



Information and communication technology in the management of Nursing research groups^a

Tecnologia da informação e comunicação na gestão de grupos de pesquisa em enfermagem
Tecnología de información y comunicación en la gestión de grupos de investigación en Enfermería

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ABSTRACT

Objective: This study aimed to understand how Information and Communication Technologies are used in the management of Nursing research groups. **Method:** This is a qualitative research based on theory and methodology in the Grounded Theory (direct perspective), with the study setting being 14 research groups linked to a Graduate Program in Nursing. The theoretical sample of the study was composed of 21 researchers. Data was collected through interviews and analyzed using the coding system. **Results:** Information and Communication Technologies are used by research groups to facilitate research management and development processes. They are divided into three main functions: communication and storage (Whatsapp® and e-mail), visibility strategies (website and social media) and operational strategy (data analysis software). **Conclusion and implications for the practice:** Information and Communication Technologies build a link between technology and the construction of scientific, technological and innovation knowledge. Research groups can further intensify the use of these tools, both for recruiting samples and for developing collaborative research networks.

Keywords: Information management; Research groups; Information Technology; Health Sciences, technology, and innovation management; Nursing Research.

RESUMO

Objetivo: este estudo teve como objetivo compreender como as Tecnologias da Informação e Comunicação são utilizadas na gestão de grupos de pesquisa de enfermagem. **Método:** trata-se de uma pesquisa qualitativa ancorada teórica e metodologicamente na Teoria Fundamentada nos Dados (perspectiva straussiana), tendo como cenário de estudo 14 grupos de pesquisa vinculados a um Programa de Pós-Graduação em Enfermagem. A amostragem teórica do estudo foi composta por 21 pesquisadores. Os dados foram coletados por meio de entrevistas e analisados a partir do sistema de codificação. **Resultados:** as Tecnologias de Informação e Comunicação são utilizadas pelos grupos de pesquisa para facilitar os processos de gestão e o desenvolvimento das pesquisas. Dividem-se em três funções principais: comunicação e armazenamento (Whatsapp® e e-mail), estratégias de visibilidade (site e mídias sociais) e estratégia operacional (software de análise de dados). **Conclusão e implicações para a prática:** as Tecnologias de Informação e Comunicação constroem um elo entre a tecnologia e a construção do conhecimento científico, tecnológico e de inovação. Os Grupos de Pesquisa podem intensificar ainda mais o uso dessas ferramentas, tanto para recrutamento de amostra como para o desenvolvimento de redes colaborativas de pesquisa.

Palavras-chave: Gestão da informação; Grupos de pesquisa; Tecnologia da informação e comunicação; Gestão de ciência, tecnologia e inovação em saúde; Pesquisa em Enfermagem.

RESUMEN

Objetivo: este estudio tuvo como objetivo comprender cómo se utilizan las Tecnologías de la Información y la Comunicación en la gestión de grupos de investigación en enfermería. **Método:** investigación cualitativa con base teórica y metodológica en la Teoría Fundamentada en los Datos (perspectiva straussiana), con un estudio realizado con 14 grupos de investigación vinculados a un Programa de Posgrado en Enfermería. La muestra teórica del estudio estuvo compuesta por 21 investigadores. Los datos fueron recolectados a través de entrevistas y analizados utilizando el sistema de codificación. **Resultados:** los grupos de investigación utilizan las Tecnologías de la Información y la Comunicación para facilitar la gestión de la investigación y los procesos de desarrollo. Dichas tecnologías cumplen tres funciones principales: comunicación y almacenamiento (Whatsapp® y correo electrónico), estrategias de visibilidad (sitio web y redes sociales) y estrategia operativa (software de análisis de datos). **Conclusión e implicaciones para la práctica:** las Tecnologías de la Información y la Comunicación crean un vínculo entre una tecnología y una construcción de conocimiento científico, tecnológico y de innovación. Los grupos de investigación pueden intensificar aún más el uso de estas herramientas, tanto para reclutar muestras como para desarrollar redes de investigación colaborativas.

