The effect of a tailored multifaceted implementation strategy of nutritional guidelines for stroke patients

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Samenvatting

Doel. Inzicht verkrijgen over het effect van een meervoudige implementatie strategie, bij de invoering van evidence based voedingsrichtlijnen, op de houding en competenties van verpleegkundigen en patiënten uitkomsten.

Aanleiding. De prevalentie van ondervoeding bij patiënten met een beroerte is hoog. Studies hebben aangetoond dat deze prevalentie zelfs stijgt gedurende de eerste week van opname in het ziekenhuis. Onlangs zijn de Verpleegkundige revalidatie richtlijnen voor patiënten met een beroerte gepubliceerd, waarin een systematisch en objectief overzicht wordt gegeven van de verpleegkundige interventies voor patiënten met een beroerte. De beschikbare kennis blijkt zelden aangewend in de praktijk. Een meervoudige implementatie strategie, gericht op ondersteunende en belemmerende factoren, is volgens de literatuur de meest effectieve strategie voor het implementeren van verpleegkundige richtlijnen.

Methode. Een quasi-experimentele studie in een topklinisch Nederlands ziekenhuis op een verpleegafdeling Neurologie.

Resultaten. Voor de invoering, van de voedingsrichtlijnen, is gekozen voor de evolutie strategie. Na invoering van de richtlijnen toonden de verpleegkundigen een positievere attitude ten aanzien van voeding, de competenties rond voedingsadviezen en het beschrijven van de SNAQ score zijn significant verbeterd. Daarnaast is een significant verbetering zichtbaar in hoe de verpleegkundigen gebruik maken van de SNAQ en bijbehorende interventies. Er is geen significante verandering in de voedingstoestand van de patiënt gemeten.

Conclusie. Het meten en registreren van de voedingstoestand van de patiënt met een beroerte moet voortdurend de aandacht van de verpleegkundigen krijgen. Het opleiding van verpleegkundigen en andere professionals binnen het multidisciplinair team zal de bewustwording en het belang van de meting, registratie en interpretatie van de voedingstoestand vergroten. De op maat gesneden meervoudige implementatie strategie is effectief gebleken bij de invoering van richtlijnen.

Aanbevelingen. De positieve trend die zichtbaar is gemaakt in deze studie zou door een multicenter en longitudinaal onderzoek ook op langere termijn onderzocht kunnen worden. Met betrekking tot de verpleegkundige praktijk is het belangrijk dat de aandacht voor voeding wordt benadrukt. Permanente scholing aan het multidisciplinaire team kan de zorg voor patiënten met een beroerte verbeteren.

Trefwoorden: implementatie strategie, verpleegkundig, richtlijnen, voeding.

Abstract

Aims. This paper is a report of a study which aimed to determine whether evidence based recommendations on nutritional management of the Clinical Nursing Rehabilitation Guideline Stroke (CNRG), implemented by using a multifaceted implementation strategy, improved nurses' attitude and competence and patient nutritional status.

Background. The prevalence of malnutrition in patients with stroke is high and studies have shown this prevalence to increase during the first week of admission to the hospital. Recently, the Clinical Nursing Rehabilitation Guideline Stroke (CNRG) was published which gives a systematic and objective overview of the nursing rehabilitation interventions for stroke patients. Despite that knowledge, the recommendations of the CNRG-Stroke are hardly seen in practice. A multi faceted implementation strategy, recognizing barriers to implementation and focusing on facilitators, has been recommended for the implementation of nursing guidelines.

Methods. A quasi experimental study was conducted with a convenience sample of 40 nurses, who worked on a neurology ward of a top clinical hospital, and 128 stroke patients admitted on this neurology ward during the study period.

Results. The evolution strategy was chosen to implement the CNRG-Stroke. After the implementation process nurses showed a more positive attitude, competence improved significantly in the nutritional management, the Short Nutritional Assessment Questionnaire (SNAQ) was significantly more present. A significant change was found in nurses' registration of risk of malnourished patients. There is a positive change in the way nurses conduct the SNAQ score and the appropriate interventions. The nutritional status of patients and SNAQ scores showed no significant change. There was a significant decrease in the number not taken SNAQ scores, length and weight.

Conclusion. The study shows that the measurement and recording of a stroke patient's nutritional status must claim the ongoing attention of nurses. The continuing education of nurses and other professionals will increase the awareness of the importance of nutritional management. This study shows that a tailored multifaceted implementation strategy was valuable because it enabled a reasoned, logical approach to the implementation of the CNRG-Stroke recommendations.

Recommendations. With regards to the positive trend of the findings of this study a multicentre and longer implementation timescales may show significant improvements in the use guidelines. In relation to nursing practice, it is highly important that the nutritional management of patients needs be increasingly emphasised. Once nurses are working, the hospital management should facilitate ongoing education to improve the care and outcomes of all patients.

Keywords: nursing, guideline, implementation strategy, nutrition.

Introduction

Stroke is the third most common cause of death in the western world (Struijs et al., 2005). The World Health Organization defines stroke as: 'an acute neurological dysfunction of vascular origin with sudden (within seconds), or at least quickly (within hours) occurring symptoms and signs corresponding to the area in the brain' (Goldstein et al., 1998). In 2007 the prevalence of stroke in the Netherlands was 11.7 (per 1.000) and the incidence in that same year was 2.17 (per 1.000). In 2007, 9.518 individuals died due to stroke (Hoeymans et al., 2010). Stroke carries a high risk of ongoing care dependency and one year after a stroke one third of all patients continue to be dependent on care (Franke, 2001). In view of this care dependency it is important that rehabilitation in the hospital starts as soon as possible. The consequences of a stroke are significant and patients are often confronted with impairments such as paralysis of one side of the body, mobility problems, communication and cognitive problems, swallowing difficulties, malnutrition, depression and sexual problems (Hafsteindóttir & Schuurmans, 2009).

