Use of the dental hygiene interventions of scaling of teeth and root planing including curetting surrounding tissue, orthodontic and restorative practices, and other invasive interventions for persons\(^1\) with leukemia.

Cite as
College of Dental Hygienists of Ontario, CDHO Advisory Leukemia, 2017-12-12

Scaling of teeth and root planing including curetting surrounding tissue, orthodontic and restorative practices, and other invasive interventions (“the Procedures”).

**DISEASE/CONDITION(S)/PROCEDURE(S)**

Leukemia

**INTENDED USERS**

Advanced practice nurses
Dental assistants
Dental hygienists
Dentists
Denturists
Dieticians
Health professional students
Nurses
Patients/clients
Pharmacists
Physicians
Public health departments
Regulatory bodies

**ADVISORY OBJECTIVE(S)**

To guide dental hygienists at the point of care relative to the use of the Procedures for persons who have leukemia, chiefly as follows.

1. Understanding the medical condition.
2. Sourcing medications information.
3. Taking the medical and medications history.
4. Identifying and contacting the most appropriate healthcare provider(s) for medical advice.

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\(^1\) Persons includes young persons and children
5. Understanding and taking appropriate precautions prior to and during the Procedures proposed.
6. Deciding when and when not to proceed with the Procedures proposed.
7. Dealing with adverse events arising during the Procedures.
8. Keeping records.

TARGET POPULATION

Child (2 to 12 years)
Adolescent (13 to 18 years)
Adult (19 to 44 years)
Middle Age (45 to 64 years)
Aged (65 to 79 years)
Aged 80 and over
Male
Female

Parents, guardians, and family caregivers of children, young persons and adults with leukemia.

MAJOR OUTCOMES CONSIDERED

For persons who have leukemia: to maximize health benefits and minimize adverse effects by promoting the performance of the Procedures at the right time with the appropriate precautions, and by discouraging the performance of the Procedures at the wrong time or in the absence of appropriate precautions.

RECOMMENDATIONS

UNDERSTANDING THE MEDICAL CONDITION

Terminology used in this Advisory

Resources consulted
- Acute lymphocytic leukemia: PubMed Health
- Acute myeloid leukemia: PubMed Health
- Children with Leukemia: SickKids
- Chronic lymphocytic leukemia: PubMed Health
- Chronic myelogenous leukemia: PubMed Health
- Hairy cell leukemia: PubMed Health
- Leukemia Facts and Statistics: Leukemia and Lymphoma Society
- Leukemia: American Cancer Fund
- Leukemia: Leukemia & Lymphoma Society
- What is leukemia?: Canadian Cancer Society

Terminology and classifications vary among centres. Terminology and classifications used in this Advisory are as follows.
Leukemia, cancer of the blood that
1. begins within the bone marrow
2. involves lymphocytes
3. develops in the form of cancerous white blood cells, which
   a. increase uncontrollably
   b. interfere with the production of other blood cells, such as red cells
   c. spread in the blood stream to lymph nodes and other parts of the body
4. occurs as three main types
   a. acute leukemia
      i. acute lymphocytic leukemia
      ii. acute myelogenous leukemia
   b. chronic leukemia
      i. chronic lymphocytic leukemia
      ii. chronic myelogenous leukemia
   c. unusual cancer of the blood
      hairy cell leukemia.

Other terminology includes
1. Acute and chronic leukemias, which differ as follows
   a. acute leukemia, in which the affected cells
      i. from the outset are very abnormal
      ii. do not function normally causing health to deteriorate quickly
      iii. rapidly increase in number
   b. chronic leukemia, in which
      i. early in the disease
         1. the abnormal blood cells can still function
         2. symptoms may be absent
      ii. later in the disease, as the number of leukemia cells in the blood rises
         1. deterioration of health sets in
         2. symptoms develop.
3. Acute myelogenous leukemia, acute cancer in which the bone marrow makes many abnormal cells that
   a. do not develop normally
   b. cannot fight infections
   c. may result in abnormal red blood cells and platelets
   d. crowd out the normal red blood cells, white blood cells and platelets needed by the body.
4. Aphthous ulcers, canker sores, aphthous stomatitis, oral lesions of unknown cause that are frequently misdiagnosed, treated incorrectly, or ignored.
5. Biological therapy, a type of leukemia treatment with substances such as interferons that affect the immune system’s response to cancer.
6. Blast cells, immature blood cells in the blood or bone marrow.
7. Chronic lymphocytic leukemia, chronic cancer of a type of lymphocytes.
8. Chronic myelogenous leukemia is chronic cancer that
   a. starts inside bone marrow
   b. grows from cells that would normally become lymphocytes.
9. Cytogenetics, examination or study of chromosomes; in leukemia, of samples of peripheral blood, bone marrow, or lymph nodes.

10. Development of normal and abnormal blood cells with
   a. the normal process that produces blood cells in the bone marrow, which starts with the primitive, unspecialized stem cells that differentiate into immature cells called
      i. myeloid stem cells, which become myeloid blast cells, which then develop into
         1. white blood cells called granular leukocytes, which include
            a. basophils
            b. eosinophils
            c. neutrophils
         2. red blood cells
         3. platelets
      ii. lymphoid stem cells, which become lymphoid blast cells, which then develop into
         1. lymphocytes
         2. red blood cells
         3. platelets
   b. the abnormal process that produces leukemia creates deviant lymphocytes, termed leukemia cells, which develop from the immature cells, and which
      i. at first function normally or nearly so
      ii. in time outnumber the normal white blood cells, red blood cells, and platelets, impairing their functioning.

