

Brazilian Nursing Technology Production: An Integrative Review

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Abstract

Aim: Technology is essential for nursing care and is seen as support that puts a transforming action into practice.

Methods: Integrative review consulting 97 issues of the Revista Brasileira de Enfermagem published from 2000 to 2015.

Results: A total of 2,163 papers were identified, 15 of which were included in the corpus of analysis: 40% of these referred to technologies aimed to aid direct care provided to patients, 33% addressed education in nursing; and 27% addressed the management of services. The largest number (three) of papers was published between 2010 and 2011, followed by two papers published in 2009. The remaining years together totalled 46%.

Conclusion: Given the daily practice of nurses, they are able to identify needs that can be met by the production of technology of their own authorship or in partnership with other professionals. Nonetheless, the papers do not present a discussion from this perspective or regarding intellectual property and do not present a taxonomy regarding technology and technological production in the nursing field.

Keywords: Nursing; Technology; Innovation management; Products technology

Introduction

The term technology has been frequently used by various fields in Brazilian and international nursing and is “seen as a set of tools, among them work actions, which put into movement a transforming action of nature” [1].

In the historical process of techniques and technologies, these cannot be interpreted as only a description of products that were discovered or created. These also refer to life conditions, arising from circumstances in various situations, which can either favor or harm human performance in the development of artefacts and in the way world is transformed [2].

Technologies in the nursing field overcome a strictly technical-scientific nature because interpersonal relationships are key and a priority in the practice of nurses [3]. In this sense, the definition of technology is not directed to a product only, but also to the broader sense of a process that is based on knowledge and instruments mutually connected, which justifies and define the various forms in which care is provided. Hence, technology plays a mediating role between human subjectivity and rationality, structuring and improving healthcare [4,5].

In this sense, there is no single classification for the different types of technologies. Two segments were addressed in the 20th century based on the understanding of health technologies, namely: technology of products and technology of processes. These approaches guide the

definition of technology, though some consider these to be insufficient to encompass the complexity that delineates it [1].

Technologies are important tools for nursing. They are used in teaching as didactic resources, seeking a pedagogical process and also used in research addressing education in nursing. In management, technologies are used in the planning of scales, care actions and in the supervision of services, while technologies also guide proper procedures in the care delivered to patients [6].

Nurses use technologies to acquire or improve skills compatible with their functions as either a member of the health staff, a professor or a manager. Technological advancements have influenced the work of nurses and have led to changes in the various professional settings [7].

Constant change, adaptation and improvement in care delivery highlight the central role of nurses in the development of technologies. The reason is that nurses have scientific knowledge and daily experience with the delivery of care, which enables them to recognize the need for new products and processes.

For this reason, the objective established for this study was to identify papers addressing the topic of technological production published in the Revista Brasileira de Enfermagem from 2000 to 2015.

Methods

This integrative review is based on 97 issues of the Revista Brasileira de Enfermagem (REBEn) and 2,163 papers published from 2000 to 2015. Data were collected between June and August 2016, using the following descriptors found in the BIREME platform: Scientific and

Technical Activities (Atividades Científicas e Tecnológicas, Actividades Científicas y Tecnológicas); Scientific Production Indicators (Indicadores de Produção Científica; Indicadores de Producción Científica); Production of Products (Produção de Produtos, Producción de Productos); Clean Technology (Tecnologia Limpa, Tecnología Limpia); Self-Help Devices (Equipamentos de autoajuda, Dispositivos de Autoayuda); Technology (Tecnologia; Tecnología); Technology Assessment, Biomedical (Avaliação da Tecnologia Biomédica; Evaluación de la Tecnología Biomédica); Appropriate Technology (Tecnologia Apropriada, Tecnología Apropriada); Intermediate Technology (Tecnologia Intermediária, Tecnología Intermedia); Technology, High-Cost (Tecnologia de Alto Custo, Tecnología de Alto Costo); Technology Transfer (Transferência de Tecnologia, Transferencia de Tecnología); Low-Cost Technology (Tecnologia de Baixo Custo, Tecnología de Bajo Costo); Point-of-Care Systems (Sistemas Automatizados de Assistência Junto ao Leito, Sistemas de Atención de Punto); Multimedia (Multimídia, Multimedia); Biomedical Technology (Tecnologia Biomédica, Tecnología Biomédica); Health Sciences, Technology and Innovation Management (Gestão de Ciência, Tecnologia e Inovação em Saúde, Gestión de Ciencia, Tecnología e Innovación en Salud); Science and Technology Information Networks (Redes de Informação de Ciência e

Tecnologia, Redes de Información de Ciencia y Tecnología); Network of Science and Technology Indicators - Ibero-American and Inter-American); Products Technology (Tecnologia de Produtos, Tecnología de Productos); Information Technology (Tecnologia da Informação, Tecnología de la Información).