Palabras clave: Gestión de información; Grupos de investigación; Tecnología de la información; Gestión de ciencia, Tecnología e innovación en salud; Investigación en Enfermería.

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INTRODUCTION

Over the years, education has undergone changes that transformed it from a traditional teaching system to a dynamic and creative environment, in which students are stimulated to develop discoveries, while learning.¹ Many of such transformations are prompted by using technologies, among them, the Information and Communication Technology.

Since the emergence of technologies, rapid changes have occurred in all areas of society, resulting in changes in various scenarios, such as: in the education, in the economy, in the environment, and in health, among others. Universities and research centers, more specifically research groups, have not remained inert to this changing scenario and have started to incorporate some of these available technologies into their practices.

In Brazil, the Nursing Research Groups were created in 1970 and, since then, mainly since 2002, there has been an exponential growth in terms of expansion. In 2000, there were 1,832 groups in the large area of Health Sciences. In 2016, that number increased to 5,877 research groups.²

With the expansion of the research groups, it was necessary to establish management processes to meet the demands of the researchers, training requirements, research needs, as well as development agencies and the demand for extremely productive groups.

For this, management processes in research groups are supported by the Information and Communication Technology. An expanded concept of Information and Communication Technology, adopted for this work and closely related to management principles, encompasses the use of technologies to assist in the development of human activities, whether for the general or institutional public, linked to information, information processing, storage and dissemination.³ Information and Communication Technologies help to make management processes more agile, interactive and flexible, in order to keep up with the demands of science.⁴

The integration of Information and Communication Technologies is closely related to innovation and excellence in research groups. These technologies are found in the production of scientific knowledge, but also in issues related to information, such as production, dissemination and consumption. The maturation of the Information and Communication Technologies is an indispensable point for a research group to reach its highest point in the production of knowledge.⁴

In research groups, the diffusion and use of Information and Communication Technologies have become indispensable due to the demands arising from the production of scientific and technological knowledge development, due to an influence that comes from the market and a greater diffusion in the economy environment. In addition, they are related to more intense and faster processes with more complex technologies and the expansion of technologies available for innovation.

Information and Communication Technologies contribute to the establishment of partnerships between research groups, companies, industries, schools, communities and between researchers, enabling systematic sharing of information, which

is of common interest, facilitating the understanding and solution of problems for a particular area of knowledge. The applications of Information and Communication Technologies in research groups bring out the following as positive aspects: communication efficiency; interaction with external systems; and ease of exploring research opportunities on various topics.⁴

The previous literature on the content suggests research studies that address the theme of technology in various themes and specialties in the health area, comparing the use of more than one technological resource and evaluating the primary and secondary outcomes of the technologies used in education in the long run.⁵ However, studies specifically related to the adoption of Information and Communication Technologies in the management of Nursing research groups were not identified.

Given the above, this study aimed to understand how Information and Communication Technologies are used in the management of Nursing research groups.

METHOD

A qualitative research study, with theoretical-methodological support from the Grounded Theory (GT), Straussian strand.⁶ The prominent results of this study are inserted in the project entitled: "Management of research groups in a *stricto sensu* Graduate Program in Nursing in a public university".

The study scenario were 14 research groups linked to a *stricto sensu* Graduate Program in Nursing in a public university in the South of the country.

The theoretical sample of the study was composed by 21 researchers linked to the research groups and knowledgeable about their operation and the use of Information and Communication Technologies. The participants were arranged in two sample groups: the first sample group was composed by ten leaders of research groups; the second sample group was made up by nine students and two former leaders of research groups. From the analytical inferences based on the data of the first sample group, the hypothesis of shared management between leaders and participants of research groups emerged, deepened in the second sample group. The use of Information and Communication Technologies for the management of Nursing research groups permeated the two sample groups.

The sample was composed by participants who met the proposed inclusion criteria. For the first sample group: acting as a permanent professor, leader or vice-leader of a research group for at least two years, supervisors of master's and doctoral degrees. The inclusion criteria for the second sample group were as follows: students, research group participants for at least six months, volunteer teachers and former leaders of research groups. The exclusion criteria for both sample groups were the following: being on vacation, away from work or from the University for any reason or in academic activities outside the country during data collection.

