KNOWLEDGE, PERCEIVED ABILITY, AND PRACTICE BEHAVIORS REGARDING ORAL HEALTH AMONG PEDIATRIC HEMATOLOGY AND ONCOLOGY NURSES.

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A thesis submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Science in Dental Hygiene Education in the Department of Dental Ecology, School of Dentistry.

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ABSTRACT

ANTIANA D. PERRY: Knowledge, Perceived Ability, and Practice Behaviors Regarding Oral Health among Pediatric Hematology and Oncology Nurses
(Under the direction of Dr. Hiroko Iida)

The purpose of this study was to examine the knowledge, perceived ability, and practice behaviors of pediatric oncology and hematology nurses in assisting with the various oral health care needs of pediatric oncology patients and to identify pediatric oncology nurses’ previous training/education, practice types, and other demographic characteristics that are related to their oral health competencies. A survey of a convenience sample of nurses was conducted during the Association of Pediatric Oncology and Hematology Nurses’ (APHON) 36th Annual Conference and Exhibit. Among the 300 surveys that were distributed, 235 surveys were returned, giving a response rate of 78%. Approximately 75% of survey participants reported receiving less than 3 hours of oral health related education/training and 60% did not have a clinical requirement regarding the assessment of the teeth and gums during their nursing school education. Pediatric oncology nurses’ knowledge, perceived ability, and practice behaviors vary by topic and might reflect their educational preparedness.
ACKNOWLEDGEMENTS

First and foremost, I would like to thank my thesis advisor, Dr. Hiroko Iida, for her profound patience, expertise, and assistance throughout this process. She was instrumental in helping to develop this project, finding the appropriate people and funding to carry out the project, editing various writings and presentations throughout the process, and keeping me on track. For this, I am forever grateful. I would not have been able to produce this project without you!

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I would like to thank my wonderful family for their love and support throughout this process. It has been a long time coming, but I am finally done! I would especially like to thank my mother, sister, niece, and nephews for their unconditional love and unwavering faith in me. It is my deepest desire in life to make you all proud and to keep smiles on your faces in this unpredictable and sometimes uneasy world that we live in. My successes are your successes and I will never forget the love, affection, and dedication you showed me throughout my life and academic career. Mom, you were instrumental in me being who I am today and I will forever strive to be as great of a person as you are!

Lastly, to my best friend, thank you for helping me through the toughest year of my life. You taught me how to be a better human being. Because of you I am kinder, calmer, and have learned how to see the goodness in all people despite their faults. I am forever grateful for the happiness you have brought into my life and will never forget how instrumental you were in helping me become a better me!
# TABLE OF CONTENTS:

LIST OF TABLES: .................................................................v

LIST OF FIGURES: ............................................................vi

LIST OF ABBREVIATIONS: ....................................................vii

Chapter

I. INTRODUCTION ..........................................................1

II. REVIEW OF THE LITERATURE .......................................3

   a. Cancer in the Pediatric Population ..........................3

   b. Oral Complications of Childhood Cancer ...............3

   c. Oral Care for the Pediatric Oncology Patient ..........5

   d. Clinical Practice Guidelines for the Prevention
      and Treatment of Oral Complications ..........6

   e. Nurse Training and Qualifications ......................8

   f. Purpose .................................................................8

III. INTRODUCTION AND REVIEW OF THE LITERATURE ......10

IV. MATERIALS AND METHODS .......................................18

V. RESULTS .................................................................20

VI. DISCUSSION ..........................................................23

VII. CONCLUSIONS ......................................................26

VIII. TABLES AND FIGURES .............................................27

APPENDIX ........................................................................35

REFERENCES ....................................................................39
LIST OF TABLES:

Table 1. Demographic and professional characteristics of survey participants (N=235)…………………………………………………………………………..27

Table 2. Quantile for domain of oral health related knowledge by survey respondents’ background characteristics (N=235)………………………………32

Table 3. Quantile for domains of confidence in performing oral health related tasks by survey respondents’ background characteristics (N=235)..33

Table 4. Quantile for domains of performing oral health related tasks by survey respondents’ background characteristics (N=235)………………..34
LIST OF FIGURES:

Figure 1: Knowledge of oral health care recommendations for pediatric oncology patients among survey respondents (N=235) ......................28

Figure 2: Frequency of performing oral health related tasks on pediatric oncology patients among survey respondents (N=235).....................29

Figure 3: Perceived ability in performing oral health related tasks on pediatric oncology patients among survey respondents (N=235)..........30

Figure 4: Stage in which survey respondents usually refer pediatric oncology patients to a dental professional (N=235).........................31
LIST OF ABBREVIATIONS:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>APHON</td>
<td>Association of Pediatric Hematology and Oncology Nurses</td>
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<tr>
<td>NCBD</td>
<td>National Cancer Data Base</td>
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<tr>
<td>SEER</td>
<td>Surveillance, Epidemiology, and End Results</td>
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<tr>
<td>HSV</td>
<td>Herpes Simplex Virus</td>
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<tr>
<td>UNC-CH</td>
<td>University of North Carolina at Chapel Hill</td>
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<tr>
<td>AAPD</td>
<td>American Academy of Pediatric Dentistry</td>
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<tr>
<td>CE</td>
<td>Continuing Education</td>
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<tr>
<td>IOM</td>
<td>Institute of Medicine</td>
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<td>U.S.</td>
<td>United States</td>
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INTRODUCTION

Information gathered from the National Cancer Data Base (NCDB) and the Surveillance, Epidemiology, and End Results (SEER) registries, both of which collect data relating to the diagnosis and treatment of individuals with cancer, reveal that there were an estimated 13.7 million Americans with a history of cancer alive on January 1, 2012. The population of cancer survivors is projected to increase to nearly 18 million by January 1, 2022.\textsuperscript{1} Although childhood cancers, from birth to age 14, are considered rare, affecting less than 1\% of all new cancer diagnoses, nearly 59,000 Americans are survivors of childhood cancers.\textsuperscript{1} Improved survival rates are largely due to newly implemented aggressive treatment strategies.\textsuperscript{2} It is predicted that “nearly 80\% of children diagnosed with cancer in 1990 will survive into adulthood” due to these treatment modifications.\textsuperscript{2-4} But, these new cures may be associated with long-term effects that have adverse effects on the quality of life of survivors.\textsuperscript{2}

Oral complications, such as mucositis, herpes simplex virus (HSV) infections, erythematous or pseudomembranous candidiasis, xerostomia, dental caries, and dental anomalies, are common in children undergoing head and neck radiation and chemotherapy due to compromised immune systems, damage to salivary glands and/or developing dentition.\textsuperscript{2,5-8} As oral complications persist with chemotherapy or radiation therapy and worsen with prolonged treatment, patients may experience debilitating pain when performing simple tasks, such as eating, drinking, and/or talking.\textsuperscript{5,9} Secondary to this debilitating pain in the mouth and compromised nutrition, patients may also experience delayed wound healing, decreased treatment effects and diminished quality of life.\textsuperscript{5,10,11}

It is widely accepted throughout the literature that basic oral hygiene practices, such as brushing, flossing and using mouth rinses help in reducing the oral microbial flora in the mouth and preventing oral complications associated with the treatment of
Furthermore, early and radical professional dental intervention reduces the frequency of problems, minimizing the risk for oral and associated systemic complications. Therefore, it is recommended that all newly diagnosed pediatric oncology patients seek early dental consultation to allow adequate time for necessary dental care to be completed prior to initiating cancer therapy and continue to place emphasis on preventive interventions.

