Oral Health Documentation in a Pediatric Cancer Unit at a Children's Hospital

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Abstract

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Purpose: Patients hospitalized for cancer and blood disorders have an elevated risk of infection due to immunosuppression during treatment. Damaged oral mucosa can be a direct entry for bacteria and fungus, leading to bloodstream and systemic infections. Oral care documentation measures are essential to understanding and improving oral hygiene practices among these high-risk patients. This quality improvement project aimed to increase oral care documentation among patients hospitalized in the Cancer and Blood Disorders Center (CBDC) to support infection prevention efforts.

Methods: An interdisciplinary group of healthcare providers developed and implemented interventions to improve oral care documentation. The dental team developed educational materials for families and certified nursing assistants (CNAs) to improve knowledge and behavior around oral care documentation. The documentation rate for the pre and post intervention groups was analyzed.

Results: Forty-seven CNAs (87%) completed the post-education oral care questionnaire. Among them, 33 CNAs (70%) reported using the 3-2-1 poster and encouraging families to use hygiene reminder tools. Fifteen CNAs (32%) indicated they chart oral care twice per shift. Post-intervention data showed a statistically significant improvement in oral care documentation ($P = .042$); however, overall documentation remained low, with a median rate of 4.3%.

Conclusions: Improving oral care documentation requires sustained, systemic changes and long-term interdisciplinary collaboration. While targeted interventions showed some improvement, consistent effort is needed to achieve meaningful and lasting outcomes.

Introduction

According to the American Cancer Society (ACS), approximately 9,550 children (<15 yo.) will be diagnosed with cancer in 2025.[1] The annual report on national cancer statistics is a collaborative effort by the ACS, Centers for Disease Control and Prevention, the National Cancer Institute, and the North American Association of Central Cancer Registries.[2] The annual report displayed that the incidence for overall cancer rates was stable, and mortality decreased for cancer trends among children younger than 15 years old. The 5-year survival rate has increased due to treatment advancements.[3] In the mid-1970s, the 5-year survival rate was 58% and is currently about 85%.[4] The improvements in cancer treatment facilitate decreased mortality rates however, cancer remains the second leading cause of death in children (1-15 years old).[3,4]

Depending on the cancer diagnosis, treatment may include chemotherapy, radiation, surgery, immunotherapy, stem-cell transplant, targeted therapeutic drugs, or a combination of these modalities.[5] Although the goal is lifesaving, cancer treatments cause numerous acute and chronic adverse effects. Chemotherapy causes damage throughout the body, and radiation therapy damage is more isolated to the location of radiation.[6] Common late side effects of cytotoxic treatment include abnormal bone growth, and may affect multiple organ systems such as endocrine, lung, liver, renal, heart, auditory, and vision.[7,8] Early adverse effects may include alopecia, nausea, fatigue, pain, anemia, thrombocytopenia, and neutropenia.[9] Neutropenia leaves the immune system fragile and susceptible to infections, especially during prolonged hospitalization.[10] The National Healthcare Safety Network (NHSN) of the Centers for Disease Control and Prevention (CDC) track hospital-acquired infections (HAIs) to increase awareness and to implement evidence-based preventive strategies to improve patient safety.[11, 12] Given the toxicity of many chemotherapeutic agents, patients may require a central line which will increase their risk of infection while immunosuppressed.[13] The NHSN categorizes hospital-acquired bloodstream infection (BSI) as central line-associated bloodstream infection (CLABSI), Non-central Line-Associated Bloodstream Infection, and Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI).[14]

Mucositis/ mucosal barrier injury

Patients undergoing head and neck radiation and chemotherapy are at elevated risk for mucosal barrier injuries (MBI).[15] The rapid turnover of mucosal cells makes the mouth highly susceptible to damage from cytotoxic drugs and radiation.[16] These treatments interfere with cell proliferation and can delay or diminish the growth of new cells.[17] The interruption of normal cell growth causes oral tissue damage, inflammation, ulceration, and, ultimately, a breakdown in the mucosal barrier.[17] Oral MBI consists of four phases: inflammatory, epithelial, ulcerative, and healing.[18] MBI is more commonly referred to as mucositis.[19]When the mucosa is ulcerated and no longer intact, it creates a gateway for pathogens to enter the bloodstream.[18]

Oral mucositis causes painful mouth sores, making eating, drinking, and swallowing difficult.[9, 20] Cell damage gives rise to neurotoxicity and dysgeusia. Mucositis can lead to dehydration, malnourishment, and weight loss.[9] The lack of oral intake and damage to the salivary glands from radiation can cause gland dysfunction and xerostomia.[9, 20] Saliva is a natural buffer; therefore, xerostomia and vomiting increase caries risk.[9] Other oral complications include opportunistic infections (herpes simplex virus, candidiasis), oral graft versus host disease, gingival hypertrophy, mucosal fibrosis, soft tissue necrosis, trismus, craniofacial anomalies, dental developmental anomalies, osteoradionecrosis, and medication-related osteonecrosis.[9,20,21] Overall, oral complications drastically impact the patient's quality of life. [22]

Neglect of oral care during treatment can cause infections and compromise medical treatment.[9,18] Oral complications, such as MBI, increase the risk of morbidity and mortality [23] hospitalization time, and costs [9, 24, 25] Daily oral care can decrease oral complications of cancer treatment.[9] Recommended oral hygiene includes brushing teeth, oral rinse, and lip care.[9] Standardization of care can also significantly reduce Heathcare-Associated Infections (HAIs).[26] A multidisciplinary team approach is needed to combat oral complications during cancer treatment.[27]

Nursing

An interdisciplinary team approach to oral care may include physicians, occupational therapists, nurses, nursing assistants, and dentists. Since the caregiver task load is ever-growing, caregivers must prioritize tasks to work effectively.[28] Priority setting is an essential clinical skill in nursing practice. Priority setting allows nurses to order tasks according to the ranking of urgency; therefore, they can prioritize critical patient care interventions.[29] Research suggests that nurses are exposed to time and resource scarcity, which forces them to limit care.[30] Nurses reported that due to a lack of time, adverse events often occur when important nursing tasks are not completed.[31] Palese et al., investigated nursing priorities and found "Providing patient hygiene' was the intervention receiving the lowest priority.[32] Patient education is another nursing task that is commonly reported as not completed. Findings suggested 'Role ambiguity,' 'Not a priority nursing care,' and 'Informal teaching' are barriers to patient education.[33]

Delegation is a time management skill that helps nursing care teams complete tasks.[34] Patient care teams that assign tasks and delegate to assistive personnel promote efficient patient care.[35] Nursing assistants can help with activities of daily living (ADLs), such as oral care.[35] Structured delegation practices that involve respectful communication and well-defined roles can positively impact patient outcomes.[36]

The Institute for Healthcare Improvement (IHI) developed the concept of care bundling to improve care and patient outcomes.[37,38] A defined patient population in a specific care setting with evidence-based interventions forms a bundle. Bundles developed by interdisciplinary teams have higher acceptance and completion rates.[37] Collaborative communication, bundle discussion during rounding, and analysis of compliance are fundamental to the success of a bundle.[37] Bundling has proven effect, activities of daily living initiative 1-2-3 (daily chlorhexidine gluconate bath, two physical activities, and oral care 3 times a day) increased compliance rates from 25% to 66% in 90 days.[39] Seattle Children's Hospital implemented the Complete Your 3-2-1 in 2019. Activities include bundling care, which includes three activities, two toothbrushing/ rinses, daily movement and one chlorhexidine skin treatment to decrease the risk of bloodstream infections. The 3-2-1 poster was made available in each hospital room for patients to track each activity by checking off boxes on the poster and reminding families that these activities can be completed to make a positive impact on health.

