Advantages of Information Systems in Health Services

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Maria Malliarou[1], Sofia Zyga[2]

[1] *Technological Institution of Larisa, Nursing Department*
[2] *Nursing Department, University of Peloponnese*

Abstract

Nursing Information System (NIS) has been defined as "a part of a health care information system that deals with nursing aspects, particularly the maintenance of the nursing record". Nursing Uses of Information Systems in order to assess patient acuity and condition, prepare a plan of care or critical pathway, specify interventions, document care, track outcomes and control quality in the given patient care. Patient care processes, Communication, research, education and ward management can be easily delivered using NIS. There is a specific procedure that should be followed when implementing NISs. The electronic databases CINAHL and Medline were used to identify studies for review. Studies were selected from a search that included the terms 'nursing information systems', 'clinical information systems', 'hospital information systems', 'documentation', 'nursing records', combined with 'electronic' and 'computer'. Journal articles, research papers, and systematic reviews from 1980 to 2007 were included.

In Greek Hospitals there have been made many trials and efforts in order to develop electronic nursing documentation with little results. There are many difficulties and some of them are different levels of nursing education, low nurse to patient ratios, not involvement of nurses in the phases of their implementation, resistance in change. Today's nursing practise in Greece needs to follow others counties paradigm and phase its controversies and problems in order to follow the worldwide changes in delivering nursing care.

Key Words: *Nursing Information Systems, Clinical Information Systems, Hospital Information Systems, Documentation, Nursing records, Electronic, Computer.*

Information Systems are "computer systems that collect, store, process, retrieve, display, and communicate timely information needed in practice, education, administration and research" (Malliarou, 2006; Malliarou et al., 2007). The benefits of using Information Systems are many. They not only reduce errors and increase speed of care and accuracy but they also can lower health costs by coordinating services and improving quality of care.

Nursing Information System is "a part of a health care information system that deals with nursing aspects, particularly the maintenance of the nursing record" (Currell et al., 2003). A Nursing Record System is the record of care planned and/or given to individual patients/clients by qualified nurses or other caregivers under the direction of a qualified nurse. Nursing Record Systems may be an effective way of influencing nurse practice (Mahler et al., 2007). Documentation is important for efficient communication within the healthcare professional team and for quality assurance.

Registered Nurses use Nursing Information Systems in order to assess patient acuity, prepare a plan of care or critical pathway and specify interventions, document care, track outcomes and to control quality. Nurses can have an integrated view of patient data (e.g. integrate nurses and physician orders in the patient care plan). Data may be available from different locations (including bedside entry). Nursing information systems help nurses plan support activities, but also communicate with related services. The users can control correctness, validity, safety and confidentiality of patient information (Reimer et al., 1996). Nursing information systems should have a user-friendly interface and that means easy to learn, fast to use, and help functions included and homogeneous in appearance.

Functions of a Nursing Information System

The main tasks in the nursing care process include processes of patient care, of ward management, of communication and cooperation with other health professionals and education and research processes. The activities nurses perform when caring for patients have been identified and nursing roles have been categorized into three global categories. The first is managerial roles or coordinating activities that involve the gathering and transmission of patient information, such as order entry, results reporting, requisition generation, and telephone booking of appointments. The second category is physician-delegated tasks. Current systems can capture these tasks from the physicians' order entry set and then incorporate them into the patient care plan. The third category is autonomous nursing function, characteristic of professional nursing practice, when knowledge unique to nursing is applied to patient care.

Patient care processes include all the treatments administered to patient by the nursing personnel. Nursing interventions describe the activities and behaviours used to deliver nursing treatments (Malliarou et al., 2007). As previously indicated, some of these respond to a physician's order but many do not. Data gathered for documenting nursing work includes nurse's observations, their examinations and observations that formulate nursing diagnosis, scheduling of treatments and administration of medication, medical record charting, dietary registration, workload assessment, discharge or transfer of patient.

Clinical documentation is also written evidence of the following (Partin et al, 1985):

- Interactions among members of the healthcare team.
- Administration of assessments, tests, procedures, treatments, and patient education.
- Results or evaluation of a patient's response to diagnostic tests and interventions.
- Outcomes, or expected outcomes, of the patient's interaction with, and as a part of, the plan of care.

Even electronic Nursing documentation needs to fulfil legal aspects concerning documentation as well as specific professional nursing aspects such as documenting the nursing process. These can be summarized according to (Lippeveld, 2000) in the following purposes of nursing documentation:

1. Inner- and interprofessional communication among health care providers to ensure the delivery of safe and effective care as well as to ensure the continuity of good quality of care,
2. Source of data to prove that patient related interventions affect patient outcomes,
3. Evidence of the efficient use of means of care and the assurance of financial reimbursement,
4. Source of legal evidence to testimony nursing quality.

