# Documentation system prototype for postpartum nursing

Protótipo de sistema de documentação em enfermagem no puerpério

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## Abstract

**Objective:** To develop a documentation system prototype for postpartum nursing.
**Methods:** For the software planning, a model based on object orientation was used, which included: understanding and definition of the context and usage modes of the system design project, identification of the main objects of the system, development of project models, specification of object interfaces. The languages *Structured Query Language* (SQL), MySQL and *Hypertext Preprocessor* (php) were used.
**Results:** The prototype shows the planned requirements, among them: use of the International *Classification For Nursing Practice* (ICNP®) version 1.0 as support code to perform the nursing process; presentation of the axes of ICNP® version 1.0 in order of use; elaboration of reports about the usage practice of nursing processes.
**Conclusion:** The proposed documentation system prototype was successfully developed, allowing professional nursing records to be registered in a standardized language.

## Resumo

**Objetivo:** Desenvolver protótipo de sistema de documentação em enfermagem no puerpério.
**Métodos:** Planejamento de software utilizou modelo baseado em orientação a objetos, que englobou: compreensão e definição do contexto e dos modos de utilização projeto de arquitetura do sistema, identificação dos principais objetos do sistema, desenvolvimento dos modelos do projeto, especificação das interfaces dos objetos. Foram utilizadas as linguagem *Structured Query Language* (SQL), MySQL e *Hypertext Preprocessor* (php).
**Resultados:** O protótipo apresenta os requisitos planejados, entre eles: uso da *Classificação Internacional para a Prática de Enfermagem* (CIPE®) versão 1.0 como código de apoio para execução do processo de enfermagem; apresentação dos eixos da CIPE® versão 1.0 em ordem de uso; geração de relatórios sobre a prática de uso dos processos de enfermagem.
**Conclusão:** O protótipo de sistema de documentação proposto foi desenvolvido com sucesso com possibilidade de registros de enfermagem por meio de linguagem padronizada.

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## Introduction

Professional nursing practice is focused on care. Caring for people necessarily requires that nursing professionals use communication resources. Among its various forms, communication among professionals may be a tool for successful nursing care. And, in this context, nursing records stand out as an important way of documented communication.

The clinical information nursing professionals are faced with daily each time they meet with patients is numerous and valuable; however, the current process of obtaining and using this information produces a fragmented rather than synergistic documentation and, as a consequence, its potential to improve nursing care has not been explored.[1]

The records show the way professional nursing practice is perceived and integrated by itself, by other healthcare professionals, by institutions' payment and audit systems and by the healthcare system, and also serve as a parameter for clinical decision making and management.

The tasks of recording clinical data are varied and complex. As the quantity of data and information in clinical practice increases, the volume and levels of detail in nursing documentation also increase, without necessarily resulting in an improvement in the quality of information contents.[2]

The development of computer systems that make record taking, use and analysis of clinical information easier promotes communication among healthcare teams and contributes to the quality of nursing care.

Nursing documentation systems are resources used to make nursing record taking quicker and more accurate, since they provide nursing and other professionals with current and reliable information.

Using technological advances to plan the activities involved in patient care in a controlled and effective way is increasingly imperative, besides being a requirement for nurses. Nurses want information systems that reflect the reality of their clinical practice (tacit knowledge), but that can have elements of formal knowledge (explicit), adapting them to an automated system that covers the nursing process as a whole.[3]

The nursing process serves as a systematic structure, in which nurses seek information about patients, respond to clinical instructions, identify and respond to issues that affect patients' health.[4] Therefore, it also serves as a work tool for nurses in relation to data management, which need to be shared with other members of the nursing and healthcare teams.

The system proposed by this prototype was based on the nursing process practice and its stages. To record the information obtained through its application, nurses use vocabulary and classification systems. Professional nursing practice has sought to standardize its language in order to support the communication among nursing team members and also with other healthcare professionals, thus seeking to facilitate the analysis and comparison of its expected outcomes, as well as enabling the identification of its area of knowledge.

Among the terminologies and classification systems, the ICNP® (International Classification of Nursing Practice) is a very feasible option, since it has noticeable linguistic, cognitive and technological advantages. The ICNP® is a classification system aimed at standardizing the vocabulary used in professional nursing practice, and a tool to value the nursing process. In print and digital formats for handheld computers, it can provide nurses with a shared language for communication and analysis of the practice and the overall progress of nursing care outcomes.[5]

The use of a standardized language in the development of care systems is an important progress and need for nurses, since it supports the construction of resources that assist the practice and strengthen the practice field.[6] This context also includes postpartum care. Midwives demonstrate knowledge about the process in professional nursing practice, but point out factors that hinder or prevent its use, such as lack of time, the large number of patients admitted to hospitals and the service turnover.[7] This prevents skilled nurses from delivering efficient postpartum care to mothers and children and makes them perform repetitive activities, based on institutional routines that remain distant from the individual needs of women during the postpartum period.