Education

The National Assessment of Adult Literacy (NAAL) reported that only 12% of U.S. adults had proficient health literacy.[40] Health literacy is obtaining, processing, and understanding basic health information and services to make appropriate health decisions.[41] Health literacy needs to be considered by educators when developing and distributing health care information. Hospital educators play a critical role in making patient information easy to find and use, which is essential to promote well-being.[41]

Providing patient and parent education is a key component of patient care. Patient compliance with suggested treatment modalities increases when families are aware of acute and long-term side effects of cancer treatment.[9,42,43] The format of patient education materials can play a significant role in patient outcomes. Video-based instructions compared with handout-based instruction showed significantly higher individual skill assessment scores and retention of instructions.[44,45] Students reported that using podcasts enhanced their learning experience and were more enjoyable compared to traditional written information.[46] Patients also benefit from alternative methods of patient education. [47] Patients report that technology-based education material is the preferred format for patient education. The video format was ranked significantly higher by participants compared to paper handouts. The way patients prefer to access information and learn is constantly evolving; therefore, educators in healthcare organizations need to adapt to meet patient needs.[48] Patient education should always be patient- and family-centered. A patient- and family-centered care model improves patients' understanding of health care information and enhances outcomes.[49] Educators should train all team members on how to deliver patient- and family-centered care.[49]

Audit reports can evaluate how well patient education is understood and if education improves task completion. The audit report from the Cancer and Blood Disorders Center (CBDC) within Seattle Children's Hospital from October 2022 to July 2024 showed that only 4.4% of patients had two oral cares documented per day. The absence of oral care is a clinic concern since the Cancer and Blood Disorders Center (CBDC) patients are at higher risk for opportunistic infections and hospital-acquired infections. Educating the child and parents on the side effects of cancer therapies may motivate patients to complete oral care protocols during cancer therapy. [9] Yet the literature shows that nursing teams do not prioritize oral hygiene and patient education. [32, 33] This quality improvement project aims to improve oral hygiene in the CBDC through patient and provider education and tracking of oral care documentation.

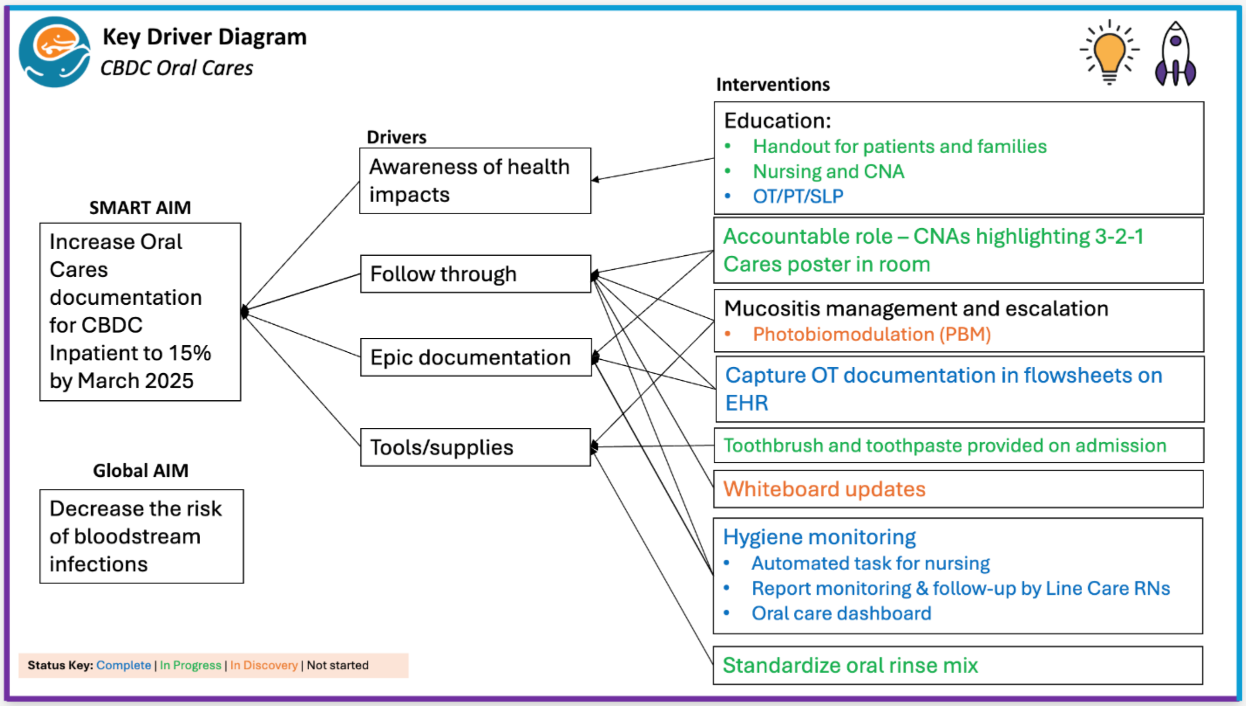
Methods

The CBDC Inpatient is a 48-bed unit within the 407 inpatient beds available at Seattle Children's Hospital. The CBDC at SCH diagnoses and treats all types of cancers and blood disorders for newborns up to young adults, depending on the type of cancer. As part of the hospital protocol, oral care is documented daily in the patient's electronic medical record (EMR). The CBDC Microsystem team tracks and reviews patient hygiene, such as documentation of oral care and bathing (bath, shower, chlorhexidine wipe). The data is exported from the EMR and de-identified via Tableau software systems.

Tableau information data categories include line category (all, central line, no line, other and peripherally inserted catheter), unit location (floor 7, floor 8 of hospital in-patient beds, all), language of care (all, English or other), service group (all, BMT, HemOnc, other), day inclusion (all, no, yes (day inclusion equals yes if day is not patient's first or last on unit), Race/Ethnicity, age (7 or younger, older than 7), patient sex (female, male), oral care compliance (at least two oral cares documented per day in flowsheets, one or more oral cares documented per day in flowsheets). Oral care was defined as any of the following; lip moisturizer applied, mouth moisturizer, mouth suctioned, mouth swabbed, patient/caregiver refused, suction toothette, swish and spit, teeth brushed, other (comment). The median baseline data for oral care documentation from October 2020 to August 2022 had a median of 1.2%. After an initial educational intervention by the CBCD Line Care RNs, the baseline from September 2022 to July 2024 was improved up to 4.6%. There were a series of interventions such as rounding with families related to line care and automated tasks for nursing.

As a result of the low oral care documentation, the CBDC Microsystem created an interdisciplinary group (CBDC Oral Cares Project team), which includes nurses, occupational therapists, pediatric dentists, physicians and family advocates with the goal to improve oral documentation to 15%. The key driver diagram was developed to organize drivers and interventions (Figure 1) during five team meetings.[50] The group created a survey for the CBDC nursing staff to identify quality improvement interventions to improve oral care documentation and compliance on the units. The survey asked about barriers to oral care, barriers to oral care documentation, and ideas for improvement. Results were analyzed by the CBDC Oral Cares Project team and used to direct interventions. Based on survey results, the CBDC group concluded that the initial intervention for the dental team was to focus on education of oral care for patients, families, and certified nursing assistants (CNAs).

Figure 1. Key Driver Diagram



Patient Education:

- Once the patient arrives at the CBDC, a transition nurse provides the family with cancer care education, which includes a section on oral care. The dental team provided an updated supplemental document (Mouth Care During Treatment) on oral education. The education highlights the rationale for oral care during cancer therapy to decrease the risk of infection and improve quality of life. The Patient and Family Education team at SCH reviewed and edited the oral care document to ensure appropriate language for families.
- The Mouth Care During Treatment patient education handout is available in English, Spanish, Simplified Chinese, Somali, and Vietnamese. QR codes are available for all languages if families prefer electronic copies. Also made available on the Cancer and Blood Disorders Center Patient and Family Education Toolkit.
- Per hospital protocol, admitted patients with a new cancer diagnosis or need for bone marrow transplant receive a baseline dental exam with a hospital-based pediatric dentist. The dental team will review the revised oral care handout with the families during consultation. (Appendix A- Mouth Care During Treatment)
- A Nursing Quality Indicator Consultant and an infection prevention nurse completed high-risk central line rounding on CBDC. During these rounds they prioritize Tableau High Risk patients who speak a language other than English and patients who are black or African American.