Nurses are often frontline clinicians who triage outpatient’s conditions and needs and spend more time with inpatients and their families than do physicians. In the pediatric oncology unit, nurses may firsthand see the incidence of oral complications that may affect patients’ quality of life and treatment success. Baseline surveys from two demonstration projects, whose purpose was to eventually develop an oral care protocol for use in cancer care units in the U.S., indicated that nurses were capable of identifying simple oral complications, such as mucositis and oral candidiasis but were not able to diagnose more severe oral complications, such as xerostomia. These studies also found that the nurses lacked current knowledge on oral care recommendations for pediatric oncology patients and were not performing oral assessments and referrals on a regular basis.
REVIEW OF THE LITERATURE

Cancer in the Pediatric Population

Information gathered from the National Cancer Data Base (NCDB) and the Surveillance, Epidemiology, and End Results (SEER) registries, both of which collect data relating to the diagnosis and treatment of individuals with cancer, reveal that there were an estimated 13.7 million Americans with a history of cancer alive on January 1, 2012, and the population of cancer survivors is projected to increase to nearly 18 million by January 1, 2022.1

Although childhood cancers, from birth to age 14, are considered rare, affecting less than 1% of all new cancer diagnoses, it is the second leading cause of deaths among U.S. children, exceeded only by accidents.1 Nearly 59,000 Americans are survivors of childhood cancers, and it was estimated that approximately 12,060 cases of childhood cancers would be newly diagnosed by 2012.1

Although incidence rates for some childhood cancers have increased, mortality rates have declined significantly for most cancers since the mid-1970s.2,21 Improved survival rates are largely due to newly implemented aggressive treatment strategies. It is predicted that “nearly 80% of children diagnosed with cancer in 1990 will survive into adulthood” due to these treatment modifications.2-4 But, these new cures may be associated with long-term effects that have adverse effects on the quality of life of survivors.2

Oral Complications of Childhood Cancer

Oral complications are recognized as a common adverse effect of childhood cancer therapy, with oral mucositis, oral infections of bacterial, fungal and viral origin, xerostomia, and dental abnormalities being the most common oral complications affecting children and adolescents undergoing cancer treatment.5,6,22 It was found that 5-
year survival rates ranged from 68.1% to 97.5% for all cancer types, and from 2001 to 2007 the overall 5-year relative survival rate for childhood cancers was 82.5%. As the overall survival rate of children affected by cancer continues to rise, there is a heightened need to reduce the frequency and impact of oral complications. Children diagnosed with cancer may experience treatment related side effects not only during treatment, but many years after diagnosis as well.

Oral mucositis is described as erythematous inflammatory changes that occur on soft tissue surfaces of the mouth, including the buccal and labial surfaces, ventral surface of the tongue, floor of the mouth, and soft palate. The condition is marked by a burning or tingling sensation that makes the mouth hypersensitive, and damage and breaks in the epithelial barrier of the oral mucosa allow infections of resident oral flora origin to develop; therefore, eating, swallowing, and talking become difficult as the condition progresses. Relative studies recorded the incidence of oral mucositis in children undergoing cancer therapy as 50 – 54%, and suggest that adolescents have a greater incidence of chemotherapy-induced mucositis than adults.

Herpes simplex virus (HSV) is the most common viral infection affecting children undergoing cancer therapy, and it most often occurs as a reactivation of the virus in an individual that was previously infected. HSV infections are characterized by vesicular lesions that occur in or around the mouth. These lesions may develop into crusted lesions or may remain ulcerated with a yellowish appearance. It is often difficult to visually distinguish between oral mucositis and HSV, therefore a viral culture is often needed to make a clinical diagnosis and to determine the appropriate treatment that follows. HSV infections can be very painful and patients may present with pain, distress, drooling, and an inability to swallow due to the profound effects that the virus has on the oral mucosa.

Fungal infections of the oral cavity are very common in children receiving cancer treatment, with oral candidiasis being the most common type of fungal infection experienced by these patients. Oral candidiasis is characterized by patchy or curd-like white lesions, which can be removed, with bleeding and erosion beneath the white lesions or diffuse areas of erythema mostly on the palate. Children are more likely to experience oral fungal infections, due to the use of broad-spectrum antibiotics and
steroids, and poor oral hygiene and nutrition.\textsuperscript{5,6,7} Although many children with oral candidiasis infections generally do not present with any complaints, the lesions can spread to the esophagus and untreated oral candidiasis may progress to systemic disease, which can be fatal.\textsuperscript{5,6,28-30}

Xerostomia, or dry mouth, is a common condition found in individuals undergoing chemotherapy and radiation to the head and neck regions, and results from damage to the salivary gland, which causes changes in the consistency and amount of saliva.\textsuperscript{5} This change creates an acidic environment that promotes dental caries formation.\textsuperscript{5,6,22,31,32} Xerostomia is quite distressing to individuals affected due to the changes in taste, difficulty chewing, swallowing and speaking, and discomfort experienced.\textsuperscript{5} Damage to salivary glands is usually permanent, but some patients’ salivary function may return 4 – 12 months after therapy.\textsuperscript{5,6,31}

Dental abnormalities, including root stunting, microdontia, hypodontia, enlarged pulp chambers, over-retention of primary teeth, delayed eruption, agenesis, V-shaped or shortened roots, facial asymmetry, trismus, and underdeveloped mandible have been found in children undergoing radiation or chemotherapy for the treatment of cancer.\textsuperscript{2,5,8,33} One study found dental abnormalities in 71\% of cancer patients, and another found dental abnormalities in 83\% of the children being treated for cancer.\textsuperscript{5,8} Some dental abnormalities may cause aesthetic, functional and/or occlusal disturbances.\textsuperscript{8} Advanced techniques are refining cancer treatment and patients receiving radiation or chemotherapy of the head and neck regions are showing promising reductions in the rate of dental abnormalities.\textsuperscript{2,5}

**Oral Care for the Pediatric Oncology Patient**

The most effective measure in the prevention and treatment of oral complications of cancer therapy is meticulous oral hygiene.\textsuperscript{5} Several studies have shown that (1) mouth lesions were more common in individuals who had poor oral hygiene,\textsuperscript{5,23} (2) there was a significant decrease in the incidence of oral mucositis following a preventive dental cleaning protocol, administering mouth rinses, and applying mouth aids topically,\textsuperscript{5,34} (3) patients with good dental health who maintain good oral hygiene were found to have fewer episodes of oral mucositis than those with poor oral hygiene and maintenance,\textsuperscript{5,25,35}
and (4) there was a reduction in the incidence of ulcerative lesions in children following an oral care protocol consisting of toothbrushing and using mouthrinses.\textsuperscript{5,24}

A multidisciplinary team, including oncology physicians and nurses, and dental professionals, is recommended for children receiving radiation or chemotherapy.\textsuperscript{5} An increased incidence of oral complications and infections during cancer therapy has been linked to poor preexisting oral health.\textsuperscript{10,36,37} Therefore, it is recommended that the child be examined by a dentist to remove plaque, treat existing caries, and examine the oral cavity prior to starting cancer treatment.\textsuperscript{5} Dental assessments should be performed at the initial diagnosis to evaluate any preexisting problems and should be “continued regularly throughout cancer therapy”.\textsuperscript{10} Pre-treatment dental assessments help to identify oral complications or possible concerns. In essence, removing any active or potential source of infection and patient education is the goal of pre-treatment dental assessments.\textsuperscript{10,38}

