

Documenting Nursing Practice by Using ICNP on the Web

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Abstract

This paper presents the design and implementation of an internet based nursing care planning system which helps nursing professionals and students to study ICNP beta 2 version and to create nursing diagnoses, interventions and outcomes by selecting relevant terms from ICNP. This advanced web-based ICNP browser enables the authentication of the user, and the creation of a type of nursing care plan through the use of ICNP. It provides different ways for creating nursing diagnoses, interventions and outcomes, by selecting relevant ICNP terms through the tree-structure view, index and search components of the tool. The created diagnoses, interventions and outcomes are stored to a secured database. The system provides to the user the facility to build and manage nursing care plans by using both the English and the translated Greek ICNP versions. The first results of the implementation of this internet based nursing care planning system are presented.

Keywords

Databases, Data Display, Information Storage and Retrieval, Internet, Nursing Informatics, Terminology, User-computer interface.

1. Introduction

ICNP (International Classification for Nursing Practice) was initiated by the International Council of Nurses (ICN) in 1989. It is an international effort to develop a nursing terminology and classification that can be used worldwide to describe and organize nursing data for nursing care. [1]. The ICNP is defined as the classification of nursing phenomena, nursing actions, and nursing outcomes. As an informational tool to describe nursing practice, it can be used to make nursing practice visible in multidisciplinary health information systems. The alpha version was released in 1996, the beta in 1999, while in 2001 some changes have been released in the ICNP beta 2. The latest changes reflect mainly editorial correction of the beta version. ICNP Version 1 is planned to be released in 2005. [2]. As part of the achievements of Telenurse and TelenurseID-ENTITY (Integration and Dissemination of European Nursing Terminology in Information Technology) EC projects, ICNP was translated from English into several European languages. The translation of both alpha and beta ICNP versions in Greek language was organised by Health Informatics Laboratory of the Faculty of Nursing of the University of Athens, which has participated in both European projects. [3]. ICNP beta has been designed as a multi axial and poly hierarchical classification, with one top term being subdivided according to several different principles of division. Such structure allows different concepts in nursing clinical practice to be expressed as combinations of concepts from different axes or hierarchies. The three main classifications are nursing phenomena, nursing actions and nursing outcomes. [4]

Nursing phenomenon is an aspect of health of relevance to nursing practice. It is described in the axes of Focus of Nursing Practice, Judgement, Frequency, Duration, Topology, Body Site, Likelihood, and Bearer. Nursing Diagnosis is a label given by a nurse to the decision

about a phenomenon which is the focus of nursing interventions. A nursing diagnosis is composed of concepts contained in the classification of phenomenon axes.

Nursing Action is a behaviour of nurses in practice. It contains the axes of Action type, Target, Means, Time, Topology, Location, Route, and Beneficiary. Nursing Intervention is an action taken in response to a nursing diagnosis in order to produce a nursing outcome. For the ICNP a nursing intervention is composed of concepts contained in the Nursing Actions Classification.

Nursing Outcome is the measure or status of a nursing diagnosis at points of time after a nursing intervention. It is described in the same axes with the nursing phenomenon, which are used for the composition of its concepts as well. [2]

Both the English and the Greek translation of ICNP beta 2 version is proposed by this work to be implemented in a computer-based system, and especially in a care planning system that operates on the internet or an intranet. ICNP possesses specific characteristics needed for implementation in such computer systems. Compared with other language systems developed to represent nursing judgements in computer-based systems, ICNP meets most of the criteria required. [5], [6]

2. Methods

2.1. Design phase

In order to compose a specific nursing diagnosis (or nursing outcome) and a nursing intervention by using ICNP classification system, one has to select the appropriate terms from two to eight different axes from the total of sixteen axes of ICNP Nursing Phenomena and Nursing Actions Classifications. The eight axes used in Nursing Phenomena classification can be combined in about 1.6 trillion ways, while the Nursing Actions classification allows about 1.2 trillion possible combinations. Moreover, the specific rules that someone has to follow in order to compose specific nursing diagnoses and interventions by using ICNP, according to the guidelines that the development team of ICNP has provided, make the possibility of creating invalid combinations of concepts very high, proportional to the great number of ICNP axes and concepts. [7]

This very large number of axes, levels and concepts, all used for the same specific field (nursing practice) makes difficult to find with speed, validity and efficiency, the appropriate terms needed to define specific nursing diagnoses and interventions. While designing our system we described the requirements it needed to eliminate these problems. It should provide different views of ICNP terms so as to facilitate the easy and quick selection of terms from the different axes. One basic view for the presentation of ICNP terms is the view of its hierarchical structure. One top term with its definition is viewed and, when clicked other terms in the sub-level of the hierarchy are presented. Another view, is the index view in which ICNP terms are indexed alphabetically. In the English version of ICNP only the Body Site (axis F) from the nursing phenomenon classification and the Location – Body Sites (axis F) and Target – Body Part (axis B) of the nursing action classification are indexed in alphabetical order, in contrast to the other terms in other axes, which are classified differently. In Greek ICNP version, none of the axes are classified in alphabetical order. A third view proposed is the search view, where specific terms are displayed according to several search criteria.

