

Facilitating and Inhibiting Factors of Clinical Knowledge Sharing among Medical Specialists in University Hospitals

Abstract

Background: Clinical knowledge sharing (CKS) is one of the key points of knowledge management in the field of health and significantly increases the quality of care and patient safety. It also provides the achievement of an efficient system in hospitals and educational and treatment centers involved in clinical processes in order to make the best clinical decisions. The purpose of this research is to identify the factors that facilitate and inhibit CKS among medical specialists in the educational-treatment hospitals in Iran. **Methods:** This was an applied qualitative study with the conventional content analysis method conducted in 2022. The data collection tool was a semi-structured interview. The participants were 13 medical specialists and sub-specialists working in educational-treatment hospitals of the country, who were selected by purposeful and snowball sampling. The method of data analysis was based on Graneheim and Lundman's five-step method, which was followed by codes, sub-categories, main categories, and classifications. **Results:** After conducting the interviews and assessing their content, finally, 193 codes were extracted, which were identified in two general classification of facilitating and inhibiting factors with 92 and 101 concepts, respectively. Facilitating factors in the three main categories of "education in the context of culture, society and university", "planning and implementation management", and "behavioral-motivational factors" and inhibiting factors in the four main categories of "infrastructural, policy-making and cultural challenges", "technological and scientific infrastructural challenges", "personality-behavioral challenges", and "financial and non-financial motivations" were classified. **Conclusions:** The participants of the research pointed out the effective role of CKS in keeping them up-to-date in the use of diagnostic, therapeutic, and even drug prescribing methods. According to their belief, knowledge sharing (KS) in the clinical setting will reduce diagnostic errors and cause the primordial prevention of diseases as well as increase the knowledge and awareness of the society members.

Keywords: Clinical knowledge sharing, improving clinical care, medical specialist, primary prevention

Introduction

Knowledge sharing (KS) is one of the key points of knowledge management in organizations in order to provide the possibility of creating knowledge, accessing and using it for the organization^[1] and ultimately leading to the success and growth of the organization.^[2] Clinical knowledge sharing (CKS) refers to the process of effective sharing of knowledge obtained by health care specialists based on experience, new pieces of evidence, research, and audit.^[3] Because of the effective role of KS in promoting the performance of organizations, KS in health care organizations is also considered a vital and strong element because it significantly increases the quality of care and patient

safety^[4] and achieve an efficient system in hospitals and educational and treatment centers involved in clinical processes to make the best clinical decisions.^[5]

The ability to share knowledge by academic members and medical specialists is very important in the process of clinical training in hospitals and educational-treatment centers^[6] which can be influenced by various factors. In previous studies, KS has been evaluated to some extent from individual, cultural, organizational, and technological aspects in clinical settings. In their research, Armoun *et al.*^[7] pointed out the influence of individual-human, organizational-institutional, cultural, leadership-management, and technological factors as factors affecting KS of academic staff members of Ardabil University of

Elaheh Mazaheri,
Mousa Alavi¹,
Rahele Samouei²,
Hasan Ashrafi-rizi³

Student Research Committee, Health Information Technology Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, ¹Nursing and Midwifery Care Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, ²Social Determinants of Health Research Center, Isfahan University of Medical Sciences, Isfahan, Iran, ³Health Information Technology Research Center, School of Management and Medical Information Sciences, Isfahan University of Medical Sciences, Isfahan, Iran

Address for correspondence:
Prof. Hasan Ashrafi-Rizi,
Health Information Technology
Research Center, Isfahan
University of Medical Sciences,
Isfahan, Iran.
E-mail: hassanashrafi@mng.
mui.ac.ir

Access this article online

Website:
www.ijpvmjournal.net/www.ijpvm.ir

DOI:
10.4103/ijpvm.ijpvm_143_23

Quick Response Code:



How to cite this article: Mazaheri E, Alavi M, Samouei R, Ashrafi-rizi H. Facilitating and inhibiting factors of clinical knowledge sharing among medical specialists in university hospitals. *Int J Prev Med* 2023;14:132.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

Medical Sciences. In their study, Jafari *et al.*^[8] have mentioned the attitude of nurses in sharing knowledge and accepting clinical information technology systems in this process. In the research of Strom and colleagues, facilitators such as dynamic collaboration, dialogue, commitment, and mutual KS and barriers such as passive collaboration, lack of dialogue, and lack of commitment among Norwegian health personnel are mentioned.^[9] In the study of Chelagat *et al.*, the impact of barriers such as inappropriate management support, lack of expertise, and inconsistency of employees and managers in Kenyan health care service organizations has been mentioned.^[10] In the research of Zhou and Nunes,^[11] the barriers to KS in the provision of health services in China have been pointed out, and the barriers of inter-personal trust, communication, management, and organizational factors were among the most important of them.

It seems that at present, the universities of medical sciences and educational-treatment hospitals of the country do not have accurate information about the status of CKS and its inhibiting and facilitating factors among their medical specialists and the contribution of the use of tangible and intangible knowledge among medical specialists which is affected by organizational, individual, and other influencing factors is not clearly defined. Because the lack of KS in the clinical environment causes negative effects on the performance of the individual and the organization and imposes excessive costs and waste of resources in the health care system and disrupts the process of diagnosing and treating diseases and ensuring the health of the community^[12-14], conducting research to identify obstacles and facilitators in the process of CKS according to the needs of the organization to improve the behavior of CKS of medical specialists and overcoming obstacles and encouraging the use of facilitating factors in this field are necessary to take an effective step to improve the quality of care and clinical training, accuracy in clinical judgments, diagnosis and treatment of disease and prevention of pathogenic agents, reduction of costs, and development of new clinical services. Therefore, the purpose of this research is to identify the factors that facilitate and inhibit CKS among medical specialists in the educational-treatment hospitals in Iran.

Methods

This was an applied qualitative study with the conventional content analysis method conducted in 2022. The participants included 13 medical specialists and sub-specialists of all surgical and non-surgical fields who were faculty members and worked in educational-treatment hospitals of Isfahan, Baqiyatallah, Shahid Beheshti, Jundishapour, Ilam, Shushtar, and Shahrekord universities of Medical Sciences affiliated to the Ministry of Health and Medical Education (MHME) selected by purposeful sampling to select knowledgeable people who are a rich

source of information in the field of the research. To complete the human resource chain, snowball sampling was used. Inclusion criteria were being medical specialists and sub-specialists of all surgical and non-surgical fields working in educational-treatment hospitals affiliated to MHME and willing to participate in the research. The exclusion criterion was the interviewee's non-cooperation with the research and withdrawal to continue for any reason.

