

# **CLINICAL RECOMMENDATIONS: ORAL MANAGEMENT OF THE PAEDIATRIC BONE MARROW TRANSPLANT PATIENT**

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## **1. Introduction**

This clinical practice guideline is based on a review of the current dental and medical literature related to dental management of children with cancer receiving a bone marrow transplant (BMT). A MEDLINE search was conducted using the terms "dental management of pediatric bone marrow transplant patients", "dental management of pediatric hematopoietic stem cell transplant patients", "oral complications of pediatric bone marrow transplantation", "oral complications of pediatric hematopoietic stem cell transplantation", "oral mucositis and bone marrow transplantation" and "stomatitis and bone marrow transplantation". Expert opinion and best practice advice was also sought from consultant staff at the RCH Children's Cancer Centre in the development of this guideline. In addition, international paediatric dental and oncology organisations with similar guidelines were accessed for contemporary recommendations[1-4].

## **2. Background**

Paediatric patients undergoing chemotherapy and/or radiotherapy for the treatment of cancer or in preparation for BMT may present with many acute and long-term side effects within the oral cavity[1]. Furthermore, because of the severe immunosuppression such patients experience, any existing or potential oro-dental infections and trauma can compromise their medical treatment, leading to morbidity, mortality and higher hospitalisation costs[2]. It is also imperative that the paediatric dentist be familiar with the oral manifestations of the patient's underlying condition and the different management guidelines between patients undergoing chemotherapy only and those who will receive a BMT after initial remission. Therefore, the paediatric dental professional plays an important role in the prevention, stabilisation and treatment of oral and dental problems that can compromise the child's quality of life before, during and after the cancer treatment. Dental intervention with certain modifications must be completed promptly and efficiently, with attention to the patient's medical history, treatment protocol and general health status.

## **3. Rationale**

The most frequently documented source of sepsis in the immunosuppressed cancer patient is the mouth, therefore early and thorough dental intervention, including aggressive oral hygiene measures, reduces the risk for oral and associated systemic complications[3]. At a consensus conference on oral complications of cancer therapies sponsored by the National Institutes of Health in 1989, the most important recommendation was that all patients with cancer should have an oral examination before initiation of the oncology therapy, and that treatment of pre-existing or concomitant oral disease was essential to minimise oral complications in this population[4]. The underlying key component to success in maintaining a healthy oral cavity

during cancer therapy is patient compliance with preventive advice. Accordingly, the child and the caretakers should be educated regarding the possible acute side effects and the long-term sequelae in the oral cavity. Younger patients develop more acute oral complications than adults[5]. Due to the fact that there are many oncology and BMT protocols, every patient should be dealt with on an individual basis and appropriate consultations with BMT oncologists and paediatric dental specialists should be sought before dental care is instituted.

#### 4. Case selection

The oral complications seen in BMT patients are related to their pre BMT systemic and oral health status, oral manifestations of the underlying condition, and oral complications of recent medical therapy. Most of the principles are similar to those discussed for paediatric oncology. The two major differences are: 1) with BMT, the patient receives conditioning chemotherapy and/or total body irradiation in just a few days before the transplant, and 2) there is prolonged period of immunosuppression following the transplant, usually between 14-21 days duration. Elective dentistry must be postponed until immunological recovery has occurred, which may take as long as 9 to 12 months after BMT or longer if chronic graft versus host disease (GVHD) or other complications occur. Therefore, all dental treatment must be completed a minimum of 10 days before the child is admitted for BMT conditioning in order to control oral disease that potentially could lead to complications during and after the transplant[6].

Almost all children undergoing BMT develop the typical oral mucosal changes of oral ulceration, keratinisation, atrophy, acute GVHD and erythema. Both tend to maximal about 4-14 days post transplantation. Mucositis is also frequently associated with ulceration between 1-3 weeks after transplantation. During this period oral pain is often severe with many patients requiring narcotic analgesia. The use of keratinocyte growth factor (Palifermin) has been demonstrated to reduce this complication in adults undergoing autologous transplantation and paediatric studies of this promising therapy are in progress[7, 8].

