



# Nursing Knowledge-Sharing in Mobile Social Networks as a Means of Professional Dynamic Interactions: A Qualitative Content Analysis

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## ABSTRACT

**Background:** Nurses play a key role in maintaining and promoting community health; therefore, they need to constantly upgrade and update their professional knowledge through knowledge management process. Nowadays, knowledge-sharing within social networks is considered as a modern and effective strategy for the co-creation of new knowledge that would not be possible without the active participation of the members. The present study aimed to examine experiences of nursing knowledge-sharing in social networks based on smartphones.

**Methods:** This was a qualitative content analysis conducted between 2017 and 2019 in Tehran, Iran. Participants were eighteen nurses from virtual communities in social network platforms and included nursing-related virtual specialty groups. They were selected by purposive sampling and sampling continued until data saturation was achieved. Strategy of data collection included in-depth and semi-structured interviews. The data were analyzed using Landman and Grenheim method with the aid of MAXQDA 10 software.

**Results:** During the data analysis, six main categories emerged, including: a) “The emergence of virtual communities”, b) “Professional setting”, c) “Professional Virtual Communities”, d) “Dynamic interactions”, e) “Organizing and advancing” and f) “Outcomes of interaction in virtual communities”. Data analysis indicated that the main concern of nurses was professional advancement which encouraged them to create and join virtual communities to share knowledge. Dynamic interactions were also the main phenomenon studied.

**Conclusion:** This study provided a better and deeper understanding of the phenomenon of sharing nursing knowledge in virtual communities based on smartphones. The acquired concepts can be used in creating professional virtual communities as well as diagnosing their complications.

**Keywords:** Interaction, Knowledge Management, Qualitative Research, Smartphone, Social Networking, Content Analysis

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## Introduction

Today, all practical and scientific groups believe that in order for organizations to have a stable and continuous presence in a competitive business world, they must work around the axis of knowledge and information (1-3). Nurses also serve as the main knowledge providers in the health care system within the profession and among patients, families and the community (4, 5).

With the increasing changes in health care settings and technological advances (6-8), and the subsequent development of professional plans to provide safe and effective evidence-based care in complex health settings, nurses need their knowledge, skills and competencies to be empowered and play their specialized roles (9-11). Therefore, there is a need for an optimal nursing education system to keep pace with these ongoing changes (12). However, how to acquire, produce, store, share and apply this knowledge and select the best teaching and learning methods in the age of technology and information overload is a major challenge for nursing educators and leaders (8, 13).

Today, information accumulation is the most serious challenge for individuals and organizations, which leads to their confusion (14, 15). Information will be valuable when it is processed and made meaningful and turned into knowledge (16, 17). Therefore, in order to achieve this goal, a knowledge management process must be implemented, which emphasizes sharing knowledge rather than concealing it (18-20).

One of the challenges facing nursing educators in the area of knowledge management process is to facilitate the acquisition of knowledge and skills required to comprehend and use appropriate tools for learning (21, 22). Knowledge management is an approach that prepares nurses for variable health care settings and is a tool that enables nurses to act intelligently, effectively and efficiently (23).

With the rapid growth of technology, healthcare professions, including the nursing

profession, are trying to keep up with it (4, 24). Knowledge sharing through knowledge management systems can have a significant impact on nursing education systems and has the ability to help nurses understand and acquire appropriate and effective knowledge on the quality of health care services (25, 26). It also enables health care organizations to expand on the knowledge of professionals (27), and provides an opportunity to share social support, consult with professionals, and enhance professional training (28).

Among social media tools, social networks have a profound impact on social interactions and are one of the most important means of communication between people today (29), and there is a growing inclination among people and health care providers, especially nurses, towards utilizing these tools (30, 31).

