

RESEARCH PAPER

Nursing Information Systems: exploration of information shared with physicians

Sistemas de Informação de Enfermagem: exploração da informação partilhada com os médicos
Sistemas de Información en Enfermería: explotación de la información compartida con los médicos

Liliana Andreia Neves da Mota*; Filipe Miguel Soares Pereira**; Paulino Artur Ferreira de Sousa***

Abstract

Theoretical framework: Over the years there has been substantial change in the amount of nursing documentation arising from the daily use of information technologies by health professionals. Physicians are the greatest consumers of the information collected, processed and documented by nurses, given the relevance of this information to the clinical decision-making process. **Objective:** To identify and describe the information collected, processed and documented by nurses which is considered to be the most relevant for the medical profession.

Methodology: A qualitative exploratory study using participant observation (98 hours) and semi-structured interviews (3) with key-informants, conducted in a hospital setting. Inductive content analysis of field notes and interviews was performed.

Results: For physicians, the most relevant information depends on the context of the subject, the action and the professions, and was gathered into three categories: "monitoring parameters"; "medication and therapeutic attitudes"; and "intercurrent data".

Conclusion: Data collection strategies produced valid data to identify the most relevant information categories for physicians ("monitoring parameters", "medication and therapeutic attitudes" and "intercurrent data"). Relevant information for physicians is not influenced by the person who makes a decision on data collection.

Keywords: information systems; documentation; nursing.

Resumo

Enquadramento: Ao longo dos anos foram-se verificando alterações substanciais ao nível da documentação em enfermagem resultantes da utilização de tecnologias da informação na atividade diária dos profissionais de saúde. Os médicos são os maiores consumidores da informação recolhida, processada e documentada pelos enfermeiros, dada a relevância dessa informação no seu processo de tomada de decisão clínica.

Objetivo: Identificar e descrever a informação recolhida, processada e documentada pelos enfermeiros que é mais relevante para atividade profissional dos médicos.

Metodologia: Estudo qualitativo e exploratório com recurso à observação participante (98 horas) e entrevistas semi-estruturadas (3) com informantes-chave, realizado em contexto hospitalar. Foi realizada a análise indutiva de conteúdo das notas de campo e entrevistas.

Resultados: A informação mais relevante para os médicos depende do contexto dos sujeitos, da ação e das profissões, e foi agregada em três categorias: «parâmetros de vigilância»; «medicação e atitudes terapêuticas»; e «dados intercorrentes».

Conclusão: As estratégias de recolha de dados mostraram-se capazes de gerar dados válidos para a identificação das categorias de informação mais relevantes para os médicos («parâmetros de vigilância», «medicação e atitudes terapêuticas» e «dados intercorrentes»). A informação relevante para os médicos não é influenciada por quem toma a decisão de prescrição da colheita dos dados.

Palavras-chave: sistemas de informação; documentação; enfermagem.

Resumen

Marco contextual: A lo largo de los años, se han producido cambios sustanciales en relación a la documentación en enfermería, como resultado del papel que las tecnologías de la información desempeñan en la actividad diaria de los profesionales sanitarios. Los médicos son los mayores consumidores de la información recopilada, procesada y documentada por el personal de enfermería, dada la relevancia de esta información en el proceso de toma de decisiones clínicas.

Objetivos: Identificar y describir la información recopilada, procesada y documentada por el personal de enfermería más relevante para la actividad profesional de los médicos.

Metodología: Se llevó a cabo un estudio cualitativo y exploratorio en el que se utilizaron una observación participante (98 horas) y unas entrevistas semiestructuradas (3) a informantes clave en el contexto hospitalario. Asimismo, se realizó un análisis de contenido inductivo de las notas de campo y entrevistas.

Resultados: La información más importante para los médicos depende del contexto de los sujetos, de la acción y de las profesiones, y se estructura en tres categorías: «parámetros de seguimiento»; «medicación y actitudes terapéuticas»; y «datos intercorrientes».

Conclusión: Se demostró que las estrategias para la recopilación de datos sirvieron para generar datos válidos para identificar las categorías de información más relevantes para los médicos («parámetros de seguimiento», «medicación y actitudes terapéuticas» y «datos intercorrientes»). La persona que toma la decisión de prescribir la recogida de datos no influye en la información relevante para los médicos.

