The cross-cultural adaptation of the Belgium Nursing Minimum Data Set to Finnish nursing

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TURTIAINEN A.-M., KINNUNEN J., SERMEUS W. & NYBERG T. (2000) *Journal of Nursing Management* 8, 281–290

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Background Nursing has been invisible in most of the international and national healthcare information systems and databases; also in Finland. The use of nursing minimum data set could be one solution to this problem. It is an information system that collects, stores, processes, retrieves, displays and communicates timely information about nursing practice needed for a variety of users and purposes.
Objectives To test the cultural applicability of the Belgian Nursing Minimum Data Set (BeNMDS) to Finnish nursing.
Methods The study design was methodological. It included testing of the validity, reliability and sensitivity of the BeNMDS. Content validity was tested using content analysis of the Finnish nursing doctorate dissertations, Katie Eriksson's publications of her Nursing Process Model and focus-group interviews of the healthcare administrators. Reliability, construct validity and sensitivity were tested using the data collected with the BeNMDS-tool from patients' nursing notes in Finnish Hospitals.
Findings The validity, reliability and sensitivity of the BeNMDS in Finland were mainly good. The study showed, however, that the interventions to describe the patient's spiritual well-being, were missing and the psycho-social care interventions were insufficient in the data set.
Conclusion The Finnish version of the BeNMDS has been shown to be valid, reliable and sensitive and applicable to describe nursing practice in Finland. Should the interventions to describe patient's spiritual and psycho-social well-being be included in the data set, Finnish nursing will have a valuable tool available to make nursing visible for the healthcare information systems and databases.

Accepted for publication 17 March 2000

Introduction

The rapidly changing healthcare environment, characterized by escalating healthcare costs and demands for reliable data for decision-making, has increased the need for uniform standardized languages and information systems. Although many systematic collections of healthcare data exist, nursing data is usually absent from these systems around the world (see Andersson & Hannah 1993, Foster & Conric 1994, Mortensen *et al*. 1994, Jones 1997,

