High dose treatment for haematologic malignancies: from rituals to evidence based practice
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Chapter 5

Providing oral care in haematological patients: Nurses’ knowledge and skills

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Abstract

Introduction: In the international literature, the most commonly recommended intervention for managing oral mucositis is good oral care, assuming that nurses have sufficient knowledge and skills to perform oral care correctly. The aim of the present study was to investigate if knowledge and skills about oral care improve when education in oral care is provided to nurses in charge of patients who are at risk of oral mucositis.

Method: This intervention study consists of a baseline test on the knowledge and skills of nurses of the hematology wards of two different hospitals. Oral care education sessions were given in one hospital and follow-up tests were performed in both hospitals. Nursing records were examined and observations of nurses performing oral care were made at baseline as well as at follow-up.

Results: The results show significant differences in the scores for knowledge and skills before and after the education, whereas there was no difference in scores at the two points in time for the comparison hospital, where no education had taken place. The records test showed no differences at baseline or follow-up for the two groups. Observations showed that nurses who followed the education session implemented the oral care protocol considerably better than those who did not attend.

Conclusion: Education in oral care has a positive influence on the knowledge and skills of nurses who care for patient at risk of oral mucositis, but not on the quality of oral care documentation.
Introduction

Patients who receive chemotherapy to treat malignant disease, often experience oral mucositis as the most debilitating side effect resulting in a poorer quality of life can be affected by pain, infection, altered nutrition and impaired oral function. Oral mucositis is one of the most common causes of treatment delay and dosage reductions in cancer therapy. Prevention and treatment are as important to oral mucositis as they are to fatigue, nausea and vomiting and many other side effects affecting patients with cancer.

Nurses play a central role in preventing and managing oral mucositis and reducing its debilitating effects on patients. In fact they have 3 main tasks in managing oral mucositis: (1) assessing and monitoring changes in the oral cavity; (2) providing appropriate oral care; and (3) offering patient education. Nurses give oral care of patients with cancer a high priority, but very little is known on day-to-day practice.

In the international literature, regular oral care is most commonly mentioned for managing oral mucositis though the standards for oral care are not consistently implemented and advice on the frequency of oral care frequency varies from “once every shift” to ‘only if patient requests it’. Furthermore, obstacles to providing oral care have been little investigated. McGuire outlined barriers to implementing oral care standards and proposed strategies to overcome them. In a study by Wallace attitudes and subjective norms predicted 39% of the behaviour of nurses in providing oral care.

Simple lack of knowledge about oral care is a major barrier to providing optimal oral care. A first and necessary step in the process of change is to identify the educational needs that exist in order to be able to offer adequate education and support, both theoretically and practically. However, knowledge deficits are not the only barriers. To manage oral care effectively, nurses require more and continuing education.

An important part of daily oral care is to assess the oral cavity of each patient at risk for oral mucositis. To this end, nurses should be trained in the use of standardised tools for screening and assessment in order to be proficient in using such instruments. Besides this, training increases the inter-observer reliability of the oral assessment and improves the evaluation of mucositis.
The aim of the present study was to investigate whether knowledge and skills regarding oral care improve when education is provided to nurses caring for patients who are at risk for oral mucositis.

**Methods**

**Study design**

Baseline tests on the knowledge and skills of nurses in hematology wards of two different hospitals were conducted. Oral care education sessions were given in one hospital and follow-up tests were performed in each hospital (Figure 1). The baseline and follow-up consisted of performance observations as well as the nursing record tests. A knowledge test was also employed to investigate nurses’ familiarity with the key principles of oral care. Oral care education sessions were tailored to the baseline scores. The follow-up tests were performed one month after the last education session in the intervention hospital.

