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Nonpharmacologie interventions for procedural pain

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Nonpharmacologic Interventions for Procedural Pain

by

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THESIS

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Non-pharmacologic interventions for procedural pain-Bonnie Faigeles

Abstract

Background: Many hospitalized adults are incapable of repositioning themselves, so they are regularly turned in order to prevent pressure ulcer formation. Previous research indicates that turning is painful and patients are rarely pre-medicated with analgesia. Potentially, nurses and patients may be utilizing non-pharmacologic techniques to help with this painful procedure. However there is no published research on prevalence of use of non-pharmacologic interventions for any type of procedural pain, including turning.

Objectives:

1) To determine the frequency of use of specific non-pharmacologic interventions

2) To determine factors that predict use of non-pharmacologic interventions for pain associated with turning

Method: Hospitalized adult patients who experienced turning and the nurses caring for them were asked if they used various non-pharmacologic interventions to help manage pain during turning.

Results: Of 1395 patients, 92.5% got at least one non-pharmacologic intervention. Most frequently used were calming voice (65.7%), information (60.6%), deep breathing (37.9%), gentle touch/hand holding (36.6%), pillow splinting (34.0%), humor (25.9%), and distraction (22.9%). Multivariate logistic regression models predicting use of calming voice, information, and deep breathing, showed that critical care patients (OR= 1.66, $p<.01$ for calm voice; OR=1.62, $p<.001$ for information; and OR= 1.36, $p<.05$ for deep breathing) and those reporting higher pain (OR=1.01, $p<.05$ for all 3) were consistently more likely to receive each of the three interventions. Primary diagnosis was a significant

predictor of the use of both information and deep breathing interventions, but not calm voice: surgical patients were more likely to get these two interventions, as compared to medical patients (OR=1.73, p<.001 for information, OR=2.33, p<.001 for deep breathing).

Conclusions: Non-pharmacologic interventions are used frequently, notably much more than pharmacologic ones. The specific interventions used most often are ones that can be initiated spontaneously. These data suggest that nurses may sense patients' pain during turning and respond to increased pain with non-pharmacologic interventions available in that situation, such as calm voice, encouraging deep breathing, and gentle touch. Future randomized controlled trials examining the efficacy of non-pharmacologic interventions for procedural pain might use these results in order to focus study on those interventions commonly used in clinical practice.

Introduction

Hospitalized patients are regularly subjected to potentially painful procedures, such as turning. Yet little is known about the painfulness of common procedures in acute and critical care settings. To investigate this phenomenon, American Association of Critical Care Nurses (AACN) conducted the Thunder II study. Previous reports from this study demonstrated that perceptions of procedural pain were variable by procedure and patient (Puntillo et al, 2001); most patients receive no pharmacologic analgesia prior to or during their procedures (Puntillo et al, 2002); and behavioral responses are strongly predictive of reported pain (Puntillo et al, 2004). The Thunder 2 investigators explored the use of non-pharmacologic techniques that may reduce the pain and distress during procedures since limited data are currently available on the practice of such techniques. The purpose of this report is to: 1) describe the frequency of use of various non-pharmacologic techniques for hospitalized adult patients undergoing the potentially painful procedure of turning and 2) determine factors which predict use of specific non-pharmacologic interventions for pain associated with turning.

There are limited data about turning, but studies consistently indicate increased pain with this procedure (Bahar, Rosen, & Vickers, 1985; Lamb, 1979; Morrison et al., 1998; K. A. Puntillo et al., 2001; Stanik-Hutt, Soeken, Belcher, Fontaine, & Gift, 2001; Young, Siffleet, Nikoletti, & Shaw, 2006). Recently, Young et al (2006) demonstrated that among sedated, unconscious Intensive Care Unit patients, 73% had increased behavioral pain scales (BPS) while undergoing repositioning and the odds of an increase in BPS after turning was 25 times more as compared to the increase in BPS following eye care ($p<.0001$). A previous report from Thunder II data showed that turning was the

most painful procedure studied, with a mean NRS pain during turning of 4.93 (0-10 scale), and only 15% of patients were pre-medicated for the turn (Puntillo et al., 2001). Given this information that turning is painful and rarely pre-medicated with pharmacologic analgesia, turning is an ideal model to study use of non-pharmacologic techniques for procedural pain.