The dental and nursing team finalized a mouth rinse protocol for mucositis treatment and published it in the clean supply room for easy reference for CNAs. Mouth rinse protocol

(Appendix B) standardized the mixing of bland mouth rinses (normal saline 1000 mL or water with two tablespoons of sodium bicarbonate). The CBCD nurse educators also ensured that 3-2-1 posters were available in each patient room.

To standardize care for oral health, the dental team created dental education for the fifty-four CNAs on CBDC Inpatient. The dental team educators included a pediatric dental resident and two pediatric dentists. The dental educators provided an in-person learning session for the CNAs at a CBDC Inpatient staff meeting in August 2024. CNA oral health education sessions included oral hygiene, mouth rinse protocol for mucositis, oral care documentation in Epic, mucositis, patient education, encouraged the use of the 3-2-1 poster and review of hygiene supplies in a PowerPoint presentation format (Oral Care, Improving oral hygiene in the Cancer & Blood Disorders Center (Appendix C)). At the CBDC Inpatient staff meeting in February 2025 nurse educators reviewed the PowerPoint presentation again with CNAs.

The CNAs absent for this meeting completed the training asynchronously. Dental educators sent asynchronous learners a link to the video recording and a copy of the PowerPoint presentation. A post-teaching questionnaire in Google Form was sent to each CNA to review barriers to care, assess knowledge and behavior regarding bland oral rinses, address questions regarding oral health education, and track completion (Appendix D). CNAs were sent weekly reminders to complete the training. The nurse educators encouraged the completion of the oral care training. All CNAs who completed the training in either format received a $10.00 gift card.

Provider education on mouth care was placed in CBDC breakrooms. Packets included abbreviated version of CNA education including patient handout, 3-2-1 poster and mouth rinse protocol. Memo of rates of oral care completion and reminder to chart oral care was developed. Email of memo was sent to CNAs and was also displayed in breakroom. Snacks were provided in the breakroom for CBDC staff.

During a pediatric dental provider monthly meeting, the dental educators reviewed the Mouth Care During Treatment patient education handout, 3-2-1 poster, and recommended updates to patient education during inpatient dental consults. Anticipatory guidance specific to blood stream infections was added for consistent messaging to families across medical-dental providers. Additionally, the consulting dentist began reviewing with families where to locate the oral care handout, providing an example of the handout, and providing a QR code for an electronic copy. The dental team was also educated on identifying the location of the 3-2-1 poster in the patient's room, checking in with the patient's poster awareness, and encouraging the use of the 3-2-1 poster. All pediatric dental providers received a laminated copy of the handout, 3-2-1 poster and QR codes to use as a resource during dental consults. Dental provider education included six attending pediatric dentists and nine pediatric dental residents. Education included provider meeting, email with provider resources and one on one discussions.

Interventions by Date:

- 8/20/24 Patient handout published, Mouth Care During Treatment (English)
- 8/22/24 Staff meeting CNA education presentation by dental
- 9/25/24 - 11/18/24 CNA post education questionnaire completion, weekly emails
- 9/2024 - 11/2024 CNA education materials and snacks in breakroom
- 9/29/24 Dental provider education (3-2-1, handout, QR code)

- 10/10/24 Patient handout published, Mouth Care During Treatment (Spanish, Simplified Chinese, Somali, Vietnamese)
- 1/8/25 Mouth rinse protocol developed and posted on units
- 1/19/25 CNA message sent by email and unit newsletter (graph with completion rates, reminder to chart)
- 2/27/25 Staff meeting CNA education presentation by RN
- 3/19/25 High risk central line rounding on CBDC with nurse and dentist

The institutional review board at Seattle Children's Hospital reviewed this project and considered it a quality improvement project that did not constitute human subjects research.

Descriptive statistics were calculated for demographic data and pre and posttest oral care documentation. The median value was utilized as the dataset was not a normal distribution. Bivariate analyses were completed using the chi squared tests for categorical variables. The statistical package used for analysis was IBM SPSS version 28, 2023. The significance level was present at $P<0.05$.

Results

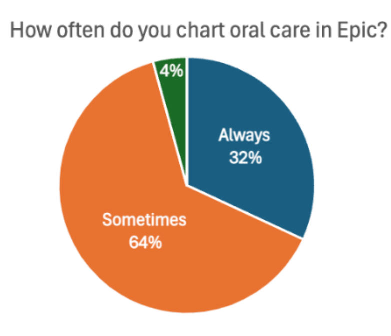
CNA Education

The CBCD units employ a total of fifty-four CNAs. A total of forty-nine (91%) of CBDC CNAs completed the Oral Care training. Five CNAs and a nurse educator were present for in-person training. Three CNAs joined the meeting virtually via Webex. Forty-one CNAs (84%) completed the training asynchronously. Post training questionnaires were sent to all fifty-four CNAs.

CNA Post Education Questionnaire

Forty-seven (87%) CNAs completed the oral care post education questionnaire. Twenty-eight (60%) CNAs reported that they make mouth rinses for patients, thirty-three (70%) of CNAs reported that they use the 3-2-1 poster and encourage families to use the poster. Fifteen (32%) CNAs report that they chart oral care in Epic twice a shift, 64% reported that they sometimes chart oral cares in Epic and 4% stated that they never chart oral cares (Figure 2).

Figure 2. Percentage of reported oral care documentation among CBCD CNA's (N=49)



Oral Care Documentation

Study population patient characteristics

Patients were inpatient in the Cancer and Blood Disorders Center (CBDC). This included 2727 patients with an average length of stay on unit of 7.3 days (standard deviation 18.2 days). There were 20,000 opportunities to document oral cares and bathing across the study period from

February 2024 to March 2025. The majority of patients were older than 7 years old (57.2%), male (56.2%), white (42.9%), and English-speaking (84.9%). Approximately 2/3 of the patients were classified as Hematology/Oncology patients compared to Bone Marrow Transplant patients and "Other" services (65.2% followed by 21.6% and 13.2% respectively). A majority of patients had a line present (Central Line, PICC, or Other line; 85.4%). In terms of oral care documentation, 75.5% received no oral cares documentation, 20.4% received 1 oral care, and 4.1% received 2 oral care documentation. In contrast, bathing documentation was at 71.3%, as shown in Table 1.

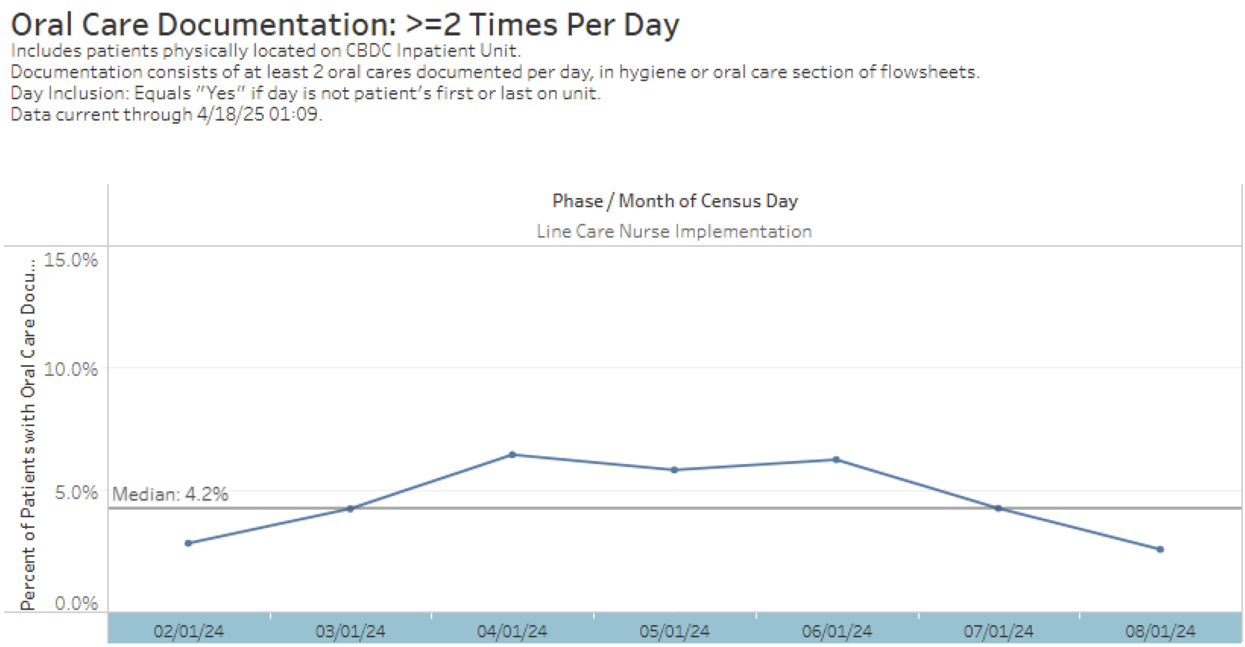
Table 1. Descriptive characteristics of inpatients where an oral documentation intervention was implemented (N=20,000)

