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Nursing process documentation systems in clinical routine—prerequisites and experiences

Elske Ammenwerth [a,1]*, Ulrike Kutscha [b], Ansgar Kutscha [c], Cornelia Mahler [b], Ronald Eichstädter [d], Reinhold Haux [a]

[a] *Department of Medical Informatics, Institute for Medical Biometry and Informatics, University Medical Center, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany*

[b] *Department of Dermatology, University Medical Center, 69120 Heidelberg, Germany*

[c] *Department of Pediatrics, University Medical Center, 69120 Heidelberg, Germany*

[d] *Department of Psychiatry, University Medical Center, 69120 Heidelberg, Germany*

Abstract

Documentation of the nursing process is an important, but often neglected part of clinical documentation. Paper-based systems have been introduced to support nursing process documentation. Frequently, however, problems, such as low quality and high writing efforts, are reported. However, it is still unclear if computer-based documentation systems can reduce these problems. At the Heidelberg University Medical Center, computer-based nursing process documentation projects began in 1998. A computer-based nursing documentation system has now been successfully introduced on four wards of three different departments, supporting all six phases of the nursing process. The introduction of the new documentation system was accompanied by systematic evaluations of prerequisites and consequences. In this paper, we present preliminary results of this evaluation, focusing on prerequisites of computer-based nursing process documentation. We will discuss in detail the creation and use of predefined nursing care plans as one important prerequisite for computer-based nursing documentation. We will also focus on acceptance issues and on organizational and technical issues.

Keywords: Nursing documentation; Nursing process; Evaluation study; Acceptance; Nursing care plan; ICNP

1. Introduction

Nursing documentation is one important part of clinical documentation. A thorough nursing documentation is a precondition for good patient care and for efficient communication and cooperation within the healthcare professional team [1,2].

* Corresponding author. Present address: University for Health Informatics and Technology Tyrol Innrain 98, 6020 Innsbruck, Austria. Tel.: +43-512-58-67-34809; fax: +43-512-58-67-34850.

E-mail address: elske.ammenwerth@mit-hit.at (E. Ammenwerth).

[1] www.mit-hit.at

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Nursing care is usually oriented toward the so-called nursing process. The nursing process provides a systematic methodology for nursing practice [3]. It consists of six phases: (1) assessment of relevant information; (2) definition of patient problems and resources; (3) derivation of nursing aims; (4) planning of nursing tasks; (5) execution and documentation of these tasks; (6) evaluation of nursing care and possibly redefinition of the care plan [4].

Paper-based systems have been introduced to support nursing process documentation. Frequently, however, high documentation efforts, low quality and limited acceptance of the nursing process [2,5–7] are reported.

There have been many attempts to support the nursing process using computer-based documentation systems. The aim is to reduce documentation efforts, to increase documentation quality and to allow reuse of data for nursing management and nursing research. But despite high investments, problems associated with computer-based documentation systems are reported, for example, an insufficient reflection of the complexity of the nursing process, a lack of a standardized nursing terminology, computer-anxious users, fear of less individual care and too much control, high implementation and operation costs, and unclear benefits [8–14].

Yet, the actual effects of computer-based nursing documentation systems have hardly been systematically evaluated. Studies evaluating some effects of computer-based nursing information systems exist [13,15–22], however only few concentrated on some phases of computer-based nursing process documentation (mostly on care planning) [2,5,23–25].

Overall, it seems unclear which prerequisites and consequences these systems have. Consequently, the project 'computer-based nursing process documentation' was initiated at the Heidelberg University Medical Center in 1998. A computer-based nursing process documentation system ('PIK') was selected and successfully introduced on four pilot wards in three departments (Department of Psychiatry: two wards; Department of Dermatology and Department of Pediatrics: one ward each). The introduction was followed by a long-term, systematic evaluation study of prerequisites and consequences of the computer-based documentation system.

Some results of our randomized evaluation study on the first pilot ward have already been published [26,27]. The evaluation of the other three wards is still under way.