As for the composition of the sample for the first sample group, of the 29 leaders of research groups, ten of them were excluded for not meeting the inclusion criteria of the study, eight

did not respond to the invitation to participate in the research, and one refused to participate in the study. The second sample group was made up by nine students and two former leaders of research groups; the 11 participants agreed to participate in the study and met the inclusion criteria. None of the sample groups had dropouts.

Data collection took place from April to October 2018. The invitation to participate in the research was carried out via e-mail obtained in the website of the graduate program, and the individuals were informed about the objectives by means of the Free and Informed Consent Form. After acceptance, an adequate date, time and place for the participants and the researcher to perform the interview was verified. In order to maintain the confidentiality of the participants and of the information, the interviews were coded with the letter "P", followed by the order in which the participants were interviewed, for example: "P11".

Semi-structured interviews were conducted, guided by the following research question: "What meanings did you attribute to the management of the research group?" The dialog of the second sample group was instigated by the following guiding question: "How do you perceive the management of the research group?" The interviews were audio-recorded using a smartphone recording application, stored on a portable storage device (pen drive) and transcribed in full, using *Microsoft® Office Word* 2013. The interviews lasted a mean of 40 minutes.

After transcription, the interviews were sent via e-mail for validation; two participants requested reviews related to text writing, and there were no changes in the content of the interviews. At that time, it was also possible to deepen data; one of the participants was asked to give a detailed example of what he wanted to say in a given speech, aiming at a better understanding of the phenomenon under study. The interviews were conducted by the main researcher of the study, with previous experience in qualitative research and data collection in the interview modality. It is added that, at the time of data collection, the researcher was a Master's student in the Graduate Program in Nursing, in which the study was carried out, maintaining academic contact with the research participants.

Data collection was completed with theoretical data saturation, that is, when new data were not found and the categories were well developed in terms of properties, dimensions and validity.⁶

Data analysis followed the precepts of the Straussian perspective of the Grounded Theory, by means of open, axial and integration coding. Open coding is the conceptualization moment, when the data are grouped according to their similarity, identifying their characteristics and the properties inherent to each of the concepts. Subsequently, in axial coding, the subcategories are obtained, which are formed from the initial phenomena, with a view to explaining these phenomena. Finally, the last category is integration, in which the concepts of categories and subcategories are unified in order to build the theory.⁶ Data was analyzed and organized with the support of the NVIVO® 10 software.

At the end, for data organization, the three components of the paradigmatic model were adopted: condition, actions-interactions, and consequences. The condition component represents the

cause expressed by the participants for the occurrence of a certain situation, as well as their explanations; the actions-interactions are the movements, the connections between people in order to seek a solution or change for a given situation; from the condition, from the actions-interactions the consequences arise as a result of everything that was generated. These movements associated with the analysis component highlight the phenomenon.⁶

From the analysis of the constructs, the analytical direction of the study is guided by the construction of memos, explaining the deepening of the hypothesis, as well as the theoretical density of the research. The focus of this study is the "Using information and communication technologies" subcategory, which stood out for its theoretical-conceptual relevance in the "actions-interactions" component, according to the coding paradigm adopted.⁶

This research followed the recommendations described in Resolution No. 466 of December 12th, 2012, of the National Health Council (*Conselho Nacional de Saúde*, CNS) and was approved by the Committee of Ethics in Research with Human Beings, with opinion number 2,595,322 and Certificate of Presentation for Ethical Appreciation (*Certificado de Apresentação para Apreciação Ética*, CAAE) 81636317.0.0000.0121.

RESULTS

The study resulted in the participation of 21 researchers, 20 are female and one male, aged between 20 and 67 years old. The time of participation in the research groups ranged from 06 months to 40 years. Among the leaders, vice-leaders and ex-leaders, the teaching experience varied between 12 and 53 years, the post-graduation experience between 02 and 40 years, and the time as a leader or vice-leader was 01 to 30 years. For post-doctoral, doctoral, master and undergraduate students, research experience ranged from 03 months to 11 years.