Demographic Characteristic	N (%)
Age	
7 or younger	8556 (42.8)
Older than 7	11444 (57.2)
Sex	
Male	11240 (56.2)
Female	8760 (43.8)
Race	
American Indian or Alaska Native	873 (4.4)
Asian	1637 (8.3)
Black or African American	2054 (10.3)
Native Hawaiian or Other Pacific Islander	186 (0.9)
White	8587 (42.9)
2 or more races	1666 (8.3)
Other	3522 (17.6)
Patient Declined or missing	1474 (7.3)
Language	
Language other than English	3169 (15.8)
English	16831 (84.2)
Unit	
F7	13423 (67.1)
F8	6577 (32.9)
Service Group	
BMT	4318 (21.6)
HemOnc	13043 (65.2)
Other	2639 (13.2)
Line	
No Line	2924 (14.6)
Line	17076 (85.4)
Oral Care Compliance	
Not done	15114 (75.5)
1 oral care	4072 (20.4)
>=2 oral cares	814 (4.1)
Bathing Documentation Compliance	
No	5742 (28.7)
Yes	14258 (71.3)

The Cancer and Blood Disorders Center (CBDC) study population was categorized into a 7-month pre-intervention group (February 2024 – August 2024) and a 7-month post-intervention (September 2024 – March 2024) group. The data was analyzed this way to identify differences in oral documentation between the pre-intervention period and the post-intervention period.

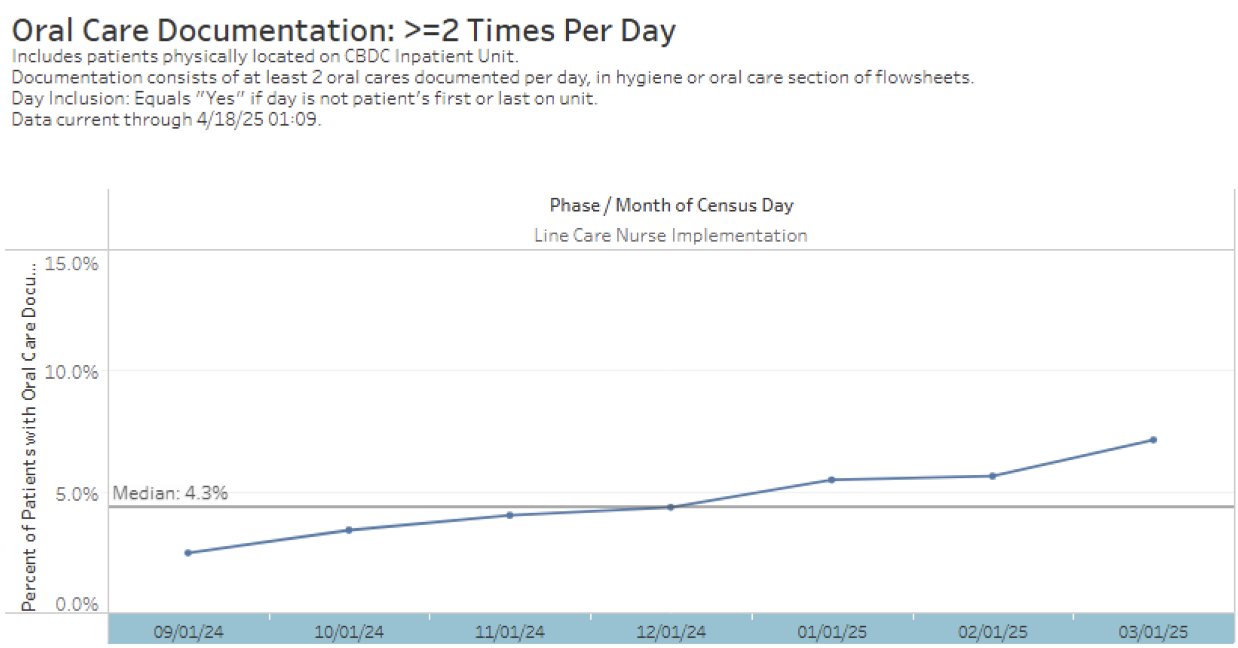
The pre-intervention median for oral care documentation of at least 2 oral cares for February 2024 was 2.4%. The median documentation increased to >5% April through June. In August 2024 the median documentation dropped to 2.3% (Figure 3).

Figure 3. Pre-invention group, Oral Care Documentation >=2 Times Per Day



The post-intervention median for oral care documentation of at least 2 oral cares was 2.5% for September 2024. There was a steady increase in oral care documentation from October to March 2025. In March 2025 the median for oral care documentation was 7.1% (Figure 4).

Figure 4. Post-invention group, Oral Care Documentation >=2 Times Per Day



The data was stratified by the pre-intervention and post-intervention periods. Demographic differences across the study period were most notable with regards to race data where there was a 3-fold increase among American Indian or Alaska Native patients from 1.8% to 6.7% from the pre to the post test group. There was a similar increase in the same direction among Native

Hawaiian/Pacific Islander patients from 0.5% to 1.4% (Table 2).

In both pre-and post-intervention groups, patients were most likely to have no oral care documentation completed daily (76%, and 75% respectively), and less likely to have two oral care documentations per day (approximately 4% in both groups) (Table 2).

Table 2. Descriptive characteristics of inpatients where an oral documentation intervention was implemented pre- and post-intervention (N=20,000)

Demographic Characteristic	**Pre-Intervention (February 2024~August 2024; N=9649); N (%)**	**Post-Intervention (September 2024 ~ March 2025; N=10,351); N (%)**
Age		
7 or younger	4170 (43.2)	4386 (42.4)
Older than 7	5479 (56.8)	5965 (57.6)
Sex		
Male	5457 (56.6)	5783 (55.9)
Female	4192 (43.4)	4568 (44.1)
Race		
American Indian or Alaska Native	176 (1.8)	697 (6.7)
Asian	1033 (10.7)	604 (5.9)
Black or African American	900 (9.3)	1154 (11.1)
Native Hawaiian or Other Pacific Islander	44 (0.5)	142 (1.4)
White	4171 (43.2)	4416 (42.7)
2 or more races	683 (7.1)	9983(9.5)
Other	1843 (19.1)	1679 (16.2)
Patient Declined or missing	799 (8.3)	676 (6.5)
Language		
Language other than English	1679 (17.4)	1490 (14.4)
English	7970 (82.6)	8861 (85.6)
Unit		
F7	6446 (66.8)	6977 (67.4)
F8	3203 (33.2)	3374 (32.6)
Service Group		
BMT	1840 (19.1)	2478 (23.9)
HemOnc	6006 (62.2)	7037 (68.0)
Other	1803 (18.7)	836 (8.1)
Line		
No Line	1718 (17.8)	1206 (11.7)
Line	7931 (82.2)	9145 (88.3)
Oral Care Compliance		
Not done	7354 (76.2)	7760 (74.9)
1 oral care	1913 (19.8)	2159 (20.9)
>=2 oral cares	382 (4.0)	432 (4.2)
Bathing Documentation Compliance		
No	2747 (28.5)	2995 (28.9)
Yes	6902 (71.5)	7356 (71.1)

The outcome of oral care documentation was examined as 0 (no oral care documentation), 1 (one oral care documentation) and 2 (two oral care documentation). The variables among the pre and post intervention groups were initially stratified by oral care compliance (0, 1, 2) (N=20,000). For purposes of simplicity and to facilitate data analysis of a binary outcome, the group of one documented oral care and the group of two documented oral cares per day were collapsed into one single group which included any documentation per day compared to no documentation.

