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Development of the Austrian Nursing Minimum Data Set (NMDS-AT): The Third Delphi Round, a Quantitative Online Survey

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Abstract. Background: A Nursing Minimum Data Set (NMDS) aims at systematically describing nursing care in terms of patient problems, nursing activities, and patient outcomes. In an earlier Delphi study, 56 data elements were proposed to be included in an Austrian Nursing Minimum Data Set (NMDS-AT). Objectives: To identify the most important data elements of this list, and to identify appropriate coding systems. Methods: Online Delphi-based survey with 88 experts. Results: 43 data elements were rated as relevant for an NMDS-AT (strong agreement of more than half of the experts): nine data elements concerning the institution, patient demographics, and medical condition; 18 data elements concerning patient problems by using nursing diagnosis; seven data elements concerning nursing outcomes, and nine data elements concerning nursing interventions. As classification systems, national classification systems were proposed besides ICNP, NNN, and nursing-sensitive indicators. Conclusion: The resulting proposal for an NMDS-AT will now be tested with routine data.

Keywords. Nursing care, nursing process, nursing informatics, nursing records, classification, data collection, Austria

1. Introduction

Nursing minimum data sets (NMDSs) have been developed in several European countries, in the United States of America, Canada and Australia [1]. An NMDS aims at systematically describing nursing care in terms of patient problems, nursing activities, and patient outcomes [2]. The international experiences with NMDS have demonstrated that the data from an NMDS can be used to describe nursing care in different populations and a variety of settings; make data available for research activities; evaluate the costs and outcomes of nursing care; benchmark nursing quality indicators; extrapolate trends in nursing care; and allocate hospital resources. Such information can support nursing managers and policy makers in their decision making [1, 3, 4].

An NMDS has four elementary characteristics: 1. it has a nursing focus, 2. it is a minimum data set, 3. it meets the demands of multiple data users, and 4. it is uniform. *'Nursing focus'* indicates that an NMDS addresses a specific aspect or dimension of nursing care. *'Minimum'* refers to the balanced selection of NMDS items, choosing an

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optimal level of detail and a given period or frequency to obtain the most information with minimal effort. The third characteristic, *'demands of multiple data users'*, addresses the support for decision making on the transactional, operational, managerial, and strategic levels. This implies that an NMDS has to consider the information needs of different health care stakeholders. *'Uniform'* means that data are collected in a standardized way and coded using a uniform language system (coding system) [2, 5].

Austria has no systematic collection of nursing care data at a national level yet. However, pressure is growing from nursing managers, decision makers and policy makers to capture the nursing contribution to patient care [6]. In 2012, a research team began with the development of a nursing minimum data set for Austria [1, 7]. The purpose of the NMDS-AT is to describe the nursing care practice, distribution of the financial means, benchmarking, human resources planning, trend analyses, and quality assurance [1]. Based on a systematic review [1] and a two-round Delphi study, a draft proposal for an NMDS-AT has been developed [7]. This draft proposal comprises a number of data elements that are proposed to be included in an Austrian NMDS (NMDS-AT).

The objective of this study now is to prioritize these data elements and to identify the most important data elements to be included in the NMDS-AT. Furthermore, the coding schemes for these data elements should be defined.

2. Methods

Different methods have been used to generate the specific nursing care items for NMDS, such as interviews or consensus rounds [8, 9]. For this study, a third Delphi round was conducted. The Delphi method is well-suited for consensus-building and uses a series of surveys, with multiple iterations, to collect data from panels of experts [10]. In the first round, the Delphi process began with 22 semi-structured expert interviews. In the second round, a focus group with five experts was conducted. These first two rounds resulted in the draft proposal, containing a comprehensive list of data elements for an Austrian NMDS (for details, see [7]). Now, a third round based on a quantitative online survey was conducted to reach a consensus in the ranking of these data elements and to define the coding schemes for the selected data elements.