Due to the growing popularity and growth of virtual specialized groups on mobile-based social networking software platforms, it is increasingly important to create new opportunities to learn and improve nursing knowledge, as well as address the lack of basic models of user behavior and subscription process. In these communities (3). The characteristics of qualitative studies make it possible to describe phenomena, and understand the relationships between phenomena and processes (12). Therefore, in this study a qualitative content analysis was applied to discover new perspectives and concepts and to communicate between them. Qualitative research is a form of social research, where people interpret their experiences and the world in which they live. Qualitative methods are used to reveal people's behaviors, views, feelings and experiences in order to understand the social realities of individuals, groups and cultures (23).

Given the expansion of knowledge frontiers as well as the use of virtual programs to facilitate the management of this space and its optimal use, this study was conducted to examine the experiences of nurses for nursing knowledge-sharing in social networks based on smartphones.

## Methods

### *Study Design*

Due to the fact that the study of the knowledge sharing requires a deep and comprehensive examination of the participants' experiences in view of the agents influencing their knowledge-sharing processes, this research was conducted with an exploratory approach and qualitative research method along with conventional content analysis (32). This research was done in Tehran, Iran, from April 2017 to July 2019. The study settings were virtual communities of practice (VCoPs) related to nursing, and specialized virtual groups in Telegram software platform, which was the most popular mobile-based social network in Iran during the study (33).

### *Sampling and Participants*

The study population included General Nurses and specialists from VCoPs on the Telegram platform that were not affiliated with any organizations. These VCoPs contained virtual groups created with a focus on clinical activities such as wound care, intensive care and cardiopulmonary resuscitation (CPR).

Members who met the inclusion criteria were elected as a participants through purposeful sampling. The inclusion criteria contained individuals within the accessible VCoPs from all over Iran meeting the following criteria: 1) at least a Bachelor's degree in nursing; 2) having a minimum 3 years of clinical experience; 3) having a minimum five months of experience in at least 1 of the voluntary nursing-related VCoPs (non-associated with organizations or associations); 4) adequate experience of the event under study, as well as, the capability to represent them; and 5) willingness to collaborate with the researcher. The sampling process lasted until data saturation was reached.

A purposive sampling method with maximum variability (various educational degrees ranging from Bachelor to Ph.D., both male and female sexes, from all educational, clinical, and managerial fields, as well

as from various clinical units) was used. Also, 3 members who did not have active participation in the VCoPs were classified as negative cases.

### *Data Collection and Interview*

Data collection methods in the present study include in-depth and semi-structured interviews (formal and informal interviews) that were done individually with each member. Data were collected from July 2017 to March 2019.

In two cases, due to the preference of the participants and their difficulty in making an appointment, the interview was conducted by telephone and the conversations were recorded with their permission via the Advanced Audio Recorder software. In the case of four knowledgeable and experienced users with whom face-to-face or telephone interviews were not possible, informal interviews were conducted through text or voice conversations on their private page in the Telegram software.

Each nurse was interviewed in one or two sessions. In total, twenty interviews were conducted with 18 nurses who met the inclusion criteria. Interviews were usually conducted in a quiet environment in staff rest rooms in different clinical wards of the hospital or professors' offices in nursing schools. Upon the fourteenth interview, data saturation and categories were obtained; despite the continuation of the interviews and their analysis, no new concepts or categories were added to the data.

The interviews were recorded using a professional tape recorder. The duration of the interviews ranged from forty-five to seventy minutes. The interview process was such that at first the interviewer introduced himself, stated the objectives of the study and ensured the confidentiality of the information, and after obtaining informed written consent, the interviewers asked questions about the biography of participants such as "Introduce yourself and Provide a biography of your education, educational, clinical or managerial background" and "In

what scientific groups related to nursing are you a member and activity of Telegram or other mobile social networks?"; Then general questions were posed, such as "What is happening in this virtual community where you are a member?" And "Describe your activities in a specialized mobile-based virtual community during the day?". Questions were asked based on the interview guide but the interview direction was guided by the participants' response. Some of the specific questions asked of these participants included questions such as "What factors have prompted you to post in this virtual group so far?", "What are the characteristics of virtual groups in which you are more willing to share your information and experiences?", "In which groups did you participate less or did not want to participate at all?" And "What factors prevented you from participating in group discussions?". Probing questions such as "Can you give an example in this case?" Or "What did you mean by that?" And like them, were asked to gain a more profound understanding of participants' statements, and to acquire richer data.

