Support [www.macmillan.org.uk](http://www.macmillan.org.uk)
12. Christie Hospital NHS Foundation Trust [www.christie.nhs.uk](http://www.christie.nhs.uk)
13. The Clatterbridge Cancer Centre NHS Foundation Trust [www.clatterbridgecc.nhs.uk](http://www.clatterbridgecc.nhs.uk)

### Comments from clinicians (received September 2013)

- Daniel Collins. Lead Pharmacist, Cancer Services. Royal Liverpool and Broadgreen University Hospitals NHS Trust.
- Nicholas Fabbri, General Dental Practitioner, Altmere Dental Practice, London.
- Dr Vicki Jones. Senior Community Dentist. Aneurin Bevan University Health Board.
- Andrew Kwasnicki. 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)**

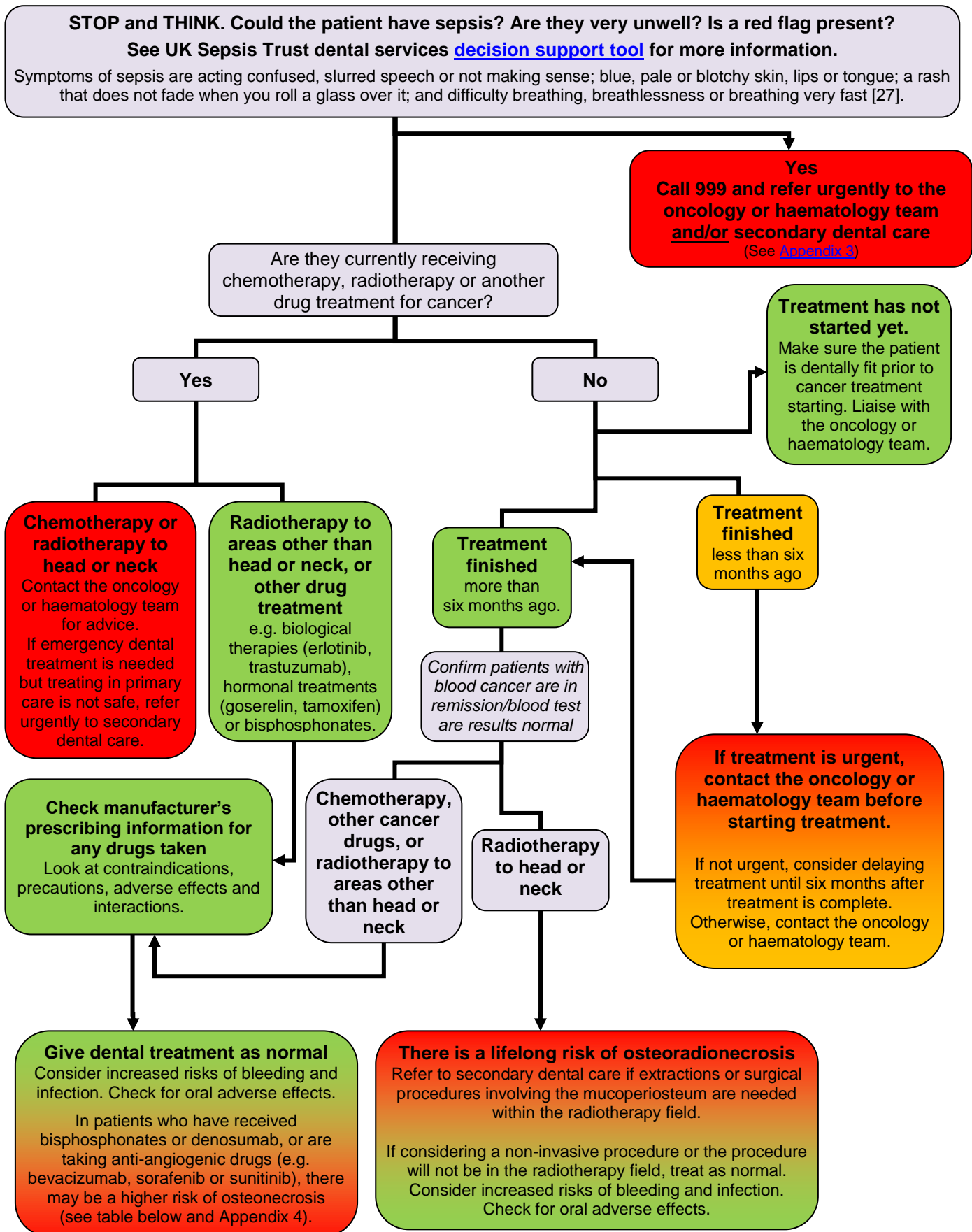
- Daniel Collins. Lead Pharmacist, Cancer Services. Royal Liverpool and Broadgreen University Hospitals NHS Trust.
- Andrew Kwasnicki. Consultant in Special Care Dentistry. Liverpool University Dental Hospital.
- Tara Madhok, General Dental Practitioner, Longfield Lodge Dental Practice, Urmston.
- Sarah 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.