Background

Malnutrition is a common complication after stroke with a prevalence between 8 and 62% (Kumlien et al., 2002; Choi-Kwon et al., 1998) and during the first week of admission, the incidence of malnutrition in hospitalized stroke patients increased from 12 to 20% (Yoo et al., 2008). Adverse outcomes associated with malnutrition in stroke patients were: worse functional status, slower recovery, higher mortality and reduced ability to take part in rehabilitation programmes (Davalos et al., 1996, Gariballa et al., 1998, Westergren et al., 2001, Food Trial Collaboration, 2003). Malnutrition seems to be largely unrecognized and untreated despite the fact that systematic reviews show that nutritional treatment seems to decrease mortality and may improve outcomes for older patients (Milne et al., 2006).

In recent years, there has been increasing demand for nurses to work according to evidence based guidelines. The following definition of evidence-based nursing was given by Cullum et al. (2000): 'Evidence based nursing is the process by which nurses make their clinical decisions based on the best research, their clinical experience, patient preferences and available resources'. A guideline is a document with recommendations, advice and interventions to support the decision making process of professionals in health care, based on the results of scientific research, upon discussion and subsequent opinions, focusing on the explicit efficient and effective medical practice (Everdingen et al., 2004). Recently the Clinical Nursing Rehabilitation Guideline Stroke (CNRG-Stroke) was published in the Netherlands (Hafsteinsdóttir & Schuurmans, 2009), aiming to give a systematic overview of nursing and rehabilitation interventions for stroke patients. An important part of the CNRG-

Stroke focuses on the role of nurses by adequate registration of patients' nutritional status and on nutritional management of stroke patients. It emphasis the early screening and detection of malnutrition and the use of evidence based interventions. Although the CNRG-Stroke has been recommended and legitimized by the Dutch Nursing Association (V&VN, 2009) it is not used generally in the daily care of stroke patients.

The problem therefore is to find effective ways to implement these nursing guidelines. According to Estabrooks (1999) nurses prefer to be informed by colleagues, rather than using knowledge gained through nursing databases on the internet. Nurses rely on what they learn from experience and nursing education (Egerod & Hansen, 2005; Pravikoff et al., 2005). An important condition for the implementation of guidelines is competence and attitude. The competence and attitude of nurses can be defined as a blend of knowledge, judgment, skill, energy, experience and the motivation required to respond adequately to the demands of one's professional responsibilities (Roach, 1992). When considering the implementation of guidelines in health care, Grol and Grimshaw (2003) indicated that a combination of strategies, focusing on barriers to implementation and situational related factors are the most effective. Implementation is a set of activities and events leading to use, change or innovation (van Linge, 2006). An unpublished review by Bijl et al. (2010) showed that multifaceted strategies are more effective in implementing guidelines than single-faceted strategies. A multifaceted strategy, consisting of various combinations of implementation interventions is an effective way of implementing knowledge. Important components described and identified for successful implementation in multifaceted strategies were: education, audit and feedback, leadership, opinion leaders, reminders and workshops. The review also described barriers and facilitators for adoption of guidelines. Facilitating factors include: education, support of managers, leadership, audit and feedback, whereas barriers were: lack of knowledge and motivation, lack of support from other organizational levels, lack of time (Ring et al., 2005; Sinuff et al., 2007; Thomason et al., 2007; Davies et al., 2008; Gifford et al., 2008; Hamilton et al., 2008; Koh et al., 2008). Whilst there is greater understanding about facilitating and constraining factors, there seems to be little clarity about what combination of facilitating factors are most effective in implementing and effectively delivering evidence based guidelines. Halfens and van Linge (2003) indicate that the use of various strategies (e.g. education, reminders) have a positive influence on the implementation of knowledge in nursing. In van Linge's innovation contingency theory (2006) it is considered that various factors, including team culture and knowledge, influence the adoption and implementation process of integrating research into practice. Accordingly, based upon this theory research can be conducted into the tailored implementation of a specific innovation into nursing practice. By tailoring the strategy to the parameters of a ward

an individual implementation plan can be developed that considers the context of that particular ward (Cahill, 2010).

The innovation-contingency theory

Van Linge (2006) states that nurses make little use of effective interventions. There is a gap between available, existing evidence based knowledge and the knowledge used by nurses. Although nurses are aware of the results of research, it does not mean that they simply adopt and integrate these research findings into practice (van Linge 2006). The contingency theory consists of the following three principles: the configuration approach, layering (operational features, explicit values, basic assumptions) of organizations and innovations and the strategy contingency approach. The systems (organization and innovation) can be characterized within one or more configurations which are based on two dimensions: external or internal orientated and flexible or control orientated (figure 1).

Insert Figure 1 here

The theory assumes that a certain congruity should exist between the demands of the innovation and characteristics of the context which is necessary for a successful implementation. A diagnosis of the nature and the extent of the gap between the ideal situation for evidence based nursing practice and the actual situation in the organization should form the basis for the choice of the tailored implementation strategy (Halfens & van Linge, 2003). According to the contingency theory a certain fit is required between the systems (innovation and context) and the implementation strategy (van Linge, 2006). Van Linge (2006) describes eight strategies (such as in house strategy, evolution strategy) that are distinguished by three characteristics: depth of change, a closed or an open end and the dynamics of change. Based on the configurations a pre-implementation diagnosis can be made which describes a fit or misfit between innovation and context. This diagnosis makes the effectiveness of the implementation more or less predictable. Implementation effectiveness can be defined as the degree of success of a chosen implementation strategy (van Linge, 2006). The predicted implementation effectiveness should lead to a specific tailored multifaceted implementation strategy (TMIS) to increase implementation effectiveness.