### *Data Analysis*

Conventional content analysis based on the Landman and Grenheim's method in 2004 was used to analyze the data (34). In general, conventional content analysis is used when the objective of a study is to describe a phenomenon, and there are limited ideas (32) or fragmented knowledge about it (35). In this method, the researcher also coded and analyzed the data in the course of data collection. As the researcher immersed himself in the data, he gained access to its main themes and concepts. MAXQDA (10) was used to manage data coding and analysis. The following steps were taken in this study.

1. Verbal transcripts of interviews and multiple reviews to understand the whole concept.
2. Decomposition of text into reasonable and dense units.
3. Conceptualization of the compressed

significant units and labeling them with codes.

4. Categorization of the codes into subcategories and categories, depending on their similarities and differences.

5. Devising themes and main categories based on the latent content of the text.

### *Trustworthiness of Research*

Research rigor was provided according to Guba and Lincoln's (1989) criteria (36, 37). Credibility was created with the prolonged involvement with the data and member check. Summaries of the interviews were returned to the participants to confirm the homogeneity of the researcher's and the participant's views. Internal expert panel method was used for Confirmability. The research team reviewed the data after being coded and categorized by the first author. For the codes and categories on which there was no consensus, the discussion continued until the issue became clear and consensus was reached. Audit was used for dependability. Initial data, categories, and themes were preserved until the end of the research process. Maximum variation sampling contributed to transferability as well as credibility.

## **Results**

### *Participant Characteristics*

A total of twenty interviews were conducted with 18 participants, including 12 men (66.7%) and 6 women (33.3%) with a mean age of 35.4±6.9 years, half of whom were single and the rest were married. They had 13.1±6.4 years of work experience and 22.8±14.6 months of membership in related virtual communities (Table 1).

During data analysis, a total of 2132 codes, 16 sub-categories and 6 main categories were extracted (Table 2).

### *1. The Emergence of Virtual Communities*

This category consists of the sub-categories "Stimuli for creating virtual communities" and "Motivations to join virtual communities", which refer to the factors that motivate users to form virtual communities



**Table 1:** Participants' characteristics

Participants Number	Gender	Age	Educational Degree	Marital Status	Work Experience (Years)	Role Within The VCoP	Duration of Membership Within the VCoP (Month)
P.No.1	Male	28	MSc	Single	5	User	11
P.No.2	Male	36	BSc	Married	15	Administrator	13
P.No.3	Female	50	Ph.D.	Married	25	Administrator	10
P.No.4	Male	29	BSc	Single	8	User	8
P.No.5	Female	39	MSc	Married	14	Administrator	13
P.No.6	Male	33	MSc	Married	10	Administrator	8
P.No.7	Male	33	BSc	Single	10	User	10
P.No.8	Male	32	BSc	Married	9	User	12
P.No.9	Male	30	BSc	Single	8	User	6
P.No.10	Male	52	MSc	Married	30	Administrator	36
P.No.11	Female	36	Ph.D.	Single	16	User	26
P.No.12	Male	42	Ph.D.	Married	18	User	30
P.No.13	Male	36	Ph.D.	Single	14	Administrator	49
P.No.14	Male	29	BSc	Single	9	User	20
P.No.15	Male	31	MSc	Single	9	User	41
P.No.16	Female	34	MSc	Single	12	User	35
P.No.17	Female	29	BSc	Single	7	User	44
P.No.18	Female	39	BSc	Married	17	User	40

**Table 2:** The main categories and their sub-categories

Rows	Main categories	Sub-categories
1	The emergence of virtual communities	Stimuli for creating virtual communities Motivations to join virtual communities
2	Professional setting	The nature of the nursing profession Characteristics of the creators of virtual communities
3	Professional Virtual Communities	Features of virtual communities Features of social networks Features of professional knowledge management
4	Dynamic interactions	Durability in virtual communities Interaction in virtual communities
5	Organizing and advancing	Virtual communities' leadership Guiding contracts Management facilitator technologies
6	Outcomes of interaction in virtual communities	Individual-social outcomes Professional outcomes Health Outcomes Outcomes of the interactive setting

and add to or join these communities.