An electronic spread sheet was built as a database in the first stage after locating the manuscripts, so three analysts could consult it by the papers' titles that were linked to electronic versions of the papers. In the second stage, three independent analysts read the abstracts and those that referred to technology and met the following criteria were selected: quantitative approach, original paper, addressing patents and intellectual property, authored or co-authored by a nurse. The exclusion criteria were: qualitative approach, essays, theses, dissertations, experience reports, editorials, chronicles, letters, interviews, news reports, papers the authorship or co-authorship of which did not include a nurse or yet, the authors' background was not reported.

The full texts were read in the third stage. Table 1 was developed after excluding those considered being outside the topic after the results from the independent analysts were reconciled.

N	Year	Thematic technological area/References	Thematic field	Problem to solve	Type of technology	Is it associated to informatics?	Language	Is it patented?
1	2000/S P	Development and assessment of educational software [8]	Education	Aid the teaching of nursing regarding the administration of medications in the pediatric field.	Development of Software	Yes	The multimedia authoring software of multimedia programs Macromedia Director® 7.	There is no information
2	2003/S P	Use of WebCT as a supporting tool for teaching Intravenous Therapy during an undergraduate nursing course [9]	Education	Development of educational material on Intravenous therapy and make it available on the internet within a WebCT environment	Development of modules of a course on IVT, assessment on WebCT environment. Online course on IVT.	Yes	WEBCT-Web Course Tools	There is no information
3	2004/B A	Assess NADNT (mastering of new technologies) of nurses in the management of a surgical center; identify and describe the factors interfering at this level, as well as to propose actions to improve this level of management of surgical centers [10]	Management	Identify and describe the factors that interfere in NADNT, as well as propose actions for the development of NADNT by nurses in the management of hospital's surgical centers.	To better understand the management of new technologies by nurses in surgical centers.	No	Satisfactory mastering of new technologies (NADNTS) and unsatisfactory level of adequacy to the mastering of new technologies (NADNTI).	No
4	2008/S P	Assessment of a system specialized in nursing diagnoses related to urinary elimination [11]	Care	It is a prospective study validating diagnosis test	To validate a system	Yes, but not in its development	ALTURIN.SDD	No

