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Original Article

# Knowledge management in nursing during THE SARS-CoV-2 COVID-19 pandemic

Gestión del conocimiento en enfermería durante la pandemia por SARS-CoV-2 COVID-19

Gestão do conhecimento em enfermagem durante a pandemia SARS-CoV-2 COVID-19

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### ABSTRACT

**Introduction.** The COVID-19 pandemic posed a significant challenge for the nursing profession and personnel involved in direct patient care, particularly in the generation and assimilation of new knowledge to provide relevant and timely care. **Objective.** To explore the experiences of nursing staff regarding knowledge management and its application in clinical practice for the care of patients with COVID-19. **Methodology.** A qualitative multiple-case study was conducted using 8 semi-structured interviews with nurses who cared for COVID-19 patients in two hospitals in Colombia. **Results.** The study highlights the leadership role of nurses in planning and implementing actions aimed at the creation and dissemination of knowledge.

## Author Contributions

### LMD.

Conceptualization, methodology, formal analysis, research, data curation, original draft writing, writing, reviewing and editing, visualization, project management (Bogota), fund acquisition. CAOM.

Conceptualization, methodology, research, writing original draft, data curation, writing, reviewing and editing, visualization, project management (Cali), acquisition of funds. CMVJ.

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Conceptualization, methodology, formal analysis, research, data curation, writing, reviewing and editing.

Key factors facilitating knowledge flows included the organizational structure for knowledge management, ongoing collaboration with academic institutions, and the preparedness, experience, and professional commitment of all staff members. Additionally, the ability to contextualize knowledge for the healthcare of COVID-19 patients emerged as a critical factor. This ability is particularly relevant as it represents tacit knowledge, developed collectively and interdisciplinarily through prior experiences and the essential assimilation of external information. **Discussion.** The findings align with other studies that emphasize the role of nursing in knowledge transfer to the entire healthcare team under adverse conditions, as well as the barriers that impede knowledge creation and access. **Conclusion.** The experiences of nursing staff in knowledge management underscore the profession's leadership in educational processes, even in challenging contexts. However, the social recognition of this role remains an area that requires further strengthening.

### Keywords:

Knowledge Management; Information Dissemination; Education, Nursing; Nursing Education Research; COVID-19.

## RESUMEN

**Introducción.** La pandemia de COVID-19 significó, para la enfermería y personal involucrado en la atención directa, un reto en la generación y apropiación de nuevos conocimientos que les permitieran brindar una atención pertinente y oportuna. **Objetivo.** Explorar las vivencias del personal de enfermería con relación a la gestión del conocimiento y su apropiación en la práctica asistencial para la atención a pacientes con COVID-19. **Métodos.** Investigación cualitativa de casos múltiples mediante 8 entrevistas semiestructuradas a enfermeras que atendieron pacientes con COVID-19 en 2 hospitales de Colombia. **Resultados.** El estudio evidencia el liderazgo que ejerce la enfermería en la planeación y ejecución de acciones orientadas a la construcción y divulgación del conocimiento. Entre los componentes que favorecieron los flujos de conocimiento, se encuentran la estructura organizativa para la gestión del conocimiento; el relacionamiento permanente con la academia, la preparación, experiencia y compromiso profesional de todo el personal de las entidades. Además, la capacidad del uso contextualizado para el cuidado de la salud de pacientes con COVID-19, que se hace más relevante en tanto se considera un conocimiento tácito construido colectiva e interdisciplinariamente a partir de saberes y vivencias anteriores, y de la apropiación crítica de la información externa. **Discusión.** Los resultados del estudio se asimilan a otras investigaciones que señalan tanto el rol de enfermería en la transferencia de conocimientos a todo el equipo de salud en condiciones de adversidad, como en las barreras que obstaculizan la construcción y el acceso al conocimiento. **Conclusión.** Las vivencias del personal de enfermería en torno a la gestión del conocimiento, resaltan la profesión como líder en los procesos educativos, incluso en contextos de adversidad, cuyo reconocimiento social es un aspecto que se requiere fortalecer.

