MEASURING ONCOLOGY NURSING-SENSITIVE PATIENT OUTCOMES:
EVIDENCE-BASED SUMMARY

1. Outcome: Mucositis

2. Category: Symptom experience

3. Definition and Description of the Problem

Mucositis is an inflammatory and potentially ulcerative process that affects the mucous membranes of the oral cavity and gastrointestinal tract of individuals receiving chemotherapy and radiation therapy as treatments for cancer (i.e. mucotoxic chemotherapy, hyperfractionated radiotherapy to a field including the oral cavity, and concurrent chemotherapy and radiation therapy) (Avritscher et al., 2004; Brown & Wingard, 2004).

ICD-9 Criteria for Mucositis (Puckett, 2004, p. 738)
528.0 Stomatitis—inflammation of the oral mucous membrane
Stomatitis:
Not otherwise specified
Ulcerative—a form marked by the appearance of small ulcers
Vesicular stomatitis—a form marked by vesicular eruption on the mucous membrane

Historically, literature used the terms mucositis and stomatitis in combination (i.e., mucositis/stomatitis) or almost interchangeably. For reference searches, stomatitis and mouth mucosa are the required Medical Subject Headings (MeSH) terms. Use of the term mucositis will produce less comprehensive findings. In contrast, experts in oral cavity changes associated with mucositis recommend a change in nomenclature to use the term *stomatitis* to refer to inflammatory diseases of the mouth including mucosa, dentition/periapices and periodontium and the term *mucositis* to refer to inflammation of the mucous membranes which typically manifests as erythema or ulcerations (National Cancer Institute & National Institutes of Health, 2004; Rubenstein et al., 2004). A request is pending with the National Library of Medicine to have mucositis made into a MeSH heading.

Mucositis can encompass all of the mucous membranes. One other example of a change in terminology related to this clarification in the use of the terms mucositis and stomatitis is use of the term mucotoxic rather than stomatotoxic to refer to treatments that have the potential to damage the mucous membranes.

This document will focus on mucositis involving the oral and oropharyngeal cavity. Gastrointestinal mucositis, although of significance in the well-being of patients, is less readily visible and thus more challenging for nurses to assess, diagnose, and treat.

Mucositis is a multifaceted problem that can lead to a number of clinical complications (Eilers, 2004; Eilers & Epstein, 2004), including pain, hemorrhage, and taste changes, that can decrease quality of life. Xerostomia, or lack of saliva, may or may not accompany mucositis. Individuals with mucositis use the terms pain, bleeding, taste changes, and dry mouth to report the symptoms that they experience and have reported mucositis to be the most distressing symptom of high-dose therapy (Bellm et al., 2002; Borbasi et al., 2002).

Mucositis remains a major dose-limiting side effect of cancer therapy. This dose-limiting effect is related to the risk of life-threatening infections secondary to breakdown in the mucosal lining that normally provides the first line of defense against microbial invasion by the organisms in the oral cavity. Use of antimicrobial agents in individuals receiving cancer treatments also alters the make-up of the normal flora in the oral cavity, thus contributing to the risk of problems because of the disruption of the normal balance of organisms.

Factors That Influence Mucositis

Risk Factor		Increased Risk
Patient related		
	Age	Young children and elderly [a, d]
	Gender	Women are at greater risk for severe mucositis. [a] No difference [b]
	Oral health and oral hygiene	Poor oral health and poor oral hygiene [a,.b]
	Salivary function	Reduced production [a]
	Genetics	High expression of cytokines [a]
	Body mass index	Poor nutritional status [a] Role of nutritional status controversial [b]
	Renal function and possibly hepatic function	Altered drug metabolism [a, d, e]
	Smoking	History of tobacco use may increase risk. [a, c]
	Alcohol use	History of heavy use may increase risk. [c]
Therapy related	Chemotherapy or biotherapy agent	Agents that affect DNA synthesis [g] Interleukin-2, lymphokine-activated killers, tumor necrosis factor, and interferons [f]
		Higher doses and longer-term infusions [a]
		Combined with radiation therapy [a]
	Type of blood and marrow stem cell transplant	Allogeneic [a]
	Radiation site and fractionation	Head and neck treatment fields, including total body irradiation (fields including thorax, abdomen and anal-rectal produce gastrointestinal mucositis) [a] Hyperfractionation and acceleration [a]
Previous cancer treatment		History of mucositis with previous treatment [a]