Palabras clave: sistemas de información; documentación; enfermería.

Received for publication: 07.11.12

Accepted for publication: 09.10.13

* Ph.D. in Nursing Science by the Institute for Biomedical Sciences Abel Salazar of the University of Porto. Master in Medical Computing by the Faculty of Medicine of the University of Porto. Master in Medical-Surgical Nursing by the Nursing College of Porto. Specialist Nurse in Medical-Surgical Nursing at the Hospital Centre of Porto – General Hospital of Santo António, Liver and Pancreas Transplant Unit, 4099-00, Porto, Portugal [saxoenfermeira@gmail.com]. Address: Travessa do Formal, 42, 4415-653, Leiria, Portugal

** Ph.D. in Nursing Science by the Institute for Biomedical Sciences Abel Salazar of the University of Porto. Master in Nursing Science by the Institute of Biomedical Sciences Abel Salazar of the University of Porto. Coordinating Professor at the Nursing College of Porto, 4200-072, Porto, Portugal [filipeira@esen.pt].

*** Ph.D. in Nursing Science by the Institute for Biomedical Sciences Abel Salazar of the University of Porto. Master in Nursing Science by the Institute of Biomedical Sciences Abel Salazar of the University of Porto. Coordinating Professor at the Nursing college of Porto, 4200-072, Porto, Portugal [paulino@esen.pt].

Introduction

Documentation of the care provided so that records accurately represent clinical practice in order to ensure the continuity of care and the improvement of its quality has been an issue of concern since Florence Nightingale's time (Simões & Simões, 2007; Mota, 2010).

Nowadays, people are more and more aware of the need to find Information Systems which foster communication and continuity of care, management, research and training (Pereira, 2009). These goals extend the horizons and pose new challenges to all involved in the design, implementation and reformulation of the Nursing Information Systems (NIS) used in healthcare institutions.

Promoting continuity of care is a major objective of clinical Information Systems, thus implying that, at the moment of design, requirements (both structural and content) focusing on relevant information for the coordination between the various professionals involved in client assistance are met. Continuity of care is a frequent aspect in the quality assessment processes of health services, proving the importance of this dimension of assistance in the whole dynamics of care.

Regarding the role of information in the promotion of continuity of care, it is important to clarify that this issue can be addressed through the perspective of multiprofessional information sharing between professionals of the same discipline or the same service, or from a perspective of interservice or interinstitutional collaboration (Sousa, 2006). In this study, the emphasis has been placed on information sharing between nurses and physicians within the same care environment.

This research study aims to identify and describe information shared between physicians and nurses which is relevant for continuity of care. It also aims to identify other examples that help make a further advance into a second stage of a quantitative study. Therefore, we intend to address issues related to the nature of the information, as well as the repositories of information collected, processed and documented by nurses which is relevant to physicians.

Theoretical Background

Information Systems (IS) are occupying a more prominent place in organizations, including the health services. In fact, IS have become a paramount resource in health services' governance and action strategies (Friedman & Wyatt, 2006). In the health sector, the capital associated with IS quality is acknowledged, as they ensure (or should ensure) the useful and necessary information for the various functions of health professionals and the different decision-making levels of the institution. Therefore, there is a need for IS able to affirm themselves as sound structures, capable of guaranteeing efficient data collection, processing, organisation and management processes of care. In this way, it will be possible to gather, store, process and provide relevant information so as to make it accessible and useful for those who want to (and can) use it. Hence, optimizing health IS and the information flow in health institutions needs to be seen as a key strategy for improving the quality of care provided to citizens (Ministério da Saúde. Administração Central do Sistema de Saúde, 2009), a reality which Nursing should not overlook (Sousa, 2006).

The advances in information sciences and in the Discipline of Nursing have greatly contributed to the already mentioned evolution of the specific role played by NIS. Facing increasing concerns regarding the quality of care, health organizations are investing on the implementation of IS to optimise their processes and, thus, maximize results (Pereira, 2009). The quality of the care provided is directly related to the quality of the information available to health professionals, and clinical information management is a fundamental part of their daily activity (Currell & Urquhart, 2003).

