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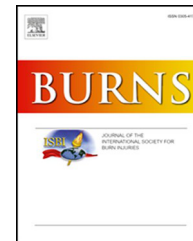
Improvement of burn care by video interaction guidance

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ARTICLE INFO

ABSTRACT

Aims: To evaluate the effect of video interaction guidance on improving the nurse-child relationship during the wound care procedures. Additionally, determine whether the interactional behavior of nurses is related to pain and distress experienced by children.

Methods: The interactional skills of seven nurses receiving video interaction guidance were compared with those of ten other nurses. The nurse-child interactions were video-taped during wound care procedures. Of the nurses receiving video interaction guidance, three wound dressing changes were videotaped before they received video interaction guidance and three after. The interaction between nurse and child was scored with the Nurse-child interaction taxonomy by two experienced raters. The COMFORT-B behavior scale was used to assess pain, and distress. All raters were blinded regarding video interaction guidance allocation and the sequence of tapes

Results: Five nurses in the intervention group (71 %) showed clinically relevant progress on the taxonomy while only four nurses (40 %) showed similar progress in the control group [$p = .10$]. A weak association was found between the nurses' interactions and the children's pain and distress [$r = -.30$, $p = .002$].

Conclusions: This is the first study to show that video interaction guidance can be used as a tool to train nurses to become more effective during patient encounters. Furthermore, nurses' interactional skills are positively associated with a child's pain and distress level.

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1. Introduction

Effective nursing is based on relationships and the ability of nurses to establish a relationship with patients [1–5]. The nurse-patient relationship is one of the three domains that is important when providing basic care [1]. In the fundamentals of care (FOC) framework, Kitson et al [1]. describe five elements that are required to establish a positive nurse-patient relationship: developing trust with the patient, focusing and giving the patient (and their family) undivided attention, anticipating the patient's needs, knowing enough about the patient to act appropriately, and evaluating the quality of the relationship. In daily practice however, it is unclear how nurses construct their daily interactions with their patients [5]. According to the person-centered nursing framework, it is important to treat people as individuals and to build positive relationships [6].

Communication is an essential competency for the professional practice of nurses and physicians [7] and requires a combination of good verbal and non-verbal skills to build a therapeutic relationship [4]. The verbal part is used to provide information and to check whether this information is understood, and the nonverbal part is necessary to engage with each other. In professional education, however, the essential role of nonverbal signals is often overlooked [8]. Behaviour and elements of speech, aside from the words themselves, have meaning. Nonverbal communication includes pitch, speed, tone and volume of voice, gestures and facial expressions, body posture, stance, proximity to the listener, eye movements and contact, and dress and appearance. Attending to these signs has significant effects on patient satisfaction and health outcomes [8]. When nursing very young patients, nonverbal communication skills of nurses are of the utmost importance as these patients have less developed verbal and cognitive skills. It has been suggested that if nurses have better nonverbal skills to interact with children, care will be less distressing and less painful for the children [9].

In burn centers approximately 25% of patients are young children (0–4 years) [10]. At these centres, wound dressings have to be changed frequently, if not daily. These dressing changes are painful and stressful for children with burns [11] and therefore these are also challenging tasks for the nurses. In one of the burn centres, video interaction guidance (VIG) is used to optimize the relationship between nurse and patient. VIG aims to improve and enhance effective communication where it occurs naturally, building on each individual's unique and effective style.

VIG is an intervention which builds positive relationships through filming and feedback sessions. The VIG principles for attuned interaction and guidance were established in the ear in the early 1980 s and originate from Harrie Biermans [12]. Short video-clips of interactions between an adult (in this case a nurse) and a child are recorded. A certificated VIG guider micro-analyses the video-clip and selects the successful interactional moments. Special attention is given to attuned responses of the adult to the initiatives of the child (attuned interaction). These moments are reviewed in a session by the nurse together with the VIG guider. The nurse reflects actively through conversation with the VIG guider on the nature and details of what made those attuned interactions more successful than other interactions. This kind of training is widely used to improve the interactions between parents and their child(ren), for example in Video Home Training [13].

