Collaborative Patient Centred eHealth
E. De Clercq et al. (Eds.)
IOS Press, 2008

doi:10.3233/978-1-58603-922-6-130

The implementation of an Electronic Nursing Record in a general hospital in the Netherlands: Lessons to learn

R.VERWEY RN[a,1] R.A.B.CLAASSEN RN[b] M. J.RUTGERS RN[c] L.P.DE WITTE PhD,MD [d]

[a] *Senior lecturer, Advanced Nursing Practice, Faculty Health and Care, Centre of Research Technology in Healthcare, Zuyd University*

[b] *Junior lecturer, Bachelor of Nursing, Faculty Health and Care, Centre of Research Technology in Healthcare, Zuyd University*

[c] *Project manager, uitrol zorg ICT, Orbis Medical and Healthcare group, Maasland Hospital*

[d] *Lector, Centre of Research Technology in Healthcare, Zuyd University*

Abstract. This article describes the implementation of an Electronic Nursing Record (ENR) in Maasland Hospital (Orbis Medical and Healthcare group) in Sittard, the Netherlands. Through analysis of documents, structured interviews and participatory observation, a study was made of the plans prior to the introduction of the ENR, how the process proceeded, which enhancing and constraining factors influenced the process and how the nursing staff experienced the introduction of the ENR. The implementation of the system took place in 2006 and 2007. The selection and design of the system was carried out first, followed by a pilot phase. After thorough review and adjustment, the introduction of the ENR in the other wards of the hospital followed according to plan. The implementation process was carried out by several nurses in different roles (project management, project group members, key-users and teachers). The introduction of the system had two objectives: saving time by promoting efficiency and quality improvement by the introduction of standardization in documentation and the use of nursing care plans. The study indicates, however, that no time-efficiency was achieved by using the ENR so far. This had an adverse effect on the acceptance of the system by the nurses. The nurses were positive about the set-up of the implementation process, especially the contribution of the project group, the key-users on the ward and the resources which were made available (the staffing, external expertise and training).

Keywords. Electronic Nursing Record, implementation process, process evaluation.

1. Introduction

Nurses in Dutch hospitals are increasingly using electronic records. Not only are small-scale experiments being introduced, but also nurses are using electronic records on a large scale more and more [1]. Relevant to the acceptance and proper use of an electronic nursing record (ENR) is the way the system is introduced in the organization

[1] Corresponding author: R.Verwey: Faculty Health and Care, Centre of Research Technology in Healthcare, Zuyd University, Postbus 550, 6400 AN Heerlen, Nederland; E-mail: r.verwey@hszuyd.nl.

[2]. This article discusses the results of an evaluation study of the ENR implementation process in Maasland Hospital (Orbis Medical and Healthcare group) in Sittard, the Netherlands. Communication with the users is a major factor of success in such an implementation process. Communications between all parties involved in the introduction of the ENR (nurses on the wards, key-users, members of the project group, the project manager and the steering committee) are set down in reports and notes. This material has been used in the survey.

Underestimating the time and resources necessary for the implementation of a nursing information system is a common pitfall. This fact is illustrated by an article about a similar implementation process in Oslo, Norway [3]. From this research it became clear that the main challenge for the implementation of an ENR in this hospital consisted of organizing and finding time for the introduction and training of users.

Within the Netherlands, hospital-wide introductions of an ENR is known to have been carried out in Tilburg and in Sittard so far. The most recent research in the Netherlands on the use of nursing information systems in hospitals dates from 1997 [4]. Research on comparable introductions of ENR's in hospitals abroad is written in terms of effects, for example the effects on the registration of caregivers [5], the quality of the documentation and the user acceptance of the system [6, 7]. A review study of the effects of nursing record systems on nursing practice and health care outcomes showed that the introduction of electronic records often did not produce the expected benefits [8]. The involvement of nursing staff in the development of these systems is therefore strongly recommended. One of the conclusions of another study of the definition, structure, design, use and impact of Electronic Healthcare Records was that research specifically aimed at electronic nursing documentation is strongly recommended [9]. Therefore it was decided to link an implementation study to the introduction of the ENR in Maasland Hospital [2].