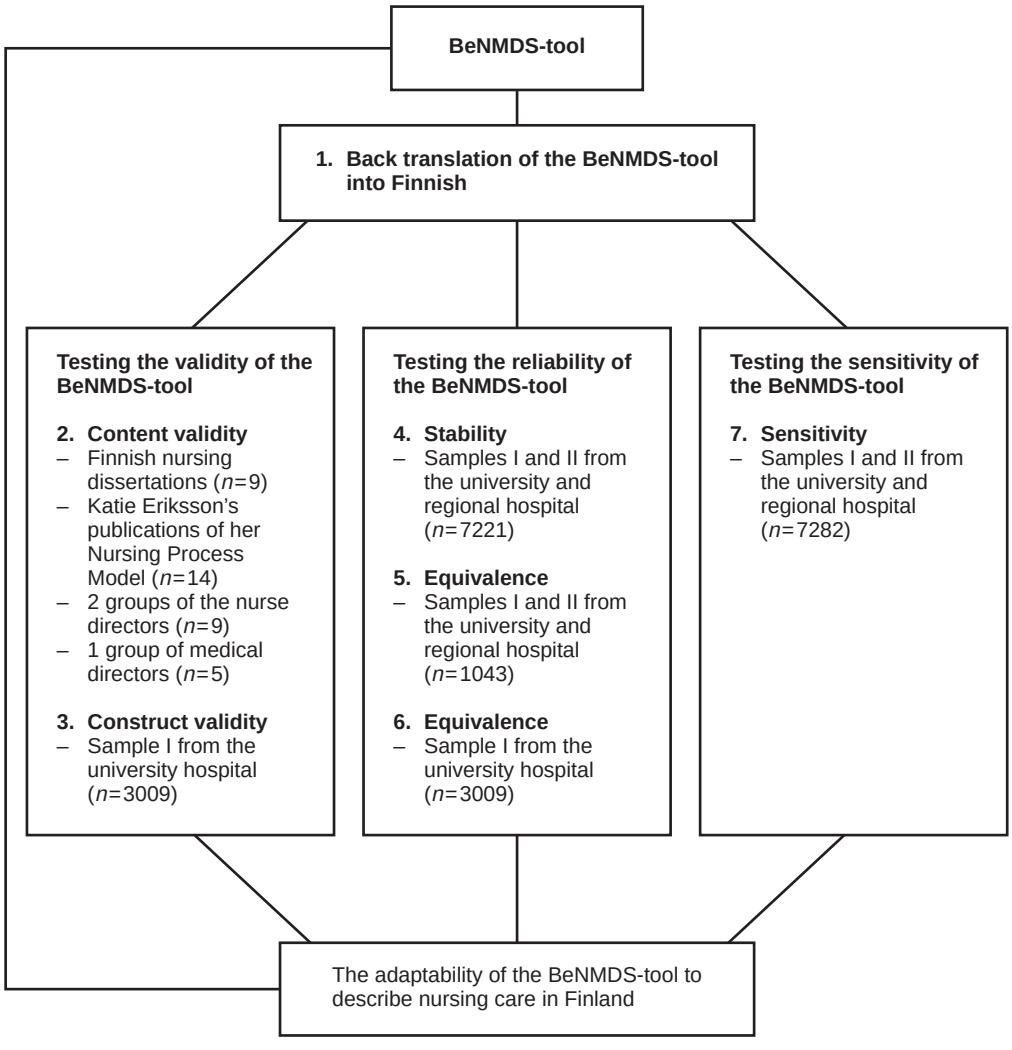

Figure 1
The cross-cultural adaptation process of the Belgium Nursing Data Minimum Set-tool to Finnish nursing. Numbers 1–7 describe the phases of the cross-cultural adaptation process.

Goossen *et al*. 1998). Finland is no exception to this. There is no uniform standardized nursing nomenclature, classification or minimum data set in use in Finland. Information of nursing practice is also missing from all the local, regional and national healthcare databases (Mäkelä *et al*. 1997, Orre 1998).

Nowadays, to determine the best value for healthcare money depends heavily on statistical information. If nurses do not develop or adopt tools needed to participate in the current information-driven environment, opportunities to provide nursing services may significantly diminish in the future (Jones 1997). When restructuring occurs, nursing lacks the data needed to demonstrate the value of nursing practice, as well as the outcomes of altering the practice. During the 1990s this restructuring has often included decreasing the number of nursing staff and requiring nurses to increase efficiency by altering or discontinuing services provided to patients. (Simpson 1997.)

To make nursing visible through information systems demands at least the followings:

(i) There must be a regulatory mandate to collect and analyse data about nursing practice.
(ii) There must be a unified approach to use uniform standardized nursing language to describe the types of patient-care problems that nurses address, their interventions and the contribution of nursing care to patient outcomes.
(iii) There must be a unified approach to collect, code and analyse the data (Henry *et al*. 1994, Jones 1997, Goossen *et al*. 1998).

According to many researchers (Sermeus *et al*. 1994, Jones 1997, Goossen *et al*. 1998) the solution to add specific information about nursing to existing healthcare information systems and databases can be through a nursing minimum data set. Nursing minimum data registration has been defined as 'a systematic registration

of the smallest possible number of unequivocally coded data, with respect to or for the purpose of nursing practice, making information available to the largest possible group of users according to a broad range of information requirements' (Sermeus *et al*. 1994). A nursing minimum data set can help nursing and the whole healthcare to obtain information of the priority areas of nursing care in order to help to produce cost-effective, efficient and high quality nursing care and to guide nursing practice, management and policy-making.

The aim of this research was to test the cultural applicability of the BeNMDS to Finnish nursing. In other words the aim of the research was with the help of Finnish nursing theory, healthcare administrators and nursing practice to study the validity, reliability and sensitivity of the BeNMDS-tool in producing information for the use of healthcare administrators, nursing management, nursing practice and research in Finland.

Belgium Nursing Minimum Data Set

The nursing minimum data set (BeNMDS) developed and in regulatory mandate use in Belgium was chosen to be the focus of this study because it was the only NMDS found in use in a whole country. It was also the only NMDS that included information system with analysing, presentation and feedback programs.