### **Comments from clinicians (received January/February 2020)**

- Andrew Kwasnicki. Consultant in Special Care Dentistry. Liverpool University Dental Hospital.
- Joanne McCaughey. Deputy Chief Pharmacist, The Clatterbridge Cancer Centre NHS Foundation Trust.
- Dr Nikolaus A Palmer, Clinical Advisor in Dental Education and Research Fellow in Primary Care. Health Education North West.
- Dr Jeffrey Smith. Consultant Haematologist. Aintree University Hospital NHS Foundation Trust.

## Appendix 1. Patient having an invasive dental procedure

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



## 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].

Patient:		Managing risk of bleeding	Managing risks of infection and osteonecrosis
<ul style="list-style-type: none"> <li>is currently receiving chemotherapy or radiotherapy to head or neck, or</li> <li>received chemotherapy or radiotherapy to head or neck in the last six months, or</li> <li>had a stem cell/bone marrow transplant in the last six months.</li> </ul>	<p>Contact the patient's oncology or haematology team [6].</p> <p>Before starting an invasive dental procedure, obtain blood test results taken within the last 48 hours [6] and check with the oncology or haematology team whether treatment in primary care is suitable or special precautions are needed.</p>	<b>For a patient needing emergency dental treatment</b>	
		<ul style="list-style-type: none"> <li>Follow the advice of the patient's oncology or haematology team [13]. If no advice is available, urgently refer the patient to secondary dental care.</li> </ul>	
		<b>For a patient needing elective dental treatment</b>	
		<ul style="list-style-type: none"> <li>Consider delaying treatment [6] until six months after chemotherapy or radiotherapy to head or neck finishes, and six months after stem cell/bone marrow transplant.</li> <li>In a patient who has received chemotherapy or total body irradiation:               <ul style="list-style-type: none"> <li>Confirm platelet count is more than <math>100 \times 10^9/L</math> (threshold chosen as spontaneous bleeding rarely occurs above this level [11]) – if not, refer to secondary dental care or delay treatment.</li> <li>Confirm all coagulation results (other than platelet count) are normal [6].</li> <li>Check if the patient is taking other medicines that can increase risk of bleeding (e.g. anticoagulants, antiplatelet drugs, non-steroidal anti-inflammatory drugs and some antidepressants) [1].</li> </ul> </li> <li>Provide dental treatment but be prepared to manage bleeding using local measures [28].</li> </ul>	<ul style="list-style-type: none"> <li>In a patient who has received radiotherapy to head or neck, refer to secondary dental care if extractions or surgical procedures involving the mucoperiosteum are needed within the radiotherapy field [6,14]. Do not extract teeth involving irradiated bone in primary care due to lifelong risk of osteoradionecrosis [6,14].</li> <li>In a patient who has received chemotherapy or total body irradiation:               <ul style="list-style-type: none"> <li>Treatment must wait until neutrophils are more than <math>1 \times 10^9/L</math> [28].</li> <li>If neutrophil count is more than <math>2 \times 10^9/L</math>, treat as normal [6].</li> </ul> </li> <li>Ask the patient's oncology or haematology team whether prophylactic antibiotics are needed [6]. Clinical judgement is critical: if infection is present or unclear, more aggressive antibiotic therapy may be indicated.</li> <li>If the patient has mucositis, avoid dental treatment if possible as there is a risk of systemic infection [6].</li> </ul>
<p>Patient:</p> <ul style="list-style-type: none"> <li>is receiving radiotherapy to areas other than head or neck, or</li> <li>is taking medicines to treat cancer other than chemotherapy, or</li> <li>received chemotherapy or radiotherapy to head or neck more than six months ago, or</li> <li>had a stem cell/bone marrow transplant more than six months ago.</li> </ul>		<ul style="list-style-type: none"> <li>Treat as normal, unless there is a risk of osteonecrosis (see below).</li> <li>Confirm with patients who have received chemotherapy that their blood tests are normal prior to providing invasive dental treatment. If patients are not sure, consult their oncology or haematology team.</li> <li>Confirm patients with blood cancer are in remission/blood test results are normal [29].</li> <li>Be prepared to manage increased risks of bleeding and infection with current non-chemotherapy cancer treatments, although these should be minimal with most medicines. Ask the patient about their general wellbeing, and if they bruise or bleed easily. Check prescribing information for advice on whether the medicine needs to be stopped before and after a procedure (e.g. ibrutinib [30]) – but always check with the patient's oncology or haematology team before stopping cancer treatments.</li> <li>Consider possibility of oral adverse effects and drug interactions with current non-chemotherapy cancer treatments.</li> </ul>	