Oral infection with candida albicans, herpes simplex, cytomegalovirus, and varicella zoster are the major infective agents seen in children undergoing BMT, if inadequate prophylaxis is given. These conditions can be life threatening if not treated aggressively at diagnosis.

Oral manifestations of defective haemostasis are common but seldom serious and include oral mucosal bleeding or crusting of the lips and gingival oozing.

#### General stages of bone marrow transplantation

	day 0		day 30	day 100
<b>STAGE 1:</b> pre-therapy	<b>STAGE 2:</b> intra-therapy		<b>STAGE 3:</b> post-therapy	<b>STAGE 4:</b> long-term follow-up
patient education eliminate/stabilise malignancy	conditioning chemotx radiotx	immune suppression early recovery	immune suppression continued recovery	immune suppression to full recovery  chronic GVHD,

	mucositis, infection, haemorrhage, acute GVHD	mucositis, infection, acute and chronic GVHD, xerostomia	xerostomia, late effects
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## Oral complications

### Stage 1: Pre-transplantation

The oral complications are related to the current systemic and oral health of the patient, oral manifestations of the underlying condition, and oral complications of recent medical therapy.

### Stage 2: Conditioning/neutropaenia

The oral complications are related to the conditioning regimen and medical therapies, approximately up to day 30 post-transplant[3]. Mucositis, xerostomia, oral pain, oral bleeding, opportunistic infections, and taste dysfunction have been reported[6]. The patient should be followed up closely during the hospitalisation period to monitor and treat the oral changes and reinforce the importance of optimal oral care. Invasive dental care is not allowed in this stage.

### Stage 3: Initial engraftment to hematopoietic reconstitution

The intensity and severity of oral complications begin to decrease normally 3 to 4 weeks after transplantation. Oral fungal infections and herpes simplex virus infection are most notable. Acute oral GVHD can be a concern for some allogeneic graft recipients. A dental/oral review should be performed at day 100 and invasive dental procedures, including dental prophylaxis and soft tissue curettage, should only be done if authorised by the BMT team because of the patient's continued immunosuppression[3]. Patients should be encouraged to continue optimal oral hygiene and avoid a cariogenic diet. Attention to xerostomia and acute oral GVHD management, including topical application of steroids or cyclosporine, oral psoralen and palliative ultraviolet A therapy, could be considered when appropriate[9].

### Stage 4: Immune reconstitution/ late post-transplantation

After day 100 post-BMT, the oral complications are predominantly related to the chronic toxicity associated with the conditioning regimen, including salivary dysfunction, craniofacial growth abnormalities, late viral infections, chronic oral GVHD and oral squamous cell carcinoma[10, 11]. Close monitoring of the post BMT patient is critical to establish an early and correct diagnosis of chronic GVHD in order to prevent later complications and disability[6, 12]. If the classic systemic manifestations of the disease are not present, a lip biopsy may aid the diagnosis and determine the extent of dissemination[13]. The chronic oral GVHD predictive value for lip biopsy approaches 100% sensitivity when combined with oral mucosal changes such as buccal and labial atrophy, erythema and lichenoid lesions (focal hyperkeratinisation), oral pain and xerostomia[14]. Patients are anaesthetised using a standard infiltration, and an elliptical incisional biopsy specimen measuring 3x6mm is taken from the inner lower labial mucosa 10mm below the vermilion border. The tissue is fixed in 10% neutral buffered formalin and sent to the pathology laboratory for

analysis. Histological findings include ductal necrosis, sialadenitis, epithelial lymphocytic infiltration and acinar destruction in the labial minor salivary glands[14, 15]. The presence of irreversible salivary gland dysfunction is associated with the severity of the original malignancy and seems to be less prevalent and persistent in children compared with adults[12].

Soft tissue non-gingival growths, such as pyogenic granulomas, may occur due to reactive proliferation of fibrous and granulation tissue raising the concerns of new malignancy[16]. A very unusual periodontal presentation has been described in a 15 month old girl with severe chronic oral GVHD[17].