Good oral care is important in preventing, reducing the severity, and managing oral complications, but it is rarely stressed in clinical practice.\textsuperscript{10,39} Effectively keeping a pediatric oncology patient’s mouth clean, even with basic oral hygiene, such as toothbrushing, helps prevent and assist in treating any oral complication.\textsuperscript{10} In one study, the only intervention that showed a clear benefit in preventing and treating oral mucositis in pediatric oncology patients was good oral hygiene.\textsuperscript{10,40}

Patients are generally not taught oral care, and “the nursing practice of assessing for oral complications and educating families on the importance of oral hygiene is often overlooked”.\textsuperscript{10,41,42} Also, oral hygiene has been shown to vary across and even within clinical institutions and one survey found that oral care procedures were based on tradition or subjective evaluation rather than evidence-based practice.\textsuperscript{10,43,44}

**Clinical Practice Guidelines for the Prevention and Treatment of Oral Complications**

Therapies aimed at treating oral complications of cancer are largely based on clinical experience, and although there are recommendations for managing and treating oral complications of cancer therapy no ‘gold standard’ has emerged.\textsuperscript{5} Further research is needed to standardize preventive oral care, prophylactic care, and the treatment of oral mucositis, and bacterial, fungal and viral oral infections, in order to improve the quality
of life for patients undergoing treatment for childhood cancers and to prevent the residual long-term effects in cancer survivors.\(^5\)

Oral mucositis is extremely painful for patients affected and the co-operation of children with this condition, as regards to eating and performing oral hygiene, requires special accommodations.\(^5\) Using mouthrinses to facilitate mucosal healing and applying topical anesthetic for pain management are recommended for treating and managing oral mucositis symptoms.\(^5,28,45\) In some cases, despite adequate pain control, children with mucositis cannot be enticed to eat and parenteral or enteral feeding may be needed.\(^5\) In patients affected by this condition, pain, nutrition, and risk for infection need to be carefully assessed in the ulcerative phase.\(^5\)

As with oral mucositis, HSV is described as “exquisitely painful” and treatment recommendations include supportive care with fluids, pain management, and antiviral therapy with acyclovir, given orally or intravenously.\(^5,27,28\) Oral candidiasis, on the other hand, generally does not cause patients pain and can be treated with nystatin oral suspension and clotrimazole troches.\(^5\) The drawback with this treatment is that it requires four times-a-day topical oral administrations, which produces poor compliance in children, and the product has a high sucrose content, which predisposes pediatric patients to dental caries.\(^5\) Furthermore, there are very few publications concerning xerostomia in the pediatric population, and the few publications that are available recommends using synthetic salivary substitutes, stimulating the remaining salivary tissue, meticulous daily oral hygiene, and topical fluoride.\(^5,6,28\)

The use of oral care protocols has helped lower the incidence of oral mucositis in pediatric oncology patients.\(^10\) A comprehensive, evidence-based, oral care guideline/protocol is recommended to nurses that are “interested in delivering the best standard of care to their patients”.\(^10\) Oral care protocols have proven to be an essential component of an oncology program, and has the potential to reduce the incidence, severity, and duration of oral complications significantly when applied.\(^10,46,47\) Using a dental care protocol ensures that patients are receiving the “gold standard” of care.\(^10\)

Treatments for oral complications of cancer therapy tend to be variable and lack standardization due to inconsistent and inconclusive research on one intervention versus another.\(^10,41\) Overall, thorough examinations, dental protocols, meticulous oral hygiene,
and a multidisciplinary team approach have been shown to minimize the oral complications of childhood cancer and improve the quality of life in survivors.\(^2,5\)

**Nurse Training and Qualifications**

Nurses often take the lead in providing oral and preventative care to patients.\(^5\) A nurse preventative program has been shown to be effective way to reduce cancer morbidity in adult patients.\(^5\)

Evidence suggests that many interventions prescribed by nurses are currently being used in clinical practice despite the lack of rigorous evaluation and determined effectiveness of these interventions.\(^10,48\) Many institutions do not have oral care guidelines or protocols in place, and some may find that their guidelines need to be modified after careful re-evaluation.\(^10\)

Although oral care is acknowledged as highly important and is recognized as one of the most important step in reducing oral complications of cancer therapy, it is often one of the first things set aside when nursing workloads become excessive.\(^10,12,49\) And, some studies even suggest that oral health care is “generally given a low level of priority by hospital nursing staff”.\(^19,50\)

**Purpose**

After reviewing the literature, it was determined that oral complications can result from cancer therapy in pediatric oncology patients. These oral complications can cause devastating long-term effects in survivors of childhood cancer. With innovations in cancer treatment, there is a heightened need to prevent and treat oral complications effectively.

In the pediatric oncology unit, nurses may witness the incidence of oral complications that may affect patients’ quality of life and treatment success firsthandedly.\(^10\) Baseline surveys from two demonstrational projects, whose purpose was to eventually develop an oral care protocol in cancer care units in the US, indicated that nurses were capable of identifying simple oral complications, such as mucositis and oral candidiasis but not able to diagnose more severe oral complications, such as xerostomia.\(^19,20\) These studies also found that the nurses lacked current knowledge on oral
care recommendations for pediatric oncology patients and were not performing oral assessments and referrals on a regular basis.

To determine the need and opportunity for interprofessional oral health care education and collaboration in order to increase access to comprehensive oral care for pediatric cancer patients, the purpose of this study was to examine the knowledge, perceived ability, and practice behaviors of pediatric oncology and hematology nurses in assisting with the various oral health care needs of pediatric oncology patients and to identify their training/education, practice types, and other demographic characteristics that are related to their oral health competencies.
INTRODUCTION AND REVIEW OF THE LITERATURE

Information gathered from the National Cancer Data Base (NCDB) and the Surveillance, Epidemiology, and End Results (SEER) registries, both of which collect data relating to the diagnosis and treatment of individuals with cancer, reveal that there were an estimated 13.7 million Americans with a history of cancer alive on January 1, 2012. The population of cancer survivors is projected to increase to nearly 18 million by January 1, 2022. Although childhood cancers, from birth to age 14, are considered rare, affecting less than 1% of all new cancer diagnoses, nearly 59,000 Americans are survivors of childhood cancers. Improved survival rates are largely due to newly implemented aggressive treatment strategies. It is predicted that “nearly 80% of children diagnosed with cancer in 1990 will survive into adulthood” due to these treatment modifications. But, these new cures may be associated with long-term effects that have adverse effects on the quality of life of survivors.

Oral complications, such as mucositis, herpes simplex virus (HSV) infections, erythematous or pseudomembranous candidiasis, xerostomia, dental caries, and dental anomalies, are common in children undergoing head and neck radiation and chemotherapy due to compromised immune systems, damage to salivary glands and/or developing dentition. As oral complications persist with chemotherapy or radiation therapy and worsen with prolonged treatment, patients may experience debilitating pain when performing simple tasks, such as eating, drinking, and/or talking. Secondary to this debilitating pain in the mouth and compromised nutrition, patients may also experience delayed wound healing, decreased treatment effects and diminished quality of life.