The aim of this paper is to present first results concerning prerequisites of computer-based nursing process documentation systems. Several general prerequisites, such as general motivation and involvement of the users, computer knowledge and attitudes, and general organizational issues, are well known [28–31] and are not specific to the area of the nursing process. In this paper, we will instead focus on specific prerequisites for nursing process documentation. We will discuss the creation and use of predefined nursing care plans as one important prerequisite for computer-based nursing documentation. We will also focus on acceptance issues and on organizational and technical issues.

2. Functionality of computer-based nursing process documentation systems

In this chapter, we present the typical functionality of a computer-based nursing process documentation system, based on the example of the documentation system PIK ('Pflegeinformations-und Kommunikationssystem'—'Nursing information and communication system') used in Heidelberg. The aim of these documentation systems is to support all six phases of the nursing process. A detailed

description of the nursing documentation system PIK can be found in [32].

Nursing anamnesis is usually supported by the ability to define and use individual forms (for example, for social anamnesis), containing structured and unstructured information.

Based on the information gathered in the anamnesis, a nursing care plan for an individual patient can then be created. To support this, typical nursing problems, aims and tasks can be predefined and selected during creation of the care plan. Typical combinations of problems, aims and tasks can even be combined in predefined nursing care plans.

Later, during care planning, these predefined items and standards can be selected and adapted to the patients individual needs by adding or removing certain items. This makes care planning much easier and more efficient than conventionally possible.

Fig. 1 presents a typical computer-based care plan for a patient: (recent and potential) problems, aims and planned tasks are presented in different columns.

Based on this care plan, nursing tasks are executed and documented, usually using a time axis within the documentation form. The system allows the documentation of planned tasks or other tasks along with information of special observations or occurrences.

In Fig. 2, an example for the documentation of planned tasks is presented.

In addition, nursing aims can be planned, checked and documented. The procedure is nearly identical to that of task documentation. Finally, nursing reports can be written, usually containing free text. Individual nursing reports may be highlighted for other health care professionals.

The functionality described above covers the six phases of the nursing care process. Usually, in addition, computer-based documentation systems offer functions for ward management (for example, patient management and use of general forms), for management of the predefined care plans, and for the use of nursing knowledge (such as nursing standards).

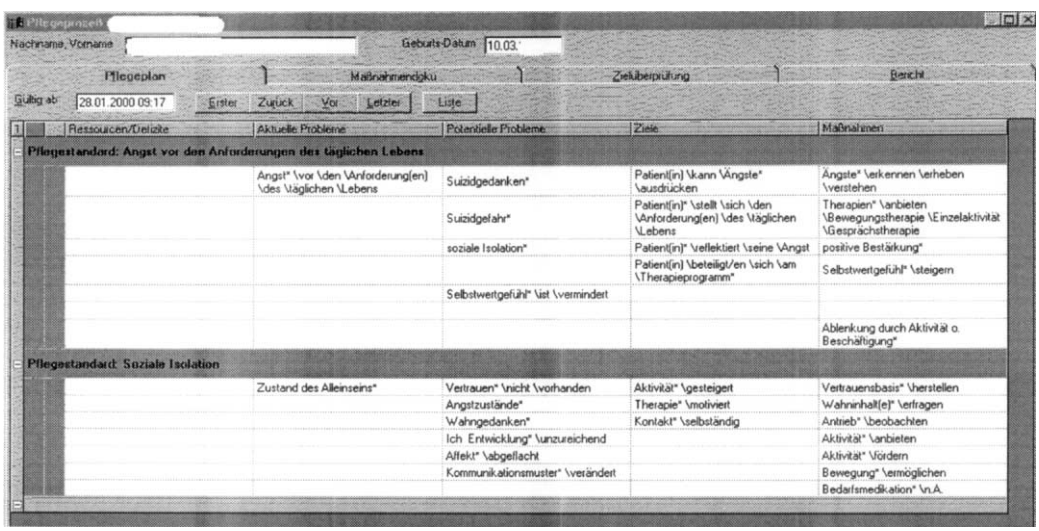

Fig. 1. A typical computer-based care plan for a patient. Two predefined care plans have been used. The columns 1–5 contain resources, recent problems, potential problems, aims and planned tasks. All screenshots are taken from the documentation system PIK.