[a] Avritscher et al., 2004; [b] Barasch & Peterson, 2003; [c] Porock et al., 2004; [d] Berger & Eilers, 1998; [e] Daeffler, 1998; [f] Madeya, 1996; [g] National Cancer Institute & National Institutes of Health, 2004

4. Integrative reviews and meta-analyses

Clarkson, J.E., Worthington, H.V., & Eden, O.B. (2000). Prevention of oral mucositis or oral candidiasis for patients with cancer receiving chemotherapy (excluding head and neck cancer) [Cochrane review]. In *The Cochrane Library,* Volume 2, 2000. Oxford, UK: Update Software. PubMed Abstract

Clarkson, J.E., Worthington, H.V., & Eden, O.B. (2003). Interventions for preventing oral mucositis for patients with cancer receiving treatment [Cochrane review]. In *The Cochrane Library,* Volume 3, 2003. Oxford, UK: Update Software. PubMed Abstract

Rubenstein, E.B., Peterson, D.E., Schubert, M., Keefe, D., McGuire, D., Epstein, J., et al. (2004). Clinical practice guidelines for the prevention and treatment of cancer therapy-induced oral and gastrointestinal mucositis. *Cancer, 100*(9, Suppl.), 2026–2046. PubMed Abstract

Extensive Reviews of the Literature

Eilers, J. (2004). Nursing interventions and supportive care for the prevention and treatment of oral mucositis associated with cancer treatment. *Oncology Nursing Forum, 31*(4, Suppl.),13–23. Oncology Nursing Forum

Eilers, J., & Epstein, J.B. (2004). Assessment and measurement of oral mucositis. *Seminars in Oncology Nursing, 20,* 22–29. PubMed Abstract

Epstein, J.B., & Schubert, M.M. (2003). Oropharyngeal mucositis in cancer therapy. Review of pathogenesis, diagnosis, and management. *Oncology, 17,* 1767–1779. PubMed Abstract

Kostler, W.J., Hejna, M., Wenzel, C., & Zielinski, C.C. (2001). Oral mucositis complicating chemotherapy and/or radiotherapy: Options for prevention and treatment. *CA: A Cancer Journal for Clinicians, 51,* 290–315. PubMed ABstract

Kwong, K.K. (2004). Prevention and treatment of oropharyngeal mucositis following cancer therapy: Are there new approaches? *Cancer Nursing, 27,* 183-205. PubMed Abstract

Miller, M., & Kearney, N. (2001). Oral care for patients with cancer: A review of the literature. *Cancer Nursing, 24,* 241–254. PubMed Abstract

Peterson, D.E., & Cariello, A. (2004). Mucosal damage: A major risk factor for severe complications after cytotoxic therapy. *Seminars in Oncology, 31*(3, Suppl. 8), 35–44. PubMed Abstract

Scully, C., Epstein, J., & Sonis, S. (2003). Oral mucositis: A challenging complication of radiotherapy, chemotherapy, and radiochemotherapy: Part 1, pathogenesis and prophylaxis of mucositis. *Head Neck, 25,* 1057–1070. PubMed Abstract

Scully, C., Epstein, J., & Sonis, S. (2004). Oral mucositis: A challenging complication of radiotherapy, chemotherapy, and radiochemotherapy. Part 2: diagnosis and management of mucositis. *Head Neck, 26,* 77–84. PubMed ABstract

