

A Proposal for an Austrian Nursing Minimum Data Set (NMDS)

A Delphi Study

R. Ranegger¹; W.O. Hackl²; E. Ammenwerth²

¹Steiermärkische Krankenanstaltengesellschaft m.b.H., Management / Pflege, Austria;

²Institute of Health Informatics, UMIT – University for Health Sciences, Medical Informatics and Technology, Hall in Tirol, Austria

Keywords

Nursing minimum data set, minimal data set, nursing informatics, health statistics, Austria

Summary

Objective: Nursing Minimum Data Sets can be used to compare nursing care across clinical populations, settings, geographical areas, and time. NMDS can support nursing research, nursing management, and nursing politics. However, in contrast to other countries, Austria does not have a unified NMDS. The objective of this study is to identify possible data elements for an Austrian NMDS.

Methods: A two-round Delphi survey was conducted, based on a review of available NMDS, 22 expert interviews, and a focus group discussion.

Results: After reaching consensus, the experts proposed the following 56 data elements for an NMDS: six data elements concerning patient demographics, four data elements concerning data of the healthcare institution, four data elements concerning patient's medical condition, 20 data elements concerning patient problems (nursing assessment, nursing diagnoses, risk assessment), eight data elements concerning nursing outcomes, 14 data elements concerning nursing interventions, and no additional data elements concerning nursing intensity.

Conclusion: The proposed NMDS focuses on the long-term and acute care setting. It must now be implemented and tested in the nursing practice.

Correspondence to:

Renate Ranegger
Steiermärkische Krankenanstaltenges.m.b.H.,
Management / Pflege
Stiftingtalstraße 4–6
8010 Graz, Austria
Austria
E-mail: renate.ranegger@kages.at

Appl Clin Inform 2014; 5: 538–547

<http://dx.doi.org/10.4338/ACI-2014-04-RA-0027>

received: April 4, 2014

accepted: April 30, 2014

published: June 4, 2014

Citation: Ranegger R, Hackl WO, Ammenwerth E. A proposal for an austrian nursing minimum data set (NMDS): A Delphi study. Appl Clin Inf 2014; 5: 538–547 <http://dx.doi.org/10.4338/ACI-2014-04-RA-0027>

Introduction

For the management of a continuously changing healthcare system, standardized healthcare data are needed. Although a number of systematic collections of healthcare data exist (such as cancer registers, trauma registers), nursing data are usually not contained in these systems [1].

Therefore some countries such as Belgium [2] have started to introduce a nursing minimum data set (NMDS) to collect specific nursing information. A nursing minimum data set is defined as “a minimum data set of items of information with uniform definitions and categories concerning the specific dimension of nursing, which meets the information needs of multiple data users in the health care system” [3]. The international experiences with NMDS have demonstrated that by using NMDS, nursing data can be compared across clinical populations, settings, geographical area, and time [4, 5]. NMDS support several purposes, such as: to describe the diversity of different populations for nursing care [5], to support clinical and managerial services and to inform policy [6], to describe the variability of nursing care practice, to support the distribution of funds, to support benchmarking of nursing quality indicators, to support human resources planning, to allow trend analyses regarding nursing care, and to support the quality assurance of nursing care [7] on an individual level or an institutional level [2].

Several countries have developed national NMDS – a detailed review is provided in [7]. In addition, the International Medical Informatics Association, Nursing Informatics Special Interest Group (IMIA NI-SIG) and the International Council of Nurses (ICN) are supporting a project to develop the international Nursing Minimum Data Set (i-NMDS). The i-NMDS project focuses on coordinating international data collection and analyses of nursing information to support the description, study, and improvement of nursing practice. The intent is to describe nursing care around the world in a comparable manner [8]. In Austria, a national NMDS does not exist yet, and it is unclear which nursing data should be included in this NMDS when taking into account international developments but also reflecting national needs. Due to the lack of an Austrian NMDS, comparisons of nursing data to support the above-mentioned purposes on a national basis have not been possible until now. The nursing minimum data sets of other countries seem not easily transmittable to Austria because of the many differences in the healthcare systems as well as the legislation or the cultural applicability [7].

The objective of this study is to identify data elements to be included in an Austrian NMDS.

