Pain from zero to ten : effects of a pain monitoring program for nurses

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Chapter 2

A Pain Monitoring Program for nurses: effects on nurses’ pain knowledge and attitude

Chapter 2

ABSTRACT

Objectives: To study the effects of the Pain Monitoring Program on nurses' knowledge and attitude towards pain and pain management.

Methods: The effects of the Pain Monitoring Program were measured in a pretest-post-test design. In total 216 nurses participated in the education program. Of these nurses, 175 nurses were included in the analysis of the pretest and 144 nurses were included in the analysis of the post-test.

Interventions: Twice-daily pain assessment by nurses using a numeric rating scale was one of the components of the Pain Monitoring Program, which further consisted of educating nurses about pain and pain management.

Results: The results showed that nurses had knowledge deficits and prejudices with regard to pain and pain management. Age and additional pain courses in pain partly predicted nurses' pain knowledge. After nurses were educated, the average score on the Pain Knowledge Questionnaire increased from 69.1% (SD = 13.2) at pretest to 75.8% (SD = 11.5) at post-test (P < 0.001). Nurses' attitude changed with regard to their level of knowledge and skills in relieving pain, willingness to assess pain on a daily basis, and attention to patients' pain complaints.

Conclusions: It can be concluded from this study that the Pain Monitoring Program is effective in improving nurses' knowledge of pain management and focusing nurses' attention on patients' pain complaints.

INTRODUCTION

Treatment of pain is often inadequate in hospitalized patients.1-8 Deficits in nurses' knowledge and attitude are suggested as one reason for inadequate pain treatment.2,9-15 Several authors have reported on nurses' inadequate knowledge about opioid analgesic drugs, fear of addiction, tolerance, etc., and the failure to systematically assess pain.10,16-26 The effect of pain education has been studied by several researchers.27-36 Francke's study28 showed that pain education led to an increase in nurses' knowledge of pain medication. Weissman and Dahl,29 Ferrell et al.,30 Hauck,33 Myers,34 Sofaer,35 and Westfall and Speedie36 came to comparable conclusions.

For changing pain management behavior, education about pain is not enough.13,29,37 According to nurses who followed the program developed by Francke,28 it is easier to apply new knowledge when it is translated into a new ward policy, e.g. implementation of a standard pain rating. However, most studies simply describe the implementation of such
pain management protocols,\textsuperscript{27,38,41} while only few studies describe how nurses’ attitude and behavior have been changed after implementation of a pain management protocol. Bookbinder et al.\textsuperscript{42} implemented the American Pain Society quality assurance standards for relief of acute pain and cancer pain,\textsuperscript{43} and educated nurses to ensure basic knowledge and skills in pain management. It was found that nurses’ knowledge, attitude, as well as patients’ satisfaction with how caregivers treated their pain, had improved. Studies by Breitbart et al.,\textsuperscript{44} Titler et al.,\textsuperscript{45} and Davis\textsuperscript{46} also found better knowledge and attitude toward pain management after implementation of pain management protocols. Unfortunately, the sample sizes of these three studies\textsuperscript{44-46} were rather small, while the study of Bookbinder et al.\textsuperscript{42} was carried out only in cancer patients; thus, it is not clear whether their results can be generalized to other settings. It is also not clear if it is necessary to educate all nurses or only certain subgroups of nurses. Several researchers have studied which variables correlate with nurses’ pain knowledge. The following variables were examined as potential predictors of knowledge: age,\textsuperscript{42,47,48} professional nursing experience,\textsuperscript{47,49,51} level of education,\textsuperscript{20,21,23,42,47,51} percentage of patients in pain in care,\textsuperscript{20,21,52} hours spent on pain management during education and additional pain courses\textsuperscript{20,22,48} and care setting.\textsuperscript{20,47,50} The results of these studies have been contradictory.

In this study, a Pain Monitoring Program (PMP) for nurses was developed and implemented. Twice-daily pain assessment by nurses using a numeric rating scale was one of the components of the PMP,\textsuperscript{53} which further consisted of educating nurses about pain and pain management. The purpose of the PMP was to improve nurses’ knowledge about pain and pain treatment, to enhance their understanding of patients’ pain experience, and to change their pain management behavior. In this paper, the effects of the PMP on nurses’ pain knowledge and attitude, and factors influencing nurses’ pain knowledge will be addressed.