The experts participating in this third round were identified using the method of a snowball sampling [11]. The participants of the earlier Delphi rounds were asked to participate and to nominate other experts. The recommended experts were divided into panels according to their qualification. Of the included experts, 42 were nurse managers, eight were nursing educators, 23 were nursing scientists, eight were governmental or health policy representatives, fifteen were information systems or health records specialists, and 22 were quality management representatives. Overall, a total of 118 experts were identified by the research team.

In May 2014, all 118 experts were invited by e-mail to participate in the third Delphi round and to complete the online questionnaire. We received a response from 88 experts (return rate: 74.6%). The survey questionnaire used was developed based on the previous Delphi rounds [7] and was tested and refined by a group of experts who were not involved in this study. The questionnaire comprised the list of 56 proposed data elements for an Austrian NMDS, organized in the following categories: data of the institution, patient demographics, medical care elements, nursing care elements (nursing assessment,

risk assessment, nursing diagnosis, nursing outcomes, and nursing interventions), and nursing classification systems.

The participants were asked to rate the relevance of each item for an Austrian NMDS based on a four-point rating scale from strongly agree (++) to strongly disagree (--). The exact question was: 'The following data elements should be included in an Austrian NMDS'. Each item included a summary of the group response of the previous Delphi rounds. In this way, the participants were able to compare the group response with their own response and were encouraged to reconsider their answer [10].

In addition, the experts were asked to propose a coding scheme for nursing diagnosis, nursing interventions, and nursing outcomes. These questions were multiple response questions. In order to identify factors which were important for an NMDS-AT, free-text questions were also included. Descriptive analysis of quantitative data was performed using SPSS. A data element was found relevant for inclusion in the NMDS-AT if ≥50% of the participants rated the item as highly relevant (strongly agree). The free-text responses were analyzed by one researcher (RR) using a qualitative content analyses approach as described by Mayring [12].

3. Results

In both previous Delphi rounds, 56 data elements for an Austrian NMDS were identified [7]. In this third round, a total of 43 data elements were rated as highly relevant by ≥50% of the experts. An overview of the results is presented in Figures 1–3.

3.1. Patient demographics, data of institution, and medical care elements

Nine data elements were identified as relevant for an NMDS-AT in the categories related to patient demographics, data of institution, and medical care elements. In contrast, five data elements were rated as less important, for example *unique patient code (pseudonymized)* (see Figure 1).

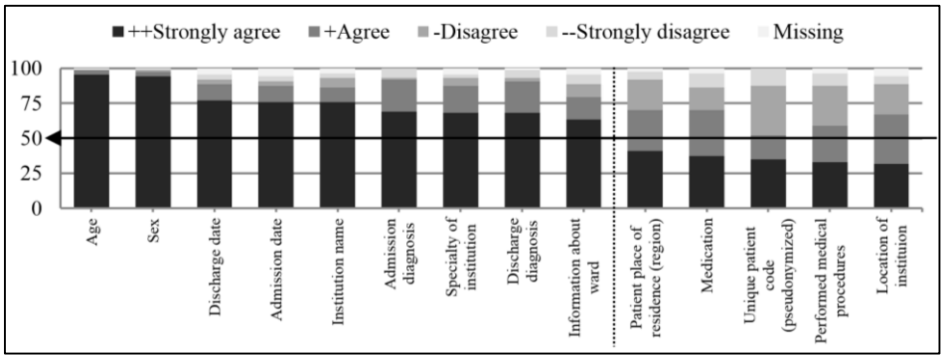

Figure 1. Answers to the question "The following data elements should be included in an Austrian NMDS" for the categories "patient demographics, data of institution, and medical care elements" (n=88 experts). Nine of 14 items were rated as relevant (strong agreement ≥50%).