Stimuli for creating virtual communities refer to stimuli such as the enjoyment of "humanitarian activities" and "professional

development" that motivate users to create virtual communities. In this regard, one of the participants mentioned:

*(Participant No.3): "In this sense, one of*

our goals was for children who need the experiences of others to be able to access it. Another goal was to share a series of scientific material that others could use.”

After the formation of virtual communities, the next step is to add users as members of these communities. Based on the data, users joined virtual communities with motivations such as “Satisfaction of needs” (addressing personal or clinical issues and needs) and “individual-professional development”. For example, one of the participants said:

*(Participant No.7):“Because I am a member of the hospital education department and need to update my information, I am both a member of this group and several other nursing groups.”*

## 2. Professional Setting

This category consists of the subcategories “The nature of the nursing profession” and “Characteristics of the creators of virtual communities”. The nature of the nursing profession, which consists of sub-concepts such as the specific characteristics of nurses, the educational task of nurses, the breadth of the fields of nursing knowledge and the nursing profession from the perspective of society, somehow represents the unique nature of the nursing profession. In this regard, one of the participants mentioned:

*(Participant No.4):“We need to have an overall view of nursing; I mean, for example, if I am a gastrointestinal nursing instructor, I might see an ECG in the same patient hospitalization file and the student would ask me to interpret that ECG. I can’t say no. And I have to answer it anyway.”*

The creators of virtual communities are in fact the nurses who make up these communities, including managers and leaders, as well as their members. In other words, the creators are the same intelligent and dynamic elements and components of virtual societies, and the phenomenon of knowledge sharing is the result of their interactions and occurs among them; Therefore, the unique characteristics of these creators, which are rather influenced by the nursing profession,

can be considered in the context of the studied virtual communities, and based on the findings, they have a significant impact on the knowledge sharing process. For example, one of the participants said:

*(Participant No.11):“The director of our group was literate, knowledgeable and ethical, and he led the discussions very interestingly.”*

## 3. Professional Virtual Communities

This concept refers to the features that affect the creation of a virtual professional community. These features include “Features of virtual communities”, “Features of social networks” and “Features of professional knowledge management”.

Features of virtual communities are composed of sub-concepts such as “being influenced by the professional background of creators”, “the diverse nature of virtual communities” and “situations facing virtual communities”. In this regard, one of the participants stated:

*(Participant No.13):“If I formed a group with the children of our neighborhood, I do not think this group is very scientific and it is humorous, but a group in which scientific people participate, for example in a hospital as a treatment group, should not normally have irrelevant or Immoral content should be posted.”*

Software platforms or social networking platforms based on mobile instant messaging are the platforms and the infrastructure needed to build virtual communities; thus, their characteristics include “social media potentials”, “social media management facilities” and “social media benefits” affecting virtual professional communities. In this regard, one of the participants stated:

*(Participant No.5):“With the advancement of these technologies, it became easier for us to control the group because it was possible for us to easily remove those who were disrupting them from the system.”*

The concept of Features of professional knowledge management includes the

subcategories “Knowledge Properties”, “Knowledge Transfer Process” and “Knowledge Sharing Challenges”. From the participants’ point of view, knowledge has different categories, including theoretical and practical knowledge, as well as tacit and explicit knowledge. Also, the process of knowledge transfer generally includes knowledge extraction and internalization. In this regard, one of the participants mentioned:

*(Participant No.9): “In this group, several files have already been placed on this subject, and in the qualitative research group, good discussions have been done, which can be retrieved in both groups by the search option.”*