\textbf{METHODS}

\textbf{Sample}

This multicenter study was conducted in three hospitals in the Netherlands: two general hospitals and one university hospital. In each hospital, three nursing wards participated, including one medical and two surgical wards. The unit size of the nursing wards varied from 32 beds in the university hospital to 46 beds in one of the general hospitals. The majority of patients had acute pain (67.4%) with a non-malignant cause (62.9%). In total, 240 nurses worked in the nine wards. In the university hospital, most of the staff nurses were registered; in the general hospitals, two-thirds of the staff were registered nurses, and
one-third were student nurses. To our knowledge, four wards were extremely busy and had problems with staffing due to illness. All nurses working in the nine wards were asked to participate and to attend the education program.

**Design**

The effects of the PMP on nurses were measured in a one group pretest-post-test design. Before the start of the education program, nurses filled in a questionnaire about sociodemographic variables, pain, and pain management. Then, they were educated about pain and pain management, and trained how to conduct daily pain assessment. When all nurses had finalized the education program, they started to use the numeric rating scale on a daily base. Six months after the implementation of the PMP, a questionnaire was sent to the nurses with regard to their pain knowledge and attitude. Thus, nurses completed a questionnaire at two measurement points: just before the start of the PMP and six months after the start.

**Pain Monitoring Program**

Nurses followed a 3-hour education program. The program consisted of a formal lecture and a discussion, and focused on basis knowledge and attitudes about the current trends in pain assessment, pain treatment with analgesics, and the use of non-pharmacological pain treatment (Table 1).\(^{11,54-56}\) Nurses were instructed in daily pain assessment by means of a numeric rating scale from 0 to 10, on which 0 means 'no pain at all' and 10 'the worst possible pain'. The rationale and principles of daily pain assessment were explained by means of a case study.\(^{57}\) The implementation of daily pain assessment in nursing practice and its value for nurses and patients has been described previously.\(^{53}\) Participants were given a book\(^{55}\) summarizing the main topics of the program. In the first months after the education program, during the implementation of daily pain assessment, follow-up meetings were held to promote the use of the newly acquired knowledge in nursing practice.\(^{53}\)

**Study measures**

At both assessment points, nurses filled in two questionnaires and a few additional questions regarding sociodemographic information. For reasons of anonymity, nurses were not asked for their names at pretest and post-test. At pretest, nurses were asked to estimate the amount of hours spent on pain during their basic education, and whether they had followed additional courses about pain after their basic education.

*Nurses' pain knowledge* was assessed by using a Dutch version of Ferrell's Patient Pain Questionnaire.\(^{58,59}\) The Pain Knowledge Questionnaire was translated backward and then forward and pretested in a group of 49 patients. It demonstrated acceptable levels of validity.
Table 1. Content of the 3-hour education program for nurses

1 Introduction
   Welcome and introduction
   Pain Knowledge Questionnaire-Dutch-language version and Pain Attitude Inventory
   Definitions of Pain
   - Nurses’ role in pain management
   - Function of pain
   Pain theories
   - Gate control theory
   - Circle of Loeser
   Classification of types of pain
   - Acute versus chronic pain
   - Non-malignant versus malignant pain

2 Instruction in Daily Pain Assessment
   Assessment tools
   - Unidimensional
   - Multidimensional
   Numeric rating scale
   - Advantages and disadvantages
   - Discussion case
   Implementation of daily pain assessment

3 Pain Management
   WHO-analgesic ladder
   - NSAIDs and other non-opioids
   - Opioids
   Side effects of opioid analgesia
   - Constipation
   - Nausea and vomiting
   - Sedation
   Guidelines for pain control
   Myths and misconceptions related to the use of opioids
   Non-pharmacological pain treatments
   - Psychosocial interventions
   - Improving comfort and rest
   - Relaxation and distraction
   - Massage
   - Application of heat and cold

and reliability. Although the Dutch language version of the Pain Knowledge Questionnaire (PKQ-DLV) was originally designed to test the knowledge of cancer patients, the questions also seemed suitable to test the basic knowledge of nurses. The PKQ-DLV includes eight items measuring knowledge about cancer pain and pain management. Nurses were given statements that could be answered on a 5-point Likert scale (strongly agree, agree, not agree/not disagree, disagree, strongly disagree). Before transforming the answers into a 0-100 scale, some items were recoded. A total score was computed for overall pain knowledge.

