Assessing stomatitis: Refinement of the Western Consortium for Cancer Nursing Research (WCCNR) stomatitis staging system

By Western Consortium for Cancer Nursing Research

Abstract

The purpose of this study was to refine the Western Consortium for Cancer Nursing Research (WCCNR) stomatitis staging system. Fifty-six adult cancer patients were accrued. Using all eight descriptors, 96.4% of the participants were correctly staged. Using only lesions, colour and bleeding, however, 92.9% of the cases were correctly staged. Based on the findings of this study, the WCCNR stomatitis staging system has been shortened to include only lesions, colour and bleeding.

The significance of stomatitis as a result of cancer therapy was recognized by the National Institute of Health Consensus Development Conference (1990). Incidence levels range from 10% to 97% in patients receiving stomatotoxic chemotherapy protocols (Barrett, 1987; Morry, 1984; Seto, Kim, Wolinsky, Mito & Champlin, 1985).

A survey of cancer nurses in Canada identified the prevention and treatment of chemotherapy-induced stomatitis as the top research priority (Western Consortium for Cancer Nursing Research, 1987). The WCCNR, a group comprised of one academically-based individual and one clinically-based individual from each of the four western Canadian provinces, was interested in developing interventions for the prevention and management of stomatitis, but was hampered by the lack of a valid and reliable assessment tool.

Literature review

The assessment of chemotherapy-induced stomatitis severity has historically been considered a special case of oral health assessment. It is not surprising, therefore, that oral health assessment tools have been used to assess stomatitis severity. The tools reviewed below are frequently used in nursing studies of stomatitis.

The guide for the numerical rating of the condition of the mouth, developed by Passos and Brand (1966), forms the basis of most oral health assessment guides used in nursing. The guide consists of eight items (saliva, tongue, palates, membranes, gums, odour, lips and nares) rated from 1 (normal) to 3 (severe). It was developed as part of a study evaluating three oral hygiene protocols for use with acutely ill individuals in an intensive care unit who were unable to carry out their own oral care.

Van Drimmelen and Rollins (1969) modified the tool developed by Passos and Brand and created an 11-item scale (palates and membranes for moisture and debris, the tongue for coating and moisture, gingiva, teeth, lips for moisture and general condition, and odour). All items were rated from 1 (normal) to 3 (worst possible condition). The tool was used to evaluate the effectiveness of lemon and glycerin as an oral hygiene agent for nursing home residents.

Bruya and Madeira (1975) were the first nurses to publish a tool for assessing chemotherapy-induced stomatitis. This tool was a 17-item scale (physical state of the patient [level of consciousness, breathing habits, nutritional status, chewing ability, self-care ability]; lips and tongue for texture, colour and moisture; mucous membranes, gingival tissue, teeth, saliva, taste and voice). Each item was rated from 1 (worst possible condition) to 3 (normal).

Beck's oral exam guide (1979), a 15-item scale, requires the nurse to assess the lips, tongue, mucous membranes, gingiva, teeth (dentures), saliva, voice and ability to swallow. The lips and the tongue are evaluated on texture, colour and moisture, and the mucous membranes and gingiva are evaluated on colour and moisture only. The remaining elements of the exam are only evaluated on one parameter, except that dentures, if present, are also evaluated for fit. All of the above elements are rated from 1 (normal) to 4 (most severe).

Eiler's oral assessment guide (OAG) was developed following a review of published assessment tools and discussions with an expert panel of dentists who also had expertise in oncology (Eilers, Berger & Petersen, 1988). This eight-item tool requires the nurse to assess the lips, tongue, mucous membranes, gingiva, teeth/dentures, voice and swallow, as in Beck's tool, but also adds an assessment of saliva. All items are rated from 1 (normal) to 3 (most severe). The correlation between two nurses' scores was high, with a Pearson's r of 0.92, and per cent agreement ranged from 85% for mucous membranes to 100% for swallow. The clinical utility and validity of this tool was evaluated with 20 patients (10 women, 10 men) undergoing bone marrow transplantation. Patients' scores on the OAG increased as the condition of mouth declined, and decreased as the condition of the mouth improved. Staff compliance with use of the tool was high.

