Medical Informatics Europe '99
P. Kokol et al. (Eds.)
IOS Press, 1999

The development and testing of information system for community nursing

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Abstract. The paper presents the development and testing of information system (IS) for community nursing (CN). The goal of IS is to support CN practice and to encourage research and developement in the field. The development was based on analysis of CN process. Principal functions of CN were analysed. The logical data model and corresponding user interface were designed. A special emphasis in the development process was put on testing in practice and users' training. The developed IS will: increase work efficiency, introduce process-oriented nursing doctrine, support integrated treatment of the subjects and enable data comparison and exchange. An important subsidary goal of the IS development and usage is the harmonisation of concepts and terminology used in Slovenia with those used in the EU. In this framework International Classification of Nursing Practice (ICNP) which was translated into Slovene was introduced and tested.

1. Introduction

CN is defined as a special form of health care that ensures an active health and social care of clients (individuals, families and communities) that are, due to their biological features or a particular disease, more exposed to harmful effects from the environment. Community nurse helps clients to better perform daily living activities in various health conditions from birth to death. The role of the community nurse is to support activities in primary health care, prevention and health education (for example Salvage, 1993). According to the Resolution WHA49.1 (World Health Assembly) »nursing/midwifery service development is an integral part of health development. To maximize the contribution of nurses and midwives to the achievements in the field of health country-specific approach must be adopted. Active involvement of nurses at all levels of the health care system, together with the recipients of health care, policymakers, the public and private sectors, representatives of professional associations and educational institutions, and those who have responsibility for social and economic development must be assured«.

The goal of an IS for CN is not only to help in performing the routine work in pratcise. The use of information tools is also a challenge and opportunity for new ideas and solutions leading to a higher level of quality of work and life. The interdisciplinary approach is herewith a prerequisite as it enables co-operation of various experts from different institutions. The IS will move the community nurse's work away from a task-oriented approach to a more client-oriented one using problem-solving strategy covering the following major steps: identification of needs for nursing care, decisions on nursing interventions and outcome evaluation (Šušteršič, Rajkovič, 1996).

The IS was developed in the frame of EU project INCO Copernicus: Co-operative Research in Information Infrastructure. The project linked the efforts of several public and private research/government /industry partners: University of Maribor, Faculty of Organizational Sciences, University of Ljubljana, University College of Health Care, INFONET company, Health Centre Ljubljana-Bežigrad, Health Centre Radovljica and Danish Institute for Health and Nursing Research . Summary of the project is available on Internet page (http://lopes1.fov.uni-mb.si/patro/index.htm). In the process of IS development prototyping approach with the on-line verification in practice was used. This methodology is suggested in the literature (for example Martin, 1991). Such approach does not only ensure greater functional adequacy of the system, it also stimulates the user, i.e. the community nurses, to exhibit a higher degree of creativity. The program is written in Borland Delphi and runs under Microsoft Windows. Users' manual with program documentation is already available. IS supports the following main functions of CN process: identification of needs for CN care, treatment and evaluation, including statistics and costs. Clients' treatment includes follow-up of daily activities (nursing anamneses), nursing diagnoses, nursing interventions (actions) and evaluation of outcomes. Program is designed to be used as a client-server application on local area network in health centres. It offers the possibility for the nurse to use a portable PC, for example Toshiba Libretto, on home visits and use it for updating the client's record immediately on site.

In the paper the function of CN will be described, followed by the data model and user's interface description. Special emphasis will be laid on implementation and testing of the proposed of prototype.

2. Functional model of community nursing

The process of CN enables systematical, individualized and holistic approach in solving nursing issues relevant to healthy or sick client, family and community. There are four phases: a) need assessment which covers nursing problem and making of diagnosis, b) goal and intervention planning, c) performing nursing interventions and d) evaluation of outcome (Ellis, 1989). The data flow diagrams showing the detailed functional decomposition is reported in the proposed project documentation (Jereb, 1997). The need assessment function consists of five subfunctions: information gathering, interpreting, recognizing, ranking and checking. The planning gives detailed CN plan, which includes decision making, what to do and how to do. The subprocess of planning are: joint goal settings, selecting nursing interventions, preliminary contact with client in order to get confirmation of the plan, dissemination of the CN plan to other relevant recipients (co-workers, relatives). Implementation of planned interventions includes nursing and technical procedures. These procedures are adjusted according to the current state of the client and unpredictable developments. Performed interventions are recorded in CN plan. Evaluation is the most important phase in CN. It enables process improvement for the benefit of the client and cost effective treatment. Feedback information can contribute to better need assessment.

The analysis of the current practice in two health centres was performed. It was determined that current practice differs among health centres and that practice deviates from proposed theoretical education process. Duplicated, incomplete and inaccurate paper documentation on clients are kept on various locations. Several problems related to data gathering, data updating, and data deletion were identified. Personal data security problem was generally inadequately treated. Scheduling of the CN process, planning and evaluation were neglected either because of shortage of time or because of inaccessibility of relevant

data. On the other hand the administrative tasks proposed by theoretical model would significantly decrease the time that a nurse devotes to a client. The »unified nursing language« described in (Mortensen, 1993, Wake et al, 1993, Mortensen, 1997) and proposed by ICNP is hard to use without computer support. Extensiveness of the language on one side and semantic deficiency on the other side are identified as serious problems. The conclusions made by system analysts were not black/white. It was decided to design open-ended system, to implement theoretical model where it is reasonable, and to support good practice where necessary.