A post-implementation audit after the introduction of a nursing information system should consider the following elements: the implementation process, training, functioning of the system and user satisfaction [10]. This research has mainly focused on the implementation and training. Concerning the functioning of the system and user satisfaction, data are gathered during an analysis of the system and survey of the experiences of the nurses, but these components have not been systematically studied [11]. This study mainly aimed to learn from the findings and to apply new insights in subsequent projects [12].

The main research question was: *How* has the ENR been implemented? The research included the following sub-questions:

- What were the plans at the beginning of the implementation of the ENR?
- How is the actual implementation process being carried out?
- What were enhancing and constraining factors in this process?
- How did the nurses experience the introduction of the ENR?

[2] The study was partly funded by a subsidy RAAKpubliek provided by the Stichting Innovatie Alliantie.

2. Context

In the region *Westelijke Mijnstreek Zuid Limburg*, situated in the south of the Netherlands, a new hospital is being built and is planned to be ready in October 2008. It is a large regional general hospital with all the basic medical specialties.

To prepare for the relocation, a number of innovative projects have been initiated, including the introduction of an Electronic Health Record (EHR) and an Electronic Medication System (EMS) with the ultimate objective of achieving a "paperless" organization where ICT supports care and logistical processes.

An EHR in SAP (ISHmed) has been chosen, in Germany known as the Med-is Pflegedossier, PIK® [13, 14]. In this system a medical and nursing module is developed. This ENR consists of an anamnesis with questions categorised by functional health patterns according to Gordon [15]. Based on this anamnesis, a nursing care plan is formulated with appropriate nursing diagnoses, nursing outcomes, nursing interventions and schedules. Developments in nursing care are reported in a nursing report. The most important developments in the health of the patient are recorded in a special document called "vital signs".

The ENR was introduced on 15 wards. Each ward has the use of five permanent computers and two laptops connected to the intranet. In the new hospital all rooms will be equipped with bedside terminals. During the implementation process 520 nurses were trained in the use of the system.

3. Method

The next paragraphs describe the methods used in the research.

3.1. Literature study

A literature study was conducted of several national and international implementation processes of electronic nursing records. Recent (published after 2000) Dutch and English papers held by INVERT, PubMed, Cinahl and ScienceDirect were collected using the keywords information systems, electronic patient record, electronic healthcare record, electronic nursing record, nursing and implementation and the Dutch translations of those keywords. Because no scientific publications on Dutch ENR implementations were found, the search was extended to papers published after 1995. Subsequently sources describing more general implementation strategies were searched [2].

3.2. Framework for the implementation

Grol & Wensing developed a framework for describing a process of introducing an innovation in health care [2]. This framework was used in the labeling and analysis of the results of the study. The components of the framework are a description of the innovation, a characterization of the strategy by giving a description of the interventions (professional targeted interventions, financial and organizational interventions), a description of the participants, their professions, the target group, its

size and motivation, a description of the implementers, their professions, their authority and ability to lead and finally a description of the frequency of the activities.

3.2.1. Data collection

Various methods of data collection were used, namely participatory observation, analysis of relevant documents and semi-structured interviews [16].

3.2.2. Participating observation

Two of the researchers (RV and RC) were involved in the implementation of the ENR, as teachers in the training program and through the participation in the steering committee. Their experiences are stated at the start of this paper.

3.2.3. Document analysis

All conferences, meetings and training courses held during the implementation process were minuted. These internal documents were collected. Missing documents were obtained by the secretary of the project office. The relevance of the documents was determined by the extent to which the contents of the document contained information about the research question.

Finally, 72 documents were analyzed. These documents were divided randomly between two researchers (RV and RC) who read the documents and collected those fragments which were directly related to the research question. These fragments were labeled. Labels were chosen to fit as closely as possible to the original text of the fragment. The fragments and the matching labels from the two different researchers were merged.

Then the fragments (510) were sorted, the frequency of the labels was evaluated and some labels were combined. The core labels were combined to fit into the framework. Where the fragments contained insufficient information to complete all the aspects of the framework, the missing information was obtained during the interviews. Based on the labels and the fragments, a summary was made.