While there have been no studies of the effect of specific non-pharmacologic interventions on pain associated with turning, there have been many that address efficacy of non-pharmacologic interventions for other types of procedural/acute pain. Specific non-pharmacologic methods studied include music (Bally, Campbell, Chesnick, & Tranmer, 2003; Broscious, 1999; Cepeda, Carr, Lau, & Alvarez, 2006; Chan et al., 2006; Kwekkeboom, 2003), providing procedural and sensory information (Lang et al., 2005; K. Puntillo & Ley, 2004), massage (Kubsch, Neveau, & Vandertie, 2001; Okvat, Oz, Ting, & Namerow, 2002; Taylor et al., 2003), healing touch/therapeutic touch (Turner, Clark, Gauthier, & Williams, 1998; Umbreit, 2000), relaxation/deep breathing (Benson, Greenwood, & Klemchuk, 1975; Friesner, Curry, & Moddeman, 2006; Lang et al., 2000), ice (Sauls, 2002), and combined interventions (Kshettry, Carole, Henly, Sendelbach, & Kummer, 2006; Pellino et al., 2005). Results of efficacy are mixed, possibly due to limitations of study designs. Some studies were descriptive or non-randomized (Kubsch, Neveau, & Vanderlie, 2001; Freisner, Curry, & Moddeman, 2006). Some studies were underpowered or did not report power analyses (Broscious, 1999; Puntillo and Ley, 2004; Pellino et al, 2005).

An important question is how frequently are hospitalized patients receiving or using non-pharmacologic interventions to facilitate pain relief. While there are no

published studies specific to turning or even procedures in general, a handful of investigations have focused on use of non-pharmacologic techniques for post-operative pain, which is similar to procedural pain by being acute in nature.

In a multi-hospital study of 212 critically ill trauma and postoperative patients, only 33% of patients had non-pharmacologic pain interventions documented in their medical records (Caroll, et al, 1999). However, this value may be an underestimation of actual interventions received, as nurses may not document them. Furthermore, the use of these methods was not correlated to patients' pain intensity scores. Manias, Bucknall, and Botti (2005) observed 52 nurses working with 316 postoperative patients and found similarly low rates of non-pharmacologic interventions. These investigators studied massage, walking, hot baths, and heat compresses and found about 1% use of each technique for managing postoperative pain. They did not measure patients' pain. Their methodology involved observation of nurse behavior during specified hours of the day, so it is possible some of these behaviors may have been missed. Also, these three interventions are a very narrow definition of non-pharmacologic intervention for pain and walking, one of the interventions studied, may actually increase pain in postoperative patients.

Tracy and colleagues (2006) demonstrated that, by providing pre-operative education about the non-drug methods of massage, music, and self-guided imagery, patients (n=46) increased knowledge and attitudes about and increased utilization of these techniques post-operatively. Mean knowledge scores, pre and post intervention, were compared with paired t-tests ($p<.05$) as were mean attitude scores ($p<.01$). Pre-operatively, patients reported relatively infrequent use of non-pharmacologic measures

for pain relief (39% frequently used music, 9 % frequently used massage, and 2% frequently used therapeutic touch). Post-operatively and post-intervention, on average these patients used music twice daily, guided imagery once daily, and requested a massage almost once daily. There was a significant correlation between prior use of non-drug measures and postoperative use. However, it is not specified what sort of pain the patients used these measures for pre-operatively, so it is difficult to compare pre and post intervention use. All patients were over 50 years of age and 98% were white, limiting generalizability of the results.

The interpretability of these data on the prevalence of use of non-pharmacologic interventions for procedural/acute pain in adults is restricted. Available study results are limited by convenience sampling (Manias, Bucknall, and Botti, 2005; Tracy et al, 2006), a focus on chart review as compared to observing or interviewing (Carroll et al, 1999), a narrow definition of non-pharmacologic measures (Manias, Bucknall, and Botti, 2005), and use of a sample that was given education about non-pharmacologic methods for pain control (Tracy et al, 2006). This study is novel in that it will report the prevalence of various non-pharmacologic interventions for turning and be able to examine patient demographic and clinical characteristics that might predict use of specific non-pharmacologic interventions. Although patients were selected by convenience sampling, the study has a large sample size (n=1395) from multiple sites. Also, the results are from interview data from multiple sources and the list of non-pharmacologic measures was comprehensive, including ones that are completely absent from the literature: hand-holding, humor, calming voice, and presence of family/friends.