The data collection tool in this research was a semi-structured interview, the participants determined the place and time of the interviews, and the interviews were conducted until data saturation (the researcher faced data repetition from the 11th interview onward that finally reached 13 people's information saturation). The interview questions were compiled based on the results of the literature review and based on the opinions of the research team (12 questions in total), which were conducted after the necessary coordination to conduct the interviews with the individuals. Six interviews were conducted in the interviewees' offices in hospitals or universities, and due to the COVID-19 pandemic and the reluctance of some people to conduct face-to-face interviews, seven interviews were also conducted over the phone. In the face-to-face interviews, the agreement was obtained by presenting the consent form to participate in the interview, and in the telephone interviews, the form was sent to them via email and the agreement was received. At the beginning of each interview, the participants were assured that all their statements will be confidential and that they will be used in the form of a code or a pseudonym. The interviews started with open and general questions and then progressed with more detailed questions. At each stage of implementation, data were reviewed to complete immature and incomplete categories by receiving new information from new participants. Each interview was conducted between 20 minutes and 1 hour and 5 minutes, and all interviews were recorded with a voice recorder in addition to taking notes, which were informed to the participants before the start of the recording. The interview started with these open questions such as "What do you think about the importance of sharing knowledge in your field?" and "What are the main resources (tools) for sharing clinical knowledge in your specialty?" and then with more detailed questions such as "What are the factors facilitating (inhibiting) the sharing of clinical knowledge in your area?" It continued, and the researcher encouraged the participants to provide more explanations and more detailed information.

In this study, the Granheim and Lundman model was used for data analysis.^[15] In the first stage, the text of the conducted interviews was implemented word by word and they were used as the main data of the research. In the second step, the text of each interview was divided into units with abbreviated and shortened meaning. In the third stage, the act of abstracting meaningful units and

selecting codes took place. Explicit and inexplicit concepts were determined as denoting codes, and then coding and purification were done. In the fourth stage, the researchers placed the codes that indicated the same subject in one class by confronting and comparing the differences, similarities, and appropriateness of the codes, and the sub-categories and main categories were classified. There were no ambiguous cases during the classification of codes that required revision by the participants. Therefore, the position of each code in each floor was clearly defined. In the fifth stage, at the interpretation level, the classes were summarized and the main concept of each class was determined and the main and abstract concepts were extracted. The codes were revised according to the internal themes and based on the total data. In this phase, Microsoft Office, Word 2016 software was used for data management. In the final stage, the information obtained from the interpretation and report was presented.

In order to guarantee the accuracy of the data, the Lincoln and Guba criteria were used.^[16] The reliability of the data was obtained through member review, exchange of opinions with peers, and long-term exposure (more than 6 months) to the research. Member review and peer review by co-authors also contributed to the reliability of the study. Verifiability was also achieved by documenting all study steps in a way that others would be able to track all activities related to our research. Transferability was also ensured through clear descriptions of the study setting, participants, sampling, process, data collection, and data analysis.

Results

A total of 13 medical specialists were interviewed as participants, whose characteristics are shown in Table 1.

After carrying out the steps related to data extraction and categorization of the concepts in the interviews, finally, 193 codes or concepts were extracted in two general classifications to answer the research questions in order to identify the

factors that inhibit and facilitate CKS from the point of view of medical specialists working in educational-treatment hospitals affiliated to MHME and were divided in separate tables.

Factors facilitating CKS from the perspective of medical specialists

In order to answer the first question of the research in the field of factors that facilitate CKS from the point of view of specialists, a total of 92 codes (concepts) were identified, which after examining the concepts in three main categories of “education in the context of culture, society and university”, “planning and implementation management”, and “behavioral-motivational factors” were classified. The main and sub-categories in this section are shown in Table 2. In general, in the field of “education in the context of culture, society and university”, the participants pointed out to the process of CKS from cultural, social, and educational perspectives. In the “planning and implementation management”, they have mentioned management-related issues, and in the behavioral-motivational factors, they have stated the behavioral and supportive features that can facilitate CKS.

1- Education in the context of culture, society, and university: In this context, the role of social education and training can be mentioned as one of the important categories facilitating CKS among specialists. According to physicians, family education, community culture, and institutionalizing the spirit of sharing knowledge from childhood and through education in schools can be a good basis for CKS.

“Suppose the guy grow up in this manner..... When I detect his personal life, I saw that he grew up in the family in such a way that he easily and wholeheartedly shared his knowledge with others. Altogether, the root of all of this goes back to the family upbringing and the culture in which I grew up. If the right culture is created and it happens in such a way that I feel responsible for others and do not see myself, I will share everything I have”. (P13)

Table 1: Demographic characteristics of participants

Field	Academic Ranking	Gender	Work experience (Years)
1 Medical Specialist/Community medicine	Professor	Female	30
2 Clinical fellowship/Clinical cardiac electrophysiology	Assistant Professor	Female	5
3 Clinical subspecialty/Pulmonary Diseases	Professor	Male	33
4 Clinical subspecialty/Nephrology	Professor	Male	29
5 Clinical subspecialty/Neonatal-perinatal Medicine	Associate Professor	Male	12
6 Clinical subspecialty/Rheumatology	Associate Professor	Male	14
7 Clinical subspecialty/Endocrinology and Metabolism	Assistant Professor	Female	14
8 Medical Specialist/Neurology	Assistant Professor	Female	6
9 Clinical subspecialty/Pulmonary Diseases	Assistant Professor	Female	9
10 Clinical Fellowship/Multiple Sclerosis and Related Disorders	Assistant Professor	Male	6
11 Medical Specialist/Psychiatry	Assistant Professor	Male	6.5
12 Clinical subspecialty/Nephrology	Associate Professor	Female	11
13 Medical Specialist/Pediatrics	Associate Professor	Female	30

Table 2: Main and sub-categories of factors facilitating CKS from medical specialists' point of view

Class	Main Category	Sub-category
Facilitating factors	Education in the context of culture, society and university	Social education and upbringing
		Scientific-educational optimization
		Sharing awareness and knowledge
		Spirituality and ethics
		Political and organizational planning
	Planning and implementation management	Supervision, monitoring and review of implementation
		Accessibility, facilities and resources
		Virtual platforms
		Adjustment of teaching hours and time management
		Behavioral-motivational factors
Behavioral-motivational factors	Behavioral-communicative characteristics	
	Financial-motivational support	

Scientific-educational optimization is considered one of the other effective and facilitating components of KS, which medical specialists participating in this research have specifically mentioned. Many participants believe that in order to facilitate the process of clinical training and the effective CKS that leads to the training of skilled physicians and the improvement of the quality of clinical and therapeutic services, it is necessary to go beyond the traditional teaching methods and to modern methods of knowledge transfer and replacing working rounds with long traditional rounds.