Methods

Various methods have been used to develop other NMDS, including inputs from experts, reviews of academic literature, and analysis of clinical documents [9, 10]. For this study, a two-round Delphi design based on expert interviews and a focus group was chosen, representing a Delphi Type 3 according to Häder [11]. This study was conducted from November 2012 to December 2013.

Identification of Experts

The experts were identified by using the method of a “predetermination” selective sampling [12]. Austrian experts were selected based on their complementing areas of expertise in nursing science, nursing management, nursing education, and nursing data analysis to combine different points of view and analysis strategies for the planned Austrian NMDS. 21 experts were identified by brainstorming in the research team, 12 further experts were recommended by the 21 initially contacted experts. All experts were contacted and asked to take part in an interview. Overall, 22 experts agreed to participate.

Nine of the included experts were nurse managers, two were nursing educators, three were nursing scientists, two were governmental or health policy representatives, four were information systems or health records specialists, and two were quality management representatives.

Expert Interviews

In the first round of the Delphi survey, all 22 experts were interviewed in the form of a qualitative “expert interview” by Meuser & Nagel [13, 14]. Based on our literature review [7] of available NMDS in other countries, a semi-structured interview guideline was developed, tested, and adapted. The guideline comprised the following elements: possible objectives of an Austrian NMDS, possible data elements of an Austrian NMDS, and possible analysis of these data elements.

All participants were interviewed by personal or phone interview by one researcher (RR). The 22 interviews were recorded using an audio recorder and, in addition, interview postscripts were made.

The 22 recorded interviews were transcribed literally based on the methodology by Kuckartz et al. [15]. The resulting 245 text pages and the postscripts were interpreted by using the qualitative content analyses as described by Mayring [16] using MAXQDA [17]. A combination of deductive and inductive techniques was used [18, 19]. Each interview transcript was analyzed line by line, with the aim of identifying data elements to be included in an NMDS, as seen by the interviewed expert. In a first step, this analysis was performed in a deductive way: data elements mentioned in the interviews were assigned to a list of predefined categories of possible NMDS data elements that had been identified before in a systematic literature review [7].

Then two members (RR, WH) of the research team again read five transcripts to inductively identify additional categories of data elements mentioned in the interviews that could not be assigned to the predefined list. When the identified categories were stable and no new categories were found, one researcher (RR) analyzed the remaining 17 interviews. In either instance, after processing of 20–30% of the material, the categories were rechecked for formative reliability as described in Mayring [20]. In the final phase, the identified categories were discussed, concerted, and refined again by two researchers. The results were checked to the original transcripts to identify possible misinterpretations. Finally, even when not mentioned in the interviews, data elements could be added to the list in case they were identified in the literature review [7] as an important element. As a result of the interviews, a list of possible data elements for an Austrian NMDS was generated.

Focus Group

As a second step of the Delphi study, a focus group was conducted [21, 22]. Focus groups can generate complex information with a wide range of people from different settings. They are particularly useful for exploring people’s knowledge [23]. A focus group interview was considered useful to validate the findings from the expert interviews and to refine the generated list of data elements through consensus-building work with experts and nursing stakeholders. A total of five nurse experts that had participated in the interviews and represented different points of views on NMDS were selected and invited, namely a nurse manager, a nurse educator, a nurse scientist, a health records specialist, and a quality management expert.

One member (RR) of the research team served as moderator of the focus group. A discussion guideline was developed that summarized the results of the expert interviews (see above), namely possible data elements for an Austrian NMDS clustered into six categories: data of the institution, patient demographics, nursing care elements, quality indicators, medical care elements, and patient case characteristics. The group discussion was recorded.

First, in the focus group, the wording and meaning of the data elements identified from the interviews were discussed and validated to remove any ambiguity.

In a second step, the participants were asked to rate each element based on a two-point rating scale regarding usefulness of each element for an Austrian NMDS (1 = useful or 0 = useless) and feasibility of each element (1 = feasible or 0 = not feasible). Usefulness refers to the question whether the given element should be contained in the NMDS. Feasibility refers to the question whether healthcare institutions would indeed be able to deliver the requested element for all patients in a standardized way to an NMDS. The individual ratings were discussed in the focus group. Different opinions, such as the usefulness of data on behavioral problems or nosocomial infections, were clarified in a consensus process. A data element was included in the NMDS proposal if at least three (of the five) participants rated the data element as useful (consensus value ≥ 3). The opinions about

feasibility were also discussed; although the ratings were not decisive for inclusion in the NMDS, they were used as important information for further NMDS development.