Materials and Methods

Participants

A convenience sample of hospitals agreed to participate in this study. As described previously (Puntillo et al, 2001), each hospital had a site coordinator who was a nurse with research experience and/or research support. The protection of human subjects in research was confirmed at individual sites vs. a centralized review process. The study sample was obtained by convenience at the participating institutions. Selected procedures included turning, central venous catheter insertion, wound drain removal, non-burn wound care, tracheal suctioning, and femoral sheath removal. This report will focus on turning. Patients were included in the study if they were experiencing the selected procedure as part of normal care and were determined by their nurse to be a) awake, alert, oriented, and medically stable enough to respond to questions; b) $\geq$ 18 yrs of age; c) able to understand and communicate, either verbally in English or nonverbally; and d) able to hear and see. Patients were excluded from the study if they a) were receiving neuromuscular blocking medications or b) had a disease process or injury that impaired sensory transmission proximal to the procedure site such as a peripheral neuropathy.

Procedures and Measures

Data on pain intensity and quality were collected at baseline (time 1), during procedure (time 2), and 10 minutes post-procedure recovery (time 3). At post-procedure time, subjects were asked about use of non-pharmacologic techniques. Specifically, the patient, nurse, and others present during the procedure were asked what non-

pharmacologic measures, if any, they used during the procedure. Participants were asked to select all that applied from the following list: distraction; progressive relaxation; guided imagery; gentle touch/hand holding; acupressure; massage; presence of family/friends; information; hypnosis; deep breathing; therapeutic touch; calming voice; pillow splinting; unknown; other (please specify).

Pain intensity and procedural distress were measured using separate 0-10 numeric rating scales (NRS), with higher numbers meaning greater pain intensity or greater procedural distress. Construct and criterion validity as well as reliability of NRS have been previously established (Jensen, 2003). Anchor words for the pain intensity NRS were "no pain" (score = 0) and "worst possible pain" (score = 10). Additional procedure related and patient demographic data, including analgesics administered within 1 hour prior to and during the procedure, were obtained from the patient's chart.

Data Analysis

Each non-pharmacologic intervention was aggregated to incorporate affirmative response by patient, nurse, or others present (a negative response indicated that neither the patient, nurse, nor others present endorsed that they used that intervention for the turn). This aggregation was done because conceptually it is irrelevant who recognized the "doing" or "receiving" of the intervention, as well as to avoid multiple counting of the same intervention.

Descriptive statistics were used to present patient demographics as well as frequencies of each non-pharmacologic intervention. Chi square statistics and t-tests were conducted to explore univariate associations between frequency of use of the three

most frequent non-pharmacologic interventions for turning and clinical/demographic patient characteristics. Then, three multivariate logistic regression models were constructed to examine clinical and demographic predictors of the three most frequently used non-pharmacologic interventions for turning.

Results

Sample

This report focuses on the adult patients in the Thunder II study who were turned, a sub-sample of 1395 patients. Table 1 reports demographic and clinical characteristics for this group. The group was predominantly white (86.3%), slightly more male (55.3%), and with a mean age of 63.5 years. The majority (65.9%) of patients were on a critical care unit; 21.9% were on a specialty floor; and 12.2% were in "other" units. Most patients had a primary diagnosis that was surgical (70.4%), 24.2% had medical diagnoses, and 5.4% had trauma, burn, or "other" diagnoses. More patients were turned using a drawsheet (53.6%), than not (43.6% hands, 2.9% other) and most patients (69.4%) assisted with the turn. Very few patients were pre-medicated for the turn with an opioid analgesic (12%).

NRS pain during turning

Mean NRS pain during the turn was 4.9 (SD 3.1) out of a 0 -10 scale, and mean pain intensity significantly varied by all sample characteristics except for ethnicity (Table 2). Specifically, the younger age categories, females, specialty floor patients, surgical, trauma, and burn patients reported higher levels of pain during the turn. Those who were

turned with a drawsheet, those who did not assist with the turn, and those who were pre-medicated reported more pain.

Frequency of non-pharmacologic interventions

Figure 1 reports the frequency of specific non-pharmacologic interventions during turning. Frequently reported interventions (> 25%) included calming voice, information, deep breathing, gentle touch, pillow splinting, and humor. Moderately frequent (2-25%) were massage, presence of family/friends, therapeutic touch, progressive relaxation, ice, and "other". Infrequently used ones (<2%) were music, heat, guided imagery, TENS, acupressure, and hypnosis.

Table 3 presents the total number of all non-pharmacologic interventions used during turning. The vast majority of patients (92.5%) participated in a least one non-pharmacologic intervention, and over a quarter (26.3%) participated in 5 or more.