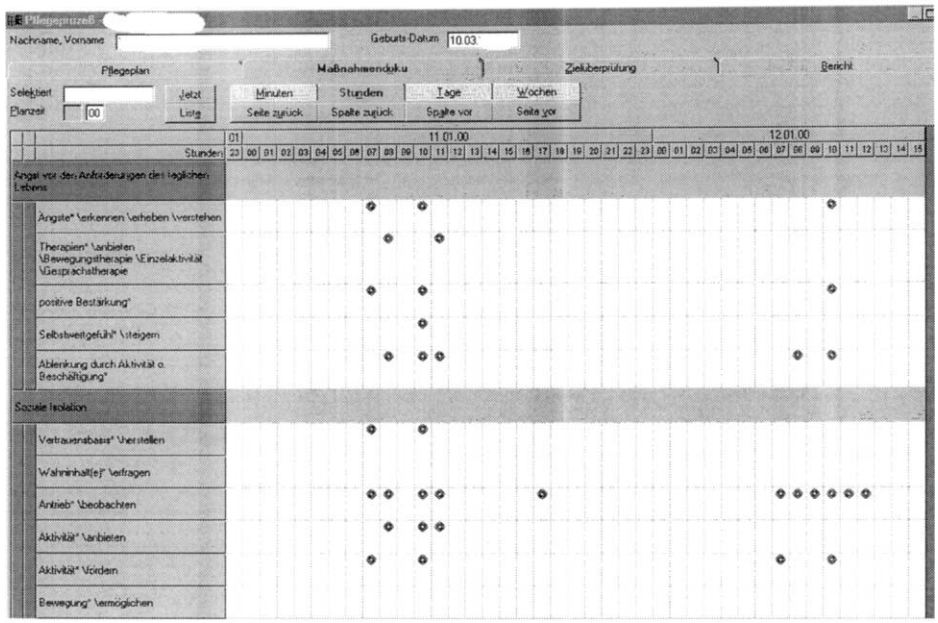

Fig. 2. Typical documentation of planned or other tasks in a computer-based documentation system. The first column presents the list of planned tasks. The time axis is scalable (minutes, hours, days or weeks).

3. Prerequisite: standardization issues

An essential precondition for the introduction of computer-based nursing process documentation is the predefinition of items (nursing problems, aims and tasks) and of predefined nursing care plans (as a combination of problems, aims and tasks). All documentation can then be done based on those catalogues.

The use of predefined care plans is seen to have several advantages [5,8,33]: First of all, using predefined care plans, makes care planning easier and more efficient, by extremely reducing documentation efforts and terminological difficulties during care planning. Secondly, those predefined care plans can make nursing more transparent, reproducible and comparable. They can thus be seen as one step towards quality management in nursing. Thirdly, predefined care plans support learning and exchange of knowledge within the nursing team. Fourthly, as documentation becomes more complete, fewer items are forgotten, and the question 'what do nurses do' is easier to answer. Last of all, using predefined care plans supports the understanding and implementation of the nursing care process and is therefore of extreme help to nursing education. It should be mentioned that most of these advantages are not specific to computer-based documentation, but also result from conventional documentation based on predefined care plans.

In the next paragraphs, we will discuss structure, content, creation and usage of predefined care plans during computer-based documentation.

3.1. Structure

Predefined nursing care plans are usually based on items (such as problems, aims and tasks), which themselves are based on a nursing terminology (Fig. 3).

Predefined care plans are mostly specific to a nursing field (for example, surgery or psychiatry). Nursing items may be field-dependent, but may also be used in more than one field (for example, 'decubitus' as a nursing problem). Nursing terminology should be universally valid to enable exchange, analysis and comparisons of items and care plans.

A universal nursing terminology which is just being developed is the ICNP (International Classification of Nursing Practice). The aim of the ICNP is to establish a common language for describing nursing practice, to describe nursing care, and to enable comparison of nursing data across clinical populations, settings, geographic areas and time [34–37].