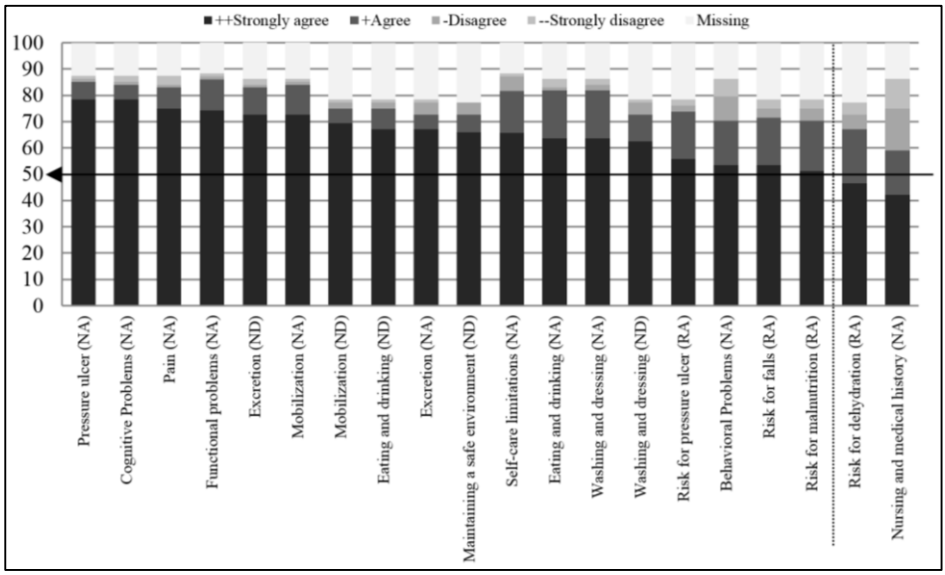

Figure 2. Answers to the question "The following data elements should be included in an Austrian NMDS" for the category "patient problems" (n=88 experts). Eighteen of 20 items were rated as relevant (strong agreement ≥50%).

Free-text comments were made by 32 experts. Three main themes were identified in the categories related to patient demographics, data of institution, and medical care elements. The importance of anonymity in data processing, the use of key figures for institutions, such as average length of stay, and the linkage to other registers were stressed in the free-text comments.

3.2. Patient problems

Eighteen data elements were identified as relevant for an NMDS-AT in the category patient problems. These data elements addressed nursing assessment (NA), nursing diagnosis (ND), or risk assessment (RA). Two data elements, *risk of dehydration* and *nursing and medical history*, were rated less relevant (see Figure 2).

Forty-six (46) experts identified in free-text answer three principal themes in this category: 1. patient's resources, such as available social resources or self-care management, 2. psycho-social aspects, and 3. the degree of dependence. These three themes are, however, already contained in the nursing diagnoses.

3.3. Nursing outcomes, nursing interventions

Sixteen data elements were identified as relevant for an NMDS-AT in the category nursing outcomes, nursing interventions (see Figure 3); seven of these data elements related to nursing outcomes and nine data elements related to nursing interventions.

One nursing outcome element (*total parenteral feeding*) and five nursing intervention elements (*tube feeding*, *care relating to mental health problems*, *care relating to behavioral problems*, *administration of medication*, *indirect interventions*) were rated less relevant for the NMDS-AT. In the thirteen free-text comments, the

