Revision of the Belgian nursing minimum dataset: from data to information

Walter Sermeus[a], Koen Van den Heede[a], Dominik Michiels[a], Pieter Van Herck[a], Luc Delesie[a], Jean Codognotto[b], Olivier Thonon[b], Caroline Van Boven[b], Pierre Gillet[b], Daniel Gillain[b], Nancy Laport[b], Guy Vandenboer[c], Wim Tambeur[c]

[a] *Centre for Health Services Research, Catholic University of Leuven, Belgium*

[b] *University Hospitals Liège (CHU-Liège), Belgium*

[c] *University Hospitals Leuven, Belgium*

Summary

The Ministry of Public Health commissioned a research project to the Catholic University of Leuven and the University Hospital of Liège to revise the Belgian Nursing Minimum Dataset (B-NMDS). The study started in 2000 and will end with the implementation of the revised B-NMDS in January 2007. The study entailed four major phases. The first phase involved the development of a conceptual framework based on a literature review and secondary data analysis. The second phase focused on language development and development of a data collection tool. The third phase focused on data collection and validation of the new tool. In the fourth phase the validity and reliability of the dataset was tested. The new dataset is without avail if it is not leading to new information. Four applications of the dataset has been defined from the beginning: evaluation of the appropriateness of stay (AEP) in the hospital, nurse staffing, hospital financing and quality management. The aim of this paper is to describe how the B-NMDS can contribute to each of these applications.

Keywords

Nursing minimum data set, diagnosis related groups, appropriate evaluation protocols, nurse staffing, patient outcomes

From concept to data

The Ministry of Public Health commissioned a research project to the Catholic University of Leuven and the University Hospital of Liège to revise the Belgian Nursing Minimum Dataset (B-NMDS) [1-2]. The study started in 2000 and will end with the implementation of the revised B-NMDS in January 2007. The study entailed four major phases. The first phase (June until October 2002) involved the development of a conceptual framework based on a literature review and secondary data analysis. The Nursing Interventions Classification (NIC) was selected as a framework for the revision of the original B-NMDS [3]. The second phase (November 2002 until September 2003) focused on language development for six care programs (cardiology, oncology, geriatrics, pediatrics, intensive care, chronic care) evaluated by panels of clinical experts ($N = 75$). A draft instrument with 92 variables using the NIC was developed. This led to an alpha version of a revised B-NMDS. The third phase (October 2003 until December 2004) focused on data collection and validation of the new tool. The revised B-NMDS (alpha version) was tested in 158 nursing wards in 66 Belgian hospitals from December 2003 until March 2004. This test generated data for some 95,000 in-patient days. The interrater reliability of the revised B-NMDS was assessed. The criterion-related validity of the revised B-NMDS was

1

compared to that of the original B-NMDS. The discriminative power of the revised B-NMDS was studied to select only the most relevant variables for data collection. This resulted in a beta version of the revised B-NMDS in December 2004. The records of the revised B-NMDS were linked to the Hospital Discharge Dataset and other mandatory datasets to integrate the revised B-NMDS into the overall healthcare management system. In the fourth phase (January 2005 until December 2005) the validity and reliability of the dataset was tested in 51 medical-surgical and 22 maternity wards in 42 Belgian hospitals in March 2005 leading to a NMDS-II version in September 2005.

From data to information

The new dataset is without avail if it is not leading to new information. At the very start of the project 75 clinical experts selected four applications as the priorities of the revised B-NMDS. A first application is the incorporation of nursing data in the evaluation of the appropriateness of stay (AEP) in the hospital. Research reveals that 80% of inpatient stays is explained by nursing care [4]. A second application is the calibration of the NMDS to nurse staffing (FTE and qualification). A third application is the development of nursing profiles per DRG by linking the hospital discharge dataset and the NMDS. A fourth application is the use of these nursing data for quality management. An example is the linking of nurse staffing levels with adverse event rates from the hospital discharge dataset [5]. These four applications were addressed by different grants. The AEP-study was granted in 2002 to the U. Liège by the Federal Ministry of Public Health. Linking nurse staffing and outcomes was granted in 2005 to the Catholic University Leuven by the Federal Ministry of Science Policy. The use of the NMDS for hospital financing is granted to a research consortium from the Catholic University Leuven, the University Hospitals Leuven and the University of Liège by the Federal knowledge Centre for Healthcare..