When creating nursing care plans, the ICNP can be used in two areas: First, it can be seen as the nursing terminology used to build nursing items and predefined care plans. Second, it can be used for indexing nursing items and care plans as a basis for nursing data analysis (both for nursing research and management).

In 1998, we started using the alpha version of ICNP as a basis for nursing items and care plans but quickly learned that the alpha version was not sufficient and incomplete. Several terms used in the pilot Department of Dermatology could not be matched to ICNP terms. Nevertheless, the relevance of a common nursing terminology is well known. Therefore, we are just starting a similar project, now using the recent beta-version of the ICNP.

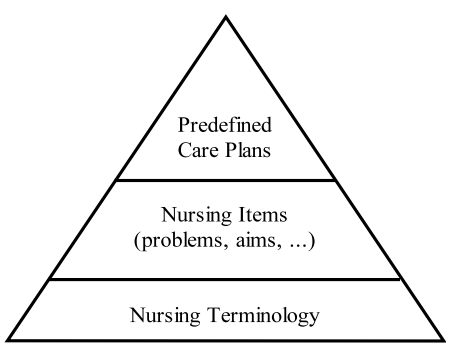

Fig. 3. Creation of predefined nursing care plans based on nursing items and nursing terminology.

3.2. Content

The content of predefined nursing care plans can be oriented towards different aims: they may represent typical medical diagnosis (for example, HIV), or nursing diagnosis (for example, itching), but also, they may represent typical sequences of tasks (for example, tasks during patient admission, pneumonia prophylaxis, or the monitoring of suicide patient).

By reviewing the content, we could observe a typical development on our somatic wards. We observed that the first nursing care plans were either based on medical diagnosis or were task oriented. However, after some time, the wards learned that certain nursing problems reappeared in various care plans (such as itching in dermatological care plans). This motivated them to reformulate the predefined care plans which now are more based on nursing diagnosis.

In contrast, the care plans used by the psychiatric wards have been oriented toward nursing diagnosis all along. The reason may be that nursing process documentation has been established fore some years, in contrast to the somatic departments.

We learned that the wards tended to start with rather long predefined care plans. After some experience, they began splitting them into smaller parts (for example, containing no more than 20 items).

Another observation we made was that each department began with self-formulated nursing care plans. After several months of working with these plans, the pilot wards are

Table 1
Number of predefined nursing items and predefined nursing care plans in the three departments before (first date) and after (second date) introduction of a computer-based nursing documentation system

Department	Department of Dermatology		Department of Pediatrics		Department of Psychiatry	
Date	October 00	December 00	October 00	December 00	September 98	December 00
Predefine resources	13	6	–	0	–	18
Predefined problems	110	174	223	242	–	436
Predefined aims	69	72	136	111	–	201
Predefined tasks	124	183	271	260	–	293
Predefined care plans	12	20	23	30	36	55

The number of items for September 98 is not available.

now considering to establish 'general' hospital-wide care plans which are to be valid for every department. Examples are pneumonia prophylaxis or patient mobilization, nursing activities which are relevant in each of the pilot departments. Obviously, there are some overlaps in care plans which can and should be standardized to ease the maintenance of the predefined care plans.

3.3. Creation

Before the introduction of a computer-based nursing documentation system, a certain amount of nursing items (problems, aims, tasks) and predefined nursing care plans must be prepared.

Table 1 presents the number of items and care plans on our four wards during the beginning of the projects and again in December 2000. The numbers indicate that the items and catalogues must be maintained regularly, adapted and extended as the ward becomes more and more accustomed to computer-based documentation.

Our experiences show that the preparation of the items and care plans take several months for a department, depending on the amount of information which can be reused from other wards. This effort will certainly be partly reduced in the next years, when a common nursing terminology (for example, ICNP) is available to cover a certain part of the catalogues. In addition, as more and more departments begin developing predefined care plans and nursing items, this information can be reused, most probably reducing the required preparation time.

3.4. Usage

A documentation system must be well integrated into the clinical workflow in order to be of use. Predefined care plans are an important issue in this context. In this paragraph, we will shortly describe how the documentation system and the predefined care plans can typically be used.