Problem statement

Although the CNRG-Stroke, which includes various evidence-based nutritional recommendations, has been legitimized and recommended for use in the daily care of stroke patients, these recommendations are not generally followed. Various barriers and facilitating factors inhibiting the implementation of nutritional guidelines are described in the literature. However it is not known which combination of strategies is most effective in ensuring the effective implementation of these nutritional guidelines. According to the innovation-contingency theory implementation effectiveness is influenced by a (mis)fit between personal characteristics, organizational characteristics and the innovation's characteristics. It is unknown how the mix of different characteristics affects the effectiveness of the implementation of the CNRG-Stroke nutritional guidelines. This means that, in order to optimise a tailored and multifaceted implementation of CNRG-Stroke, it is important to understand the way the individuals, the department and the nutritional guideline (the innovation) interact to affect that implementation process. An effective implementation strategy will help improve care for stroke patients.

The Study

Aim

The aim of this study was to determine whether evidence based nutrition recommendations of the CNRG-Stroke, implemented by using a tailored multifaceted implementation strategy (TMIS), would improve nursing attitude and competence, together with having a positive effect upon patient outcomes. The knowledge obtained will provide insight into how to adopt, implement and integrate evidence based interventions into clinical practice.

The research questions were:

- Which TMIS is most suited to the present organisation-innovation fit and what is the effect of the best suited strategy on implementation effectiveness?

- What is the effect on nursing attitude and competence of nurses when a TMIS is used to implement the evidence based nutrition recommendations of the CNRG-Stroke within the neurology department of a general hospital?

- What is the effect on the nutritional status of stroke patients when the evidence based nutrition recommendations of the CNRG-Stroke are implemented with a TMIS?

Design

A prospective quasi-experimental pre-test/post-test study was conducted and the data was collected from November 2010 to April 2011 (Polit & Beck, 2008). In the pre-test, nursing attitude, competence and team configurations were measured. Patient charts were reviewed

to determine nutritional status. Then the CNRG-Stroke guidelines, focusing on six nutritional recommendations, were implemented by a TMIS. In the post-test all pre-test measurements were repeated extensively with the implementation effectiveness.

Participants

The study population consisted of nurses working in the stroke unit of a neurology ward within a general hospital in the Netherlands. The inclusion criteria for nurses were that they needed to be registered nurses (RN) and have worked on the stoke unit of the neurology ward for the duration of the research period. All nurses (n = 40) working on the ward during the time of the study were approached for participation. A convenience sampling was used, which entails using the most convenient available people as study participants (Polit & Beck, 2008).

The accessible patient population consisted of all stroke patients on this neurology ward, during the research period (November to December 2010 and March to April 2011). Charts were reviewed from patients with a clinical diagnoses of stroke based on the WHO definition (1998). Excluded were all terminally or palliative ill, patients who could not be weighted or couldn't participate in the study because of their condition.

For nurses a sample size of 39 was calculated based on an alpha set at 0.05 and an estimated effect size of .50, the research has a power of .60. For patients, a sample between 98 and 251 patients per test was sufficient as the most common range for nursing studies is an effective sample group of .20 to .40 (Polit & Beck, 2008).

Data collection

Data were collected by the researcher during November and December for the pre-test. Implementation of the CNRG-Stroke guideline took place in January. For the post-test the data were collected in March and April.

Insert Figure 2 about here

Variables and instruments

Participants

Demographic and health related data

Socio-demographic data for nurses and patients was collected.

For nurses this information concerned: age, gender, educational level, working experience and part-time or fulltime employment.

For patients, the following demographic and health related data was registered from the patient's records: age, gender, living situation, length of stay, health history, motor function disorder, language function (assessed by a speech language therapist), functional status (assessed using the Barthel Index (BI) by a physiotherapist), swallowing disorder (assessed by a nurse), nutritional status (assessed using the Short Nutritional Assessment Questionnaire (SNAQ) by a nurse) and nutritional advice that was provided by a nurse. When the SNAQ score was three or higher a dietician advised the patient. The dietician discussed the advice with the nursing staff and the nutrition assistant of the ward. The BI records indicators of independency in ten different activities of daily living that cover personal care and mobility such as mobility, toilet use and dressing (Mahony & Barthel, 1965). All disciplines described their findings in the patient chart.

Nurses' attitude

Attitude of the team was measured by the Staff Attitude to Nutritional Nursing Care (SANN). This questionnaire was developed and validated by Christensson et al. (2003) and showed an internal consistency reliability of 0.86. The SANN investigates the attitude of nurses towards nutrition and consists of 19 propositions. Two questions were removed from the list as those questions related specifically to the care of geriatric patients. Therefore a new total score and internal consistency was calculated. The 17 propositions were answered on a 5-point Likert scale ranging from 'I totally disagree' (1) till 'I totally agree' (5). After removing the two questions a total score of 17 points reflected the most negative attitude to nutritional nursing care whereas 85 points reflected the most positive attitude. A score of <47 indicates a negative attitude to nutritional care, a score of 47 to 66 indicates a moderate attitude, whereas a score of ≥ 66 indicates a positive attitude towards nutritional care.

Nurses' competence

Nursing competence was measured by a patient's chart review on nursing documentation. The patient's files were analyzed with respect to how nurses documented nutritional recommendations, including nutritional problems, nutritional status, nutritional management and nutritional interventions.

The CNRG-Stroke focuses on various aspects of care and includes 210 recommendations, 19 of which discuss nutrition. For the intervention in this study six recommendations were used: the SNAQ score, proper use of the SNAQ score, the weight and length at admission and repeated weekly, the risk and malnourished patients, the nursing interventions and nursing documentation.

Nutritional status of patients

Patient's charts were reviewed to gather information on the nutritional status of stroke patients two months before and after implementing the CNRG-Stroke. The assessment of the nutritional status was done by the SNAQ score. The SNAQ is a screening tool to increase early recognition and awareness of malnutrition. The SNAQ score is based on three questions:

1. Did you lose weight unintentionally:

    More than 6 kg in the last 6 months? (if yes, 3 points)

    More than 3 kg in the last month? (2 points)

2. Did you experience a decreased appetite over the last month? (1 point)

3. Did you use supplemental drinks or tube feeding over the last month? (1 point)

Patients who are classified as moderately or severely malnourished following the SNAQ-score (≥ 2 points) received energy- and protein-enriched meals and a nutritious snack twice per day.. Patients who are classified as severely malnourished (≥ 3 points) received, (besides the energy- and protein-enriched meals and snacks), treatment by a dietician. A SNAQ-score < 2 stands for well nourished patients. The SNAQ has proven to be a valid and reproducible instrument to detect and treat malnourished hospital patients at an early stage of hospitalization without the need to calculate percentage weight loss or Body Mass Index (kg/ m²) (Kruizenga et al., 2003).