It is widely accepted throughout the literature that basic oral hygiene practices, such as brushing, flossing and using mouth rinses help in reducing the oral microbial flora in the mouth and preventing oral complications associated with the treatment of cancer. Furthermore, early and radical professional dental intervention reduces the
frequency of problems, minimizing the risk for oral and associated systemic complications.\textsuperscript{14-18} Therefore, it is recommended that all newly diagnosed pediatric oncology patients seek early dental consultation to allow adequate time for necessary dental care to be completed prior to initiating cancer therapy and continue to place emphasis on preventive interventions.\textsuperscript{14}

Nurses are often frontline clinicians who triage outpatient’s conditions and needs and spend more time with inpatients and their families than do physicians. In the pediatric oncology unit, nurses may firsthand see the incidence of oral complications that may affect patients’ quality of life and treatment success.\textsuperscript{10} Baseline surveys from two demonstration projects, whose purpose was to eventually develop an oral care protocol for use in cancer care units in the U.S., indicated that nurses were capable of identifying simple oral complications, such as mucositis and oral candidiasis but were not able to diagnose more severe oral complications, such as xerostomia.\textsuperscript{19,20} These studies also found that the nurses lacked current knowledge on oral care recommendations for pediatric oncology patients and were not performing oral assessments and referrals on a regular basis.

\textbf{Cancer in the Pediatric Population}

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Although incidence rates for some childhood cancers have increased, mortality rates have declined significantly for most cancers since the mid-1970s.\textsuperscript{2,21} Improved
survival rates are largely due to newly implemented aggressive treatment strategies. It is predicted that “nearly 80% of children diagnosed with cancer in 1990 will survive into adulthood” due to these treatment modifications.\textsuperscript{2-4} But, these new cures may be associated with long-term effects that have adverse effects on the quality of life of survivors.\textsuperscript{2}

**Oral Complications of Childhood Cancer**

Oral complications are recognized as a common adverse effect of childhood cancer therapy, with oral mucositis, oral infections of bacterial, fungal and viral origin, xerostomia, and dental abnormalities being the most common oral complications affecting children and adolescents undergoing cancer treatment.\textsuperscript{5,6,22} It was found that 5-year survival rates ranged from 68.1\% to 97.5\% for all cancer types, and from 2001 to 2007 the overall 5-year relative survival rate for childhood cancers was 82.5\%.\textsuperscript{1} As the overall survival rate of children affected by cancer continues to rise, there is a heightened need to reduce the frequency and impact of oral complications. Children diagnosed with cancer may experience treatment related side effects not only during treatment, but many years after diagnosis as well.\textsuperscript{1}

Oral mucositis is described as erythematous inflammatory changes that occur on soft tissue surfaces of the mouth, including the buccal and labial surfaces, ventral surface of the tongue, floor of the mouth, and soft palate.\textsuperscript{5,6,22} The condition is marked by a burning or tingling sensation that makes the mouth hypersensitive, and damage and breaks in the epithelial barrier of the oral mucosa allow infections of resident oral flora origin to develop; therefore, eating, swallowing, and talking become difficult as the condition progresses.\textsuperscript{5,6,9} Relative studies recorded the incidence of oral mucositis in children undergoing cancer therapy as 50 – 54\%, and suggest that adolescents have a greater incidence of chemotherapy-induced mucositis than adults.\textsuperscript{5,23-26}

Herpes simplex virus (HSV) is the most common viral infection affecting children undergoing cancer therapy, and it most often occurs as a reactivation of the virus in an individual that was previously infected.\textsuperscript{5,7,27} HSV infections are characterized by vesicular lesions that occur in or around the mouth. These lesions may develop into crusted lesions or may remain ulcerated with a yellowish appearance.\textsuperscript{5,28} It is often
difficult to visually distinguish between oral mucositis and HSV, therefore a viral culture is often needed to make a clinical diagnosis and to determine the appropriate treatment that follows. HSV infections can be very painful and patients may present with pain, distress, drooling, and an inability to swallow due to the profound effects that the virus has on the oral mucosa.5

Fungal infections of the oral cavity are very common in children receiving cancer treatment, with oral candidiasis being the most common type of fungal infection experienced by these patients.5 Oral candidiasis is characterized by patchy or curd-like white lesions, which can be removed, with bleeding and erosion beneath the white lesions or diffuse areas of erythema mostly on the palate.5,7,28,29 Children are more likely to experience oral fungal infections, due to the use of broad-spectrum antibiotics and steroids, and poor oral hygiene and nutrition.5,6 Although many children with oral candidiasis infections generally do not present with any complaints, the lesions can spread to the esophagus and untreated oral candidiasis may progress to systemic disease, which can be fatal.5,6,28-30

Xerostomia, or dry mouth, is a common condition found in individuals undergoing chemotherapy and radiation to the head and neck regions, and results from damage to the salivary gland, which causes changes in the consistency and amount of saliva.5 This change creates an acidic environment that promotes dental caries formation.5,6,22,31,32 Xerostomia is quite distressing to individuals affected due to the changes in taste, difficulty chewing, swallowing and speaking, and discomfort experienced.5 Damage to salivary glands is usually permanent, but some patients’ salivary function may return 4 – 12 months after therapy.5,6,31

Dental abnormalities, including root stunting, microdontia, hypodontia, enlarged pulp chambers, over-retention of primary teeth, delayed eruption, agenesis, V-shaped or shortened roots, facial asymmetry, trismus, and underdeveloped mandible have been found in children undergoing radiation or chemotherapy for the treatment of cancer.2,5,8,33 One study found dental abnormalities in 71% of cancer patients, and another found dental abnormalities in 83% of the children being treated for cancer.5,8 Some dental abnormalities may cause aesthetic, functional and/or occlusal disturbances.8 Advanced techniques are refining cancer treatment and patients receiving radiation or chemotherapy
of the head and neck regions are showing promising reductions in the rate of dental abnormalities.  

**Oral Care for the Pediatric Oncology Patient**

The most effective measure in the prevention and treatment of oral complications of cancer therapy is meticulous oral hygiene. Several studies have shown that (1) mouth lesions were more common in individuals who had poor oral hygiene, (2) there was a significant decrease in the incidence of oral mucositis following a preventive dental cleaning protocol, administering mouth rinses, and applying mouth aids topically, (3) patients with good dental health who maintain good oral hygiene were found to have fewer episodes of oral mucositis than those with poor oral hygiene and maintenance, and (4) there was a reduction in the incidence of ulcerative lesions in children following an oral care protocol consisting of toothbrushing and using mouthrinses.

A multidisciplinary team, including oncology physicians and nurses, and dental professionals, is recommended for children receiving radiation or chemotherapy. An increased incidence of oral complications and infections during cancer therapy has been linked to poor preexisting oral health. Therefore, it is recommended that the child be examined by a dentist to remove plaque, treat existing caries, and examine the oral cavity prior to starting cancer treatment. Dental assessments should be performed at the initial diagnosis to evaluate any preexisting problems and should be “continued regularly throughout cancer therapy”. Pre-treatment dental assessments help to identify oral complications or possible concerns. In essence, removing any active or potential source of infection and patient education is the goal of pre-treatment dental assessments.

Good oral care is important in preventing, reducing the severity, and managing oral complications, but it is rarely stressed in clinical practice. Effectively keeping a pediatric oncology patient’s mouth clean, even with basic oral hygiene, such as toothbrushing, helps prevent and assist in treating any oral complication. In one study, the only intervention that showed a clear benefit in preventing and treating oral mucositis in pediatric oncology patients was good oral hygiene.