Predictors of the three most frequently performed non-pharmacologic interventions

The three most frequently performed non-pharmacologic interventions were calming voice, information and deep breathing. Table 4 presents univariate associations between each of these three interventions and demographic and clinical characteristics. T-tests were used to compare continuous variables (mean age and NRS pain score) between those who got a specific intervention and those who did not, while chi-square tests were used to assess the frequency distributions for categorical variables. Significant predictors of receiving calming voice intervention include care level (critical care more likely to receive), turning method (those turned with drawsheet more likely to receive),

and pain intensity during the turn (higher NRS pain more likely). Significant predictors of receiving information similarly included care level, turning method, and pain intensity (same direction as for calming voice), but also included diagnosis (surgical, trauma, burn, other more likely), and patient assistance during turn (those who did not assist more likely). Deep breathing was the only non-pharmacologic intervention to differ by age, with those utilizing deep breathing being younger than those who did not. Other significant predictors of deep breathing included pain intensity (higher NRS pain more likely), care level (critical care more likely), diagnosis (surgical and then trauma burns more likely), and opioid pre-medication (those pre-medicated more likely).

Since all demographic and clinical variables had significant univariate associations with at least one of the three top non-pharmacologic interventions, it was decided to construct three multivariate logistic regression models with all predictors included (Table 5). Neither age nor gender was significantly predictive of any of the three non-pharmacologic interventions examined. However, ethnicity was predictive, with white subjects more likely than subjects of "other" ethnicity to receive calm voice and information. Level of care was consistently a significant predictor for all three non-pharmacologic interventions; specifically, those in critical care were more likely to get the interventions than were those on a specialty floor. Primary diagnosis was significantly predictive of both information and deep breathing interventions, but not calm voice, as surgical patients were more likely to get these two interventions, as compared to medical patients. Pain intensity during the turn was positively correlated with all three interventions, patients reporting higher pain were more likely to receive the interventions.

Discussion

The results of this study provide original and important insights into the practice of non-pharmacologic interventions in the hospital setting, specifically for adult patients who are being turned. Most notably we found a very high level of use of non-pharmacologic interventions, with 93% of patients receiving at least one and over a quarter getting five or more. While there are no published data on frequency of non-pharmacologic interventions for procedural pain, these results contrast to the limited data for acute pain which suggest low utilization of non-pharmacologic techniques (Carroll et al., 1999; Manias, Bucknall, & Botti, 2005). The Thunder II study differed from these previous studies by including a very comprehensive list of non-pharmacologic techniques, which might partially explain this discrepancy. Also, perhaps utilization of non-pharmacologic interventions for procedural pain is much greater than it is for acute pain. One possible hypothesis is that nurse presence in ICUs is required for procedures in general and turning in specific, so patients are more likely to receive an intervention from the nurse or be coached to initiate one, such as deep breathing, during procedures. Another possible explanation is that procedures, especially turning, occur during brief, discrete and relatively predictable blocks of time, which would facilitate an intervention. However, the most likely explanation for use of non-pharmacologic interventions is the lack of pre-medication with pharmacologic analgesia: patients experience pain during the turning procedure so they and their caregivers attempt to control the pain using other methods. Our findings provide important data supportive of increasing the use of

medications during this often painful procedure. Non-pharmacologic methods can be complementary to, not in lieu of, analgesic interventions.

This study also elucidated which non-pharmacologic techniques are commonly used and which ones are rarely used. In general, the most common techniques shared a common denominator of being easy to implement, without requiring equipment or training. In contrast, the methods that require equipment and/or training, such as TENS, music, and guided imagery are infrequently used. These results are not unexpected given the busy nature of acute and critical care settings. It is important to compare these results about the frequency of specific techniques with literature regarding efficacy of specific non-pharmacologic interventions for procedural pain. Overall, the non-pharmacologic interventions previously studied for efficacy do not full correspond to those that this study found to be most frequently used. For example, the largest body of efficacy research for procedural pain is for music (Bally, Campbell, Chesnick, & Tranmer, 2003; Broscious, 1999; Cepeda, Carr, Lau, & Alvarez, 2006; Chan et al., 2006; Kwekkeboom, 2003), yet only 1.9% of our sample used music. Also, calming voice, gentle touch, pillow splinting, and humor, were four out of the six most frequently used interventions, yet there are no published data regarding their efficacy for procedural pain. Our study did not examine the efficacy of these interventions for pain, yet the identification of them and predictors of their use provides foundational information for future studies.