11. Erythema multiforme, an unusual allergic reaction that
   a. is characterized by red rashes, blisters and ulcers of the mouth and the skin, together or separately
   b. is commonly mild and self-limiting but in some forms may be severe and even fatal
   c. may recur, especially when the trigger is recurring herpes simplex virus infection
   d. is abrupt in onset and normally resolves without scarring in 2–6 weeks
   e. is of unknown cause but may be linked to some medications.

12. Granuloma, localized nodule of inflammation found in tissues, caused by various biological, chemical and physical irritants of tissue.

13. Hairy cell leukemia, an unusual cancer of the blood
   a. that affects B cells, a type of lymphocyte
   b. in which the affected cells appear “hairy” under the microscope because of fine projections coming from their surface.

14. Hematopoietic stem cell transplantation, which
   a. involves intravenous infusion of stem cells collected from bone marrow, peripheral blood, or umbilical cord blood
   b. is used to re-establish production of all types of blood cells in defective bone marrow.

15. Incidence, the number of new cases of a particular type of cancer diagnosed each year; differs from prevalence.

16. Interferons, a family of naturally occurring proteins produced by cells of the immune system
a. which direct the immune system’s attack on viruses, bacteria, tumors and other foreign substances that invade the body
b. which by attacking the invader slows, blocks, or changes its growth or function.

17. Lymphocytes, leukocytes, small white blood cells that
   a. are manufactured in the bone marrow
   b. circulate in the blood
   c. collect in the lymph nodes, spleen and tonsils
   d. defend the body against disease
   e. are fundamental to the immune system
   f. are of two main types
      i. B cells, which manufacture antibodies that attack bacteria and toxins
      ii. T cells, which attack body cells themselves when these are
         1. infected by viruses
         2. cancerous.

18. Monoclonal antibody, any member of a class of antibodies produced in the laboratory from a single clone of cells or cell line that consists of identical antibody molecules.

19. Mortality, the number of deaths each year due to a particular type of cancer or other disease.

20. Mucositis, oropharyngeal mucositis, a common, treatment-limiting side effect of cancer treatment, that
   a. may be severe enough to require interruption or discontinuation of cancer treatment
   b. may increase the risk of local and systemic infection
   c. may significantly affect quality of life
   d. requires care that is essentially **palliative**, that includes
      i. appropriate oral hygiene
      ii. non-irritating diet and oral care products
      iii. mouth rinses
      iv. topical anesthetics
      v. opioid analgesics.

21. Palliative care, which
   a. aims to improve the quality of life of persons and their families faced with life-threatening illness
   b. provides prevention and relief of suffering with early identification, careful assessment and effective treatment of pain and other challenges of a physical, psychosocial and spiritual nature.

22. Petechiae, flat round red spots the size of pinpoints under the skin surface, caused by bleeding into the skin.

23. Prevalence, the number of people currently suffering from an illness in a given year.

24. Purpura, purple-colored spots and patches occurring on the skin and in mucous membranes, including the lining of the mouth.

**Overview of leukemia**

Resources consulted
- **Acute lymphocytic leukemia: PubMed Health**
- **Acute myeloid leukemia: PubMed Health**
- **Children with Leukemia: SickKids**
- **Chronic lymphocytic leukemia**: PubMed Health
- **Chronic myelogenous leukemia**: PubMed Health
- **Hairy cell leukemia**: PubMed Health
- **Leukemia: The Leukemia & Lymphoma Society of Canada**
- **Leukemia Facts and Statistics: Leukemia and Lymphoma Society**
- **Leukemia: American Cancer Fund**
- **Leukemia: Leukemia & Lymphoma Society**
- **Leukemia: MedicineNet.com**
- **Leukemia: MedlinePlus**
- **Leukemia: PubMedHealth**
- **What is leukemia?: Canadian Cancer Society**

### Occurrence

1. **Leukemia** in children
   a. occurs as **acute lymphocytic leukemia** and **acute myelogenous leukemia** which together account for about 25 percent of all childhood cancers
   b. reflects significant advances in leukemia treatments, including chemotherapy, which have
      i. increased the probability of survival for a child diagnosed with **acute myelogenous leukemia** from 35 percent to 50–60 percent over the past twenty years
      ii. increased the probability of long-term survival to nearly 80 percent for some forms
      iii. have reached their peak effectiveness, so that, with current treatments
         1. complete, universal cures are not achieved with existing chemotherapy
         2. despite the initial favourable response to treatment, the leukemia recurs, reducing prospects of subsequent cure
         3. recurrence affects
            a. 40–60 percent of children with **acute myelogenous leukemia**
            b. 20–30 percent of children with **acute lymphocytic leukemia**
   2. **Acute lymphocytic leukemia** occurs
      a. usually affects children aged 3 to 7
      b. as the most common childhood acute leukemia
      c. also in adults
      d. when the cancerous **lymphocytes**
         i. are produced in large numbers in the body
         ii. replace normal cells in the bone marrow.
         iii. prevent the production of healthy blood cells
      e. as a life-threatening condition.
   3. **Acute myelogenous leukemia** occurs
      a. around age 60; rarely below age 40
      b. as one of the most common types of leukemia among adults
      c. more commonly in men than women
      d. when their bone marrow is occupied by abnormal cells, which
         i. grow quickly
ii. replace healthy blood cells
iii. eventually cause the bone marrow to stop working correctly thus
   1. decreasing the numbers of healthy blood cells
   2. increasing the risk of
      a. infection
      b. abnormal bleeding.