Oral documentation was more likely for patients who were older than age 7 (pre-intervention (pre) 65.1%, post-intervention (post) 67.3%), male (pre 53.1%, post 57.2%), white (pre 40.7%, post 41.9%), and who had English as a first language (pre 80.3%, post 85.4%). Oral documentation was also higher among patients on the Hematology-Oncology service (pre 65.1%, post 60.6%) versus the Bone Marrow Transplant Service (pre 24.1%, post 34.7%), those with a central line (pre 66.5%, post 91.4%) and for patients who also had bathing compliance documentation (pre 87.6%, post 84.5%). There was an increase in oral documentation among American Indian or Alaska Native (pre 3%, post 7.9%) and Native Hawaiian or Other Pacific Islander (pre 0.6%, post 1.2%). There was a decrease of documentation of 50% (from pre 12.3% to post 6.1%) among Asian children (Table 3).

Patients in the post intervention group were more likely to have oral care documentation ($p<0.05$). Chi-squared test for pre- and post-intervention oral care compliance (yes/no): p-value = 0.042).

Patients with a line were more likely to have oral care documentation compared to patients with no line. Chi-squared test for line and no line was statistically significantly (p-value<2.2e-16).

Table 3. Descriptive characteristics of inpatients where an oral documentation intervention was implemented pre- and post-intervention stratified by oral care compliance (yes/no) (N=20,000)

Demographic Characteristic	Pre-Intervention (February 2024~August 2024; N=9649); N (%)		Post-Intervention (September 2024 ~ March 2025; N=10,351); N (%)	
	Oral Care Compliance		Oral Care Compliance	
	No (N=7354)	Yes (N=2295)	No (N=7760)	Yes (N=2591)
Age				
7 or younger	3368 (45.8)	802 (34.9)	3540 (45.6)	846 (32.7)
Older than 7	3986 (54.2)	1493 (65.1)	4220 (54.4)	1745 (67.3)
Sex				
Male	4238 (57.6)	1219 (53.1)	4301 (55.4)	1482 (57.2)
Female	3116 (42.3)	1076 (46.9)	3459 (44.6)	1109 (42.8)
Race				
American Indian or Alaska Native	107 (1.5)	69 (3.0)	439 (6.4)	204 (7.9)
Asian	751 (10.2)	282 (12.3)	445 (5.7)	159 (6.1)
Black or African American	666 (9.1)	234 (10.2)	844 (10.9)	310 (12.0)
Native Hawaiian or Other Pacific Islander	31 (0.4)	13 (0.6)	110 (1.4)	32 (1.2)
White	3238 (44.0)	933 (40.7)	3331 (42.9)	1085 (41.9)
2 or more races	523 (7.1)	160 (6.9)	750 (9.7)	233 (9.0)
Other	1408 (19.1)	435 (18.9)	1265 (16.3)	414 (16.0)
Patient Declined or missing	630 (8.6)	169 (7.4)	522 (6.7)	154 (5.9)
Language				
Language other than English	1226 (16.7)	453 (19.7)	1113 (14.3)	377 (14.6)
English	6128 (83.3)	1842 (80.3)	6647 (85.7)	2214 (85.4)
Unit				
F7	5005 (68.1)	1441 (62.8)	5225 (67.3)	1752 (67.6)
F8	2349 (31.9)	854 (37.2)	2535 (32.7)	839 (32.4)
Service Group				
BMT	1286 (17.5)	554 (24.1)	1578 (20.3)	900 (34.7)
HemOnc	4512 (61.4)	1494 (65.1)	5467 (70.5)	1570 (60.6)
Other	1556 (21.1)	247 (10.8)	715 (9.2)	121 (4.7)
Line				
No Line	1494 (20.3)	224 (33.5)	983 (12.7)	223 (8.6)
Line	5860 (79.7)	4891 (66.5)	6777 (87.3)	2368 (91.4)
Bathing Documentation Compliance				
No	2463 (33.5)	284 (12.4)	2593 (33.4)	402 (15.5)
Yes	4891 (66.5)	2011 (87.6)	5167 (66.6)	2189 (84.5)

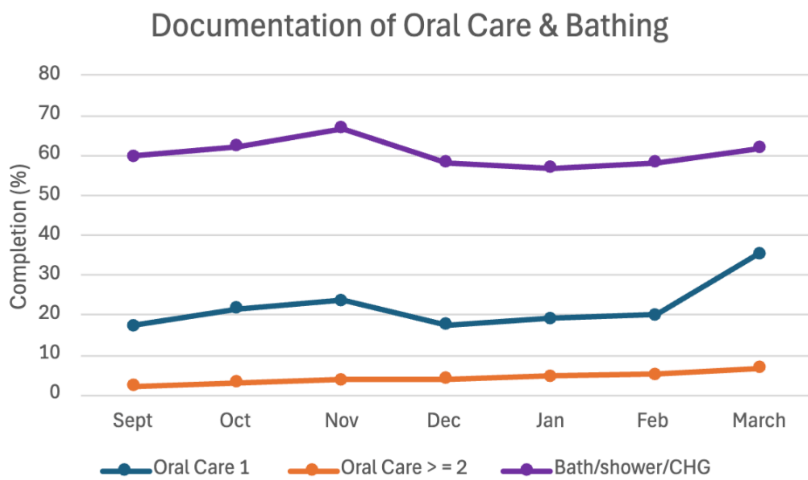
An ANOVA test was completed to determine if there was a significant difference between the intervention and oral care documentation (categories). There is a significant difference between the three oral documentation groups (no care, 1 care, and greater than or equal to 2 cares). Between groups mean square: 1.83, p-value <0.001 (Table 4).

Table 4. ANOVA for Oral Care Compliance

Oral Care compliance	Mean	95% confidence interval
Not done	1.56	[1.55,1.57]
1 oral care	1.59	[1.57,1.60]
>=2 oral cares	1.60	[1.57,1.64]

A comparison of oral care documentation and bathing documentation is displayed in Figure 5. Less than 5% of patients have oral documentation twice a day. Oral care documentation once a day is higher with 22% of patients on average. This contrasts with bathing documentation (which included bath, shower, or wipe), whereas 60% of patients had bathing hygiene documented daily. Chi-squared test for bathing documentation and oral care compliance (yes/no) shows a statistically significant difference, p-value < 2.2e-16.

Figure 5. Comparison of oral care and bathing documentation



Mucosal barrier injury laboratory confirmed bloodstream infections were also reviewed. There was a total of 10 infections during the pre-intervention period and a total of 14 infections during the post-intervention period. Preintervention N=9649, 10 infections (0.10%). Postintervention N=10351, 14 infections (0.14%).

A dentist and the Nursing Quality Indicator Consultant nurse completed rounding on three high risk patients during one session. Barriers of care that were identified during rounding included nursing staff being unaware of dental hygiene supplies. CNAs were not trained on how suction toothette can be set up and used for oral care. The nursing team was uncertain of what age oral hygiene should be started therefore did not advise a family to complete brushing. Nursing was hesitant to complete oral cares due to age and lab values. The nursing team was not knowledgeable about the patient handout (Mouth Care During Treatment).

Discussion

Bloodstream infections cause complications for patients and can compromise medical treatment. Complications in treatment can increase hospitalization time and cost; therefore, it is crucial that hospitals educate healthcare providers on preventive measures to decrease risk. Continuing education and training healthcare professionals can be laborious. An asynchronous education format may be the preferred delivery method for busy hospitals and providers. Either in-person or asynchronous continuous education is needed and can be done. The post education questionnaire showed that most CNAs thought they were charting at least sometimes (64%). This did not match our EHR data which showed completion was less than 4%. From this information we can extrapolate that CNAs overestimate their own documentation rates. Self-reporting is not a reliable method of monitoring. Tasks that are reported as completed may not be completed.