Regular quarterly dental examinations with/out radiographs (depending on caries risk) should be done routinely but invasive dental work should be avoided in patients with profound impairment of immune function[3]. Orthodontic treatment can be considered subject to the patient's previous risk status[18].

## 5. Clinical steps

### STAGE 1: Pre-BMT therapy oral care

#### Objectives

- to identify, stabilise or eliminate existing and potential sources of infection, local irritants and irregular surfaces that may complicate the BMT without needlessly delaying the treatment or inducing complications;
- to educate the patient and caretakers about the importance of optimal oral care in order to minimize oral problems/discomfort during and after treatment and about the possible acute and long-term effects of the therapy in the craniofacial complex[6].

<p><b>CLINICAL EVALUATION</b></p> <ul style="list-style-type: none"> <li>• to identify existing and potential sources of infection</li> </ul>	<ul style="list-style-type: none"> <li>• head and neck exam</li> <li>• intraoral soft tissues</li> <li>• dental and periodontal status</li> <li>• oral hygiene (OH) assessment</li> </ul>
<p><b>RADIOGRAPHIC EVALUATION</b></p> <ul style="list-style-type: none"> <li>• to evaluate dental and oro-facial development, diagnose oral pathology</li> </ul>	<ul style="list-style-type: none"> <li>• panoramic film (mandatory for all patients)</li> <li>• periapical and bitewing films when clinically indicated</li> </ul>

<p><b>TREATMENT PLAN</b></p> <ul style="list-style-type: none"> <li>to prevent, stabilise and eliminate oral infections and potential complications</li> </ul>	<ul style="list-style-type: none"> <li>plan execution dependent on patients medical status</li> <li>may require completion under GA on a work-in list</li> <li>OH instruction (see below)</li> </ul>
<p><b>PATIENT EDUCATION</b></p> <ul style="list-style-type: none"> <li>to understand oral complications in BMT, stress the importance of protocol compliance to minimise discomfort, to facilitate execution of dental treatment plan</li> </ul>	<p>Discuss with parent or care giver:</p> <ul style="list-style-type: none"> <li>examination findings and treatment plan</li> <li>prevention as per oncology guideline</li> <li>possible oral side effects of the conditioning regimen and therapies</li> <li>potential long-term complications (disturbances to oro-facial growth and development)</li> </ul>

## ORAL HYGIENE INSTRUCTIONS

<b>TOOTH BRUSHING</b>	<ul style="list-style-type: none"> <li>• regular soft brush (soften under hot water before use)</li> <li>• brush 2-3 times daily</li> <li>• preferably with a paediatric fluoridated toothpaste</li> <li>• brush teeth and tongue</li> <li>• end-tufted toothbrushes are recommended (Oral B brushes)</li> <li>• contact dental department if patient does not have a suitable tooth brush</li> </ul>
<b>FLOSSING</b>	<ul style="list-style-type: none"> <li>• once daily if patient older than 12 years and child is used to regular flossing and can manage it atraumatically</li> <li>• if not, it can be taught and emphasised following hospital discharge in the department at day 100 review</li> </ul>
<b>MOUTH RINSES / GELS</b>	<p><b>Normal saline:</b></p> <ul style="list-style-type: none"> <li>• general indications: recent extraction sockets</li> <li>• swish/spit 4 times daily</li> </ul> <p><b>Sodium bicarbonate:</b></p> <ul style="list-style-type: none"> <li>• general indications: if patient has xerostomia or thick ropy saliva</li> <li>• swish/spit 4 times daily</li> </ul> <p><b>Aqueous chlorhexidine 0.2% (rinse or gel):</b></p> <ul style="list-style-type: none"> <li>• general indications: poor/fair OH, gingivitis, mouth ulcers, mucositis</li> <li>• if children are prescribed chlorhexidine rinses, it should only be stopped if they can't tolerate it anymore (due to burning/stinging sensations)</li> <li>• swish/spit for one minute 3 times daily, preferably after meals, NPO for 30 minutes afterwards</li> <li>• brown staining of teeth and tongue may occur (easily removable later by hygienist)</li> <li>• do not use it together with oral Nilstat* or other topical meds; use these at least 30 minutes apart (their interaction decreases their clinical efficacy due to competition for anionic oral sites)</li> </ul> <p><b>Neutral sodium fluoride 0.05% (rinse or gel):</b></p> <ul style="list-style-type: none"> <li>• general indications: high dental caries risk patients, prolonged xerostomia associated with TBI</li> <li>• frequency of use to be determined upon clinical examination</li> <li>• rinse 5mls nightly for 30 seconds before bedtime</li> <li>• gel applied in custom trays (made from dental impressions) for 3 minutes before bedtime</li> </ul>