The conceptual and logical schema of the database that would store and manage data from ICNP and from the created Nursing Diagnoses, Actions, Outcomes of the care plan, was designed. [8]

2.2. Implementation phase

Our nursing care planning system was proposed to be implemented in the client – server model and to run as an intranet or internet application, while the security requirements were taken into account. The main benefit of such an implementation is that the user has the ability to access parts of the system authorised to do so, and select, insert or update data, through a web browser from every computer that it is online.

For the implementation of the data storing and management of our system, Microsoft SQL Server 2000 RDBMS was selected. An MS SQL Server database can be replicated via the Internet and make data accessible to users in remote locations throughout the world. Furthermore, MS SQL Server security features protect data from users that should not be viewing or adding, changing, or deleting the data.

Controlling access to sensitive data, in databases being placed on the Internet, has become more of a focus recently than in the past. Thus, database management and administration should be easy to maintain, especially when dealing with a great number of users of large databases. The way that SQL Server 2000 and NT based Windows 2000 servers are integrated in checking the access and permissions of the user is strengthened and simplified in comparison with previous SQL server versions or other RDBMSs. The combination of Microsoft SQL Server and Microsoft Internet Information Server (IIS) provides the framework to connect the relational database to the Internet while using Web browsers to display data. [9], [10]

The design of the web site was based on Microsoft's server side technology, ASP version 3.0. The idea of an ASP is that the page is generated by the server at the time of the request, and can be changed according to the parameters the client sends to the server. This has numerous advantages, and the two that we most benefit from, are namely that the server can access its database to dynamically display information in HTML format to the client, and that the client approaches it just with a web browser without any special software needed. ASP-formatted pages are read by browsers the same way as regular HTML pages. Included with ASP is the database access server component which provides access to databases using ActiveX Data Objects (ADO). ADO was designed to be a high-level interface to provide ease of access to databases. [10], [11]

Another way apart from ASP-ADO technology, which provides more direct results and was also used in specific parts of the implementation of our nursing care planning system, is SQL-XML. XML is becoming a standard way to deliver data on the web; moreover SQL Server 2000 supports a number of methods to return XML results. [9]

The scripting language used for the development of the web interface of the database, is for the server-side VBScript, as it is the default language of ASPs. While for the client-side scripting, Jscript is used. Also DHTML (Dynamic HTML) innovating features of MS Internet Explorer are exploited. DHTML gives the ability to create visually outstanding HTML documents that interact with the user to achieve special effects. [12]

3. Results

In the implemented internet based nursing care planning system, one has the ability when authenticated, to create or view stored nursing diagnoses, nursing interventions and nursing outcomes, created by him or by another user with the same security roles. If nursing diagnoses, interventions, outcomes or completed care plans are to be accessed, and they are already stored to the database, they are presented on the screen, according to the user's requests to the database, through the web interface of the application.

On the other hand, if a new nursing diagnosis, intervention or outcome is about to be created an ICNP browser with enhanced features is provided as an encapsulated tool of the system. This ICNP browser enables the selection of ICNP terms in three different views. The tree-structure view presents terms from the selected ICNP axis according to its hierarchical structure. Figure 1 presents the selection of a specific term from the Focus axis of ICNP Phenomenon classification. The hierarchical structure of the selected axis is presented, while other information like the term's code, description or root in the hierarchical structure, is given. The selected term is stored temporarily to the bottom side of the application.

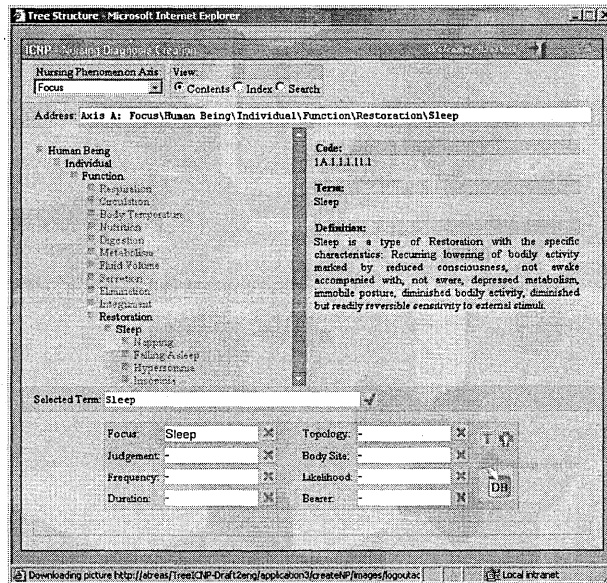


Figure 1. Selecting ICNP terms through tree-structure view

The index view of the implemented ICNP browser, indexes ICNP terms in alphabetical order. Figure 2 presents the selection of a term from the Judgement axis of ICNP Phenomenon classification with the typing of the first letters of the searching term.