The population of this study had a large standard deviation (18.2 days). Hospitalizations for chemotherapy are typically a short admission, and transplant treatment is typically greater than 30 days. These two diverse populations may contribute to the large standard deviation seen in this study.

Oral care documentation after intervention showed an improvement (p-value <0.05) but remained low and did not reach the goal of 15%. There are many barriers to completing oral care and charting oral care documentation. Barriers include low knowledge of oral health impacts, low confidence to provide oral care support among CNAs and nurses, and an undefined workflow to complete documentation. Immunosuppression risk, bleeding risk and patient fatigue may make healthcare providers overly cautious and hesitant on providing oral care.

This project aimed to provide oral health education to increase clinical knowledge and confidence. Education by patient handout and provider education by memo and meetings were not a sufficient way to improve oral care documentation. Audio visual formats may help with comprehension and bridge gaps in health literacy. Providing patient and provider education through video platforms may yield more promising outcomes. Video formats were considered in this project but not pursued due to time and cost restraints.

Documentation for bathing was significantly higher compared to oral care documentation. CNAs and nurses may have more training in bathing, and therefore more confident in completing tasks related to bathing. Bundling completion and charting of bathing and oral care could possibly increase oral care compliance documentation.

The mouth rinse protocol was developed to standardize the mixture and posted in CBDC to serve as a quick reference to improve utilization. Mouthrinses can help decrease the risk for oral infections and count towards oral care compliance. Mouth rinses can be easier for patients in some respects but more difficult in regard to flavor. Toothpastes are offered in a variety of flavors, but the mouthrinses have no added flavor to make them more palatable. The mouth rinse protocol standardized the mixing of bland mouth rinses but did not address barriers to flavor.

Data collection defined oral care as any of the following; lip moisturizer applied, mouth moisturizer, mouth suctioned, mouth swabbed, patient/caregiver refused, suction toothette, swish and spit, teeth brushed, other (comment). Since counts were a combination of all of the above options there is not a true understanding if oral hygiene is being completed. For example, if patient/caregiver refused was documented, this would count towards oral care compliance documentation. Documentation of refusal is still useful though since healthcare providers can develop patient specific interventions, acknowledge refusal and address reasoning of refusal. Data collection that separated oral care and refusal would be beneficial.

The global aim of this project was to decrease the risk of bloodstream infections. The hospital tracks hospital-acquired infections, therefore interventions can be developed to prevent infections and improve patient safety. Mucosal barrier injury laboratory confirmed bloodstream infections were reviewed. There was a total of 10 infections during the pre-intervention period and a total of 14 infections during the post-intervention period. Although the aim was to decrease infection rate through oral care compliance, there was a slight increase in infections.

Limitations

The study had a short study time of only 7-months post intervention.

The ANOVA results revealed the need for more analysis in the future since there is a significant difference between the three oral documentation groups (no care, 1 care, and greater than or equal to 2 cares). Further statistical analyses should consider a regression model to look at specific values and differences while also controlling and adjusting for potential confounding factors.

Our interventions were highly dependent on proper training of healthcare providers. If the work environment had a high turnover rate of CNAs, this could have contributed to lower training rates, decreased understanding of role and lower completion of tasks. The hospital-wide turnover rate for April 2024 through April 2025 was 36%. The CBDC turnover rate is 24%. The CNA role has a high turnover rate because many CNAs further their education and advance into other roles. The CBDC unit provides a higher scope of practice for CNAs than other units, therefore they have a lower turnover rate than most units.

Although the dental and medical team worked together on interventions, the dental clinic and CBDC are separate departments, both with limited resources. If more resources were allocated to this project that aimed at fostering continual working relationships this may promote a higher completion of documentation and a more consistent message. Future pediatric dental resident rotations to the CBDC could possibly include pediatric dental resident providing hands-on training of oral care products and indications to the nursing team.

Conclusion

After interventions, oral care documentation showed an improvement from baseline. However, CNA oral health knowledge and oral care documentation in hospitalized children remained low and did not reach the target. Provider and patient education are important but not sufficient to improve inpatient oral care documentation.

Ways to improve oral documentation in a hospital setting include consistent and unified oral health messaging for families, targeting RN/CNA knowledge and confidence in providing oral health anticipatory guidance, and supportive workflow measures. The CBDC interdisciplinary group will continue to implement new interventions to improve oral care messaging, documentation, and address barriers.

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Appendix A
Mouth Care During Treatment

Mouth Care During Treatment

For more information and a video about keeping your child's mouth heatlhy, visit
kidshealth.org/en/parents/healthy.html

Why is mouth care important during treatment?

Cells in the mouth can be affected by chemotherapy and radiation therapy. During treatment your child is at a higher risk for an infection.

The mouth has thin tissue, and when it is injured bacteria can enter your child's bloodstream. Help your child keep their mouth and teeth as clean as possible to reduce the risk of infection and help your child feel more comfortable during treatment.

When your child is inpatient, we may ask for a pediatric dentist to evaluate your child's mouth and teeth (oral health). The pediatric dentist can review common dental concerns that you and your child may have. It is very helpful if you share information about your child's previous dental care.

How do I keep my child's mouth clean?

- Brush teeth, gums, and tongue 2 times a day (after breakfast and last thing before going to sleep).
- Use a soft toothbrush and fluoride toothpaste.
- Children 2 years and younger: Use rice-sized amount of fluoride toothpaste.
- Children 3 to 6 years: Use pea-sized amount of fluoride toothpaste.
- Air dry the toothbrush between uses and replace every 2 to 3 months.
- If your child flosses at home please continue to gently floss daily to remove food from between the teeth.
- Some children need help with toothbrushing. If your child is unable to tie a bow, they may not have the hand skills to brush their own teeth without help from an adult.
- Help your child rinse their mouth after vomiting with water.
- Avoid mouth rinses with alcohol because they can cause dryness and discomfort.
- Your care team will ask questions about your mouth and look in your mouth during your hospital stay.
- Some families find it helpful to bundle daily activities such as: movement, brushing teeth and bathing. See our handout, Complete Your 3-2-1 at seattlechildrens.org/pdf/PE2861.pdf.
- If your child is having trouble brushing their teeth or has questions, please talk with your care team.

To Learn More
- Cancer and Blood Disorders 206-987-2106
- Ask your child's healthcare provider
- seattlechildrens.org/patient-education

Free Interpreter Services
- In the hospital, ask your nurse.
- From outside the hospital, call the toll-free Family Interpreting Line, 1-866-583-1527. Tell the interpreter the name or extension you need.

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Appendix A
Mouth Care During Treatment

Mucositis

Some treatments can cause mouth pain, swelling, breakdown and redness (inflammation) of the lips, tongue, mouth, throat, and gastrointestinal tract. This is known as mucositis.

If your child has mucositis, they might have:

- Thick saliva
- Mouth sores causing pain
- Swelling inside the mouth and digestive tract (swollen mucosa)
- Bleeding in the mouth
- Diarrhea and blood in bowel movements (stools)
- Stomach pain (abdominal discomfort)

If your child has mucosistis:

- Swelling in the mouth can make it hard to swallow and breathe. This can be painful and can make eating, drinking and sleeping difficult.
- Your child needs to get enough nutrition. If eating and drinking is difficult, we will make a plan to help them.
- Your child's ability to fight infection is weakened by their treatment. Bacteria can get into cracks and sores. Cleaning their mouth and teeth can help prevent this from happening, even if your child is not able to brush with a toothbrush or floss.

If your child cannot brush

If your child cannot brush, help them rinse their mouth every 3 to 4 hours while awake. Ask your care team for help with mouth rinses.