<p><b>Patient:</b></p> <ul style="list-style-type: none"> <li>• is receiving radiotherapy to areas other than head or neck, or</li> <li>• is taking medicines to treat cancer other than chemotherapy, or</li> <li>• received chemotherapy or radiotherapy to head or neck more than six months ago, or</li> <li>• had a stem cell/bone marrow transplant more than six months ago.</li> </ul>	<p><b>Risk of osteoradionecrosis in patients who have had radiotherapy to head or neck</b></p> <ul style="list-style-type: none"> <li>• Refer patients who have had radiotherapy to head or neck to secondary dental care if extractions or surgical procedures involving the mucoperiosteum are needed within the radiotherapy field.</li> <li>• Extractions from irradiated sites following radiotherapy to head or neck should be avoided because of the lifelong risk of osteoradionecrosis [3,6]. Patients at higher risk include those whose total radiation dose exceeded 60Gy, with uncontrolled periodontal disease or an ill-fitting prosthesis, or who are malnourished [6].</li> </ul> <p><b>Risk of medication-related osteonecrosis of the jaw</b></p> <ul style="list-style-type: none"> <li>• Patients who have taken anti-resorptive drugs (bisphosphonates, or denosumab in the last nine months) or are taking anti-angiogenic biologic therapies (e.g. bevacizumab, sorafenib, sunitinib) are at higher risk of medication-related osteonecrosis of the jaw [31].</li> <li>• If tooth extraction is indicated, explore all possible alternatives where teeth could be retained. Consider seeking advice from secondary dental care.</li> <li>• If extraction is the most appropriate treatment, discuss risks and benefits with the patient to ensure valid consent.</li> <li>• Do not prescribe antibiotic or antiseptic prophylaxis unless required for other clinical reasons.</li> <li>• Refer to secondary dental care if the socket has not healed at eight weeks [31].</li> <li>• Avoid placing implants in patients receiving high-dose anti-resorptive or anti-angiogenic drugs [31].</li> </ul>
--	---

## 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 (and re-cementing) crowns, local anaesthetic injection, basic periodontal examination, root canal work, and scale and polish above the gum-line [1]. Also examinations and radiographs.

<p><b>Patient:</b></p> <ul style="list-style-type: none"> <li>• is currently receiving chemotherapy or radiotherapy to head or neck, or</li> <li>• received chemotherapy or radiotherapy to head or neck in the last six months, or</li> <li>• had a stem cell/bone marrow transplant in the last six months.</li> </ul>	<p>Contact the patient's oncology or haematology team [6] to confirm arrangements for dental care.</p>	<p><b>Managing risks of bleeding, infection and osteonecrosis</b></p> <ul style="list-style-type: none"> <li>• <b>All non-essential work should be avoided for six months after a stem cell/bone marrow transplant.</b></li> <li>• Treat all other patients as normal, including if the patient has received radiotherapy to the head or neck.</li> <li>• 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.</li> <li>• Ask the patient about their general wellbeing, and if they bruise or bleed easily.</li> <li>• Consider the possibility of oral adverse effects and drug interactions.</li> </ul>
<p><b>Patient:</b></p> <ul style="list-style-type: none"> <li>• is receiving radiotherapy to areas other than head or neck, or</li> <li>• is taking medicines to treat cancer other than chemotherapy, or</li> <li>• received chemotherapy or radiotherapy to head or neck more than six months ago, or</li> <li>• had a stem cell/bone marrow transplant more than six months ago.</li> </ul>		



### Appendix 3. Patient with a dental infection

- It is important to maintain good dental care and treat dental infections aggressively [14].
- 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 [14].

