Contextual Factors Impacting a Pain Management Intervention

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Abstract

**Purpose:** To determine if findings from our preliminary study related to patient and nursing satisfaction with a pain management intervention could be replicated in a changed environment, and if contextual factors could impact the effectiveness of a pain management intervention on patient satisfaction with nursing staff’s management of pain.

**Methods:** A prospective, experimental design was used with six monthly assessments before, during, and after the intervention. Data were collected from 540 patients admitted to eight medical surgical and progressive care units and nurses that worked in these units at an academic health sciences center in the southern United States, from March to July 2015. The script-based, pain management communication intervention included three specific tactics: script-based communication, use of white boards, and hourly rounding. The Hospital Consumer Assessment of Healthcare Providers and Systems survey was used to assess two items: “pain is well controlled” and “staff did everything they could to help with pain.” Contextual factors focused on the practice setting.

**Findings:** Both scores for “pain is well controlled” (\( \beta = .028, p = 0.651 \)) and scores for “staff did everything they could to help with pain” (\( \beta = .057, p = .385 \)) did not change initially but then increased significantly and were sustained over time. Nurses had high levels of satisfaction with the intervention (\( M = 7.9, SD = 2.1 \)) and compliance with the intervention (\( M = 8.0, SD = 1.9 \)), and had little difficulty in implementing the intervention (\( M = 8.3, SD = 1.4 \)). In terms of contextual factors, the number of beds on the unit and the number of patients being discharged negatively impacted scores for “pain is well controlled” and “staff did everything they could to help with pain.” Hospital length of stay positively impacted scores for “pain is well controlled” by staff.

**Conclusions:** Despite challenging contextual variables, the study extended the findings of an early preliminary study in showing the effectiveness of pain management intervention on patient satisfaction with staff’s management of pain. In evaluating the impact of an intervention, it is essential to examine the contextual environment.

**Clinical Relevance:** Using simple, clear, and consistent communication between patients and nurses related to pain can positively impact patient satisfaction with pain management over time. The health care environment can enhance nursing practice and patients’ outcomes.
Increasingly, there is recognition that the effectiveness of healthcare interventions should be considered within the context in which they occurred (Shekelle et al., 2011). Contextual influences may help or hinder an intervention and the resulting outcomes (Bonell, Fletcher, Morton, Lorenc, & Moore, 2012). Understanding the contextual environment before and during the implementation of an intervention is crucial in determining the circumstances under which this intervention can be effective and successful (Bonell et al., 2012; Ovretveit et al., 2011).

Current healthcare systems provide an interesting and complex environment for conducting healthcare research. Healthcare systems in the United States have changed tremendously during the past few decades (Antos, 2015; Jennings, 2008; Wexler, Hefner, Welker, & McAlearney, 2014), with the aim to improve quality of care, increase patients’ satisfaction, and decrease costs (Antos, 2015; Ellner et al., 2015). Some of the changes may negatively impact the nursing work environment (Fox & Abrahamson, 2009). In addition, the healthcare environment is currently characterized by nursing shortages. Nursing shortages are associated with increased nurses’ workload and lower job satisfaction, which consequently impact patients’ care, outcomes, and experiences (Curtin, 2007). Interestingly, the healthcare environment and empowerment of nurses (context) commensurate with ANCC Magnet® designation are associated with improved patient outcomes (Kutney-Lee et al., 2015; Tei-Tominaga & Sato, 2016).

Assuring high-quality health care is an essential goal for all healthcare organizations in order to promote quality, safety, and a positive patient experience. A critical aspect of the patient experience is successful management of their pain by their care providers. Patient satisfaction is a core element in reflecting patient experience, quality, safety, and a positive patient experience. A majority of the nurses felt the script-based communication approach was easy to comply with (score = 17, 94.4%). The ‘nurses were satisfied with the script-based communication approach (score = 7.84; 1 = unsatisfied and 10 = very satisfied) and were very compliant with implementing the script-based communication tactics (score = 8.16; 1 = noncompliant and 10 = very compliant).

The preliminary study was limited by use of only two matched units in one academic health sciences center. Therefore, further research is needed to test the effectiveness of the intervention and generalizability of study findings.

