

# Assessing Quality of Nursing Care as a Confounding Variable in an Outcome Study on Neurodevelopmental Treatment

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When planning a study measuring the effects of a neurodevelopmental treatment (NDT), we were confronted with the methodological problem that while measuring the effects of NDT, a rival hypothesis is that the decision to implement the NDT might be related to the quality of nursing care. Therefore, we measured the quality of nursing care as a possible confounding variable in relation to this outcome study. The quality of nursing care was measured on 12 wards participating in the experimental and control groups of the outcome study. Data were collected from 125 patients and 71 nurses and patients' records. The findings showed no significant differences in the quality of nursing care between the 2 groups of wards ( $P = .49$ ). This method may be useful to other researchers conducting outcome research and who are confronted with a similar methodological problem. **Key words:** *instruments, nursing quality, reliability, validity*

**N**EURODEVELOPMENTAL TREATMENT (NDT) is widely used in the daily care of stroke patients<sup>1</sup> despite the lack of evidence provided for the beneficial effect of this therapy.<sup>2,3</sup> NDT nursing requires considerable investment in postgraduate education. With today's focus on cost containment and evidence-based practice, there is an increased need to measure the effects of nursing in-

terventions on patient outcomes. Therefore, in a previous, nonrandomized study, we compared the outcome of stroke patients receiving NDT nursing with the outcome of patients not receiving NDT nursing.<sup>4,5</sup> In this outcome study, it was not possible to allocate patients to the 2 treatment groups by randomization because of the nature of NDT nursing. NDT nursing is implemented on a ward level. Nurses have to learn and be competent in the application of various NDT techniques to position stroke patients when assisting them with mobility and activities of daily living. When nurses conduct their daily nursing care according to the NDT protocols, it becomes a set of integrated skills. In light of this, 12 neurological wards were selected, 6 wards using NDT nursing and 6 wards *not* using this therapy, in various geographic regions in the Netherlands to participate in an outcome study measuring the effects of NDT on the functional status and health-related quality of life of patients with stroke. Details of the study design are described elsewhere.<sup>4</sup>

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In this study, however, we needed to control for quality of nursing care as a confounding variable because while measuring the effects of NDT nursing, a rival hypothesis is that the decision to implement the NDT nursing might be related to the quality of nursing care given to the wards. As the implementation of NDT therapy requires considerable investment in educational courses, it is possible that wards that have decided to implement NDT nursing are more innovative and up-to-date in their daily nursing practice, which might lead to better quality of nursing care. The differences between the experimental group and the control group in the outcome study might then be due to the quality of nursing care on the wards and not to the effectiveness of NDT nursing. Therefore, the general quality of nursing care was measured to determine whether it was a rival explanation in the outcome study on the effects of the NDT therapy.

Three approaches to measure the quality of nursing care have been identified in the literature focusing on *the structure* or the setting describing the physical, organizational, and other characteristics of the system that provides care, and of its environment; *the process* describing what is done in caring for patients; and *the outcome* as what is achieved, an improvement usually not only in health but also in attitudes, knowledge, and behavior.<sup>6,7</sup> In this study, we focused on measuring quality of nursing care as a process variable. The aim of this study was to measure the quality of nursing care on the 12 neurological wards participating in an outcome study measuring the effects of the NDT approach.

## METHODS

### Instrument for measuring quality of nursing care

After carefully evaluating the literature on the existing quality of nursing care instruments in the Netherlands, we identified only 2 Dutch instruments. These were the Radboud-instrument<sup>8</sup> and the quality of nursing care instrument for paralyzed patients.<sup>9</sup> These in-