Patients are generally not taught oral care, and “the nursing practice of assessing for oral complications and educating families on the importance of oral hygiene is often
overlooked.” Also, oral hygiene has been shown to vary across and even within clinical institutions and one survey found that oral care procedures were based on tradition or subjective evaluation rather than evidence-based practice. \(^{10,43,44}\)

**Clinical Practice Guidelines for the Prevention and Treatment of Oral Complications**

Therapies aimed at treating oral complications of cancer are largely based on clinical experience, and although there are recommendations for managing and treating oral complications of cancer therapy no ‘gold standard’ has emerged.\(^5\) Further research is needed to standardize preventive oral care, prophylactic care, and the treatment of oral mucositis, and bacterial, fungal and viral oral infections, in order to improve the quality of life for patients undergoing treatment for childhood cancers and to prevent the residual long-term effects in cancer survivors.\(^5\)

Oral mucositis is extremely painful for patients affected and the co-operation of children with this condition, as regards to eating and performing oral hygiene, requires special accommodations.\(^5\) Using mouthrinses to facilitate mucosal healing and applying topical anesthetic for pain management are recommended for treating and managing oral mucositis symptoms.\(^5,28,45\) In some cases, despite adequate pain control, children with mucositis cannot be enticed to eat and parenteral or enteral feeding may be needed.\(^5\) In patients affected by this condition, pain, nutrition, and risk for infection need to be carefully assessed in the ulcerative phase.\(^5\)

As with oral mucositis, HSV is described as “exquisitely painful” and treatment recommendations include supportive care with fluids, pain management, and antiviral therapy with acyclovir, given orally or intravenously.\(^5,27,28\) Oral candidiasis, on the other hand, generally does not cause patients pain and can be treated with nystatin oral suspension and clotrimazole troches.\(^5\) The drawback with this treatment is that it requires four times-a-day topical oral administrations, which produces poor compliance in children, and the product has a high sucrose content, which predisposes pediatric patients to dental caries.\(^5\) Furthermore, there are very few publications concerning xerostomia in the pediatric population, and the few publications that are available recommends using synthetic salivary substitutes, stimulating the remaining salivary tissue, meticulous daily oral hygiene, and topical fluoride.\(^5,6,28\)
The use of oral care protocols has helped lower the incidence of oral mucositis in pediatric oncology patients. A comprehensive, evidence-based, oral care guideline/protocol is recommended to nurses that are “interested in delivering the best standard of care to their patients”. Oral care protocols have proven to be an essential component of an oncology program, and has the potential to reduce the incidence, severity, and duration of oral complications significantly when applied. Using a dental care protocol ensures that patients are receiving the “gold standard” of care.

Treatments for oral complications of cancer therapy tend to be variable and lack standardization due to inconsistent and inconclusive research on one intervention versus another. Overall, thorough examinations, dental protocols, meticulous oral hygiene, and a multidisciplinary team approach have been shown to minimize the oral complications of childhood cancer and improve the quality of life in survivors.

**Nurse Training and Qualifications**

Nurses often take the lead in providing oral and preventative care to patients. A nurse preventative program has been shown to be effective way to reduce cancer morbidity in adult patients.

Evidence suggests that many interventions prescribed by nurses are currently being used in clinical practice despite the lack of rigorous evaluation and determined effectiveness of these interventions. Many institutions do not have oral care guidelines or protocols in place, and some may find that their guidelines need to be modified after careful re-evaluation.

Although oral care is acknowledged as highly important and is recognized as one of the most important step in reducing oral complications of cancer therapy, it is often one of the first things set aside when nursing workloads become excessive. And, some studies even suggest that oral health care is “generally given a low level of priority by hospital nursing staff”.

**Purpose**

After reviewing the literature, it was determined that oral complications can result from cancer therapy in pediatric oncology patients. These oral complications can cause
devastating long-term effects in survivors of childhood cancer. With innovations in cancer treatment, there is a heightened need to prevent and treat oral complications effectively.

In the pediatric oncology unit, nurses may witness the incidence of oral complications that may affect patients’ quality of life and treatment success firsthandedly. Baseline surveys from two demonstrational projects, whose purpose was to eventually develop an oral care protocol in cancer care units in the US, indicated that nurses were capable of identifying simple oral complications, such as mucositis and oral candidiasis but not able to diagnose more severe oral complications, such as xerostomia. These studies also found that the nurses lacked current knowledge on oral care recommendations for pediatric oncology patients and were not performing oral assessments and referrals on a regular basis.

To determine the need and opportunity for interprofessional oral health care education and collaboration in order to increase access to comprehensive oral care for pediatric cancer patients, the purpose of this study was to examine the knowledge, perceived ability, and practice behaviors of pediatric oncology and hematology nurses in assisting with the various oral health care needs of pediatric oncology patients and to identify their training/education, practice types, and other demographic characteristics that are related to their oral health competencies.
MATERIALS AND METHODS

This cross-sectional survey research study was approved by the Biomedical Institutional Review Board of the University of North Carolina at Chapel Hill (UNC-CH). The survey instrument was developed with input from questionnaires used in two previous similar studies, three committee members (1 pediatric dentist, 1 general dentist, and 1 dental hygienist), a survey methodology consultant from the H.W. Odum Institute for Research in Social Science at UNC-CH, and the recommendations set forth by the American Academy of Pediatric Dentistry (AAPD). The survey included 21 question items that solicited demographic and practice information as well as knowledge, practice behaviors, and confidence to assist with the oral health care needs of pediatric oncology patients, which were intended to measure the nurses’ oral health competencies. The survey instrument was field tested by two Pediatric Oncology Nurses and their suggestions were incorporated in the final survey. A scannable TeleForm questionnaire was developed by the UNC School of Dentistry Data Coordinating and Statistical Consulting Unit to reduce potential entry errors.

Three hundred surveys were distributed to a convenience sample of nurses at a booth in the exhibit hall during the Association of Pediatric Hematology and Oncology Nurses’ (APHON) 36th Annual Conference and Exhibit on October 4 – 6, 2012 in Pittsburgh, Pennsylvania. The APHON is a professional organization for pediatric hematology/oncology nurses and allied healthcare professionals, and it currently has approximately 3,381 active members. Approximately 800 members of APHON attended the conference in Pittsburgh. By the last day of the conference, 272 surveys were returned.

Data Analysis

The data were analyzed using SAS version 9.2 (SAS Institute, Inc., Cary, NC). Frequencies were computed to summarize demographics and practice characteristics as
well as knowledge, confidence, and practice behaviors of pediatric oncology nurses with regard to oral health. Among five oral health related knowledge questions shown in Figure 1, three knowledge items, (1) daily inspection of mouth by caregivers, (2) use of fluoridated toothpaste, and (3) referrals to a dentist prior to cancer therapy, appeared to form a domain based on the factor analysis and were thus included in the further analyses. Bivariate analyses were conducted with the Mantel-Haenszel test to identify the pediatric oncology nurses’ previous training/education, practice types, and other demographic characteristics that were associated with the seven domains of oral health competencies, with statistical significance set at p<0.05.
RESULTS

Of the 272 surveys that were returned, 235 surveys were completed by those who are currently employed as a pediatric oncology, pediatric oncology or hematology nurse, giving a response rate of 78%. The demographic and professional characteristics of the survey respondents are summarized in Table 1. The majority of the respondents were women (97%) and reportedly work 36 hours or more a week (70%). Slightly more than half of respondents work as certified pediatric oncology/hematology nurses and have been employed as a pediatric oncology nurse for 10 or more years (54% and 53%, respectively). Approximately 75% of the respondents reported receiving 3 hours or less of education and/or training related to oral health care in nursing school, and about 60% did not have a clinical requirement regarding the assessment of the teeth and gums during their nursing school education. While 91% of survey respondents expressed a desire to take Continuing Education (CE) Courses relating the oral health care for pediatric oncology patients in the future, only 25% had taken such a CE Course in the last 5 years.