The BeNMDS is an information system that includes data collection tool, coding-system, manual, in-put, analysing and feedback programs. The data collection tool consists of demographic, service, nursing resource, 23 nursing intervention and medical care variables (through ICD-9) and variables of activities of daily living (through an adaptation of Katz Scale, Katz *et al*. 1970). It can be used manually and partly or completely automatically, depending on the state of information technology in a given hospital (Sermeus *et al*. 1994, Sermeus 1995). The manual contains the detailed descriptions how to use the data collection tool, and the definitions and the coding instructions of the variables. The data collection tool and the manual together form the BeNMDS-tool. The data input and the analysing programs have been developed from the Excel and SAS programs.

The cross-cultural adaptation process of the BeNMDS to Finland

Cross-cultural adaptation process of a measurement tool (Thorsen *et al*. 1993, Phillips *et al*. 1994, Koivukangas *et al*. 1995) was used to test the cultural applicability of the BeNMDS to Finnish nursing. The process included translating the BeNMDS-tool into Finnish and testing validity, reliability and sensitivity of the nursing intervention variables (Fig. 1). The minimal standards of publishing a report of the psychometric testing of a measurement tool described by Norbeck (1985) were used to guide the research process. Testing was done using the Finnish nursing theory, nursing practice and healthcare administrators as the subjects of the study.

Translation of the BeNMDS-tool

In order to maintain the original construct of the tool, and the possibility to compare the nursing practice of the both countries with each other, a symmetrical backtranslation procedure was used to translate the BeNMDS-tool from its original language into Finnish (Jones 1986, Koivukangas *et al*. 1995, Jones & Kay 1992). An official Finnish-French translator translated the original French version of the BeNMDS-tool into Finnish. A group of experts in nursing ($n=8$) who also had studied French reviewed the translation. The pilot study to test the language equivalence (Phillips *et al*. 1994), clarity and intelligibility of the tool was performed in six surgical departments in a Finnish hospital. After this an official Finnish-English translator translated the tool into English. This version was verified in Belgium by the original developers of the BeNMDS-tool and the researcher. The verified version was back translated into Finnish by the researcher and the expert group of nurses. The final stage of the back-translation was the grammar inspection by a Finnish language specialist.

Validity of the BeNMDS-tool

Validity of a tool is the determination of the extent to which the tool actually reflects the concept being examined. Content and construct validity were used to test the interventions of the BeNMDS-tool. The content validity was tested by doing content analysis of the Finnish nursing doctorate dissertations ($n=9$) and Eriksson's publications of her Nursing Process Model ($n=14$) and by doing focus-group interviews of the healthcare administrators ($n=13$). The construct validity was tested by using quantitative statistical analysis of the data collected from the patients' nursing notes ($n=7828$) with the BeNMDS-tool.

The purposive sampling method was used to select the dissertations and Eriksson's publications to be studied in this research. Content analysis was performed using the BeNMDS-tool as a classifying tool and Katie Eriksson's Nursing Process Model as a framework for the analysis. Twelve BeNMDS-interventions were found from both the dissertations and Eriksson's publications, six from either

Table 1
Content validity (CV) of the interventions of the BeNMDS-tool in the Finnish nursing dissertations (D), Katie Eriksson's publications of her Nursing Process Model (NPM) and in the focus-group interviews (F)