## Methods

This is an applied technological development research.

The Seven Axis Model of ICNP® [7] version 1.0 was used to represent the structural aspects of the nursing process for data collection, establishment of diagnoses, nursing interventions and outcomes.

A model based on object guiding was used to plan the software, which includes: a) Understanding and definition of the context and methods of using the system; b) System design project; c) Identification of the main objects of the system; d) Development of models and project; e) Specification of the objects' interfaces. [8]

The programming language PHP (hypertext preprocessor) was used to dynamically create the contents on the web (worldwide web). This type of language was chosen because it is a programming language guided by objects, it is portable (it does not depend on operational systems) and safe, which allows the running of programs via network with performance restriction and also presents features for internationalization, thus natively supporting unicode characters.

For the development of the database system, the language SQL (Structure Query Language) was applied. MySQL (http://www.mysql.com/), version 5.0.51 was used as the database management system. This choice was due to the fact that it has a free language, is easy to handle, supports any platform and does not require many hardware resources. The platform used was Linux Red Hat AS 5 and PHP 5.3.

In order to support the development of the system prototype, the researchers chose to work with usage cases, given that this would facilitate and guide the programming and review stage.

The system requirements consisted of features that would permit: (a) the use of ICNP® as a registered support code for the performance of the nursing process; (b) the search for patients through their personal details; (c) the entry of patients using the function "admit", using the form of identification data or additional information; (d) data entry concerning the first stage of the nursing process (data collection) in the format of physical examination data, interview data or additional data; (e) the inclusion of the data collected through menus rather than in writing; (f) the free entry of text into the data collection module; (g) the automatic completion of sentences as the user types, based on the last sentences written with the same opening words; (h) the use of data as a form of printed records, which allowed for the addition of further functions; (i) the appearance of the ICNP® axes in order of use, which made user access easier; (j) the possibility (with no obligation) to automatically create text about patients' progress based on the collection of data previously entered by users; (l) the creation of reports by the administrator about the usage practice of nursing processes, based on statistical data.

The development of the study complied with national and international guidelines for ethics in research involving human beings.

## Results

The cases of system usage are directly related to the requirements previously defined, resulting in actions that are available to users (nurse users and administrators). Among the actions available to the nurse users are: login, change password, create reports and exit the system. It also contains functions related to three other types of functions, such as admission management, patient management and the nursing process. The actions related to user management and bed management functions are available to the administrators (Figure 1).

Among its functions, it also provides the possibility of communication among users through an area of notes the administrator can register for access by all users and dissemination of important information about a specific patient, about the system itself or about the institution, thus permitting communication among users.
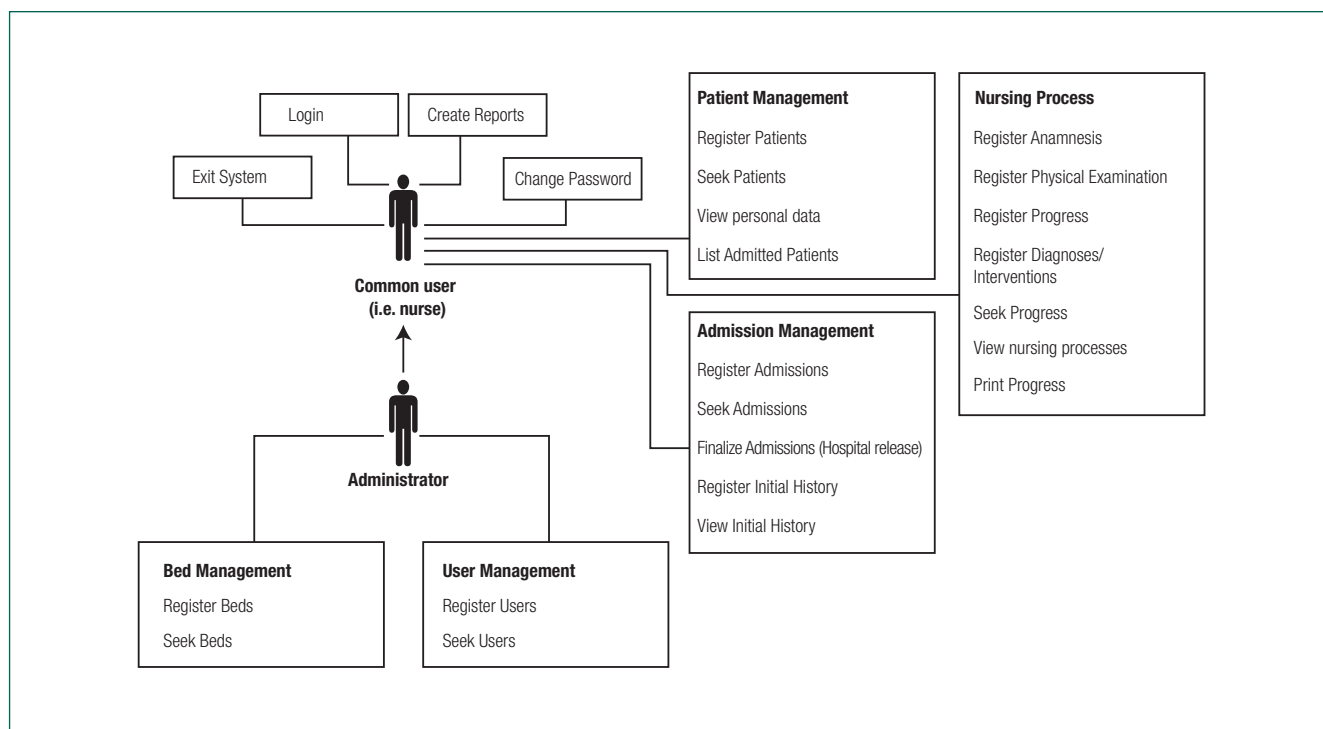
**Figure 1.** System usage case diagram