![Figure 1. study plan](image)

**Setting and sample**

The study population consisted of nursing staff of the hematology wards of two university hospitals in the Netherlands. The intervention group was made up of qualified nurses experienced in nursing on the hematology ward of the Radboud University Nijmegen Medical Centre (RUNMC). The ward
has 28 patient beds and admits 100 patients a year for autologous and allogeneic HSCT. The Daily Mucositis Score (DMS) \(^{17}\) was used to assess oral mucositis on a daily basis as it is easy to use and is valid and reliable. Briefly, this requires the nurse to score erythema, oedema, dysphagia, lesions and pain assigning a score of 0 to 3 on a specially designed chart containing each day of the week.

Nursing staff developed an oral mucositis care plan when the first signs of oral mucositis appeared which consisted of brushing the teeth four times daily using a soft toothbrush and using oral rinses with normal saline (0.9% NaCl) or water.

The control group consisted of experienced nurses from the hematology/oncology ward of the Academic Medical Centre of Amsterdam (AMC). The ward has 18 hematological beds and admits 60 patients a year for autologous and allogeneic HSCT. Patients admitted to this ward received an oral care regime similar to that included in the RUNMC care plan. Oral inspection was done every day for patients at risk for oral mucositis without employing a specific assessment instrument. Signs of oral mucositis were recorded, though not in a standardised manner and a checklist was used to monitor daily oral care.

The protocols of both wards were based on published guidelines including those of the MASCC \(^{11, 18}\).

The intention was to examine 60% of the nurses per ward at both baseline and follow-up. All nurses were informed that participation was voluntary, and their anonymity was guaranteed.

**Instruments and procedures**

Demographic data were collected on gender, age, years of nursing experience and basic nursing degree.

**Knowledge test**

The knowledge test was a 32-item questionnaire including open-ended and multiple-choice questions and 8 photographs of the mouth illustrating different stages of oral mucositis. A team of experts including a hematologist (NB) nurse specialist (CP) dental hygienists (AO, MO) and an oncology nurse (AM) developed the test from existing protocols, the international literature and their own specialized knowledge. Topics included:

- Anatomy and pathology of the oral cavity (10 open questions, max. score 123 points).
- Oral hygiene (10 open questions, 3 multiple-choice questions, max. score 166 points).
- Oral mucositis (4 questions, max. score 45 points).
- Patient education (5 open questions, max. score 76 points).
- Assessment of oral mucositis in 8 photographs, (max. score 40 points).

The overall maximum score was 450 points. On average, 30-45 minutes were needed to complete the test. In the intervention hospital, only the nurses who had received these sessions were asked to participate in the follow-up test.

**Observation of skills**

The observations were designed to evaluate nurses’ oral care skills. A list consisting of 44 observations points (OP) was developed to audit these activities and each was answered with “yes” (done) or “no” (not done). The OP was grouped into 5 subsections;

- Checking patient’s oral status of the previous days (3 OP)
- Assessment of the patient’s oral cavity according to the protocol (12 OP)
- Assisting with or performing, oral hygiene for the patient (23 OP)
- Patient directed advice for oral care (3 OP)
- Documentation of findings in the nursing record (3 OP)

The maximum score was 44 points. The list was a mix of the standardised protocols of both hospitals, though some questions were not relevant for both settings (e.g. locally standardised preventive or treatment prescriptions). The observations at both baseline and follow-up were done during the day by examining the mouths of patients known to have oral complaints. Two dental hygienists observed the nurses while they assessed the oral cavity and delivered oral care.

**Nursing record test**

Correct and adequate reporting of findings and interventions is essential to nursing care. The nursing record test consisted of 6 questions derived from the hospital protocols:

- The status of the oral cavity is recorded daily
- Results of oral assessment are reported
- The patient’s oral pain is recorded
- In case of signs of oral mucositis, the oral care protocol is started
- Advice concerning oral care is provided to the patient and documented
- Interventions are started and documented
Ten nursing records from each ward were reviewed in retrospect, both at baseline and follow-up. Each question was assigned a maximum of 4 points and the completeness of the records was given up to 24 points.