Effects of video-feedback on change in behaviour of professionals have been described [14–16]. However, until now, there is no research showing objective change in interactional behaviour of nurses during medical events or nursing interventions due to VIG.

2. Methods

2.1. Aims

The aims of this study were to evaluate the effectiveness of VIG in improving nurses' skills to interact with their patients, and to examine whether more interaction is associated with less pain and stress non-verbally expressed by patients.

2.2. Design

This study has an experimental design. While delivering standard care, the interactional skills of a group of nurses receiving VIG were compared with the skills of a group of nurses not receiving VIG.

2.3. Ethical considerations

This study was approved by the medical ethics committees in both hospitals (no. 2011–28 and L2015–088). All nurses gave informed consent to participate in this effectiveness study, and to be filmed while delivering standard care. Parents or caregivers of the children gave informed consent to film the encounter with the nurse from the start till they said goodbye. No information on the treated children was gathered for this study. The study is reported in accordance to the TIDieR checklist.

2.4. Participants

Nurses with at least one year of experience and no previous experience with VIG working in our burn centers were eligible to take part in this study. This way we were sure that they had enough experience in performing the technical part of wound care procedures. Nurses were randomly selected from those eligible and then asked if they wanted to participate. Those agreeing to participate were subsequently randomized in two groups: a group receiving VIG ($n = 7$) and a group of nurses not receiving VIG ($n = 10$). Selection of nurses and allocation to the VIG and non-VIG group was randomized by someone not involved in data acquisition and processing using a computer-generated list and computerized coin flipping, respectively.

The sample size was calculated based on data collected to examine the reliability of the NCIT in which a median total score of 70 points on the sixteen NCIT elements was found [17]. An improvement on eight items is expected and more

than five points difference was perceived as clinically relevant. Because the clinical setting enhances the possibility for nurses to exchange experiences and insights gained through the VIG training with -non-trained- colleagues, the trained group had to be small and therefore a liberal alpha of 10% was adopted. By doing so, we were willing to take a 10% instead of 5 % chance of making a type I error. If sample sizes are small, setting alpha = .10 or.15 is found quite reasonable [18]. A higher type I error results in a lower type II error and higher power [18]. As the hypothesis is that VIG will lead to higher scores on the taxonomy, we tested one-sided. For one-sided testing (α = .10 and power.80) in total six nurses in each group were needed. To prevent loss of data due to drop-out an extra nurse was trained. Seven nurses were allocated to receive VIG (of which four in the largest burn center). To ensure that the control group had at least an equal number of nurses, ten nurses were selected to form a robust control group.

Nurses were filmed several times while changing wound dressings of different children with burns. However, they did not know how often they would be filmed before the VIG-training would start. They were asked not to share their experiences and learning benefits with colleagues. In the intervention group, VIG started after three wound dressing changes were filmed, and after two or three VIG sessions, another three films of wound dressing changes were made for this evaluation study. In the control group, nurses received VIG after six films were made and data collection had ended. So, for this study, no intervention was provided in the control group.

2.5. Intervention

To provide video interaction guidance (VIG), a video camera, a video screen, a person filming, a quiet room, and a VIG guider are needed. The person filming can be the VIG guider. For each nurse who participated, three films were made during a patient encounter in which the wound dressings were changed. The VIG guider watched these films in a quiet room with no one nearby. He micro-analyzed the observable interactions, and gave special attention to attuned responses of the nurse to the initiatives of the child (attuned interaction). The successful interactional moments were selected to be shown in a review session with the nurse.

Face-to-face review sessions were planned individually during working hours, in a quiet room with a video screen. In these review sessions, the VIG guider and the nurse watched and discussed the selected moments. The nurse reflected actively on their own behavior on how to build a positive relationship with the child through conversation with the VIG guider on the nature and details of what made those attuned interactions more successful than other interactions. These sessions took approximately one-hour each. In this study, the VIG feedback sessions were provided by a child-life specialist who is certified as VIG guider since 1998, has trained many parents with complicated children, and works as child-life-specialist in one of our burn centers for more than 20 years. No harm was done by making and watching the video-clips.