To that effect it is useful to consider the mismatch between clinical practice (frequency of interventions) and the focus of efficacy trials of the non-pharmacologic interventions. It is also important to consider the overlap of clinical practice and efficacy data in order to determine if interventions commonly being

practiced are those with efficacy data to support their use. The interventions that we found to be commonly utilized and that have efficacy data include information and deep breathing.

There have been two studies evaluating the effect of providing information; that is, preparing patients for procedural discomfort with descriptions of sensations they might experience. One recent study examined the relationship between pain intensity and information offered by healthcare providers about the painful sensations they may feel during vascular and renal interventional radiological procedures (Lang et al, 2005). This analysis was a descriptive, retrospective one examining videotapes of 159 patient procedures in order to observe the information offered to patients by health care providers. The investigators found that warning the patient of pain or noxious stimuli resulted in even greater NRS procedural pain intensity. In contrast, Puntillo and Ley (2004) suggest that the addition of sensory information to pharmacologic analgesia does not affect procedural pain. Specifically, they examined the effect of providing procedural and sensory information, in addition to pharmacologic analgesia, on pain intensity and distress during chest tube removal in cardiac surgery patients and found that pain intensity and distress did not differ significantly across time between the information groups. So, while these are only two studies and they do have methodological limitations, they suggest that information may not alleviate procedural pain.

There have been two studies assessing deep breathing as an intervention for procedural pain. Freisner, Curry, and Moddeman (2006) conducted a quasi-experimental pretest/posttest design study to investigate deep breathing exercises and pain management during chest tube removal. Subjects who performed deep breathing exercises (inhaling

through nose and exhaling slowly through pursed lips) and received opioids had a significant decrease in NRS pain when compared with the group who received opioids alone. Lang and colleagues (2000) conducted a randomized controlled trial of self-hypnotic relaxation among patients receiving renal and vascular interventional radiological treatment. A self-hypnosis group was instructed to close their eyes, breath deeply, and concentrate on a sensation of floating. A structured attention group received attentive listening; encouragement; swift response to requests; and use of neutral descriptors (focus on sensation of fullness, numbness, coolness, or warmth when painful stimuli were imminent). A standard care control group was included. The investigators found that NRS pain intensity increased linearly with time during the procedure in the control group and the attention group, but remained constant in the hypnosis group. This study is somewhat limited in applicability as it also included eye closing and concentration on a sensation of floating, so it is impossible to determine the independent contribution of deep breathing. In summary, both of these studies provide evidence that deep breathing may alleviate procedural pain.

Therefore, for the most frequent non-pharmacologic techniques, evidence is mixed regarding their efficacy. There are no data on calming voice, and information may have no effect or a detrimental effect on pain, while deep breathing may alleviate pain. All of these data focus on procedures other than turning, and given the paucity of research, it is unclear which procedures are generalizable to one another. More research, specifically randomized controlled trials, is needed to elucidate the efficacy of different non-pharmacologic techniques, with subsequent development of evidence-based guidelines.

In this study we explored clinical and demographic factors that, when studied in the context of other factors, influenced whether or not a patient got the interventions of calming voice, deep breathing, and information. The logistic regression indicated that, for the most part, demographic factors did not affect non-pharmacologic intervention use, while many clinical factors did. Of the demographic variables, it is interesting that age was not predictive, as it suggests that while age is related to pain, there is no association of age with non-pharmacologic intervention above and beyond that explained by pain or other select demographic/clinical variables. Of the clinical characteristics, a critical care setting and pain intensity during turn were consistently associated with increased likelihood of getting all three non-pharmacologic interventions. Perhaps the critical care finding can be explained by different nurse-patient ratio by setting: a critical care nurse will be caring for fewer patients and thus may be able to allocate more time for the turn, assessing for pain, and intervening. The pain finding suggests that nurses may be aware of a pateint's pain during the turn and respond with non-pharmacologic interventions that are available. Similarly, this finding might suggest that when patients experience procedural pain during a turn, they might initiate an intervention such as deep breathing. Since the responses were collapsed to combine across patient, nurse, and others present, any of these may be initiators.

While this study does present new findings, it does have limitations. One of the biggest ones is that, due to the observational design of the study, we cannot look at efficacy of the various non-pharmacologic interventions. In fact, the results demonstrated that pain was positively associated with intervention, thus a randomized, experimental design is needed to answer this question. Another limitation is that

convenience sampling was utilized, possibly contributing to selection bias and/or limiting generalizability. However, the sample was very large, with multiple units at multiple hospitals. We cannot think of any factor related to sampling that might systematically affect the results However, these factors cannot be measured, thus leaving open the possibility of bias.