Changes have occurred in health care, and specifically in our academic health science center, since the completion of the preliminary study in 2013 and publication of study findings in 2014. These changes have included: (a) merger of our academic health sciences center with a large, national healthcare system; (b) appointment of a new chief nursing officer; (c) increased nurse manager turnover rate; (d) increased registered nurse turnover rate resulting in challenges in staffing; and (e) change in the way data are collected for patient satisfaction from mailed survey to phone survey. In order to determine if findings from our preliminary study could be replicated in a changed environment, our first two aims were the...
same as in our pilot study. The first aim of the current study was to evaluate the effectiveness of an intervention (script-based communication, use of white boards, hourly rounding) related to pain management on patient satisfaction with the nursing staff’s management of pain. Patient satisfaction was measured by using scores of the two HCAHPS items related to patients’ experience with pain: (a) “pain is well controlled” and (b) “staff did everything they could to help with pain.” The second aim of the study was to assess nurses’ satisfaction with script-based communication related to pain management, as tested in our pilot study. Finally, the third aim of the study was to identify contextual factors that could impact the effectiveness of a pain management intervention on patient satisfaction with staff’s management of pain.

Methods

The study replicated methods (e.g., intervention, instruments, procedures) used in our preliminary study, extending the intervention to all eight medical-surgical and progressive care units in the academic health sciences center. Since the preliminary study and the current study were both conducted in the same setting, contamination of the site did not allow for a control group for this study.

Design

A prospective, experimental study design was used. Research ethical approval was obtained by the University Institutional Review Board and the hospital research committees.

Participants and Setting

Data were collected in a hospital located in an academic health sciences center in the southern United States. The study was conducted on eight separate nursing units with mixed acuity. The units included both medical-surgical and progressive care level patients. The patients’ conditions included cancer, stroke, trauma, elective surgeries, and multiple medical diagnoses. Patients who were admitted to the eight medical-surgical and progressive care units at the academic center and who responded to the HCAHPS survey (n = 540) and nurses who worked during the study period in these units (n = 84) were included.

Experimental Intervention

The study intervention included three specific tactics that may positively impact patient satisfaction with pain: script-based communication, use of white boards, and hourly rounding (Dearmon et al., 2013; Sherwood et al., 2003; Studer et al., 2010). Patient-centered communication may improve health outcomes, including patient satisfaction (Brand & Stiggelbout, 2013; King & Hoppe, 2013). The content of the white boards included up-to-date information about pain levels, pain goals, and pain management options. This information was required to be shared with patients in hourly rounding around the clock, unless patients were sleeping. Below is the script used by nurses:

We are going to do everything that we can to help keep your pain under control. Your pain management is our number one priority. Given your (condition, history, diagnosis, status), we may not be able to keep your pain level at zero. However, we will work very hard with you to keep you as comfortable as possible.

Procedures

Nurses read the script to patients when they were assessing their pain, as opposed to individualizing their communication related to pain assessment. Posters with the script were displayed throughout all units, including the patients’ rooms, as visual reminders for the staff and patients. Unless the patients were sleeping, nurses were required to assess patients’ pain on an hourly basis using the 0- to 10-point pain scale and to use the white board to document patients’ pain level and pain medication schedule.

Data on patient satisfaction with pain management were collected from the HCAHPS database by the research team at the end of the study. Data were collected on all subjects who received care on any of the units studied and who responded to the survey.

As in the preliminary study, all nurses (n = 84) working on each unit attended an in-service education program provided by the pain service charge nurse prior to the implementation of the study. The content of this training focused on the three specific tactics in detail and the importance of adherence to these tactics. Each session lasted for 1 hour during regular working hours. The charge nurse encouraged group interaction to promote nurses’ participation in the implementation process. A post-test was conducted at the end of each session to ensure that nurses understood the essential elements of study intervention. After completion of the nurses’ training, the research team contacted the units’ managers to obtain permission to start the implementation of the script-based intervention.

Instruments

The Hospital Consumer Assessment of Healthcare Providers and Systems. The HCAHPS was used to assess
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patient satisfaction with pain management. The HCAHPS (Giordano, Elliott, Goldstein, Lehrman, & Spencer, 2010) is a 27-item national, standardized, and publicly reported survey which was developed by the Centers for Medicare and Medicaid Services and the Agency for Healthcare Research and Quality. This survey was designed to be administered to a random sample of adult patients who were recently discharged from the hospital to assess their opinions about the quality of care they received at the hospital on a monthly basis. Three items of this survey are specifically related to patients’ experiences with pain. The first item assesses patients’ need for pain management; the second item inquires if the pain was well controlled; and the third item identifies how often the hospital staff did everything they could to help with pain. The first item is answered by “yes” or “no.” The second and third items are answered on a 4-point Likert scale ranging from 1 (never) to 4 (always). The HCAHPS was administered by a contacted third-party vendor using phone interviews.