Nursing interventions in the BeNMDS-tool	*D*	*NPM*	*F*	*CV*
Taking care of patient's hygiene	1	1	1	Good
Taking care of patient's mobility	1	1	1	Good
Taking care of patient's excretion	1	1	1	Good
Taking care of patient's eating and drinking	1	1	1	Good
Taking care of patient's tube feeding	0	0	1	Poor
Performing special mouth care	0	0	0	–
Preventing patient's pressure sores by positioning	1	0	0	Poor
Dressing patient	1	1	1	Good
Taking care of patient's endotracheal or intubation tube	0	0	1	Poor
Doing patient assessment on admission	1	1	1	Good
Instructing and teaching patient to become independent	1	1	1	Good
Supporting patient in emotional crisis	1	1	1	Good
Taking care of disoriented patient	1	1	1	Good
Taking care of isolation	1	1	0	Moderate
Observing patient's vital signs	1	1	1	Good
Observing patient's clinical parameters	1	1	1	Good
Taking care of patient's cast or traction	0	0	0	–
Taking blood sample	0	0	1	Poor
Medication i.m., i.d., s.c.	1	0	1	Moderate
Medication i.v.	1	0	1	Moderate
Taking care of patient's continuing i.v.-infusion	1	0	1	Moderate
Taking care of patient's surgical wound	1	0	1	Moderate
Taking care of patient's traumatic wound	1	0	1	Moderate

the dissertations or Eriksson's Model and five interventions were not found at all. (Table 1.) Using the Eriksson's Model as the framework of the content analysis it was revealed that interventions to describe patient's spiritual well-being were missing and the psycho-social care interventions were insufficient in the data set.

Because of these insufficient content validity results, focus-group method was used to test further the validity of the BeNMDS-tool. The Finnish healthcare administrators' opinions and perceptions of the instrument, its content and its usefulness for the management of the healthcare were studied. The purposive sample of the healthcare administrators was taken from the University and the Regional Hospital under the study. The groups were formed according to the professions and the Hospitals. There was one group of directors of nursing ($n=8$) from both the Hospitals and one group of medical directors ($n=5$) from one Hospital. Each group was met once and the interviews lasted about 1.5 h each. The semistructured group interviews were taped.

The verbatim transcripts of the taped interviews together with the observation notes done by the moderator and observer functioned as the data source for the content analysis of the focus-group interviews. The healthcare administrators regarded the content of the BeNMDS-tool good and useful. They did not want to exclude any of the interventions from the BeNMDS. Instead they wanted to add the following interventions to the BeNMDS: to give information and results of the operations, treatments and tests to the patient, to take care of patient's well-being and to take care of the co-ordination and continuity of the patient's care.

The content validity of the BeNMDS-tool was regarded as good if an intervention from the tool was found from the doctorate dissertations, Eriksson's publications and from the focus-group-interviews. The content validity of the BeNMDS-tool was regarded as moderate if an intervention was found from two of the before mentioned study objects. If an intervention was found only from one of the study objects then the content validity was regarded as poor. According to these criteria 17 interventions of the tool had good or moderate and four interventions had poor content validity. There were two interventions that were not mentioned in any of the study objects (Table 1). The content validity of the adapted tool can be regarded as mainly good.

Reliability, construct validity and sensitivity of the BeNMDS-tool

Reliability concerns how consistently the measurement technique measures the concept of interest and the extent to which measurements are intended to be stable over a variety of conditions in which essentially the same results

should be obtained (Nunnally 1978, Fercetich 1990, Burns & Grove 1995). To test reliability of a measurement tool involves usually testing its stability, equivalence and homogeneity or internal consistency. These were also the tests performed in this study.

The statistical techniques used to test the reliability, construct validity and sensitivity of the BeNMDS-tool in Finland were nonparametric statistics. The reasons for this were the following: the data was collected using convenient sampling technique and not random sampling. The assumptions of normality and of homogeneity of variance were not met. The distributions of the nursing activities were skewed and most of the data were measured on a nominal or ordinal scale. Also the fact that the reliability tests of the original BeNMDS in Belgium had been done with the same techniques supported the choice of these analysing methods.

Multistage sampling (Burns & Grove 1995) was used to select the sample to test the reliability, construct validity and sensitivity of the BeNMDS-tool in Finland. The data was collected during one week both in September and December 1997, from two hospitals (University and Regional Hospital). From both hospitals the surgical (consisted also an intensive care ward), internal medicine, obstetric, gynaecological and children's wards ($\lambda = 24$) were the study sites.