\*NOTE: be aware of high sugar content of some paediatric oral meds. e.g., liquid Nilstat drops contain 50% - 60% sucrose

## STAGE 2: Intra-BMT therapy oral care

### Objectives:

- to maintain optimal oral health during therapy
- to manage oral side effects that may develop as a consequence of therapy
- to reinforce the patient and parents' education regarding the importance of optimal oral care in order to minimise oral problems and discomfort during therapy

### ORAL HYGIENE INSTRUCTIONS

<b>TOOTH BRUSHING</b>	<ul style="list-style-type: none"> <li>• same as Stage 1, may have to stop tooth brushing if severely thrombocytopenic</li> <li>• soft end-tufted toothbrushes are particularly useful when mucositis is present (oral B brushes)</li> <li>• use foam brushes (toothettes) <u>only</u> if patient cannot tolerate a normal toothbrush</li> </ul>
<b>FLOSSING</b>	<ul style="list-style-type: none"> <li>• same as Stage 1</li> </ul>
<b>MOUTH RINSES</b>	<ul style="list-style-type: none"> <li>• aqueous 0.2% chlorhexidine is the preferred dental caries prophylactic agent due its proven clinical efficacy, must be applied for at least one minute to be effective, either gel (&lt; 6 years) or rinse (&gt;6 years) form depending on child's age</li> <li>• sodium bicarbonate or saline recommended only if severe mucositis or thick ropy saliva are present</li> <li>• lower rinse temperature if possible as cold mouth rinses soothe inflamed oral tissues</li> </ul>

## MUCOSITIS MANAGEMENT

<p><b>PAIN</b></p>	<p><b>TOPICAL ANAESTHETICS</b></p> <ul style="list-style-type: none"> <li>• 2% viscous lignocaine (dilute a little with normal saline to make it easier to apply, make up to 5-10 mls)</li> <li>• <b>USAGE:</b> - <u>no</u> gargling nor swallowing</li> <li>• swish/bathe tissues for at least 30 seconds</li> <li>• not to be used more than once every 3 hours</li> <li>• Diffiam lozenges with topical anaesthetic for older children</li> </ul> <p><b>OTHER AGENTS (not all evaluated by RCT[19])</b></p> <ul style="list-style-type: none"> <li>• systemic analgesics as prescribed by medical consultant</li> <li>• patient controlled analgesia (PCA pump)</li> <li>• ice packs to throat and cheeks prn, ice blocks, popsicles</li> <li>• mucosal coating agents (Caphosol)</li> <li>• anti-inflammatory agents such as topical steroids (0.1% Betamethasone in a saline mouth rinse qid)</li> <li>• low level laser therapy may be available</li> <li>• bedside suction for oral secretions</li> <li>• tissue debridement if necessary and when platelets are adequate (tetracycline in a saline mouth rinse bd)</li> </ul>
<p><b>LIP CARE</b></p>	<ul style="list-style-type: none"> <li>• keep it moist with lanolin-based product: <u>do not</u> use vaseline</li> <li>• if ulcerated (mucositis): lanolin prn applied with cotton bud</li> <li>• angular cheilitis (Daktarin cream or Kenalog oral gel applied with cotton bud qid)</li> </ul>
<p><b>ORAL INFECTIONS</b></p>	<ul style="list-style-type: none"> <li>• request clinical exam by dental consultant</li> <li>• monitor symptoms</li> <li>• investigations: oral cultures (PCR), serology if required</li> <li>• meds as indicated for causative organism</li> </ul>
<p><b>GINGIVAL OR MUCOSAL HAEMORRHAGE</b></p>	<ul style="list-style-type: none"> <li>• identify source, usually an exfoliating tooth or extraction socket</li> <li>• apply moist gauze pressure packs for 30 minutes</li> <li>• use topical haemostatic agents (Surgicel, Thrombin, Gelfoam, Tranexamic Acid)</li> <li>• systemic therapy (platelet transfusion as directed by BMT medical consultant)</li> </ul>
<p><b>XEROSTOMIA</b></p>	<ul style="list-style-type: none"> <li>• mouth rinses and OH same as Stage 1, other non-alcoholic mouthwashes (Biotene) can be helpful</li> <li>• artificial saliva substitute prn, methyl cellulose</li> <li>• 0.05% neutral fluoride rinse or gel for enamel demineralisation</li> <li>• CPP ACP gum (Recaldent) may be considered</li> </ul>