The system functions are presented to users on the main screen, through a menu on the top of the page with eight options, as follows: registered patients, admitted patients, beds, users, nursing process, reports, change password and exit.

It is possible to have access to nursing processes, which are sorted in descending order of admission, from the most recent admissions to the first. This helps to consult the nursing actions that were performed at other times and the actions that are being performed referent to the current hospitalization. These registrations of nursing processes can be done daily or as often as needed. Given that the nursing activities occur in accordance with dynamics based on established needs and that these are renewed every time there is a change in health conditions, the system foresees the need for an indefinite number of processes to be performed per patient and per day.

The first stage of the nursing process, known as data collection or nursing history, is subdivided into two stages: the anamnesis and the physical examination. The anamnesis, which is generally filled out daily, is composed of the following items: general health, pain, sleep, nutrition, urinary elimination, bowel movements, nausea, vomiting, breast, abdomen, suture/surgical incision, bleeding, breastfeeding, movements and care for the newborn.

Concerning the physical examination, the screen displays a menu with eight items for completion, which cover the basic physical examination of postpartum women. Users are not required to complete any of the items and can move from one item to another as they wish. The menu items are: general observations, weight/height, vital signs, head and neck, chest, abdomen, perineum and extremities. At the end of the completion of the instrument, there is an option to save the information registered into the physical examination database concerning each of the menus chosen.

Most of the subsequent items in the menu options present pre-established alternatives in order to minimize the needs of users to write the information. This prevents the occurrence of registration errors, and also speeds up the process of documenting these data.

The record of the physical examination, similarly to the anamnesis, is unique for each process and can occur several times a day, depending on the postpartum women's needs. This is expected to oc-

cur at least once a day, although it is not mandatory within the system. The first forms are: general observations, anthropometric measurements and vital signs. The next forms follow the cerebrospinal flow of the traditional physical examination; however, emphasis is given to the assessment of postpartum women during the immediate and mediate postpartum period.

Nursing diagnoses are developed based on the seven axis model of ICNP® version 1.0, which requires the mandatory inclusion of at least two axes: focus and judgment; the others are complementary and not mandatory.

The system offers all the words found in the ICNP® for the construction of sentences by simply entering three letters. Users will see all the words registered in the ICNP® in that axis, which starts with that combination of letters, and they can then choose the word they wish. Then, the referenced ICNP® code associated with each registered word appears.