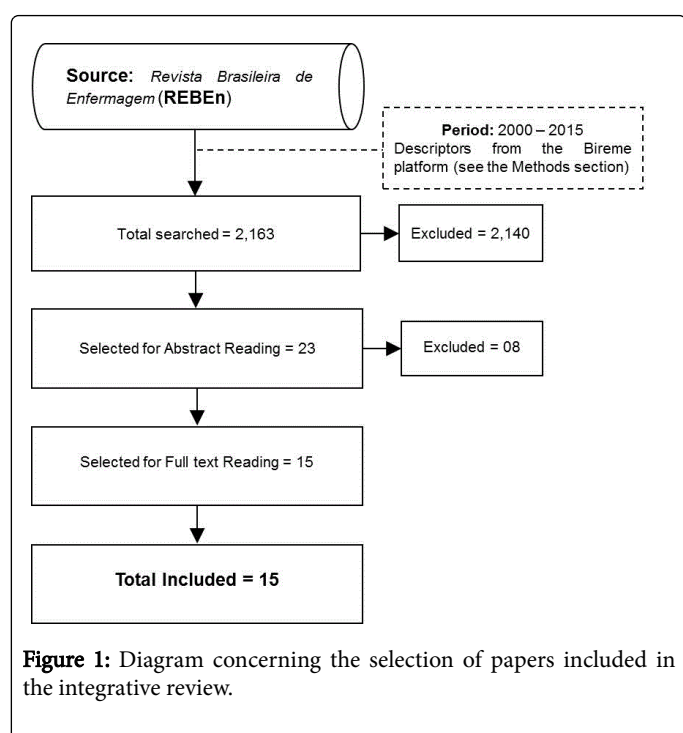
5	2009/CE	Development of assistive technology for validation among blind people: focus on breastfeeding [12]	Care	People with disabilities, specifically visual impairment, do not acknowledge an instrument that depends on vision to be efficient for disseminating health knowledge	Educational material on breastfeeding focusing on blind individuals who are to assess the material using cordel literature	No	Development of cordel literature	No
6	2009/SP	Proposal of an instrument to assess the health of institutionalized elderly individuals based on the concept of a Nursing Essential Data set [13]	Care	In general, there is no a protocol to guide care, nor is the commitment of the professional even ensured to update a minimum of information necessary to better meet the needs of patients	Methodological research on the development of a data collection instrument	Protocol not associated with the development of informatics	Development of an instrument to collect data concerning the health of elderly individuals	No
7	2010/SP	Material consumption in surgical center after the implementation of a computer management system [14]	Management	To compare the effectiveness of the Computer Material Management System in relation to the traditional system in regard to consumption and stock of materials	Assessment of a surgical center's material system	Yes, but to assess system	Computer Material Management System	No
8	2010/PR	Georeferencing as an instrument to manage a family health unit [15]	Management	The system can be an appropriate tool to aid specialists committed to the process of territorialization in the cities	The Geographical Information System (GIS) is a structure of electronic processing of data that enables the capture, storage, manipulation, analysis, demonstration and reports of data geographically referenced	Yes, utilize this technology to manage PHC unit	Geographical Information System (GIS)	No
9	2010/PR	Information system to support the Systematization of Nursing care [16]	Care	Help the implementation of SAE	Information system to support the systematization of Nursing Care based on the stages of the Nursing Process	Yes	Java programming language with client-server architecture	Development of a support system to the systematization of nursing care (Decree No. 001/2009, available at: http://www.abennacional.org.br/images/conteudo/PORTARIA_001.pdf)
10	2011/SP	Theory of Meaningful Learning: development and assessment of virtual class on the Moodle platform [17]	Education	Appropriation of technological competence on the part of nurses, insertion of nursing in the still incipient Brazilian online teaching context as there is a need for higher education institutions to adopt	Develop and assess a virtual class on the "Theory of Meaningful Learning" available on the Moodle platform	Yes	Virtual learning environments (VLE)	No, only approval from the Ethics Board

				policies to invest in the technological qualification of both professors and students				
11	2011/MG	Development of educational software on personality disorders [18]	Education	Computer studies applied to Nursing show the importance of using this resource, confirming the positive trend of interactive technologies in the teaching-learning process	Describe the stages of the development of educational software to teach personality disorders applied to mental health using hypermedia resources	Yes	Microsoft PowerPoint, Office 2007	No
12	2011/CE	Nursing technology on the prevention of pressure ulcers in people with spinal cord injury [19]	Care	Seek to assess nursing technology used in the prevention of pressure ulcers in people with spinal cord injury	Assess nursing technology using the Waterlow Score to prevent pressure ulcers in people with spinal cord injury	Yes	Software Excel, SPSS version 13.0. Kolmogorov-Smirnov statistical tests; Person's coefficient of correlation; and Spearman's coefficient of correlation	
13	2012/SC	Assessment of wiki technology: tool to access information on mechanical ventilation in intensive care [20]	Education	Verify with nursing students Ergonomics criteria and usability of Wiki tools as technology to access nursing care information concerning mechanical ventilation in an intensive care unit	Wiki is an information and communication tool made available by WEB 2.0 technology, which can be explored and used in teaching, learning, care delivery and in research in the nursing field	Yes	Wiki WEB 2.0	No, there is no need for it.
14	2013/RJ	Non-nutritive sucking of preterm infants as a nursing technology [21]	Care	Demonstrate that non-nutritious sucking is effective in managing pain during the installation of nasal CPAP in preterm newborns by the nursing staff	Nursing technology	No	CPAP nasal	No, there is no need for it.
15	2015/SP	Manual concerning the monitoring of quality of nursing recording in home care [22]	Management	Monitor the quality of nursing recording in the Home Care Program from the University Hospital at University of São Paulo	The instrument titled Operational Manual was developed by the researchers based on SAE developed by nurses in the	No	Manual	Does not apply.

					university hospital at the University of São Paulo and on the results of the study addressing the quality of nursing recording at PAD-USP			
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Table 1: Synthesis of papers included in the review of REBEN 2000 to 2015.