4. **Chronic lymphocytic leukemia** occurs
   a. most commonly in Jewish people of Russian or East European descent
   b. mostly in adults, around age 70
   c. rarely under age 40
   d. as a slow increase in B **lymphocytes**
   e. by spreading from the blood marrow to the blood and to
      i. lymph nodes
      ii. other organs such as the liver and spleen
   f. as eventual failure of the bone marrow.

5. **Chronic myelogenous leukemia** occurs
   most often in middle-aged adults and in children.

6. **Hairy cell leukemia** (which is usually classified as a form of chronic lymphocytic leukemia) occurs
   a. in men more often than women
   b. as a diagnosis at the average age of 55
   c. as a result of abnormal growth of B **lymphocytes**, which may lead to low numbers of normal blood cells.

**Cause**

1. **Acute lymphocytic leukemia**
   a. often lacks an obvious cause
   b. is associated with recognized **risk factors**.

2. **Acute myelogenous leukemia**
   a. often lacks an obvious cause
   b. is associated with recognized **risk factors**.

3. **Chronic lymphocytic leukemia**
   a. has no known cause
   b. lacks links to radiation, cancer-causing chemicals, or viruses.

4. **Chronic myelogenous leukemia**
   is usually associated with a chromosome abnormality called the **Philadelphia chromosome**.

5. **Hairy cell leukemia**
   has no known cause.

**Risk factors**

1. **Leukemia** risk factors generally include
   a. certain chromosome problems
   b. exposure to radiation, including x-rays before birth
   c. past treatment with chemotherapy drugs (**CDHO Advisory**)
   d. history of bone marrow transplant
   e. toxins such as benzene.
2. **Acute lymphocytic leukemia** risk factors include
   a. Down syndrome or other genetic disorders
   b. a sibling with leukemia.

3. **Acute myelogenous leukemia** risk factors include
   a. immunosuppression *(CDHO Advisory)* associated with organ transplant
   b. blood disorders, including
      i. polycythemia vera *(CDHO Advisory)*
      ii. essential thrombocythemia
      iii. myelodysplasia, refractory anemia
   c. exposure to
      i. toxins such as benzene
      ii. certain chemotherapy drugs *(CDHO Advisory)*
      iii. radiation
   d. genetic abnormalities.

4. **Chronic lymphocytic leukemia** risk factors
   a. are identified only as
      i. age
      ii. ethnicity
   b. are otherwise unknown.

5. **Chronic myelogenous leukemia** risk factors
   a. include radiation exposure
      i. from
         1. high-dose radiation treatments used in the past to treat
            a. thyroid cancer
            b. Hodgkin’s lymphoma
         2. nuclear disaster
            i. following which development of chronic myelogenous leukemia takes
               many years to develop
   b. but with the caution that most persons
      i. treated for cancer with radiation do not go on to develop leukemia
      ii. with chronic myelogenous leukemia have not been exposed to
          radiation.

6. **Hairy cell leukemia** risk factors
   are unknown.

**Signs and symptoms**

1. **Acute lymphocytic leukemia** signs and symptoms are non-specific, such as
   a. appetite loss, and weight loss
   b. bone and joint pain
   c. bruising and bleeding, including
      i. abnormal menstruation
      ii. bleeding gums
      iii. nosebleeds
      iv. skin bleeding
   d. discomfort below the ribs
   e. enlarged lymph glands in the neck, under the arms, and in the groin
   f. fever
   g. increased liability to infection
h. night sweats
i. pallor
j. petechiae
k. weakness and fatigue.

2. **Acute myelogenous leukemia** signs and symptoms are non-specific, such as
   a. bone pain or tenderness
   b. bruising and bleeding, including
      i. abnormal menstruation
      ii. bleeding gums
      iii. nosebleeds
      iv. skin bleeding
   c. fatigue
d. fever
e. pallor
f. shortness of breath, worsened with exercise
g. skin rash or lesion
h. swollen gums (rare)
i. weight loss.

3. **Chronic lymphocytic leukemia** signs and symptoms
   a. usually develop slowly over time
   b. are often detected by blood tests done for reasons unrelated to chronic lymphocytic leukemia
   c. include
      i. abnormal bruising, which occurs late in the course of the disease
      ii. enlarged lymph nodes, liver, or spleen
      iii. excessive sweating, night sweats
      iv. fatigue
      v. fever
      vi. infections that recur
      vii. loss of appetite or early satiety
      viii. weight loss.