Results

In the individual expert interviews, 149 possible data elements for an Austrian NMDS were identified, organized into 7 categories. In the focus group, this list could be reduced to 56 data elements judged as “useful”, organized into 4 categories. All 56 data elements have a consensus value ≥ 3 in terms of usefulness. An overview of the categories is presented in ► Figure 1. Details of each category are presented in the following sections.

Categories 1–3: Patient Demographics, Data of the Institution, and Medical Care Elements

Three categories, which are not directly related to nursing care, were identified. These categories – data of the institution, patient demographics, and medical care elements (see ► Table 1, Categories 1–3) – provide useful background and contextual data for an NMDS. These data elements allow analysis of patient subgroups defined by e.g. age, sex, institution, ward, or medical diagnoses. The data elements regarding institution and patient demographics are also presented as important in the literature [e.g. 7]. In contrast, the medical care elements are often part of a separate medical minimum data set [3]. Our experts consider medical data elements as an important category of an NMDS, as they allow, among other things, the comparison of nursing care in patient subgroups.

The data elements of Categories 1–3 can be collected once per hospitalization. Only the performed medical procedures and medications have to be collected several times over the entire hospitalization.

Category 4: Nursing Care Elements

Forty-two nursing care elements were identified as important NMDS elements concerning the nursing care process. These data elements comprise patient problems as described in nursing assessment and nursing diagnosis, as well as nursing outcomes, performed nursing interventions, and nursing intensity (see ► Table 1, Category 4).

Patient Problems

The experts suggested 20 data elements on patient problems for an Austrian NMDS. The first 11 elements describe results related to the activities of living typically coming from the nursing assessment. Participants agreed that especially cognitive problems, for example *confusion* (No. 24 in ► Table 1), are particularly important factors because they influence nursing workload. Other less specific data elements are grouped together into general concepts such as “Functional problems with activities of living” (No. 16). The experts recommended that patient problems are documented both during admission and again during discharge – it would then be possible to compare the patient’s conditions.

Four data elements (Nos. 26 and 29 in ► Table 1) illustrate patient problems that are usually documented in a risk assessment. This information – particularly about risk for pressure ulcer and risk for falls – was found to be useful for developing a risk-adjusted quality indicator. The inclusion of two of these data elements in the NMDS, namely risk for malnutrition and dehydration, was discussed controversially by participants because these are interdisciplinary topics. Risk assessments and nursing diagnosis should be collected over the entire hospitalization because these events can occur at any time.

Nursing Outcomes

Eight nursing outcomes were proposed useful for an NMDS (► Table 1). From the perspective of the participants, the four data elements of restraints, patient falls, pressure ulcer, and physical well-being

should be contained in an NMDS (consensus value 5), although physical well-being seems difficult to capture in an NMDS. Four identified nursing outcomes (restraints, patient falls, pressure ulcer, and nosocomial infection) are equivalent to the ten nursing-sensitive quality indicators of the American Nurses Association (ANA) [24]. The element nosocomial infection, which is rated with a consensus value of 3 by participants and also listed by ANA, has also been extensively discussed by participants because of their more medical-oriented focus.

Participants agreed that nursing outcomes should be collected on discharge to be able to describe nursing events during the hospital stay.

Nursing Interventions

A total of 14 nursing interventions were proposed for an Austrian NMDS. Indirect interventions such as taking telephone calls or discharge planning were considered relevant for assessment for nursing workload but difficult to be captured and thus not really feasible.

Direct interventions carried out by a nurse are conducted in direct contact with a patient, for example “care related to mobility”. In contrast to patient problems or nursing outcomes, according to the participants, nursing interventions should be collected over the entire hospitalization.

Nursing Intensity

All experts considered that resource allocation for nursing staff depends on the intensity of nursing care. The experts found, however, that no specific data elements regarding nursing intensity were needed, as nursing intensity can be described by a mix of medical characteristics, nursing diagnosis, and nursing interventions (compare [6], [25]), all this being already included in the described NMDS elements. Thus no further data elements seem to be required here.