struments were found to be relevant to the situation and the client population as well as valid and reliable, but they were too long and time consuming. Therefore, it was decided to combine and adapt these instruments to the aim of this study. The Radboud-instrument contains 155 items, which are divided into 3 categories: *Nursing Instrumental and Technical Interventions*, *Patient's Guidance*, and *Coordination of Nursing Care*. This is in accordance with the nursing model underlying the instrument.<sup>10</sup> Within each category, there are 4 to 9 subcategories. The instrument has been tested for validity and reliability on neurological wards.<sup>8</sup> The quality of nursing care instrument for paralyzed patients by de Heide and van de Mortel contains 85 items. It includes 10 dimensions: impairment in mobility, sensory impairments, impairment in elimination, complications in relation to motor impairment, problems with relationships, impairments in relation to physical problems, coping problems, social problems, home-community care, and transferal to other facilities. It has also been tested for validity and reliability.<sup>9</sup> Both instruments assess quality from a process perspective and have 3 sources of data: the patient as the receiver of care, the nurse providing the care, and the nursing records.

### Phase 1: Elimination of items

The instrument by de Heide and van de Mortel included items that would be influenced by NDT nursing.<sup>9</sup> As the aim of this study was to compare the *general* quality of nursing care between the 2 groups of wards, items relevant for NDT nursing were eliminated. A panel of 4 expert nurses, specialized in NDT nursing, evaluated the instrument by answering the question: "Would a nurse, having followed a NDT course, score different for this item *before* attending the NDT course from *after* attending it?" If 3 or 4 members of the panel agreed on an item being affected by an NDT course, that item was eliminated from the instrument. A total of 39 items were eliminated, leaving the instrument with 46 items. The Radboud instrument (155 items) was

reviewed by the first author, who eliminated 20 items not relevant to nursing care of the neurological patient, leaving 135 items.<sup>8</sup>

### Phase 2: Content validation

Because the combined instrument (181 items) was still too extensive and time consuming for the purpose of the study, it was decided to shorten it further, maintaining the original structure and preserving items from all categories and subcategories. A consensus judgment on the content validity of the instrument was obtained from experts in the field as recommended by Lynn.<sup>11</sup> A panel of 7 expert nurses specialized in the nursing care of stroke patients separately evaluated the relevance of the items of the combined instrument for stroke patients by asking the question: "Is this item relevant in the nursing care of the hemiplegic stroke patient?" The 78 items that received a positive score from all experts were included in the instrument.

### Phase 3: Selection of items based on interrater reliability

The newly composed 78-item instrument still needed to be shortened. Items containing the subitems that showed the highest interrater reliability were included in the instrument. The interrater reliability of the items was measured with Cohen's kappa ( $\kappa$ ) by comparing the scores of 2 interviewers when interviewing 12 cases, a case meaning each patient and the nurse caring for him or her on the day of the study. The first author and a research assistant simultaneously but independently rated the 78 items. A kappa higher than 0.75 was taken to represent "excellent agreement beyond chance."<sup>12</sup> On the basis of this reliability test, a total of 25 items (49 subitems) were included in the instrument.

To further test the interrater reliability of the 25 items instrument, 12 more cases were evaluated. The data were analyzed together with the 12 earlier cases ( $n = 24$  cases). The agreement in the scoring between the 2 interviewers was again calculated with Cohen's kappa, but this time for each item. Excellent agreement was found between the 2 inter-

viewers as 19 of the 25 items had  $\kappa = 1$ . Also, Spearman's rho rank correlation coefficient ( $\rho_s$ ) showed excellent correlations between the interviewers.

### The new instrument

The newly developed 25-item instrument is divided into the 3 categories: *Nursing Instrumental Technical Interventions*, *Patient's Guidance*, and *Coordination of Care*. The instrument has the same structure and contains questions from all categories of the original instruments. For each question, it is possible to give a score of "0" (*not sufficiently conducted*); "1" (*sufficiently conducted*); or "2" (*well conducted*).<sup>8,9</sup> In this study, the quality of care is calculated on a ward level and for each group of wards, not on a patient level. The maximum score per item is 2. The following formula is used: (total score reached)/(total possible scores)  $\times$  100. The questions focus on 3 dimensions of care: the patient as a receiver of care, the nurse as a provider of care, and the nursing administration. The scoring of the items was kept identical to the original instruments (Table 1).