The third view (search view) that ICNP browser provides, presents the results for the given searching keyword(s), moreover the number of found terms appears on the application's status bar. The keyword(s) given for the searching process can be sought either in the field of ICNP terms, or in that of ICNP description or even in both fields. The default searching mode is in the field of ICNP terms. Furthermore, the ability of conducting compound searches by using more than one keywords being composed with the logical operators AND, OR, NOT is also provided. Figure 3 presents the selection of a term from the Likelihood axis of ICNP Phenomenon classification.

If the composed nursing diagnosis is to be stored, a message window informs which data are going to be stored in the database. In case the composed nursing diagnosis already exists in the database, an error message appears in the status bar of the application, informing the user of its existence. In the status bar other messages are also appeared.

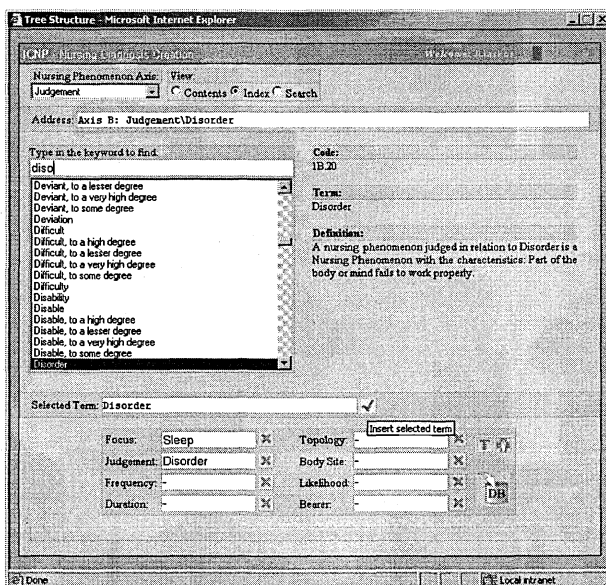


Figure 2. Selecting ICNP terms through index view

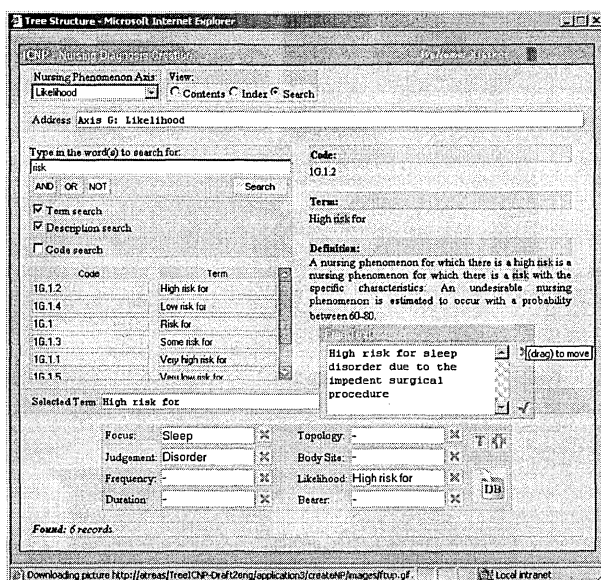


Figure 3. Selecting ICNP terms through search view and adding free text to the created ICNP nursing diagnosis

A number of professionals in clinical nursing, who were aware of ICNP classification system and tested the tool by trying to create a care plan via internet, have expressed a positive attitude towards the tool developed. Some of the benefits pointed out, are the friendly user interface with the detailed instructions, the different views of ICNP provided (tree-view, index, search) which decrease the time needed for the creation of a care plan based on ICNP terms, the bilingual environment with both English and Greek versions of

ICNP, the ability of creating and managing care plans from every computer connected to the intranet, or internet, and the security obtained by authenticating users.

4. Conclusion and Future Developments

We have proposed a system that allows documenting nursing practice with the use of an internationally accepted nursing vocabulary. The tool is now at a prototype level. We aim to integrate it with an electronic patient record and further evaluate it for its usability in clinical practice, and for the assistance it provides to the nursing professionals in the creation and management of nursing care plans. Moreover, we will examine if it is possible for the clinical nurse to adopt ICNP terminology in such a system, given the little progress that has been made in Greek hospitals in the use of a common acceptable method for documenting nursing practice. Nursing professionals with long experience in health care and nursing practice will be evaluating the system.

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