The system displays the options of axes in the order they are usually used in nursing practice. Even if users decide, for example, that the patient axis should come before the focus axis, the sequence is maintained and users have the option to edit the order of the words in the final sentence, which consequently changes the order of the axes in the sentence (Figure 2).
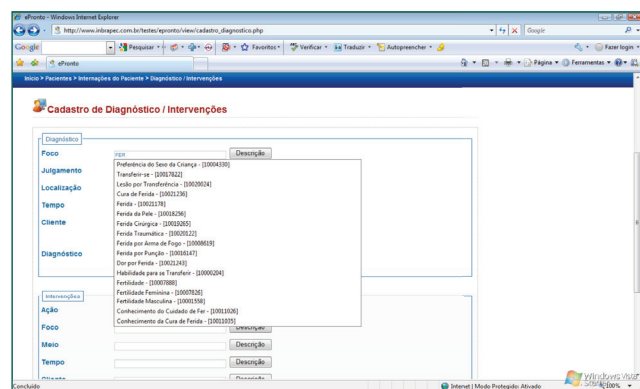


**Figure 2.** Nursing Diagnosis Screen in use

In case users are in doubt about the meaning of that word within the classification, they can identify it by using the function/key DESCRIPTION.

The system will open the accurate description and code found in the classification. Once a word from the first axis has been chosen, users will continue making these choices in relation to each remaining axis, until the desired nursing diagnosis is completed (Figure 3).
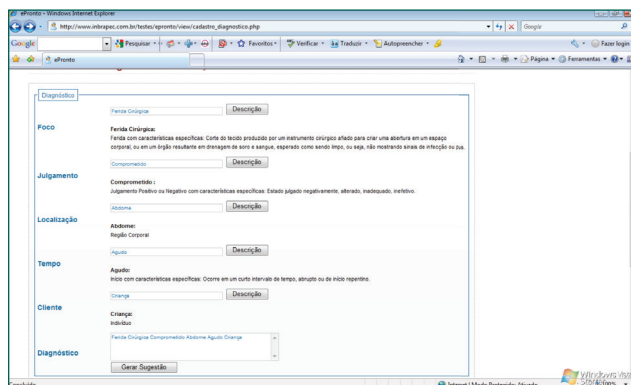


**Figure 3.** Nursing Diagnosis Screen with descriptions of the axes

Once the nursing diagnosis is completed, the system permits its editing. It is possible to insert articles, prepositions and others, as well as to change the gender to female, given that the data registered relate to postpartum women. This permits better adjustment and use of the ICNP®, since it is similar to spoken language in daily professional nursing practice without changing the classification. After defining the diagnosis, it is possible to save the sentence. For each defined diagnosis, it is possible to create possibilities of nursing prescriptions specifically for that defined diagnosis.

The planning, similarly to what occurs with the nursing diagnosis, is developed with the help of the seven axis model. However, there are no mandatory axes and only the axis judgment cannot be used. Normally, the action and method axes are used, while the other axes are complementary. As with the nursing diagnosis, the system shows all the words prior to the terms for the composition, besides the function DESCRIPTION (Figure 4).

Once the nursing prescription has been completed, the system enables its edition. It is possible to insert articles, prepositions, as well as to change the gender, like with the nursing diagnoses. After defining the nursing prescription, the sentence
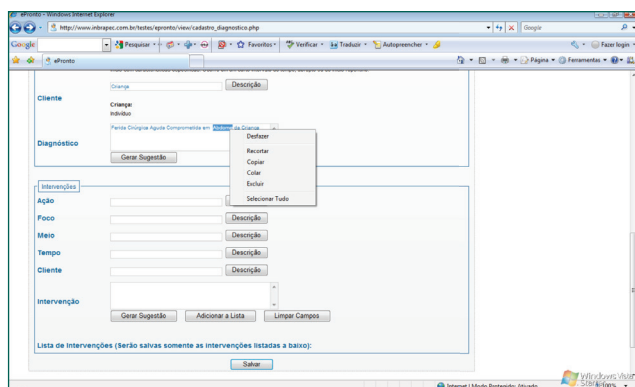
**Figure 4.** Formulation of Nursing Prescriptions Screen

needs to be saved. This generates a list of prescriptions for the previously defined diagnosis.

It is possible for users to exclude a previously created prescription at any time before saving the list of nursing prescriptions. However, once that prescription is saved, it can only be suspended with a new prescription, within a new nursing process (Figure 5).
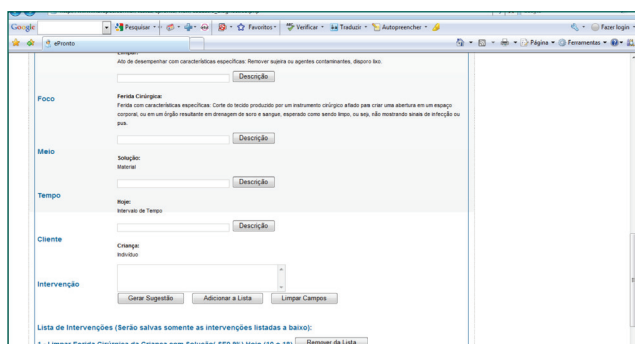


**Figure 5.** Nursing Prescriptions Screen with list

The nursing progress, an important form of nursing records, is made within the system through previous data automatically entered during data collection, either about the physical examination or on the anamnesis. At the end of each list of prescribed interventions, it is possible to generate it as a printed document and move to the automatic execution of nursing progress, based on the data collected during the physical examination and anamnesis.