“The education process still happens in the traditional setting and classroom, and outside of that, nothing happens to share knowledge, and this setting is not an effective situation. The teaching curricula for the residents are designed in such a way that they have to sit in the classroom for long hours, which is not a good situation. It is better to use modern methods of knowledge transfer such as electronic learning, hard talk, mini-lecture and group discussion sessions in order to effectively transfer CK”. (P10)

In some cases, the participants considered the presence of virtual training, which started since the outbreak of the COVID-19 pandemic, to be very useful for medical specialists, and they believed that due to the busyness of them and their presence in hospitals and not having time constraint to in-person participation in workshops and training sessions, it is better to use this kind of training again.

“Using of these virtual platforms. For example, in the era of covid, that the virtual platforms were better

formed and used, we held some training classes outside of routine classroom hours, we prepared some training videos for the learners, colleagues and residents to use. Or, for example, the webinars that did not necessarily require in-person participation, these kinds of training are very facilitating”. (P2)

In this section, some of the participants pointed out to holding weekly intra-disciplinary or inter-disciplinary meetings in the hospital and planning for holding meetings and joint meetings with colleagues to review the results of new papers in the field of medicine to CKS. Using the experiences of pioneer professors in complex medical cases and transferring their experience to novices was another facilitating factor of CKS among medical specialists.

2- Planning and implementation management: In this category, most participants emphasized the important role of managers and policy makers in facilitating the effective process of CKS. The attitude of managers and their correct policy making in accordance to the organizational goals for CKS, correct management in order to eliminate competing thoughts, promoting inter-departmental activities, establishing justice and equal opportunity in the system for all individuals, correct planning at the university and MHME levels, systemic discipline, and organizational culture were mentioned in this category.

Among the other important and key points that medical specialists believe facilitates CKS and makes them constantly up-to-date and able to exploit the important scientific results of the day is providing the possibility of easy access and free of charge to important journals in the field of medicine and electronic resources, which is sometimes not possible due to Internet problems or the lack of Iran's subscription to some important databases or publishers in the world. In some cases, many physicians consider the existence of applications such as WhatsApp as a suitable platform for KS, creating specialized groups to discuss rare clinical cases and receiving clinical consult from experienced professors and using scientific channels available on this app.

“For instance, Up to Date is very useful and helpful especially regarding the drugs that I prescribe for psycho patients, the effects and side-effects of the drugs, the new drugs introduced in this field, of course, if access to the database is provided for information sharing”. (P11)

“We ourselves also have some scientific WhatsApp groups with a large number of participants, in which we put several cases, and those who have problems raise the issue there. They post the patient picture and state the problems. Anyone can comment. In fact, advice is taken from each other. And if someone has a similar experience, he/she would help. This is very helpful. (P9)

In the sub-category of adjustment of training hours

and time management, medical specialists believed that sharing can be facilitated by reducing the training hours of residents and giving them time to carry out inter-departmental activities and effectively transfer knowledge and establish a balance between training, research, and treatment. Some of professors believed that there is enough time for CKS; the students should try to create and hunt opportunities.

“The opportunity must be hunted by the student. When the professor is visiting the patient, the questions that he is asking the patient are opportunities. Therefore, those who are looking for opportunities should take time to create opportunities besides the experienced professors”. (P3)

3- Behavioral-motivational factors: The important factor in this main category, which according to the participants has a significant impact on facilitating the sharing of clinical knowledge, was the behavioral-communicative characteristics of individuals. The medical specialists emphasized that factors such as the friendly relationship between professor and learner, colleagues, physicians and patients, and individual’s mood are facilitators, and in a friendly atmosphere where trust prevails, knowledge sharing is done easily and the system has the necessary dynamics and the medication and treatment in the health system will be more successful.

“some friendly meetings can be held in a place, creating subgroups including university members to make better communication between members, making more friendly atmosphere in these meetings, in these places, while having tea, if there are issues, they can be discussed right there, resolved and consulted, and information can be exchanged”. (P4)

In this dimension, financial-motivational support such as individual’s interest, motives, desire and enthusiasm, consideration of rewards for those who share the knowledge, distinguishing between capable and hardworking individuals and people who do the job perfunctorily as effective and facilitating factors for CKS is enumerated from the perspective of medical specialists.

“The starting point of all this is interest. Totally, physician is looking for learning and finding the right treatment solution for the patient because of her interest; anyway, in 10% of cases, the specialist is looking for the medical knowledge as well as therapeutic guidelines for the legal issues or financial reasons”. (P7)

Factors inhibiting CKS from the perspective of medical specialists

In order to answer the second question of the research in the field of factors preventing CKS from the point of view of experts, a total of 101 concepts were identified, after examining the concepts in the four main categories of “infrastructural, policy-making and cultural challenges”, “technological and scientific infrastructural challenges”,

“personality-behavioral challenges” and “financial and non-financial motivations”. The main categories and sub-categories in this section are shown in Table 3. Totally, “infrastructural, policy-making and cultural challenges” were the CKS barriers that were influenced by management factors and its related limitations. “Technological and scientific infrastructural challenges” were derived from some boundaries related to technology disadvantages and educational problems in the system. Personality-behavioral challenges were related to some psycho-personality concerns in the participants’ point of view. “Financial and non-financial motivations” items as obstacles in CKS process have been related to some concerns like the rewards system in organizations and job-economic status, which were considered as the barriers to CKS.

1- Infrastructural, policy-making, and cultural challenges: Failure to take KS seriously by managers, lack of proper planning at the university and MHME levels, and the inefficiency of managers in organizing the organization’s knowledge were important factors inhibiting KS among medical specialists.

“I think that as a very important issue, managers do not take this matter seriously in this context”. (P1)

Other inhibiting factors in this category are weakness in doing inter-departmental cooperation, lack of sharing culture in the society, constant movement of people from one department to another, limited access to databases, problems of publishing articles in international journals, and participating in international congresses that everyone is considered as an obstacle on the way to sharing knowledge in the clinical setting. *“International congresses are a very good opportunity for us to learn the new world topics that are being discussed and shared; experienced scientists all over*

Table 3: Main and sub-categories of factors inhibiting CKS from medical specialists’ point of view

Class	Main Category	Sub-category
Inhibiting factors	Infrastructural, policy-making and cultural challenges	Political-management
		Lack of culture and mechanism of sharing
	Technological and scientific infrastructural challenges	Scientific limitations caused by political issues
		Infrastructure and technology
Personality-behavioral challenges	Personalities-behavioral challenges	Educational-skill problems
		Psycho-personality dimensions
	Financial and non-financial motivations	Lack of accountability and commitment to CKS
Dysfunctional interpersonal relationships		
Financial and non-financial motivations	Financial and non-financial motivations	Dissatisfaction of physicians with the economic and job situation
		Weakness of reward and evaluation system

the world in our field will present and we can get good information and share knowledge with them. I would participate before, but now with these costs, I can't participate at all". (P9)

- 2- **Technological and scientific infrastructural challenges:** In this section, many participants pointed to weak infrastructure related to technology, such as slow and intermittent Internet speed, filtering of international social networks, and non-continuity of virtual education. *"Unfortunately, the group's scientific discussions were interrupted these few months due to the internet outage and WhatsApp filtering".* (P5)

In this category, some other specialists pointed out to shared educational-skill problems such as the lack of training units in relation to the number of patients, lack of sufficient staff in relation to the number of patients, lack of up-to-date professors, weakness of retraining plans, and the use of traditional methods of education as important challenges of CKS.