To provide insight into the patient's nutritional status their weight must be checked weekly.

Implementation variables:

Organization and innovation configuration

The team configuration was measured by the questionnaires: 'organization characteristics' and 'innovation characteristics', developed by van Linge (2006). The questionnaire 'organization characteristics' uses 12 items to measure the configuration features of an organization. The reliability of this questionnaire is good with a Cronbach's alpha ranging from 0.71-0.78 (van Berkom, 2009). The questionnaire 'innovation characteristics' also uses 12 items to measure the configuration features of the innovation. It was found to be reliable with a Cronbach's alpha ranging from 0.70-0.81 (Roodbergen, 2007). Each item was assessed on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (completely agree). The scores of both questionnaires measure the degree of team-oriented, rule-oriented, result-oriented or development-oriented thinking of the nursing staff.

Tailored multifaceted implementation strategy

An expert panel, consisting of the developer of the guideline (TBH), the author of the innovation-contingency model (RvL) and two researchers (AvD, JE), determined that the primary focus of the innovation (the implementation of guidelines) to be result-oriented. It also contains rule- and team-oriented secondary aspects.

Based on analysis of the differences and similarities between the organization and the innovation, at the pre-test, a specific implementation strategy, namely the evolution strategy, was chosen. This evolution strategy is designed to maintain the team-oriented characteristics of this particular neurology team and to strengthen the result-oriented and rule-oriented characteristics, needed to achieve the effective implementation of nutritional guidelines (van Linge, 2005).

Implementation effectiveness

The success of the implementation of the CNRG-Stroke was measured by using the Implementation Effectiveness questionnaire including 22 statements (van Linge, 2006) divided in two subscales: individual and group. It is a five-point Likert scale with a scoring from 1 (strongly disagree) to 5 (completely agree). The questionnaire was found to be reliable with a Cronbach's alpha of 0.90 (Beemsterboer, 2005). The construct validity of this instrument has been measured against the assumed theoretical relationships with innovation and organizational perception and the fit between them. Earlier studies (Douw, 2009; Huisman, 2010) support the hypothesis that an increased fit manifests in a higher degree of implementation effectiveness.

Procedure

Pretest

In a formal meeting the researcher gave the nurses verbal and written information regarding the importance, purpose and processes involved in the study. The information given included the timescale allowed to complete the questionnaires, the voluntary nature of the study, the anonymity guaranteed in relation to any data collected and the means whereby the researcher could be contacted. Following this introduction by the researcher all of the nurses were asked to fill in the questionnaires. The pre-test SANN questionnaire was designed to investigate nurses' attitudes and competence with respect to nutrition. The innovation and organization questionnaire was used to give more insight into the characteristics of the team. In addition the nurses were asked to provide socio-demographic data. To reduce non-response, the questionnaires were distributed at the meeting. The researcher personally delivered the questionnaires to the nurses who were unable to attend the formal meeting. The researcher also visited the ward daily and highlighted the questionnaires to the nurses. A reminder was sent by an e-mail to the nurses to encourage the return of the questionnaires. With the return of the questionnaires, the participants also consented to participate in the study. Patients' charts were reviewed by the researcher during November-December.

The tailored multifaceted implementation

The second stage was a four week implementation phase using the interventions based on evolution strategy.

- The researcher delivered two training sessions to provide information to the nurses within the study group. First an overall training session was given about CNRG-Stroke nutritional recommendations. The second training session concentrated on malnutrition, the symptoms of malnutrition and how to screen them.
- Posters about malnutrition and the implementation process were hung in the team post and a subscription list for questions and comments was provided.
- A practice card was developed and was given to all the nurses so that they could review it when needed. The practice card provided information about the SNAQ score and about the CNRG-Stroke focusing on: malnutrition, symptoms, recommendations, registration.
- Active reminders were sent by mail, to remind nurses to document nutritional interventions.
- A newsletter was twice sent by mail. This newsletter provided information about the pre-test; the prevalence of malnutrition, the background to the SNAQ screening tool, registration recommendations and an update of the implementation process.

- Two opinion leaders, familiar with the nutritional recommendations of the CNRG-Stroke, were on the ward daily, to answer questions and to provide feedback on the implementation.

Posttest

One month after the implementation phase the post-test commenced and all measurements from the pretest were repeated. In addition the nurses were asked to fill in a fourth questionnaire, 'the implementation effectiveness questionnaire'. Meanwhile a post-test review of patient charts was conducted.

Data analysis

Data analysis was conducted in five stages. The first stage tested the organization and innovation characteristics the team. Data was recorded in Excel, which gives an overview of averages of the different configuration grades of all respondents (table 5). This data was used as a basis for the choice of implementation strategy.

Secondly the demographic data of patients and nurses descriptive statistics was presented. Discrete data frequencies and percentages are given and, for interval/ratio data, the mean and standard deviation are presented.

The third stage included the nurses' attitude and competence. Attitude, measured by the SANN, was calculated by an independent T-test. Nurses' competence was compared by using a Chi-square test.

The nutritional status of patients was also compared by using a Chi-square test. The proportions of (risk of) malnourished patients were compared by using the Fisher's exact test.

Finally the implementation effectiveness was tested with the K-means cluster analysis. A K-means cluster analysis is a tool designed to assign cases to a fixed number of groups. As K-means cluster analysis is outlier-sensitive a scatter plot has been produced.