Shih, A., Miaskowski, C., Dodd, M.J., Stotts, N.A., & MacPhail, L. (2002). A research review of the current treatments for radiation induced oral mucositis in patients with head and neck cancer. *Oncology Nursing Forum, 29,* 1063 –1080. Oncology Nursing Forum PubMed Abstract

Sonis, S.T., Elting, L.S., Keefe, D., Peterson, D.E., Schubert, M., Hauer-Jensen, M., et al. (2004). Perspectives on cancer therapy induced mucosal injury: Pathogenesis, measurement, epidemiology, and consequences for patients. *Cancer, 100*(9, Suppl.), 1995–2025. PubMed Abstract

Trotti, A., Bellm, L.A., Epstein, J.B., Frame, D., Fuchs, H.J., Gwede, C.K., et al. (2003). Mucositis incidence, severity, and associated outcomes in patients with head and neck cancer receiving radiotherapy with or without chemotherapy: A systematic literature review. *Radiotherapy and Oncology, 66,* 253–262. PubMed Abstract

Vered, M., Dayan, D., & Buchner, A. (2004). Treatment modalities for chemo—and radiotherapy-induced oral mucositis—Critical analysis and practical guidelines. *Refu'at Ha-peh Veha-shinayim, 21*(1), 19–28, 99. PubMed Abstract

5. Guidelines and Standards

Organization-based practice guidelines

American Society of Clinical Oncology does not have practice guidelines specifically for mucositis as of December 2004. It does have guidelines for use of chemotherapy and radiotherapy protectants, indicating that data are inadequate to recommend the use of amifostine for the prevention of radiation therapy induced mucositis. (www.asco.org/prof/pp/html/guide)

National Guideline Clearinghouse, the Nursing Outcomes Classification labels and definitions, and the Nursing Intervention Classification labels and definitions databases were searched. No specific guidelines were available that address mucositis in the patient receiving cancer therapy. (www.guideline.gov)

The Multinational Association for Supportive Care in Cancer (MASCC), in collaboration with the International Society for Oral Oncology, issued clinical practice guidelines in 2004 with suggestions for oral care based on review of literature published from 1966–May 2002.

Rubenstein, E.B., Peterson, D.E., Schubert, M., Keefe, D., McGuire, D., Epstein, J., et al. (2004). Clinical practice guidelines for the prevention and treatment of cancer therapy-induced oral and gastrointestinal mucositis. *Cancer, 100*(9, Suppl.), 2026 - 2046. PubMed Abstract

National Cancer Institute. (2005). Oral complications of chemotherapy and head/neck radiation (PDQ®). Retrieved June 7, 2005, from Oral Complications of Chemotherapy and Head/Neck Radiation (PDQ)

National Comprehensive Cancer Network (NCCN) does not have practice guidelines for mucositis as of 2004. (www.nccn.org)

National Institute of Dental and Craniofacial Research/National Oral Health Information Clearing House Web site has documents and related publications to guide practice. (www.nidcr.nih.gov/HealthInformation)
These guidelines address an interdisciplinary approach, the need for dental evaluation prior to treatment, and the patient/family education piece.

Oncology Nursing Society Guidelines:

Kelleher, L.O., Polovich, M., & White, J. (Eds.). (2005). *Chemotherapy and biotherapy guidelines and recommendations for practice.* Pittsburgh, PA: Oncology Nursing Society.

Assessment—use of standardized assessment tool
Collaborative management—use of MASCC guidelines
- Oral care protocol, including patient education
- Pretreatment dental evaluation, repair, and prevention
- Nutrition and fluid management

Prevention of mucositis with 5-fluorouracil—use of 30 minutes of cryotherapy
Treatment—symptom-focused interventions

The Joanna Briggs Institute for Evidence Based Nursing and Midwifery (www.joannabriggs.edu.au) published evidence-based practice information sheet on the prevention and treatment of oral mucositis in patients with cancer in 1998, but the review has not been updated and thus cannot be regarded current at this time.