The implementation of an IS allows for improving clinical practice, adjusting health care and increasing the efficiency and effectiveness of health care organisations (Ammenwerth et al., 2004).

NIS should be understood as a powerful "(...) repository of patient data, in digital form, stored and exchanged securely, and accessible by multiple authorized users" (Häyrynen, Saranto, & Nykänen, 2008, p. 293).

In organizations, information is used as a resource for it strongly influences all decision-making, whether at clinical, organizational or management level, as

“Information is a primary resource for decision making” (Guimarães & Évora, 2004, p. 74).

The decision-making process results from a systematic process involving the study of the problem based on data collection, information production, proposed solutions, decision choice, decision viability and implementation and result analysis (Guimarães & Évora, 2004).

Methodology

This study was carried out at the Hospital Centre of Porto, EPE (CHP, EPE), in the department of Surgery of the General Hospital of Santo António (HSA).

Within the department of surgery, the Surgery 3 ward was chosen to carry out the core of the empirical phase of the study. It is a hepatobiliary and pancreatic surgical service with electronic medical records. Nurses record patient information in the Support System for Nursing Practice (Sistema de Apoio à Prática de Enfermagem - SAPE) and physicians consult the information collected and processed by nurses using the Medical Support System (Sistema de Apoio ao Médico - SAM). These IS are interoperable.

This is an exploratory qualitative study. Therefore, “researchers focus on reality as people perceive it to be” (Fortin, 2003, p. 149). Thus, this study was conducted based on (real context) observation, from an interpretive research perspective, aiming to analyse the issue of the relevance of the information documented by nurses for physicians, “(...) things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them” (Denzin & Lincoln, 1994, p. 2). Observation studies, together with field notes and (unstructured) interviews, allow for an in-depth exploratory study of a reality in its “field” (Fortin, 2003, p. 149). “This methodology is a comprehensive research strategy that can be used to describe, explore, understand or evaluate phenomena of professional interest appropriate for many nursing contexts” (Anthony & Jack, 2009, p. 1177), as it allows the study of a set of characteristics of real life events. At this stage of the study, in addition to using participant observation (98 hours) based on the guidelines proposed by Leininger (1991), three semi-structured interviews were performed to clarify some aspects verified during the observation

phase. All interviews were conducted in Surgery 3 of the HSA, usually at the medical office, according to the availability and willingness of each informant. Interviews lasted between 30 and 120 minutes.

Data were collected by the main researcher, after permission was granted by the the Board of Directors of the CHP, EPE and all the entities deemed appropriate by this Board. Content analysis was carried out using Nvivo9 software, which does not replace the researcher in the organization of the findings.

Results and Discussion

The study aimed to identify the information collected and documented by nurses which is considered as being relevant for physicians. Information relevance is “context dependent”, which means that various aspects were adopted as the basis for the value assigned to information by physicians.

When we say “context” we refer to the three dimensions proposed by Le Boterf (1994, 1998): “context of the subject(s)”; “context of action”; and “context(s) of the profession(s)”. This means that, in this study, information relevance is influenced by intrinsic aspects to physicians, factors associated with the specific reality of the Surgery 3 service of HSA and also issues regarding the nature of the (Medical and Nursing) professions.

Context of the subjects

This domain includes issues regarding participants’ dispositions and attitudes, the level of information on the patients and a number of behaviours, of which some are “self-defensive” behaviours.

“What would hospitals do if nurses did not record information, regardless of what doctors ask for? There would be no records at all.” (Dr. X) – Field notes.

“Nursing methodologies to support patient records are what save us” (Dr. Y) – Interview.

It is possible that, overwhelmed by information, users do not capture the essence, the core of the problem. We can safely say that when there is an overflow of data, excessive information ends up trivialising relevant information.

“She [the nurse accompanying the doctors in the round] draws my attention to some things I may have neglected, mainly because I wasn’t there, or I may

not have seen in the entanglement of stuff written down on the computer; and she points it out. It's important." (Dr. X) Interview.

Within this scope, the concrete realities of each context of action try to define organizational strategies and models capable of not diluting relevant information into an entanglement of data, as is the aim of this study.

Context of action

The context of action include (implicit) practice patterns, traditions and routines of the service, and, to a certain extent, "care patterns" or "clinical routes" which, even though insufficiently formalised, are also grounded on service routines and traditions.