The statistical significance level was set at a p-value of ≤ 0.05. All data were processed and analyzed either using SPSS (de Vocht, 2008) version 16.0 or Microsoft Office Excel 2007.

Ethical considerations

Approval from the Local Ethical Committee (LEC) was granted for the study. Each nurse received a letter from the researcher explaining the purpose of the study and that all information collected would be held as confidential. The approval of patients for the patient chart review was deemed unnecessary as the care given was described as normal care. In all cases the anonymity of all personnel and the confidentiality of all data were assured.

Results

Participants characteristics

Nurses

Of the 40 nurses approached for the study, 35 nurses participated in the pre-test and 31 nurse in the post-test, a response rate of 87.5% and 77.5% respectively. The non-response differential is explained by maternity leave and, in some instances, negative feelings about the questionnaires. In the pre-test group 33 nurses were female with a mean age of 35.5 years (±12.8) whereas in the post-test group 30 nurses were female with a mean age of 34.6 years (±12.6) (table 1).

Insert Table 1 about here

Patients

The charts of 112 patients, admitted to the ward during the pre-test period, were reviewed. Charts of 81 patients were included (72.3%). Ten patients died and 21 patients did not meet the inclusion criteria. During the post-test period, 67 patients were admitted on the ward and their charts were reviewed. The charts of 47 patients were included in the study, whereas six patients died and 14 did not meet the inclusion criteria (table 2).

Insert Table 2 about here

Nurses' attitude and competence

Nurses' attitude

In the pre-test, 35 nurses completed the SANN-questionnaire, a response rate of 87.5%. Thirty one nurses (88,6%) had a moderate attitude towards nutritional nursing care. One nurse (2.9%) had a positive attitude and three nurses (8.6%) a negative attitude towards nutritional nursing care. The mean SANN score was 56.4 with a range from 45 to 75. After the implementation phase, the attitude was measured again (table 3).

   In the post-test, 31 nurses completed the questionnaire (77.5%). Twenty nine nurses (93.5%) had a moderate attitude towards nutritional nursing care and one nurse (3.2%) had a positive attitude whereas one (3.2%) had a negative attitude. The ranging of the scores were the same as at the pretest (table 3).

   The difference between the pretest and posttest, measured with the independent T-test showed, was not significant with a p-value of 0.683. Because of the removal of two questions

an internal consistency was measured again. The Cronbach's alpha for the pre-test was 0.63 and for the post-test 0.53.

Nurses' competence

The SNAQ was significantly (p 0.014) more present at the post-test (n=41; 89.1%) than at the pre-test (n=68; 84%). Also a significant change (p 0.001) was found in the nurses registration of risk of malnourished patients in the nursing action plan from 37% (n=30) to 74.5% (n=35).There is a positive change, but not significant, in the way nurses conduct the SNAQ score (from 75.3% to 76.1%) and also a positive change in the appropriate interventions (44.4% to 51.1%). At the pre-test, 36 patients were admitted to the hospital for a period longer than a week. Of these 36 patients 21 (58.3%) were weighted weekly. A significant (p 0.000) change was achieved at the post-test, 20 patients stayed at the hospital longer than one week, weight measurement was repeated for 17 (85%) patients (table 3).

Insert Table 3 about here

Nutritional status of patients

In the pretest 65 patients (80.2%) were well nourished, 4 patients (4.9%) were at risk of malnutrition and 6 patients (7.4%) were malnourished. SNAQ score, length and weight was not present in 23 patients' charts (table 4).

In the post-test 35 patients (74.5%) were well nourished, 5 patients (10.6%) were at risk of malnutrition and 4 patients (8.5%) were malnourished. The SNAQ score, length and weight was not present in 6 patients charts (table 4).

The nutritional status all patients, and all SNAQ scores (pre-test and post-test) showed no significant change. There was a significant (p 0.014) decrease in the number not taken SNAQ scores, length and weight between pretest and posttest (table 4).

Insert Table 4 here

Implementation variables:

Organization and innovation configuration

The perception of the innovation and organization characteristics is diverse. The averages for all four configurations are higher for the organizational characteristics than for the innovation characteristics (table 5). The organization and innovation both had the highest score on the team-oriented configuration (3.77 and 3.80). The result-oriented and rule-oriented characteristics of the innovation both had low scores (3.57 and 3.27). As the guidelines implementation was mainly result-oriented there was no internal fit, therefore the evolution strategy was chosen. After the implementation process the organization characteristics still had the highest score (4.0). The basic views of the rule-oriented characteristics were less negative (table 5). The reliability for the entire scale before and after the implementation was tested and had a Cronbach's alpha of 0.80 and 0.94 respectively. With all scores > 0.800, the instrument was found reliable.

Implementation effectiveness

Twenty-eight nurses (70%) completed all questionnaires. The results of these 28 nurses were used for the K-means cluster analysis. All items were scored. The average implementation score was 3.35 with a standard deviation of 0.37. Overall the subscale of the individual implementation effectiveness was perceived slightly stronger than the subscale of the whole group (respectively 3.52 and 3.21). The first cluster of respondents (n=9), indicated weaker configuration characteristics and also a lower score on implementation effectiveness. With respect to the innovation, the team-oriented and result-oriented both measured scores of 3.40. The scores of the organization were higher especially for team-oriented characteristics (3.60). All scores of the organization characteristics were higher but remained under four (range 3.44-3.82). The second cluster included just over half of respondents (n=19). The implementation effectiveness was higher for the individual and the group (3.83 and 3.62). Team-oriented characteristics on the innovation had the highest score (4.37), rule-oriented characteristics for the innovation the lowest. Overall the organization configurations were higher (range 3.96-4.33) than innovation characteristics with an exception of the team-oriented characteristics. Only the rule-oriented characteristics on innovation and organization characteristics were not significant with a p-value of 0.973 and 0.110 respectively (table 5).