Nurses’ attitude toward pain and pain management was assessed by means of a newly developed Pain Attitude Inventory (PAI). The PAI is a 9-item questionnaire which measures nurses’ opinions about several aspects of pain and pain management. The questionnaire was especially developed for this study. Some items of the PAI were derived from the Wisconsin Pain Initiative Survey, which has been used with medical and nursing students, as well as practicing nurses and physicians. The Wisconsin Survey includes, for example, the following items: “What percentage of patients with cancer on your ward have pain complaints?”, and “Which statement is most applicable: Most patients receive more pain medication than necessary, Most patients receive less pain medication than necessary, or Most patients receive adequate pain relief”. The remaining items
concerned two other areas relevant to pain: the quality of pain management (questions 4, 5, 6 and 7), and nurses’ own role in pain management (questions 8 and 9). These questions were formulated as statements, which could be answered on a 5-point Likert scale (strongly agree, agree, not agree/not disagree, disagree, strongly disagree).

**Statistical analysis**

Data were analyzed using the Statistical Package for the Social Science for Windows (SPSS) version 7.5. Descriptive statistics were used to evaluate nurses’ sociodemographic characteristics. Because nurses could not be matched at an individual level, comparability between pretest and post-test groups needed to be checked. This was analyzed using Chi-square and Student’s t-test. Differences between pretest and post-test scores on the Pain Knowledge Questionnaire-Dutch-language Version were analyzed using Student’s t-test, and on the Pain Attitude Inventory by means of a non-parametric test. To evaluate which variables predict total score on the Pain Knowledge Questionnaire-Dutch-language version, correlations were computed between the total scores from the pretest with age, years of professional nursing experience, level of education, percentage of patients in pain in care, hours spent on pain management during education, additional pain courses, hospital and care setting. The variables that correlated significantly were analyzed in a forward multiple regression model.

**RESULTS**

**Nurses’ characteristics**

Participation in the program was mandatory and 240 nurses from nine wards were invited for the education program. Ninety percent of the nurses participated (N = 216). Six months later, the number of nurses employed had changed and 252 nurses were surveyed, of whom 90.1% (N = 227) returned the questionnaire. Of these nurses, 31 registered nurses (13.7%) had not followed the education program and the participation of 2 nurses (0.9%) was unknown. For reasons of comparability, it was decided to exclude all student nurses from the analysis at pretest (N = 41) and post-test (N = 50). Thus, 175 nurses at pretest and 144 nurses at post-test were included in the analysis.

The majority of nurses were female (81.3%), the mean age was 34 years (SD = 8.9), and the mean professional nursing experience was 10 years (SD = 8.2). There were no differences between the nurses at pretest and at post-test with regard to age, years of professional nursing experience, educational level, care setting and the hospital for which they were working (Table 2).
At pretest, nurses were asked about previous pain education and courses they attended. A majority of nurses indicated that they had received no or little training in the management of pain during their basic education (mean = 3.4 hours, SD = 2.4): 8.5% of the nurses did not receive any training in pain management at all, 32% spent 1 to 2 hours on pain management, and 26.3% spent 3 or 4 hours. After having finished their basic education, only 31.4% had followed a course in which pain management was included.

Nurses' pain knowledge

The overall scores on the PKQ-DLV before the start of the PMP ranged from 37.5% to 100%, with a mean percentage of 69.1% (SD = 13.2). The questions were also analyzed separately and Table 3 contains the list of items. The item with the lowest score was: “giving the lowest amount of medicine possible”, the items with the highest score were: “pain medications should be given around the clock” and “treatments other than medications can be effective”.