Appropriate Evaluation Protocols (AEP)

Although healthcare systems in Europe and the USA are quite different, they share the same concern to the use of scarce resources. A key element in this evaluation is the appropriateness of admission and stay in the hospital. One of the instruments most frequently used to evaluate appropriateness of inpatient stays [6] is the Appropriate Evaluation Protocol '(AEP) Studies using AEP show that 6-24% of admissions and 12 à 39% of inpatient days could be inappropriate [7]. The study of the U. Liège consists in evaluating AEP in Belgian Healthcare and to explore if AEP-data could not be derived from routinely collected data such as Hospital Discharge and Nursing Minimum Datasets. The AEP-protocol consists of three types of criteria: medical, nursing and patient.

In the study, nurses and doctors were asked to evaluate the appropriateness of admission and stay in the hospital. A Belgium AEP-instrument was developed consisting of 9 medical, 8 nursing and 9 patient criteria. The instrument was validated and tested in various settings and phases. At the same time, the data were compared with information from the hospital discharge dataset and NMDS. The study reveals that in more than 70% of inpatient stay, appropriateness was given by nursing criteria. Medical criteria explained 43%; patient criteria explained 20%. There is a high correlation of AEP (nursing) with the NMDS, although that there is probably an underreporting of the NMDS, giving the larger number of false negatives in the sample.

Nurse staffing

There is a definite need for more pinpointed information to guide staffing decisions. The analyses of the core-dataset shows three major dimensions of nursing care: Self-care versus intensive care; basic care versus technical care; education of patients and family.

To calibrate these dimensions towards the required staffing a Delphi approach will be used. The research team will select approximately 100 cases typifying the three dimensions of nursing care, based on data-analyses. The nursing care of each case is described based on the B-NMDS data. A panel of experts (N=40) will asked to reach consensus about the required patient to nurse ratio per case.

A first pilot study [8] to test this methodology was done on one-day clinics. 18 different cases were described using the existing NMDS-II vocabulary. These cases were given to a panel of 12 experts, mainly head nurses from one-day clinics in Belgian hospitals. The cases were grouped in 6 different nursing profiles, with 3 replicates each. Cases were described with and without context such medical diagnoses, age of

patient. Half of the panelists got the cases with context, half of the panelists got them without context info. Group allocation was randomized. Using a cross-over design, each panelist received 9 cases with and 9 cases without context info. Three rounds of Delphi were conducted. In the first round, every rater has to rate the cases independently. In the second round, each rater received feedback about the scores of other raters and could revise his/her score. In the last round, all raters met and could discuss their scores. If possible, a consensus could be reached. The results confirmed the validity of the methodology. Replicate cases were scored more similar than different cases. The scores were in line with what was expected from the nursing profiles. There was no significant difference in cases with and cases without context. This implies that nurse staffing is indeed more related to nursing care than to context. Although there were large differences among raters about patient-to-nurse ratios for the different cases, the scores were converging to consensus when proceeding in the Delphi-procedure. The study ended with two nurse staffing profiles for one-day clinics, based on NMDS.

Linking NMDS with DRGs for hospital financing

The B-NMDS records are technically linked with the hospital discharge dataset. The challenge is to link the nursing data with Diagnosis Related Groups (DRGs) in a logical and meaningful way. We also aim to measure the variability of nursing care per DRG. Most applications on linking DRGs and nursing data result in a relative nursing cost-weight per DRG. The problem is that there is a high variability of nursing care per DRG per day of stay, what makes an average cost-weight difficult to use. A patient with an extended hospital stay will have another nursing activity pattern on a given day than a patient who is recovering extremely well and is staying just a few days. The link between length-of-stay and nursing care should be investigated more precisely. In Belgium, the data collection design gives an extra complication. The hospital discharge dataset is collected for all patients on the day of discharge. The NMDS is collected cross-sectional during a sample of 4 times 15 days a year. This design permits a sample of 16,6% of all inpatient days and 25% of all admissions. A drawback is that only 12% of all stays are completely documented from admission to discharge. The implementation of

electronic patient records will probably help to solve this issue. Given these limitations, the approach will be tested on a set of high-volume APR-DRGs. Identifying the key medical events and mapping the nursing data in this clinical timeframe, are key for evaluating each hospital's care processes. The analysis holds the evaluation of the consistency/variability of the nursing activity per day of stay, the degree of redundancy/uncertainty embedded in the B-HDDS and revised B-NMDS datasets and the degree that both datasets allow meaningful monitoring of the whole care process. The study will help to understand how medical and nursing data interrelate. This understanding will be integrated in the final revised B-NMDS and probably lead to new applications for healthcare policy and management.