"In the end, what she [the head nurse] does is: collect all the data which we require from the system and the group of people working during the different shifts who have witnessed a number of alterations or abnormalities... She gathers all that. She is our computer. (Dr. X) - Interview.

Context of the profession(s)

There is no doubt that, when analysing the factors underpinning the value assigned by physicians to the information resulting from the nursing activity, it becomes relevant to describe how relationships and interactions between these two professional groups have traditional and historically developed. Traditionally, the abovementioned aspects related to both the "context of the subject(s)" and the "context of action" are traditionally the product of the relationships between both professions: physicians and nurses.

"I don't use the [information] system, I ask all the questions to the head nurse, because that's her responsibility." (Dr. X) - Interview.

"(...) I'm here in the morning for this. This is a very important part of my job..." (Nurse Y) - Field notes.

Since the multiple factors which, in the service where the first stage of the study was conducted, influence the value assigned to information have been identified, it is now important to describe the information items documented by nurses which have shown to be relevant to physicians.

After content analysis was completed, and based on the current architecture of the systems, we can say that the contents of the information collected, processed and documented by nurses which is

relevant for physicians' practice is organized into three categories: "monitoring parameters"; "medication and therapeutic attitudes"; and "intercurrent data".

Monitoring parameters

Items resulting from the monitoring activities of patients' physiological parameters, such as vital signs, "drainage", metabolic control (capillary blood glycaemia), fluid balance, among others, were included in this category. These are the items which composed "patient monitoring sheets", which were the sheets where 24-hour monitoring records were made and used to be left "at the foot of the bed" before the Support System for Nursing Practice and the Medical Support System (electronic systems) were introduced.

"Well, 24-hour monitoring, that's where I find the information I need (...) The most important, from the beginning, vital data, and then equally relevant information, as surgical drainage and their characteristics, and further information..." (Dr. X) - Field notes.

We are aware that, in the context of health professions, diagnosis and clinical decision can be understood as dynamic processes of data collection, processing and analysis (Stempsey, 2009). Therefore, we acknowledge the usefulness of monitoring parameters for physicians' clinical practice.

According to this study, the value assigned to the parameters included in this category also stems from physicians' perceptions of the usefulness of those data for the early detection of intercurrent complications.

"Dr. X tells Dr. Y [who works with her] to take a look at the monitoring records [an IS output] to see if patients are apyretic ..." - Field notes.

"Yes, that ["drainage"] is one of the parameters we use to assess whether or not to remove a drain; for example: it's the quantity and type of what is suctioned; if what is suctioned is pathological, even just a bit... it's pathological (...), even if it drains just a little, it is pathological. This is going to make me stay alert for potential complications." (Dr. Z) - Interview.

Given the surgical nature of the service where the field work was carried out, pain is one of monitoring parameters to which physicians pay greater attention. "Dr. X (sitting at the computer) promptly searches for the occurrence of pain and its development among the monitoring items" - Field notes.

Additionally, an aspect emerging from the importance assigned by physicians to pain monitoring is pain control, namely through available “SOS” medication.

Medication and Therapeutic Attitudes

This category highlights information items which allow physicians to see, for example, if the prescribed “SOS” medication is producing the desired effect, or decide upon the planning of complementary diagnostic tests. As expected, the information items documented by nurses which are relevant for physicians are closely related to “clinical routes”.

“I’m very interested to know whether or not medication was effective ...” (Dr. X) - Interview.

“It is important to know if the nurses administer [the medication)]” (Dr. Y) - Interview.

“One of the doctors was telling me that regarding medication, she is very interested to know whether or not patients have refused their doses, whether or not there are adverse effects.” – Field notes.

In this study, data regarding the occurrence of drug adverse effects and reactions are a common feature of physicians’ discourse, where they refer significant accessibility problems.

“The most significant are the clinical and intercurrent ones, medication and reactions or intolerance to medication. The most frequent are even of mandatory record. Say, for example: eruptions. Perhaps (...) if there was a specific table...” (Dr. X) – Interview.