### Interrater reliability

Prior to the data collection in each hospital, the interrater reliability among the 3 researchers was measured. For this, a patient and the nurse to whom he or she was assigned (later to be referred to as a case) were interviewed. First, 1 researcher stated the questions, and all 3 scored the answers on the scoring form. Then, they compared the 3 scoring forms to evaluate the agreement and, if there were differences, discussed them and decided on the correct score. The interrater reliability was measured with 1 case on each ward, using Cohen's kappa ( $\kappa$ ), calculated for each item, and for each subcategory. Kappa showed excellent agreement for 20 items ( $\kappa = 1$ ), and for 5 items the value of  $\kappa$  was somewhat lower but sufficient ( $\kappa = 0.69-0.89$ ). There was an excellent agreement among the 3 researchers for each of the categories, that is, for category 1, *Nursing Instrumental Technical Interventions*, the value of  $\kappa$  was 0.86; for category 2,

**Table 1.** The quality of nursing care instrument

<b>The quality of nursing care instrument</b>	
Category 1. Nursing instrumental technical interventions	
1.1	<i>Attention for physical well-being</i> The nurse observes the patient's impairments in activities of daily living and mobility resulting from the paralysis and reports these. The nurse discusses the patient's impairments in activities of daily living & mobility in the multidisciplinary team, makes a report and a nursing care plan accordingly. The nurse gives the patient sufficient opportunity to rest and sleep without disturbance.
1.2	<i>Attention for physical hygiene</i> The nurse assists the patient with washing as needed and as prescribed. The nurse assists the patient with cleaning of mouth after meals and before sleeping if the patient is not able to do so.
1.3	<i>Caring for the patient's skin</i> If the patient has signs of a pressure wound(s), is there a general rule or prescription on the ward on how to take care of the wound and does the nurse follow the rule or prescription?
1.4	<i>Attention for nutrition</i> Does the nurse provide the patient assistance with eating, if needed?
1.5	<i>Attention for elimination</i> Does the nurse give the patient information on the changes in the function of the bladder due to the paralysis and refer him or her to the specialist?
1.6	<i>Attention for sufficient activity</i> If the patient is confined to bed, does the nurse assist him or her out of bed as prescribed or as often as needed? Does the nurse take care that the patient does not become isolated on the ward?
1.7	<i>Attention for sufficient oxygen</i> If the patient is confined to bed, does the nurse take care that the patient is in a position that does not obstruct the breathing?
1.8	<i>Protection from complications</i> If the patient is confined to bed, does the nurse take care that the patient is correctly positioned to prevent from developing muscular contractures or atrophy?
1.9	<i>Protection from accidents</i> Does the nurse take care that the necessary things are within the patient's reach? Does the nurse discuss the possible risks of falling (out of bed/transfers) and does she or he report these?
Category 2. Patient's guidance	
2.1	<i>Personal approach for the patient</i> Does the nurse provide the patient with the possibility of conducting a confidential conversation?
2.2	<i>Trusting relationship</i> Does the nurse give the patient enough time/patience for personal contact with him or her? Does the nurse inform the patient about interventions conducted and make sure that the patient understands this information.
2.3	<i>Stimulating the patient to self-care</i> Does the nurse stimulate the patient to conduct his or her self-care activities and take responsibility for his or her own self-care?
2.4	<i>Involving the patient in his own care</i> When speaking to the patient, the nurse uses words that the patient understands. If the physician provides information to the patient on test results and medical treatment, then the nurse informs if the patient understands this information and if not provides him or her with explanations and/or takes the necessary measures. If the patient wishes the nurse to speak with the family, then the nurse will do so.
Category 3. Coordination of nursing care	
3.1	<i>Nursing documentation</i> If the patient has a specific nursing problem, then the nurse will make a nursing care plan.
3.2	<i>Nursing report</i> The nurse reports on the patient's situation after each shift (nursing care plan) and signs his or her name on the report.
3.3	<i>Transferal report</i> If there are other disciplines taking part in the patient's treatment, do they all meet at least once a week to discuss the planning of the patient's treatment?
3.4	<i>Discharge planning</i> Does the nurse report in the nursing care plan which activities are to be conducted before the discharge of the patient?