2.6. Data collection

All seventeen participating nurses were video-taped six times (n = 102 videotapes). These tapes were scored with two instruments: the Nurse-child interaction taxonomy [17] and the COMFORT-Behavior scale [19]. All raters were blinded regarding VIG allocation and the sequence of tapes. The VIG guider started training nurses in one center, and later went to train nurses in the other center. The data collection period was between September 2013 and April 2018.

2.6.1. Observation of nurse-child interaction (NCIT)
The video-tapes were systematically scored using the Nurse-child interaction taxonomy (NCIT; Table 1) [17]. The NCIT was especially developed to score the interaction between nurses and children with burns during wound dressing changes. It contains sixteen observable elements, each scored on a seven-point Likert scale. These elements can be categorized in three patterns of interaction; being considerate, attuning oneself and procedural intervention. Low scores indicate no/little interaction, while higher scores indicate more interaction (in time or frequency). The NCIT was found to be a valid and reliable instrument [17]. Each video-tape was watched by two raters who observed and rated together as suggested by the developers.

2.6.2. COMFORT behavior scale
To assess whether the interactional behavior of nurses during wound care procedures was associated to the intensity of pain and distress experienced by the child, the COMFORT behavior scale (COMFORT-B) was used. The COMFORT-B contains 6 behavioral items: crying, calmness/ agitation, facial tension, physical movement, muscle tone, and alertness. These items are scored on a 5-point Likert-scale. The total score ranges from 6 (no pain) to 30 (severe pain). The version used in this study, see Table 2 [19], is an adapted version of the scale developed by Ambuel et al [20]. and has proven to be reliable and valid for use in the Dutch burn centers [21]. All tapes were scored by two experienced raters, working as nurses in center A. These raters scored independently of the NCIT observers, and were blind for (scores on) the NCIT, VIG allocation, and the sequence of tapes.

2.7. Data analyses

For analyses at an individual level, the mean NCIT total score and pattern scores were calculated for each nurse's first three and last three videos. As some children did not show signs of distress like crying, the item *'Persevere in making contact if the child is in distress / upset'* was not scored and a computational problem occurred. Therefore, in these cases we imputed the missing value with the mean of the other four items in Pattern 2 ("Attuning oneself"). By doing so, we could calculate difference scores for all nurses. The number of persons showing an improved mean NCIT score of more than 5 points (see sample size calculation) was counted, and the difference between groups was tested with Chi-square.

For analyses at group level, we performed multilevel statistics as it is known that working with aggregated data per

| **Table 1 – The nurse-child interaction taxonomy.** | | | |
Pattern	Dimension	Elements	Rating in
Being considerate	Posture	Adopting lower or same height as child	% of total time
		Directing towards the child	% of total time
	Face	Looking at the child	Frequency of looking at the child
	Voice	Tempo of speech is low	% time of speech
		Voice directed to child (high and variable pitch	% time of speech
Attuning oneself	Initiative contact by child	Receiving the child's initiative/ following gaze	% of seen initiatives
		Naming initiative of the child	% naming, without questioning
		Reacting to initiative of child	% of reaction on seen initiatives
	Initiative contact by nurse	Taking initiative on right moment	% of initiative on the right moment
		Persevere in making contact if child is in distress/upset	% of time child was distressed or upset Possibility of inapplicable if child is not distress/upset at all.
		Perceiving child's reactions	% of opportunities for the child to react
Procedural intervention	Verbal preparation	Introducing what they are going to do	% of total time
	Child participates/in control	Letting child participate in decision making	Frequently of offering the child to participate
		Restricting movements as little as possible	% of total time
		Attuning speed to child	% of total time
	In sync with others	Attuning medical procedures to other persons around	% of total time