Discussion

An Austrian NMDS should reflect the variability of the patient populations and nursing activities by offering the following 56 data elements:

- date stamp of the generated NMDS dataset,
- four data elements concerning data of the institution,
- six data elements concerning patient demographics,
- four data elements concerning patient’s medical condition,
- 20 data elements concerning patient problems,
- eight data elements concerning nursing outcomes, and
- 14 data elements concerning nursing interventions.

For nursing intensity, no additional data elements were found to be needed because the proposed NMDS contains sufficient information regarding this aspect.

This study was an essential first step toward developing a proposal for an Austrian NMDS. There are some limitations to the current study. The first limitation is the identification of the experts for the data collection. A selection bias both in the interviews and the focus group could have influenced the results, even though we tried to find experts from various professional fields and regions. Also, not all included experts had detailed knowledge of an NMDS. A part of the interviews was thus spent on giving an introduction into the motivation and content of an NMDS. As a strength, the combination of individual interviews with a focus group was found to be useful, as the group discussion gave important additional insight into usefulness, feasibility, and context of the chosen NMDS elements. This multi-stage method for developing an NMDS is also recommended in the literature [e.g. 4, 26].

Comparing these results to international nursing minimum data sets, there are some similarities but also some differences. The number of data elements is lower when compared to the NMDS for the Netherlands and Ireland, where each NMDS has over 100 data elements [e.g. 6, 27]. These differences in the number of elements can be traced back to the various granularities, the characterization of each data element, and the associated objectives of the NMDS. Nevertheless, most of the patient problems and nursing outcomes of international NMDS [7] are similar to the patient problems and

nursing outcomes identified in this study. Additionally, most nursing intervention elements that are included in the Belgian Nursing Minimum Data Set II (B-NMDS II) [8, 28] were also identified in our study. However, B-NMDS II only includes nursing interventions [2], while our Austrian NMDS proposal also integrates patient problems and nursing outcomes. A completely different approach is taken by the NMDS from the United States. The US-NMDS uses 16 data elements but an unlimited set of all possible patient problems, nursing interventions, and nursing outcomes. It thus allows a free choice of nursing classification [29].

The described differences between international NMDS imply that international comparisons among various NMDS are difficult. Comparisons are only possible when all data elements and underlying concepts are comparable and the data collection methods are consistent, which is not the case today. Nevertheless, in order to be partly comparable, high-quality NMDS can be used for parts of the Austrian NMDS. For example, B-NMDS II is a valid and reliable instrument [30] that could be used for the collection of nursing interventions as part of an Austrian NMDS.

The focus of this proposed Austrian NMDS was, among other things, to describe the diversity of patient populations and the variability of nursing interventions, and to allow a determination of the nursing workload that is related to nursing care. Even if the selected experts were specialists from different clinical settings, the current NMDS proposal focuses on the long-term and inpatient care setting. No pediatrics, maternity, or psychiatric specialists were included in the sample, and outpatient settings were not considered.

As a next step, before the proposed NMDS can be introduced in practice, the nursing data elements need to be operationalized and tested. Thus, valid assessment instruments and scoring systems need to be chosen for patient problems or nursing outcomes, and lists of nursing interventions need to be chosen or developed. The test will have to verify whether data elements are sufficiently clear and feasible, or whether additional patient problems, nursing interventions, and/or nursing outcomes need to be included.

During these tests, special emphasis will be on the question of how routine nursing data, often comprising free text, can be sufficiently standardized to be included in an Austrian NMDS. In addition, routine nursing data, especially for nursing diagnosis, interventions, and outcomes, even when documented in a standardized form, may need to be mapped to the terminology chosen for the Austrian NMDS. Here, semantic mappings of used nursing terminologies will be necessary [7]. One idea is to map specific terminologies with the reference terminology ICNP®, as recommended in the international literature [e.g. 31, 32].

Next, for a successful introduction in Austria, it is important to regulate the NMDS strategy by law, such as experiences from Belgium show [33]. Finally, the suggested testing of the proposed NMDS is necessary to establish its value for supporting policy making and for nursing practice.

Clinical Relevance

After further development of an Austrian NMDS, the instrument will make nursing activities and outcomes more visible. This will improve the access of healthcare administrators and managers to information to better manage healthcare and nursing according to the present demands. In addition, nursing management will get a benchmarking instrument and will be able to compare nursing practice between organizations and further improve its quality.

Conflict of Interest

The authors declare that they have no conflicts of interest in the research.