Insert Table 5 about here

Discussion

The aim of this study was to investigate whether evidence based nutrition recommendations of the CNRG-Stroke, implemented by using a TMIS, improve nursing attitude and competence and improved patients' nutritional status. The higher SANN scores indicate that the nurses showed a more positive attitude and significantly improved competence in the nutritional management of patients with stroke. This was clearly reflected in the improvement in the registration and recording of nutritional factors in nursing documentation. Following an introduction to and training in the recommendations of CNRG-Stroke, nurses were more aware of the importance of the registration of patient outcomes such as weight and length and that this information needs to be processed in a uniform manner. The implementation did not lead directly to improved patient outcomes but over time the improved awareness and competence of the nurses should influence the care and outcomes for stroke patients. The findings of this study suggest that a TMIS is an effective strategy for the implementation of evidence-based nutritional guidelines. The multifaceted strategy used was a combination of education, a poster about the implementation process, a practice card, active reminders, a newsletter and the use of opinion leaders.

Limitations of the study are the generalizability, the characteristics of the respondents and the measurements. Regarding the generalizability, it can be stated that the study was conducted in only one hospital and almost all nurses were women. The nurses indicated that the questionnaires about the organization and innovation were difficult concepts both in terms of language and understanding. This may have influenced the results. For example, by frequently awarding the score of three, the average between 'I don't agree / I don't disagree' In addition, the researcher has doubts about the utility of the SANN. This due to the fact that Defloor et al. (2007) found an interrater reliability of 0.86 whereas we found, after eliminating two items, an interrater reliability of 0.63 at the pretest and 0.53 at posttest. It is important to note that during the post-test an electronic patient record system was implemented in the hospital which may have influenced the results as nurses saw a pop-up when entering patient data. Thus they were more aware of recording length, weight and SNAQ score. Concerning the patients' nutritional status there is minimal effect due to the limited duration of the study and the relatively short hospitalization period of stroke patients. The strength of this study is the theoretical framework used for the TMIS. Previous studies often used implementation strategies without a theoretical framework. The theoretical framework describes the complexity of all the elements that are important for a successful implementation.

Consistent with the findings of our study, Kim & Choue (2009) stated that nurses' attitude towards nutritional management is generally positive. Education may help promote nurses' active involvement in the nutritional management of hospitalized patients and it may prove to

be a cost effective way of improving their ability to ensure patient nutritional status. In our study differences in patient nutritional status during admission could not be measured due to the short period of hospitalization. Nip et al. (2011) also concluded that requiring participants to be recorded as medically stable before invitation to take part delayed recruitment and those with lesser deficits who were discharged swiftly often left hospital before the completion of assessments. Nip et al. (2011) suggest a larger multicenter study to examine the effects with larger sample groups. Similar to the findings of this study, Cahill et al. (2010) also describe the implementation effectiveness of a tailored approach to guideline implementation. According to Cahill et al. (2010) this will help to bridge the current guideline-practice gap and lead to significant improvements in nutrition practices and patient outcomes. In this study, with the use of a TMIS, there is a significant improvement in the use of the SNAQ presence, the registration of patient weight and nursing registration. There is also a positive trend in nurses' attitudes towards nutrition, in properly conducted SNAQ score and in the use of appropriate interventions.

Prior et al. (2008) describe that an effective guideline implementation should be multifaceted and should actively engage clinicians throughout the process. A closer collaboration between health care professionals is needed to provide constant focus on patient nutritional status. Remarkably, the file study showed that nurses generally do pay attention to the nutritional status of stroke patients. Their work is described in the patient's charts but not in a clear, uniform and predefined manner which means that the information is often not readily accessible. Similarly, interactions with nutritional assistants, dieticians, speech therapists and physiotherapists are undertaken and competently recorded within a patient's charts, however once again the not in a systematic, clear and uniform manner, but are randomly described somewhere in the patient files. There is no fixed position within patient's charts to describe these expanded operations. Possibly the Electronic Patient File (EPD) can provide the solution.

Conclusion

The study shows that the measurement and recording of a stroke patient's nutritional status must claim the ongoing attention of nurses. The continuing education of nurses and other professionals within the multidisciplinary team will increase the awareness of the importance of measurement, registration and interpretation of nutritional status and nutritional management. This study shows that TMIS was valuable because it enabled a reasoned, logical approach to the implementation of the CNRG-Stroke recommendations.

Recommendations

Nurses indicated that the questionnaires about the organization and innovation characteristics presented concepts that were difficult to grasp which, in turn may have distorted the responses given. Therefore further research into the comprehensibility and impact of shortened version of the questionnaires, 'organization and innovation characteristics' is recommended. For this study a decision was been made to use the evolution strategy with a TMIS. With regards to the positive trend of the findings of this study a multicentre and longer implementation timescales may show significant improvements in the use of evidence based guidelines.

Nurses perform repeated weight measurements every Saturday after admission but it is not always registered in the same place in every patient's file. This can present significant problems in detecting malnourishment and determining nutritional trends. The data regarding patients weight should be recorded in a standardised location on the patient's chart.

During the first 24 hours of hospital admission the stabilisation of the stroke victim is of paramount importance and this is as it should be. However it should be recognised that malnutrition plays a significant role in patient outcomes and attempting to conduct a partial SNAQ during that first fraught day may not prove to be good practice. Such an assessment may be hurried or incomplete and yet it may be taken as definitive. Future research should be done to see whether a more considered and complete nutritional assessment is more likely to be conducted on, for example, the third day after admission.

In relation to nursing practice, it is highly important that the nutritional management of patients needs be increasingly emphasised. This should be reflected both in the basic and post graduate education of nurses focusing on the importance of nutritional screening and providing evidence based nutritional interventions. Once nurses are working on a neurology ward, the hospital management should facilitate ongoing education to improve the care and outcomes of all patients.

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Conflict of interest

No conflict of interest has been declared by the authors.