Directions: Combine baking soda or salt and water. Mix well. Have your child swish the mouth rinse around in their mouth for 30 seconds and spit. Keep the mouth rinse in a closed container and make a new rinse daily. Follow water safety guidelines for the water you use in the mouth rinse seattlechildrens.org/pdf/PE3322.pdf.

Baking soda (sodium bicarbonate) rinse

- Combine 1/3 tsp of baking soda with 2 oz of water

Salt water rinse

- 0.9% normal saline may be given by care team
- Or can be made by combining 1/2 tsp of salt with 8 oz warm water

If your child cannot tolerate baking soda or salt water rinses, you can use just water, making sure to follow water safety guidelines seattlechildrens.org/pdf/PE3322.pdf.

Baking soda and salt water rinses reduce bacteria in the mouth, so it is good to use them if your child can tolerate them.

If needed, we can give you alcohol-free chlorhexidine (CHG) mouth rinse and foam brushes for mouth cleaning.

Toothbrushing is the best way to keep your child's mouth clean. Start normal toothbrushing again as soon as possible if symptoms improve.

Appendix A
Mouth Care During Treatment

Lip care	• Dry cracked lips can bleed and cause bacteria to enter bloodstream. • To prevent and treat dry cracked lips use lanolin, beeswax, cocoa butter-based lip-balm or ointments. • Avoid petroleum-based products (like Vaseline) because they can cause drying and cracking of lips
Dry mouth	• Frequent sips of water, sugar-free hard candies and gum may help reduce dry mouth. • There are mouth rinses and hydrating gel products for dry mouth. If this may help your child, please ask your care team.
Mouth sores	• Stop using toothpaste if it stings, burns or causes nausea. • Replace your child's toothbrush every 7 days. • Ice chips or popsicles in your child's mouth can cool the mouth, provide comfort and prevent sores. Do this 30 minutes before chemotherapy, during and 30 minutes after chemotherapy. • You can use ice chips and ice packs on cheeks and lips for 10 to 15 minutes every 2 hours. This can help with pain, swelling and reduce bleeding. • Avoid foods that are spicy, acidic, dry and rough because many of these can cut or injure of the mouth during treatment. • Serve your child soft foods and cut up their food into small pieces.
More resources	**Flossing** American Dental Association (ADA) – Mouthhealthy mouthhealthy.org/en/all-topics-a-z/flossing **Brushing Your Teeth** American Dental Associtoin (ADA) – Mouthhealthy mouthhealthy.org/en/all-topics-a-z/brushing-your-teeth **Mouth Care (page 59)** Children's Oncology Group (COG) – Family Handbook https://childrensoncologygroup.org/downloads/English_COG_Family_Handbook.pdf

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Appendix B
Mouth Rinse Protocol

Sodium bicarbonate mouth rinse protocol

How to make:

1. Add 1 med cup (2 TBS.) of sodium bicarbonate (baking soda) to 1000 mL of normal saline (NS) or water
2. Write on the patient label or directly on the bottle with black Sharpie:
   a. Opened: Date, Time
   b. Expire: Date, Time (expires in 24 HR)
3. Place patient label on the NS bottle
4. Keep the lid on the NS bottle

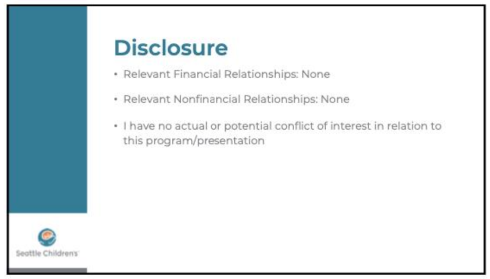
   Are you looking for Sodium bicarbonate?
   Call nutrition desk phone 7-3964 or the nutrition lead at 7-8173

How to use: Swish for 30 seconds and spit. Rinse mouth every 3 hours while awake. Apply with mouth swab with suction if patient cannot swish and spit.

Indication: Reduce bacteria in patients that cannot brush or have mucositis

Appendix C
Oral Care Presentation

1



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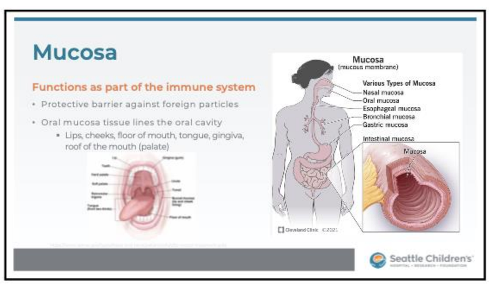

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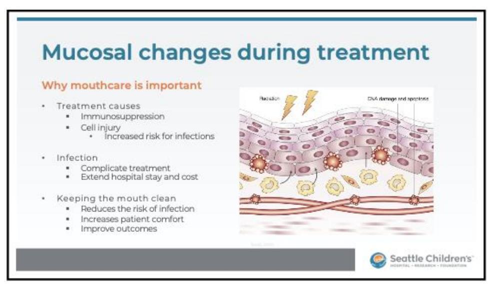

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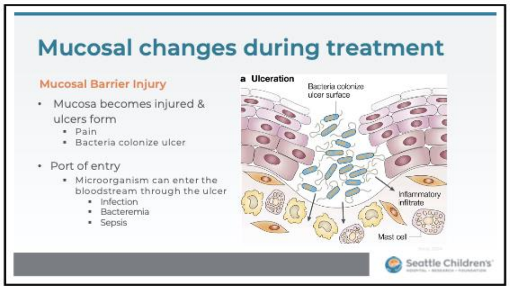
Appendix C
Oral Care Presentation



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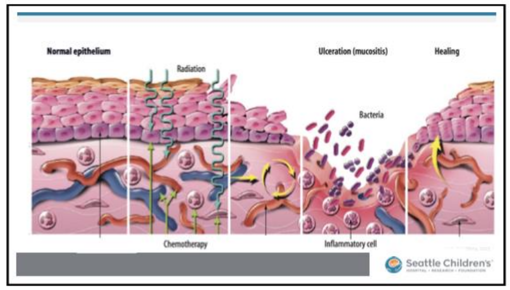

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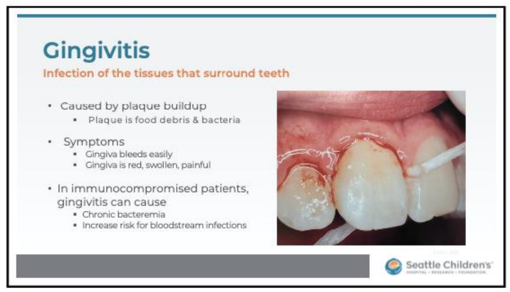

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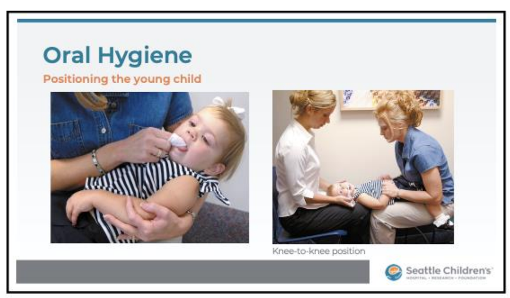

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Appendix C
Oral Care Presentation

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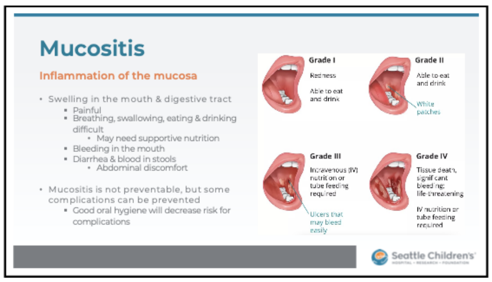

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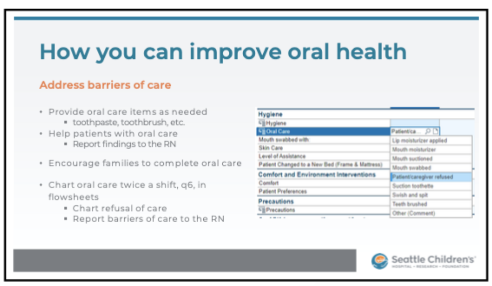