Knowledge

The majority of respondents were aware of potential oral complications related to cancer treatment (100%) and professional oral health care recommendations for pediatric oncology patients such as the use of a soft bristled toothbrush (97%) and daily inspection of the child’s mouth by his/her caregivers to determine the presence or absence of oral complications (87%) (Figure 1). However, the use of fluoridated toothpaste and referrals to a dentist for consultation prior to cancer treatment received lower rates of correct responses (57% and 29%, respectively). Overall, only 14% of survey participants responded correctly to all informative questions that assessed their knowledge of oral health care recommendations for pediatric oncology patients undergoing cancer treatment.
Perceived Ability

The majority of the respondents reported that they are comfortable performing oral procedures on patients (77%), and are adequately trained to provide oral health care instructions/education to patients (72%) and to perform oral care procedures (84%). When asked about their level of confidence in performing various oral health related tasks for pediatric oncology patients, more than 70% of survey respondents were reportedly very confident in examining for the presence of oral pain, providing oral hygiene instructions, and discussing the importance of seeking routine professional dental care (Figure 2). However, less than half of respondents reported that they were very confident in their ability to examine the health of teeth and gums for complications of trismus, dysphagia, and xerostomia.

Practice Behaviors

While more than 60% of respondents reported examining all of their patients for the presence of oral pathology or oral pain (63% and 69%, respectively), about half of survey participants examine all of their pediatric oncology patients’ teeth and/or gums, detect dysphasia, and provide instructions for oral hygiene care and management of oral complications (Figure 3). Only about 40% or less of respondents reported examining all patients for the presence of xerostomia, trismus, and discussing the importance of seeking routine professional dental care.

Figure 4 shows survey respondents’ practice of patient referrals to dental professionals. More than one-third of survey respondents reported referring patients to dental professionals prior to the initiation of cancer treatment and/or during cancer treatment (39% and 31%, respectively). Twenty percent of survey respondents reported never referring patients to dental professionals.

Oncology Nurses’ Demographic Characteristics and Oral Health Competencies

Extracted outcomes of bivariate analyses are shown in Tables 2-4. Exploratory factor analysis was used to identify the factor pattern and domains of question items measuring the nurses’ oral health competencies. Cronbach’s alpha ranged from 0.71 to
0.95 for the six domains identified for nurses’ perceived ability and practice behaviors. Overall, nurses’ characteristics such as having had a clinical requirement regarding oral health assessment during nursing education/training, having taken oral health related CE courses in the past 5 years, and number of years worked as a pediatric oncology nurse were associated with domains of oral health competencies. Survey respondents who had a clinical requirement regarding oral health assessment during nursing education presented greater oral health related knowledge and confidence in examining patient’s mouth, detecting oral complications, and providing oral care management while they were also likely to provide oral care instructions and examine the patient’s mouth more often than those who did not (p<0.02). History of having taken an oral health related CE course in the past 5 years was associated with all domains of oral health competencies except for the domains of practice of and confidence in examining for oral complications (p<0.007). The level of oral health related knowledge, confidence, and practice were greater among survey respondents who worked as a pediatric oncology nurse for a longer time than those with a shorter history of specialty practice (p<0.05). However, no difference was observed in the confidence in and practice of examining for oral complications such as xerostomia, dysphagia, and trismus with the length of professional work experience as a pediatric oncology nurse (p>0.1). More nurses who work full-time in direct patient care and have a source for dental referrals responded to oral health knowledge questions correctly than those who don’t work full-time in direct patient care. Job title, such as whether they were a certified oncology nurse or not, as well as hours spent in oral health education/training during nursing school were not associated with oral health competencies.
DISCUSSION

This study identified gaps in pediatric oncology nurses’ knowledge, confidence, and practice in assisting with the oral health care needs of their patients, depending on the area of oral health topic assessed and the survey respondents’ educational background. In conjunction with the findings from previous studies, our data imply that pediatric oncology nurses are learning in the field about oral health and oral complications among pediatric oncology patients as opposed to having been formally trained in this health knowledge area in nursing school. Most of our survey respondents reported having received less than 3 hours of formal training and/or education relating oral health care, nor did they have a clinical requirement regarding the assessment of the teeth and/or gums, while in nursing school. Our study revealed that overall oral competencies were greater among individuals who had worked longer as an oncology nurse.

Previous studies have surveyed internists and endocrinologists, nurse practitioners and nurse midwives, and diabetes educators to determine their knowledge, opinions, and behaviors regarding periodontal disease and adverse health outcomes. Owens et al. found that internists and endocrinologists knowledge about periodontal disease was high, but they lacked training and education relating to periodontal disease and oral health care. Wooten et al. found that nurse practitioners and certified nurse midwives had limited knowledge about periodontal disease and oral health care. And, Lopes et al. found that the majority of diabetes educators had no formal education and/or training related to oral health care, nor did they have any continuing education once they began their careers. All three studies suggested that a collaborative effort between healthcare providers and dental professionals would positively benefit patients in various areas of the healthcare system.

While on-the-job training or taking CE courses may improve oncology nurses’ confidence and practice behavior of providing oral exams and oral care instructions over time, our data suggest that these factors may not sufficiently improve confidence and
practice related to oral complications among nurses. Confidence and practice behaviors related to examination for oral complications (i.e. xerostomia, dysphagia, trismus) were greater among survey respondents who had oral health related clinical requirements during nursing school than those who did not. Previous studies also found that while nurses could readily identify simple oral complications, they could not diagnose or treat more severe oral complications prior to the implementation of a structured oral health protocol and receiving additional training in children’s hospitals. These findings thus indicate the importance of incorporating oral health education and/or training into nursing schools’ curricula and finding innovative ways to motivate nurses to adhere to evidence-based oral health care recommendations for pediatric patients who undergo cancer treatment. Although only less than 25 percent of survey respondents reported having taken a CE Course relating to oral health care in the last 5 years, it is encouraging that almost all survey participants (91 percent) desire to take a CE Course relating to oral health care in the future.

The Institute of Medicine (IOM) report in 2011, Advancing Oral Health in America, states that “Nurses, physicians, and other health care professionals have generally not been trained in providing oral health services or screenings. In addition, dental professionals are generally educated and trained separately from other health care professionals, which reinforces the separation of care as well as lack of training in appropriate referrals between professionals.” As the complexity of health care continues to increase, it has been recommended that health care providers learn to work more collaboratively in order to provide quality care. It has been shown that interprofessional collaboration, with nursing and dental professionals, positively affects quality of care, patient satisfaction, effectiveness of health care services, health care costs, and communication among health care professionals. In order to improve compliance with evidence-based recommendations, perceived abilities, and practice behaviors of pediatric oncology nurses as related to oral health care, an interprofessional approach with emphasis placed on implementing an oral health care protocol and continuous staff education and training at each pediatric oncology unit might be important.