The patient admission is based on a task-oriented admission standard, using a predefined form for nursing anamnesis. Based

on this information, the responsible nurse creates the first care plan for the patient. After selecting adequate care plans, they are adapted to the individual needs. Mostly, items are removed (for example, problems which do not apply). Sometimes, items are added (such as individual patient resources). Obviously, it is much easier to find a list of possible problems than to find a list of possible individual resources. There are too many possible patient resources to list them all. Thus, a nurse using a predefined care plan must be motivated to add individual patient resources, and to eliminate the problems (and aims and tasks) which do not apply.

The description shows that the use of predefined care plans integrate the steps 2–4 of the nursing process (definition of problems and patient resources; derivation of nursing aims; planning of nursing tasks) into one care planning step, i.e. choosing and editing a patient-related care plan. This procedure seems to simplify care planning and improves the nursing attitude towards the nursing process.

On our four pilot wards, we observed that the amount of changes to the predefined care plans grew the more familiar the nurses became with the computer-based documentation system. Fig. 4 shows some statistics for one ward.

After care planning, the execution of planned tasks can be scheduled, if necessary. After executing the tasks, they can be documented and information and observations may be added. This documentation is carried out a multiple number of times during each shift.

The evaluation of planned aims is also scheduled. When the planned dates are reached, the accomplishments of the aims are checked. Depending on the results, the care

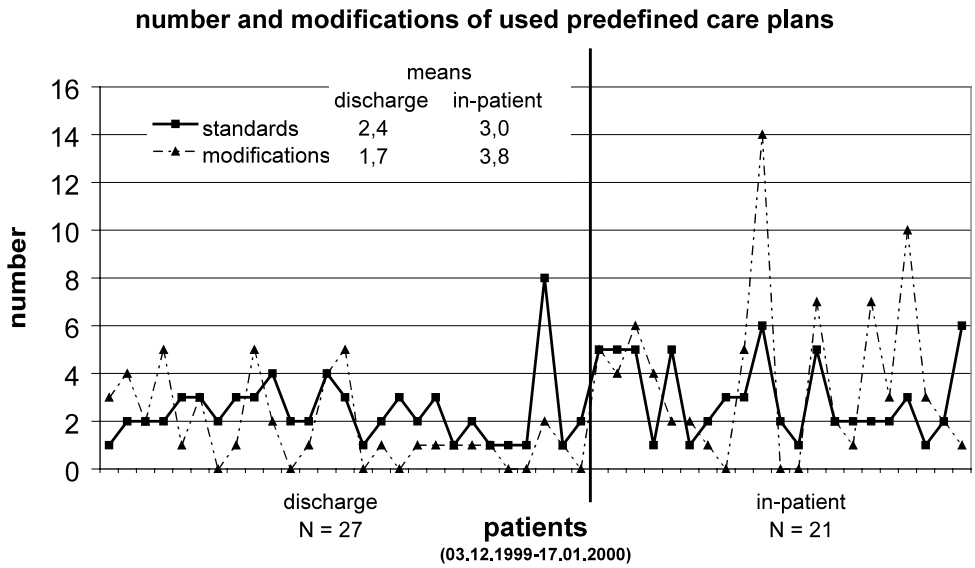

Fig. 4. Number of predefined care plans and amount of modifications of the care plans of 58 patients, treated between December 08, 1999 and January 17, 2000 on one pilot ward. Date of analysis was January 17, 2000. Patients are divided into two groups: 'discharge group' with 27 patients already discharged, and 'in-patient group' with patients still in treatment at the time of analysis. Individual numbers and mean numbers for each group are presented. The figures indicate that, after becoming more familiar with the documentation system, the nurses use more predefined care plans and modify them more often.