### STAGE 3: Post-BMT therapy oral care

#### ORAL HYGIENE INSTRUCTIONS

##### Objectives:

- to maintain optimal oral health
- to reinforce to the patient and parents' the importance of optimal oral health for life

<b>TOOTHBRUSHING</b>	<ul style="list-style-type: none"> <li>• same as Stages 1 and 2</li> </ul>
<b>FLOSSING</b>	<ul style="list-style-type: none"> <li>• same as Stages 1 and 2</li> </ul>
<b>MOUTH RINSES</b>	<ul style="list-style-type: none"> <li>• same as Stage 2 but less frequently as mucositis and dryness start to improve</li> </ul>

<b>PAIN, LIP CARE HAEMORRHAGE ORAL INFECTION GINGIVAL OR MUCOSAL HAEMORRHAGE</b>	<ul style="list-style-type: none"> <li>• same as Stage 2</li> </ul>
<b>XEROSTOMIA</b>	<ul style="list-style-type: none"> <li>• rinses and OH same as Stage 2, other non-alcoholic mouthwashes can be helpful</li> <li>• artificial saliva substitute prn, methyl cellulose</li> <li>• 0.05% neutral fluoride rinse or gel nightly, if indicated</li> <li>• advise sugarless gum (Recaldent) only if all else fails</li> </ul>
<b>CHRONIC ORAL GVHD</b>	<ul style="list-style-type: none"> <li>• close monitoring by dental consultant (every month)</li> <li>• consider lip biopsy to confirm diagnosis of chronic GVHD</li> <li>• follow closely for malignant transformation of their mucosa such as oral squamous cell carcinoma[10, 20]</li> <li>• <u>if asymptomatic</u>: no topical treatment, systemic meds to treat other compromised areas as prescribed by medical consultant</li> <li>• <u>if symptomatic</u>: improved OH, mouth rinses, topical anaesthetics, diet control to avoid sensitive foods</li> <li>• 0.1% dexamethasone rinses qid, swish 10-15 ml x 1 min at least, spit, NPO 30 min, 3-6x/day, limit use to 2 weeks</li> <li>• 0.5% triamcinalone acetonide ointment bd, dry using cotton bud and apply thin film, NPO 30 min, limit use to 2 weeks</li> <li>• Intra-lesional steroid injections with triamcinalone acetonide (40mg/mL) may help for large oral lesions</li> <li>• low level laser ablation therapy may be available in the future</li> </ul>

<b>DENTAL HYPERSENSITIVITY</b>	<ul style="list-style-type: none"> <li>• clinical examination to check for dental anomalies</li> <li>• avoid extreme food temperatures (hot/cold, sweet/spicy)</li> <li>• stannous fluoride or a similar desensitising toothpaste</li> <li>• CPP-ACP may be considered</li> </ul>
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#### STAGE 4: Long-term follow-up