| **Table 2 – COMFORT-Behaviour scale used in this study (adapted from Ambuel et al. [20]).** | | |
score		
Alertness	• Deep asleep (eyes closed, no response to changes in environment)	1
	• Lightly asleep (eyes mostly closed, occasional responses)	2
	• Drowsy (child closes wyes frequently, less responsive to environment	3
	• Awake and alert (responsive to environment)	4
	• Awake and hyper-alert (exaggerated responses to environmental stimuli	5
Calmness/agitation	• Calm (child appears serene and tranquil)	1
	• Slightly anxious (child shows slight anxiety)	2
	• Anxious (child appears agitated, but remains in control)	3
	• Very anxious (child appears very agitated, just able to control)	4
	• Panicky (severe distress with loss of control)	5
Crying	• No crying sounds	1
	• Occasional sobbing or moaning	2
	• Whining (monotonous sound)	3
	• Crying	4
	• Screaming or shrieking	5
Physical movement	• No movement	1
	• Occasional (three or fewer), slight movements	2
	• Frequent (more than tree), slight movements	3
	• Vigorous movements limited to extremities	4
	• Vigorous movements including torso and head	5
Muscle tone	• Muscles totally relaxed; no muscle tone	1
	• Reduced muscle tone; less resistance than normal	2
	• Normal muscle tone	3
	• Increased muscle tone and flexion of fingers and toes	4
	• Extreme muscle rigidity and flexion of fingers and toes	5
Facial tension	• Facial muscles totally relaxed	1
	• Normal facial tone	2
	• Tension evident in some facial muscles (not sustained)	3
	• Tension evident throughout facial muscles (sustained)	4
	• Facial muscles contorted and grimacing	5
Total		

nurse 'is dangerous at best, and disastrous at worst' [22], but working with disaggregated data would lead to multiplication of the number of units [23]. With multilevel regression analyses, it is possible to account for the nesting structure in the dataset which violates the assumption of independency of data. Furthermore, this kind of analyses makes it possible to differentiate the variance between nurses (level 2, $n = 17$) and measurements within these nurses (level 1, $n = 102$). First, empty models were built without explanatory variables and with the NCIT total and pattern scores as the dependent variables. Then, explanatory variables such as the experimental group (VIG versus non-VIG), first three or last three video clips, and an interaction term of group*last three video clips were added. Furthermore, while watching the video's the raters noticed differences between children whose wound dressing was changed during admission to the hospital and children whose dressing was changed during an out-patient visit. All videos were watched again, and type of encounter (in- or out-patient) was noted and used as explanatory variable. To test whether VIG was effective, alpha was set at .10 (see participants section). For other analyses, to prevent capitalization on chance, alpha was set at .05. Analyses were performed in IBM SPSS version 25 and MlWin 3.0 [24].

2.8. Validity, reliability and rigor

The psychometric properties of the two instruments used in this study have been tested. Van Ingen Schenau-Veldman et al. included validity and reliability testing when they developed the NCIT [17]. They showed that the reliability was good, with all ICCs > .70, and agreement within one point was high (80%). The COMFORT-B version used in this study has proven to be reliable and valid for use in the Dutch burn centers [21]. The COMFORT-B correlated .88 with the POCIS for procedural pain and the inter-rater reliability ICC was .82 for procedural pain.

3.   Results

In this study 17 nurses participated. See Table 3 for their mean age and sex. In total 102 nurse-patient encounters during wound dressings were filmed.

3.1. Individual effect of VIG

In the group allocated to VIG, five out of seven nurses (71 %) improved more than five points on the NCIT. In the control group, four nurses (40%) showed improvement. This difference between groups is statistically significant ($p = 0.10$, one-

tailed). None of the nurses reached the maximum score of 112 points on the NCIT. Fig. 1a and b show the mean pre- and post-VIG NCIT-scores per nurse.

Differences were observed in the setting nurses were filmed in; the amount of in-patient video clips is depicted for each nurse and each group in Fig. 1a and b. This observation could explain improvement observed in two nurses in the control group (nurse 6 and 7; Fig. 1b) whose first three wound dressing changes were all videotaped while treating - in-patients and in their latter videotapes (also) out-patients were treated. Furthermore, no effect of age on the NCIT scores was found, which can be seen as proxy for experience ($r_s = -0.04$, $p = .987$, $n = 17$).