### Table 2  Nurses' sociodemographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Pretest (N = 175)</th>
<th>Post-test (N = 144)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender (N, %)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>---</td>
<td>27 (18.8)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>---</td>
<td>117 (81.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Age (mean in years, SD)</strong></td>
<td>34.2 (8.9)</td>
<td>34.6 (8.9)</td>
<td>NS*</td>
</tr>
<tr>
<td><strong>Years of professional nursing experience (mean in years, SD)</strong></td>
<td>10.8 (8.3)</td>
<td>10.5 (8.2)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Educational level (N, %)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Registered nurse</td>
<td>137 (78.3)</td>
<td>100 (69.4)</td>
<td></td>
</tr>
<tr>
<td>Registered nurse with specialized continuing education</td>
<td>38 (21.7)</td>
<td>44 (30.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Care setting (N, %)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Medical wards</td>
<td>55 (32.0)</td>
<td>46 (31.9)</td>
<td></td>
</tr>
<tr>
<td>Surgical wards</td>
<td>119 (68.0)</td>
<td>98 (68.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Hospital (N, %)</strong></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Hospital A</td>
<td>63 (36.0)</td>
<td>48 (33.3)</td>
<td></td>
</tr>
<tr>
<td>Hospital B</td>
<td>66 (37.7)</td>
<td>54 (37.5)</td>
<td></td>
</tr>
<tr>
<td>Hospital C</td>
<td>46 (26.3)</td>
<td>42 (29.2)</td>
<td></td>
</tr>
</tbody>
</table>

* NS: not significant
Table 3  Results of Pain Knowledge Questionnaire-Dutch-language version

<table>
<thead>
<tr>
<th>Statement</th>
<th>Pretest Mean (SD)</th>
<th>Post-test Mean (SD)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cancer pain can be effectively relieved.</td>
<td>77.5 (17.9)*</td>
<td>78.3 (17.4)</td>
<td>NS*</td>
</tr>
<tr>
<td>2. Pain medication should be given only when pain is severe.</td>
<td>78.9 (25.1)</td>
<td>85.0 (20.4)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>3. Most cancer patients who take pain medication, will become addicted over time.</td>
<td>61.3 (29.8)</td>
<td>81.3 (23.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4. It is important to give the lowest amount of medicine possible to save larger doses for later when the pain is worse.</td>
<td>48.5 (34.8)</td>
<td>63.2 (33.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5. It is better to give pain medications around the clock (on a schedule) rather than only when needed.</td>
<td>84.2 (20.9)</td>
<td>87.7 (19.0)</td>
<td>NS</td>
</tr>
<tr>
<td>6. Treatments other than medications (such as massage, heat, relaxation) can be effective for relieving pain.</td>
<td>82.2 (17.5)</td>
<td>79.0 (20.8)</td>
<td>NS</td>
</tr>
<tr>
<td>7. Patients are often prescribed too much pain medicine.</td>
<td>60.4 (24.2)</td>
<td>69.9 (22.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8. Prescriptions for the use of pain medicine can be adjusted by the patient, without consulting the general practitioner /specialist/(district) nurse.</td>
<td>60.2 (30.4)</td>
<td>61.1 (29.4)</td>
<td>NS</td>
</tr>
</tbody>
</table>

| Total score | 69.1 (13.2) | 75.8 (11.5) | <0.001 |

* Higher scores indicate better pain knowledge
* NS: not significant
* Statements were recoded

To estimate the amount of knowledge gained during the PMP, the results of the pretest and the post-test were compared by means of a Student’s t-test. The mean pretest score was 69.1% (SD = 13.2). At post-test, the mean score was 75.8% (SD = 11.5) (min. = 43.8; max. = 96.9), representing a 6.7% increase (P < 0.001) (Table 3). Item analysis showed improved knowledge on the items: “psychological addiction is inevitable over time” (P < 0.001), “giving the lowest amount of medicine possible” (P < 0.001), “patients are often overmedicated” (P < 0.001), and “medication only for severe pain” (P < 0.05).

At pretest, there were no differences in the total score among the nurses from the three hospitals. At post-test, nurses from hospitals B and C (general hospitals) showed a significantly increased level of knowledge (P < 0.05 respectively P < 0.001), whereas this was not significantly increased for nurses from the university hospital.