<b>ORAL HYGIENE FLOSSING</b>	<ul style="list-style-type: none"> <li>• same as Stage 3</li> </ul>
<b>XEROSTOMIA, TASTE, DISTURBANCES, DENTAL HYPERSENSITIVITY</b>	<ul style="list-style-type: none"> <li>• same as Stage 3</li> </ul>
<b>CHRONIC ORAL GVHD</b>	<ul style="list-style-type: none"> <li>• same as Stage 3</li> </ul>
<b>DENTAL TREATMENT</b>	<ul style="list-style-type: none"> <li>• no operative dental procedures advisable for the first 12 months post-transplant due to opportunistic infection</li> <li>• however, regular 3 monthly dental exams (including radiographs when indicated) are recommended</li> <li>• in case of dental emergencies, BMT consultant should be contacted before any procedure is done</li> <li>• follow-up on growth and development of oro-facial complex</li> </ul>

<b>Dental Screening post BMT</b>			
<b>Possible Dental Abnormalities</b>		Tooth / root agenesis, root thinning / shortening, enamel dysplasia, xerostomia, microdontia, temporomandibular joint dysfunction.	
<b>Age</b>	<b>Risk Indicators</b>	<b>Risk</b>	<b>Follow-Up Regimen</b>
Any	Any of the following: <ul style="list-style-type: none"> <li>▪ Specific head &amp; neck tumours</li> <li>▪ BMT</li> <li>▪ Radiation therapy to fields including the head &amp; neck</li> </ul>	<b>High</b>	Minimum yearly dental check up at Children's Oral Health RCH. OPG scan at age 5-6 years Repeat at 10-12 years if abnormal previously
< 2	Any chemotherapy	<b>Medium</b>	Yearly dental check up with dentist OPG scan at age 5-6 years

			Repeat at 10-12 years if abnormal previously
Any	All other patients	Low	Yearly dental check up with dentist
<b>Dentist Letter</b>		Generic dental letter should be forwarded to local dentist (see appendix)	
<b>Counselling</b>		Provide education about good dental hygiene & tobacco avoidance education	

## 6. References

- [1] da Fonseca MA. Management of mucositis in bone marrow transplant patients. *J Dent Hyg.* 1999 Winter;73(1):17-21.
- [2] Yamagata K, Onizawa K, Yoshida H, Yamagata K, Kojima Y, Koike K, et al. Dental management of pediatric patients undergoing hematopoietic stem cell transplant. *Pediatr Hematol Oncol.* 2006 Oct-Nov;23(7):541-8.
- [3] Schubert MM PD, Lloid ME. Oral complications. In: Thomas ED BK, Forman SJ., ed. *Hematopoietic Cell Transplantation.* 2nd ed. Malden: Blackwell Science, Inc 1999:751-63.
- [4] National Institutes of Health NCI. Diagnosis, Prevention and Treatment. Consensus Development Conference on Oral Complications of Cancer Therapies; 1990; Bethesda Md: National Institutes of Health; 1990.
- [5] Sonis S, Kunz A. Impact of improved dental services on the frequency of oral complications of cancer therapy for patients with non-head-and-neck malignancies. *Oral Surg Oral Med Oral Pathol.* 1988 Jan;65(1):19-22.
- [6] da Fonseca MA, Hong C. An overview of chronic oral graft-vs-host disease following pediatric hematopoietic stem cell transplantation. *Pediatr Dent.* 2008 Mar-Apr;30(2):98-104.
- [7] Scully C, Sonis S, Diz PD. Oral mucositis. *Oral Dis.* 2006 May;12(3):229-41.
- [8] Blijlevens N, Sonis S. Palifermin (recombinant keratinocyte growth factor-1): a pleiotropic growth factor with multiple biological activities in preventing chemotherapy- and radiotherapy-induced mucositis. *Ann Oncol.* 2007 May;18(5):817-26.
- [9] Kuhn A, Porto FA, Miraglia P, Brunetto AL. Low-level infrared laser therapy in chemotherapy-induced oral mucositis: a randomized placebo-controlled trial in children. *J Pediatr Hematol Oncol.* 2009 Jan;31(1):33-7.
- [10] Euvrard S, Kanitakis J, Claudy A. Skin cancers after organ transplantation. *N Engl J Med.* 2003 Apr 24;348(17):1681-91.
- [11] Curtis RE, Metayer C, Rizzo JD, Socie G, Sobocinski KA, Flowers ME, et al. Impact of chronic GVHD therapy on the development of squamous-cell cancers after hematopoietic stem-cell transplantation: an international case-control study. *Blood.* 2005 May 15;105(10):3802-11.
- [12] Treister NS, Woo SB, O'Holleran EW, Lehmann LE, Parsons SK, Guinan EC. Oral chronic graft-versus-host disease in pediatric patients after hematopoietic stem cell transplantation. *Biol Blood Marrow Transplant.* 2005 Sep;11(9):721-31.
- [13] Horwitz ME, Sullivan KM. Chronic graft-versus-host disease. *Blood Rev.* 2006 Jan;20(1):15-27.
- [14] Nakamura S, Hiroki A, Shinohara M, Gondo H, Ohyama Y, Mouri T, et al. Oral involvement in chronic graft-versus-host disease after allogeneic bone marrow transplantation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1996 Nov;82(5):556-63.
- [15] Soares AB, Faria PR, Magna LA, Correa ME, de Sousa CA, Almeida OP, et al. Chronic GVHD in minor salivary glands and oral mucosa: histopathological and immunohistochemical evaluation of 25 patients. *J Oral Pathol Med.* 2005 Jul;34(6):368-73.
- [16] Woo SB, Allen CM, Orden A, Porter D, Antin JH. Non-gingival soft tissue growths after allogeneic marrow transplantation. *Bone Marrow Transplant.* 1996 Jun;17(6):1127-32.

