CLINICAL RECOMMENDATIONS: ORAL CARE OF THE PAEDIATRIC ONCOLOGY 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 paediatric oncology patients receiving chemotherapy and/or radiotherapy. A MEDLINE search was conducted using the terms “dental management of pediatric oncology patients”, “dental management of pediatric cancer patients”, “oral care and pediatric cancer”, “oral care and pediatric oncology”, “chemotherapy and oral mucositis” and “radiotherapy and stomatitis”. 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[1-3].

2. Background

Childhood cancer accounts for approximately 1% of all cancer cases in the population. In Australia, the annual incidence rate of malignant tumours in children under 15 years is approximately 13.8 per 100,000 children[4]. Approximately 600-700 children aged between birth and 15 years develop cancer each year in Australia[5]. Whereas most adult cancers are carcinomas with strong aetiological associations, childhood cancers derive from a wide range of different histological types of tumour with less aetiological connection.

The incidence, either of childhood cancer as a whole or of individual types of cancer, varies little from one country to the next and no racial group is exempt. There are more than 50 types of childhood cancers; the most common forms include leukaemias, lymphomas, central nervous system tumours, primary sarcomas of bone and soft tissues, Wilms' tumours, neuroblastomas and retinoblastomas. Acute leukaemias and tumours of the central nervous system account for approximately one-half of all childhood malignancies. Multimodal therapy (chemotherapy, radiotherapy and surgery) has resulted in an overall 5 year survival rate for childhood cancer of approximately 75%[6].

3. Rationale
Close collaboration between the child’s oncologist and the paediatric dentist is essential when planning appropriate multidisciplinary care. Odontogenic infection can potentially become a focus for life threatening sepsis in a child with severe myelosuppression during chemotherapy or following a bone marrow transplant[6-8]. Central venous lines used for the administration of chemotherapeutic agents are particularly prone to secondary infection from bacteraemia sourced from the oral cavity[1]. Occasionally, even mobile exfoliating primary teeth have been reported to cause severe facial cellulitis and secondary airway complication in the immunocompromised child[7].

4. Case selection

All children diagnosed with cancer should be screened bedside by a paediatric dentist prior to commencement of chemotherapy. When oral disease is noted, a paediatric dental consultant should assess the child more thoroughly within the department of dentistry. A comprehensive dental examination should be undertaken with the aid of appropriate radiographs and other clinical investigations. When dental treatment is needed prior to or during chemotherapy, careful planning with the oncology team is essential[8, 9]. At the time of diagnosis and during the initial stages of chemotherapy, dental care should be provided by the paediatric dentist within the hospital. Elective dental treatment should be delayed until the child is either in remission or on maintenance chemotherapy. Children in full remission for two years can be treated by a general dentist for most routine care, although a FBC is prudent if an invasive procedure is planned. Pulpal therapy of primary teeth during the induction and intensification phase of chemotherapy is contraindicated[1]. When pulpal therapy of permanent teeth is needed, the risk of bacteraemia and potential septicaemia must be weighed against the potential benefits of tooth conservation.

5. Clinical steps

Although oncology children require continual medical evaluation of treatment and decisions, oral care can be divided into three phases in accordance with the child’s medical status, cancer treatment and dental needs[10]. Each cancer treatment phase presents different oral problems and management strategies[1].

**STAGE 1: PRE-ONCOLOGY THERAPY**

**Objectives:**
- to manage acute dental pathology
- to eliminate a potential focus for dental related sepsis
- to investigate orofacial region for presence of malignancy[10]

<table>
<thead>
<tr>
<th>CLINICAL EVALUATION</th>
<th>RADIOPHGRAPHIC EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>to identify existing and potential sources of oral infection / sepsis</td>
<td>• panoramic film (mandatory for all patients)</td>
</tr>
<tr>
<td>to evaluate potential dental / oro-facial development anomalies</td>
<td>• periapical and bitewing films when clinically indicated</td>
</tr>
</tbody>
</table>

- head and neck exam
- intraoral soft tissue exam
- dental and periodontal status
- oral hygiene (OH) assessment
### TREATMENT PLAN

To prevent, stabilise and eliminate oral infections and potential complications.