"Unfortunately, the therapeutic part is so busy that there is not enough staff for giving services to the patients. If there is enough staff, there will be an opportunity for research". (P12)

- 3- **Personality-behavioral challenges:** In this component, most of the physicians mentioned the personality factors and obstacles such as lack of patience in professors and students, insults and humiliation, belittling, individualism, scientific stinginess, monopolization, shyness of students to ask questions, lack of personal interest, unwillingness to share knowledge, and doing work perfunctorily, which were listed as the main obstacles to CKS. *"During teaching, professors treat us as if we waste their precious time".* (P8)

In this sub-category, the important impact of inefficient inter-personal relationship in the clinical context has been mentioned, and in this case, medical specialists face obstacles such as loss of trust between specialists, competing thoughts, lack of effective communication between physicians and patients due to the difference in scientific level and anxiety of patients have been mentioned.

- 4- **Financial and non-financial motivations:** Unfortunately, the commercialization of medicine knowledge, having time constraint, a lot of works in therapeutic units, more income in the treatment sector than education and research, financial competition between medical specialists, and the lack of a proper evaluation system are other factors that hinder CKS in the view of medical specialists in the clinical context. *"Thou see, we as medical specialists always have little time, we really always have little time because full-time professors like us and part-time professors after teaching and training assistants and treating patients in the hospital have to work in their personal office; they have to spend a lot of time in the field of treatment and*

usually we do not have a separate time for example one or two days to allocate only to research or education and sharing experience or knowledge in the field. Time constraint is a challenge in all clinical fields and does not come easily". (P2)

Discussion

The present study was conducted in order to identify the barriers and facilitators of CKS among medical specialists working in educational-treatment hospitals of universities of medical sciences affiliated to MHME in order to improve and promote the quality of clinical care in the society. In this research, 13 medical specialists and sub-specialists expressed their views on the factors affecting CKS, which were divided into two general classifications into facilitating and inhibiting factors.

The findings of the research showed that the main categories that facilitate knowledge sharing are education in the context of culture, society and university, planning and implementation management, and behavioral-motivational factors. The first key point in facilitating CKS is the correct understanding of the importance, function, benefit, and effectiveness of KS among medical specialists. According to the participants, when the physicians realize the benefits of KS and how it benefits them, they implement it. According to the medical specialists, the main challenge is that we do not believe in sharing at all, and policymakers have not explained the mechanisms of sharing. In her study, Nemati Anaraki^[17] considered the increase of employees' awareness of the importance of knowledge sharing as one of the facilitating factors of KS. The research findings in this field are in line with the findings of Jabari^[18] and Kamalzadeh,^[19] who in their studies have pointed out the role of people's beliefs and attitudes as factors affecting KS.

In this research, more than half of the participants mentioned the role of interest and individual motivations, passion, and desire as factors that facilitate CKS. The participants stated that there are many who love sharing knowledge and teach with enthusiasm and transfer everything they have to the students. According to the academic members, the interest and motivation of clinical assistants and their efforts to learn can also encourage them to update their knowledge in the ever-changing field of medicine. Nemati Anarki *et al.*^[20] also mentioned individual desire and interest as individual factors affecting KS.

The results of this research showed that making some policies such as appropriate planning, increasing inter-departmental activities, organizational discipline, establishing justice and equality, creating an organizational culture, eliminating competing thoughts, monitoring the correct quality of effective knowledge dissemination and transfer, and promotion of the individual in the direction of more effective KS by managers and policy-makers can play a significant role in providing an efficient environment

to facilitate KS among medical specialists. Perhaps failure in management, planning, and implementation can be an important obstacle to the effective sharing of clinical knowledge in the system as the participants indicated that the policy maker did not think at all about how clinicians share necessary knowledge with the assistant, nurse, patient, and colleagues outside of the classroom. Chelagat^[10] and Karamitri^[21] also considered the weak support of managers and management strategies as factors affecting the knowledge sharing process in the organization. Other researches, in concordance with the present research, have considered the effective role of organizational leadership and management as one of the factors influencing this process.^[7,18,22]

According to the belief of many specialists participating in this research, virtual platforms and social media can play a facilitating role in CKS. According to medical specialists, membership in virtual scientific groups and networks and exchanging opinions with expert colleagues can help to treat their patients and solve many rare medical cases and get advice from colleagues from other cities and experienced professors who cannot be accessed in-person. In his study, Rolls^[23] also mentioned the role of virtual forums in the exchange of knowledge, experience, and medical skills, and Armon also considered virtual platforms as an effective factor in sharing knowledge in the technology infrastructure category.^[7] Participants in this field stated that all mass media, including radio and television, can be effective for teaching and sharing knowledge with people. According to physicians, many educations on the level of primary prevention of diseases at the community level can be delivered to the people through television, and it is undoubtedly effective in improving the health of the community. In this regard, Wang^[24] also mentioned the role of social media as a suitable platform for exchanging health information. It is worth mentioning that according to the belief of some specialists, the filtering of international social networks, the low speed of the Internet, and the lack of proper replacement of national social networks are obstacles for sharing the knowledge among medical specialists.

According to the participants, the existence of friendly inter-personal communication and trust at all levels, including doctor-to-doctor, doctor-to-patient, and medical staff can provide a suitable environment for CKS. The trust between medical specialists and the removal of competing thoughts, individualism, narcissism, exclusivity, and nastiness provide a tension-free environment for KS in the clinical setting. The participants mentioned that when the doctor-patient relationship is good, they easily accept all the tips, orders, and prescriptions that we do, and regarding communication with other specialists and medical staff, they believed that one of the things that can facilitate KS is good communication between colleagues. In other research studies, in line with this research, the effective role of

communication and trust as important factors in KS has been pointed out.^[7,25-30] One of the points that the medical specialists considered as an obstacle to the effective CKS is the constant transfer of staff from one department to another. According to them, a nurse or an assistant who has received the necessary training to deal with patients in a department should not be transferred because a lot of time should be spent on retraining the personnel. Chelagat *et al.*,^[10] in line with this research, have mentioned this as an obstacle to knowledge exchange.