### Palabras clave:

Gestión del Conocimiento; Difusión de la Información; Educación en Enfermería; Investigación en Educación de Enfermería; COVID-19.

## RESUMO

**Introdução.** A pandemia de COVID-19 representou um desafio para os enfermeiros e pessoal envolvido nos cuidados diretos, um grande desafio na geração e apropriação de novos conhecimentos que lhes permitam prestar cuidados relevantes e oportunos. **Objetivo.** Explorar as experiências do pessoal de enfermagem sobre a gestão do conhecimento e sua apropriação na prática assistencial para o cuidado de pacientes com COVID-19. **Métodos.** Pesquisa qualitativa de estudo de caso múltiplo usando 8 entrevistas semi-estruturadas com enfermeiros que atenderam pacientes com COVID-19 em dois hospitais na Colômbia. **Resultados.** O estudo evidencia a liderança exercida pela enfermagem no planejamento e execução de ações voltadas para a construção e disseminação do conhecimento. Entre os componentes que favoreceram os fluxos de conhecimento destacam-se a estrutura organizacional para a gestão do conhecimento, a relação permanente com a academia e a preparação, a experiência e o comprometimento profissional de todo o pessoal das instituições. Além disso, a capacidade de uso contextualizado para a atenção à saúde dos pacientes com COVID-19, que se torna mais relevante por ser considerado um conhecimento tácito, construído coletiva e interdisciplinariamente a partir de conhecimentos e experiências prévias, e da apropriação crítica de informações externas. **Discussão.** Os resultados do estudo estão

alinhados com outras pesquisas que ressaltam tanto o papel da enfermagem na transferência de conhecimento para toda a equipe de saúde em condições adversas, quanto as barreiras que dificultam a construção e o acesso ao conhecimento. **Conclusão.** As experiências da equipe de enfermagem na gestão do conhecimento destacam a profissão como líder nos processos educativos, mesmo em contextos de adversidade, cujo reconhecimento social é um aspecto que precisa ser fortalecido.

**Palavras-chave:**

Gestão do Conhecimento; Disseminação de Informação; Educação em Enfermagem; Pesquisa em Educação em Enfermagem; COVID-19.

## Introduction

Health care in all settings must be grounded in solid knowledge, understood not merely as information but as its application to solve problems or to create frameworks for thought and action. According to Nonaka, as interviewed by Kawamura (1), knowledge is a dynamic process that is constructed from the inside out, thus involving individuals' subjectivity or personal understanding. In contrast, information is acquired from the outside in and can only evolve into knowledge when it is internalized through action or practice. This distinction seeks to move beyond the Western perspective, in which only the objective and explicit can be termed knowledge, and instead invites the reconciliation of the subjective and objective as essential elements in the construction of knowledge. This approach opens science to experience and local wisdom (2). In Breilh's words, since knowledge is socially and historically determined, its construction requires the integration of all possible voices and must be relevant to each context. Therefore, it must be intercultural, transdisciplinary, and transformative (3).

Particularly in situations that suddenly and massively threaten human systems, such as the recent COVID-19 pandemic, the demand for timely and relevant responses based on accurate and contextually applicable knowledge necessitates the rapid coordination of various sectors. This includes not only transnational scientific and technological collaboration (4) but also the involvement of local actors responsible for applying knowledge in the fields of research, education, administration, and health care. Consequently, knowledge management is understood as the processes aimed at planning, coordinating, and controlling knowledge flows within and around an organization (5), intending to ensure that knowledge, as a human asset, is available when needed (6), became a priority during the pandemic for decision-makers, the scientific community, and health care personnel tasked with organizing efforts to respond to the health emergency. These knowledge flows refer to the continuous generation of new knowledge and its rapid dissemination among the actors responsible for its application (7).

Particularly for the nursing profession, producing, accessing, and assimilating knowledge, as well as integrating it into the

object of study itself such as health care requires multiple cognitive, technical, and empirical capabilities. This is especially true when agile and assertive decision-making is required, as was the case during the pandemic. In this context, limitations in time, resources, and even mobility due to the need for isolation, coupled with the opportunities provided by current technological advancements, necessitated the adoption of new approaches to creating and disseminating knowledge to facilitate decision-making in adverse situations.