3. Data model

Data model was developed gradually during the research project. The first preliminary models were more medically oriented (for example Milavec et al, 1995) and proposed mainly logical-semantic approach (Šušteršič, Rajkovič, 1996). The later one included more or less complete data support for CN. The core of the current data model is described in Leskovar et al (1998). Complete data model includes more than 60 relational tables. The most important relational tables are *Client*, *Family*, *Community* and *Nurse*. Each *Family* can be include many Clients; each family member is a potential *Client*. The new *Order* issued by *Order Issuer* triggers one or more *CN Processes*. Each *Process* corresponds to one of the states of the *Client* (for example newborn, child, teenager, adult, elderly person). The *Process* triggers *Visit*. Each *Visit* is scheduled by *Calendar*. The *Process* links different states of the same person while *Visit* links different activities during the visit. *Properties* are measured and each property has its own set of agreed values (*Domain*). *Instances of CN diagnoses* are confirmed during the visit. *Instances of CN interventions* are executed during the visit. Table *Property* stores all nursing anamneses. Additional classification of properties enables testing various coding schemes (for example complete or reduced ICNP, user proposed properties etc.). Tables *Insurance Company* and Instance of *Other intervention* will serve to demonstrate the financial aspect of CN.

4. User interface

Borland Delphi was the chosen implementation tool. The application was designed as multiple document interface (MDI). Main window controls one or more child windows as presented in Figure 1. Standard Windows entry/transition controls are used (drop down menus, combo boxes, ALT+character, toolbars etc.). After successful authorization, the application permits the user to perform granted functions. Three classes of users can simultaneously use the programe: Administrator, Head Nurse and Nurse. The user interface keeps a significant degree of similarity with theoretical model of community nursing described in chapter 2. Report section of the application is opened for new tools such as statistical package or expert system.

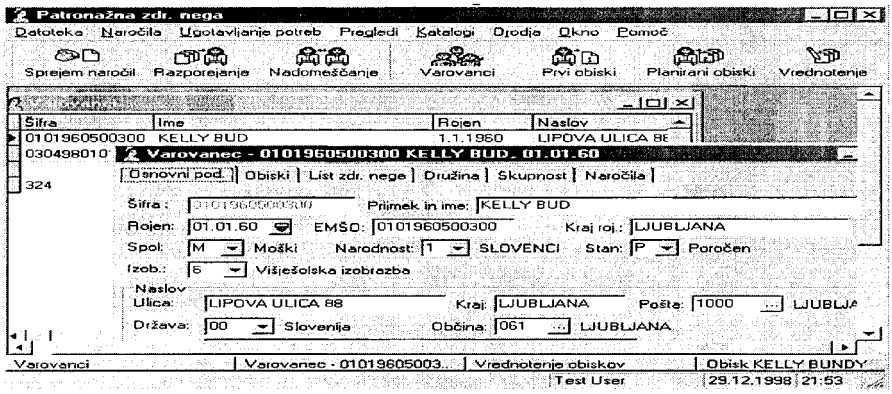

Figure 1: Main window of community nursing IS with four child windows.

5. Implementation of the information system

The information system architecture is schematically presented in figure 2. Servers in different municipals are connected via routers and public or private network. Alternatively, fast modems can be used. It is expected that the link between servers will support e-mail and client migration mainly. The proposed minimum configuration of the server is: processor speed 166MHz, memory 32MB, disk capacity 2Gb, DAT backup unit 4/8Gb, Windows NT operation system and Access/Paradox/Oracle/MS SQL database system. Work stations and portable PCs are Windows 95/98 based systems. The communication between server and client is enabled via LAN preferably Ethernet. Portable PCs and personal digital assistants without network interface card will receive and send data through RS 232 or infrared interface. Personal digital assistants require data conversion from chosen database format to ASCII and vice versa. Preliminary tests with Apple Newton PDA and cable showed relatively fast conversion and transmission but at present too complicated for target users (nurses).

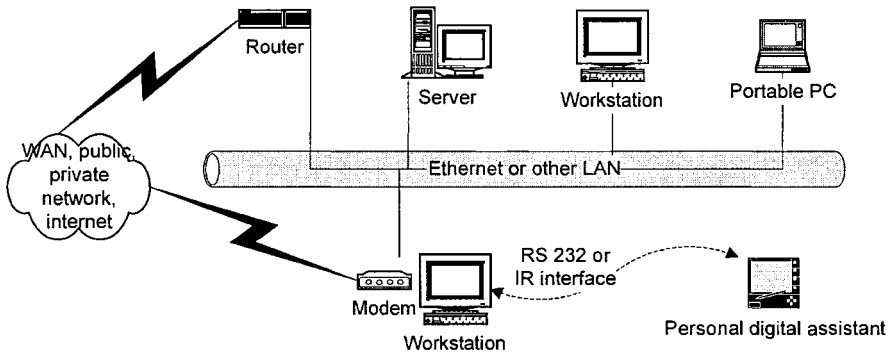

Figure 2: Information system architecture for community nursing.

6. Conclusion

The proposed information system integrates nursing practice with modern information technology. Information system for community nursing can serve operational, administrative, research and educational purposes. Theoretical model of the process approach to community nursing is effectively applied and adapted for the practice. Modular structure enables flexibility and adaptability. User-friendly interface also enabled several testings including ICNP. The extensiveness of the language and semantic deficiency were identified as serious obstacles in practical usage. Various adds-on like financial module, statistical package or expert system, could be easily connected. Some supplementary functions will be added in the final release until mid of 1999.

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