<p><b>Patient:</b></p> <ul style="list-style-type: none"> <li>• is currently receiving chemotherapy, or</li> <li>• received chemotherapy in the last six months, or</li> <li>• had a stem cell/bone marrow transplant in the last six months.</li> </ul>	<p><b>All suspected infections</b></p> <ul style="list-style-type: none"> <li>• Always contact the patient's oncology or haematology team for advice.</li> <li>• If the patient is very unwell, suspect neutropenic sepsis [32,33]. This can be life-threatening. See UK Sepsis Trust <a href="#">decision support tool</a> for primary dental care for more information [34]. Is one of the listed red flags present?</li> <li>• If a red flag or any of the following symptoms are present, <b>call 999</b> and <b>urgently</b> contact the oncology or haematology team <u>and</u> secondary dental care.             <ul style="list-style-type: none"> <li>○ acting confused, slurred speech or not making sense</li> <li>○ blue, pale or blotchy skin, lips or tongue</li> <li>○ a rash that does not fade when you roll a glass over it, the same as meningitis</li> <li>○ difficulty breathing, breathlessness or breathing very fast [27].</li> </ul> </li> <li>• If neutropenic sepsis can be confidently ruled out, 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. Then manage as below, taking into account advice from the oncology or haematology team.</li> </ul>
<p><b>Patient:</b></p> <ul style="list-style-type: none"> <li>• is receiving radiotherapy to any area of the body, or</li> <li>• is taking medicines to treat cancer other than chemotherapy, or</li> <li>• received chemotherapy more than six months ago, or</li> <li>• had a stem cell/bone marrow transplant more than six months ago.</li> </ul>	<p><b>Dental abscess</b></p> <p>Treat patients with cancer the same as those who do not have cancer, but be extremely vigilant about follow-up and monitoring for deterioration.</p> <p>Confirm with patients who have received chemotherapy that their blood tests are normal; if patients are not sure, consult their oncology or haematology team. Confirm patients with blood cancer are in remission/blood test results are normal.</p> <p>First [14]:</p> <ul style="list-style-type: none"> <li>• check for fever, malaise, fatigue, dizziness or other debility,</li> <li>• measure pulse and temperature (normal temperature 36.3°C to 37°C),</li> <li>• define nature, location and extent of the swelling,</li> <li>• identify cause of the infection.</li> </ul> <p>The dentist should then decide whether they can provide treatment in primary care or the patient needs to be referred to secondary dental care; for example, if there is/are [14]:</p> <ul style="list-style-type: none"> <li>• signs of septicaemia, e.g. grossly elevated temperature (i.e. above 39.5°C), lethargy, tachycardia,</li> <li>• spreading cellulitis,</li> <li>• swellings that may compromise the airway, or cause difficulty swallowing or closing the eye,</li> </ul>

**Patient:**

- is receiving radiotherapy to any area of the body, or
- is taking medicines to treat cancer other than chemotherapy, or
- received chemotherapy more than six months ago, or
- had a stem cell/bone marrow transplant more than six months ago.

- dehydration,
- significant trismus associated with a dental infection,
- failure to respond to previous treatment or an uncooperative patient.

Treat with local measures first [14,35]:

- if pus is present in a dental abscess, drain by extracting the tooth (unless the patient has received radiotherapy to head or neck) 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 400mg three times daily for five days for penicillin-allergic patients) if [14,35]:

- the patient is immunosuppressed [15],
- local measures prove ineffective [35],
- there is cellulitis, spreading infection (to face or neck [15]) or systemic involvement (fever or lethargy) [14,35],
- 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) [14].

When prescribing antibiotics [14]:

- 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 necrotising periodontitis**

- If there are signs of spreading infection, systemic infection or the patient is immunocompromised, prescribe metronidazole 400mg three times daily for three days [14,15,35].
- Scale teeth as effectively as symptoms allow – local anaesthesia may be required [14,15]. 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), and consider giving oral hygiene and smoking cessation advice [15].