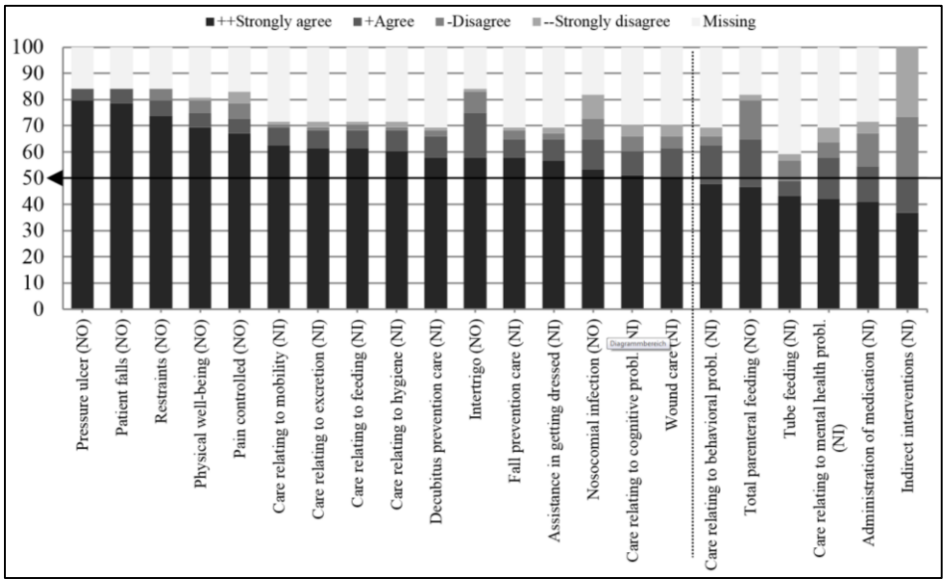

Figure 3. Answers to the question "The following data elements should be included in an Austrian NMDS" for the category "nursing outcomes, nursing interventions" (n=88 experts). Sixteen of 22 items were rated as relevant (strong agreement ≥50%).

experts stressed that the trend regarding mental and behavioral problems as well as developments in the field of nursing care in Austria should be considered in an NMDS-AT.

3.4. Choosing a uniform language system (coding system)

Around half of the participants suggested internationally standardized language systems such as the International Classification of Nursing Practice (ICNP®) or the NANDA-I *taxonomy to code nursing diagnosis. For nursing outcomes,* around *one-fourth of experts* suggested internationally standardized language systems and 10% of participants *proposed nursing-sensitive indicators, such as* National Database of Nursing Quality Indicators (NDNQI®) *[13]. For nursing interventions, around one-third of experts suggested* internationally standardized language systems, such as ICNP® or Nursing Interventions Classification (NOC) *(see Table 1).*

Table 1. Ratings regarding the use of standardized language systems for coding nursing diagnosis, nursing outcome, and nursing interventions. Absolute and relative number of experts (n=88) that proposed a language system (more answers were possible for each category, the suggestion of additional language systems was possible).

			International	**National**
To be used for:	**ICNP®**	**NANDA-NIC-NOC**	**Nursing-Sensitive Indicators**	**Other**
Nursing diagnosis	33 (37.5%)	21 (23.9%)	---	55 (62.5%)
Nursing outcome	27 (30.7%)	16 (18.2%)	12 (13.6%)	64 (72.7%)
Nursing interventions	26 (29.5%)	13 (14.8%)	---	64 (72.7%)

Many experts proposed different national nursing language systems to code nursing diagnosis, nursing outcomes, and nursing interventions, for example ENP® [14], DiZiMa® [15] or LEP® [16].

In the free-text comments, the experts stressed that any language system should be scientifically validated and effective.

4. Discussion

In this third Delphi round, 43 data elements were rated as relevant for an NMDS-AT: nine data elements concerning the institution, patient demographics, and medical condition; 18 data elements concerning patient problems using nursing diagnosis; seven data elements concerning nursing outcomes, and nine data elements concerning nursing interventions. *N*ational *language systems were proposed* besides ICNP, NNN, and nursing-sensitive indicators.

A potential limitation of this study is the use of the snowball sampling method because a sample selection bias could have influenced the results. However, snowball sampling has the advantage of helping researchers to identify additional experts. The participants had different knowledge of NMDS. For example, several participants proposed national nursing classification systems even when these are typically not suited for an NMDS. Therefore, we used a multiple-step iterative approach to identify the data elements for the NMDS-AT as recommended in the literature [5, 8]. It should be noted, however, that the results of a Delphi study are only as valid as the expert opinions.