Nursing notes of all the inpatients from the wards described above were included into the samples during the data collection periods. The samples were collected manually with the BeNMDS-tool by the nurses ($n = 50$) trained by the researcher to collect data. The final sample consisted of patients' nursing notes of 7282 days (patient days). There were 3009 patient days in September and 2768 patient days in December from the university hospital and from the regional hospital 728 and 777 patient days, respectively. The data was analysed with SPSS, Excel and BeNMDS programs.

In addition, to test the equivalence reliability, double ratings of the nursing notes of 1043 patient days were performed, 453 in September and 372 in December from the university hospital. Corresponding numbers from the regional hospital were 105 and 113, in respective order. The double ratings were done both by the raters mentioned above and by trained collectors ($n = 9$) who did not work in the study wards. No power analysis to determine the sizes of the samples was performed. The samples of this research exceeded, however, well above the demands of the sample sizes described by Fercetich (1990).

Table 2
Equivalence of the BeNMDS-tool in Finland

Nursing interventions in the BeNMDS-tool	*Lambda* λ	*Pearson's r*	*Kendall's* τ
Taking care of patient's hygiene			0.50*
Taking care of patient's mobility			0.52*
Taking care of patient's excretion			0.60*
Taking care of patient's eating and drinking			0.56*
Taking care of patient's tube feeding	0.74*		
Performing special mouth care		0.76*	
Preventing patient's pressure sores by positioning		0.71*	
Dressing patient	0.16		
Taking care of patient's endotracheal or intubation tube	0.65*		
Doing patient assessment on admission	0.19*		
Instructing and teaching patient to become independent	0.17*		
Supporting patient in emotional crisis	0.00		
Taking care of disoriented patient	0.00		
Taking care of isolation	0.48*		
Observing patient's vital signs		0.67*	
Observing patient's clinical parameters		0.51*	
Taking care of patient's cast or traction	0.00		
Taking blood sample		0.64*	
Medication i.m., i.d., s.c.		0.45*	
Medication i.v.		0.75*	
Taking care of patient's continuing i.v.-infusion		0.43*	
Taking care of patient's surgical wound		0.34*	
Taking care of patient's traumatic wound (the extent of the wound)		0.52*	
Taking care of patient's traumatic wound (times of care)			0.76*

*$P < 0.05$

Stability of the BeNMDS-tool

Stability reliability is concerned with the consistency of repeated measures. Test-retest reliability was the form used to test the stability of the BeNMDS-tool in Finland. The data from the both sampling times was first analysed with a test called ridit analysis (Hassler 1980, Sermeus & Delesie 1996). The total sample ($n=7221$), without the one ward that was closed during the second sampling time, was used as a reference distribution to identify the differences between the groups. Differences between ratings and their statistical significance were analysed using the *t*-test by Delesie (Sermeus & Delesie 1996).

The differences between the ridit-values of the ratings of every nursing intervention measured in September and December in both hospitals were very slight varying from 0.001 to 0.038. The differences were however, statistically significant ($P<0.001$). This was the case also in different medical specialities in the two hospitals. The technique of the ridit analysis is said to be powerful in detecting differences, if the data is large as the case was in this research (Hassler 1980, Jansen 1984, Freund & Gary 1997). Because of the slight differences between the ridit-values the odds ratios (OR) between the samples were tested.

According to Greenberg the values of OR varying from 0.9 to 1.1 can be regarded to show good stability of a measurement tool (Sahai & Khurshild 1996). The values of OR of all the nursing interventions of the BeNMDS-tool remained inside this frame in the University Hospital. In the Regional Hospital, the values of 21 nursing interventions stayed inside this frame. The results showed good stability of the adopted BeNMDS-tool.