Thus, some published experiences on the role of nursing during the pandemic highlight the rapid adaptation of nursing staff to acquire and transmit the knowledge required for the care of COVID-19 patients. These include the retraining of new staff in intensive care units by experienced personnel, the development of training programs combining virtual instruction with individualized in-person practice (8), the dissemination of visual materials and training sessions (9), reflection, simulation, and case-based and problem-based learning (10), and the preparation of facilitators for evidence-based knowledge dissemination (11). These studies also underscore the critical role played by nursing staff in organizing services, protecting the health of all healthcare personnel, and transferring knowledge to patients and healthcare teams.

However, the ability to produce and access knowledge in the field of health, particularly in nursing under similar conditions, faces significant challenges that extend beyond individual or institutional motivation and capacity. These challenges frequently include obstacles related to the relevance, timeliness, and accessibility of information (12). Another major challenge for nursing involves inequalities in access to information and participation. The former is partly determined by the role of communication technologies in knowledge acquisition, which can act as a differentiating factor between social classes and even as an intergenerational barrier (13). Regarding participation, although leadership and recognition of the work of nurses have increased over the years, it has entailed an ongoing struggle to overcome conditions of subordination in which power dynamics have been dominated by the medical profession. This has resulted in the exclusion of highly qualified nursing professionals from management

positions, despite their competence to perform such roles (14). These inequalities in power relations, even within healthcare teams, are directly linked to the identities historically attributed to nursing. Specifically, caregiving has been associated with women due to their perceived capacity to nurture and reproduce life a role often confined to the domestic sphere without remuneration or recognition, as it is assumed to be a natural condition. This has prevented dominant groups from valuing and acknowledging the significant contributions that nurses can make based on their experience and local knowledge, thereby perpetuating their marginalization (15,16).

To overcome these obstacles, health knowledge management is tasked with facilitating reciprocal knowledge flows, ensuring that knowledge reaches its intended recipients promptly (7), and promoting the generation, dissemination, and application of knowledge across different organizational levels. This requires addressing, as far as possible, the inequalities that hinder these objectives (17). To achieve this, it is crucial to understand the specificities of knowledge management and flows in the Latin American context, which have been poorly documented to date. Therefore, it is necessary to retrospectively examine how these processes unfolded, to identify achievements and lessons learned that can strengthen effective knowledge management in similar situations. This, in turn, can improve the quality and timeliness of care and patient outcomes.

Considering the conceptual framework and situations described, this study was conducted to explore the experiences of nursing staff regarding knowledge flows and their assimilation in clinical practice for the care of COVID-19 patients in two hospitals in Colombia. These experiences are expected to contribute to preparing professionals for future situations as complex as this one.

## Methodology

A qualitative investigation was employed with a multiple cases design from an analysis of several cases jointly, to understand a fact or human group, which implies the study of complex relations and a challenge to articulate what occurs in everyday contexts with some academic disciplinary constructs (18).

8 nurses selected intentionally participated in the study, who followed the professional nursing criteria and were working in attention units of COVID-19 patients, with a permanent employment contract with at least 6 months of antiquity in the institution and knew about the dependencies in charge of the educative processes in their respective institutions, which correspond to Public Health Service Providers Institutions, of high level of complexity

one located in Cali, Colombia and the other one in a town near Bogota in Cundinamarca department. To contact the participants with whom there was no type of approach prior to the research team, the investigation was presented through a video via hospital platforms, inviting the staff to participate. Functionaries who didn't want to participate indicated the lack of time and tiredness caused by the duplicated shifts during the second and third years of the pandemic.