<b>Patient:</b> <ul style="list-style-type: none"> <li>• is receiving radiotherapy to any area of the body, or</li> <li>• is taking medicines to treat cancer other than chemotherapy, or</li> <li>• received chemotherapy more than six months ago, or</li> <li>• had a stem cell/bone marrow transplant more than six months ago.</li> </ul>	<b>Fungal dental infections</b> <ul style="list-style-type: none"> <li>• Refer an immunosuppressed patient to their oncology or haematology team, or their general medical practitioner [15,35]. Fungal infections in immunosuppressed patients are likely to need intravenous antifungals [35].</li> <li>• If the patient is not immunosuppressed, treat as normal. If antifungal drug treatment is required, prescribe: <ul style="list-style-type: none"> <li>○ fluconazole (dose and duration will vary depending on type of infection) [36], or</li> <li>○ miconazole oromucosal gel four times daily, continuing for seven days after lesions have healed [35].</li> </ul> </li> <li>• 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 [35].</li> <li>• Prescribe a patient with dentures antifungal drug treatment for at least two weeks [6].</li> </ul>
	<b>Viral dental infections</b>
	<b>Herpes simplex</b> Treat with local measures first [35]: <ul style="list-style-type: none"> <li>• Advise the patient to avoid dehydration and alter their diet (include soft food and adequate fluids).</li> <li>• Give analgesics regularly to minimise oral discomfort, e.g. benzydamine hydrochloride mouthwash or oromucosal spray.</li> <li>• 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) [35].</li> </ul> <p>In addition, prescribe an antiviral agent if:</p> <ul style="list-style-type: none"> <li>• the patient is immunosuppressed – use oral aciclovir 400mg five times daily for five days [2].</li> <li>• 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 [2,35].</li> <li>• the patient is not immunosuppressed and the infection is not severe – use aciclovir 5% cream five times daily for five days [2,35].</li> </ul> <p>Refer an immunosuppressed patient with severe herpes simplex infection to a hospital specialist [35].</p> <b>Herpes zoster (shingles)</b> <ul style="list-style-type: none"> <li>• Treat herpes zoster infection with oral aciclovir 800mg five times daily for seven days [35].</li> <li>• Refer all patients with herpes zoster to their oncology or haematology team, or their general medical practitioner [35].</li> </ul>

## Appendix 4. General advice for all cancer patients after cancer treatment finishes

10

**Dental caries** risk depends on the type of treatment received and changes in oral health-related behaviours as a consequence of the treatment:

- Patients receiving radiotherapy to head or neck, or total body irradiation prior to a transplant, are at higher risk of dental caries [6].
- Other factors that increase the risk include xerostomia (resulting in more cariogenic oral microflora), patients consuming more cariogenic foods and drinks (in response to altered taste, mucositis, difficulties chewing and swallowing or weight loss), and poor oral hygiene (due to difficulties with toothbrushing as a result of limited mouth opening or reduced motivation) [6].

Consider lifelong daily use of high-strength fluoride toothpaste and fluoride mouthwash (each used at a different time of day), and regular fluoride varnish application [5,6]. Patients with a higher risk of caries will need more frequent follow-up; recall interval should be determined on an individual basis dependent on risk factors and presence of active dental disease [6].

**Dentures** may need reconstruction if treatment altered oral tissues. Some people struggle to tolerate dentures due to friable tissues/dry mouth [3].

**Malignancy** 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/blood test results are normal before treating.

### **Medication-related osteonecrosis of the jaw**

- Ask if the patient has received or is receiving a bisphosphonate or denosumab. Be aware the patient may not know they have received a bisphosphonate (oral or intravenous). Patients will be at increased risk of osteonecrosis even after treatment with a bisphosphonate has stopped [31]. The effect of denosumab on bone turnover diminishes within nine months of treatment completion, whilst anti-angiogenic drugs associated with medication-related osteonecrosis of the jaw (e.g. bevacizumab, sorafenib or sunitinib – see also Appendix 6) are not thought to remain in the body for extended periods of time [31].
- Estimated incidence of medication-related osteonecrosis of the jaw in cancer patients treated with anti-resorptive drugs (bisphosphonates and denosumab) or anti-angiogenic drugs (e.g. bevacizumab, sorafenib or sunitinib) is one case per 100 people [31]. This compares with an incidence of one to 10 cases per 10,000 people with osteoporosis treated with anti-resorptive drugs [31].
- Assess whether the patient is at low or higher risk of medication-related osteonecrosis of the jaw [31]:
  - Patients being treated with an anti-resorptive drug or an anti-angiogenic drug (or both) as part of the management of cancer are always considered to be at higher risk of osteonecrosis.
  - Patients taking bisphosphonates for osteoporosis or other non-malignant bone diseases for less than five years and not also concurrently being treated with systemic glucocorticoids are at low risk of osteonecrosis. If they are also on a systemic glucocorticoid or have taken a bisphosphonate for more than five years, they are at higher risk of osteonecrosis.
  - Patients who have taken a bisphosphonate at any time in the past and those who have taken denosumab in the last nine months should be allocated to a risk group as if they are still taking the drugs [31].
- For patients at higher risk of medication-related osteonecrosis of the jaw in whom an extraction is indicated, explore all possible alternatives where teeth could potentially be retained, e.g. retaining roots in the absence of infection. Consider seeking advice from secondary dental care. If an extraction remains the most appropriate treatment, discuss the risks and benefits of treatment with the patient to ensure valid consent before proceeding. Do not prescribe antibiotics or antiseptic prophylaxis unless required for other clinical reasons. Refer to secondary dental care if the socket has not healed at eight weeks [31].