Journal articles

McGuire, D.B., Rubenstein, E.B., & Peterson, D.E. (2004). Evidence-based guidelines for managing mucositis. *Seminars in Oncology Nursing, 20,* 59–66. PubMed Abstract

Stricker, C.T., & Sullivan, J. (2003). Evidence-based oncology oral care clinical practice guidelines: Development, implementation, and evaluation. *Clinical Journal of Oncology Nursing, 7,* 222–227. PubMed ABstract

6. Table of Tools to Measure Oncology Nursing-Sensitive Outcome: Mucositis

Table 6A. Cancer-Focused Assessment Tools

Name of Tool and Source	Domains of Factors	Number of Items	Scaling or Scoring	Comments
Oral Assessment Guide Eilers et al., 1988	Signs (erythema), symptoms (pain, salivary changes), functional disturbances (ability to swallow, voice)	Eight items: voice, ability to swallow, lips, tongue, saliva, mucous membranes, gingival, and teeth or denture-bearing area	Each item is scored 1, 2, or 3 1 = normal 2 = changes without breakdown or loss of function 3 = barrier breakdown or loss of function Individual factor ratings are summed for total score.	Face, content, and construct validity; inter-rater reliability was 0.912. Easy to use in clinical setting with limited training Does not quantify amount of membrane breakdown or differentiate location of membrane changes Use of individual scores rather than only total score provides more detailed data regarding changes in oral cavity
Oral Mucosa Rating Scale Kolbinson et al., 1988	Type and severity of oral mucosal changes	Atrophy, erythema, ulceration, pseudo-membranes, hyperkeratotic areas, lichenoid changes, and edema Also separate scales for pain and dryness	0–3 rating scale, 0 = normal, 3 = severe Visual analog scales No pain to worst possible pain No dryness to worst possible dryness	Classifies and quantifies oral mucosal changes Oral Mucosa Rating Scale was used to develop Oral Mucositis Index (below) Validity and reliability information not available at this time

Name of Tool and Source	Domains of Factors	Number of Items	Scaling or Scoring	Comments
Oral Mucositis Index [Uses subset of Oral Mucosa Rating Scale] Schubert et al., 1992	Atrophy	34 – items total 11 items: lips – upper and lower; labial mucosa – upper and lower; buccal mucosa – right and left; tongue – dorsal, lateral, and ventral; floor of mouth, and soft palate	Atrophy, ulceration, erythema, & edema are scored from 0 = none to 3 = severe and are summed for the total score	Chronbach's alpha and Guttman split-half coefficients 0.84–0.93 Support for validity Usually dental professional assessment
	Ulcers or pseudomem-branes	11 items: lips – upper and lower; labial mucosa – upper and lower; buccal mucosa – right and left; tongue – dorsal, lateral, and ventral; floor of mouth, and soft palate	Surface area of involvement for each site: 0 = none 1 = > 0 cm^2 to < 1 cm^2 2 = $\geq$ 1 cm^2 to < 2 3 = $\geq$ 2 cm^2	Requires training to recognize and score types and grades of changes Developed from Oral Mucosa Rating Scale (above)
	Erythema	10 items: lips – upper and lower; labial mucosa – upper and lower; buccal mucosa – right and left; tongue – dorsal, lateral and ventral; floor of mouth		
	Edema	2 items: buccal mucosa – right & left		
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McGuire et al., 2002	20-item version	20 items		Adapted from 34-item version to improve use by nondental professionals