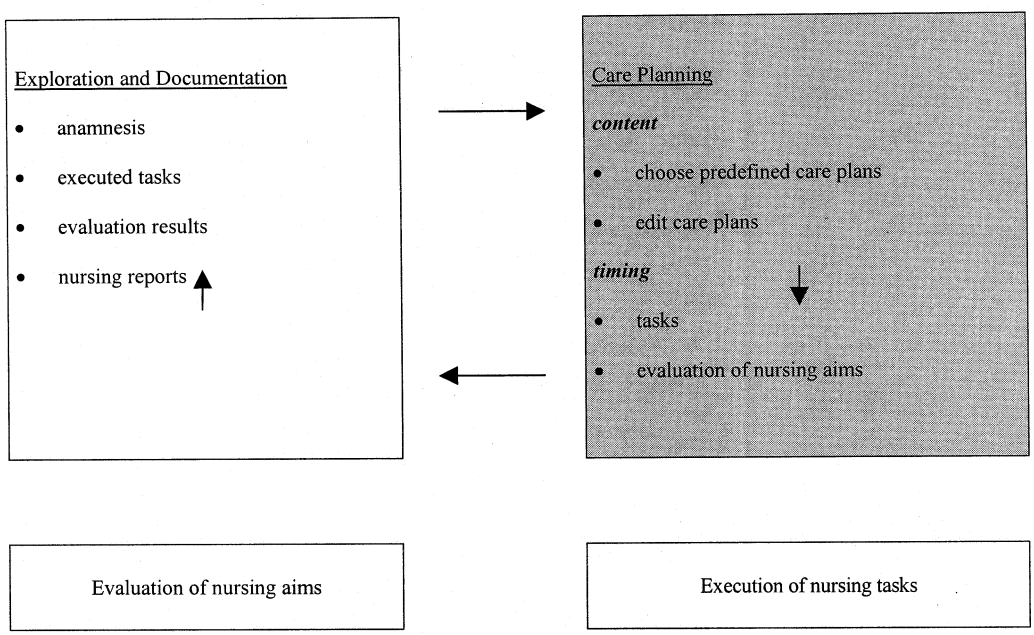

Fig. 5. Use of predefined care plans as a part of the integrated step 'care planning' (in gray) within the nursing process.

plan must be modified by removing or adding items.

A nursing reports is written as least at the end of each shift, usually in the form of free text.

When the patient is dismissed, the whole nursing documentation is added either to the electronic patients records' archive, or printed out and added to the paper-based record.

Fig. 5 presents a summary of the typical use of predefined care plans.

4. Prerequisite: acceptance issues

An important prerequisite for the introduction of any new computer-based system is user motivation and also, some general aspects such as computer anxiety and attitudes toward computers. Much research has been conducted dealing with this issues [38–42].

In this chapter, we will concentrate on the aspects specific to the introduction of nursing process documentation systems. We will include the topics of acceptance of the nursing process as a guideline for nursing care, as well as the acceptance of the use of computers in nursing which is an issue as computers are said to endanger the individuality of nursing care.

4.1. Acceptance of the nursing process

It has been questioned how the acceptance of the nursing process influences the success of computer-based nursing process documentation support. However, the relationship between the acceptance of the nursing process and successful introduction of computer-based nursing process documentation system seems to be double-sided. On the one side, nurses, who do not accept the nursing process as the basis for systematic nursing care,

will not be motivated to use computers since, to them, they seem to increase the documentation effort. On the other side, the realization of the nursing process is difficult when its documentation is done manually, as documentation efforts and formulation problems will be high.

We analyzed the acceptance of the nursing process before, during and after the introduction of the computer-based nursing process documentation system in order to answer the following two questions:

- How does the acceptance of the nursing process change when computer-support is introduced?
- Is the acceptance of the nursing process a success factor for the introduction of computer-based nursing documentation?

It is important to be aware of the fact that on wards A and B the nursing care process had been established for several years. In contrast, on ward C and D only planning and documentation of tasks have been documented; care planning or regular achievement reviews of nursing aims were not conducted prior to the introduction of computer-support. To answer our questions, we use a standardized, validated questionnaire [43] before, during and after the introduction of computer-support.

Based on the 18 items of the questionnaire, a mean acceptance score for each nurse was calculated (1 = minimum, 4 = maximum acceptance). The following are the results prior to the introduction of computer support (mean and standard deviation are presented):

- Ward A: 2.7 ± 0.4 ($n = 11$)
- Ward B: 3.4 ± 0.3 ($n = 9$)
- Ward C: 2.8 ± 0.4 ($n = 10$)
- Ward D: 3.0 ± 0.4 ($n = 11$).