4. **Chronic myelogenous leukemia** signs and symptoms
   a. derive from rapid growth of the immature blood-forming cells in the bone marrow, blood, and body tissues
   b. are grouped into phases
      i. accelerated phase, which
         1. is dangerous because during it the leukemia cells grow quickly
         2. may be associated with
            a. fever
            b. bone pain
            c. swollen spleen
      ii. **blast crisis** phase, which
         1. occurs in the absence of treatment
         2. arises when more than 30 percent of the cells in the blood or bone marrow are blast cells
         3. results in fatigue, fever, and an enlarged spleen
      iii. chronic phase
         1. which may last for months or years
2. during which symptoms are few or absent
3. during which the diagnosis is commonly made following tests for other reasons.

5. **Hairy cell leukemia** signs and symptoms include
   a. easy bruising or bleeding
   b. excessive sweating, especially at night
   c. fatigue
   d. feeling full after eating only a small amount
   e. recurrent infections and fevers
   f. swollen lymph glands
   g. weakness
   h. weight loss.

**Medical investigation**

1. **Acute lymphocytic leukemia** investigation involves
   a. physical examination for
      i. bruising
      ii. enlargement of
         1. liver
         2. lymph nodes
         3. spleen
      iii. signs of bleeding
         1. **petechiae**
         2. **purpura**
   b. blood tests, such as
      i. complete blood count, including white blood cell count
      ii. platelet count
      iii. bone marrow aspiration and biopsy
      iv. lumbar puncture to check for leukemia cells in the spinal fluid
   c. chromosome tests, for changes in the cells of some leukemias.

2. **Acute myelogenous leukemia** investigation involves
   a. physical examination for
      i. enlargement of
         1. liver
         2. lymph nodes
         3. spleen
      ii. bruising
   b. blood tests, such as
      i. complete blood count
         1. anemia
         2. platelets
         3. white blood cell count
      ii. bone marrow aspiration.

3. **Chronic lymphocytic leukemia** investigation involves
   a. physical examination for
      i. enlargement of
         1. liver
         2. lymph nodes
         3. spleen
ii. bruising
b. blood tests, such as
   i. complete blood count with white blood cell differential
   ii. bone marrow biopsy
   iii. CT scan of the chest, abdomen, and pelvis
   iv. immunoglobulin testing
   v. lactate dehydrogenase test
   vi. staging tests to gauge how much the cancer has spread
c. testing of chromosomes within the cancer cells.

4. **Chronic myelogenous leukemia** investigation involves
   a. physical examination for an enlarged spleen
   b. blood tests, such as
      i. complete blood count
      ii. bone marrow biopsy
      iii. blood and bone marrow testing for the presence of the Philadelphia chromosome
      iv. platelet count.

5. **Hairy cell leukemia** investigation involves
   a. physical examination for an enlarged spleen
   b. tests, such as
      i. abdominal CT scan
      ii. bone marrow biopsy and blood tests to detect hairy cells
      iii. complete blood count of white and red blood cells, and platelets
      iv. tests to confirm the cancer diagnosis.

**Treatment**

1. **Acute lymphocytic leukemia** treatment
   a. aims to return blood counts to normal, which produces remission when the
      i. blood counts are normal
      ii. bone marrow looks healthy with microscopy
   b. involves chemotherapy (**CDHO Advisory**)
      i. for the brain and spinal cord, which may be delivered directly into the
         space around the brain or into the spinal column
      ii. accompanied by radiation therapy (**CDHO Advisory**) to the brain
      iii. may be needed to prevent recurrence
   c. may require isolation by hospitalization if the white blood cell count is low
      enough to risk infection
   d. may require bone marrow or stem cell transplant
   e. may also require additional treatments, such
      i. antibiotics
      ii. blood transfusion.

2. **Acute myelogenous leukemia** treatment
   a. involves chemotherapy (**CDHO Advisory**)
   b. may require isolation by hospitalization if the white blood cell count is low
      enough to risk infection
   c. may include
      i. antibiotics to treat infection
      ii. bone marrow transplant or stem cell transplant after radiation and chemotherapy
iii. blood transfusions of
   1. red blood cells to combat anemia
   2. platelets to control bleeding.
3. **Chronic lymphocytic leukemia** treatment
   a. is not usually given for the early stage
      i. though the medical condition is closely monitored
      ii. unless
         1. chromosome testing indicates high risk
         2. infections are recurrent
         3. the condition is worsening rapidly
         4. blood counts are unfavourable
         5. fatigue, loss of appetite, weight loss, or night sweats are occurring
   b. may sometimes involve radiation for painfully enlarged lymph nodes
   c. may require blood transfusions or platelet transfusions
   d. may involve bone marrow or stem cell transplantation which
      i. are used in younger persons with advanced or high-risk condition
      ii. provides the only potential cure
   e. may involve chemotherapy (*CDHO Advisory*).
4. **Chronic myelogenous leukemia** treatment, which
   a. in the *blast crisis* phase is very difficult
   b. involves medications
   c. has as the only known cure bone marrow transplant or stem cell transplant.
5. **Hairy cell leukemia** treatment
   a. may not be needed for the early stages of this disease though occasional blood
      transfusions may be required
   b. involves
      i. medications
      ii. antibiotics to treat infections
   c. may involve surgical removal of the spleen
   d. may involve growth factors and, possibly, transfusions for low blood counts.