Nurses’ satisfaction. The research team used a three-question survey to assess nurses’ satisfaction with the script-based communication intervention related to pain management, developed for our pilot study (Alaloul et al., 2015). The nurses’ satisfaction survey was collected by the research team at the end of the study. Nurses were asked to rate their satisfaction with the script-based communication approach and their compliance with the intervention using a 10-point ordinal scale (1 = unsatisfied, 10 = very satisfied; 1 = noncompliant 10 = very compliant). Nurses were also asked to give their overall rating of level of difficulty in implementing the intervention (1 = difficult, 10 = easy). Only three questions were used to reduce participant burden, and reliability data were not calculated on so few questions.

Contextual factors. Contextual factors related to practice setting included variables that have previously been shown to influence quality of patient care: characteristics of the unit manager, experience (Blegen, Vaughn, & Goode, 2001; Malldiou, Cummings, Estabrooks, & Giovannetti, 2011), and education of nurses (Aiken et al., 2011; Manojlovich, Sidani, Covell, & Antonakos, 2011) on the unit, and factors that impact nurses’ work load (number of beds on unit, admissions and discharges, patient days, and average length of stay [LOS]; Aiken et al., 2012; Goode, Blegen, Park, Vaughn, & Spetz, 2011). Number of beds on unit, number of admissions and discharges, LOS, and patients days were obtained from the medical records department. Staff characteristics were obtained from the human resources department and nurse managers on each unit. Contextual variables were calculated monthly and pooled across the eight units.

Use of white boards, hourly rounding, and fidelity of the intervention. White board audits and assessment of the fidelity of script verbiage were conducted by the clinical manager and the charge nurses of each intervention unit and the pain service charge nurse on a daily basis using a check list. The check list included information about compliance with hourly rounding, content of white boards (up-to-date information about pain levels, pain goals, and pain management options), and script verbiage. Although no gold standard exists for fidelity ratings, we aimed for 90% fidelity based upon other cited studies (e.g., Wickersham et al., 2011).

Statistical Analysis

Initially we tested for differences in baseline patient (average LOS, patient days on the ward), unit (number of beds, number of admissions, number of discharges), and nurse (years of experience, recent graduate, has a bachelor of science in nursing [BSN]) characteristics (analyses of variance for continuous variables and chi-squared tests for categorical data) to determine if data could be pooled across the units. Subsequently, we performed a descriptive analysis on the pooled demographic data (since there were no significant baseline differences).

Two separate generalized linear mixed-effects models were developed for the two outcomes (“pain is well controlled” and “staff did everything they could to help with pain”) in which time since implementation of the intervention was incorporated as a repeated-measures effect and all other variables were incorporated as random effects. All random effects were calculated monthly and pooled across the eight units. We then tested if any of the studied variables impacted scores over time, as well as the impact of contextual variables. Additionally, an interrupted time series analysis model using an autoregressive, integrated moving average approach was employed to assess the effect of implementation on scores over time. The significance of changes in intercept and slope of the regression lines was assessed before and after implementation. A Durbin-Watson statistic was used to examine for the presence of first-order autocorrelation among serial observations, and the model was corrected for autocorrelation (Durbin & Watson, 1951). A descriptive analysis of nurse satisfaction with the implementation of the script-based communication was performed.

Results

White board audits and assessment of the fidelity of script verbiage on a daily basis revealed that nurses
implemented the intervention 89.4% of the time. This was slightly less than our goal of 90% fidelity.

**Aim 1**

As seen in Figure 1, both scores for “pain is well controlled” (β = 0.028, p = .651) and scores for “staff did everything they could to help with pain” (β = 0.057, p = .385) did not change initially but then increased significantly and were sustained over time. That is, scores significantly increased from March to April (p = .039 and p = .002, respectively), but remained consistent across future months (all subsequent month-to-month comparison p values > .05). There was little variability in patient satisfaction scores, and baseline scores for “pain is well controlled” were higher than in the pilot study. In the pilot study, scores were consistently around 2.4 to 2.5, while in the current study these same scores were consistently around 3.4 to 3.6. This is a full point higher on a 1- to 4-point scale, which may lead to a ceiling effect and nonsignificant results across later months. A larger sample size may be needed to see a significant change.

A significant change in intercepts of regression lines showed a significant difference between two time periods for “staff did everything they could to help with pain” scores (intercept change; pre-implementation vs. postimplementation = 0.3; 95% confidence interval [CI] 0.1, 0.5; p = 0.022). In addition, the slope of the regression line between two time periods was significant for both “pain is well controlled” (0.08; 95% CI 0.04, 0.13; p = 0.044) and “staff did everything they could to help with pain” (0.2; 95% CI 0.15, 0.25; p = 0.004). Lastly, the two slopes (for the two questions) were not significantly different from zero, suggesting consistent scores post-implementation. The Durbin-Watson statistic was 1.72, suggesting nonsignificant first-order autocorrelation.