The Information and Communication Technologies used by the researchers in research groups were intended to facilitate the necessary management processes, essential for developing research studies, with three main objectives: communication and storage, visibility strategies, and operational strategy. Figure 1 shows these categories and the strategies inserted in each one.

Information communication and storage

The participants evidenced that communication is a crucial tool to assist in the management of activities within the research groups.

[...] We often speak, generically, but communication processes are really important and relevant. So, it is not that easy to communicate. That is not what I am talking about, I am talking about if we could think of an effective communication process, I think this is an extremely relevant process for a group to function. There we have some mechanisms to communicate [...] (P13).

[...] I think that communication among the members of the research groups is really very important [...] (P16).



Figure 1. Information and Communication Technologies for the Management of Nursing Research Groups. Prepared by the authors. Florianópolis, 2020.

For effective communication within research groups, the members use *Whatsapp*[®] and e-mail as specific information communication and storage strategies. *Whatsapp*[®] is a tool used for sharing information, such as: participation in congresses; sharing materials; news; public notices; deadlines. In addition, it was also used as a space for training, discussions and shared decision-making.

[...] the space of Whatsapp[®] of the group has a lot of things and it is a group that we share a lot of information and training [...] (P13).

[...] we also have a Whatsapp[®] group, this is interesting, there are no unnecessary messages, but we know when someone presented some work at events, for example. I think it depends on the cooperation and participation of the entire group to set and fine-tune this communication [...] (P16).

[...] there is the issue of the Whatsapp[®] group where we are talking about the date of the group meetings and if many people cannot on a certain day, we move to another [...] (P18).

Regarding e-mail, it was also highlighted as a communication and storage strategy. In the research groups, it was used for

functions similar to those of *Whatsapp*[®], such as how to facilitate the forwarding of notices; materials and encourage discussions. The research group's institutional e-mail also served as a space for storing information.

[...] we have the e-mail space. The lead professor sends everything by e-mail [...] (P16).

[...] we also use the group's collective e-mail, for example when we held an event, we sent a registration form and we always sent an attachment to the group's email, so we always managed to get things back from past events. When we are going to hold a new event, for example, we take what has already been used and criticize if it is still valid, if it was well applied, if it was effective with what we wanted, and we apply it again, or not, with changes. So, we always use the group's email as a place to send things and save them so that everyone can have access [...] (P19).

Disclosure and visibility

The aforementioned visibility strategies highlighted the use of the website and social media, such as Facebook[®] and Instagram[®]. In relation to the website, this is already an existing

practice and systematized by some research groups. However, other groups still face difficulties in creating the website, mainly due to budget restrictions.

Both for the groups that already have a website and for those that are implementing it, the constant updating of these pages was cited as a challenge, as it depends on the involvement of teachers and students. One of the factors that make this solution difficult is the turnover of undergraduate and graduate students, whose length of stay in the research group often corresponds only to the training period.

The groups that manage to keep their sites up to date centralize this task on specific members, who are responsible for activities such as: calendar of meetings, participation in events, upcoming events, and publications, among others. It is a consensus for the participants of the research groups that maintaining an updated website increases the visibility of these Groups and their repercussions beyond the walls of the university.

[...] we also have the research group's website, which is an institutional website, it belongs to the university, it is nameoftheresearchgroup.university.br. It is difficult for a research group, for a laboratory to have their own website, isn't it? What we need to do now is this update, only that our time is short. So, we will be depending on the students to update, who already have their activities. It is our project to always be thinking about someone who can make this update, which also depends on all the professors collaborating [...] (P1).