**Prevention**
1. **Acute lymphocytic leukemia** prevention involves avoidance of and protection against
   a. certain chemicals
   b. certain toxins
   c. radiation.
2. **Acute myelogenous leukemia** prevention involves avoidance of and protection against
   a. certain chemicals
   b. certain toxins
   c. radiation.
3. **Chronic lymphocytic leukemia** prevention lacks any known method.
4. **Chronic myelogenous leukemia** prevention is limited to avoidance of exposure to radiation.
5. **Hairy cell leukemia** prevention lacks any known method.
Prognosis

1. **Leukemia** prognosis
   a. is poor for leukemias with certain types of chromosome changes
   b. otherwise can be good or very good with other types of genes.

2. **Acute lymphocytic leukemia** prognosis
   a. is good for
      i. children between ages of 1 and 9, who
         1. usually have a better outcome than adults
         2. can often be cured
      ii. adults below age 50
      iii. persons who
         1. have white blood cell counts below 50,000 at first diagnosis
         2. do not have a specific genetic change called Philadelphia chromosome
         3. pass into remission within 4 - 5 weeks of starting treatment
   b. is poor for persons whose leukemia spreads to the brain or spinal cord.

3. **Acute myelogenous leukemia** prognosis
   a. is good for younger persons who receive treatment
   b. is poor or doubtful for adults who develop the disease at an older age
   c. reflects remission, which
      i. is complete in most persons
      ii. if not followed by relapse of the cancer within five years is considered evidence of cure.

4. **Chronic lymphocytic leukemia** prognosis
   a. depends on the stage of the cancer
   b. is good for some 50 percent of patients diagnosed in the early stages of the disease, who live more than 12 years.

5. **Chronic myelogenous leukemia** prognosis
   a. has markedly improved with the introduction of targeted therapy
   b. may be improved by stem cell transplantation, which is usually considered in persons whose disease relapses.

6. **Hairy cell leukemia** prognosis
   a. has markedly improved with the introduction of new chemotherapy treatments
   b. for most persons with hairy cell leukemia includes the expectation of survival of 10 years or longer following diagnosis.

Social considerations

**Leukemia** is the focus of various support groups and organizations offering support groups, including
- American Cancer Society
- Cancer Care
- International Leukemia Support Groups
- National Cancer Institute
- The Leukemia and Lymphoma Society
- The Ottawa Hospital Support Groups
Multimedia and images

- Acute lymphocytic leukemia - photomicrograph
- Chronic lymphocytic leukemia - microscopic view
- Chronic myelocytic leukemia - microscopic view
- Enlarged spleen
- Formed elements of blood
- Immune system structures

Comorbidity, complications and associated conditions

Comorbid conditions are those which co-exist with hemophilia, von Willebrand disease or other bleeding disorder but which are not believed to be caused by it. Complications and associated conditions are those that may have some link with it. Distinguishing among comorbid conditions, complications and associated conditions may be difficult in clinical practice.

1. For leukemia in general, comorbid conditions, complications and associated conditions include
   a. granulomas
   b. metastatic cancer
   c. oral conditions, such as
      i. dental caries
      ii. dental pain
      iii. dental/skeletal growth and development alterations in children and adults
      iv. endodontic infections
      v. gingivitis, which is the first sign of leukemia in about 25 percent of children with leukemia
      vi. infiltration of the gingivae by leukemia cells
      vii. mucosal infections
      viii. muscle tremor in jaws or tongue
      ix. oral bleeding
      x. oral ulceration
         1. aphthous ulcers
         2. erythema multiforme
         3. oropharyngeal mucositis
      xi. periodontitis
      xii. taste dysfunction
      xiii. temporomandibular dysfunction
         1. jaw pain
         2. headache
         3. joint pain
      xiv. xerostomia.

2. For the types of leukemia, comorbid conditions, complications and associated conditions of include
a. **acute lymphocytic leukemia**
   i. bleeding
   ii. damage to different organs from chemotherapy
   iii. **disseminated intravascular coagulation**
   iv. relapse
   v. severe infection
   vi. spread to other parts of the body.

b. **acute myelogenous leukemia**
   i. severe infections
   ii. life-threatening bleeding
   iii. relapses.

c. **chronic lymphocytic leukemia**
   i. autoimmune hemolytic anemia
   ii. bleeding from low platelet count
   iii. hypogammaglobulinemia, reduced levels of antibodies, with increase in risk of infection
   iv. **idiopathic thrombocytopenic purpura**
   v. infections that recur
   vi. overwhelming fatigue
   vii. other cancers, such as aggressive lymphoma (**CDHO Advisory**)
   viii. side effects of chemotherapy.

d. **chronic myelogenous leukemia**
   i. **blast crisis**, leading to
      1. infection
      2. bleeding
      3. fatigue
      4. unexplained fever
      5. kidney problems
   ii. serious side effects of chemotherapy.

e. **hairy cell leukemia**
   i. arise from low blood counts
   ii. include
      1. infections
      2. fatigue
      3. excessive bleeding.