#### 4. Dynamic Interactions

This category has emerged as one of the main concepts, and includes the subcategories “Durability in virtual communities” and “Interaction in Virtual Communities”. Durability in virtual communities refers to the process of entering, leaving and staying in virtual communities. In this regard, one of the participants mentioned:

*(Participant No.8): “I was in scientific groups many times, but in some scientific groups I saw a joke or an inappropriate joke that is not in the dignity of people, so I left that group.”*

Interaction in Virtual Communities refers to factors that can affect member interactions and their participation in knowledge sharing activities in virtual communities. For example, one of the participants mentioned:

*(Participant No.18): “I did not have time at all to participate in the discussions, because I was also in charge of managing the province’s sports. I was very busy. On the other hand, I had children and I did not have much extra time.”*

#### 5. Organizing and Advancing

This concept refers to the process of reviewing, modifying, and promoting the dynamics of virtual communities and consists of the sub-categories of “Virtual Community Leadership”, “Guiding Contracts” and “Management facilitator technologies”.

The concept of Virtual Community Leadership is all the activities and interventions of managers, leaders and influential members of virtual communities that are meant to organize and promote virtual communities. In this regard, one of the participants is quoted as thus:

*(Participant No.4): “The group manager generally has the role of coordinator and makes a series of arrangements within the group so that there is no miscellaneous discussion in the group.”*

The concept of Guiding Contracts refers to the rules, goals and policies that are usually set by managers on a contractual basis to organize and promote virtual communities, and all members are required to comply with them. For example, the view of one of the participating members is cited as follows:

*(Participant No.2): “For example, there are now standards for blended learning in the world where we can have both virtual and face-to-face learning.”*

The concept of Management facilitator technologies refers to software facilities and technologies that help managers and their successors (admins) in organizing and promoting virtual communities. For example, one of the administrators mentioned:

*(Participant No.6): “In order to prevent chat traffic and member satisfaction, words such as function, military, plan, senior, etc. are filtered by the group robot.”*

#### 6. Outcomes of interaction in virtual communities

Interaction and participation of members in virtual communities leads to results and outcomes that can be desirable or undesirable. This category includes the subcategories “Individual-Social Outcomes”, “Professional Outcomes”, “Health Outcomes” and “Outcomes of the interactive setting”.

The concept of Individual-Social Outcomes refers to the favorable and unfavorable individual and social effects of interactions in virtual communities. These interactions may be associated with individual-social development and enhancement. In this regard,

one of the participants stated:

*(Participant No.12): "A series of things that are not relevant to the group and are for fun and laughter are spread in the group, which in turn wastes people's time."*

Interactions in virtual communities were also associated with outcomes for the nursing profession. These outcomes included the effects on nurses and their profession. For example, the quotation of one of the participating members is cited in this regard:

*(Participant No.3): "But the network is actually an extension of the science of nursing. Because there are more facilities there, either in terms of the presence of professors or in terms of rich science compared to the places where there are no facilities."*

Interactions in virtual communities and the subsequent sharing of information, experiences and ideas among nurses can enhance their professional knowledge and they can provide better, safer and more effective nursing care while making more accurate nursing diagnoses and ultimately improve the health of patients and members of the community. In this regard, one of the participants mentioned that there are nurses:

*(Participant No.14): "who have low experience and are active in these groups, and when you share this experience in the group, they upgrade themselves faster and become more up-to-date."*

Interactions in virtual communities can quantitatively and qualitatively affect the development of virtual communities. Positive outcomes of interaction in virtual communities may lead to the growth, development, dynamism, continuity and sustainability of virtual communities. Interactions in virtual communities may also have adverse effects on these communities, leading to negative growth, decline, stagnation, instability, or even dissolution of such communities. In this regard, one of the participants contended:

*(Participant No.6): "I remember one day I did not check the group for two or three hours and I was in class from morning till noon. When I entered the group, I saw several people fighting and breaking up the group."*

## Discussion

The aim of this study was to explore the concept of knowledge sharing among nurses in mobile social networks. The results of the study indicated that the main concern of nurses was "professional development"; Because in their view, factors such as the complex and challenging setting of the clinic, along with advances in medical sciences and related technologies, as well as the inappropriate attitude of society towards the nursing profession, persuaded them to take professional steps to improve their professions. To this end, nurses increase communication with other colleagues to exchange information, experiences and ideas with them and create collective wisdom, while meeting their professional needs of developing their nursing career. In fact, knowledge sharing is one of the effective strategies to enhance knowledge using dynamic interactions between members of an organization. In this regard, information technology has facilitated the sharing of knowledge among members of organizations by providing hardware and software platforms (38).