Strengths of our study include the broader geographic representation of pediatric oncology and hematology nurses. While two similar previous studies surveyed pediatric
oncology nurses in local institutions, we were able to capture nurses from various geographic regions, which was identified by the mailing addresses respondents placed on the raffle tickets. Respondents also included those with various certifications and differing educational backgrounds and training. The limitation of this study includes missing data found in various sections of the survey which made performing multivariable analysis infeasible. Furthermore, the attendees of the professional meeting may be more involved in educational activities than those who do not attend. Therefore, the findings of this study may not be representative of all U.S. pediatric hematology and oncology nurses nor all the member of the APHON professional organization. Lastly, although our study identified several domains related to oral health knowledge, perceived ability and practice behaviors in assisting pediatric oncology patients, there was no validated tool available to measure oral health competencies of oncology nurses when we conducted this study. Despite this, we provided initial evidence of the domains of oral health competencies among pediatric oncology nurses and gained insight into the type of demographic characteristics of nurses that may influence their knowledge, confidence, and practice behaviors in assisting child patients’ oral health needs.
CONCLUSIONS

Pediatric oncology nurses’ knowledge, perceived ability, and practice behaviors in assisting patient’s oral hygiene care and preventing and managing oral complications vary by topic and might reflect their educational preparedness. Interprofessional collaboration between dental and nursing schools in provider training as well as institutional efforts in implementation of evidence-based oral health practices might be needed in order to improve pediatric cancer patients’ and survivors’ oral health.
Table 1. Demographic and professional characteristics of the survey participants (N=235)*

<table>
<thead>
<tr>
<th></th>
<th>N†</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Female</td>
<td>226</td>
<td>97.4</td>
</tr>
<tr>
<td><strong>Job title</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certified oncology/hematology nurse‡</td>
<td>126</td>
<td>53.6</td>
</tr>
<tr>
<td>Others§</td>
<td>109</td>
<td>46.4</td>
</tr>
<tr>
<td><strong>Years employed as a pediatric oncology nurse</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 years or less</td>
<td>29</td>
<td>13.4</td>
</tr>
<tr>
<td>4 – 10 years</td>
<td>74</td>
<td>34.1</td>
</tr>
<tr>
<td>10 years or more</td>
<td>114</td>
<td>52.5</td>
</tr>
<tr>
<td><strong>Hours/week worked in direct patient care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;36 hours</td>
<td>62</td>
<td>30.4</td>
</tr>
<tr>
<td>≥36 hours</td>
<td>142</td>
<td>69.6</td>
</tr>
<tr>
<td><strong>Have a resource of referrals, dentist(s)/dental office(s), for patients with severe oral complications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>139</td>
<td>59.7</td>
</tr>
<tr>
<td>No</td>
<td>94</td>
<td>40.3</td>
</tr>
<tr>
<td><strong>Hours of education/training related to oral health care in nursing school</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 hours or less</td>
<td>169</td>
<td>74.5</td>
</tr>
<tr>
<td>&gt;3 hours</td>
<td>58</td>
<td>25.5</td>
</tr>
<tr>
<td><strong>Clinical requirement regarding the assessment of the teeth and gums during nursing education and/or training</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>92</td>
<td>39.7</td>
</tr>
<tr>
<td>No</td>
<td>140</td>
<td>60.3</td>
</tr>
<tr>
<td><strong>Has taken a CE Course relating to oral health care for pediatric oncology patients in the last 5 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>58</td>
<td>24.9</td>
</tr>
<tr>
<td>No</td>
<td>175</td>
<td>75.1</td>
</tr>
<tr>
<td><strong>Desire to take CE Courses relating to oral health care in the future</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>211</td>
<td>90.6</td>
</tr>
<tr>
<td>No</td>
<td>22</td>
<td>9.4</td>
</tr>
</tbody>
</table>

* Response rate 78% (235/300)
† Total may not add up to N because of missing data
‡ includes certified pediatric oncology nurse (CPON), oncology certified nurse (OCN), and certified pediatric hematology oncology nurse (CPHON)
§ includes registered nurse (RN), nurse practitioner (NP), certified pediatric nurse (CPN), certified pediatric nurse practitioner (CPNP), certified family nurse practitioner (CFNP)
Figure 1. Knowledge of oral health care recommendations for pediatric oncology patients among survey respondents (N= 235)*

* Response rate 78% (235/300)
Figure 2. Perceived ability in performing oral health related tasks on pediatric oncology patients among survey respondents (N=235)*

* Response rate 78% (235/300)
Figure 3. Frequency of performing oral health related tasks on pediatric oncology patients among survey respondents (N=235)*

* Response rate 78% (235/300)
Figure 4. Stage in which survey respondents usually refer pediatric oncology patients to a dental professional (N=235)*

* Response rate 78% (235/300)
Percentages do not add up to 100% because multiple choices were given
Table 2. Quantile for domain of oral health related knowledge by survey respondents’ background characteristics (N=235)*

<table>
<thead>
<tr>
<th></th>
<th>Oral health related correct knowledge</th>
<th>25%</th>
<th>Median</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Had a clinical requirement regarding the assessment of teeth and gums during nursing school</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td><em>Have taken a CE Course relating to oral health care in the past 5 years</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>2.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td><em>Years worked as an oncology nurse</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 3 years</td>
<td></td>
<td>1.00</td>
<td>1.00</td>
<td>2.00</td>
</tr>
<tr>
<td>4 – 10 years</td>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td></td>
<td>1.00</td>
<td>2.00</td>
<td>2.00</td>
</tr>
</tbody>
</table>

*Response rate 78% (235/300)
† Knowledge was measured as a score for true/false or multiple choice questions: correct answer=1 vs. incorrect answer=0
‡ p<0.05
§ p<0.001
Table 3. Quantile for domains of confidence in performing oral health related tasks by survey respondents’ background characteristics (N=235)*

<table>
<thead>
<tr>
<th>Confidence</th>
<th>Examining for oral complications</th>
<th>Oral exam and management</th>
<th>Oral pain and oral care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25% Median 75%</td>
<td>25% Median 75%</td>
<td>25% Median 75%</td>
</tr>
<tr>
<td>Had a clinical requirement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>regarding the assessment of teeth and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gums during nursing school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.00 1.67 2.00</td>
<td>1.00 1.00 1.33</td>
<td>1.00 1.25 1.50</td>
</tr>
<tr>
<td>No</td>
<td>1.00 1.67 2.00</td>
<td>1.00 1.00 1.33</td>
<td>1.00 1.25 1.50</td>
</tr>
<tr>
<td>Have taken a CE Course relating to oral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>health care in the past 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.00 1.33 2.00</td>
<td>1.00 1.00 1.67</td>
<td>1.00 1.00 1.50</td>
</tr>
<tr>
<td>No</td>
<td>1.00 1.67 2.00</td>
<td>1.00 1.00 1.67</td>
<td>1.00 1.00 1.50</td>
</tr>
<tr>
<td>Years worked as an oncology nurse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 3 years</td>
<td>1.42 2.00 2.00</td>
<td>1.00 1.33 2.00</td>
<td>1.50 1.50 1.75</td>
</tr>
<tr>
<td>4 – 10 years</td>
<td>1.00 1.67 2.00</td>
<td>1.00 1.00 1.33</td>
<td>1.00 1.50 1.75</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>1.00 1.67 2.00</td>
<td>1.00 1.00 1.33</td>
<td>1.00 1.25 1.75</td>
</tr>
</tbody>
</table>

* Response rate 78% (235/300)
† Perceived ability was measured on a 3-point Likert Scale, ranging from 1 = very confident, 2 = somewhat confident, and 3 = not at all confident
‡ p<0.05
§ p<0.001
<table>
<thead>
<tr>
<th>Practice</th>
<th>Examinations for oral complications</th>
<th>Dental exams</th>
<th>Oral care instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>Median</td>
<td>75%</td>
</tr>
<tr>
<td>Had a clinical requirement regarding the assessment of teeth and gums during nursing school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.00</td>
<td>1.67</td>
<td>3.00</td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>2.33</td>
<td>3.67</td>
</tr>
<tr>
<td>Have taken a CE Course relating to oral health care in the past 5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.00</td>
<td>1.67</td>
<td>3.00</td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>2.17</td>
<td>3.67</td>
</tr>
<tr>
<td>Years worked as an oncology nurse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 3 years</td>
<td>1.67</td>
<td>2.83</td>
<td>3.67</td>
</tr>
<tr>
<td>4 – 10 years</td>
<td>1.00</td>
<td>2.00</td>
<td>3.33</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>1.00</td>
<td>2.00</td>
<td>3.33</td>
</tr>
</tbody>
</table>