By choosing the icon GENERATE PROGRESS, the users will be provided with a pre-defined automatic text that follows the guide, the sequence and information of data collection. However, similarly to what occurs with the nursing diagnoses

and prescriptions through a list of interventions, it is possible to edit the entire progress text, changing the places of sentences, improving verbal and nominal conformity, adjusting gender and number, excluding or including information, among others. This preserves professional autonomy and ensures that the nurses provide the final authorization for the progress text.

The function REPORTS can be viewed in the main menu. This function permits generating, using the data collected and stored, important information for clinical decision-making and change the conduct previously defined. At first, this function is limited to the frequency of each of the variables contained in the database and the correlation between these variables. For example: if there is the need to evaluate the effectiveness of a particular treatment prescribed by nurses for a particular nursing diagnosis, the relationship between the variables "adopted interventions" and "achieved outcome" can be evaluated, based on a given nursing diagnosis, by maintaining some variables fixed in order to ensure that the sample the system is working on has the same features and avoid selection bias.

Through the frequent use of the system and when a certain number of significant nursing processes is achieved, by way of reports and statistical evaluations, it is possible to conclude that a particular conduct is valid. Therefore, through the function REPORTS, it will be possible to invest in further research, aimed at making clinical decisions based on scientific evidence.

## Discussion

The prototype presented herein is aimed at improving the quality of care and the performance of nurses in relation to the nursing process. It was evident that some aspects should be considered when developing a database system, which are: understanding the difference between content and format (or data and presentation); standardizing content and clinical data, given the diversity of methods used for presentation; establishing the content in conjunction with the workflow process through the system;

collecting and registering data; undertaking recovery and review of data and information; dealing with communication in between and during shifts and among departments.[9]

The distinguished importance of the content used, following the classical course of the nursing process, and the way in which this content was presented resulted in a clear and objective system. The use of a standardized language through the International Classification for Nursing Practice - ICNP® guarantees the standardization of clinical data.

The judicious application of a nursing classification results in more accurate nursing diagnoses. Nurses are then able to choose more effective nursing interventions, which significantly add up to patients' outcomes.[10]

Furthermore, the sequence that is didactically used was followed, which facilitated the maintenance of nurses' daily practice and avoided that the system would affect these professionals' work process.

The existence of a function that ensures communication among nurses with regard to the nursing process used related to each postpartum woman or problems, or yet any particularity of patient care or any institutional information represents a distinguishing feature of the system, since it guarantees the emphasis on passing information from one shift to another, which can also be set as a priority.

An automated database system improves management, healthcare delivery and reimbursement, since it limits data entry errors and reduces costs.[11]

This system, besides ensuring that data are recorded, is also able to retrieve information about previously performed nursing processes, so as to serve as a parameter for other records of nursing processes. This allows that nurses to adequately evaluate the patients' progress.

In nursing, there are three large areas related to healthcare information systems that need to be addressed in the immediate future in order to assist the nurses with information management. These are: collection of data in the source, nursing data standards and decision-making support systems.[9]

The proposed system immediately ensures the use of standards for nursing data, since it proposes the use of a standardized language. But it does not have a standardized system of data collection at the hospital beds, nor is a system to support decision-making. However, the selection of a programming language that can be used in networks has presented, since the beginning of the prototype process, the possibility for further adjustment of the system to work from mobile devices and being close to patients. In addition, after some time of use and through reports, the system will serve as a research resource to evaluate the effectiveness of nursing interventions concerning postpartum women and enable further adjustment to a module of the support system for clinical decision-making about postpartum nursing care.

The use of ICNP® in this system can promote the development and use of a multitude of diagnoses, intervention and nursing outcomes in relation to postpartum women and further assist to overcome the difficulties midwives face in the performance of the nursing process.

The classification used (ICNP® 1.0) proved to be a terminology that promotes organization, control and logical view of the clinical reasoning in the patient care process with the use of automated resources, because it allows nurses to establish a solid relationship between nursing diagnoses and interventions.[12]

## Conclusion

The prototype of the puerperal nursing documentation system was successfully developed, permitting nursing records using standardized language.

### Collaborations
Veríssimo RCSS and Marin HF declare that they substantially contributed to the conception and development of the research, writing, revision of the paper and final approval of the version for publication.

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