The information was recollected between June 2021 and March 2022 through semistructured interviews, the interviews were applied by four female research nurses and a male nurse with a master's and doctorate (one in Cundinamarca and three in Cali) in person within an adequate office for this matter in each one of the hospitality institutions, with an average duration of 60 minutes each interview. The interview's design took as a referent the findings derived from the quantitative phase of this research, which was carried out collectively in Argentina, the Dominican Republic, and Colombian hospitals, coordinated by the Networks Center of the University of Buenos Aires. The interviews were validated by expert testing in which 3 nurses with education nursing experience, health service attention quality, and patient security politics participated. The interviews were recorded in MP4 format and video, prior authorization, and transcribed in an excel matrix, placing in the collums the participant number, while horizontally the questions were placed under which each of the responses was systematized. For the posterior data analysis, established parameters for the methodology of collective cases by Stake were followed, which consist of the direct interpretation of data and the categoric addition of it, which means, the sum of the narratives organized by previously established themes that correspond to the questions asked (19). To reduce the possible bias of selection given the convenience sampling, the interview questions investigated situations that were presented generally in the hospitality institutions in terms of disponibility, sources, access, and their usage of information, as well as communication aspects related to health attention like channels, processes, and resources, avoiding questions about individual perceptions in front of the same categories.

Attending to the 8430 de 1993 resolution of Colombia's health minister, the present study was classified as minimum risk. In its development, all the ethical principles of confidentiality and voluntary were followed, therefore the identity of the participants was maintained anonymous, and their informed consent was counted on. The research was approved by the Human Ethics Committee of the Universidad del Valle, through approval document 016-020 and the ethics committees of both hospital institutions.

## Results

From the group of the study participants, is highlighted that seven of them who identify as females are between 36 and 56 years of age. Table 1 presents the characteristics of the participants related to their level of formation and time of work.

**Table 1.** Coding and characteristics of study participants

Subject	Education level	Working time in the institution (years)
P1	University student	2
P2	Audit Specialist	< 1
P3	University student	9
P4	University student	40
P5	University student	22
P6	Nephrology Specialist	12
P7	Health administration Specialist	29
P8	Critical Care Specialist	30

Source: prepared by authors.

The results are presented attending to the categories of knowledge gestion, described by Macias-Chapula (13): information sources, destinataries, and communication channels, in addition to incorporating categories of the basic model proposed by Shannon et al (20) who take into account aspects of the scientific communication, like: the types of knowledge and processes around attention and instruction, the resources and results, identified by the participants. Finally, other categories are included that are addressed from the knowledge spiral model proposed by Nonaka (21), such as the internalization of knowledge and feedback (17).

## Types of knowledge and contents

Considering the taxonomic descriptions of the types of knowledge that, according to Nonaka, can be classified as tacit and explicit, this study identified that both explicit and formal knowledge, as well as tacit and informal knowledge, were present. But with more reference to the first ones than the last ones. Regarding the explicit knowledge, coming from formal intra- and extra-institutional structures, four thematic cores were identified that dynamized the flow of knowledge: a. epidemiological behavior of the virus and the COVID-19 disease; b. care for infected patients; c. personal protection and d. organization of health services.

The spread of knowledge for patients with COVID-19 attention is related, in the first instance, to the virus generalities and the characteristics of each virus strain, transmission paths, distribution, and possible determinants. To strengthen abilities in attention to infected people, topics such as alarm signs, medication administration, protocols actualization, and specific care like postural changes were addressed. Regarding personal protection, the knowledge was centered on the adequate usage of elements before, during, and after each attention, adequate approach to patients, handwashing, and distancing between personnel. In respect of this category, the participants highlight the importance of integrating both types of knowledge, as one of the participants points out in the following narrative:

*“Here, when the pandemic started, they began to implement the Institution’s own protocols and also those given by State regulations... There is also empirical knowledge, international practices, for example I speak about pronation, that is not ours, that was invented there, but, then that is what I mean with the empirical part because there is not, let’s say, a pronation protocol as such documented here in the Institution” P1*

## Sources of information and organizational structures

Participating nurses identified various sources of knowledge, as well as information channels, from agencies and research teams, international organizations, government agencies at national and local levels, to the health professionals and institutions, from the beginning, sought to adopt new knowledge and adapt existing ones. In this regard, they identified both external and internal sources within the institutions where they worked, with the organizational structure in both settings either facilitating or hindering the flow of information. Among the external sources, the guidelines and communications from the Ministry of Health and Social Protection were the most recognized by professionals. However, they noted that the information was issued late, only after the first COVID-19 cases were detected in the country, which reduced the preparation time for territorial entities and institutions.