*Response rate 78% (235/300)
† Frequency of practice was measured on a 5-point Likert Scale, ranging from 1 = all patients, 2 = more than half of patients, 3 = about half of patients, 4 = less than half patients, and 5 = no patients
‡ p<0.05
§ p<0.001
APPENDIX A: Scannable TeleForm® Questionnaire

UNC SCHOOL OF DENTISTRY
Department of Dental Hygiene

Oral Health Survey of Pediatric Oncology Nurses

ID #: ____________

Instructions: Please write directly on the survey with a BLACK BALLPOINT PEN. We ask that you answer all the questions to the best of your ability. Read each question carefully and provide your most appropriate response. Choose only ONE response per question unless otherwise indicated. Fill in circles completely or fill in the boxes and blanks as needed. Write your answer as neatly as possible.

**Screening Questions**

1. Are you currently employed in the U.S. as a Pediatric Oncology or Pediatric Hematology/Oncology Nurse?  
   - Yes  
   - No

2. Do you provide direct patient care?  
   - Yes  
   - No

If you answered NO to either of the two questions above, please do not continue this survey. Thank you very much for your time.

If you answered YES to both of the questions above, please continue the survey below.

The following questions pertain to your knowledge, practice behaviors, and perceived ability to assist with the oral health care needs of pediatric oncology patients. Please read the following questions and select the best answer for each question.

1. Children undergoing radiation or chemotherapy could potentially develop oral complications, such as: oral mucositis/stomatitis, oral candidiasis infections, herpes simplex virus infections (cold sores), dental caries (cavities), as a results of oncology treatment.  
   - True  
   - False  
   - Don'tKnow

2. How often should the mouth of pediatric oncology patients, undergoing active cancer therapy, be assessed by caregivers (i.e. parents, guardians, nurses, and/or physicians)?  
   - Daily  
   - Weekly  
   - Monthly  
   - Other (please specify) __________________________  
   - Don't Know

3. Pediatric oncology patients should use a ________ bristled toothbrush.  
   - Soft  
   - Medium  
   - Hard  
   - Other (please specify) __________________________  
   - Don't Know

4. Pediatric oncology patients should use ___________ toothpaste.  
   - Non-fluoridated  
   - Fluoridated  
   - Pediatric oncology patients should not use toothpaste  
   - Other (please specify) __________________________  
   - Don't Know

5. It is recommended that pediatric oncology patients be referred to a dentist for consultation ________ cancer treatment, in order to optimize oral health of pediatric oncology patients undergoing cancer therapy.  
   - Before  
   - During  
   - After  
   - All of the above  
   - Don't Know  
   - None of the above
6. Thinking of the patients you typically see in a week, for about how many of them do you do the following? Select one response per row.

<table>
<thead>
<tr>
<th></th>
<th>All of them</th>
<th>More than half, but not all of them</th>
<th>About half of them</th>
<th>Some of them, but less than half</th>
<th>None of them</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Examine health of teeth and/or gums</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>b.</td>
<td>Examine for the presence of oral appliances (i.e. braces, retainers, dentures)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>c.</td>
<td>Examine for the presence of oral pathology (i.e. oral mucositis/stomatitis, oral candidiasis, cold sores, ulcers, etc.)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>d.</td>
<td>Examine if the patient experiences trismus (difficulty opening mouth)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>e.</td>
<td>Examine if the patient experiences dysphagia (difficulty swallowing)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>f.</td>
<td>Examine if the patient experiences xerostomia (dry mouth)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>g.</td>
<td>Examine for the presence of oral pain</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>h.</td>
<td>Provide oral hygiene care instruction</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>i.</td>
<td>Discuss the importance of seeking professional dental care regularly</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>j.</td>
<td>Provide instruction pertaining to managing oral complications/conditions</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>k.</td>
<td>Other:</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

7. How confident are you in your ability to do the following? Select one response per row.

<table>
<thead>
<tr>
<th></th>
<th>Very confident</th>
<th>Somewhat confident</th>
<th>Not at all confident</th>
</tr>
</thead>
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<td>k.</td>
<td>Other:</td>
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<td>○</td>
</tr>
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</table>
8. When do you usually refer pediatric oncology patients to a dental professional? (Please select ALL that apply)
- Upon admission
- Prior to the initiation of cancer therapy
- During cancer therapy
- After cancer therapy
- Following the presentation of oral symptoms
- At the request of the patient’s parent
- Other (please specify):__________________________
- I never refer patients to dental professionals

9. Please indicate the extent to which you agree or disagree with each of the following statements. Select one response per row.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree or Disagree</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. My knowledge about oral health care, as related to cancer, is current.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>b. I am comfortable performing oral care procedures on patients.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. I am adequately trained to provide oral health care instructions/education to patients:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. I am adequately trained to provide oral care procedures, i.e. assisting with tooth brushing, mouth swabbing, and/or application of oral topical medications, on patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. I am adequately trained to perform oral examinations on patients.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Demographic Information

10. What is your gender?  ○ Male  ○ Female

11. What is the highest credential/degree you have achieved in your field of study?
- Licensed Practical Nurse
- Certificate/Diploma in Nursing
- Bachelor of Science in Nursing
- Master of Science in Nursing
- Associate of Science in Nursing
- Other (please specify) _______________________

12. In what year did you complete training for your highest credential/degree?    

13. Which of the following best describes your job title and/or job specific certification? (please select ALL that apply)
- Licensed Practical Nurse (LPN)
- Registered Nurse (RN)
- Certified Pediatric Nurse Practitioner (CPNP)
- Oncology Certified Nurse (OCN)
- Nurse Practitioner (NP)
- Certified Pediatric Oncology Nurse (CPON)
- Certified Pediatric Nurse (CPN)
- Certified Family Nurse Practitioner (CFNP)
- Other (please specify) _______________________

14. Approximately how many hours of education and/or training related to oral health care did you receive in Nursing School?
- 3 hours or less
- Between 3 and 5 hours
- More than 5 hours

15. During your nursing education and/or training, did you have any clinical requirement regarding the assessment of the teeth and gums?  ○ Yes  ○ No

16. In the past 5 years, have you taken any Continuing Education (CE) Courses relating to oral health care for pediatric oncology patients?  ○ Yes  ○ No

17. In the future, would you like to take CE Courses relating to oral health care for pediatric oncology patients?  ○ Yes  ○ No

18. Do you have a resource of referrals, dentist(s)/dental office(s), for patients with severe oral complications?  ○ Yes  ○ No
<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. How many years have you worked as a pediatric oncology nurse?</td>
<td>3 years or less  4 - 10 years  More than 10 years</td>
</tr>
<tr>
<td>20. How many hours per week do you typically work in direct patient care?</td>
<td></td>
</tr>
<tr>
<td>21. In which division of the facility are you employed?</td>
<td>Inpatient  Outpatient  Other (please specify) __________________________</td>
</tr>
</tbody>
</table>

THANK YOU FOR YOUR PARTICIPATION!
REFERENCES