Name of Tool and Source	Domains of Factors	Number of Items	Scaling or Scoring	Comments
	Atrophy	Dorsal tongue	Scored 0–3 0 = normal papilla structure to 3 = total loss of normal papilla (bald tongue)	Internal consistency, test-retest, inter-rater reliability and construct validity Cronbach's alpha coefficients 0.71–0.96
	Edema	Lateral tongue	Scored 0–3 0 = normal to 3 = indented s/p pressure of teeth and fills the oral cavity to palate	Inter-rater reliability coefficients (three raters)—only three items are less than 0.80 (i.e., floor of mouth ulceration [0.78], dorsal tongue erythema [0.70], and dorsal tongue ulceration [0.35]).
	Erythema	Labial mucosa (upper and lower) Buccal mucosa (right and left) Tongue (dorsal, lateral, and ventral) Floor of mouth Soft palate	Scored 0–3 0 = normal for site to 3 = color of fresh oxygenated red blood	Provides erythema and ulceration subscores
	Ulceration or pseudomem-brane	Labial mucosa (upper and lower) Buccal mucosa (right and left) Tongue (dorsal, lateral, ventral) Floor of mouth Soft palate	Measure surface area involvement for each site. Scored 0–3 0 = none 1 = > 0 cm^2 to < 1 cm^2 2 = $\geq$ 1 cm^2 to < 2 3 = $\geq$ 2 cm^2	

Name of Tool and Source	Domains of Factors	Number of Items	Scaling or Scoring	Comments
Oral Mucositis Assessment Scale Sonis et al., 1999	Clinician component—objective measures of mucositis: erythema and ulceration or pseudomembrane in eight anatomic locations of the oral cavity Patient component—subjective outcomes.	Eight anatomical locations assessed for erythema and for ulceration or pseudo-membrane Pain and difficulty swallowing Ability to eat	Erythema: 0 = none to 2 = severe 0 = normal, 2 = color of fresh oxygenated blood. Ulceration or pseudo-membrane formation: 0 = no lesion to 3 = > 3 cm^2 (measure surface area for each site) 100 mm visual analog scale (0 = no problem to 100 = worst problem) Categorical scale Eating: types of food—no foods or liquids, only soft solid foods, or normal	Face and content validity, inter-rater reliability, responsive to clinically important changes, correlation with clinical condition Primarily a research tool—useful in multisite studies. Multisite research data are available. Requires training and use of scale for scoring Scoring limited to mucous membrane changes and subjective report
Spijkervet Radiation Mucositis Scale Spijkervet et al., 1989	Type and severity of mucosal changes	Areas assessed: buccal mucosa (right and left), soft and hard palate, dorsum and border of tongue (right and left), and floor of mouth	Five categories: 0 = no mucositis 1 = white appearance of oral mucosa 2 = redness more pronounced than the red color of nonirradiated normal mucosa 3 = white or yellow mucous plaques that are difficult to detach 4 = local complete loss of mucosal layer	Limited data Requires complex scoring Validity and reliability information not available at this time

Name of Tool and Source	Domains of Factors	Number of Items	Scaling or Scoring	Comments
		Length of each area	Measured by pocket gauge and summed Mucositis score of an area defined as sum of the products	
Western Consortium for Cancer Nursing Research Scale Olson et al., 2004; Western Consortium for Cancer Nursing Research, 1991, 1998	Lesions Color Bleeding Subjective variables 1998 revised version includes lesions, color, and bleeding	Specific areas not clearly differentiated	Uses staging approach 1998 revised version Healthy status = normal appearance, no problems or limitations, 50 % or more pink Stage 1 = color is 50% or more slightly red, 1–4 lesions in oral cavity, no bleeding Stage 2 = color is 50% or more moderately red, more than 4 lesions in oral cavity but not coalescing, mucosa bleeds with eating and oral Stage 3 = color is 50% or more mucosa very red, coalescing lesions are more than 50% denuded, spontaneous bleeding	Initial version tested with the World Health Organization and Oral Assessment Guide indicating moderate correlation (0.57–0.76) Mixed variables difficult to score precisely Revised in 1998: eliminated measures other than lesions, color, or bleeding 92.9 % of cases were correctly staged Agreement between data collectors at five sites (kappa = 0.75) three additional sites close to this target Validity and reliability information not available at this time