<p><b>Patients who have received chemotherapy</b></p>	<p><b>Mucositis</b> treatments (e.g. <i>Caphosol</i>, <i>Gelclair</i>, <i>MuGuard</i>) have limited efficacy and are usually started by specialists [6,22]. If mucositis is a problem, contact secondary dental care for advice. Mucosal protectants cannot be prescribed on an NHS dental prescription [2].</p> <p><b>Oral hygiene</b> and good nutrition are important for patients with cancer, especially those with salivary gland dysfunction [3,6].</p> <p><b>Orthodontic treatment</b></p> <ul style="list-style-type: none"> <li>• The decision to start orthodontic treatment must be taken carefully and discussed with the patient's oncology or haematology team in advance. Overall health, susceptibility to dental caries and response to oral health prevention regimes should be assessed [6].</li> <li>• Oral bisphosphonates have been shown to inhibit orthodontic tooth movement and although there are no data on the effects of intravenous bisphosphonates, the general consensus is that orthodontic treatment should be avoided in patients currently receiving intravenous bisphosphonates, and for a period after [6].</li> </ul> <p><b>Xerostomia</b> can be managed with saliva substitutes. Selected substitutes can be prescribed on an NHS dental prescription – see <a href="#">Medicines Q&amp;A</a>.</p>
<p><b>Patients who have received radiotherapy to head or neck</b></p>	<ul style="list-style-type: none"> <li>• Once all complications of chemotherapy have resolved, patients may be able to resume their normal dental care schedule [3].</li> <li>• 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.</li> </ul>
<p><b>Patients who have had a stem cell/bone marrow transplant</b></p>	<p><b>Implants and other invasive surgical procedures</b></p> <ul style="list-style-type: none"> <li>• Refer the patient to secondary dental care if extractions or surgical procedures involving the mucoperiosteum are needed within the radiotherapy field; they may consider using antibiotic prophylaxis (and possibly hyperbaric oxygen therapy) before and after surgery [6].</li> <li>• Do not extract teeth involving irradiated bone because of the risk of osteoradionecrosis [3,6], which can occur in all areas of the jaws and from extractions undertaken before radiotherapy [37]. Patients at higher risk include those whose total radiation dose exceeded 60Gy, whose dose fraction was large with a high number of fractions, with uncontrolled periodontal disease or an ill-fitting prosthesis, or who are immunodeficient or malnourished [6]. Regions outside the radiation treatment field are generally considered safe for dental surgery [38].</li> <li>• 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 [39]. Implants are not recommended for patients receiving intravenous bisphosphonates for cancer [6].</li> <li>• Location of the irradiated area, and type and dose of radiation, are important factors when considering a patient for implant surgery [38]. Implant failure is less likely with a radiation dose lower than 45Gy [6].</li> </ul> <p><b>Oral complications</b></p> <ul style="list-style-type: none"> <li>• Keep in mind that oral complications can continue or emerge long after radiotherapy has ended [18].</li> <li>• High doses of radiation to the head or neck carry a lifelong risk of dry mouth, dental caries and osteoradionecrosis [3,18,37].</li> <li>• Refer the patient to secondary dental care if dental infections do not respond to treatment [14].</li> </ul>
<p><b>Patients who have had a stem cell/bone marrow transplant</b></p>	<p><b>Infection</b></p> <ul style="list-style-type: none"> <li>• Patients may be at increased risk of infection for up to a year after bone marrow/stem cell transplant, even though blood results are normal, as their immune system will be very immature [3].</li> <li>• The oral cavity and salivary glands are commonly involved in graft-versus-host disease (GvHD) in allograft recipients, resulting in mucosal inflammation, ulceration and xerostomia [3]. Lichen planus-like changes in the oral cavity may also indicate GvHD [22] – refer to a specialist.</li> </ul>