The main problem of medical specialists, which is one of the main obstacles to KS among them, is the lot of works in treatment units, the lack of sufficient staff in relation to the number of patients, and not having enough opportunities for education and research. The participants declared that the treatment departments are very busy and research and education are placed in the next priorities. Of course, from the point of view of some others, the presence in hospitals and holding grand rounds and morning rounds give them sufficient opportunity for CKS. Some participants announced that there is enough opportunity in academic centers and hospitals and educational programs such as ground rounds and morning rounds are the best opportunities for CKS between professors and students. According to some participants, there is an opportunity, but it should be better managed. In some cases, several specialists believed that due to the high income in the field of treatment, some of them prefer to treat patients in their offices instead of wasting their time in the field of education and research. In line with this study, in the research studies done by Gravel^[31] and Vest,^[32] time constraint in therapeutic context has been mentioned.

Regarding the competitive factor between medical specialists in order to earn more income, more than half of the participants did not accept this phenomenon and believed that the physicians only think about treating patients and releasing them from the pain; so, curing a patient is considered as a success for them. Therefore, financial income is not a priority for them. Only one or two of the participants believed that in specialized fields that a certain technique or procedure is considered, maybe some physicians are not willing to teach their technique; otherwise, sharing, consulting, and exchanging knowledge can easily happen among medical specialists and there is no stinginess. Hosseini and Serrano also have mentioned miserliness and financial issues related to KS.^[25,30] One of the participants also pointed out that some professors do not easily share their expertise with assistants. It seems that when commercial benefits have entered medicine, the individuals are not willing to share their knowledge and experience easily and try to keep many techniques exclusive to themselves. In this context, the more we move toward ethics, the better the clinical knowledge sharing situation is, and the more we move toward commercialization, the worse the sharing situation between medical specialists is.

Ghasemzadeh and his colleagues have also mentioned in their research the mediating effect of professional ethics with the knowledge sharing of physicians.^[33] According to many medical specialists, the lack of organizational incentives and not considering the appropriate evaluation system in order to effectively share knowledge are among the other obstacles of CKS. According to the participants, many training programs in some hospitals offered to interns by residents were canceled due to the lack of rewards in the system for the trainer, and they were reluctant to devote time to training beginners. Other studies also pointed to the role of organizational incentives as an effective factor on KS in the clinical setting.^[7,34,35] In many cases, physicians cited fear of being humiliated, embarrassment, being judged, fatigue, frustration, discouragement, and the exodus of talented medical students as other barriers of CKS. In this context, if famous professors introduce their cases in scientific groups and ask others for consult and advice, the younger ones will put aside the fear of being judged and embarrassed.

In general, according to the medical specialists in this research, we are somewhat successful in KS in the clinical setting. Some of them believed that the conditions are ready for CKS and the situations have been prepared for more activities in this field, and others declared that the facilities and equipment of educational-treatment hospitals are less compared to other countries and believed that if the hospitals are equipped, of course, the process of CKS will also be more successful. It seems that the findings of this research can provide the necessary knowledge about the importance, necessity, and impact of CKS to all stakeholders such as managers and policy makers, healthcare specialists, clinical residents, and assistants as well as medical librarians and clinical information specialists to identify facilitating and inhibiting factors of CKS by using the provided solutions to empower themselves in providing medical and health services and by reducing treatment costs, preventing long and exhausting treatment steps, and building trust in the society, they can provide better services to the health system and members of the society. The results of this research can be generalized to the management and sharing of knowledge in other contexts considering the conditions and facilitate KS. It seems that according to the role of new technologies in CKS, the use of artificial intelligence in line with CKS should be considered by health researchers to see if this technology can be used to optimize CKS.

One of the limitations of the research was that due to the COVID-19 pandemic, some participants had no willingness to face-to-face interviews that the researcher overcame this problem to some extent by arranging telephone interviews; but due to the impossibility of receiving sufficient reactions of the participants due to the lack of face-to-face interviews, the results will be affected to some extent. Also, despite repeated follow-ups by the researcher, the opportunity to interview some experts in this field was not possible.

Conclusions

The medical specialists participated in this study pointed out the effective role of CKS in keeping them up-to-date in the use of diagnostic, therapeutic, and even drug prescribing methods. They believed that CKS will reduce diagnostic errors in them, and with appropriate and timely diagnosis, they can provide the best service to patients and finally improve the quality of services and clinical care. According to medical specialists, one of the most practical effects of CKS is to help in the primary prevention of diseases and to raise the knowledge and awareness of the society.

At the end, the practical suggestions of this research to facilitate CKS and remove the obstacles in this process are presented as follows so that the results of this research can be used better and more effectively:

1. Preparation of a protocol or a guideline in order to explain the mechanisms of CKS by MHME;
2. Each health care professional should share an abstract of the latest article or scientific information they read with their colleagues in the groups;
3. Due to the fact that the traditional training classes do not have the necessary efficiency in the field of knowledge transfer and sharing, it is suggested that CKS process be held in modern forms of knowledge transfer and electronic education;
4. Policy-making in the organization should be explained in such a way that the process of knowledge transfer and dissemination of information among clinical care specialists is institutionalized, and the fear of losing the job position, competition, monopoly, and jealousy do not cause problems in the main mission of physicians and the health-treatment system. The result of correct management in this field is for the benefit of the society, and it also reduces many costs incurred in the entire treatment system.
5. Optimizing CKS by using artificial intelligence in the clinical processes.

Acknowledgments

The researchers express their gratitude to all the participants who agreed to be interviewed despite being busy at the hospital.

Data accessibility

The data of this study is completely confidential and the researchers will only provide it to the journal as needed. All the codes (concepts) extracted from the interviews have been sent to the journal as supplementary files [Supplementary 1 and supplementary 2] in submitting process.

Financial support and sponsorship

This study extracted from Ph.D thesis entitled "Identification and prioritization of factors related to the clinical knowledge sharing of medical specialist working

in educational-treatment hospitals affiliated to the Ministry of Health and Medical Education in Iran” with the code of ethics IR.MUI.RESEARCH.REC. 1399.552 is approved by the Vice-Chancellor of Research and Technology of Isfahan University of Medical Sciences.

Conflicts of interest

There are no conflicts of interest.

Code of Ethics

IR.MUI.RESEARCH.REC. 1399.552

Ethical Considerations

All ethical issues were observed by the researchers in all study processes.