Table 6B. Other Tools

Name of Tool	Source	Focus or Purpose
Daily Mucositis Scale for Hemopoietic Stem Cell Transplant (HSCT)	Donnelly et al., 1992	Scheme for daily monitoring of oral mucositis in allogeneic bone marrow transplantation recipients
Epithelial Viability Scale	Wymenga et al., 1997	In vitro assay for quantitation of chemotherapy-induced mucositis
MacDibbs Mouth Assessment	Dibble et al., 1996	Evaluate mucositis in radiation therapy recipients
Tardieu Quantitative Scale of Oral Mucositis for HSCT	Tardieu et al., 1996	Quantitative scale of oral mucositis associated with autologous bone marrow transplantation
Walsh Quantitative Scoring System for Oral Mucositis	Walsh et al., 1990	Quantitative evaluation of oral mucositis during bone marrow transplantation

Table 6C. Clinical Toxicity Assessment Scales

Name of Scale and Source	Grade 0 (None)	Grade 1 (Mild)	Grade 2 (Moderate)	Grade 3 (Severe)	Grade 4 (Life – threatening)	Grade 5 (Death)
National Cancer Institute Common Toxicity Criteria (Trotti et al., 2000)						
Chemotherapy-induced stomatitis or pharyngitis, oral or pharyngeal mucositis	None	Painless ulcers, erythema, or mild soreness in the absence of lesions	Painful erythema, edema, or ulcers, but eating or swallowing is possible	Painful erythema, edema, or ulcers requiring IV hydration	Severe ulceration or requiring parenteral or enteral nutritional support or prophylactic intubation	Death related ito toxicity

Name of Scale and Source	Grade 0 (None)	Grade 1 (Mild)	Grade 2 (Moderate)	Grade 3 (Severe)	Grade 4 (Life – threatening)	Grade 5 (Death)
Mucositis resulting from radiation http://ctep.cancer.gov/forms/CTC	None	Erythema of the mucosa	Patchy pseudomembranous reaction (patches generally < 1.5 cm in greatest dimension	Pseudo-membranous reaction (contiguous patches generally > 1.5 cm in greatest dimension)	Ulceration and occasional bleeding not induced by minor trauma or abrasion	Death related to toxicity
World Health Organization, 1979	None	Oral soreness and erythema	Oral erythema and ulcers; solid diet tolerated	Oral ulcers; liquid diet only	Oral alimentation impossible	---
Radiation Therapy Oncology Group RTOG see http://www.rtog/	No change over baseline	Injection; may experience mild pain not requiring analgesic	Patchy mucositis that may produce inflammatory serosanguinitis discharge; may experience moderate pain	Confluent fibrinous mucositis; may include severe pain requiring narcotic	Ulceration, hemorrhage, or necrosis	----

7. References related to instruments to measure mucositis

Beck, S. (1979). Impact of a systematic oral care protocol on stomatitis after chemotherapy. *Cancer Nursing, 2,* 185–199.

Eilers, J., Berger, A.M., Petersen MC. et al. (1988). Development, testing, and application of the oral assessment guide. *Oncology Nursing Forum, 15,* 325–330.

Hyland, S.A. (2004). Assessing the oral cavity. In M. Frank-Stromborg & S.J. Olsen (Eds.), Instruments for clinical health-care research. (3rd. ed., pp. 594– 602). Sudbury, MA: Jones and Bartlett.

Kolbinson, D.A., Schubert, M.M., Flournoy N, Truelove EL. (1988). Early oral changes following bone marrow transplantation. *Oral Surgery, Oral Medicine, and Oral Pathology, 66,* 130–138.

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Sonis, S.T., Eilers, J.P., Epstein JB, LeVeque FG, Liggett WH Jr, Mulagha MT, Peterson DE, Rose AH, Schubert MM, Spijkervet FK, Wittes JP. (1999). Validation of a new scoring system for the assessment of clinical trial research of oral mucositis induced by radiation or chemotherapy. Mucositis Study Group. *Cancer, 85,* 2103–2113.