**Aim 2**

Nurses had high levels of satisfaction with the intervention (M = 7.9, SD = 2.1) and compliance with the intervention (M = 8.0, SD = 1.9), and had little difficulty in implementing the intervention (M = 8.3, SD = 1.4).

**Aim 3**

In terms of contextual factors, on average, the nurse managers had 2.7 years (SD = 1.9) of experience in their roles, 2.6 (SD = 2.0) new nurses started on the units monthly, and 80.0% (SD = 7.2%) of the nurses had a BSN. On average, the units had 21.8 beds (SD = 5.1), 85.8 (SD = 32.1) admissions a month, and 117.0 (SD = 42.0) discharges a month, representing 534.8 (SD = 133.1) total patient days a month and an average LOS of 4.8 (SD = 1.0) days. This represented a total of 686 admissions, 936 discharges, and 4,278 patient days for the entire study period. As seen in Table 1, the number of discharges (β = −2.15, p = .008) led to significant decreases in “pain is well controlled” scores over time, while the number of beds (β = −1.95, p = .003), average LOS (β = 2.04, p = .006), and time since implementation of intervention (β = 1.76, p = .030) led to significant increases in “pain is well controlled” scores over time. By contrast, the number of beds on the unit (β = −1.88, p = .009) and number of discharges (β = −2.23, p < .001) led to significant decreases in “staff did everything they could to help with pain” scores over time, while average LOS (β = 1.12, p = .036) and time since implementation of intervention (β = 1.58, p = .027) led to significant increases in “staff did everything they could to help with pain” scores over time.

**Discussion**

Pain is one of the most significant problems that negatively impact patients’ quality of life (Muller-Schwele et al., 2011) and patients’ experience (Subramanian, Ramasamy, Ng, Chinna, & Rosli, 2016), and increases healthcare expenses (Institute of Medicine, 2011). It is worth pointing out that improvement in patient satisfaction with pain management may not indicate improvement in pain scores. Our intervention was not intended to improve pain scores but to improve patients’ satisfaction with pain management. We demonstrated continued effectiveness of a script-based pain management intervention on patients’ satisfaction with nursing management of pain. The study extended the findings of our preliminary study to a larger population. The continued effectiveness of the intervention was demonstrated despite challenging contextual variables. Effectiveness trials, such as this study, measure the degree of beneficial effect of an intervention in “real world” clinical settings, and thus extend the science. It is important to understand the contextual environment when evaluating the impact of an intervention. Appraising study findings in isolation of context may lead to distortion of reality. Hospitals (such as our academic health sciences center) undergoing restructuring and merger can negatively impact nursing working environments (Aiken, Clarke, & Sloane, 2000; Castner, Wu, & Dean-Baar, 2015). Indeed, several studies have demonstrated that restructuring of hospitals and mergers of hospital systems can negatively impact nurses’ job satisfaction and increase burnout (Cummings, Hayduk, & Estabrooks, 2005; Gonzalez, Wolf, Dudjak, & Jordan, 2015; Teo, Pick, Newton, Yeung, & Chang, 2013).
Figure 1. Impact of the intervention on patient satisfaction with the nursing staff’s management of pain.

Table 1. Scores for Predictors of “Pain is well controlled” and “Staff did everything they could to help with pain”

<table>
<thead>
<tr>
<th>Predictor</th>
<th>“Pain is well controlled”</th>
<th>p value</th>
<th>“Staff did everything they could to help with pain”</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse manager’s years of experience</td>
<td>−.54</td>
<td>.387</td>
<td>−.48</td>
<td>.199</td>
</tr>
<tr>
<td>Number of new RNs</td>
<td>−.42</td>
<td>.429</td>
<td>−.31</td>
<td>.603</td>
</tr>
<tr>
<td>Percentage of nurses with a BSN</td>
<td>1.12</td>
<td>.412</td>
<td>.75</td>
<td>.102</td>
</tr>
<tr>
<td>Number of beds on unit</td>
<td>−1.95</td>
<td>.003**</td>
<td>−1.88</td>
<td>.009**</td>
</tr>
<tr>
<td>Number of admissions</td>
<td>−.92</td>
<td>.696</td>
<td>−.48</td>
<td>.224</td>
</tr>
<tr>
<td>Number of discharges</td>
<td>−2.15</td>
<td>.008**</td>
<td>−2.23</td>
<td>&lt;.001***</td>
</tr>
<tr>
<td>Patient days</td>
<td>−.39</td>
<td>.848</td>
<td>.64</td>
<td>.092</td>
</tr>
<tr>
<td>Average length of stay</td>
<td>2.04</td>
<td>.006**</td>
<td>1.12</td>
<td>.036*</td>
</tr>
<tr>
<td>Time since implementation of intervention</td>
<td>1.76</td>
<td>.030**</td>
<td>1.58</td>
<td>.027*</td>
</tr>
</tbody>
</table>

Note. BSN = bachelor of science in nursing; RN = registered nurse.
*p < .05; **p < .01; ***p < .001.