- May require urgent care under GA on work in list with dental registrar
- Dental restorations (temporisation only, if appropriate)
- Extractions of pulpally involved teeth
- Extractions of exfoliating primary teeth
- Removal of orthodontic appliances and potential soft tissue irritants
- Dental scaling and prophylaxis
- Topical fluoride treatment

### PATIENT EDUCATION

To understand oral complications of disease and therapy, stress the importance of protocol compliance to minimise discomfort, to facilitate execution of dental treatment plan.

Discuss with parent or care giver:

- Examination findings and treatment plan
- Possible oral side effects of the chemotherapy regimen and therapies
- Issue patient information brochure
- Potential long-term complications (disturbances to oro-facial growth and development)

### GENERAL MANAGEMENT GUIDELINES

See appendix.

Routine dental care only if:

- Neutrophil count >1000
- Platelet count > 75,000
- Antibiotic prophylaxis if central venous line is present or neutrophil count <1000
- Allow 10 days for post-surgical wound healing
## ORAL HYGIENE INSTRUCTIONS

### TOOTH BRUSHING
- regular soft brush (soften under hot water before use)
- use 2-3 times daily
- preferably with a paediatric fluoride toothpaste (400ppm)
- brush teeth and tongue
- end-tufted toothbrushes are recommended (Oral B)
- contact department if patient does not have a suitable tooth brush

### FLOSSING
- once daily if patient older than 12 years and is used to regular flossing and can manage it atraumatically
- if not, it can be taught and emphasised following hospital discharge in the department

### MOUTH RINSES

<table>
<thead>
<tr>
<th>Normal saline:</th>
<th>general indications: recent tooth extraction sockets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>swish/spit 4 times daily</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sodium bicarbonate:</th>
<th>general indications: if patient has xerostomia or thick saliva</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>swish/spit 4 times daily</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aqueous chlorhexidine 0.12% (rinse or gel):</th>
<th>general indications: poor/fair OH, gingivitis, mouth ulcers, mucositis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>if children are prescribed chlorhexidine rinses, it should only be stopped if they can’t tolerate it anymore (due to burning/stinging sensations)</td>
</tr>
<tr>
<td></td>
<td>swish/gargle for 30 secs 3 times daily, preferably after meals, NPO for 30 minutes afterwards</td>
</tr>
<tr>
<td></td>
<td>brown staining of teeth and tongue may occur (removable later by hygienist in dental department)</td>
</tr>
<tr>
<td></td>
<td>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 sites on the mucosa)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neutral sodium fluoride 0.05% (rinse or gel):</th>
<th>general indications: high dental caries risk patents, prolonged xerostomia associated with head and neck radiotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>frequency of use to be determined by caries risk assessment</td>
</tr>
<tr>
<td></td>
<td>rinse 5mls nightly for 30 seconds before bedtime</td>
</tr>
<tr>
<td></td>
<td>gel applied in custom trays (made from dental impressions) for 3 minutes before bedtime</td>
</tr>
</tbody>
</table>

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

| To understand the oral complications during oncology treatment | • discussion of the possible oral complications of chemotherapy and radiotherapy  
• discussion of dental / oral exam findings and recommended treatment plan  
• issue the parent information brochure  
• discussion of the potential long-term effects of therapy on orofacial and dental development |
| --- | --- |
| To facilitate execution of dental treatment plan and encourage long term follow-up | • obtain written informed consent for dental management  
• arrange urgent care under GA at RCH on work in list with paediatric dental registrar  
• if not possible, arrange appropriate care at a public community dental clinic (if eligible) or private general dentist  
• use the referral letter template and copy to oncologist and family GP |
STAGE 2: DURING ONCOLOGY THERAPY

Objectives: to decrease the severity and prevalence of oral complications
to prevent the occurrence of opportunistic infections
to minimise adverse effects on the developing dentition
to reduce the prevalence and severity of mucositis[9-13]