Given the delay in receiving official guidelines, both institutions experienced a rapid process of studying and adjusting existing protocols on topics such as isolation and the use of personal protective equipment, which became the primary sources of guidance for the teams’ actions. This planning process was led by departments such as the functional unit of continuing education or training programs, in coordination with other areas like the quality office, occupational health, epidemiology, emergency and disaster committees, and service leaders, including

laboratories. Notably, nursing leadership played a key role in planning and implementing training actions for all healthcare and support staff, as nurses were in charge of the education units, as reflected in the following narratives:

*“An initiative we had at the time with the head of quality was: quickly, let’s train people. On what? On whatever we have, whatever the Ministry has sent us... We managed to train approximately 100 people per session. We trained everyone, from security staff, social workers, general services, nurses, doctors, even specialist doctors listened to nursing because we tried to be those leaders who wouldn’t be dismissed just because ‘you’re not a doctor.’ No, we as nurses say it because it’s what the Ministry says, what the WHO says, what the INS says, what all the institutions say because we are always in that constant struggle where the doctor is assumed to always be right, but that’s not always the case.” P5*

## Recipients of knowledge flows and healthcare outcomes

Two types of recipients were identified: intermediate and final, along with the expected and perceived differential outcomes for each group. Among the intermediate recipients are the care, administrative, support services and general services personnel, among whom articulation was essential for the training and provision of services. The expected results of knowledge transfer to hospital staff were identified, in the first instance, as providing relevant care, improving the quality of service, reducing the risks of contagion for staff, and their families, and facilitating the management of emotions, especially the fear produced by facing the unknown.

It is worth highlighting in both institutions the dual role of nursing as an intermediate recipient of knowledge but also as the leader in planning and implementing internal knowledge flows. This role is not new, but it became more visible during the pandemic.

On the other hand, participants identified patients as the final recipients, on whom the outcomes of applying acquired knowledge are expected to have an impact. Among these expected effects were responses focused on accelerating recovery and preventing complications, individualizing care, guaranteeing information to users and their families about the prognosis and treatment, as well as administrative procedures. The following narratives illustrate the intermediate and final outcomes that are expected to be reflected in patient care:

*“Pronation works for the patient and helps them recover a little bit faster.” P1.*

*“We identified this issue with the patient that they are being pronated, and their face is rubbing. So, we decided to do it differently, and right away, we implemented an improvement plan to prevent anyone else from experiencing the same issue.” P2.*

*“The intensivist, the doctor, is very attentive to the patients. After completing rounds, they call the family to update them and tell how is, what has been done, and what will be done next.” P3.*

## Communication Channels and Resources

In one of the institutions, the education unit was responsible for disseminating information, while in the other, this role was handled by the epidemiology service. To expedite knowledge transfer to nursing teams and all staff, both in-person and virtual tools were combined, initially favoring the on-site modality, which was progressively replaced by technological mediation through platforms and virtual groups on social networks, used to disseminate information and monitor and evaluate educational processes. This incursion of ICTs, even migrating to teleworking, was perceived by the participants as one of the changes that occurred most quickly and for which, in general, the staff was not prepared. The following narratives illustrate these experiences:

*“Everything is done through Classroom. They send you the assessments, you complete them, and you are constantly evaluated.” P6.*

*“Virtual communication groups were created, and that helped a lot here; those chat groups still exist. That became an important part of our lives.”*

Although the relevance of technological mediation was recognized, the narratives point out the lack of preparation of hospital staff and society, in general, to assume virtuality as an educational strategy, in addition to the initial rejection of technologies due to the intergenerational gap. In this regard, they mark the arrival of younger staff as a strength and a support point for advancing knowledge and the use of these technologies as well as highlighting the improvement of information management that in physical media was less efficient.