Spijkervet, F.K., van Saene, H.K., Panders AK, Vermey A, Mehta DM. (1989). Scoring irradiation mucositis in head and neck cancer patients. *Journal of Oral Pathology and Medicine, 18,* 167–171.

Western Consortium for Cancer Nursing Research. (1991). Development of a staging system for chemotherapy-induced stomatitis. *Cancer Nursing, 14,* 6–12.

Western Consortium for Cancer Nursing Research. (1998). Assessing stomatitis: Refinement of the Western Consortium for Cancer Nursing Research (WCCNR) stomatitis staging system. *Canadian Oncology Nursing Journal, 8,* 160–162.

References for Clinical Toxicity Assessment Scales

National Cancer Institute. (2003). *Common terminology criteria for adverse events v.3.0.* Retrieved June 7, 2005, from Common Terminology Criteria for Adverse Events

Radiation Therapy Oncology Group http://www.rtog.org

World Health Organization. (1979). *WHO handbook for reporting results of cancer treatment* [WHO Offset Publication No. 48]. Geneva: Author.

Trotti, A., Byhardt, R., Stetz J, Gwede C, Corn B, Fu K, Gunderson L, McCormick B, Morrisintegral M, Rich T, Shipley W, Curran W. (2000). Common Toxicity Criteria: Version 2.0. An improved reference for grading the acute effects of cancer treatment: Impact on radiotherapy. *International Journal of Radiation Oncology, Biology, Physics, 47,* 13–47.

References for other tools in section 6

Dibble, S.L., Shiba, G., MacPhail L, Dodd MJ.(1996). MacDibbs Mouth Assessment. A new tool to evaluate mucositis in the radiation therapy patient. *Cancer Practice, 4*(3), 135-140.

Donnelly, J.P., Muus, P., Schattenberg A, De Witte T, Horrevorts A, DePauw BE. (1992). A scheme for daily monitoring of oral mucositis in allogeneic BMT recipients. *Bone Marrow Transplant, 9,* 409–413.

Tardieu, C., Cowen, D., Thirion X, Franquin JC. (1996). Quantitative scale of oral mucositis associated with autologous bone marrow transplantation. *European Journal of Cancer. Part B, Oral Oncology, 32B,* 381–387.

Walsh, L.J., Hill, G., Seymour G, Roberts A. (1990). A scoring system for the quantitative evaluation of oral mucositis during bone marrow transplantation. *Special Care in Dentistry, 10*(6), 190–195.

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8. Summary of Key Evidence That Nursing Interventions Influence This Outcome and Gaps in the Current Evidence Base

This section is based on a review of the cited meta-analysis, integrated reviews, and clinical practice guidelines published on mucositis (see Section 4 & 5). Currently, no intervention has been shown to be uniformly efficacious and can be presented as evidence-based standard therapy. Knowledge of experts in the field promote that some form of oral care protocol that includes regular cleansing of the teeth and mucosal tissues with a nontraumatizing solution is best practice, but further research is required to identify optimal agents, devices, and schedules.

9. Recommendations:

This section is based on a review of the cited meta-analysis, integrated reviews, and clinical practice guidelines published on mucositis (see Section 4 & 5).

Practice

1. The oral cavity should be assessed regularly using valid and reliable instruments to document "normal pattern" of changes seen with cancer treatment regimens.

2. Clearly document changes seen and "routine" oral care.

3. Implement an oral care protocol using
   a. Non-irritating agents
      i. Normal saline with or without baking soda
      ii. Sterile water
      iii. Avoid mouth washes with alcohol.
   b. Soft-bristle toothbrush
      i. Continue as long as tolerated if no uncontrolled bleeding present
      ii. Changed frequently especially when patient is neutropenic (at least every week during aplasia)
   c. Floss

i. If a regular part of patient's oral care, continue as long as tolerated if no uncontrolled bleeding present.

d. Use foam toothettes for cleansing of soft tissues and for teeth when tooth brush is not tolerated.