**Oral health considerations**

Adapted from
- A prospective study to evaluate a new dental management protocol before hematopoietic stem cell transplantation: Nature.com
- Bleeding Disorders of Importance in Dental Care and Related Patient Management: Journal of the Canadian Dental Association
- Dental abnormalities in children after chemotherapy treatment for acute lymphoid leukemia: Leukemia Research
- Gingivitis due to Leukemia in Children: Merck Home Health
- Oral and Dental Management After Cancer Therapy: National Cancer Institute
Oral healthcare
1. is important at all the stages of leukemia, including
   a. after medical diagnosis is made but prior to treatment decisions
   b. as a precursor to specific types of treatment
   c. during treatment with chemotherapy and radiation therapy
   d. after completion of treatment
   e. throughout all the stages of detection and treatment of oral complications of cancer
2. includes instruction on oral self-care to keep the mouth clean and healthy
3. emphasizes prevention, detection and treatment of oral infection which can
   a. degrade the quality of life
   b. lead to systemic infections that
      i. may spread because of the immunocompromised state that accompanies leukemia
      ii. may be induced by treatment
      iii. may be life-threatening
      iv. include
         1. oral mucositis, caused by chemotherapy or radiotherapy
         2. fungal infections, such as oral candidiasis, which are treated with antifungal drugs
         3. bacterial infections, which are treated with antibiotics
         4. viral infections, especially with the herpes simplex virus, which
            a. cause pain and blistering on or around the lips and within the mouth
            b. because of the immunocompromised state induced by cancer treatment may
               i. be extensive
               ii. be recurrent, and particularly aggressive, painful and slow to heal
               iii. increase susceptibility to the development of drug-resistant strains of the virus
               iv. be treated with antiviral medications
4. emphasizes prevention, detection and treatment of various oral conditions that develop during or as a sequel to treatment, including
   a. mouth conditions, such as
      i. dental abnormalities in children
      ii. dental caries and endodontic disease
      iii. ill-fitting dentures resulting from oral changes
      iv. periodontal disease
      v. salivary abnormalities
   b. temporomandibular dysfunction
   c. taste dysfunction
5. supports hematopoietic stem cell transplantation with
   a. assessment of hematopoietic stem cell transplant patients
b. careful consideration of the priority accorded to the type and scheduling of oral healthcare interventions to avoid unnecessary interventions and to fit in with the transplantation regimens, given
   i. that stem cell transplants are essential treatment for many persons with leukemia
   ii. the widely held view that, in the mouth, infectious processes which invade the bone pose the highest risk if left untreated prior to the chemotherapy used to prepare for stem cell transplantation

6. aims at detection and treatment of oral comorbidities, complications or associated conditions

7. supports nutritional requirements, which are important during cancer treatment, by treating oral health problems that discourage eating well, such as
   a. taste dysfunction
   b. oral mucositis

8. takes account of medical advice pertaining to children and adults relative to the
   a. the level of a child’s oral health
      i. as a significant determinant in the outcomes of cancer treatments
      ii. a child who is immunosuppressed is at high risk for septicemia originating in oral infections
   b. requirements for antibiotic prophylaxis
   c. advisability of active dental treatment when leukemia is not in remission
   d. management of dental pain and, in particular, when it should be treated conservatively with antibiotics and analgesics
   e. bleeding risk
      i. generally
      ii. from deep hemorrhage from regional-block anesthesia positions a patient/client with leukemia as a patient/client with special needs.

**MEDICATIONS SUMMARY**

**Sourcing medications information**

1. Adverse effect databases
   - Health Canada’s Marketed Health Products Directorate
     - toll-free 1-866-234-2345
     - Health Canada’s Drug Product Database

2. Specialized organizations
   - US National Library of Medicine and the National Institutes of Health Medline Plus Drug Information

3. Medications considerations
   All medications have potential side effects whether taken alone or in combination with other prescription medications, or as over-the-counter (OTC) or herbal medications.

4. Information on herbals and supplements
   - US National Library of Medicine and the National Institutes of Health Medline Plus Drug Information All Herbs and Supplements
5. Complementary and alternative medicine

National Center for Complementary and Integrative Health

Medications for certain types of leukemia

1. **Chronic lymphocytic leukemia**
   - alemtuzumab injection (Campath®)
   - bendamustine injection (Treanda®)
   - chlorambucil (Leukeran®)
   - cyclophosphamide (Cytoxan®)
   - fludarabine injection (Fludara®)
   - rituximab injection (Rituxan®)

2. **Chronic myelogenous leukemia**
   - dasatinib (Sprycel®)
   - hydroxyurea (Droxi®-Hydrea®)
   - imatinib (Gleevec®)
   - nilotinib (Tasigna®)

3. **Hairy cell leukemia**
   - cladribine (Leustatin®)

Medications for specific purposes

1. Antiviral medications, such as
   - acyclovir (Zovirax®)
   - famciclovir (Famvir®)
   - penciclovir (Denavir®)
   - valacyclovir (Valtrex®)

2. Antifungal medications that are
   a. absorbed or partially absorbed into the body are most helpful to prevent fungal infections in the mouth, such as
      - fluconazole (Diflucan®)
      - ketoconazole (Nizoral®)
   b. not absorbed into the body are less helpful, such as
      - nystatin (Mycostatin®, Nystat-Rx®)