While the large sample size based on multiple sites strengthens generalizibilty, it also can lead to overpowering and the finding of significant results that are due to chance. However, some of the key findings were purely descriptive and not influenced by statistical power. For the univariate and logistic regression analyses, we should consider focusing on effect sizes and clinical significance, as well as focusing attention on results that meet a more rigorous p- value, such as <.01 or<.001. Another potential limitation of the sample is that it was not very ethnically diverse: it was predominantly white (86.3%), with a small group of African – American patients (7.1%). This ethnic distribution limits applicability of findings to Asian and Latino patient populations. Future studies should attempt to incorporate sampling techniques to ensure ethnically diverse studies.

Conclusion

In conclusion, we found that non-pharmacologic interventions are used frequently for turning, notably much more than pharmacologic ones. The specific interventions used most often include calming voice, information, and deep breathing, ones that can be initiated spontaneously and without specific equipment or training. These data suggest that nurses may be aware of patients' pain during turning and respond to increased pain with non-pharmacologic interventions available in that situation, such as calm voice,

encouraging deep breathing, and gentle touch. Future randomized controlled trials examining the efficacy of non-pharmacologic interventions for procedural pain might use these results in order to focus study on those interventions most commonly used in clinical practice.

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Table 1. Sample Characteristics- Demographic and Clinical (N=1395)

Gender			
	Male	733	(55.3%)
	Female	592	(44.7%)
Ethnicity			
	White	1204	(86.3%)
	African American	98	(7.1%)
	Other	77	(5.6%)
Age			
	Mean=63.5 years		Range (18-97)
Level of care			
	Critical Care	907	(65.9%)
	Specialty Floor	302	(21.9%)
	Other	167	(12.2%)
Primary diagnosis			
	Medical	332	(24.2%)
	Surgical	965	(70.4%)
	Trauma/Burn/Other	74	(5.4%)
Turning method			
	Hands	518	(43.6%)
	Draw Sheet	637	(53.6%)
	Other	34	(2.9%)
Patient assist with turn			
	Assisted	927	(69.4%)
	Did not assist	409	(30.6%)
Opioid premedication			
	Yes	168	(12.0%)
	No	1227	(88.0%)

Table 2. Mean NRS pain during turning procedure by demographic and clinical characteristics (N=1395)

	Mean NRS pain during turn	
Overall	4.9	
Age		
18-40	6.0	***
41-60	5.5	
61+	4.5	
Gender		
Male	4.7	***
Female	5.2	
Ethnicity		
African American	4.9	
White	4.9	
Other	4.9	
Level of care		
Critical Care	4.7	***
Specialty floor/other	5.4	
Diagnosis		
Medical	3.8	***
Surgical	5.2	
Trauma/burn/other	6.1	
Turn procedure		
Drawsheet	5.2	***
Hands/other	4.7	
Patient assist with turn?		
Assisted	4.8	***
Did not assist	5.3	
Opioid pre-medication		
Pre-medicated	6.4	***
Not pre-medicated	4.7	

*** $p<.001$

Table 3. Frequency of non-pharmacologic interventions during turning, in descending order of frequency (N=1395)

Calming voice	65.7%
Information	60.6%
Deep breathing	37.9%
Gentle touch	36.6%
Pillow splinting	34.0%
Humor	25.9%
Massage	15.4%
Presence of family/friends	13.7%
Therapeutic touch	10.1%
Progressive relaxation	8.1%
Other	4.7%
Ice	2.3%
Music	1.9%
Heat	1.4%
Guided imagery	0.9%
TENS	0.7%
Acupressure	0.2%
Hypnosis	0.0%

Figure 1. Frequency of number of non-pharmacologic interventions (N=1395)