4. Use a multidisciplinary team approach to oral care to include the integration of dental health professionals as indicated by the status of a patient's oral cavity.
   a. Clean and repair teeth prior to initiation of immunosuppressive therapy.
   b. Treat potential problems prior to initiation of immunosuppressive therapy.
   c. Use the National Institute of Dental and Craniofacial Research/National Oral Health Information Clearing House document (English or Spanish) "Oral Health, Cancer, and You"

5. Use MASCC guidelines.

6. Identify individuals at risk for increased problems.

Education

1. Patients and family care providers should learn about
   a. The importance of oral care during cancer treatment to decrease morbidity and mortality
   b. Systematic care of oral cavity—promote health and avoid trauma
   c. Assessment of the oral cavity (i.e., at least daily during mucotoxic therapy)
   d. Signs and symptoms to report (i.e., changes in sensation or taste, presence of ulcerations and/or bleeding).
2. Healthcare providers should learn about
   a. The physical (morbidity and mortality), psychosocial, and financial costs of mucositis
   b. Awareness of proposed models for pathobiology associated with mucositis
   c. Use of valid and reliable oral cavity assessment tools
   d. Awareness of risk factors associated with mucositis
   e. Skills to critique oral care research to promote evidence-based practice
   f. Awareness of oral care agents with the potential to contribute to optimum oral health and those that are damaging to the mucosa.

Research

1. Conduct further validity and reliability testing of instruments to measure oral cavity changes.
2. Explore other clinical complications that accompany mucositis (e.g., pain, hemorrhage, xerostomia).
3. Explore factors that can be used to predict risk for mucositis.
4. Identify and test interventions for the prevention and treatment of mucositis, including combinations of agents during different phases of mucositis.
5. Identify optimum treatment approach for pain associated with mucositis.
6. Examine relationship of oral mucositis and systemic mucositis (can oral cavity serve as an indicator?).
7. Conduct randomized controlled trials of interventions for prevention and treatment of mucositis.
8. Explore fit of proposed biophysiologic model with actual mucositis to confirm phases and guide future interventions.
9. Expand intervention trials across diverse groups.
10. Continue work on guidelines for evidence-based practice.

Recommended Indicators and Timing of Measurement Across Settings

Research has not established recommended timing for measurement. DeWalt and Haines (1969) identified changes in the normal oral cavity within four hours of exposure to stressors (e.g., continuous nasal oxygen, mouth breathing, mechanical suction, nothing by mouth). High-dose chemotherapy and continuous-infusion chemotherapy has a more rapid onset of oral cavity changes than does intermittent bolus therapy. Frequency and duration of measurement should be determined by changes anticipated by the antineoplastic therapy, phase of mucosal change, and desired effect of the intervention more than the availability of professional staff to conduct the assessments.

Research literature also has not reached consensus regarding the domains to assess. Some instruments focus only on mucous membrane changes, and some include other aspects of the oral cavity such as saliva and teeth. Instruments vary in the inclusion of oral cavity function such as swallowing, speaking, and eating. Selection of an instrument should be determined by changes anticipated by antineoplastic therapy and the desired effect of the intervention.

10. Links

http://www.asco.org/prof/pp/html/guide

http://ctep.cancer.gov/forms/CTCAEv3.pdf

http://www.cancer.gov/cancertopics/pdq/supportivecare/oralcomplications/HealthProfessional

http://www.joannabriggs.edu.au/

http://www.mascc.org/

http://www.nidcr.nih..gov/HealthInformation

http://www.rtog.org/members/toxicity/acute.htm

11. Links to Current Research Related to Mucositis

ONS Foundation-Funded Research (www.ons.org/research/funding/Projects/index.shtml)

National Institutes of Health-Funded Research (http://crisp.cit.nih.gov)

International Cancer Research Portfolio (www.cancerportfolio.org)

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