ORAL HYGIENE

| TOOTH BRUSHING | • regular soft brush and paediatric fluoride toothpaste (400 ppm)  
|                | • soften brush with warm water prior to use  
|                | • 2-3 times daily  
|                | • use end-tufted tooth brushes  
|                | • use foam tooth brushes (toothettes) if child cannot use a brush  
|                | • if child cannot tolerate toothpaste, dip toothbrush in normal saline, sterile water or a sodium bicarbonate solution |

| FLOSSING | • once daily if patient is used to doing it  
|          | • discontinue if mucositis is present  
|          | • if patient is not used to it, do not emphasise it |

| MOUTH RINSES | • chlorhexidine 0.12% is the preferred prophylactic agent for mucositis[11]  
|              | • discontinue if patient has burning / stinging sensations or soft tissue dryness  
|              | • use sodium bicarbonate or normal saline as an alternative  
|              | • swish for one minute then spit out 3x during the day  
|              | • keep it cold (it soothes inflamed tissues)  
|              | • rinse mouth with water after each emesis episode to clear gastric acid from mouth to avoid tissue irritation / tooth decalcification  
|              | • hydrogen peroxide or alcohol based rinses are not recommended because they increases dryness, breakdown of newly formed tissues, disrupt the normal oral flora, there is increased risk of aspiration and foaming and are not well tolerated by children  
|              | • there is a limit to removal of hardened debris and management of periodontal infections with mouth rinses |
## ORAL MUCOSITIS MANAGEMENT

### PAIN
- systemic analgesics prescribed by oncologist
- topical 2% viscous xylocaine
  - do not gargle or swallow (keep gag reflex active)
  - gently swish / bathe tissues for at least 30 seconds
  - not to be used more than once every 3 hours
- other measures to be considered
- systemic analgesics
- ice packs to throat and cheeks prn
- ice blocks, popsicles, slushies
- bedside suction to clear oral secretions
- tissue debridement (for loose hyperkeratotic tissues only)

### LIP CARE
- use lanolin-based products
- avoid petroleum jelly, vaseline, mineral oil due to risk of aspiration, flammable, increase tissue dryness, can promote bacterial growth
- angular cheilitis, apply Daktarin or Kenalog cream applied tid with cotton bud

### ORAL INFECTIONS
- close monitoring of oral mucosa by dental consultant
- oral cultures for all suspicious lesions
- systemic meds are often needed for fungal and viral lesions in consultation with medical consultant

### GINGIVAL OR MUCOSAL HAEMORRHAGE
- identify source, usually an exfoliating tooth or socket
- apply WET gauze pressure packs
- use topical haemostatic agents (Surgicel, Thrombin, Gelfoam, Tranexamic Acid)
- systemic therapy (platelet transfusion as directed by medical consultant)

### FACIAL SWELLING
- common with oral mucositis and after radiotherapy
- ice packs 4-6 times daily for 20 minutes

### DENTAL TREATMENT
- see appendix for general management guidelines
- only emergency dental procedures should be undertaken
- extraction therapy on a work in list with dental registrar
- if neutrophil count <1000, appropriate antibiotic coverage is recommended
- emergency relief of toothache or jaw pain with systemic analgesia directed by medical consultant
- in the absence of obvious dental infection, oral pain is usually due to drug neurotoxicity (particularly vincristine)
STAGE 3: POST-ONCOLOGY THERAPY

ORAL HYGIENE

Objectives: to decrease the severity and prevalence of future oral diseases to minimise adverse effects on the developing dentition and facial skeleton[12]

| TOOTHBRUSHING          | • tooth brushing 2-3 times daily  
|                        | • use a paediatric fluoride toothpaste (400ppm) |

| FLOSSING               | • flossing once daily |

| MOUTH RINSES           | Neutral sodium fluoride 0.05% (rinse or gel):  
|                        | • general indications: high dental caries risk patients, prolonged xerostomia associated with head and neck radiotherapy  
|                        | • frequency of use to be determined by caries risk assessment  
|                        | • rinse 5mls nightly for 30 seconds before bedtime  
|                        | • gel applied in custom trays (made from dental impressions) for 3 minutes before bedtime |

| DENTAL RECALL          | • regular dental visits every 4-6 months (recall interval based on caries risk assessment)  
|                        | • xerostomic patients: every 3 months |