**Oral care education sessions**

The oral care education sessions were offered to the nursing staff of the RUNMC only. The results of the baseline knowledge tests directed the content of these sessions. The training was given by two dental hygienists who provided theoretical education on the anatomy of the oral cavity, relevant pathology, oral hygiene, oral mucositis and options for prevention and treatment. Oral assessment training was archived with the help of slides. A second component of the training consisted of nurses cleaning each other’s teeth, which helped them rehearse their skills and experience the process from the patient’s perspective. The education session took 1½ hours. Four identical sessions were offered to enable as many nurses as possible to attend.

**Statistical analyses**

The tests on the nursing record, nurses’ knowledge and the skills performance observations resulted in summary scores and were analysed using the Statistical Package for the Social Science (SPSS version 14.0) using simple descriptive statistics. A total score for both tests was used to give a final analysis of nurses’ knowledge, skills and performance in documentation.

The effect of the intervention (education sessions), compared to no intervention was analyzed using two-way independent 2^2 ANOVA. A significant (alpha=0.05) interaction of the main effects for time point (baseline versus follow-up) and group (intervention versus control) was to indicate a positive effect of the education sessions.

**Results**

**Knowledge test**

Thirty-one and 29 nurses participated in the knowledge test at baseline and at follow-up respectively. Two nurses of the control group started the knowledge test but did not finish it. Their tests results were not analysed. Nurses were predominantly females, with a mean age of 34.3 years (range
and a mean number of 6.4 years (range 1-15) of experience in care of oncology patients (Table 1).

At baseline, only 30% of the nurses knew all the characteristics of mild mucositis, whereas 60% of the nurses were able to describe severe mucositis. Most of the nurses knew the most important risk factors for development of oral mucositis. On the other hand, only half of the nurses gave correct answers to the questions on anatomy and pathology. Knowledge about oral hygiene varied, with more than 50% of the nurses being unable to offer advice to a patient with dental prostheses and oral mucositis. Three out of eight photographs showing various stages of oral mucositis were assessed correctly by 75% of the nurses. The test was a revelation to some nurses as it showed how little they knew about aspects of oral mucositis.

Table 2 shows the means and standard deviations on the knowledge test for the two groups and both points in time. There was a significant interaction effect (illustrated in figure 2) between time (baseline versus follow-up) and group (control versus intervention): \( p = 0.008 \). The difference in the increase in mean knowledge was 56.9, 95%CI: [15.7; 98.0], indicating a relevant positive effect of education on knowledge (Figure 2).

### Table 1. Nurses’ age and experience for both nursing teams at both time points

<table>
<thead>
<tr>
<th></th>
<th>Intervention group baseline</th>
<th>Intervention group follow-up</th>
<th>Control group baseline</th>
<th>Control group follow-up</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>20</td>
<td>20</td>
<td>11</td>
<td>9</td>
<td>60</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>36.4</td>
<td>34.9</td>
<td>36.6</td>
<td>31.9</td>
<td>34.9</td>
</tr>
<tr>
<td>Mean experience (years)</td>
<td>7.6</td>
<td>5.9</td>
<td>5.7</td>
<td>5.6</td>
<td>6.2</td>
</tr>
</tbody>
</table>

The difference in mean increase is 56.9, 95%CI: [15.7; 98.0], \( p = 0.008 \)
Figure 2. Estimated marginal means of total score knowledge test.

Table 3. Observations mean scores per item and overall mean score and standard deviation per group

<table>
<thead>
<tr>
<th></th>
<th>Intervention baseline N=10 Mean</th>
<th>Intervention follow-up N=10 Mean</th>
<th>Control baseline N=10 Mean</th>
<th>Control follow-up N=10 Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking patient’s oral status of previous days before oral assessment.</td>
<td>4.5</td>
<td>5.6</td>
<td>5.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Assessment of patient’s oral cavity according to the protocol.</td>
<td>15.8</td>
<td>21.9</td>
<td>15.2</td>
<td>15.3</td>
</tr>
<tr>
<td>Assisting with- or performing oral hygiene for the patient.</td>
<td>32.4</td>
<td>39.5</td>
<td>29.8</td>
<td>34.2</td>
</tr>
<tr>
<td>Patient directed advice for oral care</td>
<td>5.2</td>
<td>5.8</td>
<td>4.4</td>
<td>5.1</td>
</tr>
<tr>
<td>Documentation of findings in the nursing record.</td>
<td>2.7</td>
<td>2.7</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>60.6</td>
<td>75.5</td>
<td>57.0</td>
<td>59.6</td>
</tr>
<tr>
<td>St. deviation</td>
<td>9.0</td>
<td>5.6</td>
<td>7.9</td>
<td>8.8</td>
</tr>
</tbody>
</table>