The figures show that the acceptance of the nursing process is quite high despite the different implementation of the nursing process on the four wards. When data from both during and after introduction is available, we will test if there is a significant change in the acceptance scores. Preliminary results from wards A and B indicate a significant increase. The data from wards C and D will be used to complete this analysis.

In seems useful to precede the introduction of computer-based nursing process documentation by such an evaluation of users' acceptance. If low acceptance scores are found, training courses for the nursing process should be offered. Without a general acceptance of the nursing process (as found on our four pilot wards), the introduction of computer-support may not be successful, as their functionality will not be used or will be found useless and burdensome.

When looking at the responses in detail, we can see that most nurses are in favor of the idea of the nursing process and want to use it, but that the majority thinks it takes too much time and causes too much writing effort. With these details in mind, it is clear that the acceptance scores tend to rise when a computer-based system is introduced, as the writing efforts and formulation problems will be reduced.

To analyze the importance of this acceptance score as a success factor, we correlated the acceptance of the nursing process with the overall acceptance of the computer-based documentation system after 1 year of use. Preliminary results from wards A and B indicate that the acceptance of the nursing process prior to the study is positively correlated to the acceptance of the computer-based system following 1 year of use. This indicates that the acceptance of the nursing process may be a one factor relevant for a successful introduction.

4.2. Acceptance of computers in nursing

Some discussion has arisen over the fear that computers endanger individual patient care, reduce the time nurses have for patients, and reduce the professional autonomy of the nurses. We analyzed the acceptance of computers in nursing before, during and after the introduction of the computer-based nursing process documentation system in order to answer the following questions:

- How does the acceptance of computers in nursing change when a computer-support is introduced?
- Is the acceptance of computers in nursing a success factor for the introduction of computer-based nursing documentation?

To answer our questions, we use a standardized and validated questionnaire [44] before, during, and after the introduction of computer-support. Based on the 18 items of the questionnaire, a mean acceptance score for each nurse was calculated (1 = minimum, 4 = maximum acceptance). The following are the results before computer-support was introduced (mean and standard deviation are presented):

- Ward A: 2.6 ± 0.6 ($n = 11$)
- Ward B: 3.0 ± 0.5 ($n = 9$)
- Ward C: 2.5 ± 0.6 ($n = 10$)
- Ward D: 3.0 ± 0.4 ($n = 11$).

The figures show that the acceptance is quite high. Preliminary results from wards A and B indicate that these acceptance scores did not change during or after introduction. The data from ward C and D will be used to complete this analysis.

To analyze the importance of the acceptance scores as a possible success factor, we correlated it with the overall acceptance of the computer-based documentation system after 1 year of use. Preliminary results from wards A and B indicate, that the acceptance of computers in nursing before the study is not correlated to the acceptance of the computer-based system after some time of use.

5. Prerequisite: organizational issues

As much research is being conducted in the field of organizational issues [28,30], we will concentrate on organizational issues specific to the introduction of computer-based nursing process documentation in this chapter.

It seems to be helpful to select those wards as pilot wards in which the nursing process is at least partly accepted. The aims of the introduction of computer-support should be made clear. Typical aims are, for example: increase the number of documented tasks as a basis for nursing management, increase the quality of documentation as a basis for quality management, reduce documentation efforts for the nurses themselves, increase reusability of documented data for nursing research, or improve communication within the healthcare professional team. These aims may require different project organization, as well as different functionality and specific preparation of nursing terminology and predefined care plans. To avoid aim conflicts, the aims should be discussed and clearly defined beforehand.

After the aims are clear and wards have been selected, it should not be forgotten to inform and include the non-nursing professionals such as physicians or psychologists. These professionals at least temporarily use nursing documentation as a source of information. It should therefore be decided whether they receive online access to computer-based nursing documentation or whether parts of the documentation will be communicated in other forms.