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9. Figures and Tables

Figure 1
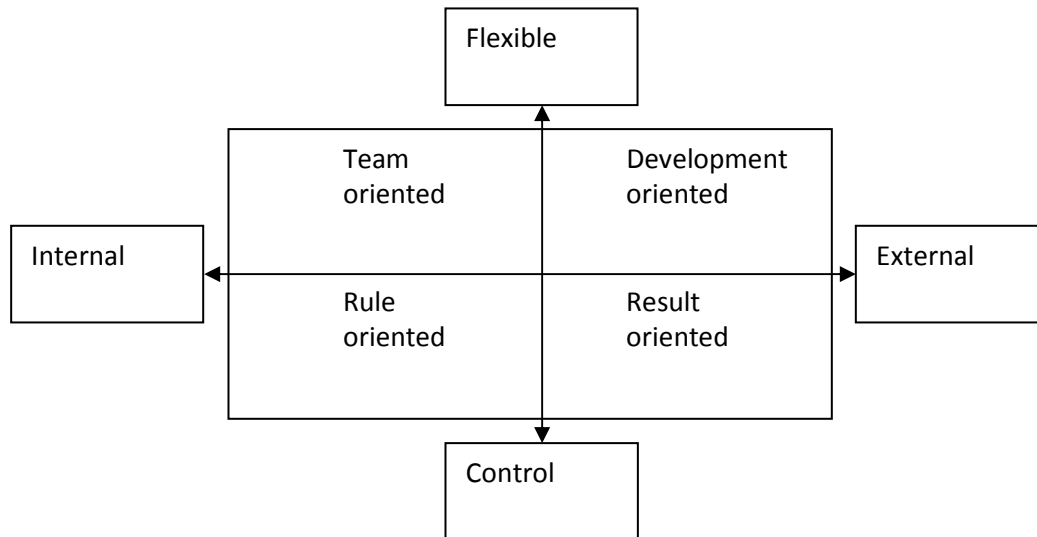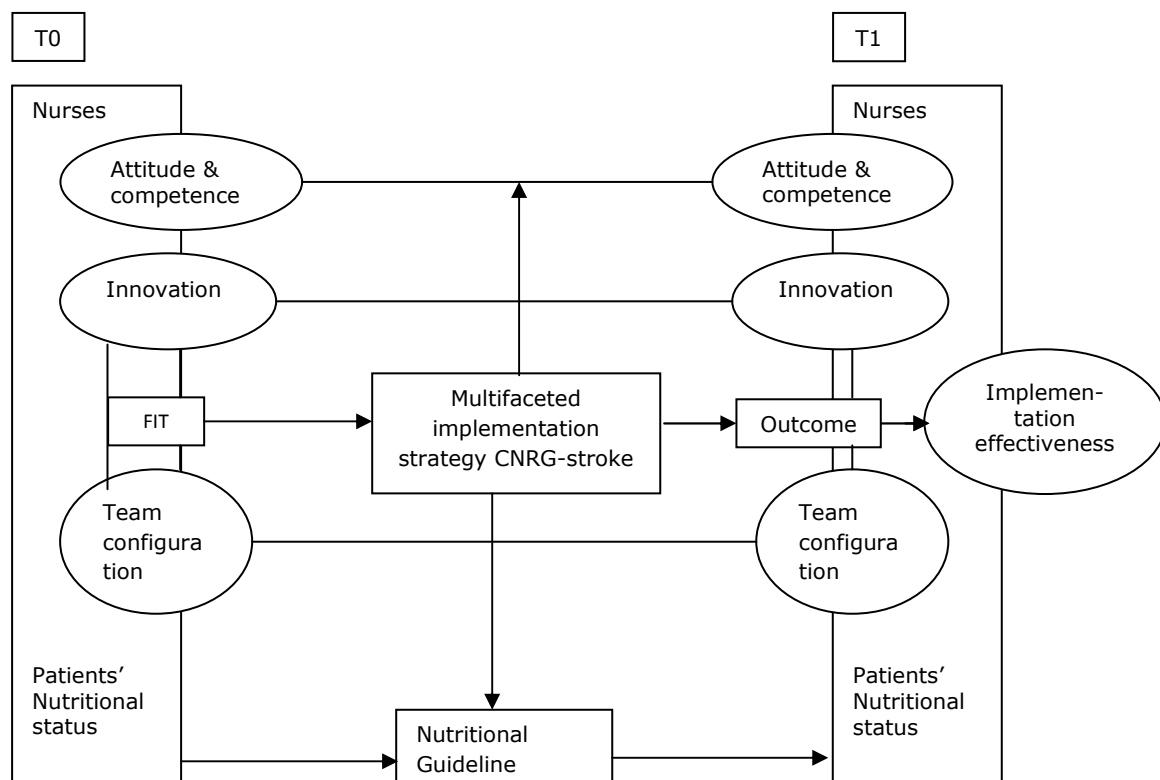*The configuration model (van Linge 2006)*

Figure 2
Study design

Table 1
Demographic characteristics of nurses

Characteristics		T1 (n = 35)		T2 (n = 31)		p-value
		n	%	N	%	
Gender	Female	33	94.3	30	96.8	p 0.646[1]
Age in years	< 20 - 59					p 0.835[2]
	< 20	1	2.9	1	3.2	
	20 – 29	16	45.7	14	45.2	
	30 - 39	3	8.6	3	9.7	
	40 - 49	9	25.7	7	22.6	
	50 - 59	5	14.3	5	48.4	
	Missing	1	2.9	1	3.2	
Education level						p 0.586[1]
	RN with a bachelors degree	19	54.3	15	48.4	
	RN without a bachelors degree	14	40.0	16	51.6	
	Missing	2	5.7	0		
Years of work, nursing experience						p 0.958[2]
	< 10	17	48.6	15	48.4	
	10 – 19	6	17.1	5	16.1	
	20 - 29	5	14.3	5	16.1	
	30 – 39	4	11.4	4	12.9	
	> 40	2	5.7	2	6.5	
Years of working on this neurology ward						p 0.675[2]
	< 10	24	68.6	21	67.7	
	10 -19	7	20.0	6	19.3	
	> 20	4	11.4	4	12.9	
Full- time or part-time employment						p 0.735[1]
	Full time	21	60.0	19	61.3	
	Part time	13	37.1	12	38.7	
	Unknown	1	2.9	0		