In addition to medication items, information regarding complementary diagnostic tests was also included in this category. These data are particularly relevant in so far as they represent one of the milestones (of the preoperative period) of the identified “clinical routes”. Also, on a value scale for information relevance, records of the “non-performance” of a test and associated justification emerge as significant. The “non-performance” of a test is “intercurrent data”, deviating from normality in terms of the management of each patient case.

Intercurrent data

All information data which, in this context, are considered “complications” or “abnormal things” are included in this category.

Regarding the evolution of patients’ clinical status, there is a pattern which is considered expected or “normal”. On the other hand, the “level of physicians’ knowledge” on each case shows that the relevant

data are the “novelties” which, in case of abundance of data, require the design of solutions capable of highlighting that “novelty” and/or “abnormality” (Field notes).

“Information related to the “abnormal things” which are witnessed by nurses.” (Dr. X) - Interview.

“What matters to us are these surprises, the interurrences of previous shifts, which we didn’t witness...” (Dr. Y) - Interview.

The specific information included in this category is closely related to the two previous categories in terms of the content of relevant information. Thus, information reporting “abnormal things”, real “surprises” (changes) related to monitoring parameters and medication should be highlighted.

“I am in the room where doctors access the terminals for consultation. I see that, at the moment, the abnormal characteristics of drainage are the data Dr. Y is looking for. That’s what she was after in the Nursing records.” - Field notes.

“ (...) if what is suctioned is pathological, even if a little, it is abnormal, if it should be white or yellow and is green (...) we have to be aware of it...” (Dr. Z) - Interview.

“If the patient defecates (...) but if it was very abundant or presented pathological characteristics. This is the kind of things that matters. If the patient is already tolerating feeding (etc.) or if he/she doesn’t tolerate it.” (Dr. Y) - Interview.

Overall, and in line with what is proposed by the Ordem dos Enfermeiros (Nurses Association) (2007), and according to Silva (2006), two broad areas can be identified in Nursing records. On the one hand, the interdependent dimension, corresponding to what the nurses record as a result of a medical prescription (medication, preparation for exams, vital signs monitoring, etc.). On the other hand, the autonomous dimension, referring to data relating to Nursing diagnoses, autonomous interventions and Nursing outcomes.

However, the same information item, e.g. blood pressure (BP), in a given situation, may be recorded by the nurse as medically prescribed and, in another scenario, as his/her own decision, while performing the “first lifting”, as he/she is focused on the nursing diagnosis “Risk of orthostatic hypotension”.

Hence, according to data from the observation and interviews, we can conclude that, for physicians, information relevance does not arise from the fact that

an information item is recorded in the interdependent or autonomous dimension of the nursing practice. What matters to physicians is:

"If the patient has defecated (...), If the patient is already tolerating feeding (etc.) or if he/she does not tolerate it." (Dr. X) - Interview.

"During the round, the Nurse alerts the physician to the fact that the patient had a fever." - Field notes.

Similarly to what happens in many other contexts of action, records of patients' bowel elimination, nutritional intake, tolerance to medication, fever episodes, among others, do not exist, unless they are prescribed by physicians.

"We must recognize that there are aspects, and that has to do with the methodologies of the Nursing practice and dates back to many years ago, that there are many things that nurses record (...) even if [physicians] do not prescribe them... And we are used to it, and this is well done and it is very important. In fact, what would hospitals do if nurses did not record information, regardless of what doctors ask for? There would be no records at all (...) and so, Nursing methodologies to support patient records are what save us" (Dr. Y) - Interview.

"Nurses are organized, have records of everything, good or bad, stuff related to your work are organized. They may sometimes not be very clear, but they are there. You just have to look for them. We use those records." (Dr. X) - Interview.

The importance that physicians assign to information, regardless of its "origin" and flow of data, ends up strengthening the need to build interoperable systems (compare ISO/IEC 2382 - 1, 1993) within the services as a strategy to optimize the resource information, for the benefit of the quality of care (Sousa, 2006).

Conclusion

Information relevance is "context dependent", which means that various aspects explain the value assigned by physicians to information regarding the disposition and attitude of the subjects (physicians and nurses), the traditions and routines rooted in these contexts, and the tradition of the relationships/interactions between physicians and nurses.

Data collection strategies proved to be capable of generating valid data for the identification of the most relevant information categories for physicians

("monitoring parameters", "medication and therapeutic attitudes" and "intercurrent data").