Linking NMDS with quality management

The open-ended framework of the revised B-NMDS provides possibilities to include variables for quality management (pressure sore prevention, discharge planning, ..). The link with the B-HDDS gives the opportunity to define nurse staffing sensitive patient outcomes (urinary tract infections, hospital acquired pneumonia, pressure ulcers, ..) based on ICD-9-CM coding rules, conform the international literature [9]. Additionally linking the B-NMDS with the B-HDDS offers the opportunity to relate patient problems with nursing interventions. The fact that the revised B-NMDS is based on NIC provides opportunities to link nursing activities to patient problems [10]. The interventions of the Nursing Interventions Classification (NIC) are linked to the Nursing Diagnoses of the NANDA-classification (North American Nursing Diagnosis). Although there is a different focus, 50% of all nursing diagnoses from NANDA correspond in some extent to one or several ICD-codes. Other NANDA diagnosis can't be deducted from the B-HDDS at all. Linking nursing interventions with patient problems, can bring up indicators evaluating the appropriateness of the performed nursing activities.

Discussion and conclusions

Data are useless if they are not leading to information, knowledge and decision making. The project aimed to follow this ideal way of tracking back from decision making to data. Four applications were defined in the beginning of the

project and the dataset is developed to support these applications. It is however very difficult to accomplish in practice. The project focused primarily in collecting the data in a reliable way. We know that the dataset, under its current form, is probably too large because the application tools, in which the data are used, are not developed yet. Several rounds of data-information cycles will be necessary to indicate which variables are really needed to support the information-applications.

References

[1] Sermeus W., L. Delesie, K. Van den Heede, Updating the Belgian Nursing Minimum Data Set: Framework and Methodology. In Roger France, F.H., Hasman, A. De Clerq, E. & De Moor, G. E-Health in Belgium and in the Netherlands: Proceedings of MIC 2002 (89-93). Amsterdam: IOS Press, 2002

[2] Sermeus, W., Van Den Heede, K., Michiels, D., Delesie, L., Van Boven, C., Thonon, O., Codognotto, J., Gillet, P. A nation-wide project for the revision of the Belgian Nursing Minimum Dataset: from concept to implementation, International Journal of Medical Informatics (in press).

[3] McCloskey J.C., G.M. Bulechek, M.C. Craft-Rosenberg, J. Daley, J. Denehey, O. Glick et al. Nursing Interventions Classification (NIC) - second edition. St. Louis: Mosby-Year Book, Inc., 1996.

[4] Gillet P, Gillain D, Fontaine P. Jacques J, Politique d'admission justifiée dans le secteur hospitalier, rapport final phase II, Avril 2004, 109pp.

[5] Van den Heede K, Sermeus W, Vleugels A, Adverse events in Belgian acute hospitals: retrospective analysis of the National Belgian hospital discharge dataset (submitted for publication)

[6] Payne SM. Identifying and managing inappropriate hospital utilization/a policy synthesis. Health Serv Res 1987;22:709-69.

[7] Smeets P, Verheggen F, Pop P, Panis L et Carpay J. Assessing the necessity of hospital stay by means of the Appropriateness Evaluation Protocol: how strong is the evidence to proceed? Int J Qual Health Care 2000;12(6):483-93.

[8] Janssens A, Sermeus W, Van den Heede K, Michiels D, Inschatting van de bestaffingsbehoeften op dagziekenhuizen op basis van verpleegkundige zorgprofielen, thesis licentiaat medisch-sociale wetenschappen, 2005

[9] Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. N Engl J Med 2002; 346(22):1715-1722.

[10] Johnson M, Bulechek G, McCloskey Dochterman J, Nursing Outcomes Classification 2e, Nursing Interventions Classification 3e and Nursing Diagnoses: NANDA, NOC and NIC Linkage Package, Mosby, 2003

Address for correspondence

Walter Sermeus, RN, PhD
Centre for Health Services & Nursing Research
Kapucijnenvoer 35
B-3000 Leuven
Belgium
e-mail: walter.sermeus@med.kuleuven.be