Human Subjects Protections

The procedures used have been reviewed in compliance with ethical standards of the responsible committee on human experimentation.

Acknowledgments

We would like to thank all the experts who participated in this study.

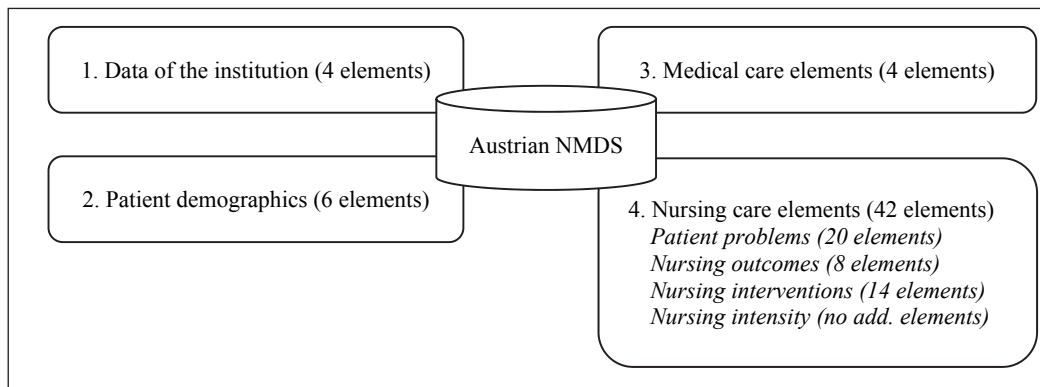


Fig. 1 Categories with the 56 data elements for an Austrian NMDS identified by expert interviews and the focus group

Table 1 Proposal for an Austrian NMDS (56 data elements) as part of an Austrian NMDS with elements identified by expert interviews and a focus group; numbers (a/b) indicate usefulness (a) and feasibility (b) as consensus value of five experts.

Category 1: Data of the institution (4 elements)	
1. Institution name (5/5), 2. Ward (5/4), 3. Specialty (3/5), 4. Location (3/5)	
Category 2: Patient demographics (6 elements)	
5. Unique patient code (pseudonymized) (3/2), 6. Age (5/5), 7. Sex (5/5), 8. Patient place of residence (region) (3/4), 9. Admission date (5/5), 10. Discharge date (5/5)	
Category 3: Medical care elements (4 elements)	
11. Admission diagnosis (4/4), 12. Discharge diagnosis (4/4), 13. Performed medical procedures (3/4), 14. Medication (3/2)	
Category 4: Nursing care elements	
a) Nursing problems (20 elements)	
Nursing assessment	15. Nursing and medical history (4/3); 16. Functional problems with activities of living (4/5); 17. Self-care limitations (4/5); 18. Washing and dressing (4/5); 19. Eating and drinking (3/5); 20. Mobilization (5/5); 21. Excretion (5/5); 22. Pressure ulcer (5/5); 23. Pain (4/3); 24. Cognitive problems (5/3); 25. Behavioral problems (3/1)
Risk assessment	26. Risk for pressure ulcer (3/4); 27. Risk for falls (3/4); 28. Risk for malnutrition (3/2); 29. Risk for dehydration (3/2)
Nursing diagnosis	30. Maintaining a safe environment (5/5); 31. Eating and drinking (5/5); 32. Excretion (5/5); 33. Washing and dressing (5/5); 34. Mobilization (5/5)
b) Nursing outcomes (8 elements)	
35. Restraints (5/5); 36. Patient falls (5/5); 37. Total parenteral feeding (4/4); 38. Intertrigo (4/4); 39. Pressure ulcer (5/5), 40. Pain controlled (4/4), 41. Nosocomial infection (3/4); 42. Physical well-being (5/1)	
c) Nursing interventions (14 elements)	
43. Care relating to hygiene (5/4); 44. Care relating to mobility (5/4); 45. Care relating to excretion (5/4); 46. Care relating to feeding (5/4); 47. Tube feeding (5/4); 48. Decubitus prevention care (4/5); 49. Fall prevention care (4/5); 50. Assistance in getting dressed (5/4); 51. Care relating to cognitive problems (3/2); 52. Care relating to mental health problems (3/2); 53. Administration of medication (3/3); 54. Wound care (3/3); 55. Indirect interventions (3/1); 56. Care relating to behavioral (5/3)	