Another limitation marked by participants regarding communication channels refers to the capacity and speed of technological resources such as the Internet, email, and virtual platforms, to upload, download, and store large volumes of information, such as standards, review documents, and protocols.

## Internalization and feedback of knowledge

The findings show that before being appropriated, knowledge goes through non-formal processes of individual and collective validation, that is, it is accepted to the extent that it demonstrates useful results for both intermediate and final recipients, especially in terms of the contribution to patient recovery, results that are evaluated based on the individual analysis of professionals but that are socialized informally in daily interprofessional conversation. Once validated, knowledge can be deconstructed and reconstructed in a process of collective construction of empirically validated tacit knowledge. The following narratives illustrate this finding:

*“As we continue observing at and attend, it is changing to improve the care... it is being seen the negative and positive aspects of the process and it is modified within the institution, they say: that is no longer done that way, we are going to do it like this and it is changing and that is how we have been working... the information is passed on and adapted to each of the users...” P4*

In the health field, the appropriation of knowledge or practice is often related to adherence, a concept marked by some participants to refer to changes in professional practice. In this regard, in one of the institutions, employees expressed that the change in practices such as hand washing and the use of protective elements in personnel from disciplines other than nursing, mainly in medicine and therapies, was more evident because of nursing adherence to protocols is more normalized and these practices were already carried out daily.

## Characteristics of knowledge within the framework of the systems model

The massive and fast dissemination of information without much clarity, improvisation, and collective construction between members of different departments are aspects that are highlighted in this category. The narratives exalt the ability to recognize one's strengths and those of each member of the team, to communicate with others, and to request support, as necessary conditions to access information and build new knowledge placed in the specific context.

Another of the characteristics to analyze from the systems model is related to equitable access to information since there is the possibility of privileging one group of recipients over another, an aspect that is analyzed in the present study for the intra-institutional space. Two key elements stand out in this regard: on the one hand, the formation of interdisciplinary teams of experts in different areas, in charge of collecting, analyzing, selecting, and

disseminating information, which facilitated the transfer of knowledge at the same speed and under the same conditions to all personnel. However, the mediation of technology in the training processes meant an inequity mediated by the intergenerational gap, with greater advantages for the youngest, accustomed to dealing with technological advances.

However, these same differences became an opportunity to support those who did not have the knowledge and experience in the use of technological tools.

*“The good thing is that here in the institution, there is a lot of staff, and young people have joined, they are much more skilled with this whole issue of virtuality and information management... That was an advantage. Many people helped us in that part.” P7.*

Finally, a factor that contributed to timely and equitable access to knowledge was the fact that both hospitals served as a setting for the training of professionals and therefore the more horizontal relationship with academia and research facilitated the daily updating processes, being a perceived advantage, as marked:

*“Being a university hospital, we are not outdated... One of the benefits of having all the support of university teachers is being up to date” P7.*

## Discussion

The findings show the professional and institutional efforts to overcome the barriers that hinder an effective transfer of knowledge, which, according to Macias-Chapula, can be identified as barriers to the organization and administration of information, staff education, absence of information channels or their disconnection from the sources and recipients (13).

In the pandemic, the barriers to access, timeliness, and relevance of knowledge, which according to Hering are present in organizations (12), were boosted even more in the hospital scenarios with the scientific uncertainty, lack of time for investigation, the wrong propagation of information and fake and historic breakdown between science, politics and practice (22). It can be related to paragraphs' critical point of view and inequality.

Despite this, several of the elements of the institutions where the study was conducted contributed to facing these challenges, among which the leading role of nurses in the continuing education processes and their integration in interdisciplinary teams, whose leadership, in accordance to multiple experiences published before (9,11) and during the pandemic (12,23-25), ensured the organization and

quality of the training actions, stand out; Therefore, it can be pointed out that nursing teams should be recognized as knowledge managers, as they fulfill this function, as Macias-Chapula points out (13). Indeed, the role of nurses as leaders of the educational processes has allowed them to gain recognition within the institutions by the healthcare and support personnel (26,27).