LONG TERM EFFECTS

| TASTE ALTERATION       | • common with head / neck radiation  
|                        | • usually returns to normal after 2-4 months  
|                        | • nutrition counselling may help |

| XEROSTOMIA             | • non alcohol based mouth rinses and oral hygiene  
|                        | • use a saliva substitute, methyl cellulose  
|                        | • frequent intake of liquids such as water  
|                        | • neutral 0.05% sodium fluoride application (rinses or gel)  
|                        | • frequency and delivery method to be determined by paediatric dental consultant |

| RADIATION CARIES       | • concurrent with xerostomia  
|                        | • use multiple topical fluoride treatments (gel or rinse) in custom trays  
|                        | • frequent dental review (every 3 months) |

| MUSCULAR TRISMUS       | • radiation damage to TMJ / masticatory muscles  
|                        | • limited jaw opening  
|                        | • physiotherapy and jaw exercises (Therabite) |
| ORO-DENTAL DEVELOPMENTAL DISTURBANCES | • tooth agenesis  
• short or non-existent roots  
• small poorly shaped crowns  
• early closure (blunting) of roots  
• enamel hypoplasia / hypomineralisation  
• microdontia  
• loss of alveolar bone height  
• loss of vertical dimension of lower facial third |
<table>
<thead>
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<tbody>
<tr>
<td>children &lt; 6 yrs: high risk</td>
<td></td>
</tr>
<tr>
<td>children 6-12 yrs: medium risk</td>
<td></td>
</tr>
<tr>
<td>children &gt; 12 yrs: low risk</td>
<td></td>
</tr>
</tbody>
</table>

| OSTEORADIONECROSIS | • compromised bone socket healing in previously irradiated bone  
• pack alveolar sockets with Gelfoam or Surgicel post extraction  
• antibiotic prophylaxis peri-operative may be helpful |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>rare in children</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX

BLOOD COUNTS

<table>
<thead>
<tr>
<th>TEST</th>
<th>NORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MALE</td>
</tr>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>13.5 – 17.5</td>
</tr>
<tr>
<td>Haematocrit (%)</td>
<td>40 – 52</td>
</tr>
<tr>
<td>Red blood cell count ( x 10^6 )</td>
<td>4.5 – 6.5</td>
</tr>
</tbody>
</table>

PLATELET DISORDERS

Disorders of platelets include increased platelets (thrombocytosis), decreased platelets (thrombocytopenia) or dysfunctional platelets

Normal platelet count – 150,000 / mm³ to 400,000 / mm³

Thrombocytosis: is a rare disorder which may be caused by polycythaemia, neoplasms, infection, and a physiological response to exercise, pregnancy, or adrenaline release.

Thrombocytopenia: is defined as a platelet count < 140,000 / mm³. Patients with platelet counts <75,000 / mm³ may exhibit post-surgical haemorrhage while counts <25,000 / mm³ cause spontaneous haemorrhage, easy bruising and petechiae and ecchymosis of the skin / mucosa.
DISEASES OF THE WHITE BLOOD CELLS (WBC)

Diseases of the leucocytes are among the most important disorders for dentists to understand since early oral signs and symptoms are prominent in this disease and dental treatment is complicated by the increase risk of infection.

### Different White Blood Cell Count

<table>
<thead>
<tr>
<th>Cell Type</th>
<th>Absolute Number per mm$^3$</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band</td>
<td>0 – 2,000</td>
<td>0 - 10</td>
</tr>
<tr>
<td>Neutrophil</td>
<td>3,000 – 6,000</td>
<td>30 - 75</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>1,500 – 4,000</td>
<td>20 - 50</td>
</tr>
<tr>
<td>Monocyte</td>
<td>200 – 900</td>
<td>1 – 12</td>
</tr>
<tr>
<td>Eosinophil</td>
<td>100 - 700</td>
<td>0 – 3</td>
</tr>
<tr>
<td>Basophil</td>
<td>20 - 150</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>

Total WBC (leucocyte) count: 4,000 to 11,000 cells/mm$^3$

**Leucopenia:** is a decrease in the absolute number of white blood cells, which may be divided into disorders causing decreased neutrophils (neutropaenia) or decreased lymphocytes (lymphopaenia) or both.