The relevance of the information collected, processed and documented by nurses does not rely on the prescriber. Physicians assign value to information, regardless of the flow of data. Therefore, the development of interoperable information systems becomes essential to ensure the quality and continuity of care.

Studies which focus on the phenomenon of information sharing between two of the most decisive professional groups in health (physicians and nurses) are imperative. Hence, future research should develop the question raised in this study from the perspective of information documented by physicians which is more relevant to nurses.

This research study presents some methodological limitations regarding the difficulty to generalise results (due to sample size). However, the study generated data and provided a new approach from a qualitative perspective to the issue under analysis which can be used in quantitative studies.

References

- Ammenwerth, E., Brender, J., Nykänen, P., Prokosch, H. U., Rigby, M., & Talmon, J. (2004). Vision and strategies to improve evaluation of health information systems: Reflections and lessons based on the HIS-EVAL workshop in Innsbruck. *International Journal of Medical Informatics*, 73 (6), 479-491.
- Anthony, S., & Jack, S. (2009). Qualitative case study methodology in nursing research: An integrative review. *Journal of Advanced Nursing*, 65 (6), 1171-1181.
- Currell, R., & Urquhart, C. (2003). Nursing records systems: Effects on nursing practice and health care outcomes. *The Cochrane Collaboration*, 2, 1245.
- Denzin, N., & Lincoln, Y. (1994). *Handbook of qualitative research*. London, England: Sage.
- Fortin, M. (2003). *O processo de investigação da concepção à realização*. Loures, Portugal: Lusociência.
- Friedman, C. P., & Wyatt, J. C. (2006). *Evaluation methods in medical informatics*. New York, NY: Springer.
- Guimarães, E., & Évora, Y. (2004). Sistema de informação: Instrumento para tomada de decisão no exercício da gerência. *Ciência da Informação*, 33 (1), 72-80.
- Häyrinen, K., Saranto, K., & Nykänen, P. (2008). Definition, structure, content, use and impacts of electronic health records: A review of the research literature. *International Journal of Medical Informatics*, 77 (5), 291-304.

- International Organization for Standardization, & International Electrotechnical Commission. (1993). *Information technology - Vocabulary - Part 1: Fundamental terms* (3ª ed.). Genève, Switzerland: Autor.
- Le Boterf, G. (1994). Modelos de aprendizagem em alternância na comunidade: Cinco desafios a enfrentar. *Formar*, 10, 40-46.
- Le Boterf, G. (1998). *De la compétence à la navigation professionnelle*. Paris, França: Les Éditions d'Organisation.
- Leininger, M. (1991). *Culture care diversity and universality*. New York, NY: National League for Nursing Press.
- Ministério da Saúde. Administração Central do Sistema de Saúde. (2009). *RSE – Registo de saúde electrónico: Documento estado da arte* (Versão 2.0). Lisboa, Portugal: Autor.
- Mota, L. (2010). *Sistemas de informação de enfermagem: Um estudo sobre a relevância da informação para os médicos* (Tese de Mestrado). Faculdade de Medicina da Universidade do Porto, Portugal.
- Ordem dos Enfermeiros. (2007). *Sistema de informação em enfermagem: Princípios básicos da arquitectura e principais requisitos técnico-funcionais*. Lisboa, Portugal: Autor.
- Pereira, F. (2009). *Informação e qualidade do exercício profissional dos enfermeiros*. Coimbra, Portugal: Formasau.
- Silva, A. (2006). *Sistemas de informação de enfermagem: Uma teoria explicativa da mudança*. Coimbra, Portugal: Formasau.
- Simões, C. M. A. R., & Simões, J. F. L. (2007). Avaliação inicial de enfermagem em linguagem CIPE® segundo as necessidades humanas fundamentais. *Revista de Enfermagem Referência*, 2 (4), 9-23.
- Sousa, P. (2006). *Sistema de partilha de informação de enfermagem entre contextos de cuidados de saúde: Um modelo explicativo*. Coimbra, Portugal: Formasau.
- Stempsey, W. (2009). Clinical reasoning: New challenges. *Theoretical Medicine & Bioethics*, 30 (3), 173-179.