Data generated by nurses that is of significant interest to physicians and include vital signs, intake/output, Kardex/care plan data, and the medication administration record, can be made easily accessible. Narrative notes, which capture patient information essential for decision-making, still comprise most of the patient record and is the area most seriously in need of improvement (Malliarou et al., 2007). The task of completing documentation in highly complex healthcare environments poses a significant, often unmanageable challenge and has become the root cause of many patient safety issues and other problems.

Head nurse can promote quality assurance by introducing in the daily practise information systems that will help her have nursing ward unit activity overviews, staff schedules, personnel management, supplies management and

financial management (budget, patient billing). The well functioning of the ward unit depends on the effective use of the available resources.

Orders, appointments, communication with the family and other work-related subjects, medical results, information transfer to other specialists can be managed through an integrated health information system (Emspak et al,1998). Nurses who are coming on duty find other nurses entries and continue the work. This continuity of delivery of care is very important in providing qualitative health services (Malliarou, 2007). Control of nursing errors at any stage of practise can easily be reached by documentation of routine functions and procedures. Education and research processes could be promoted because data can easily be tracked and acquired as well, always under the concept of the maintenance of nursing secrecy. Research can use nursing information system for outsourcing quantitative data, descriptions of health status and mortality of populations over time, also for analysis of causation of health problems, quantification of associations between health outcomes and risk or protective factors, and assessment of the effectiveness of public health interventions. Well designed information retrieval and viewing, with ease of data entry, speeds up the clinical decision-making process, innovates current research content into practice, and can improve care. To the extent that any piece of documentation can be used for legal defence, one can assuredly say that documentation is never an endpoint (Stamouli et al, 2001).

Table 1. *Nursing Information System Benefits*

1. More time spent with patient and less time at nurse station
2. Reduce paperwork/paper loss
3. Automated tools of nursing documentation
4. Uniform standards of nursing care are programmed (nursing process)
5. Cost reduction (Fewer loss of charges)
6. Quality can be measured

As Lippeveld T. (2000) stated “Nursing information systems contribute to an "integrated effort to collect, process, report and use health information and knowledge to influence policy-making, programme action and research”. Nursing judgments are not based any more on intuition, ritual, or tradition. Nurses increasingly are basing their practice on knowledge that has been developed through empirical research. However, because of the rapid increase in the volume of information in the body of nursing knowledge, it is no longer possible to expect nurses to retain the entire knowledge base of the profession in their

heads. Consequently, nurses require access to the resources that contain empirically developed nursing knowledge.

Phases of implementation of Nursing Information Systems

Life Cycle Model is one of the methods for the development of Information Systems. This method contains the following seven distinct phases: the definition of the user needs, the analysis of the current system, the design of the new system, the codification of the new system, the acceptance and the evaluation, the implementation, and the maintenance of the new system (Damigou et al., 2006).

Phases of implementing an NIS are (Allan and Englebright, 2000):

1. Planning phase
2. Analysis phase
3. Design phase
4. Development phase
5. Implementation phase
6. Evaluation phase
7. Upgrade phase

Planning phase

The planning phase involves the following steps:

1. Define problem and/or stated goal
2. Conduct feasibility study
   - State objectives
   - Determine scope
   - Determine information needs
   - Decide whether to proceed
   - Negotiate the project definition agreement
   - Write the project definition document
3. Allocate resources

Analysis Phase

In the Analysis Phase data must be collected in the form of written documents, questionnaires, interviews, observations. After analysing data with data flowcharts, grid chart, decision tables, organizational charts a model can be made. Data must be reviewed before proceeding to the design phase.

Design Phase

The design phase is divided into two parts:

1. Functional design

1. personnel
2. time frame
3. cost and budget
4. facilities and equipment
5. data manipulation and output
6. operational considerations
7. human-computer interactions
8. system validation plan

2. Implementation design

1. design inputs
2. design outputs
3. design files and databases, design controls

Development phase

The Development phase includes the following:

1. Select Hardware
2. Develop software
3. Test system
4. Document system
   – user's manual
   – operator's manual
   – maintenance manual

Implementation Phase

The implementation phase includes a detailed description of the system that specifies not only all hardware and software components but implementation, training, operation, and maintenance procedures as well. Includes the following steps:

1. Train users
2. Install System
3. Manage and Maintain System

Evaluation Phase (1)

The following criteria are considered essential in selecting a nursing information system and can be used as a basis for evaluation:

1. Applications
2. Overall system performance
3. Evaluation features
4. Ease of system use
5. Configuration or programming performance
6. Security
7. Simplification of reports
8. Database access
9. Hardware and software reliability
10. Connectivity
11. System cost

Evaluation Phase (2)

Methods and tools for evaluating a system's functional performance include:

1. Record review
2. Time study
3. User satisfaction
4. Cost-benefit analysis

Upgrade Phase

Some of the important considerations in upgrading a system include the following new technologies:

1. Bedside /point-of-care terminals
2. Workstations
3. Multimedia presentations
4. Desicion support systems
5. Artificial intelligence
6. Neural networks
7. Integrated systems architecture
8. Interfaced networks
9. Open architecture

Problems met on implementation of Nursing Information Systems in Greece

The problems associated with the development of hospital information systems in general and their implementation in organizations has been the subject of much literary debate (Bussing et al., 1998). Despite the benefits Nursing Information Systems have to offer, they are not widely used in healthcare and where they have been installed, they have not been readily accepted. Many problems have been reported during the implementation of health information systems in Greece Healthcare environment. This could probably due to lack of adequate training and failure of educate the end-user what the reasons are for their introduction. Problems that have been reported when introducing computers to support nursing are the lack of standardized nursing terminology, computer anxious users, fear of less individual care and too much control as well as unclear benefits (Goossen et al., 1997; Harris, 1990; CNA, 2006; Reuss, 2007).

System developers, however, have been remiss in providing relevant, useful information to the various healthcare professionals involved in the care of the patient. The ideal nursing system requires the technology for source data capture and considerable work by nurses on the development of the nursing knowledge base. It is clear on the basis of the data that there is a need to develop a fertile ground before the implementation of NIS. There is also a need for users to develop a framework of understanding about how the systems function. To implement NIS for users who do not understand it may lead to the failure of the system. Users are drivers of the system if they do not have reasonable knowledge about it, it is difficult for it to be optimally driven to provide objectives. There is a general ignorance of information systems amongst health workers. It is time to analyse the problems that exist in the development and use of NISs and to look for solutions to solve them (Jeffrey, 1998).

The Canadian Nurses Association (CNA) has defined strategic directions for health-care organizations if they are to truly benefit from what information systems have to offer (Oroviogoicoechea et al., 2008):

- Nurses in clinical practice: Participate, identify needs and evaluate possible solutions.
- Employers and administrators: Recognize nursing information systems as a tool of professional nursing practice. Support involvement of nurses. Encourage adoption of NIS that supports nursing practice.
- Federal, provincial and territorial ministries: Ensure participation of nurses in planning and decision-making related to NIS.
- Nursing organizations – professional associations, regulatory bodies, and unions: Provide leadership for nurses' involvement. Recognize NIS competencies as entry-level requirements.
- Educators and researchers: Develop research programs to optimize nurses' utilization of NISs.

Nursing should be a vocal part of the system selection process to assure the purchase of a system that uses nursing taxonomies (language) and collects information pertinent to nursing care. Such a system can significantly assist in measuring nursing quality and its positive impact on patient care (Jetté, 2007). Standardized documentation is required for communication nursing concepts, interventions, and outcomes to other nurses and health professionals working in different settings and countries. Better data may also be obtained by the use of structured formats and predefined care plans, in conjunction to the use of a formalized nursing language (Dowling, 1985). Electronic storage of nursing data using standardized vocabulary (nursing classification systems) would make it possible to codify and use these data. The information obtained would be useful for research, drawing up protocols and practice guides, and even for theory work, to advance nursing knowledge (Larrabee et al., 2001; Malliarou et al., 2007).

Conclusion

Nurses are responsible for a substantial part of the patient record and hence are particularly affected by the computerisation. The appliance of Information Systems into nursing provides important advantages in the administration of the nursing personnel's data, contributing to the improvement of the operating effectiveness of the Nursing Service (Malliarou et al., 2008). Economic pressures on healthcare systems have intensified the necessity of demonstrating the unique contribution of nursing care to patient outcomes. The use of nursing information systems (NIS) has increased completeness of some nursing documentation elements (Cibulskis et al., 2008).

The key for effective administration and management of the Nursing Service of a Hospital is the availability of reliable, valid, and qualitative information. This fact predicates the existence and appliance of Nursing Information Systems, and makes indisputable their superiority against the manual procedure. Organizations may need to redesign the computer interface, to provide better hardware and to maintain a more reliable network function to meet the nurses' needs during the adoption process, as well as to modify or devise appropriate documentation regulations (Damigou, 2007).

The health sector still lacks the discipline of system thinking, shared vision and a team approach. Study of NISs systems that have already been implemented need re-evaluation to determine "not just whether they work, but how and in what circumstances they work." Realistic evaluation is purported to be a means to better understand "…why and how a programme or intervention works…" Realistic evaluation is a research tool that is increasing in application to the study of the implementation of Nursing Information Systems (Dowling, 1985).

A critical factor governing the sustainability of information systems is the availability of qualified and experienced personnel. Information systems require

active management if they are to succeed. Procedures need to be established for data collection, reporting, follow-up of missing reports, data quality control, data summary and providing feedback (Jetté, 2007).

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Address for correspondence:
Maria Malliarou
Terpsithea
Larisa, 41500
Greece
e-mail: mmalliarou@gmail.com