[...] we don't have a page on the university's website yet. We had no financial resources to set up this page. There has to be someone who knows how to put it, the most difficult thing is to set up the page because maintenance is done by ourselves. But, I imagine that starting this next semester we will give priority to this. So, now we can see that this is important, we are getting a little out of step because we do not have a space for dissemination, the page is a space for dissemination. And then it ends up compromising the disclosure of the group itself, it is not only with events that we propagate the group, but it is also on a webpage, it is the meetings, and that is what we have been trying to do [...] (P9).

The social media reported were Facebook® and Instagram®, in order to increase the visibility of work and research within the Groups. The use of social media arose from a need identified by members of the Nursing research groups. As in these research groups, management occurs in a shared manner among the members; the idea was welcomed and made possible by all its participants.

This strategy was designed mainly for combining social media that are part of people's lives. It is very common to access these platforms daily. The participants also reported that it facilitates the connection between people who are geographically distant, such as ex-participants or active participants who cannot be physically

present at the meetings, but follow what has been worked on, the research carried out, the defenses. In addition, for those who do not yet know the research group, the social media enable this approach and knowledge of what the research group is like.

[...] we revitalized the Facebook® page and we created the Instagram® account. Many criticize the use of social networks in a more explicit sense of private life. When I think about the role of the university and the democratization of knowledge, I think that we should share more of what happens in the academic environment. How many of our friends do not know about the theses and dissertations we work on?, or they do still think that studying is an easy task, not being understood as work. So, I think that using social networks is a way of giving visibility to our work, dialoguing with more contemporary tools. And it connects people. We have a network in Brazil and abroad and this allows these people to know what is happening in the research group. Then the idea came from this collective management that has been happening and how we can open the group's door for everyone [...] (P13).

[...] it's been really cool to reconnect people. In addition, Instagram uses the photographic feature, which in itself is already significant. So, it affects people [...] (P13).

Research data management

For the management of research data, the use of software that serve as support for the researchers in organizing and analyzing data from their research was surveyed. Research groups have software for organizing and analyzing qualitative and quantitative data. The most cited qualitative data analysis software programs were NVIVO®, MAXQDA®, Atlas.ti® and, for quantitative data analysis, IBM SPSS® Statistics.

[...] I had the opportunity to get to know, for example, the NVIVO software that we have there in the research group [...] (P11).

DISCUSSION

The academic environment has been generating new trends and innovations along with scientific and technological development. Research groups contribute to the country's scientific production by means publications and through the exchange of information and experiences among researchers.⁷ In the training of researchers in *Stricto sensu* teaching graduate courses, more specifically in the teaching internship, the importance of understanding the available technologies and the appropriation of technological resources as allies for the teaching and learning process is emphasized.⁸

From the theoretical constructs presented in the results of the study, it was possible to relate the findings to the scientific literature,

which corroborates with the study data when describing the positive aspects of the applicability of Information and Communication Technologies in the research groups, regarding the Information and Communication Technologies that produce knowledge and those that support the development of knowledge. The first ones are related to technologies aimed at education, care and software development. The second ones are linked to the organization of the group's productions: storage, dissemination and disclosure. The synergy between technology and life science leads to the advancement of a new biology.⁴

The *Whatsapp*[®] cited by the study participants has also been described in a similar way in the literature as an effective tool to help manage group information. A clinical analysis laboratory included workers in the *Whatsapp*[®] corresponding to the sector where they worked. Information related to laboratory services was shared among the groups. The measured use of the application showed a significant improvement in communication, facilitated by the sharing of photos, critical alerts, information about accidents, scales, academic activities and guidelines. As a result, there was an increase in the information load that minimally disrupted the routine, although the benefits were greater than these situations.⁹

The social media have been increasingly used as allies of the researchers, as they provide access to databases. Their use is linked to increasing the visibility of research and they have recently been used as an effective and economical method of recruiting participants for new research studies. In addition, this form of recruitment favors the geographical, social and economic diversity of the participants, as well as it enables the participation of populations with difficult access and the construction of a robust sample. This model for recruiting participants for research demonstrates that, over time, the research groups develop new methods, models and theories with the support of telecommunications, in order to enhance the infrastructure already available, aiming at new applications and services.³⁻¹⁰