## Appendix 5. Information needed to help make decisions about dental treatment

Information needed	Notes
<b>About the patient and their cancer</b>	
What cancer does the patient have?	Ask for exact diagnosis.
When was the cancer diagnosed?	
How is their general health?	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.
Does the patient have contact details for their keyworker (clinical nurse specialist, oncologist or haematologist)?	You may need to contact the patient's keyworker to get more information or advice.
<b>About the treatment</b>	
Has treatment started and when?	
What is the treatment regimen?	Ask about chemotherapy, radiotherapy, other cancer drugs such as hormonal therapies, and additional treatments including bisphosphonates, denosumab and corticosteroids such as dexamethasone. The patient may be unsure, so contact their keyworker.
Is the treatment part of a clinical trial? At which hospital?	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.
What adverse effects do they currently have from their cancer treatment?	Specifically ask about oral adverse effects, and general bruising or bleeding.
When did the treatment finish? Or when is the treatment due to finish?	Consider that the patient may be receiving cycles of chemotherapy, with a gap of days or weeks between doses.
How often does the patient have their blood taken?	Monitoring will be more frequent if adverse effects are likely.
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: <ul style="list-style-type: none"> <li>• currently receiving chemotherapy or radiotherapy, or</li> <li>• received it in the last three months, or</li> <li>• received total body irradiation in the last six months.</li> </ul> Remember to also check other clotting results and kidney/liver function, if available.

## Appendix 6. List of cancer and other drug treatments

\* Drugs associated with medication-related osteonecrosis of the jaw [see note below table]