3.2. Group effect of VIG

Large variation existed in nurse-child interactions observed in the video-clips; the range on the NCIT was 36–92 in the VIG group and 36–96 in the non-VIG control group. The multilevel regression model built to explain the NCIT scores revealed that 20% of the variance found in the 102 observed video clips could be accounted for by the fact that one nurse was treating multiple children (empty model: mean=64.2 with variance within nurses=46.8 (SD=6.8); and variance at level of video clips= 179.3 (SD=13.4); − 2logLH= 834.8). This means that aggregated mean scores, which improved for VIG group from 65
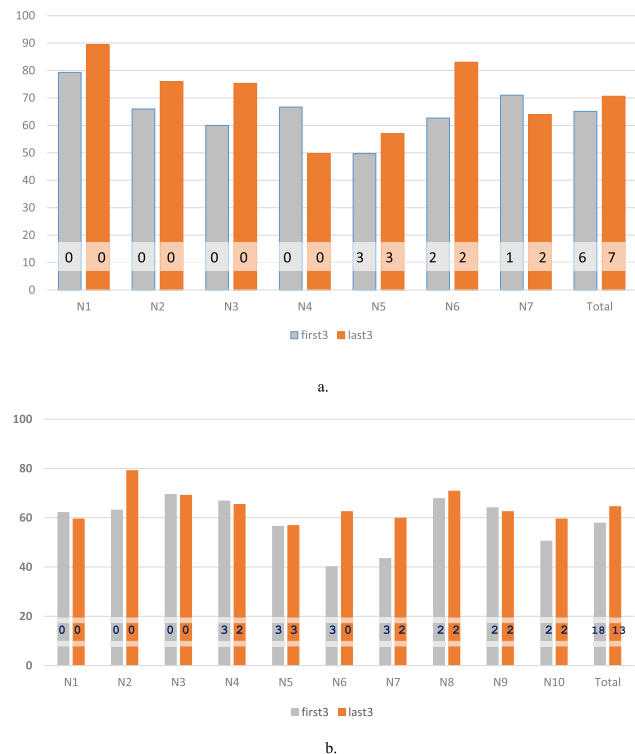
a.

b.

Fig. 1 – a. Mean Nurse Child Interaction Taxonomy score of the first 3 and last 3 video clips per nurse (N1 – N7) selected for Video Interaction Guidance. number in bar = number of video clips in-patient. b. Mean Nurse Child Interaction Taxonomy score of the first 3 and last 3 video clips, nurses (N1 – N10) not selected for Video Interaction Guidance. number in bar = number of video clips in-patient.

Table 3 – Age and sex of nurses participating in this study.

	VIG group	Control group	p-value
Number of nurses	7	10	
Sex (female)	7	8	.62
age (mean; range)	46; 33–53	42; 28–57	.32

(SD=9.2) to 70.6 (SD=14.3) and from 58.5 (SD=10.4) to 64.7 (SD=6.8) for the control group, are not reliable indicators. Moreover, existing differences between groups during the first three video clips are due to chance as the nurses were randomly allocated, but need to be adjusted for type of encounter (see Fig. 1a and b).

While accounting for the nested structure, and controlling for the type of encounter in which the video clips were made, a significant interaction effect was found, showing that nurses who were allocated to VIG scored significantly higher on the NCIT during the last three videotapes than those in the non-VIG group (interactional effect B=6.93, SE=3.66, $t = 1.89$; $p = .03$ one-tailed). In addition, significantly higher NCIT scores were reached when out-patients were treated (B=11.2, SE=3.06, $t = 3.66$; $p < .001$). Thus, at group level, nurses who were allocated to VIG, scored significantly higher on the NCIT after training when controlling for circumstances. The effect size of VIG was more than 5 points (6.93), and wound dressing changes during admission showed significant less nurse-child interactions. Compared to the empty model, the remaining variance at nurse level was 26.5, and at the level of video clips 158.9 (−2 LogLH=818.2; thus model improvement (deviance score) was 16.6, $p < .05$). Analyses of only the video-clips made during in-patient encounters, also showed the effectiveness of VIG ($n = 10$ nurses and $n = 44$ clips; 15% of total variance was found between nurses; interactional effect of VIG B=12.87, SE=5.3, $t = 2.43$; $p = .008$ one-tailed). The effect of VIG on the NCIT total score was especially due to the items in pattern 1 and pattern 2 of the taxonomy (Table 4). Noteworthy, significantly more interaction with the child during out-patient treatments was not only reflected in higher NCIT total scores but on all three patterns of the NCIT as well (Table 4).