3. Medications and specialized treatments associated with anti-cancer therapy
   a. chemotherapy
   b. radiation therapy
   c. biological therapy
      i. chronic lymphocytic leukemia: monoclonal antibody, to bind to and kill leukemia cells
      ii. chronic myeloid leukemia: interferon
         1. to slow the growth of leukemia cells
         2. to supplement other medication treatment, such as imatinib
   d. stem cell transplantation
      i. is preceded by high doses of chemotherapy and or radiation, which destroys normal as well as abnormal cells in the bone marrow
      ii. replaces the destroyed normal cells
      iii. is delivered with
         1. bone marrow transplantation
         2. blood
3. umbilical cord blood
   a. directly from a newborn baby
   b. from a frozen store

   iv. is sourced from
   1. the person’s own stem cells
   2. a donor with matching cells
   3. the person’s healthy identical twin

e. targeted therapy, which uses substances intended to block the growth and spread of cancer, while reducing the harm to normal cells; approved for chronic myeloid leukemia with
   = imatinib (Gleevec®)

Side effects of medications and related substances

1. A powerful factor influencing side effects is that currently available leukemia treatments lack specificity for leukemic cells; side effects that impair the functioning of normal cells and tissues in the body
   a. are common
   b. may cause life-threatening acute complications
   c. in children result in long-term effects on health and wellbeing that extend into adulthood.

2. Chemotherapy side effects
   a. affect other rapidly dividing cells, such as
      i. blood cells, increasing the risk of
         1. anemia
         2. bleeding problems
         3. infection
      ii. hair cells roots, leading to temporary hair loss
      iii. gastrointestinal tract cells, causing
         1. diarrhea
         2. loss of appetite
         3. mouth and lip sores
         4. nausea
         5. vomiting
   b. depend mainly on the specific medications and the dose
   c. generally affect cells that divide rapidly, such as leukemia cells
   d. impair
      i. fertility
         1. in both sexes
         2. in later life of some children
      ii. menstruation.

3. Biological therapy side effects vary
   a. with the substance or agent used
   b. among persons
   c. common side effects include
      i. rashes or swelling of skin adjacent to places where the substances or agents are injected
      ii. influenza-like symptoms
      iii. anemia.
4. Radiation therapy side effects, which depend on the area of the body treated, include
   a. fatigue
   b. redness, dryness and sensitivity of skin in the treated area.

5. Stem cell transplantation side effects
   a. reflect of the large doses of chemotherapy and radiation involved, which
      increases certain risks, including
      i. infection
      ii. bleeding
   b. include graft-versus-host disease
      i. which may occur in persons who receive stem cells from a donor’s
         bone marrow
      ii. in which the donated stem cells react against the recipient’s tissues
      iii. most commonly may involve one of the following
           1. liver
           2. skin
           3. gastrointestinal tract
      iv. ranges from mild to very severe
      v. can occur any time, even years, after the transplant.

6. Targeted therapy chiefly affects leukemia cells, resulting in fewer side effects than
   other chemotherapy medications.

See the links above to the specific medications.

THE MEDICAL AND MEDICATIONS HISTORY

The dental hygienist in taking the medical and medications history-taking should
1. focus on screening the patient/client prior to treatment decision relative to
   a. key symptoms
   b. medications considerations
   c. contraindications
   d. complications
   e. comorbidities
   f. associated conditions
2. explore the need for advice from the appropriate primary care provider(s)
3. inquire about
   a. the patient/client’s understanding and acceptance of the need for oral
      healthcare
   b. troublesome symptoms associated with the leukemia, treatment or
      complications, such as
      i. bleeding
      ii. fatigue associated with anemia
      iii. recurrent minor infections or poor healing of minor cuts associated with
           abnormal white cells
   c. antibiotic prophylaxis, previous use and present indications
   d. medications considerations, including over-the-counter medications, herbals
      and supplements
   e. problems with previous dental/dental hygiene care
   f. problems with infections specifically associated with dental/dental hygiene care
g. the patient/client’s present state of health
h. how the patient/client’s current symptoms relate to
   i. oral health
   ii. health generally
   iii. recent changes in the patient/client’s condition.

IDENTIFYING AND CONTACTING THE MOST APPROPRIATE HEALTHCARE PROVIDER(S) FOR ADVICE

Identifying and contacting the most appropriate healthcare provider(s) from whom to obtain medical or other advice pertinent to a particular patient/client

The dental hygienist should
1. record the name of the physician/primary care provider most closely associated with the patient/client’s healthcare, and the telephone number
2. obtain from the patient/client or parent/guardian written, informed consent to contact the identified physician/primary healthcare provider
3. use a consent/medical consultation form, and be prepared to fax the form to the provider
4. include on the form a standardized statement of the Procedures proposed, with a request for advice on proceeding or not at the particular time, and any precautions to be observed.

UNDERSTANDING AND TAKING APPROPRIATE PRECAUTIONS

Infection Control

Dental hygienists are required to keep their practices current with infection control policies and procedures, especially in relation to
1. the CDHO’s Infection Prevention and Control Guidelines (2019)
2. relevant occupational health and safety legislative requirements
3. relevant public health legislative requirements
4. best practices or other protocols specific to the medical condition of the patient/client.