3.3. Interviews

Twelve employees who were involved in the implementation of the ENR were interviewed: the management of the hospital, the project manager, a member of the project group and a sample of nine people from the nursing units. The special care wards like the children's ward and the ICU were excluded. Three wards were randomly selected: one ward from the pilot phase and two wards which were involved in the next phase when the hospital-wide implementation took place. In every selected ward the unit leader, the involved key-user and a nurse were interviewed. Prior to these interviews a letter was sent explaining the purpose and main questions of the research. The interviews took place at the workplaces of the interviewees. Each interview lasted three quarters of an hour. The interviews were recorded on audio cassette.

The main findings of the interview were summarized by the researcher who conducted the interview and this summary was approved by the people who were interviewed. The distribution of the interviews between the two researchers was based on chance; only at the interview of the Executive Board were both researchers present.

Important issues regarding every research question were written down. These issues were compared and summarized for each research question.

3.4. Data analyses

The analysis of the documents was carried out first. Then the results were supplemented with the results from the interviews and finally this was compared with the reports from the participatory observations.

4. Results

The results gathered are categorized according to the different sub-questions. The plans are presented, followed by the course of the process, the enhancing and constraining factors involved and a description of the experiences of the nursing staff.

4.1. Plans

In April 2006 a business case was set up and a project-based organization was created with the objective of achieving a hospital-wide implementation of the ENR before January 2008 [17]. In the business case the necessary preconditions were stated, such as the allocation of sufficient resources (hardware, software, royalties, salaries and training costs), fine-tuning with other critical (ICT) projects, realistic planning and a secure and steady technical landscape (available and reliable). The project staff consisted mainly of nurses (the manager, an assistant, four expert members of the project staff and key-users).

In every ward two key-users were appointed. They could spend five hours a week primarily on tasks relating to the implementation process. The expert members were made responsible for the design of the system, the support of the key-users and the agreement between the builders and users of the ENR, and they participated as teachers in the training. The expert member group also functioned as a filter for all the wishes and extensions requested by nurses in the hospital to improve the system.

The introduction of the system had two goals: saving time by promoting efficiency and quality improvement through the introduction of standardization in documentation and the use of nursing care plans. It was not only the implementation of the system that was carried out but also the introduction of a new method of working and the "empowerment" of the nursing professionals. The consequences of the introduction were put into words as follows: "The project will have great impact on the working methods of all staff involved. There will be radical changes in the execution of the nurses' professional duties. For instance the information will be gathered, changed and referred to in a totally different way using the ENR. The second outcome is a change in nursing treatment, namely from more intuitional towards more methodical and systematic".

Prior to the implementation a decision was made to set up cooperation with a college. The involvement of an external party in such a vast project was deemed useful. Teachers and students offered support in setting up the ENR, training during the implementation, coaching the key-users and developing the system further [18].

4.2. Course

The initialization of the project consisted of preparatory activities such as the choice of system, establishment of a project group, exploring the possibilities of the system, further structuring and complementation of the system, preparation of the pilot phase and development of appropriate training.

During the pilot phase the ENR was introduced in three departments (oncology, oncological surgery and general surgery). After a thorough review and revision of the training and composition of the project, the hospital-wide implementation started in 2007. The project was introduced on two wards each month, and subsequently introduced on specific wards (paediatric, intensive care and dialysis).

Prior to the training, key-users were trained by the project group. The key-users checked whether the capabilities of the system were appropriate for the specific type of patients and situations on the ward. Then the training for all nurses started, followed by the "live stage", in which the ward actually took up use of the system. A member of the project group was present on each ward for two weeks at this stage. In addition, extra staffing was scheduled.