3.3. Association between interaction and pain/distress

An important assumption underlying this study is that a better interaction is related to less pain, and distress in the patient. The correlation found between the NCIT total score and the COMFORT-B is moderate but statistically significant ($r = −.30$; $p = .002$; $n = 102$; R-square=9 %). In Fig. 2, the association between the NCIT score and COMFORT-B is shown. It indicates that better interaction between nurse and child relates to a more comfortable, less pain and distressing, behavior expressed by the child. Within video clips with in-patient encounters, however, no correlation was found ($r = −0.006$, $p = .97$, $n = 44$). While for out-patient encounters,

the correlation with the NCIT was moderate ($r = −0.37$; $p = .005$; $n = 58$).

In the children treated as out-patient, the COMFORT-B was lower (mean scores 17.9, SD 3.3, $n = 58$) compared to admitted patients (mean scores 18.8, SD 1.7, $n = 44$), indicating that children experienced less distress, higher well-being during out-patient treatments ($p = .07$).

4. Discussion

The aim of this study was to evaluate the effect of VIG on the interaction between nurse and child during wound care procedures and to assess whether the interactional behavior of nurses is related to the pain and distress experienced by the child. The results showed significantly improved interaction between nurse-child after VIG intervention, with higher scores on the taxonomy. Furthermore, higher scores on the taxonomy were associated with less pain and distress of the child.

In other studies also positive effects of video-feedback have been described [14–16]. However, so far, there was no research showing objective change in interactional behavior of nurses during medical or nursing interventions due to VIG. This study showed that VIG is a method to support and train nurses to establish a good relationship with children even during painful interventions. It underlines the importance for nurses to establish a positive relationship as it can help in reducing pain and stress of children during nursing interventions.

This study also provides more insight in the best way for nurses to interact with children during nursing interventions. It was found that pattern 1. "Being considerate" of the NCIT improved after VIG. The nurses more frequently adopted the same height as the child, looked more often at the child and spoke with the child more than before. Also on pattern 2 "Attuning oneself" significant improvement was observed. When treating the child, the nurses took more initiative making contact with the child, but also were more sensitive in receiving the child's initiatives (for example: following gaze). Even in very sick children, who might show less initiatives in making contact with the nurse, the nurse is trained to being susceptible to every initiative. So, even if a child only tries to make contact once, the nurses could score high on the NCIT (100% of seen initiatives). During this study we saw that the scores on the taxonomy were significantly different for in-patient and out-patient treatments. Higher

NCIT	Intercept	Interaction effect Group*VIG		Additional effect of circumstance (Out-patient)	
		B (SE)	*p*-value	B (SE)	*p*-value
NCIT Total score	56.4	6.93 (3.66)	.03*	11.2 (3.1)	< .001*
Pattern 1. *Being considerate*	21.7	2.69 (1.16)	.01*	2.12 (1.03)	.02*
Pattern 2. *Attuning oneself*	15.0	3.69 (1.74)	.017*	6.11 (1.53)	< .001*
Pattern 3. *Procedural intervention*	19.7	0.16 (1.05)	.44	3.10 (0.9)	< .001*

Table 4 – Results of multilevel analyses with NCIT scores as dependent variable.