DECIDING WHEN AND WHEN NOT TO INITIATE THE PROCEDURES PROPOSED

The dental hygienist should
1. consult with the treating physician to obtain a medical clearance for implementing the Procedures. This is a blood disorder as per Ontario Regulation 501/07 pursuant to the Dental Hygiene Act, 1991.
2. may postpone the Procedures pending medical advice if the patient/client
   a. appears debilitated
   b. is experiencing symptoms suggestive of complications of leukemia or its treatment
   c. has not complied with pre-medication, including antibiotic prophylaxis, as directed by the prescribing physician
   d. has recently changed significant medications, under medical advice or otherwise
   e. recently experienced changes in his/her medical condition such as medication or other side effects of treatment
f. is unable to provide the dental hygienist with sufficient information about
   i. medications
   ii. other treatments such as chemotherapy
   iii. bleeding problems
   iv. recurrent infections

g. has undergone or is about to undergo chemotherapy or radiation therapy or stem cell transplantation (for which medical clearance is required)

h. is being treated with medications (including corticosteroids) associated with immunosuppression +/- increased risk of infection (for which medical clearance is required)

i. has, or is suspected to have, bisphosphonate-related osteonecrosis of the jaw (BRONJ)

j. has a history of oral healthcare that required
   i. antibiotic prophylaxis
   ii. pre-medication

k. has symptoms or signs of
   i. exacerbation of the medical condition
   ii. comorbidity, complication or an associated condition of leukemia (including anemia and thrombocytopenia)

l. not recently or ever sought and received medical advice relative to oral healthcare procedures

m. is deeply concerned about any aspect of his or her medical condition.

DEALING WITH ANY ADVERSE EVENTS ARISING DURING THE PROCEDURES

Dental hygienists are required to initiate emergency protocols as required by the College of Dental Hygienists of Ontario’s Standards of Practice, and as appropriate for the condition of the patient/client.

First-aid provisions and responses as required for current certification in first aid.

RECORD KEEPING

Subject to Ontario Regulation 9/08 Part III.1, Records, in particular S 12.1 (1) and (2) for a patient/client with a history of leukemia, the dental hygienist should specifically record
1. a summary of the medical and medications history
2. any advice received from the physician/primary care provider relative to the patient/client’s condition
3. the decision made by the dental hygienist, with reasons
4. compliance with the precautions required
5. all Procedure(s) used
6. any advice given to the patient/client.

ADVISING THE PATIENT/CLIENT

The dental hygienists should
1. urge the patient/client to alert any healthcare professional who proposes any intervention or test
   a. that he or she has a history of leukemia
   b. to the medications he or she is taking
2. should discuss, as appropriate
   a. the importance of the patient/client’s
      i. self-checking the mouth regularly for new signs or symptoms
      ii. reporting to the appropriate healthcare provider any changes in the mouth
   b. the need for regular oral health examinations and preventive oral healthcare
   c. oral self-care including information about
      i. choice of toothpaste
      ii. tooth-brushing techniques and related devices
      iii. dental flossing
      iv. mouth rinses
      v. management of a dry mouth
   d. the importance of an appropriate diet in the maintenance of oral health
   e. for persons at an advanced stage of a disease or debilitation
      i. regimens for oral hygiene as a component of supportive care and palliative care
      ii. the role of the family caregiver, with emphasis on maintaining an infection-free environment through hand-washing and, if appropriate, wearing gloves
      iii. scheduling and duration of appointments to minimize stress and fatigue
   f. comfort level while reclining, and stress and anxiety related to the Procedures
   g. medication side effects such as dry mouth, and recommend treatment
   h. mouth ulcers and other conditions of the mouth relating to leukemia, comorbidities, complications or associated conditions, medications or diet
      i. pain management.

| BENEFITS/HARMS OF IMPLEMENTING THE RECOMMENDATIONS |

**POTENTIAL BENEFITS**

1. Promoting health through oral hygiene for persons who have leukemia.
2. Reducing the adverse effects, such as infection in an immunosuppressed patient/client by
   a. ascertaining through medical advice whether or not antibiotic prophylaxis is required and by proceeding accordingly
   b. generally increasing the comfort level of persons in the course of dental-hygiene interventions
   c. using appropriate techniques of communication
   d. providing advice on scheduling and duration of appointments.
3. Reducing the risk of oral health needs being unmet.

**POTENTIAL HARMs**

1. Failing to take account of bleeding problems and causing excessive bleeding.
2. Performing the Procedures at an inappropriate time, such as
   a. when the patient/client’s leukemia is
      i. not in remission
      ii. at a stage of treatment when the Procedures should be postponed
   b. in the presence of complications for which prior medical advice is required
   c. in the presence of acute oral infection without prior medical advice.
3. Disturbing the normal dietary and medications routine of a person with leukemia.
4. Inappropriate management of pain or medication.
### CONTRAINDICATIONS

#### CONTRAINDICATIONS IN REGULATIONS

Identified in the *Dental Hygiene Act, 1991 – O. Reg. 218/94 Part III*

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