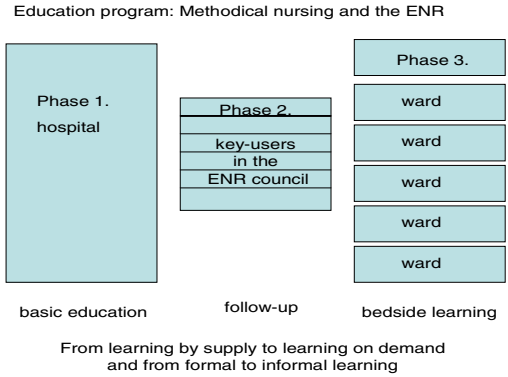

Figure 1. Training program

The construction of the training program is shown in Figure 1. The basic training consisted of four meetings of 2.5 hours during which aspects of the methodical work and navigation in the system were raised alternately and were applied to ward-specific cases [19]. A few months after the introduction, the “follow-up” (two meetings of four hours) for the key users took place. “Bedside learning”, a custom learning process, started in 2008 once the ENR was being used in the entire hospital (24 hours’ guidance per ward) [20].

The key-users formed an ENR council which together with the project group was responsible for the management, maintenance and updating of the system and for the quality assurance of the standards used therein [21]. During the entire process the status of the introduction was constantly evaluated by all concerned. Logs were kept, meetings were attended where staff members could give their views on the

implementation of the ENR and extra coaching was offered. The process was characterized by good listening and constant dialogue with the users.

During the implementation process new functionalities and improvements were developed and implemented, such as standard nursing care plans, specific anamneses, resignation forms, increasing the ease of use and making links with other systems.

4.3. Enhancing and constraining factors

The most frequently mentioned enhancing and constraining factors that played a role during the implementation are presented in Table 1.

Table 1. Enhancing and constraining factors

Enhancing factors
Unanimously: involvement of the Executive Board and the project group. Distinct communication, commitment and accessibility.
Increased workforce and extra time for the key-users.
Good staffing during "go-live stage".
Competencies of younger nurses on the ward (knowledge of nursing methodology and ICT).
Cooperation with Zuyd University.
Expertise of the project group.
Hospital-wide training (because of the alternation between methodology and "system use").
Development (specific anamneses, introducing standard nursing care plans).
Constraining factors
High workload, time deficit for adequate documentation (assessment of nursing anamneses and preparation of nursing care plans).
Using the system is more time-consuming than paper based documentation (too many clicks, not comprehensive enough).
Unclear aims in introducing the system (raising productivity and reducing staffing versus improving quality of care).
Lack of knowledge and motivation of some of the nurses.
Many changes in the organization in a short time.
Too little guidance on the ward after the "go-live stage".
Training occurred during the pilot phase because too little practice was offered.
Hardware provisions (laptops and connection to the intranet) not sufficient.

4.4. Experiences

The vast majority of the interviewees looked back positively on the introduction of the ENR. But there were differences in the experiences between the three departments. This can partly be explained by the fact that one division belonged to the pilot group. There was much talk about the effects of the introduction of the system (no time gains and quality improvement). Apparently the effect of using the system substantially determined the experience of the nurses. Using the system yielded no time gains because the ENR did not fit into existing workflow patterns and was not experienced as user-friendly. Despite the fact that the expectation of time gains was disproved during the training, the nurses expected this effect at the beginning of the implementation. The introduction of the standard nursing care plans led to a marked quality improvement. Concerning quality, nurses further indicated that they were made more aware of the nursing care by the use of nursing care plans.

5. Discussion, conclusions and recommendations

The implementation of the ENR was a large project which was completed within the prescribed period. Looking back there was a positive opinion of the communication with the end-users, the methodology of the project, the role of key-users on the wards and the resources (staffing, external expertise and training) that were deployed. The involvement of the nursing staff in the whole process promoted the acceptance of the system. This confirms the recommendation by Currell and others to involve nurses in the development and implementation of new systems [8]. However, the introduction of this ENR did not produce the benefits expected. In particular, the lack of time gains proved to be a major barrier to the acceptance of the system. Despite the fact that this expectation was disproved during the training, efficiency was seen as an expected outcome of the introduction by the nurses on the wards. Based on these conclusions, it is suggested that the following recommendations are followed before proceeding to an implementation:

- analyze the workflow and let the system fit in as far as possible,
- implement only a user-friendly system,
- ensure speedy access to the system (bedside terminals), and
- create consensus between users on the objectives and foreseeable effects of using the system.