**Neutropaenia:** is not a disease but a sign of an underlying disorder affecting the bone marrow or peripheral blood.

<table>
<thead>
<tr>
<th>Neutropaenia</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>1,000 / mm$^3$ – 2,000 / mm$^3$</td>
</tr>
<tr>
<td>Moderate</td>
<td>500 / mm$^3$ – 1,000 / mm$^3$</td>
</tr>
<tr>
<td>Severe</td>
<td>&lt;500 / mm$^3$</td>
</tr>
</tbody>
</table>

Patients with severe neutropaenia are highly susceptible to overwhelming bacterial infection, making dental treatment accompanied by bacteraemia a risky procedure.

**ABSOLUTE NEUTROPHIL COUNT (ANC)**

*ANC = WBC X (%segs + % bands)*

*segs: mature neutrophils (polymorphs or PMNs)*

*bands: immature neutrophils*
# Mouthcare for Children and Young People with Cancer: Evidence Based Guidelines

## At a glance document, page 65.

### DENTAL CARE / TREATMENT

<table>
<thead>
<tr>
<th>Oral &amp; dental assessment</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Ideally by a dentist or dental hygienist linked to the cancer centre.</td>
</tr>
<tr>
<td></td>
<td>Any treatment required should be undertaken by a consultant or specialist paediatric dentist.</td>
</tr>
<tr>
<td></td>
<td>If there is not a paediatric dental unit liaising with the cancer centre there should be clear communication between the cancer centre and the routine dental provider.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dental assessment every 3 – 4 months</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Ideally by a dentist linked to the cancer centre (retain registration and communication with usual dental provider).</td>
</tr>
<tr>
<td></td>
<td>Any treatment required should be undertaken ideally by dentist linked to the cancer centre.</td>
</tr>
<tr>
<td></td>
<td>If not available, then by usual dental provider with clear communication &amp; guidance from the cancer centre.</td>
</tr>
<tr>
<td></td>
<td>By usual dental provider with clear communication &amp; guidance from the cancer centre.</td>
</tr>
</tbody>
</table>

### BASIC ORAL CARE

- Brush teeth well twice a day using fluoride toothpaste and soft toothbrush.
- Whilst in-patient, oral assessment using OAG and score recorded. Frequency of assessment determined by individual need.
- OAG score ≥8 means increased risk of oral complications.
- Use of additional aids e.g. floss, fluoride tablets and electric toothbrushes – by recommendation of dental team only. Chlorhexidine is not recommended unless – see below. (If unable to brush teeth, clean mouth with oral sponges moistened with water or diluted chlorhexidine)

### ORAL COMPLICATIONS

<table>
<thead>
<tr>
<th>PREVENTION</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic oral care (as above).</td>
<td>Basic oral care (as above).</td>
</tr>
<tr>
<td></td>
<td>Appropriate pain control.</td>
</tr>
<tr>
<td>Basic oral care.</td>
<td>Basic oral care, plus</td>
</tr>
<tr>
<td>Clinical decision required. If antifungal agent to be used, choose one absorbed from GI tract e.g. fluconazole, itraconazole or ketoconazole.</td>
<td>Clinical decision required about which antifungal agent to use, choose one that is absorbed from the GI tract e.g. fluconazole, itraconazole or ketoconazole.</td>
</tr>
<tr>
<td>Check treatment protocols.</td>
<td>Check treatment protocols.</td>
</tr>
<tr>
<td>Nystatin is not recommended.</td>
<td>Nystatin is not recommended.</td>
</tr>
<tr>
<td>Basic oral care</td>
<td>Basic oral care.</td>
</tr>
<tr>
<td>Consider saliva stimulants/artificial saliva.</td>
<td>Consider saliva stimulants/artificial saliva.</td>
</tr>
<tr>
<td>Basic oral care</td>
<td>Basic oral care.</td>
</tr>
<tr>
<td>Aciclovir is only recommended as a preventative strategy for herpes simplex in patients undergoing high dose chemotherapy with stem cell transplant / BMT</td>
<td>Mild and/or non progressive lip lesions: topical aciclovir.</td>
</tr>
<tr>
<td>Severe oral lesions or if oral cannot be tolerated: IV aciclovir. (for doses see BNF – Children)</td>
<td>Moderate/severe and/or progressive lip lesions &amp; for Mild/Moderate oral lesions: oral aciclovir.</td>
</tr>
</tbody>
</table>
REFERENCES