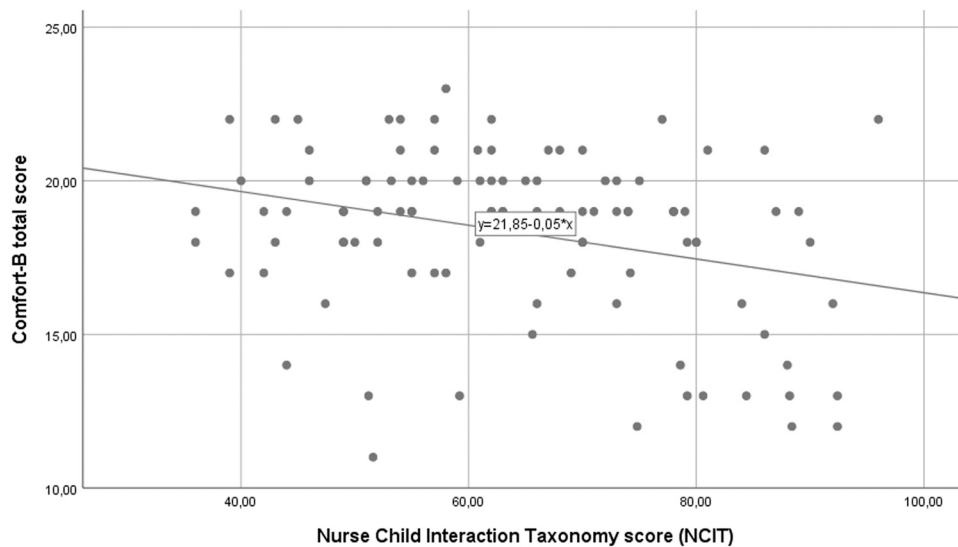* significant with alpha 10 % (see sample size calculation)

Fig. 2 – Scatterplot of Comfort-B and Nurse Child Interaction Taxonomy score (*n* = 102).

scores on the taxonomy were found for out-patient treatments. This might have influenced the difference scores of individual nurses. In the control group some might have benefitted, while in the VIG group one nurse might have been disadvantaged. The reason for lower nurse-child interaction with in-patients might be that out-patient wound dressing changes were typically done by one nurse, whereas more health care professionals were present during wound care procedures in the clinical setting. For this study, we only observed one nurse and we saw less interaction with the child during the procedures in the clinical setting. The professionals sometimes had interaction between themselves, resulting in less contact with the child. So, with more professionals attending, there is more chance for less effective nursing. Also, while observing the video clips we heard that some of the in-patients were given sedatives, which might have affected the interaction negatively. Noteworthy is that none of the in-patients were ventilated. Furthermore, in this study, all out-patients were awake and alert.

Reflecting on this study, we noticed that at first some nurses were reluctant to be trained with VIG, however after starting VIG they became very enthusiastic. They even presented a poster about their positive experience at an European burn congress. Another positive spinoff was that during this study in the center without a certified VIG-guider, a nurse and a child life specialist were trained to become guiders. So VIG is now being used in both centers. It is not only important in the care of children but also in people with less verbal/ mental capacities.

The study does have several limitations. First of all, we used small groups. Power analyses before the study indicated that such a small number would suffice. Even with these small groups, it was possible to find a significant improvement in the interaction skills of the nurses. In our setting we were not able to include more nurses. We experienced that although nurses were asked not to share their learning benefits, they do work together (especially when nursing patients admitted to the hospital) and see and learn from each other every day. Nevertheless, other studies that reproduce our findings are recommended. Second a bias was present in the control group. Two nurses in the control group were found to have significant higher scores on the NCIT in the last three recordings. Their first three recordings were clinical wound care procedures and their last were almost all outpatients. This made comparison before and after VIG difficult. Nevertheless, analyses with and without these data showed significant improvement of VIG. It would be good to take the circumstances into account in future studies. For example, the total body surface area burned, use of sedatives, and number of nurses present in the room could be explaining lower nurse-child interaction in an in-patient setting.

5. Conclusion

This study underlines the importance of building positive relations with patients. An association was found between the nurse-child interaction (NCIT) and pain and distress behavior (COMFORT-B). Establishing a positive relation with patients has a central place in the fundamentals of care [1] as well as in person-centered care framework [8], and this study shows that VIG can be used as a tool to train nurses to become more effective during patient encounters. In center A VIG is now an accredited training for nurses. Although effects were proven of VIG in burn centers during wound care with children, we recommend VIG for all nurses (in other settings as well) to empower themselves and to improve their fundamentals of care.

Funding sources

Conflicts of Interest

None.

Appendix A.   Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.burns.2023.02.005.

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