References

1. Leiner F, Gaus W, Haux R, Knaup-Gregori P, Pfeiffer KP, Wagner J. Medizinische Dokumentation, Grundlagen einer qualitätsgesicherten integrierten Krankenversorgung. 6th ed. Kempten/Allgäu: Schattauer; 2011.
2. Sermeus W, van den Heede K, Michiels D, Delesie L, Thonon O, Van Boven C, Codognotto J, Gillet P. Revising the Belgian Nursing Minimum Dataset: from concept to implementation. *Int J of Med Inform* 2005; 74(11–12): 946–951. PubMed PMID: 16153887.
3. Werley HH, Devine EC, Zorn CR, Ryan P, Westra BL. The Nursing Minimum Data Set: abstraction tool for standardized, comparable, essential data. *Am J Public Health* 1991; 81(4): 421–426. PubMed PMID: 2003618.
4. Sermeus W, Goossen WT. A nursing minimum data sets. In: Mantas J, Hasman A, editors. *Textbook in health informatics*. Amsterdam: IOS Press; 2002. p. 98–109.
5. Goossen WT, Epping PJ, Feuth T, Dassen TW, Hasman A, van den Heuvel WJ. A comparison of nursing minimal data sets. *J Am Med Inform Assoc* 1998; 5(2): 152–163. PubMed PMID: 9524348.
6. Goossen WT, Epping PJ, Van den Heuvel WJ, Feuth T, Frederiks CM, Hasman A. Development of the Nursing Minimum Data Set for the Netherlands (NMDSN): identification of categories and items. *J Adv Nurs* 2000; 31(3): 536–547. PubMed PMID: 10718872.
7. Ranegger R, Ammenwerth E. Nursing Minimum Data Sets (NMDS) – eine Literaturübersicht bezüglich Zielsetzungen und Datenelemente. *Pflege*. In press 2014. German.
8. University of Minnesota [Internet]. Minneapolis: i-NMDS (International Nursing Minimum Data Set) [updated 2013 Aug 12; cited 2014 Mar 13]. Regents of the University of Minnesota. Available from: <http://www.nursing.umn.edu/icnp/i-nmlds/>
9. Mac Neela P, Scott PA, Treacy MP, Hyde A. Nursing minimum data sets: a conceptual analysis and review. *Nurs Inq* 2006; 13(1):44–51. PubMed PMID: 16494666.
10. Kleib M, Sales A, Doran D, Mallette C, White D. Nursing Minimum Data Sets. In: Doran DM, editors. *Nursing outcomes: The state of the science*. 2nd ed. Sudbury: Jones & Bartlett; 2011. p. 487–511.
11. Häder M. Delphi-Befragungen. Ein Arbeitsbuch. 2nd ed. Wiesbaden:Verlag für Sozialwissenschaften; 2009.
12. Mayer HO. Interview und schriftliche Befragung. Grundlagen und Methode empirischer Sozialforschung. 6th ed. München:Oldenbourg Verlag; 2012.
13. Meuser M, Nagel U. ExpertInneninterviews – vielfach erprobt, wenig bedacht: ein Beitrag zur qualitativen Methodendiskussion. In: Garz D, Kraimer K, editors. *Qualitativ-empirische Sozialforschung: Konzepte, Methoden, Analysen*. Opladen:Westdeutscher Verlag; 1991. p. 441–471.
14. Meuser M, Nagel U. Das Experteninterview – konzeptionelle Grundlagen und methodische Anlage. In: Pickel S, Pickel G, Lauth HJ, Jahn D, editors. *Methoden der vergleichenden Politik- und Sozialwissenschaft*. Wiesbaden:Verlag für Sozialwissenschaften; 2009. p. 465–479.
15. Kuckartz U, Dresing T, Rädiker S, Stefer C. *Qualitative Evaluation – Der Einstieg in die Praxis*. 2nd ed. Wiesbaden:Verlag für Sozialwissenschaften; 2008.
16. Mayring P. *Qualitative Inhaltsanalyse. Grundlagen und Techniken*, 11st ed. Weinheim/Basel:Beltz Verlag; 2010.
17. maxqda.de[Internet]. Berlin: MAXQDA – The Art of Data Analysis; c1995–2014 [cited 2013 Nov 26]. Available from: <http://www.maxqda.de/>
18. Buber R, Holzmüller HH. *Qualitative Marktforschung. Konzepte – Methoden – Analysen*. 2nd ed. Wiesbaden: Gabler Verlag; 2009.
19. Mayring P. Kombination und Integration qualitativer und quantitativer Analyse. *Qualitative Social Research*. 2001 [cited 2013 Nov 26];2(1):[about 1 p.]. Available from: <http://www.qualitative-research.net/index.php/fqs/article/download/967/2111>
20. Mayring P. Qualitative Inhaltsanalyse. *Qualitative Social Research*. 2000 [cited 2013 Nov 30];1(2):[about 1 p.]. Available from: <http://www.qualitative-research.net/index.php/fqs/article/view/1089/2383>
21. Krueger R, Casey M. *Focus Groups. A Practical Guide for Applied Research*. 4th ed. Thousand Oaks: SAGE Publication; 2009.
22. Lamnek S. *Qualitative Sozialforschung*. 4th ed. Weinheim/Basel:Beltz Verlag; 2005.
23. Kitzinger J. Qualitative Research: Introducing focus groups. *BMJ* 1995; 311(7000): 299–302. PubMed PMID: 7633241; PubMed Central PMCID: PMC2550365.
24. American Nurses Association [Internet]. ANA Indicator History [cited 2013 Dec 30]. Available from: http://www.nursingworld.org/MainMenuCategories/ThePracticeofProfessionalNursing/PatientSafety/Quality/Research-Measurement/The-National-Database/Nursing-Sensitive-Indicators_1/ANA-Indicator-History