This research has focused on how the ENR in this particular situation was implemented. It is an example of a subjective evaluation approach [12]. Further, more objective research, for instance by setting up an RCT, is needed to monitor the impact of the use of an electronic nursing record and to determine the effects on efficiency and quality of nursing care.

References

[1] Hilderink H, Goossen W, Epping P. Overzorg Een nieuw fundament voor ICT in de Verpleging. Leidschendam: NICTIZ 2002.

[2] Grol RW, Wensing M. Implementatie, effectieve verbetering van de patiëntenzorg. Maarssen: Elsevier gezondheidszorg 2006.

[3] Wibe T, Edwin E, Husby EH, Vedal T. Implementation of nursing care plan in the Electronic Patient Record (EPR) findings and experiences. Stud Health Technol Inform. 2006;122:309–13.
[4] Eurlings F, van Asten A, Cozijn H, Klaassen K, Stokman R, van Valkenburg R, et al. Effects of a nursing information system in 5 Dutch hospitals. Stud Health Technol Inform. 1997;46:50–5.
[5] Poissant L, Pereira J, Tamblyn R, Kawasumi Y. The impact of electronic health records on time efficiency of physicians and nurses: a systematic review. J Am Med Inform Assoc. 2005 Sep–Oct;12(5):505–16.
[6] Ammenwerth E, Kutscha A, Eichstadter R, Haux R. Systematic evaluation of computer-based nursing documentation. Medinfo. 2001;10(Pt 2):1102–6.
[7] Moen A. A nursing perspective to design and implementation of electronic patient record systems. J Biomed Inform. 2003 Aug–Oct;36(4–5):375–8.
[8] Currell R, Urquhart C. Nursing record systems: effects on nursing practice and health care outcomes. Cochrane Database Syst Rev. 2003(3):CD002099.
[9] Hayrinen K, Saranto K, Nykanen P. Definition, structure, content, use and impacts of electronic health records: a review of the research literature. Int J Med Inform. 2008 May;77(5):291–304.
[10] Ball MJ, Hannah KJ, Newbold SK, Douglas. Nursing informatics: where caring and technology meet. 3nd ed. New York: Springer-Verlag 2000.
[11] Verwey R. Analyse EVD Maaslandziekenhuis. Heerlen: Hogeschool Zuyd 2007.
[12] Burkle T, Ammenwerth E, Prokosch HU, Dudeck J. Evaluation of clinical information systems. What can be evaluated and what cannot? J Eval Clin Pract. 2001 Nov;7(4):373–85.
[13] I.s.h.med verpleging. 2006. Available from: URL:http://www.sap.com/netherlands/industries/healthcare/brochures/index.epx.
[14] Ammenwerth E, Mansmann U, Iller C, Eichstadter R. Factors affecting and affected by user acceptance of computer-based nursing documentation: results of a two-year study. J Am Med Inform Assoc. 2003 Jan–Feb;10(1):69–84.
[15] Gordon M. Verpleegkundige diagnostiek: proces en toepassing. Maarssen: Elsevier gezondheidszorg 2002.
[16] Polit DF, Beck CT. Essentials of nursing research: methods, appraisal, and utilization. Philadelphia: Lippincott Williams & Wilkins 2006.
[17] Rutgers M. Projectplan uitrol van de verpleegkundige module van het EVD. Sittard: Orbis, Maaslandziekenhuis 2006.
[18] Verwey R. Projectplan de Nieuwe Manier van Werken De doorontwikkeling van het EVD, een voorwaarde voor vraaggestuurd methodisch verpleegkundig handelen. Heerlen: Hogeschool Zuyd 2006.
[19] Verwey R. Scholing Systematisch handelen / Verpleegkundige methodiek en het EVD. Heerlen: Hogeschool Zuyd 2006.
[20] Verwey R. Bedsidelearning; werkplekleren gericht op methodisch handelen en de hantering van het Elektronisch Verpleegkundig Dossier. Heerlen: Hogeschool Zuyd 2007.
[21] Rutgers M. De verpleegkundige als sterrolhouder. Sittard: Orbis, Maaslandziekenhuis 2007.