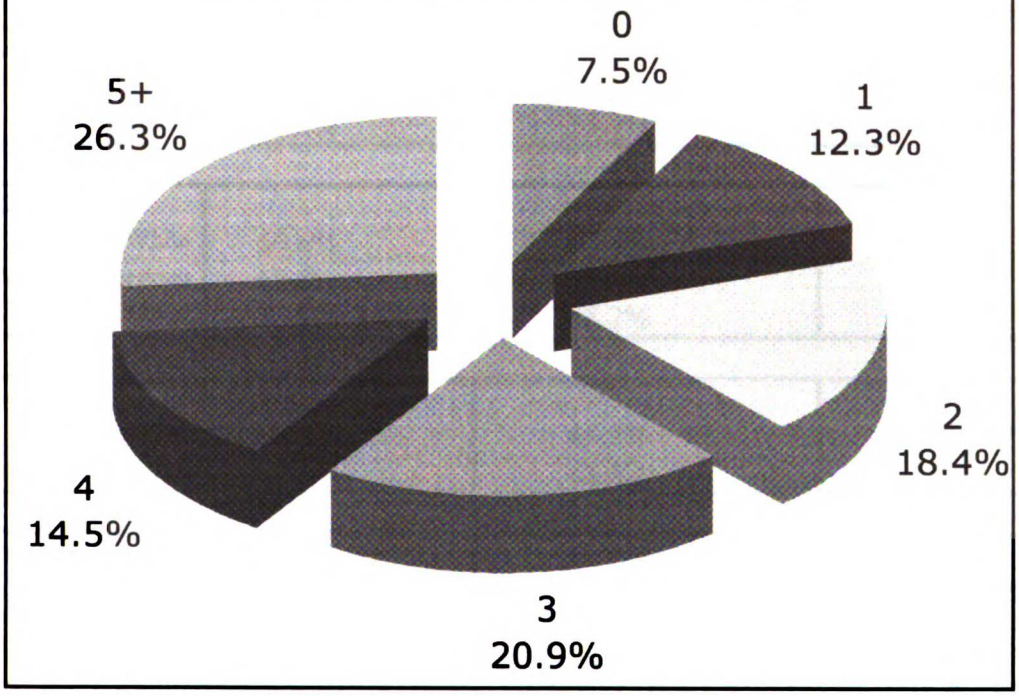


Table 4. Univariate predictors of the three most frequently performed non-pharmacologic interventions during turning

	Calming Voice	Information	Deep Breathing
Gender			
Male	62.9%	63.6% *	39.2%
Female	67.4%	55.7%	35.8%
Ethnicity			
White	66.6%	62.4% *	38.9%
African-American	68.8%	55.3%	30.8%
Other	53.3%	45.2%	38.1%
Care level			
Critical care	68.2% *	65.2% **	40.5% **
Specialty flr/ other	60.6%	51.3%	32.8%
Diagnosis			
Medical	62.5%	47.9% **	18.8% **
Surgical	66.3%	64.3%	44.5%
Trauma/burn/other	76.8%	75.0%	38.7%
Turn method			
Hands	58.5% **	56.7% **	39.0%
Drawsheet	71.2%	66.0%	38.5%
Other	54.8%	35.5%	32.5%
Patient assist			
Assisted	64.5%	57.4% **	37.0%
Did not assist	70.1%	68.0%	41.8%
Opioid premed			
Premedicated	70.7%	67.3%	57.6% **
Not premed	65.0%	59.7%	32.5%

	Calming Voice		Information		Deep Breathing	
	Yes	No	Yes	No	Yes	No
Mean NRS pain (during turn)	5.3	4.4**	5.2	4.6**	5.6	4.6**
Mean age (years)	63.7	63.1	63.6	63.3	61.1	65.0**