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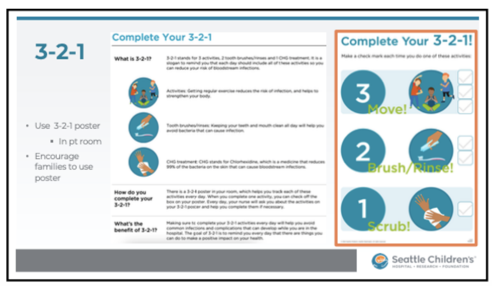
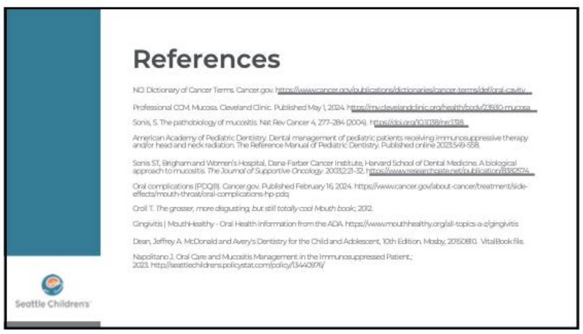


18

Appendix C
Oral Care Presentation

19

20



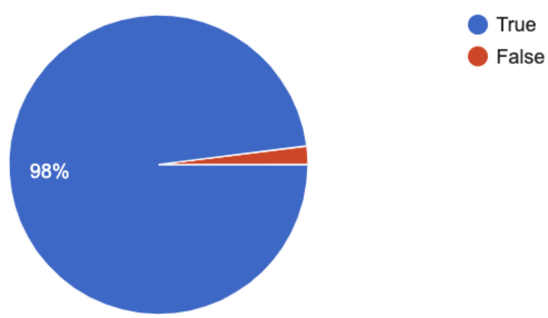
21

Appendix D
Post-teaching Questionnaire

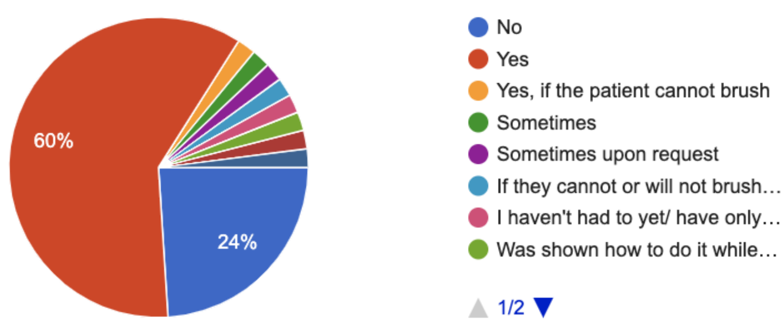
Name
Copy
50 responses

Email
Copy
50 responses

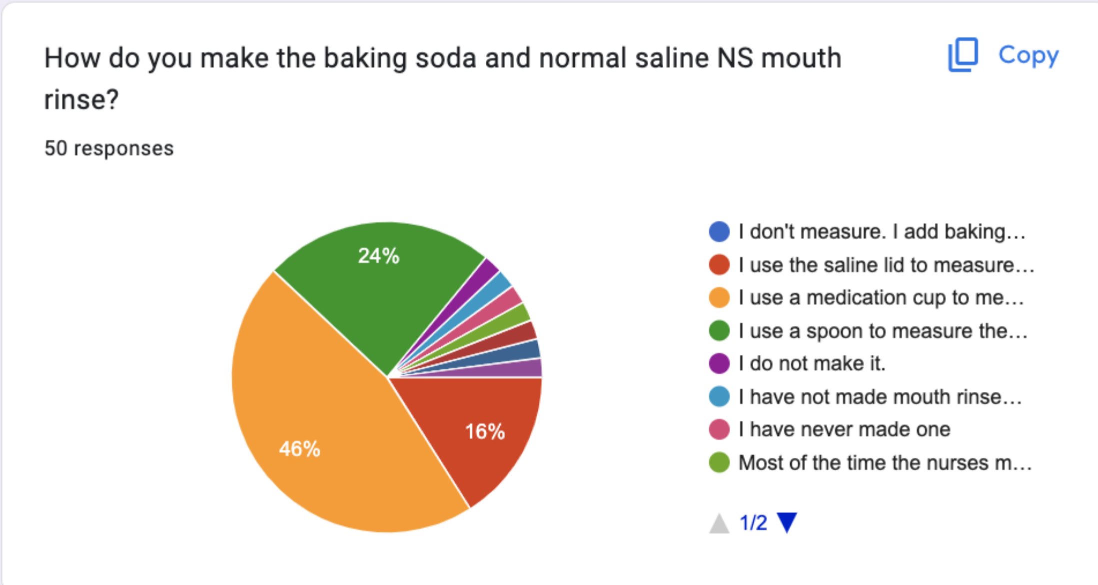
I reviewed the Oral Care PowerPoint attached.
Copy
50 responses

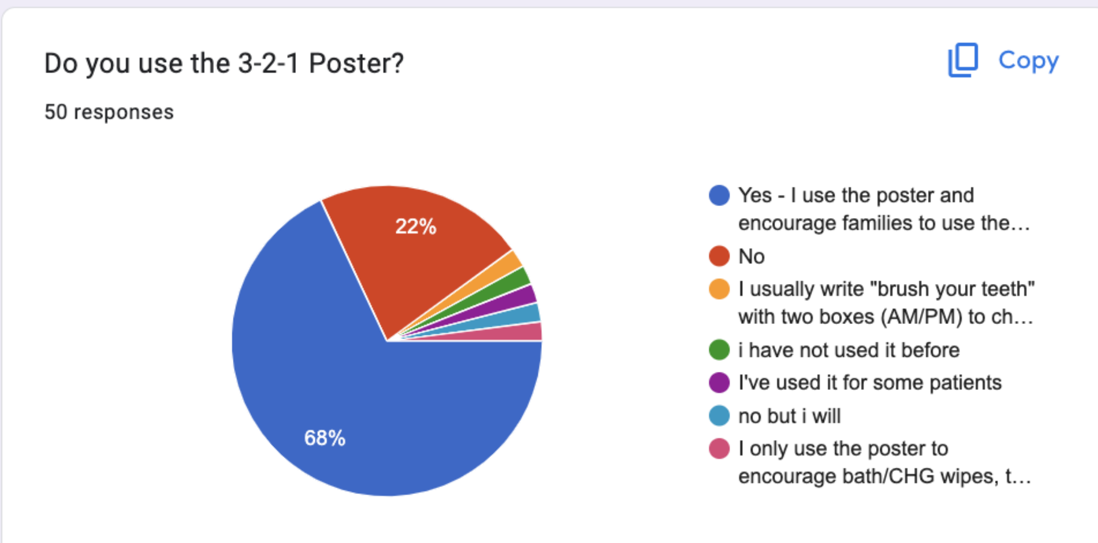


Do you make mouth rinses for patients?
Copy
50 responses



Appendix D
Post-teaching questionnaire



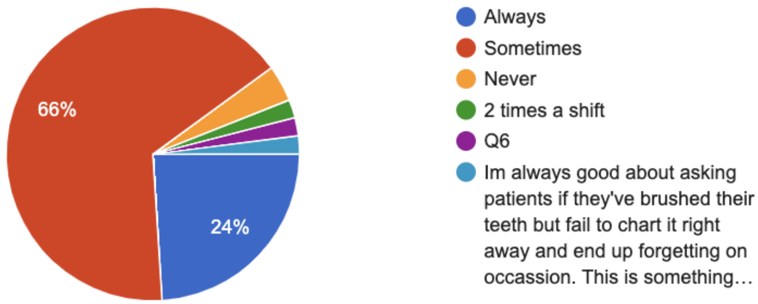


Appendix D
Post-teaching questionnaire

How often do you chart oral care in Epic?

Copy

50 responses



Do you have any additional comments or questions for the dental team?

Copy

11 responses