The supporting software programs for data analysis can be described as a research data management strategy, as they exercise the function of systematically and quickly organizing data storage, management and recovery. Although the software programs are important for these processes, the analytical capacity of the researcher is indispensable to conduct analytical thinking and scientific research. The software serves as an important support for data organization and analysis and for finalizing the research results.¹¹ Researchers in health sciences, graduate students and professors, consider it important to address the use of software programs to support data analysis in a training on Information and Communication Technology.³

In this context of insertion of Information and Communication Technologies in research groups, the focus of the studies starts to consider the need for planning and controlling cybersystems, such as humanitarian logistics, smart grids, multi-modal supply chains and the regulation of social and biological systems. In addition, computational social choice, pervasive computing, diagnosis, prediction and simulation are included as key topics for research.⁴

A study conducted with 1,065 graduate students, identified that most of the students (69%) used Information and Communication Technology in the research they were developing and that 31% did not use any type of Information and Communication Technology. However, more than 65% recognized the importance of addressing the theme of using Information and Communication Technology, as well as conducting training on the use of Information and Communication Technology in research. The students also cited the relevance of knowledge about Information and Communication Technology as essential for their educational needs, to assist researchers in their efficiency and effectiveness; to develop research protocols; in the use of electronic health records for research; knowledge about the functioning of databases (structure, attributes, storage, retrieval and relationship of data); and how to use Information and Communication Technologies in each research phase.³

In the literature, it is possible to find instruments to assess the attitude of students in the areas of health sciences towards the use of technologies, which facilitate decision-making based on access to information and information management. For example, the Scale of attitudes in digital information and communication technologies for health. The scale favors information management, as well as the administration of information technologies in education, providing elements to researchers and managers to ally themselves with these technologies in the search for qualification in the health care practice.¹²

The research groups can also incorporate new tools with the support of Information and Communication Technologies, already used in other countries, to conduct collaborative research studies that result in greater robustness and better accuracy. Regarding the potential for collaboration in health research at a global level, the use of Information and Communication Technologies has enabled various ways of interaction among the researchers, such as: joint publications; database sharing in research; mentoring; support for research groups; collaborating and financing pilot projects.¹³

In addition, the use of Information and Communication Technologies in research groups enhances support for strengthening research in emerging countries, by connecting health scientists from both extremes and facilitating access to health research tools through distance learning tools.¹³ In Norway, the development of research in international collaboration networks has had an impact on improving the quality of the publications and on increasing the productivity of the researchers.¹⁴

In Canada, partnerships between researchers and the interested community are described, such as patients, community organizations, professionals and policy makers, which generates an impact for all the participants involved, as well as for the development of successful research studies.¹⁵

Information and Communication Technologies are important tools for improving global education in health. The application of these devices is increasingly gaining a fundamental place in the teaching and learning environment of the health areas, in a scenario of profound transformations and digitalization of health,

with the transition for care, diagnosis and treatment being done remotely. Information and Communication Technologies favor the exchange of information on health, as well as health training at a global level; it enables collaboration between researchers; and it provides instruments for decision-making in public health policies.³

CONCLUSION

The Information and Communication Technologies used by the Nursing Research Group assist their management processes of science, technology and innovation in health, as well as they build a link between technology and the construction of scientific, technological and innovation knowledge. Based on the constructs resulting from the centrality of the findings, the study points out as innovation the use of Information and Communication Technologies with three main functions within the research groups: information communication and storage, dissemination and visibility, and data management and storage.

Although the research groups make use of a range of Information and Communication Technologies, they can expand their arsenal, given the amount of resources that are available in this regard. For example, using the social media for the recruitment and selection of samples for future research studies and the development of collaborative research networks.

The study presented limitations related to the scarcity of literature on the use of specific Information and Communication Technologies in research groups; even though Information and Communication Technologies are routine in the daily lives of researchers, it was a limiting factor. Thus, the need is evidenced for new research studies to deepen the theme under study and to disseminate the potential of Information and Communication Technologies for the management of research groups and the production of scientific knowledge.

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