- [17] da Fonseca MA, Murdoch-Kinch CA. Severe gingival recession and early loss of teeth in a child with chronic graft versus host disease: a case report. *Spec Care Dentist*. 2007 Mar-Apr;27(2):59-63.
- [18] Dahllöf G, Jonsson A, Ulmner M, Huggare J. Orthodontic treatment in long-term survivors after pediatric bone marrow transplantation. *Am J Orthod Dentofacial Orthop*. 2001 Nov;120(5):459-65.
- [19] Group U-PMC. Mouth Care for Children and Young People with Cancer: Evidence-based Guidelines. 2006 [cited 19 October 2010]; Version 1:[Available from: [http://www.rcn.org.uk/\\_data/assets/pdf\\_file/0017/11276/mouth\\_care\\_cyp\\_cancer\\_guideline.pdf](http://www.rcn.org.uk/_data/assets/pdf_file/0017/11276/mouth_care_cyp_cancer_guideline.pdf)
- [20] Demarosi F, Lodi G, Carrassi A, Soligo D, Sardella A. Oral malignancies following HSCT: graft versus host disease and other risk factors. *Oral Oncol*. 2005 Oct;41(9):865-77.

**Appendix**

RCH UR:

Dentistry

Date

50 Flemington Road, Parkville  
Victoria 3052, Australia

Dentist Address

T. +61 3 9345 5344  
F. +61 3 9345 5488[www.rch.org.au/dentistry](http://www.rch.org.au/dentistry)**Re: Patient NAME / DOB:**  
Address

Dear Dentist

Please be advised that the above patient has been managed at the Royal Children's Hospital for a paediatric oncology illness and that secondary dental long term effects may occur.

It is recommended that the patient's oral health be reviewed annually with particular attention to the possibility of the following adverse effects:

- Enamel dysplasia
- Tooth root agenesis, thinning or blunting
- Tooth agenesis or microdontia
- Xerostomia, enamel demineralisation
- Temporomandibular joint dysfunction
- Facial skeletal and dental developmental anomalies

Should you require further information regarding the dental care of this patient, please contact the Dentistry Department for assistance.

Yours sincerely

**Dr Kerrod B Hallett**  
MDSc MPH FRACDS FICD  
Director, Dentistry