Values are n and %, T1 = pretest, T2 = posttest
[1] Pearson Chi-square test.
[2] Independent T-test (for continuous variables)

Table 2
Demographic and health related characteristics patients

	T1 complete cases (n = 81)	T2 complete cases (n = 47)	p-value
Socio demographical characteristics			
Female (%)	36 (44.4%)	23 (48.9%)	p 0.423
Mean age (years)	69 (±13.9)	72 (±12.0)	p 0.394
Living alone (%)	25 (30.9%)	26 (55.3%)	p 0.148
Length of hospitalization (days)	8.5 (± 6.9)	13.5 (± 8.8)	p 0.108
Health history			
Stroke infarct	71 (87.7%)	38 (80.9%)	p 0.210
Stroke bleeding	10 (12.3%)	7 (8.6%)	p 0.734
Other chronic disorders	11 (13.6%)	9 (20.9%)	p 0.915
Motor function disorder			
Can walk unassisted	58 (71.6%)	27 (57.4%)	p 0.458
Left arm paresis	12 (14.8%)	12 (25.5%)	p 0.551
Left leg paresis	14 (17.3%)	14 (29.8%)	p 0.805
Language function			
Aphasia	13 (16%)	14 (29.8%)	p 0.939
Functional status			
Barthel index at admission	12.54 (±5.76)	9.64 (±7.51)	p 0.847
Barthel index at discharge	14.43 (±6.18)	11.2 (±7.14)	p 0.530

Values are n (%); mean (SD). SD, standard deviation;
Pearson Chi-square test and Independent T-test (for continuous variables)

Table 3 *Nurses' attitude and competence*
Nurses' attitude
(SANN = Staff Attitude to Nutritional Nursing Care - questionnaire)

SANN score	T1 (n = 35)	T2 (n = 31)	p-value
Average score	56.4 (6.3)	57.0 (5.4)	0.683
Positive attitude> 67	1 (2.9%)	1 (3.2%)	
Average attitude47 – 67	31 (88.6%)	29 (93.5%)	
Positive attitude < 47	3 (9.4%)	1 (3.2%)	

Values are n (%);
Independent T-test

Nurses' Competence

Nurses' registration	T1 (n = 81)	T2 (n = 47)	p-value
SNAQ registered	68 (84%)	41 (89.1%)	p 0.014*
SNAQ properly conducted	61 (75.3)	35 (76.1%)	p 0.116
Appropriate interventions registered	36 (44.4%)	24 (51.1%)	p 0.844
Nursing registration	30 (37%)	35 (74.5%)	p 0.001*
Weight repeated weekly	21 (58.3%)	17 (85%)	p 0.000*

Values are n (%);
Pearson Chi-square test; * p-value < 0.05

Table 4
Patients' nutritional status

Nutritional status	T1 (n = 81)	T2 (n = 47)	p-value
Good nutritional state (SNAQ 0 or 1)	65 (80.2%)	35 (74.5%)	p 0.613
Risk of malnutrition (SNAQ 2)	4 (4.9%)	5 (10.6%)	p 0.330
Malnutrition (SNAQ 3)	6 (7.4%)	4 (8.5%)	p 0.826
Missing	6 (7.4%)	3 (6.4%)	-
Weight (kg)	83.7 (±31.2)	79.1 (±29.0)	p 0.243
Length (cm)	169 (±0.075)	168 (±0.080)	p 0.241
Nutritional advice			
Requested	19 (23,5%)	17 (36.2%)	p 0.503
Given	18 (22.2%)	17 (36.2%)	p 0.491
Swallowing disorder	15 (18.5%)	16 (34.8%)	p 0.320
SLT-advice requested	16 (19.8%)	18 (38.3%)	p 0.901
SLT-advice given	16 (19.8%)	17 (36.2%)	p 0.647

 Values are n (%); mean (SD). SD, standard deviation; SLT, speech language therapy;
SNAQ, Short Nutritional Assessment Questionnaire (Scores for the total SNAQ: no intervention = 0-1, moderately malnourished: nutritional intervention = 2, severely malnourished (nutritional intervention and treatment by dietician = 3);
Pearson Chi-square test

Table 5
Configuration scores and implementation effectiveness

	T1 (n = 35)	T2 (n = 31)
Configuration organization		
Team oriented	3.77 (0.71)	4.00 (0.60)
Development oriented	3.87 (0.75)	3.80 (0.77)
Rule oriented	3.80 (0.74)	3.73 (0.67)
Result oriented	3.77 (0.71)	3.60 (0.68)
Configuration innovation		
Team oriented	3.80 (0.75)	3.67 (0.77)
Development oriented	3.42 (0.74)	3.50 (0.74)
Rule oriented	3.27 (0.70)	3.10 (0.72)
Result oriented	3.57 (0.77)	3.53 (0.79)

Values are mean (SD) 1= totally disagree, 5 totally agree

K-means cluster analysis	Cluster 1 (n = 19)	Cluster 2 (n = 9)	p-value
Organization:			
Result oriented	3.44	4.00	$p < 0.009$*
Team oriented	3.82	4.33	$p < 0.009$*
Development oriented	3.51	4.33	$p < 0.000$*
Rule oriented	3.60	3.96	$p < 0.110$
Innovation:			
Result oriented	3.40	3.89	$p < 0.022$*
Team oriented	3.40	4.37	$p < 0.000$*
Development oriented	3.32	3.96	$p < 0.004$*
Rule oriented	3.14	3.19	$p < 0.793$
Implementation effectiveness:			
Individual	3.34	3.83	$p < 0.000$*
Group	3.00	3.62	$p < 0.000$*
Total	3.15	3.72	$p < 0.000$*

Values are mean. 1 = totally disagree, 5=totally agree.
* p-value < 0.05