The average LOS for patients at this academic health sciences center is similar to the average national level (Weiss & Elixhauser, 2014). The percentage of nurses with a BSN degree in this center (80%) is higher than the percentage of the national registered nurses workforce (Health Resources and Services Administration, Bureau of Health Professions, National Center for Health Workforce Analysis, 2013). An explanation for this high percentage of BSN-degreed nurses is that the BSN is the preferred degree for hiring new staff in the academic health sciences center, and several baccalaureate nursing programs are available to educate nurses in the community. Lastly, our number of discharges and admissions are similar to those of hospitals of a similar size (~400 beds).

In the current study, the number of beds and number of patients being discharged negatively impacted patient scores for “pain is well controlled” and “staff did everything they could to help with pain.” Perhaps the “busyness” of larger units gives the impression to patients that their pain is not the nurses’ priority (Bourdillon et al., 2012; Greenslade & Jimmieson, 2011). Additionally, hospital LOS positively impacted scores for “pain is well controlled” by staff. There are inconsistent findings in the literature on the relationship between LOS and patient satisfaction. In the current study and some previous studies (Charalambous, 2013; Rosenheck, Wilson, & Meterko, 1997), a positive significant relationship between LOS and patient satisfaction was found. Some studies found decreasing LOS to be associated with increased patient satisfaction (Purdy, Spence Laschinger, Finegan, Kerr, & Olivera, 2010; Schoenfelder, Klewer, & Kugler, 2010), while other studies found no significant relationship between LOS and patient satisfaction (Borghans, Kleefstra, Kool, & Westert, 2012; Pompili et al., 2015). Longer time spent on the unit may provide more opportunities for nurses to
establish relationships with patients and convince patients of the nurses’ sincerity in working to control patients’ pain (Borghans et al., 2012; Pompli et al., 2015). These differences in patients’ satisfaction regarding LOS may be due to the fact that patients were more concerned with the quality of care provided during their stay at the hospital rather than the LOS. Interestingly, nurses’ level of education did not affect patients’ satisfaction with pain management. Level of education may not have been significant since standard interventions were provided. It suggested to us that all nurses were providing similar quality of care.

Scores seen in the current study (consistently around 3.5) were significantly higher than those in our previously published reported (consistently around 2.5; \( p = 0.008 \)). Whether this is due to contamination or informal communications across wards, nurses working across numerous units, any other factor or initiative in the hospital, or is simply an anomaly is currently being investigated.

The study intervention was entirely controlled and delivered by nurses. Nurses continued to be satisfied with the script-based communication intervention. There was little cost associated with delivery of the intervention. Thus, this study could be replicated in national and international low-resource settings.

### Study Limitations

Findings of this study should be generalized only to similar settings. Despite the changes in the context of the organization and the extension of the intervention to eight units, unmeasured characteristics of an academic health sciences center may have influenced study findings. Our study was not intended to measure actual pain. Future studies should include the actual quality of pain management. Findings should not be generalized to community hospital settings without further testing. In addition, study findings may not be generalizable to some cultural groups with unique perspectives on pain. Self-report was used to collect data from the nurses and limits study findings. Lastly, multicollinearity among variables could exist (e.g., number of admissions and number of discharges, patient days, and LOS), and it may simply be an artifact that, for example, the number of discharges is significant, while the number of admissions seems to not be significant. It may be an artifact that the two are measuring similar metrics (volume).

### Conclusions and Future Directions

Researchers should continue to measure context when evaluating interventions in healthcare organizations. The impact of LOS on perception of pain should be further explored. Use of a comprehensive theoretical framework to consider all relevant study variables should be considered. The framework of contextual factors (Tomoaia-Cotisel et al., 2013) is one such framework. In addition, future studies should evaluate the impact of patient- and family-centered care on the pain experience (Bookout, Staffileno, & Budzinsky, 2016).

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### Clinical Resources

- American Academy of Pain Management: http://www.aapainmanage.org/
- American Society of Pain Management Nursing: http://www.aspmn.org/

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