Authors' Contributions

EM Contributed to conception and design, acquisition of data, drafting the work, final approval, agreement to be accountable for all aspects of the work MA Contributed to interpretation of data, final approval, agreement to be accountable for all aspects of the work RS Contributed to analysis and interpretation of data, revising draft of the work, final approval, agreement to be accountable for all aspects of the work HA Contributed to conception and design, interpretation of data, revising draft of the work, final approval, Agreement to be accountable for all aspects of the work.

Received: 12 Jan 23 **Accepted:** 06 Sep 23

Published: 30 Jan 24

References

- Pangil F, Nasuridin AM. Assessing the relationship between organisational commitment and knowledge sharing behavior. *Malays Manag J* 2019;13:35-50.
- Witherspoon CL, Bergner J, Cockrell C, Stone D. Antecedents of organizational knowledge sharing: A meta-analysis and critique. *J Knowl Manag* 2013;17:250-77.
- Wood C. Writing for publication: Sharing your clinical knowledge and skills. *Br J Community Nurs* 2018;23:20-3.
- Mura M, Lettieri E, Radaelli G, Spiller N. Behavioural operations in healthcare: A knowledge sharing perspective. *Int J Operations Production Manag* 2016;36:1222-46.
- Mazaheri E, Samouei R, Alavi M, Kelishadi R, Ashrafi-Rizi H. Identification of the factors related to the clinical knowledge sharing: A protocol for systematic review. *J Edu Health Promot* 2022;11:142.
- Hosseingholizadeh R, Mirkamali SM. Key affecting factors on knowledge sharing: Case study-Ferdowsi university (Faculty of Educational Sciences and Psychology). *ijeh* 2010;3:61-78.
- Armoun A, Sattari S, Namvar Y. Effective factors on knowledge sharing among faculty members: Ardabil University of Medical Sciences. *Iran J Med Educ* 2019;19:189-98.
- Jafari SM, Rahmati M, Pourazim Z, Mohammadi Doorbash Z. The effect of nurses' attitudes toward knowledge sharing in the acceptance of clinical information technology systems. *Q J Nurs Manag* 2018;7:35-45.
- Strøm A, Fagermoen M. User involvement as sharing knowledge—an extended perspective in patient education. *J Multidiscip Healthc* 2014;7:551-9.
- Chelagat T, Onyango J, Kokwaro G, Rice J. From strategy to action: A qualitative study on salient factors influencing knowledge transfer in project-based experiential learning in healthcare organisations in Kenya. *BMJ Open* 2019;9:e031100. doi: 10.1136/bmjopen-2019-031100.
- Zhou L, Nunes MB. Barriers to knowledge sharing in Chinese healthcare referral services: An emergent theoretical model. *Glob Health Action* 2016;9:29964. doi: 10.3402/gha.v9.29964.
- Kazemi M, Vahidimotlagh T, Vahidimotlagh S. A review on effective of effector factors to knowledge share in the Iranian virtual social. *Public Manag Res* 2014;7:107-28.
- Taghipour M, Mahboobi M, Gharagozlou H. The impact of ICT on knowledge sharing obstacles in knowledge management process (including case-study). *Iran J Inform Process Manag* 2016;31:1049-74.
- Weatherall D. The inhumanity of medicine. *BMJ* 1994;309:1671-2.
- Graneheim UH, Lindgren BM, Lundman B. Methodological challenges in qualitative content analysis: A discussion paper. *Nurse Educ Today* 2017;56:29-34.
- Graneheim UH, Lundman B. Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* 2004;24:105-12.
- Nemati-Anaraki L, Nooshinfard F. Intra-organizational knowledge sharing model among faculty members based on individual, organizational, and technological factors. *J Health Admin* 2013;16:56-70.
- Jabbary N, Madhoushi M. Factors affecting knowledge sharing behavior in academic communities: Grounded theory. *Int J Educ Pract* 2014;2014:126-36.
- Kamalzadeh S, Naji A, Rajabi M. Sciences I. Preconditions and consequences of knowledge sharing intention among graduate students of Shiraz University of Medical Sciences. *Library and Information Sciences* 2016;19:73-97.
- Nemati-Anaraki L, Nooshinfard F, Babalhavaeji F, Abazari Z. Individual factors of knowledge sharing among faculty members of universities and research centers. *Health Inf Manag* 2013;10:714-25.
- Karamitri I, Talias MA, Bellali T. Knowledge management practices in healthcare settings: A systematic review. *Int J Health Plan Manag* 2017;32:4-18.
- Askarinejad M, Ghobadi Azad E. The relationship between social capital on tendency to explicit and tacit knowledge sharing among nurses of Namazi hospital. *Sadra Med J* 2019;7:413-22.
- Rolls KD, Hansen MM, Jackson D, Elliott D. Intensive care nurses on social media: An exploration of knowledge exchange on an intensive care virtual community of practice. *J Clin Nurs* 2020;29:1381-97.
- Wang W, Zhuang X, Shao P. Exploring health information sharing behavior of Chinese elderly adults on WeChat. *Healthcare* 2020;8:207.
- Ali HM, Parivash J, Shahram Y, Mehdi R. Investigating factors affecting the transfer and exchange of knowledge between rehabilitation schools and organizations providing rehabilitation services in the country. *Educ Leadership Manag Q* 2008;2:9-24.
- Kavanagh J, Barry K, Tolis A, Stano C, Newman D, Kales HC, editors. *The Challenge of Effective Knowledge Dissemination to Aging America: Initial Experience of the Program for Positive Aging*. *American Journal Of Geriatric Psychiatry (Supplementary Issue: S113-114)*; 2011: Lippincott Williams & Wilkins 530

Walnut St, Philadelphia, PA 19106-3621 USA.