# Examples of systemic cancer treatment agents known to cause oral damage [22]

<b>Cytotoxic drugs or chemotherapy</b> work by killing cancer cells [40]	
Alkylating drugs	Bendamustine, busulfan, carmustine, chlorambucil, chlormethine, cyclophosphamide, dacarbazine, estramustine, ifosfamide, <i>lomustine</i> <sup>#</sup> , <i>melfalan</i> <sup>#</sup> , streptozocin, temozolomide, <i>thiotepa</i> <sup>#</sup> , treosulfan
Anthracyclines & related drugs	<i>Daunorubicin</i> <sup>#</sup> , <i>daunorubicin with cytarabine</i> <sup>#</sup> , <i>doxorubicin</i> <sup>#</sup> , <i>epirubicin</i> <sup>#</sup> , <i>idarubicin</i> <sup>#</sup> , <i>mitoxantrone</i> <sup>#</sup> , pixantrone
Antimetabolites	Azacitidine, <i>capecitabine</i> <sup>#</sup> , cladribine, clofarabine, cytarabine, decitabine, fludarabine, <i>fluorouracil</i> <sup>#</sup> , gemcitabine, mercaptopurine, <b><i>methotrexate</i></b> <sup>##</sup> , nelarabine, <i>pemetrexed</i> <sup>#</sup> , tegafur with gimeracil and oteracil, tioguanine, trifluridine with tipiracil
Cytotoxic antibiotics & related substances	Bleomycin, <i>mitomycin</i> <sup>#</sup> , <i>pentostatin</i> <sup>#</sup>
Platinum compounds	<i>Carboplatin</i> <sup>#</sup> , <i>cisplatin</i> <sup>#</sup> , <i>oxaliplatin</i> <sup>#</sup>
Taxanes	Cabazitaxel, <i>docetaxel</i> <sup>#</sup> , <i>paclitaxel</i> <sup>#</sup>
Topoisomerase I inhibitors	<i>Irinotecan</i> <sup>#</sup> , <i>topotecan</i> <sup>#</sup>
Vinca alkaloids	<i>Vinblastine</i> <sup>#</sup> , <i>vincristine</i> <sup>#</sup> , vindesine, vinflunine, <i>vinorelbine</i> <sup>#</sup>
Others	Amsacrine, arsenic, asparaginase, bexarotene, crisantaspase, dacarbazine, dexamethasone (high-dose – <i>Neofordex</i> ), eribulin, <i>etoposide</i> <sup>#</sup> , hydroxycarbamide, mitotane, panobinostat, pegaspargase, porfimer, procarbazine, raltitrexed, temoporfin, temozolamide, trabectedin, tretinoin
<b>Immunotherapies</b> help the immune system recognise and attack cancer cells. Some immunotherapies are also called targeted treatments or biological therapies [41]	
Immunotherapies	Aldesleukin, axicabtagene ciloleucel, BCG, interferon, lenalidomide, mifamurtide, pomalidomide, talimogene laherparepvec, thalidomide, tisagenlecleucel
Monoclonal antibodies	Alemtuzumab, atezolizumab, avelumab, <b><i>bevacizumab</i></b> <sup>##</sup> , blinatumomab, brentuximab, catumaxomab, cetuximab, daratumumab, dinutuximab, durvalumab, elotuzumab, <i>gemtuzumab</i> <sup>#</sup> , inotuzumab, ipilimumab, necitumumab, nivolumab, obinutuzumab, ofatumumab, olaratumab, panitumumab, pembrolizumab, <i>pertuzumab</i> <sup>#</sup> , ramucirumab, rituximab, siltuximab, <i>trastuzumab</i> <sup>#</sup> , <i>trastuzumab emtansine</i> <sup>#</sup>
<b>Targeted cancer drugs</b> work by 'targeting' differences in a cancer cell from a normal cell that helps it to survive and grow [42]	
Proteasome inhibitor	Bortezomib, carfilzomib, ixazomib
Protein kinase inhibitors	Afatinib, alectinib, axitinib, bosutinib, <b><i>cabozantinib</i></b> <sup>*</sup> , ceritinib, cobimetinib, crizotinib, dabrafenib, dasatinib, <i>erlotinib</i> <sup>#</sup> , <i>everolimus</i> <sup>#</sup> , gefitinib, ibrutinib, idelalisib, imatinib, lapatinib, lenvatinib, midostaurin, nilotinib, nintedanib, osimertinib, palbociclib, <i>pazopanib</i> <sup>#</sup> , ponatinib, regorafenib, ribociclib, ruxolitinib, <b><i>sorafenib</i></b> <sup>##</sup> , <b><i>sunitinib</i></b> <sup>##</sup> , <i>temsirolimus</i> <sup>#</sup> , tivozanib, trametinib, vandetanib, vemurafenib
Other	<b><i>Aflibercept</i></b> <sup>*</sup> , niraparib, olaparib, rucaparib, venetoclax, vismodegib

Table continued on next page

<b>Hormone therapies</b>	
block or lower the amount of hormones in the body to stop or slow down the growth of cancer [43]	
Anti-androgens	Abiraterone, bicalutamide, cyproterone, enzalutamide, flutamide
Anti-gonadotrophin-releasing hormones	Degarelix
Anti-oestrogens	Fulvestrant, tamoxifen, toremifene
Aromatase inhibitors	Anastrozole, exemestane, letrozole
Gonadotrophin-releasing hormones	Buserelin, goserelin, leuprorelin, triptorelin
Oestrogens	Diethylstilbestrol
Progestogens	Megestrol
Somatostatin analogues	Lanreotide, octreotide, pasireotide
<b>Bisphosphonates and other bone metabolism therapies</b>	
prevent or slow down bone thinning (osteoporosis) and/or treat some types of cancer that cause bone damage [44, 45]	
Oral	<b>Alendronic acid*</b> , <b>clodronate*</b> , <b>etidronate*</b> , <b>ibandronic acid*</b> , <b>risedronate*</b>
Intravenous	<b>Ibandronic acid*</b> , <b>pamidronate*</b> , <b>zoledronic acid*</b>
Monoclonal antibody	<b>Denosumab*</b>
<b>Other drugs used in patients with cancer</b>	
Granulocyte-colony stimulating factors	Filgrastim, lenograstim, lipegfilgrastim, pegfilgrastim
Immunosuppressants	Antithymocyte immunoglobulin (rabbit), azathioprine, basiliximab, belatacept, belimumab, canakinumab, ciclosporin, mycophenolate, sirolimus, tacrolimus

List of drugs in the table is compiled from the BNF and electronic Medicines Compendium. Drugs associated with medication-related osteonecrosis of the jaw have been identified from the electronic Medicines Compendium.