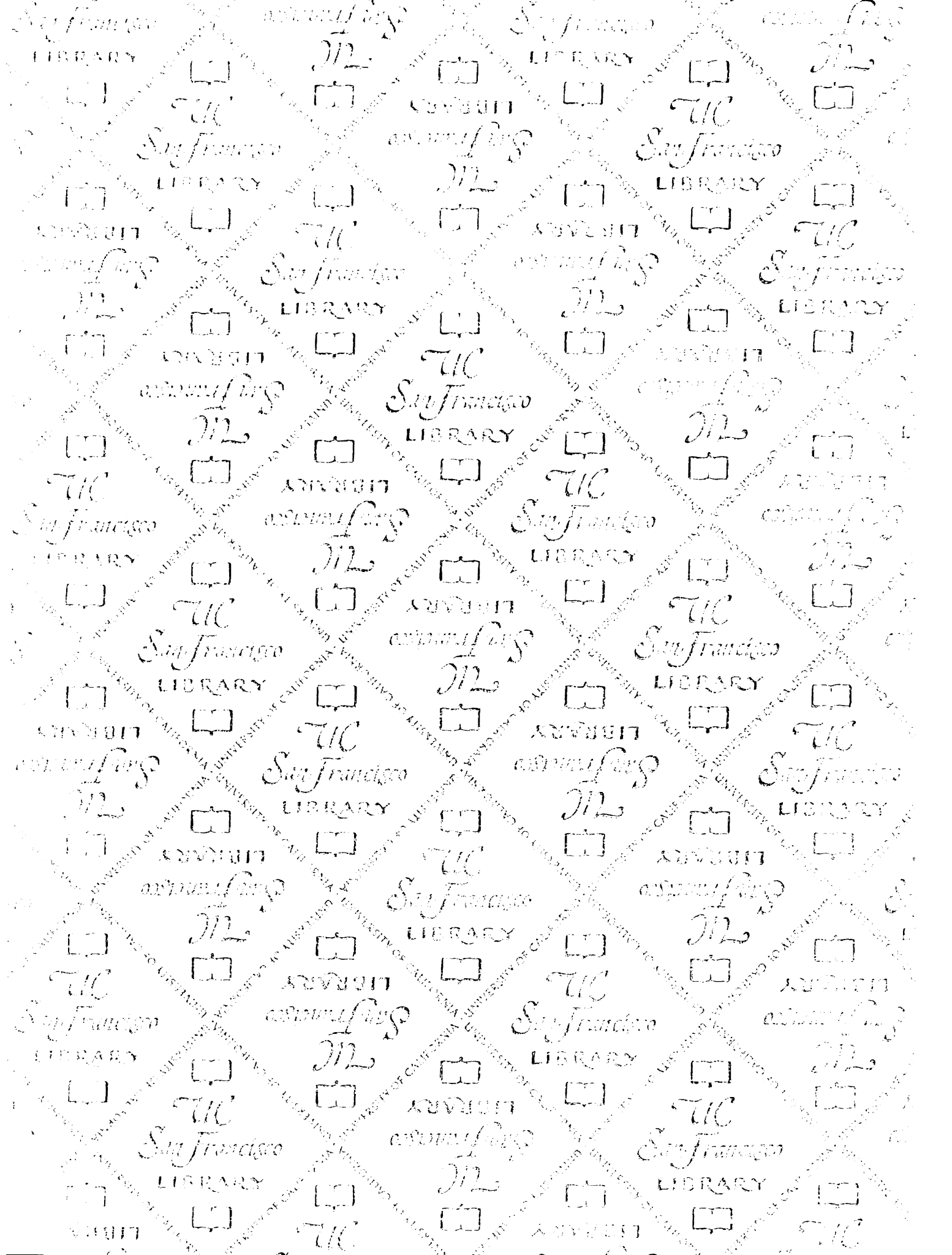
Chi-square tests for categorical variables and t-tests for continuous variables
* $p<.01$, ** $p<.001$

Table 5. Multivariate logistic regression predictors of the three most frequently performed non-pharmacologic interventions during turning (N=1395)

	Calming voice		Information		Deep breathing	
	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Age	1.00	0.99-1.01	1.01	0.99-1.01	0.99	0.98-1.00
Male gender	0.74 *	0.56-0.98	1.23	0.93-1.62	1.01	0.76-1.34
Ethnicity						
African-American	1.68	0.81-3.50	1.27	0.61-2.64	1.21	0.55-2.66
White	1.74 *	1.00-3.02	1.87 *	1.07-3.25	1.43	0.79-2.62
Critical care	1.66 **	1.23-2.23	1.62 ***	1.21-2.16	1.36 *	1.01-1.84
Diagnosis						
Surgical	1.02	0.73-1.42	1.73 ***	1.25-2.38	2.33 ***	1.62-3.34
Trauma/burn/other	1.70	0.82-3.53	4.12 ***	1.97-8.63	1.56	0.78-3.11
Turned with drawsheet	1.63 ***	1.23-2.14	1.53 **	1.17-2.02	0.90	0.68-1.19
Patient assisted with turn	1.01	0.74-1.37	0.86	0.64-1.17	0.85	0.64-1.16
Pain intensity during turn	1.01 ***	1.01-1.02	1.01 *	1.001-1.009	1.01 *	1.001-1.010
Opioid pre-medication	1.05	0.68-1.61	1.11	0.73-1.69	1.58 *	1.06-2.36

* p<.05, ** p<.01, *** p<.001

reference categories:
ethnicity: "other"
level of care/critical care: "specialty floor, other"
diagnosis: "medical"
turning method: "turned with hands/other"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