27. Kazemi M, Feili A, Sabet A, Dashtipour M, Daneshmandi H. Identifying and ranking factors influencing knowledge sharing using multicriteria decision-making methods: A case study. *J Health Admin* 2018;21:Pe7-21.
28. Pour S, Mortazavi S. Explaining factors influencing on attitudes and behaviors based on knowledge-sharing (case study: 17 Shahrivar Hospital Nurses). *Organizational Behaviour Studies Quarterly* 2014;2:70-43.
29. Salsali M, Cheraghi MA, Ahmadi F. Organizational factors influencing knowledge transfer into practice in Iranian nursing context: A grounded theory approach. *Int J Nurs Pract* 2009;15:426-36.
30. Serrano KJ, Yu M, Riley WT, Patel V, Hughes P, Marchesini K, *et al.* Willingness to exchange health information via mobile devices: Findings from a population-based survey. *Ann Fam Med* 2016;14:34-40.
31. Gravel K, Légaré F, Graham ID. Barriers and facilitators to implementing shared decision-making in clinical practice: A systematic review of health professionals' perceptions. *Implement Sci* 2006;1:1-12. doi: 10.1186/1748-5908-1-16.
32. Vest JR, Jaspersen J, Zhao H, Gamm LD, Ohsfeldt RL. Use of a health information exchange system in the emergency care of children. *BMC Med Inform Decis Mak* 2011;11:1-10. doi: 10.1186/1472-6947-11-78.
33. Ghasemzadeh A, Maleki S, Sharifi L. The mediating role of professional ethics regarding intellectual capital, organizational learning and knowledge sharing. *J Med Educ Dev* 2016;9:76-86.
34. Nemati-Anaraki L, Noushinfard F. Knowledge sharing and organizational culture among medical faculty members. *Libr Inf Organ Stud* 2015;25:129-43.
35. Qorbani M, Borgheim A, Keshtkar A, Majdzadeh R, Nedjat S, Gholami J, *et al.* Knowledge transfer in Golestan University of Medical Sciences projects in 2005-2007. *Hakim Res J* 2010;12:19-26.

Supplementary 1: Factors facilitating the sharing of clinical knowledge from the point of view of medical specialist working in educational-treatment hospitals affiliated to the Ministry of Health and Medical Education

Main Category	Sub-category	Code (Concept)
Education in the context of culture, society and university	Social education and training	Creating the spirit of sharing from childhood in schools (P13, P10), Institutionalizing in one's culture from an early age through education (P11, P13), society culture (P13), Family education (P13), Improving the culture of the society in line with the requirement to share knowledge (P11, P13),
	Scientific-educational optimization	The possibility of restarting virtual education (P2, P10), The possibility of establishing electronic education in universities (P2, P10), Changing traditional assessment methods to modern assessment in line with effective knowledge sharing (P10), Removing the heavy educational curriculum to an effective curriculum for the effective transfer of knowledge (P10), Using modern methods of knowledge transfer such as electronic learning, hard talk, mini-lectures, and group discussion sessions instead of traditional outdated methods (P10), Replacing the working round instead of long traditional rounds (P10), Training in a real environment like a hospital (P5), Use of joint and interdepartmental clinical rounds and grand rounds (P5, P11), Using the experiences of experienced professors in education (P8, P12, P13), Using professors' experiences in diagnosing and solving complex medical cases based on their experience (P3, P5, P9, P11), Transferring the experience of experienced professionals to newbies in the form of forming specialized teams (P2), Adopting appropriate methods for using evidence-based medicine in the form of short scientific messages to use the experiences and knowledge of other researchers (P1), Conducting meetings to review new articles and inform colleagues about the results of medical studies (P12), Planning and creating the ground for holding meetings and joint meetings of colleagues to review the results of new articles in the field of medicine (P12, P13), Weekly interdisciplinary or interdisciplinary meetings in the hospital (P2), Holding weekly conferences to present new guidelines by residents (P2), Publishing scientific materials of specialists at the hospital level (P3), Professors' use of creative teaching methods instead of traditional classroom methods
Planning and implementation management	Sharing awareness and knowledge	Knowledge ability of the educator (P2, P3), Dissemination of knowledge based on audience needs (P1, P13), Correct understanding of the function of sharing clinical knowledge (P1), Correct understanding of the benefit of sharing clinical knowledge (P10), Understanding the effectiveness and efficiency of knowledge sharing (P11), Understanding the benefits of sharing knowledge for the individual and society (P13),
	Spirituality and ethics	Ethics in Medicine (P3), Love to teach and training (P4), Going from material to spiritual dimensions (p13),
	Political and organizational planning	Managers' view of correct sharing (P2, P5), Association and policy making in line with organizational goals for clinical knowledge sharing (P3, P2), Taking policy makers' measures to avoid damaging the image of doctors in the society (P8, P9), Correct management in order to eliminate competing thoughts (P11), Increasing sufficient strength in the treatment staff (P2, P12), Correct planning at the university level (P2, P5), Proper planning at the ministry level (P2, P5), Increasing inter-organizational activities (P10, P13), Promotion of interdepartmental activities (P10), Management system discipline (P11), Establishing justice and equal opportunity in the system for all people (P8), Organizational culture (P10),
	Supervision, monitoring and review of implementation	Planning and revising the promotion regulations at the ministerial level in line with the goals of sharing clinical knowledge (P8, P10, P13), Monitoring the correct quality of effective dissemination and transfer of knowledge (P11), Grading one's education (P3), Individual development in order to promote more and more effective knowledge sharing (P2, P3, P4, P9, P10), The system requires the individual to be up-to-date and efficient in the field of knowledge sharing (P5).
	Accessibility, facilities and resources	Choosing the right channels for sharing clinical knowledge (P1), Using the potential of social networks to share clinical knowledge (P9), Sharing of patients and scientific results of articles in virtual groups to use diagnostic and therapeutic methods of colleagues (P8, P12), Creating specialized social channels by experts in each discipline and trying to update clinical knowledge (P5, P9, P12, P3, P2), Providing access to important journals in the field of medicine (P7, P9, P11, P12), Providing the necessary and suitable platform, space and facilities for teaching, research and sharing clinical knowledge (P2, P3, P4, P7, P9, P13), Access to electronic resources, books and people (P7), Making research results available to the audience (P1, P12),

Contd....

Supplementary 1: Contd...

Main Category	Sub-category	Code (Concept)
	Virtual platforms	Good internet platforms (P5, P10), Internet speed (P5, P6, P9, P10, P11),
	Adjustment of teaching hours and time management	Reducing training hours and establishing a balance between training, research and treatment in specialists and clinical assistants and giving time to carry out research activities (P2, P10, P13), Reducing training hours for clinical assistants and giving them time to perform interdepartmental activities and effectively transfer knowledge (P10), Allocating sufficient opportunity to share clinical knowledge (P6, P7, P9, P11), Hunting Opportunity (P3), Creating opportunities (P11),
Behavioral-motivational factors	Behavioral-communicative characteristics	Friendly relationship between teacher and learner (P8), Friendly communication (P8, P9, P11, P13), Good communication between colleagues (P12), Friendly atmosphere (P11), Availability of effective communication with colleagues (P4, P8, P9), Trust between patient and doctor (P8), Trust between doctor and doctor (P8), Professors' mood (P7),
	Financial- motivational support	Financial help in APC of international papers (P9), Purchasing subscriptions to important international resources and databases in the medical field (P7, P9, P11, P12), Purchasing special university software for holding virtual meetings and classes (P7), Pride in giving knowledge and transferring information to others (P11), Helping others (P9), Receiving positive feedback (P8), Strengthening the psychological dimensions of people in the work environment (P13), Changing the place of service to relax (P4), Giving study opportunities to give vitality and spirit (P4), Considering rewards for sharing knowledge (material or spiritual) (P2), Organizational incentives (P2, P4, P8, P9, P13), Individual motivations (P3, P4, P5, P6, P9, P11, P12, P13), Willingness and enthusiasm to share (P7, P9, P12), Preparing conditions for education and research (P13), Interest (P1, P2, P3, P6, P7, P8, P11, P13), Respecting the doctor's position (P8, P9), Giving importance to research work (P13), Differentiating between capable and hardworking people and people who doing the job perfunctorily (P9, P8)