The topics on which the transfer of knowledge was focused coincide with those addressed in other contexts, where priority was given to training in personal protection measures, hygiene and isolation, hand washing, disinfection of equipment and furniture, patient assessment and monitoring, especially of respiratory parameters, administration of fluids and medications, together with other care such as postural changes, oxygen therapy, mobilization, patient transport and information on discharge from the hospital (28). However, in the hospitals where the interviews were carried out, it was not evident that the organization of hospital services and personnel planning were based on knowledge or experiences generated in other institutions; instead, these aspects related to the distribution of units, the demarcation of areas and routes or the number of patients assigned to each member of the health team, were more limited to administrative possibilities and trial and error. In contrast to this finding, in studies published in other countries, relevance was given to learning about the working conditions of the nursing staff to favor the quality of care and reduce the burden on the staff, since aspects such as the ratio of patients per nurse depending on the criticality, the organization of shifts and the extension of schedules, were decided based on previous studies, as were the measures for the physical safety of the staff in the social environment and the protection of their mental health (23); According to international organizations, these aspects should be strengthened, especially in the countries of the Americas (24).

Given that the research was conducted during the months with the highest incidence of cases of the disease, it was difficult to delve into more sensitive aspects such as institutional and personal management of knowledge aimed at managing the personal and family emotional burden, spiritual suffering, the experience of the disease itself and the experience of changing from caregiver to patient. There was also little research on measures to prevent or mitigate the impact of working conditions.

This is even more important in contexts of unequal working conditions, since according to some narratives, it seems that the way nursing personnel are hired negatively affects their willingness to acquire knowledge, reducing, for example, adherence to protocols, since the level of commitment that can be demanded is different. In this regard, the impact of changing working conditions, characterized by flexibilization and outsourcing, on compliance with

standards as strict as those required by the pandemic needs to be further explored.

## Conclusions

The experiences of the nursing staff regarding knowledge flows highlight the profession as a leader in educational processes, which the context of adversity during the pandemic allowed to enhance and make it even more visible, at least within the intra-institutional sphere, although there is still a long way to go for the social recognition of nursing leadership in this work.

Among the components that favored the flow of knowledge were the organizational structure for knowledge management, the permanent relationship with academia, the preparation, experience, and professional commitment of all the personnel of the entities, the organization by interdisciplinary teams to collect and disseminate the available information and the trust placed in them. Although these elements acted, perhaps spontaneously, as facilitators of knowledge transfer, being clear about the strength of each of them may favor institutional planning and response to future equally critical scenarios.

This study reveals the incursion of virtual media into personnel training and coaching as one of the most rapid and relevant changes in the flow of knowledge during the pandemic. However, as other experiences report, relying exclusively on technology generates inequity in access to knowledge, as the possession of technological equipment and services, the knowledge of these, and the intergenerational gaps privilege or exclude certain sectors of the population.

Finally, understanding how knowledge is produced and transferred among the different actors and areas in charge of health care is fundamental to planning and implementing actions that respond to the institutional and national contexts, improve the quality of health care, guarantee updating, and promote innovation in the sector. Therefore, the research team considers the relevance of involving the educational institutions responsible for training nursing professionals in learning strategies aimed at understanding and improving the flow of knowledge, not only towards the subject of care and in the intra-institutional scenario or the research exercise, but throughout the entire social system responsible for the health of populations, involving political and scientific actors, interdisciplinary teams, other sectors and, of course, the communities.

## Conflicts of interest

The authors declare that they have no conflicts of interest.

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## Ethical responsibilities

**Protection of persons.** This research, classified as minimal risk, has been approved by the Human Ethics Committee of the Universidad del Valle.

**Confidentiality of data.** The authors declare that they complied with the ethical principle of confidentiality, which is why they took rigorous care in the handling of the interviews and systematization matrices in coherence with the institutional research protocols.

**Right to privacy and informed consent.** The authors declare that they complied with the ethical principle of voluntariness, obtaining informed consent from each participant.

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