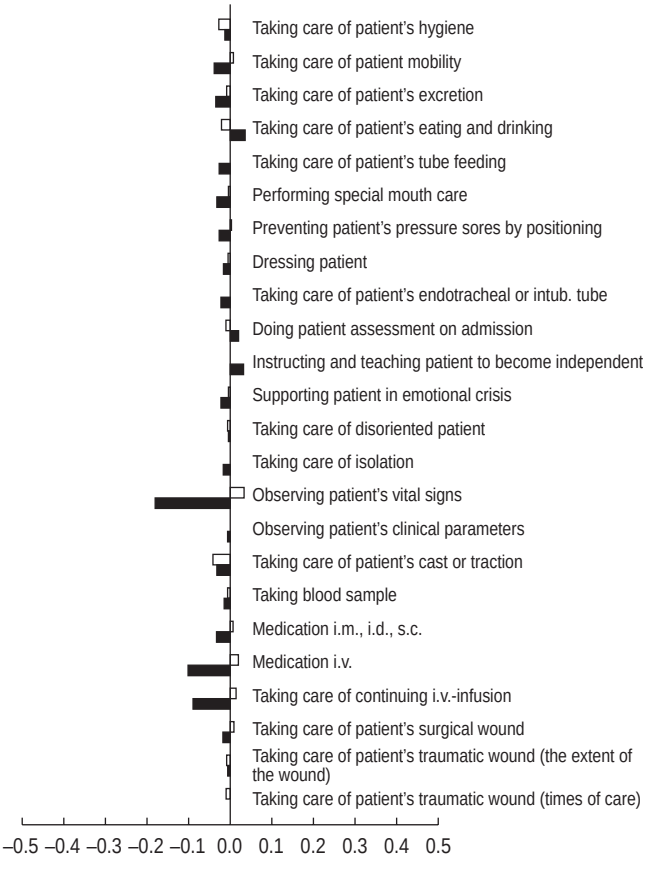

Figure 2
Comparison of the fingerprints of the nursing care in the University (white areas) and the Regional Hospital (dark areas).

Equivalence of the BeNMDS-tool

The form of the equivalence reliability to test the BeNMDS-instrument was interrater reliability. The interrater reliability test is used to study, whether two sets of ratings, measured by two individual raters, are related and the strength of their relation. For this purpose, nonparametric statistics of Lambda (λ), Kendall's tau (τ) and parametric statistic of Pearson's correlation coefficient (r) were conducted.

To evaluate the strength of the relation between the ratings, Landis' and Koch's (Dunn 1989) evaluation criteria of the strength of agreement were used. According to these the equivalence was good in seven (values varied from 0.61 to 0.80), moderate in nine (values varied from 0.41 to 0.60), fair in one (value 0.34), slight in four (values varied from 0.01 to 0.20) and poor in two interventions (values were 0.00) (Table 2). The agreement was statistically significant ($P<0.001$) in 20 interventions. According to these results of the equivalence reliability of the adopted BeNMDS-tool was mainly good.

Internal consistency and construct validity of the BeNMDS-tool

The most common test to test internal consistency of an instrument would have been the test of internal consistency with Cronbach's alpha coefficient. But because the variables of the BeNMDS-tool have mixed measurement levels, the appropriate procedure was to use nonlinear principal component analysis by means of alternating least squares, i.e. PRINCALS. (Gifi 1990, SPSS Inc. 1990, 1994). The same method was used also to test the construct validity of the tool.

Internal consistency reliability is concerned with the items comprising a tool. It examines the extent to which the items measure the same construct (Burns & Grove 1987, 1995). The tool is internally consistent to the extent that its items are intercorrelated. Thus, a measuring tool should consist of items that correlate well with each other.

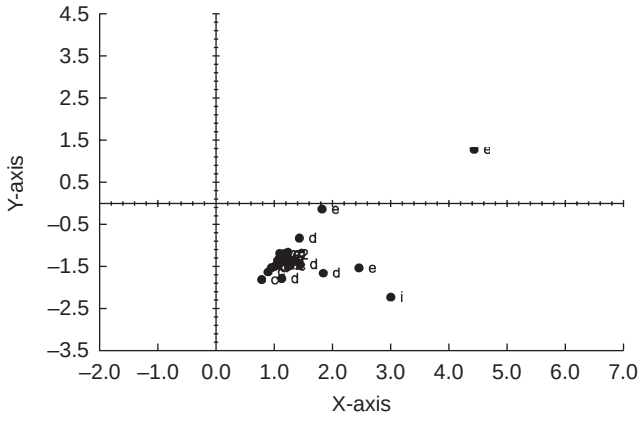

Figure 3
The picture of the Finnish nursing map. c, surgical; d, internal medicine; e, children's; g, gynaecological; i, intensive care; m, obstetrics wards.