When we compare the NMDS-AT to other international nursing minimum data sets [e.g. 4, 17], we can see differences, but also similarities. For example, unlike the B-NMDS II, NMDS-AT includes patient problems and nursing outcomes. On the other hand, the nursing interventions in NMDS-AT are consistent with the nursing interventions in B-NMDS II. For the NMDS-AT, the participants rated a unique patient code as less important. However, in the free-text comments, experts have emphasized the need for linkage of NMDS elements with other patient data. This seems only possible if a unique patient identifier is available, as patient data are fragmented across many health care data sets [18]. A unique patient identifier facilitates the integration of data from different data sets. For example, in Austria a Minimum Basic Data Set (MBDS) for each inpatient has to be documented concerning patient demographics, data of institution, and medical data elements, such as diagnosis (ICD-10) or medical procedures [19]. The MBDS does not include nursing data. A unique patient code would allow the integration of information from NMDS-AT and MBDS. This linkage would offer new opportunities, such as investigation of the variability of the intensity of nursing care in relation to Diagnostic Related Groups [20, 21]. Nevertheless, it must be ensured that in case of a linkage between both data sets no redundant data elements, such as date of birth, sex, admission and discharge date are recorded.

For the NMDS-AT, four data elements – care relating to mental health problems, care relating to behavioral problems, administration of medication, and indirect interventions – were rated by participants as less relevant. Nevertheless, these data elements should be included in the NMDS-AT because demographic changes such as an ageing population are associated with behavioral problems [22]. These changes in the field of nursing care in Austria [23] should be considered in the NMDS-AT. These data elements are also included in the Dutch NMDS [4] or the B-NMDS II [20].

The proposed NMDS-AT has a general inpatient focus and is not focused on specialties such as geriatrics or pediatrics, as the NMDS-AT will be tested in this general clinical setting. Therefore, the nursing outcome '*total parenteral feeding'* focusing on the geriatric as well as the nursing intervention '*tube feeding'* focusing on pediatrics were excluded from the NMDS-AT.

Furthermore, the data element '*risk of dehydration'* or dehydration is often subsumed in the literature [e.g. 24] as nutritional management. Dehydration as well as nutritional management is not only a nursing problem and needs an interdisciplinary intervention planning. Therefore *'risk for dehydration'* was rated as less relevant by the experts. However, *'risk of dehydration'* is an important factor in nursing care because it can influence cognitive functioning and can lead to hospitalization especially in older people [25]. For example, risks such as '*risk of dehydration'* are not included in the B-NMDS II because this instrument only considers nursing interventions [17]. In contrast, the NMDS for the Netherlands also includes nursing diagnoses which involve high risks [4].

Each health care institution may use different local or national nursing classification systems to document the nursing care that is delivered. National *nursing classifications do not seem suitable as uniform language systems for an NMDS because they do not allow comparisons of patient care across geographic areas [2, 26]*. Comparisons of data are only possible when all data elements in the NMDS are consistently coded by or mapped to a uniform language system, such as the International Classification of Nursing Practice (ICNP®) as a reference terminology model for nursing [27]. The US-NMDS allows a free choice of nursing classification [28], nevertheless it recommends the use of NANDA-I, NIC, and NOC [29]. The data collection of nursing outcomes could also be supported by nursing-sensitive indicators, such as NDNQI® database, which were established by the American Nurses Association *[13]*. It is obvious that the coding scheme for the NMDS-AT needs to be further discussed in the research team considering the literature.

As a next step, *before* t*he NMDS-AT is* introduced in the nursing practice, it *needs to be* tested in a general clinical setting. *The key question is the feasibility of an NMDS-AT. The test phase of the NMDS-AT will answer questions regarding the availability of the data elements in the electronic health record, the objectivity and reliability of these data elements. It will also be tested whether the defined NMDS-AT can adequately describe the diversity of nursing care and the variability of nursing activities or if additional data elements need to be included.* The use of nursing language systems must also be decided on. A method to map local nursing classification systems to the data elements of the NMDS-AT must be developed to enable interoperability between different nursing information systems [25].

For Austria, it would also be interesting to explore whether data from the electronic health record system (ELGA) can be used for the NMDS-AT and whether ELGA services (such as the Master Patient Index) will support the infrastructure of the NMDS-AT.

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