The difference in mean increase is 12.3, 95%CI: [2.1; 22.5],  p = 0.019
Observation of skills performance

The results of the observation test are shown in Table 3 (to facilitate the interpretation of the results, the maximal score per section is presented next to the actual scores).

At baseline, almost half of nurses assessed the patient’s oral cavity without knowing the previous oral status. Many mistakes (50%) were made with oral inspection. The equipment required was not always used, and the floor of the mouth was overlooked in two-thirds of cases. However, 65% of the nurses gave at least some advice about oral care to the patients.

Nurses who attended the oral care sessions implemented the oral care protocol significantly better than those who did not attend ($p = 0.019$). The difference in mean increase in total score was estimated at 12.3, 95%CI: [2.1; 22.5].

Table 4. Record tests mean scores per item

<table>
<thead>
<tr>
<th></th>
<th>Intervention group baseline N=10</th>
<th>Intervention group follow-up N=10</th>
<th>Control group baseline N=10</th>
<th>Control group follow-up N=10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A daily notation concerning the status of the oral cavity is written</td>
<td>1.2</td>
<td>0.9</td>
<td>1.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Results oral assessments are reported.</td>
<td>1.2</td>
<td>2.7</td>
<td>2.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Patient’s oral pain is recorded.</td>
<td>0.8</td>
<td>0.8</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>If there are signs of oral mucositis, the oral mucositis protocol is started.</td>
<td>2.6</td>
<td>2.3</td>
<td>1.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Advice concerning oral care is given to the patient and is recorded.</td>
<td>1.1</td>
<td>2.4</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Interventions are started and recorded.</td>
<td>1.4</td>
<td>1.1</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>8.3</td>
<td>10.2</td>
<td>9.1</td>
<td>8.7</td>
</tr>
<tr>
<td>St. Deviation</td>
<td>4.3</td>
<td>4.0</td>
<td>4.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

The difference in mean increase is 2.3, 95%CI: [-2.9; 7.5], $p = 0.376$. 
Nursing record test

Only records of patients at risk for oral mucositis were included in the nursing record test. Each record was carefully studied by two dental hygienists with the help of the checklist (Tables 4). There were no significant overall differences between the groups $p = 0.367$. The difference in mean increase in total score was estimated at 2.3, 95%CI: [-2.9; 7.5].

Discussion

The aim of this study was to investigate whether knowledge and skills in oral care improve when education is offered to the nurses who care for patients at risk for oral mucositis. Nursing skills were assessed by reviewing nursing records and observing nurses while they were providing oral care. Furthermore, knowledge tests at baseline and at follow-up provided a clear impression of the effect of oral education sessions.

To our knowledge, this particular study design has not been used previously though; there are a number of studies in other areas that used educational interventions to change knowledge and skills. For example, Dalton et al. designed an educational program to improve knowledge in order to change pain management practices and patient outcomes. This program was offered to nurses who provided day-to-day care for patients with cancer. A quasi-experimental design was used to measure the effectiveness of the program in changing nurses’ knowledge, attitude and behaviour. Data were collected from nurses and patient charts before and after the program. Nurses’ knowledge improved, but the change was not statistically significant. In contrast with the study by Dalton and similar studies on the effects of education in nurses, our study added observations on performance, a less common element in this type of study.