The construct validity examines the fit between the conceptual and operational definitions of the variables.

The data from the university hospital collected during the first sampling period ($n = 3009$) was used for testing the above mentioned psychometric characteristics of the tool. The result showed that there was a strong correlation between the items of the BeNMDS-tool. The nursing interventions formed two clear groups of interventions: one was formed mainly out of the independent nursing interventions and activities of daily living, the other mainly out of the interventions that were dependent on physicians' orders. The classifications of the interventions in the first mentioned group showed the right order. Whereas, in the second mentioned group the order and also the number of the classes of the interventions were not correct. This test proved that the internal consistency and also the construct validity of most of the interventions of the adopted BeNMDS-tool were good. However, the interventions that were dependent on physicians' orders need further studies.

Sensitivity of the BeNMDS-tool

Sensitivity refers to the ability of an instrument to make discriminations of necessary fineness and to identify changes during time (Sintonen 1994). To test the sensitivity of the BeNMDS-tool in Finland the graphical presentation methods called fingerprints and nursing map (in Belgium called as a national nursing map because of the coverage) produced by the BeNMDS-program were used. The sensitivity was tested between the two Hospitals, between the different medical speciality wards in the same Hospital, between the different medical speciality wards in the two different Hospitals and between the wards in the same medical speciality.

Figure 2 presents the fingerprints for all the patients from the first sample from the both Hospitals (white bars indicating the University Hospital and dark bars the Regional Hospital). The fingerprint (histogram) describes the nursing ward according to the 23 nursing interventions: which interventions were carried out more or less in comparison with the reference ward. In Fig. 2 there are 24 interventions because the last intervention taking care of patients traumatic wound has been divided into two different interventions. On the fingerprint, the value 0.0 indicates the reference value for the corresponding nursing intervention of the reference ward. The reference ward in this research was formed from all the interventions observed during the both sampling periods. A deflection of a 'finger' to the left from the 0.0-line means that this intervention was carried out less in this ward than in the reference ward. A deflection of a finger to the right means, it was carried out more than in the reference ward. (Delesie *et al*. 1992, Vanden Boer & Delesie 1996.)

The comparison of the fingerprints of the University and Regional Hospital with each other showed differences in every nursing intervention (Fig. 2). The comparison of the fingerprints of the different medical specialities with each other in the same hospital and between the two hospitals revealed differences and also some similarities in the nursing actions between them. This was also the case between the wards of the same speciality in the same hospital and between the same speciality in the two hospitals.

The graph of a nursing map presents a summary of the information of all nursing wards in one picture. The projection technique shows the positions of every nursing ward with respect to all the other nursing wards on the bases of their fingerprints (Fig. 3). The graph shows which nursing wards are comparable to each other and which wards differ from each other according to their nursing interventions. Each nursing ward has its location on the map. By lumping together all the nursing wards the location of a nation can be obtained. In the map this represents the gravity point and forms the reference ward for comparison. The graph shows to what extent every nursing ward is typical in comparison with the reference nursing ward. Wards with identical nursing practice are located close and wards with very different nursing practice are located far from each other. (Delesie *et al*. 1992.)

The X-axis displays the degree to which nurses assist patients. A deflection to the right on the map means that nurses mainly carry out the interventions. A deflection to the left on the map means that nurses give support and instruct patients how to carry out interventions by

themselves or that the patients are independent. Theoretically this axis fits in with the Orem's theory of care levels. The Y-axis describes the nature of nursing care. When nursing interventions are mainly directed to caring, the score on the Y-axis will be positive. When the interventions are characterized mainly by diagnosing and treatment (cure), the score on the Y-axis will be negative. (Delesie *et al*. 1992.) (Fig. 3.)