The usual documentation processes should also be examined and analyzed with regard to computer support. When and where is what

documented by whom? Is computer support feasible? Must working processes be changed when computer support is introduced? Can, for example, working lists be generated and applied? Is nursing documentation needed during physician rounds? In addition, it must be defined what happens with the data after the patient has been discharged. In hospitals still using a conventional patient record, all relevant information should be printed out and placed into this record. In other hospitals, nursing documentation should be transferred to the electronic record archive.

The introduction of computer-based nursing process documentation can be organized in different steps. The following presents a possible order of steps that can be defined (steps may be left out as required by a ward's preconditions): First, care plans are created and printed with the help of the computer system. During the second step, care plans are maintained within the documentation system, and no printing is required in this step. The third step involves the documentation of tasks and report writing by the computer system. Within the fourth step, nursing anamnesis is carried out using computer support. Finally, during the fifth step, the evaluation of nursing aims is conducted using computer support.

These steps may be refined, for example, to effecting an increasing number of patients. This solution allows a slow adoption of the nursing process. It is obvious that the different steps must be defined and planned beforehand and the realization be monitored carefully to ensure success.

It is helpful to have a qualified project member to accompany the introduction of each step of the nursing process. This enables to quickly realise whether the staff needs further training regarding steps of the nursing process and will finally help improve the quality of nursing documentation.

6. Prerequisite: technical issues

The technical equipment necessary to introduce computer-based nursing process documentation on a ward must be carefully defined beforehand. The required equipment depends on the number of patients and nurses, but also on the documentation and working processes. For example, a ward using nursing process documentation only in the ward room may be sufficiently equipped with two or three computer systems. In contrast, if nursing documentation is used during doctors' rounds or even by the nurses inside the patients rooms, either bedside terminals or mobile computers should be considered to avoid double documentation, data losses and user frustration. In addition to those computers, other health care professionals must also be able to access this new computer-based documentation, thus the function 'nursing documentation' must also be integrated in the Health Care Professional Workstation [45] of the non-nursing professionals.

The nursing documentation system must also be carefully integrated into the hospital information system [46]. To achieve data integration and to enable exchange of administrative patient data, the software should be interfaced with the patient management system. After patient discharge, the nursing documentation should be transferred to the electronic or conventional patient record.

Finally, it is useful if special nursing knowledge (for example, about the preparation and execution of nursing tasks or about some nursing diagnosis) can be connected to the information inside the computer-based documentation system, using for example web-based knowledge resources.

7. Discussion

In this paper, we presented some specific prerequisites for the introduction of computer-based nursing process documentation systems. We presented standardization aspects of nursing terminology, users acceptance of the nursing process and of computers in nursing, and also some organizational and technical issues. We concentrated on aspects and experiences specific to nursing process documentation.

In our opinion, a high acceptance of the nursing process, a careful preparation of predefined care plans (at least partly based on standardized vocabulary), together with elementary measures such as organizational preparation, good project management, inclusion of future users in the preparation process, and sufficient technical equipment with integration into the hospital information system are important preconditions for the success of computer-based nursing process documentation. This confirms the results of other studies [47]. In addition, the nursing terminology and the nursing care plans must be regularly maintained and updated, taking into account the development of skills and experiences of the users.

On our pilot wards, a nursing documentation system has been successfully introduced, despite the different preconditions (for example, with regard to the previous implementation of the nursing process). The user acceptance is high. The results indicate that awareness and understanding of the nursing process increased on the pilot wards after the introduction of computer assistance. Computer-support of the nursing process can therefore be regarded as one element of a strategy to integrate the nursing process into the daily nursing routine.

The analysis of the success factors can be refined when 1 year of experience is available for all four wards. We will then also be able to present detailed results concerning the effects of computer-support on quantity and quality of documentation, on working processes, and on user acceptance.

It can be discussed if our results are transferable to other wards and other departments. We deliberately chose two psychiatric and two (very different) somatic departments in order to obtain a broad view of the topic. Despite many differences among the wards, the results and the experiences are very similar. Nevertheless, this assumption should still be verified in other surroundings.

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