*Patient's Guidance*, the value of  $\kappa$  was 0.92; and for category 3, *Coordination of Care*, the value of  $\kappa$  was 1. Spearman's rho rank correlation coefficient ( $\rho_s$ ) was also calculated.<sup>13</sup> For categories 2 and 3, the value of  $\rho_s$  was 1, showing perfect correlation among the researchers. For category 1, the value of  $\rho_s$  was between 0.98 and 1.00.

### Sample

Twelve neurological wards from both university ( $n = 3$ ) and general hospitals ( $n = 9$ ) took part in the study.<sup>4,13</sup> To 6 of the wards, the nurses applied the NDT therapy and to other 6, they did not. Of the hospitals, 10 wards were categorized as large and 2 as intermediate sized. The mean number of hospital beds in the NDT group was 776 (604–942) whereas in the non-NDT group, it was 562 (301–852). The mean number of beds on the NDT wards was 42 (28–50) and 28 (16–34) on the non-NDT wards. Of the 12 wards, 7 were stroke units.

A convenience sampling method was used.<sup>13</sup> On each ward, patients included in the study were medically stable, able to communicate and comprehend the Dutch language, physically and mentally able to cooperate with the research procedures, and admitted to the ward for at least 2 days. All patients who were in the ward on the day of study and who fulfilled the inclusion criteria were approached for participation. Therefore, the sample size per ward varied ( $n = 7$ –15).

### Statistical analysis

As the unit of analysis was the ward, data were aggregated at the ward level. Means and medians were calculated for the total instrument, for each category and subcategory per ward, and for each group of wards, namely, the NDT ward and non-NDT ward. The ward's score was the average of the score of the participants of that ward. The Mann-Whitney *U* test was used to calculate differences between the groups in the quality of nursing care. Because the NDT is a rehabilitation approach developed for stroke patients, the anal-

yses were repeated for the subgroup of stroke patients.

### RESULTS

A total of 125 neurological patients were included on the NDT wards ( $n = 67$ ) and the non-NDT wards ( $n = 58$ ). Of these, 52% were women ( $n = 65$ ). Half were diagnosed with stroke ( $n = 62$ ) and the other half had other neurological disorders ( $n = 63$ ). In the NDT group, 54% ( $n = 36$ ) were diagnosed with stroke versus 45% ( $n = 26$ ) in the non-NDT group. The mean length of hospital stay was 33 days. The nurses ( $n = 71$ ) who took care of the included patients on the day of the study were interviewed. Of these, 56 were female.

The mean total quality of nursing care score for the group of wards applying the NDT nursing was 1.45 as compared with a total mean of 1.41 scored by the group of wards without the NDT nursing with no significant differences between the groups ( $P = .486$ ). For category 1, *Nursing Instrumental Technical Interventions*, the NDT group scored slightly higher (1.45) than the non-NDT group (1.28) ( $P = .134$ ). With regard to the category 2, *Patient's Guidance*, the means are virtually the same (1.69 vs 1.68, respectively) ( $P = .937$ ). For the category 3, *Coordination of Nursing Care*, the non-NDT wards scored slightly higher (1.28) than the NDT wards (1.08), with no significant differences ( $P = .240$ ). The findings for the stroke group were similar to those of the whole group, except for this subgroup, the differences were significant ( $P = .04$ ) (Table 2).

### DISCUSSION

The means for quality of nursing care showed no significant differences between neurological wards where nurses use NDT nursing when caring for patients in comparison with the wards where they do not use NDT nursing. The findings suggested that neurological wards with NDT nursing do not provide better quality of nursing care than neurological wards not using NDT therapy.