Total scores from the pretest were correlated with age, years of professional nursing experience, level of education, percentage of patients in pain in care, hours spent on pain management during education, additional pain courses, hospital and care setting. Significant correlations were found for years of professional nursing experience (r = -0.29, P < 0.001), age (r = -0.28, P < 0.001), and additional pain courses (r = 0.25, P < 0.05). A forward regression analysis indicated that age ($R^2 = 0.08$, $P < 0.001$) and additional pain courses ($R^2$
Effects on nurses' pain knowledge and attitude 29

= 0.06, \( P < 0.01 \) were predictors for pain knowledge.

Nurses' attitude toward pain and pain management

Table 4 presents the results of the PAI. There is considerable variance in responses regarding the proportions of patients experiencing pain. At pretest, a majority of nurses (60.6%) indicated that 80% to 100% of the patients on their wards experience pain. The prevalence of pain in cancer patients is almost as high: according to 53.2% of the nurses more than 80% of the cancer patients on their wards suffer from pain. Nurses were pessimistic about the pain medication given to patients: 53.7% of the nurses felt that most patients receive less pain medication than necessary. This is in contrast with the finding that 71.4% of nurses evaluated the quality of pain management on their ward as good. The need for pain education was confirmed in this study: only 57.7% of the nurses felt that nurses have sufficient knowledge and skills to relieve pain. Nurses were more positive about the other aspects of pain management: 98.3% thought that nurses play an important role in pain relief, 87.4% thought that pain should be assessed by nurses on a daily basis, and 78.3% thought that nurses pay enough attention to patients’ pain complaints. Nurses were less positive about the attention that doctors pay to patients’ pain: according to 45.7% of the nurses, doctors pay enough attention to patients’ pain.

After implementation of the PMP, the proportion of nurses who believed that they had sufficient knowledge and skills to relieve pain increased from 57.7% to 73.6% \( (P < 0.01) \). At pretest, 78.3% of the participants felt that nurses pay enough attention to patients’ pain complaints. Six months after completion of the PMP, 84.7% agreed with this statement \( (P < 0.05) \). At pretest, 87.4% of nurses felt that pain should be assessed on a daily basis, whereas at post-test this percentage had significantly decreased to 77.1% \( (P < 0.05) \). This decrease was primarily caused by the surgical nurses: at pretest 83.9% of the nurses from surgical wards agreed with daily pain assessment, whereas at post-test only 68% was still in favor of this \( (P < 0.01) \) (data not shown).

DISCUSSION

The quality of pain treatment depends on the knowledge, attitude and skills of those who provide the treatment. Nurses play a crucial role in this process: they often act as mediator between the doctor and the patient, and are the ones to monitor the pain and comfort the patient. However, the question is whether nurses are equipped to fulfill this role: do they have the necessary knowledge, attitude and skills? Pritchard\textsuperscript{62} reported that nurses receive no or only little training in pain management, and a lack of pain education was also found in
### Table 4  Results of Pain Attitude Inventory