Finally, Figure 1 presents a flowchart with the synthesis of the review process.



Results

This review and analysis of papers published in REBEN employed criteria defined in the Method section so that 97 issues were analyzed, which resulted in the identification of 2,163 manuscripts.

A total of 2,140 papers were excluded in the process, so that 23 papers remained. A deeper analysis resulted in the exclusion of another eight papers and 15 papers remained for the final analysis. These papers focus on the following areas of knowledge within nursing: six (40%) papers address direct care provided to patients; five (33%) focus on education in nursing; and four (27%) focus on the management of services.

The highest number of papers, that is three (20%) papers, was published between 2010 and 2011 followed by two (14%) papers published in 2009. The remaining years together totalled 46%.

The results refer to the benefits, weaknesses and requirements of technology for nursing, the correct use of the term technology and technological advancements in nurses' professional practice (Table 1).

Discussion

The development of health technologies seeks solutions to problems presented by various authors who work in health services and related facilities. The nurses' daily care practice reveals new needs, which can lead to the development of new products and processes, that is, innovations that can be used in the application of nursing care [23].

Technologies can aid managerial processes, practical actions and teaching/learning. Therefore, the use of technologies to perform nurses' daily tasks and functions ensures new forms of providing care [7].

The Revista Brasileira de Enfermagem (REBEN) is one of the resources that the professional class association created to disseminate knowledge of nursing. Hence, it is committed to promoting discussions on emerging themes in the scientific community. For this reason, this study presents the technological production contained in the papers published by REBEN from 2000 to 2015.

The papers indicate that technological production for education is focused on information technology. Hence, professors or researchers use existing computer technology or develop it to make teaching content available to nursing undergraduate students.

Educational technologies, mainly software, seek to break from traditional teaching paradigms, transforming learning and demanding changes of those involved in the process [9,17]. Rapidly developing information technologies have expanded didactic approaches and teaching strategies, innovating the way knowledge is acquired, promoting interaction among students, professors and content from a more dynamic and accessible perspective.

A diversity of content was found, namely: mental health, child health, Theory of Meaningful Learning, intensive care and intravenous therapy. The adequacy of technologies was highlighted because they enable the inclusion of different topics for teaching, in addition to the different forms through which they can be accessed: CD-Rom, Web-CT (Web Course Tools), Moodle platform (Modular Object-Oriented Dynamic Learning Environment), Microsoft PowerPoint Office 2007 and Wiki tool [9,17,18,20].

The technological production focused on care delivery identified in the papers is linked to nurses' decision-making, health education, systematization of nursing care, assessment of technologies, and

experimentation with new procedures in care delivery [11-13,16,19,21].

The technologies focused on care delivery do not use computer tools in their development, assessment or experimentation. The studies present technologies to solve problems in the various settings of nurses' practice, from the instrumentalization of professionals to record care delivery to the development of technology to include the vision impaired [11-13,16,19,21].

The papers addressing technological production directed to management sought to assess, compare, and implement technologies for managers to use in hospital or PHC settings or even in home care. The studies used computer-based technological resources, presented instruments for use and manual or observational recording, the construction and validation of instruments and assessment of their adequacy for mastering new technologies [10,14-15,22].

Additionally, it is possible to observe that technologies of this nature have the capacity to encompass on a large scale what one wants to manage, for instance, the use of a cartographic basis for the georeferencing of a community or the use of a management system for material and inventory control applied to the sectors of a hospital [14,15].

The papers did not present information regarding patents or intellectual property or even the responsibility nurses have in protecting nurses' capacity of production.

The papers addressing technological production show the complexity in which the work of nurses is involved, given the diversity of areas, services, target public, and because nurses assume multiple functions, which require a professional to have a proactive attitude when searching for solutions.

Conclusion

Technologies permeate nurses' professional practice in the educational, care delivery, and managerial dimensions. Given the daily practice of nurses, they are able to identify needs that can be met with the production of technologies of their own authorship or in partnership with other professionals.

Technologies represent a business opportunity for nurses when products result from research projects. The papers under study, however, do not present this perspective. Additionally, no discussions were found regarding standards regulating new creations or intellectual property protection.

The papers presented various conceptions regarding the term technologies, showing that nursing is in a development process to some degree. Therefore, no taxonomy concerning technology and technological production in nursing was found.

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