In recent years, the advent of smartphones has given rise to mobile social networks which have received increasing attention from users, including nurses, due to their ease of use and availability (39). One of the most important professional applications of these technologies is the possibility of forming virtual professional communities on their platforms (40).

According to the research findings, a set of factors such as professional advancement are among the causal conditions that encourage nursing users to create virtual communities with the aim of sharing knowledge among nurses in mobile social networking software. After the formation of virtual communities, nurses interacted with each other and shared their information, experiences and knowledge during these interactions. The main strategy of the participants to establish professional and dynamic interactions was the strategy of "Organizing and advancing". Organizing means monitoring, pathology, and correcting



issues and problems, and advancement means improving the quantity and quality of virtual communities.

In recent years, the role of interpersonal interactions in learning has been emphasized to improve staff knowledge and skills (41). Despite the increasing interest of health care workers, especially nurses, in virtual communities and the importance of implicit knowledge sharing in clinical work (42), members' involvement and participation in knowledge sharing activities in these virtual communities is limited (43, 44), which is a major concern and challenge for managers (45-47). Successful operation and survival of a virtual community depends on the dynamism and active participation of its members (48). However, the factors affecting members' participation in knowledge sharing are not yet well known (49).

In this study, it was found that the conditions governing virtual communities and the quality of the content presented in them were also the key factors influencing users' involvement in knowledge sharing activities. Evidence from previous studies suggests that a sense of belonging to society is one of the key motivational factors for knowledge sharing in virtual communities (48). Also, the quality of knowledge and information that a person can gain from information systems affects the extent of his interaction and communication with others (46).

In contrast, participants in non-professional virtual communities were seen as one of the inhibitors of knowledge sharing. In fact, due to the informal and open nature of virtual communities, trust in the quality and accuracy of shared information is a key influential factor in knowledge sharing behaviors (50). Also, according to the findings of this study, previous evidence suggests that irregularities, lengthy content sharing, or prolonged discussion in virtual communities are barriers to knowledge sharing (50, 51).

Some participants did not perform well in virtual communities due to fear of insufficient knowledge and dread of being judged by others. In fact, dread is one of

the most significant obstacles to interaction for knowledge sharing behaviors (43), and members of virtual communities may avoid participating in knowledge-sharing processes for reasons such as fear of not being able to answer other people's questions, being criticized, ridiculed, or misguided by members of the community (43, 48).

Another deterrent to the involvement of participants in the activities of virtual communities was the hoarding of knowledge due to competition. Because employees consider knowledge as personal, private capital and competitive advantage (52), knowledge hoarding is one of the main reasons in the reluctance of users to share knowledge (48, 53).

One of the reasons that motivated participants to create or join virtual communities was humanitarian activities such as the pleasure of helping others. Although the findings of the Rode study indicate that the pleasure of helping others is not a motivating factor for knowledge sharing through social media (54), there is ample evidence suggesting that humanitarian considerations such as the inner joy of helping individuals are one of the most significant motivating factors for users to share knowledge with members (43, 52, 55). Also, the participants of the present study considered the training duty of nurses as one of the reasons for joining virtual communities and participating in knowledge sharing activities. A professional nurse is a committed and responsible person, who acquires the required professional skills with special training and at the same time, they play a variety of roles, including care, support, protection, coordinator, and training to help patients (56). In this regard, a study by Park et al. has shown that although nurses consider patient education as an important part of their care planning, they cannot provide training if needed in times of work constraints (57).