With the exception of the limited testing of the OAG outlined above, no published reports of psychometric testing of these tools were found. The main limitation of these tools, however, is that a patient could obtain a given score, 16 for example, in many different ways. Depending on the scores the nurse assigned

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following the assessment of the various parts of the oral cavity (lips, tongue, teeth, etc.), it is possible that two individuals with the same score may not have equally severe stomatitis. Dibble, Shiha, MacPhail and Dodd (1996) point out that high scores on both Beck's and Eiler's tools could also be due to other severe oral health problems such as herpetic lesions or candidiasis, rather than stomatitis.

The World Health Organization (WHO) grading scale for mucositis ranges from 0 (no side effects) to 4 (unable to eat or drink) (Miller, Hoogstraten, Staquet, Winkler, 1981). Each grade is accompanied by a brief clinical description. The assignment of a grade is accomplished by reading the clinical descriptions and choosing the one that fits an individual's mouth most closely. The problem with the WHO tool is that the clinical descriptions are not sufficiently specific. Brundage, Pater and Zee (1993) compared scores obtained on the original version and an expanded version developed by the National Cancer Institute of Canada (NCIC) Clinical Trials Group, using simulated patients receiving chemotherapy and radiotherapy for bladder cancer. Agreement levels were low for clinically-based assessments (kappa=-.04 to 0.82).

Given the problems outlined above, the WCCNR decided to develop a tool with a format similar to the WHO tool, but with descriptors that were more specific clinical indicators of stomatitis severity. The eight descriptors that comprised the first version of the WCCNR stomatitis staging system (mucosal colour, lesions, bleeding, moisture, edema, infection, ability to eat/drink, and discomfort) were grouped to reflect stage, ranging from 0 (normal) to 3 (severe) (Western Consortium for Cancer Nursing Research,

1991). In the initial test of the WCCNR stomatitis staging system, expert nurse clinicians evaluated a convenience sample of 53 adult patients with chemotherapy-induced stomatitis. Patients were also assessed using the OAG and the WHO grading system. The correlation between the WCCNR stomatitis staging system and the OAG was 0.76 ($p<0.01$); the correlation between the WCCNR stomatitis staging system and the WHO grading system was 0.69 ($p<0.01$).

Objective

The objective of this study was to further refine the WCCNR stomatitis staging system by examining the degree to which the descriptors distinguished between healthy mouths and three levels of stomatitis severity.

Method

Sample

The sample for this study was comprised of two groups of patients: the 53 patients accrued in the initial test of the WCCNR stomatitis staging system, and, following ethical clearance, a convenience sample of seven adult patients with cancer from the bone marrow transplant unit of a large hospital in western Canada. The second set of participants was added in an effort to accrue more individuals with stage 3 stomatitis. Complete data were eventually obtained for 56 individuals.

Data collection and analysis

The data collection forms for the first 53 patients were reviewed to ensure that data were entered accurately. Following consent, one of the investigators (H.P.) evaluated the mouths of the additional participants using the WCCNR stomatitis staging system. Data collection closed after six months, since only seven additional individuals agreed to participate. Discriminant analysis was used to determine the extent to which the descriptors originally proposed for each stage were actually present when a given stage was assigned by the investigator. Predictor variables were entered into the discriminant analysis in a step-wise fashion. As each descriptor was added, the percentage of cases correctly classified was examined. Following discussions with clinical staff, we decided that in order for the tool to be useful clinically, it could not misclassify more than 10% of the cases.

Findings

The staging results can be seen in Table One. All cases were correctly classified, regardless of whether eight or three descriptors were used, for patients with stage 0 and stage 1 stomatitis. Out of 16 patients with stage 2 stomatitis, 14 patients were correctly classified using eight descriptors and 13 patients were correctly classified using three descriptors. Out of seven patients with stage 3 stomatitis, all of them were correctly classified using eight descriptors, while six patients were correctly classified when only three descriptors were used. A correlation matrix showing the relationships between the descriptors appears in Table Two. Using only lesions, colour and bleeding in the discriminant analysis, 92.9% of the cases were correctly classified. The remaining five descriptors only increased the prediction to 96.4%. The standardized discriminant function co-efficients

Table One: Percentage of cases correctly classified using the original eight descriptors vs. a subset of three descriptors