The data used to test the sensitivity of the BeNMDS-tool with the 'nursing map' was from the September sampling. The map presents all 24 nursing wards in one picture; the surgical (=c), intensive care (=i), internal medicine (=d), children's (=e), gynaecological (=g), and obstetrics (=m) wards. Most of them are situated on the second quadrant of the map and nearly on the same location that made it difficult to differentiate the wards (Fig. 3). Their position tells that patients in these wards had received more 'curative', technical nursing care than caring. It shows also that the patients were not very independent but needed nurses' assistance. One of the children's wards is on the first quadrant. The patients in this ward had received more caring interventions and had been more dependent on nurses than in any other wards. With the nursing map the different wards under the study could be separated from each other. The sensitivity of the adopted BeNMDS-tool was proved to be good when tested with the fingerprints and nursing map.

Discussion

The cross-cultural adaptation process of the Belgian nursing minimum data set for use in Finland has been successfully completed. The triangulation method was used to enhance the validity of the findings (Jones 1997). The adapted version, that means the BeNMDS translated into Finnish, showed to be acceptable to nurses, and was well completed by the nurses in this study. It proved to be mainly valid, reliable and sensitive in describing Finnish nursing.

The psychometric testing of this research included two types of content validity, construct validity, stability reliability, equivalence reliability, and internal consistency reliability. These tests are the minimum standards for publishing results of psychometric testing (Norbeck 1985, Jones & Kay 1992, Leino-Kilpi *et al*. 1995).

The dissertations and the Eriksson's publications of her Nursing Process Model selected for the testing of content validity were not the most suitable for this purpose. The focus of these publications, except in two dissertations, had not been the nursing interventions. However, it was possible to test the content validity of the independent nursing interventions of the adopted BeNMDS with them. The dissertations and Eriksson's publications had not dealt with the so-called dependent nursing interventions, like patient's medication. The content validity of these nursing interventions was confirmed with the opinions of the healthcare administrators. The main emphasis of the content of the data set was on patient's physical interventions while there were no interventions in spiritual well-being and only few interventions in psycho-social well-being.

The hospitals and wards selected for the validity, reliability and sensitivity testing proved to be suitable. The values of ridit analysis did not differ significantly but their odds ratios showed the stability reliability to be good between the two applications of the adopted BeNMDS tool in the hospitals under study. The equivalence reliability of the tool was satisfactory, because in 18 interventions the level of goodness in agreement between the independent raters was moderate or better (Dunn 1989). On the other hand the results can be regarded also as poor because the correlation between the scores of two different raters were over 0.70 only in five interventions (Nunnally 1978). The equivalence reliability was best in the physical interventions. The reason for this could be that the physical interventions are usually, according to different Finnish studies (e.g. Hentinen 1984, Paunonen 1989), documented best in the nursing notes. The same trend was found also in Belgium (Sermeus *et al*. 1994). The internal consistency and at the same time the construct validity of the tool proved to be mainly good. The dependent nursing interventions will need however, further studies. Adapted version of the BeNMDS showed to be sensitive in detecting differences in nursing care between the different hospitals, wards and times.

Regardless of the mainly good psychometric characteristics of the adapted BeNMDS it remained necessary to undertake further studies to establish the content validity and the reliability of dependent nursing interventions of the Finnish version of the BeNMDS. Also the lack of the patient's spiritual interventions should be taken into consideration when the tool is further studied. These studies are currently in progress. Should the Finnish version of BeNMDS proved to be good in these studies, the availability of this tool would benefit Finnish nursing to make itself visible in information systems. This would help the healthcare administrators and managers to get valid, reliable and comparable information to manage healthcare and nursing according to the present demands – also for the part of nursing. Nursing will get a benchmarking tool to compare the nursing practice and improve its quality.

Acknowledgements

This article was based on the doctorate dissertation of Turtiainen (1999). The research was supported by grants from the Kuopio University, the Helsinki University Central Hospital and the Foundation for Municipal Development, the Finnish Federation of Nursing and the Nurse Administrator Association of Finland.

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