Another factor influencing the phenomenon of knowledge sharing and the way participants interact was the characteristics of the creators of virtual communities. The creators of virtual communities were individuals, including managers and members of virtual

communities, whose intrinsic and behavioral characteristics influenced professional interactions and knowledge-sharing behaviors in virtual communities. In this regard, socio-technology theory implies that technology alone is not sufficient for the effective sharing of tacit knowledge (58) and for knowledge sharing, the human and social girths are ever more potent than any other dimension (38).

According to the findings of this study, participants had an introverted, silent and isolated personality typical of the members who were not willing to actively participate in virtual communities. This group of people seems to have poor communication skills in interacting with others, which is one of the barriers to knowledge sharing in virtual communities (59). Ridings also found in his study that Lurkers (users who are only readers and do not participate in the virtual community) differed from Posters (users who post content) in their desire for greater social distance, less social connection, and a reluctance to rely on other people's posted information (59).

From the perspective of the participants in this study, communities seemed to be attractive and authentic, with credible members and valuable content (including specialized, practical, related, argumentative, and up-to-date content). Also, close relationships usually existed when members, due to the initial knowledge of each other, found similarities in each other, which in turn created an intimate environment and a sense of belonging to that virtual community. Evidence from previous studies suggests that a sense of belonging to society is one of the key motivational factors for knowledge sharing in virtual communities (48).

Participants cited technological factors as factors influencing their participation in knowledge sharing activities. Previous studies have also considered technology-related factors such as ease of use, availability, pragmatism, usability of platform structure, and platform speed as important factors in encouraging users to participate in knowledge sharing activities in virtual communities (40,

48, 50). In contrast, technological problems were considered as one of the barriers to the participation of users in the virtual communities, which has been mentioned in previous research (43, 48).

Also, the quality of knowledge and information that a person can gain from information systems affects the extent of his interaction and communication with others (46). In contrast, the participants identified non-professional virtual communities as one of the inhibitors of knowledge sharing. In fact, due to the informal and open nature of virtual communities, trust in the quality and accuracy of shared information is a key influential factor in knowledge sharing behaviors. Also, according to the findings of the present study, previous evidence suggests that irregularities, lengthy content sharing, or prolonged discussion in virtual communities are barriers to knowledge sharing.

### Limitations and Suggestions

Despite the fact that the majority of the Iranian nursing community are women and also have a bachelor's degree, at the beginning of the study, most of the participants were men and nurses in post-graduate studies. According to the researcher, one of the reasons for this was the reluctance of some female users to participate in the study for cultural reasons. Accordingly, the researcher tried to focus the sampling on female clinical nurses with a bachelor's degree to avoid bias in selecting and maintaining the maximum variation of participants. Another limitation of the study; since the present study was conducted with a qualitative approach; its results may be influenced by the researcher's interpretations and mental biases. To minimize these effects, interpretations and results obtained from the data were discussed with other research team members and observers at each stage of the study.

It is suggested that using the findings of this study, assessment scales related to knowledge sharing activities among members of virtual communities (including questionnaires and checklists) be designed and developed.

## Conclusion

This study provided a better and deeper understanding of the phenomenon of sharing nursing knowledge in virtual communities based on smartphones. The acquired concepts can be used in creating professional virtual communities as well as diagnosing their complications.

## Ethical Considerations

This article is taken from a doctoral dissertation on nursing. The present study was approved by the ethics committee of Baqiyatallah University of Medical Sciences with the code (IR.BMSU.rec.1395.227).

## Authors' Contributions

JMN conceived of the idea and research questions and assisted with analyses, aided in the interpretation of the results, and assisted in writing the results section. MR helped to conceive the research questions, conducted interviews with the participants, conducted the analyses, and prepared the first complete draft of the manuscript. AE and SBV helped to conceive the research questions, assisted with analyses, aided in the interpretation of the results, and contributed to the writing of the manuscript. All authors approved the final article.

## Conflict of Interest

The authors declare that they have no competing interests.

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