25. Maeder C, Bamert U, Baumberger D, Dubach A, Kühne G, editors. Kurzbeschreibung der Methode LEP®. St. Gallen: LEP; 2006 [cited 2013 Dec 30]. Available from: <http://www.lep.ch/de/produkte.html>
26. Mac Neela P, Scott PA, Treacy MP, Hyde A. Nursing minimum data sets: a conceptual analysis and review. *Nurs Inq* 2006; 13(1): 44–51. PubMed PMID: 16494666.
27. Eberl I, Bartholomeyczik S. Die Übertragung des Belgischen Nursing Minimum Data Set II (B-NMDS II) auf bundesdeutsche Krankenhäuser. Ergebnisse der ersten Untersuchungsphase zum Übersetzungs- und Adaptionsprozess des Instruments, *Pflege* 2010; 23(5): 309–319.
28. Butler M, Treacy M, Scott A, Hyde A, Mac Neela P, Irving K, Byrne A, Drennan J. Towards a nursing minimum data set for Ireland: making Irish nursing visible. *J Adv Nurs* 2006; 55(3): 364–75. PubMed PMID: 16866831.
29. University of Minnesota. Minneapolis: USA NMDS (USA Nursing Minimum Data Set) [updated 2013 Aug 13; cited 2014 Jan 4]. Regents of the University of Minnesota. Available from: <http://www.nursing.umn.edu/icnp/usa-nmlds/>
30. Van Boven C, Thonon O, Codognotto J, Gillet P, Sermeus W, Van den Heede K, Michels D, Delesie L. Criterion-related validity of the revised Belgian Minimum Dataset (B-NMDS) through the actual B-NMDS In: Oud N, Sermeus W, Ehnfors M, editors. ACENDIO 2005: Proceedings of the fifth biennial European Conference of the Association for Common European Nursing Diagnoses, Interventions and Outcomes; 2005 Apr 7–9; Bled, Slovenia. Bern: Hans Huber Verlag; 2005. p. 217–228.
31. Kim TY, Coenen A, Hardiker N. Semantic mappings and locality of nursing diagnostic concepts in UMLS. *J Biomed Inform* 2012; 45(1): 93–100. PubMed PMID: 21951759; PubMed Central PMCID: PMC3272126.
32. Hyun S, Park HA. Cross-Mapping the ICNP with NANDA, HHCC, Omaha System and NIC for unified nursing language system development. *Int Nurs Rev* 2002; 49(2): 99–110. PubMed PMID: 12094837.
33. Sermeus W, Van den Heede K, Michiels D, Delesie L, Thonon O, Van Boven C, Codognotto J, Gillet P. A nation-wide project for the revision of the Belgian nursing minimum dataset: from concept to implementation. *Stud Health Technol Inform* 2004; 110: 21–26. PubMed PMID: 15853247.