<table>
<thead>
<tr>
<th></th>
<th>Pretest N (%)</th>
<th>Post-test N (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What percentage of patients on your ward have pain complaints?</td>
<td></td>
<td></td>
<td>NS*</td>
</tr>
<tr>
<td>20% of the patients</td>
<td>2 (1.1)</td>
<td>3 (2.1)</td>
<td></td>
</tr>
<tr>
<td>40% of the patients</td>
<td>16 (9.1)</td>
<td>17 (11.8)</td>
<td></td>
</tr>
<tr>
<td>60% of the patients</td>
<td>50 (28.6)</td>
<td>42 (29.2)</td>
<td></td>
</tr>
<tr>
<td>80% of the patients</td>
<td>90 (51.5)</td>
<td>75 (52.1)</td>
<td></td>
</tr>
<tr>
<td>100% of the patients</td>
<td>16 (9.1)</td>
<td>7 (4.9)</td>
<td></td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>1 (0.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>2. What percentage of patients with cancer on your ward have pain complaints?</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>20% of the cancer patients</td>
<td>16 (9.1)</td>
<td>14 (9.7)</td>
<td></td>
</tr>
<tr>
<td>40% of the cancer patients</td>
<td>20 (11.4)</td>
<td>15 (10.4)</td>
<td></td>
</tr>
<tr>
<td>60% of the cancer patients</td>
<td>42 (24.0)</td>
<td>44 (30.6)</td>
<td></td>
</tr>
<tr>
<td>80% of the cancer patients</td>
<td>68 (38.9)</td>
<td>61 (42.4)</td>
<td></td>
</tr>
<tr>
<td>100% of the cancer patients</td>
<td>25 (14.3)</td>
<td>10 (6.9)</td>
<td></td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>4 (2.3)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>3. Which statement is applicable:</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Most patients receive more pain medication than necessary</td>
<td>9 (5.2)</td>
<td>3 (2.1)</td>
<td></td>
</tr>
<tr>
<td>Most patients receive adequate pain treatment</td>
<td>66 (37.7)</td>
<td>60 (41.6)</td>
<td></td>
</tr>
<tr>
<td>Most patients receive less pain medication than necessary</td>
<td>94 (53.7)</td>
<td>79 (54.9)</td>
<td></td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>6 (3.4)</td>
<td>2 (1.4)</td>
<td></td>
</tr>
<tr>
<td>4. What is your opinion about the quality of pain management on your ward?</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Good</td>
<td>125 (71.4)</td>
<td>106 (73.6)</td>
<td></td>
</tr>
<tr>
<td>Not good/not poor</td>
<td>42 (24.0)</td>
<td>33 (22.9)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>6 (3.4)</td>
<td>5 (3.5)</td>
<td></td>
</tr>
<tr>
<td>Missing or unknown</td>
<td>2 (1.2)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>5. Doctors pay enough attention to patients' pain complaints.</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Agree</td>
<td>80 (45.7)</td>
<td>75 (52.1)</td>
<td></td>
</tr>
<tr>
<td>Not agree/not disagree</td>
<td>34 (19.4)</td>
<td>28 (19.4)</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>60 (34.3)</td>
<td>40 (27.8)</td>
<td></td>
</tr>
<tr>
<td>Missing/unknown</td>
<td>1 (0.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>6. Nurses pay enough attention to patients' pain complaints.</td>
<td></td>
<td></td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Agree</td>
<td>137 (78.3)</td>
<td>122 (84.7)</td>
<td></td>
</tr>
<tr>
<td>Not agree/not disagree</td>
<td>20 (11.4)</td>
<td>20 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>17 (9.7)</td>
<td>2 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Missing/unknown</td>
<td>1 (0.6)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>7. Nurses have sufficient knowledge and skills to relieve pain.</td>
<td></td>
<td></td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Agree</td>
<td>101 (57.7)</td>
<td>106 (73.6)</td>
<td></td>
</tr>
<tr>
<td>Not agree/not disagree</td>
<td>41 (23.4)</td>
<td>21 (14.6)</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>31 (17.7)</td>
<td>15 (10.4)</td>
<td></td>
</tr>
<tr>
<td>Missing/unknown</td>
<td>2 (1.2)</td>
<td>2 (1.4)</td>
<td></td>
</tr>
</tbody>
</table>

*NS* indicates a non-significant result.
this study. Therefore, we used an integrated program to enhance nurses’ knowledge and attitude by educating nurses and implementing daily pain assessment.

In this paper we have described the effects of the PMP on nurses’ pain knowledge and attitude. The implementation of daily pain assessment and its value for nurses and patients is described elsewhere. The results of this study showed that nurses improved their knowledge about pain and pain management after the PMP was implemented. Nurses’ scores on the PKQ-DLV increased from 69.1% to 75.8% \((P < 0.001)\), and more nurses felt they had sufficient knowledge and skills to relieve pain. A 6.7% increase may seem rather moderate, but it should be noted that summary scores of 8 items can be misleading. On important issues there was a substantial increase in knowledge. Nurses scored better on the items: “medication only for severe pain”, “psychological addiction is inevitable over time”, “taking as low a dose as possible” and “patients are over-medicating”.