Knowledge tests

In our study, we tested the actual knowledge of nurses in the area of oral care. This is in contrast to other studies that investigated nurses’ self-reported knowledge or personal views on oral care by means of questionnaires or interviews. Nevertheless, the results are the similar; baseline data revealed that nurses have gaps in their knowledge of oral care, particularly in their knowledge and assessment of the different stages of oral mucositis.
Observation of performance

At baseline, observations of nurses carrying out oral care revealed mistakes in assessing the oral cavity as well as in assisting with- or providing oral hygiene. Moreover, even though oral assessment had become a daily routine, procedures that were wrongly learned, persisted. Observations by dental hygienists during the daily nursing routine are not common for nurses or their patients, which will alter their behaviour as they know that they are being watched. This could have resulted in more favourable scores for nurses. However, as observations were used at both points in time, the changes from baseline identified in our study are likely to be genuine. Follow-up data showed significant improvement of oral care given by nurses who attended the oral care sessions indicating that quality of oral care will likely be improved by refreshing existing knowledge and providing new knowledge.

Nursing records

Nursing records are the main source of information on each patient’s oral care as their purpose is to have an easily accessible reference that describes the patient’s needs and wishes. Nursing interventions can also be documented and evaluated in these records. At baseline, the results for the record test showed inadequacies in the documentation of oral care. Most of the records were incomplete and sometimes oral assessment was documented but the accompanying intervention was not described. Although special attention was given to this during the education sessions, the follow-up test showed no improvement in the quality of the records. This likely reflects a more general attitude of nurses towards reporting. To improve the quality of nursing records, a more comprehensive training should be provided, together with continuous feedback based on regular evaluations. The development of electronic nursing records might possibly improve accuracy and make them a more useful source for information on patient outcome.

Oral care education session

The effects of educational sessions showed the impact of education and training. Training in oral assessment is necessary even for experienced nurses to prevent mistakes when inspecting the oral cavity and to ensure the results are judged correctly. During the education sessions, slides were used of photographs of the mouth showing different stages of oral mucositis. In future studies, videotaped demonstrations and guided practice in assessing
patients’ mouth under supervision of an experienced nurse or a dental hygienist could optimise the trainings. The practical part of the education sessions consisted of nurses brushing each other’s teeth. This ‘simple’ task was regarded as unpleasant but after the session many nurses changed their attitude towards the cleaning of teeth.

Limitations

The tools used in this study were specifically designed for this study and were not extensively tested for their validity and reliability beforehand. However, the record test was based on expert validity and only two observers used the observation and the nursing record tool and they fine-tuned their interpretation to provide greater consistency.

The follow-up data were collected one month after the education sessions so we do not know whether the same results would be obtained after 6 months or later.

Our study included two wards of two different hospitals which, though similar in admission policy and patient demographics, will likely differ in other aspects. In addition, paired analysis was not possible because of the anonymity of the participants. The sample of nurses was different pre- and post-test which could have introduced bias into our study.

Generalizability is also limited as our study was conducted in only two hematology wards in the Netherlands. It is therefore not certain whether the results can be generalized to hematology wards in other centres or general oncology wards and outpatient clinics here in the Netherlands or indeed elsewhere. None the less, the literature does suggest that similar problems and challenges exist elsewhere 7, 8, 20, 21, 27, 28.

Conclusion

Knowledge and skills improve when education in oral care is given to nurses. Baseline data showed a lack of knowledge and skills concerning oral care. These data gave direction to the need for and desired content of education sessions. Our education sessions met the need for oral care knowledge among nurses.

Recommendations

Regular oral care education sessions to improve or refresh oral care knowledge, are the most important recommendation from this study. Audits
and feedback are likely to improve oral care skills in practice. Senior nursing staff should consider selecting interested and experienced nurses to become ‘resource nurses in oral care’. They can act as advisors, an information source and counsellor on oral care at the ward. These nurses should be responsible for oral care education sessions and they can also supervise and teach oral assessment and care in clinical practice.

Follow up studies are necessary to validate our findings, and to determine the most effective training interval and type of instruction and research is needed to determine the impact of knowledge on patient outcomes.
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