**Table 2.** Mean score per hospital for all patients and stroke patients

Wards	Category 1 Instrumental technical interventions	Category 2 Patient's guidance	Category 3 Coordination of nursing care	Total score
All patients ( <i>n</i> = 125)				
NDT wards	1.45	1.69	1.08	1.45
Non-NDT wards	1.28	1.68	1.28	1.41
Mann-Whitney ( <i>P</i> value)	.134	.937	.240	.486
<i>Total score</i>	1.36	1.69	1.18	1.43
Stroke patients ( <i>n</i> = 65)				
NDT wards	1.49	1.59	1.18	1.47
Non-NDT wards	1.32	1.69	1.28	1.43
Mann-Whitney ( <i>P</i> value)	.066	.486	.372	.039
<i>Total score</i>	1.41	1.64	1.23	1.45

Therefore, the study indicates that the quality of nursing care is not to be considered a confounding variable in our study measuring the effects of NDT nursing.

The subgroup analysis for the stroke patients (*n* = 62), however, showed somewhat different findings than for the whole group, as the Mann-Whitney *U* test showed significant differences between the 2 groups for the whole instrument (*P* = .039). This could be attributed to differences in category 1, *Nursing Instrumental and Technical Interventions*. In subcategory 1.1, Attention for physical well-being, the focus is on the physical impairment and discussing problems related to those impairments in the multidisciplinary team. The NDT therapy is a rehabilitation approach focusing on physical aspects of care where nurses assist patients in regaining balanced bilateral position, and nurses using this therapy are supposed to play an active role in rehabilitation and assisting patients in these aspects of care. Therefore, one may assume that within the wards where NDT nursing has been implemented, the nurses pay more attention to the patient's impairments and positioning of the patient. The higher scores in NDT wards in stroke patients, in aspects of care not directly related to the NDT therapy, may be the consequence of the close atten-

tion of nurses to these patients. The findings of the main outcome study, measuring the effects of NDT therapy, did not show this better care in combination with the NDT therapy to be translated in improved patient outcomes; the patients in the NDT group did not show better functional status, less depression, and better quality of life than patients in the non-NDT group.<sup>4</sup>

Randomized controlled trials are considered to be one of the best research designs for determining effective care in the clinical setting.<sup>14</sup> Relatively few randomized controlled trials, however, have been carried out in nursing practice. This may be because it is often not possible to randomize patients between treatment groups. This is a common problem in nursing. The reasons for this may be the fact that nursing interventions, such as the NDT nursing, are complex interventions and also because of how nursing and patient care is organized within nursing wards in hospitals and other healthcare facilities.<sup>15</sup> In many research situations, the quality of nursing care may be a confounding factor that needs to be controlled for. The method used in this study may be of use to other nursing researchers who are confronted with the problem of not being able to randomize patients into treatment groups.

It should be kept in mind that the study evaluated quality of care with respect to those aspects that are not directly affected by the implementation of the NDT therapy. The questionnaire does not contain items that are directly affected by NDT therapy. The study therefore provides no evidence for the hypothesis that the hospitals that do not implement NDT nursing are hospitals that deliver care of inferior quality.

## CONCLUSION

In this study, we measured the quality of nursing care as a possible confounding factor in relation to a large outcome study. Confronted with the methodological problem that when measuring the effects of NDT nursing, a rival hypothesis was that the decision to

implement the NDT approach into nursing might be related to the quality of nursing care conducted on the wards. The difference between the experimental group and the control group in the outcome study might then be due to better quality of nursing care on the wards and not due to the effectiveness of the NDT therapy. Therefore, the quality of nursing care was measured; there was no difference between the 2 treatment groups, indicating that the quality of nursing care was not a confounding factor in the larger outcome study. Indeed, this study was specific to the situation, that is, for the outcome study of the effects of the NDT therapy on neurological and stroke patients. However, this approach may be considered useful for other patient groups and for the study of other interventions.

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