Actual stage	# of descriptors	# of patients	Predict stage 0	Predict stage 1	Predict stage 2	Predict stage 3
0	8	10	10 (100%)			
0	3	10	10 (100%)			
1	8	23		23 (100%)		
1	3	23		23 (100%)		
2	8	16		2 (12.5%)	14 (87.5%)	
2	3	16		3 (18.75%)	13 (81.5%)	
3	8	7				7 (100%)
3	3	7			1 (14.3%)	6 (85.7%)

Table Two: Correlation co-efficient matrix for WCCNR stomatitis staging system descriptors

Variable	Colour	Lesions	Bleeding	Moist.	Edema	Infect.	Eat/Drk.	Discmf.
Lesions	.7919							
Bleeding	.6937	.7359						
Moist.	.6125	.6982	.6189					
Edema	.7260	.7183	.7295	.6219				
Infect.	.7063	.7389	.8093	.7297	.7110			
Eat/Drk.	.6537	.6370	.5589	.5393	.7309	.5566		
Discmf.	.6737	.5708	.5818	.5232	.6862	.5634	.8314	
Stage	.8586	.9110	.7296	.7976	.7879	.8032	.7240	.6641

Figure One: Revised WCCNR stomatitis staging system

Stage	Lesions	Colour	Bleeding
0	none	pink	none
1	1-4	slightly red	none
2	more than 4	moderately red	with eating and oral hygiene
3	coalescing	very red	spontaneous

were 0.69 (lesions), 0.63 (colour), and 0.59 (bleeding). Based on these findings, the WCCNR stomatitis staging system was revised, as indicated in Figure One.

Discussion

The ability of the descriptors in the WCCNR stomatitis staging system to accurately predict stomatitis severity and the high correlation with other tools for assessing stomatitis severity indicate that the WCCNR stomatitis staging system is a valid indicator of chemotherapy-induced stomatitis. The utility of the WCCNR stomatitis staging system is limited, however, since it has only been used to assess chemotherapy-induced stomatitis, and has not been tested for reliability.

Stomatitis can develop following either chemotherapy or during radiotherapy. Normally, the basal layer of epithelial cells that comprise the oral mucosa divide to produce a daughter cell or another basal cell. The daughter cells are pushed upward, becoming squamous cells, and are eventually shed. The new basal cells replace damaged cells in the basal layer of the mucosa. Stomatitis develops following chemotherapy, particularly with antimetabolites (5-FU, methotrexate) and anti-tumour antibiotics (daunorubicin, doxorubicin) because these products slow the replication of all cells undergoing rapid mitosis. This includes cancer cells as well as some healthy cells, such as basal cells in the oral mucosa. Failure to produce an adequate number of new basal cells leaves the underlying connective tissue exposed (Madeya, 1996).

As with chemotherapy, irradiation decreases the ability of the basal cells to regenerate. In addition, however, irradiation of the head and neck area also leads to decreased saliva production soon after treatment begins, and to increasing saliva viscosity as treatment progresses. Last, irradiation causes vascular congestion

and increased permeability of blood vessels in the oral cavity, which leads to local edema and decreased blood flow. This reduced circulation, when combined with changes in saliva production and viscosity, and decreased regeneration of basal cells, leads to destruction of the oral mucosa (Cox, 1994).

We are of the view that the strong classification capabilities of the WCCNR stomatitis staging system descriptors are due to their direct tie to the pathophysiology of stomatitis. If this is true, our tool may also be useful in the assessment of radiotherapy-induced stomatitis.

Conclusion

The objective of this study was to further refine the WCCNR stomatitis staging system. Based on the results of this study, our tool has been shortened without significantly compromising its validity.

In preparation for our upcoming study to test the reliability of the tool, the WCCNR has been expanded to include investigators from four additional provinces (Ontario, Quebec, Nova Scotia and Newfoundland). This new group, the Canadian Oncology Nursing Research Group, will test the reliability of the revised WCCNR stomatitis staging system assessments across three treatment groups (chemotherapy only, radiotherapy only, combined chemotherapy and radiotherapy) and 12 sites in Canada. The validity of our tool for the assessment of radiotherapy-induced stomatitis will be assessed by examining the correlation between the WCCNR results and the MacDibbs mouth assessment (Dibble, et al., 1996). Following the successful completion of this study, our group plans to develop and test nursing interventions for the prevention and treatment of stomatitis. ♡

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