Supplementary 2: Factors inhibiting the sharing of clinical knowledge from the point of view of medical specialist working in educational-treatment hospitals affiliated to the Ministry of Health and Medical Education

Main Category	Sub-Category	Code (Concept)
Infrastructural, policy-making and cultural challenges	Political-management	Failure to take knowledge sharing seriously by managers (P1), Management discussion and macro planning at university and ministry level (P5, P10, P13), Lack of proper planning at the university level (P9, P8), Lack of proper planning at the ministry level (P9, P13, P8), Lack of discipline in the performance of the management system (P11), Lack of management plan for Best Practice (P3), Inefficiency of managers in organizing organizational knowledge (P3), Failure to receive appropriate feedback from policy makers (P1), Macro-ministry policies in selecting managers and eliminating incentives in talented people (P8), Fossilization of some managers in key and influential positions due to known reasons (P8)
	Lack of culture and mechanism of sharing	Lack of sharing culture in society (P13), Lack of explanation and existence of knowledge sharing mechanism in the organization (P1, P2), Lack of difference from the management system between the one who teaches better and the one who doesn't (P6), Non-routineness of the process of effective sharing of knowledge among clinical groups at the university level (P1), Failure to use all available capacities in clinical groups (P1), Lack of a defined, principled and appropriate structure for knowledge sharing in the clinical setting (P3), Lack of interdisciplinary communication (P13), Weakness in doing interdepartmental work (P1), Continuous movement of people from one department to another (P8)
	Scientific limitations caused by political issues	The problem of publishing articles in international journals due to political conditions (P9), The problem of the cost of printing articles in magazines due to the economic conditions of the society and consequently the professionals (P9), Difficulty participating in congresses due to funding (P9), Lack of continuous and appropriate access to electronic resources, important specialized magazines and books (P7, P9, P11, P12), Lack of access to information sources (P10), Limited access to databases (P10, P11), Paid access to databases (P12), Emigration of learners (P9), The efforts of medical students to immigrate (P11)
Technological and scientific infrastructural challenges	infrastructure and technology	Lack of suitable facilities and infrastructure (necessary tools) (P4, P7), Lack of suitable physical space (P5), Infrastructure and facilities should be more basic from the beginning (P9), Internet outage (P5, P6), Filtering social networks (P5, P7, P9, P11, P12), Low internet speed (P6, P9, P10, P3, P2), Non-continuity of virtual education after the era of Covid-19 (P2, P10), Lack of suitable academic platforms for virtual education (P7), Lack of proper replacement of internal social networks (P11), Weak capabilities of national networks (P11), Distrust in national social networks (P11)
	Educational-skill problems	Lack of a suitable platform for training (P3, P4, P7, P9), Lack of suitable educational environment (P10), Lack of a suitable platform for education at the primary levels of prevention (P2, P10, P13), Using traditional education (P10, P5, P9, P11), Weakness of retraining (P7, P10, P12, P13), Lack of educational units in proportion to the number of patients (P2), Not having enough power compared to the number of patients (P12, P7), Not having the ability to type to communicate in social networks (P3), Lack of updateness of professors and telling repetitive content instead of up-to-date and varied content (P4)
Personality-behavioral challenges	Psycho-personality dimensions	insult and humiliation (P7), Giving importance to teaching in the education of learners (P8), Narcissism (P11), Individualism (P2), Being bored (P3, P6, P4), Fatigue (P4), Despair (P1, P11, P13), Discouragement (P11, P9, P8), Lack of personal interest in the learner and teacher (P7, P8, P5, P11), Embarrassment (P3, P7), People's mood and personality (P5, P7, P4), Being criticized and judged (P3, P7, P11), Attitude of colleagues (P4)
	Lack of accountability and commitment to CKS	Lack of responsibility (P7), Presentation of materials in the form of audio recording and brief and fluent Training (P4), Doing work perfunctorily (P9, P3), Lack of sufficient time and energy on the part of the professors for the learners (P8), Reluctance to share specific treatment techniques or processes (P2, P4, P5, P7, P11), Reluctance to share key points (P4), Reluctance to share knowledge capital (P3), Giving limited information (P11), Not training the facts of the master's skill (P11), Hiding information and knowledge (P13), Scientific miserliness and miserliness (P4, P7, P13), Resistance to sharing information among colleagues (P11), monopoly (P3), Lack of belief in the nature of knowledge sharing (P1)
	Dysfunctional interpersonal relationships	Loss of trust between fellow professionals (P8), Competing thoughts (P7, P8, P11), Loss of trust between patient and doctor (P8), Patients are not comfortable with the doctor (P12), The patients don't understand our scientific language and medical expressions (P12), Dissatisfaction of doctors with people's attitude and behavior (P8, P9), Patients' anxiety in feeling the difference between scientific knowledge and doctors (P10), Literacy level of patients (P2, P12, P10), The non-uniformity of patients' literacy level in the preparation of patient education media (P2), The distance of the patient's place of residence to medical-educational centers (P2)

Contd....

Supplementary 2: Contd...

Main Category	Sub-Category	Code (Concept)
Financial and non-financial motivations	Dissatisfaction of physicians with the economic and job situation	The income level of doctors in relation to the treatment workload (P2, P8, P7), Financial competition among doctors (P7, P8, P11), Medical Commercialization (P3), Insufficient salary of doctors (P8), The income in the treatment sector is more than research and education (P13), Depending on the specialized field, financial and economic competitions are different (P11, P13, P5), Inability to physically attend meetings due to treatment (P6), Not having enough time due to the large volume of work in the clinical setting (P1, P2, P3, P4, P6, P12, P5), Not having enough time (P3, P8, P6), Treatment overload (P2), The high load of therapeutic works has dimmed the research (P13)
	Weakness of reward and evaluation system	Lack of personal motivation in professors and students (P2, P7, P8, P9, P11, P13), Lack of rewards for trainers (P2), Failure to consider promotion for the individual (P3), Lack of proper evaluation system (P3), No difference between better and more motivated teachers and no motivated ones (P9)

Contd...