The outcomes of this study are consistent with the work of other researchers, who have found that pain management protocols contribute to nurses’ pain knowledge and attitude. Although no differences were observed at pretest in pain knowledge between nurses working in general versus university hospitals, it appeared that nurses from the general hospitals profited more from the PMP than nurses from the university hospital.

De Wit et al. used the PKQ-DLV in cancer patients with chronic pain. The lowest score of patients and nurses were on the same items: “giving the lowest amount of medicine possible”, “patients are often over-medicating”, and “psychological addiction is inevitable over time”. The highest score was also on the same item: “treatments other than medications can be effective”. Because patients and nurses have the same deficits in knowledge, educating nurses is very important in order to address misconceptions and
myths about pain management. Further studies are needed to determine whether better pain knowledge in nurses will lead to better pain knowledge in patients.

In the literature, several predictors of pain knowledge are described. As Sheehan\textsuperscript{48}, Brunier et al.,\textsuperscript{20} Vortherms et al.,\textsuperscript{21} and McCaffery et al.,\textsuperscript{22} we found age and additional pain courses to be predictors of pain knowledge at pretest. Attendance at a pain course positively affected the total score on the PKQ-DLV, whereas age inversely affected the total score. The overall $R^2$ indicated that only 14\% of the variation in the total score was accounted for by these background variables. So besides age and attendance at a pain course, many other variables affect nurses' pain knowledge and one can not distinguish subgroups.

It can be concluded from the PAI that pain is a frequent problem on nursing wards: more than half of the nurses believed that 80 to 100\% of the patients on their wards, either with or without cancer, were suffering from pain. Nurses were positive about the quality of pain management on their ward and their role in pain management. When they were asked to choose between three statements about pain management, 53\% of the nurses believed that most patients receive less pain medication than necessary, 37\% believed that most patients receive adequate pain treatment, and 5\% believed that most patients receive more pain medication than necessary. Although this is congruent with the findings of other researchers,\textsuperscript{48,49,52} there seems to be a paradox. On the one hand, nurses are positive about the quality of pain management on their ward, while on the other hand, they believe that most patients receive less pain medication than necessary. This may be explained by the fact that the majority of patients are satisfied about their pain management despite high pain levels.\textsuperscript{42,64,65} This might give nurses the idea that the quality of pain management on their ward is good.

After implementation of the PMP, nurses believed that they pay more attention to patients' pain and have better knowledge and skills to relieve pain. Six months after the education program and implementation of daily pain assessment, the percentage of nurses who were willing to assess pain on a daily basis had decreased significantly from 87.4\% to 77.1\%. After six months of assessing pain on a daily basis, nurses from surgical wards were less enthusiastic about daily pain assessment. According to surgical nurses, patients had difficulty with expressing their pain in a number, daily pain assessment took additional time, and physicians did not make adequate use of the pain assessment.\textsuperscript{53} It is encouraging that only 10\% of the nurses were not willing to assess pain on a daily basis any more. The majority of nurses (77.1\%) wanted to continue the daily pain assessment.

Although the results of this study are promising, several limitations should be mentioned. First, there was no control group in this study. With a lack of control group it is possible that the increase in pain knowledge is caused by other factors than the education program. On the other hand, nurses from nine wards in three hospitals were included in this
Effects on nurses' pain knowledge and attitude

study, so one can assume that other factors are neutralized. Secondly, for reasons of anonymity, we did not ask for the nurses' names at pretest or at post-test. Consequently, pretest and post-test data could not be matched at an individual level. Third, 31 nurses in the pretest were not included in the post-test. However, when testing for differences between pretest and post-test, no differences were found with regard to age, years of professional working experience, educational level, care setting and hospital. Fourth, the education program was very brief. Nurses were educated for only three hours, and a more extended program may have a greater impact on nurses' pain knowledge. Finally, the PKQ-DLV is originally designed to measure patients' pain knowledge and the PAI has not been used before. It is possible that neither of the questionnaires is suitable or precise enough for measuring nurses' pain knowledge and attitude. However, effects of the PMP were found with these two questionnaires.

It can be concluded from this study that nurses have knowledge deficits and prejudices with regard to pain and pain management. The study also shows that the PMP is effective in improving nurses' knowledge of pain management and in focusing nurses' attention to patients' pain complaints.

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