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Application of knowledge logistics in telemedicine

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Abstract

Purpose: Telemedicine is a concept with a history of several decades, which means providing medical and therapeutic services remotely using information and communication technology. This issue requires the transfer and flow of medical and therapeutic knowledge from specialists to those in need, and in this context, the importance of knowledge logistics can be realized in order to identify the need and provide a solution in the telemedicine process. Therefore, the aim of the current research is to review the concepts of these two fields and identify their common points in order to identify the application of knowledge logistics in telemedicine.

Methodology: The current research is of applied type and using Scientometric method. At First, a descriptive review of the available resources with related keywords such as logistics, knowledge logistics, medical knowledge logistics, telemedicine and knowledge logistics in telemedicine was done in Google, Google Scholar and Sid databases, and in the second part, to determine the relationship Between the two concepts, the terms knowledge logistics and telemedicine were searched in Scopus and PubMed databases on March 3, 2022, and the outputs of each database were discussed.

Finding: The findings show that for nearly two decades and the upward trend of special resources in recent years, a major part of the United States has been in the production of resources, history and growth of resources related to two areas. Also, Anderson as the most prolific writer, the Journal of Internet Medical Research has a stronger relationship with BMC Medical Informatics and Decision Making. Finally, there is an occurrence of the keywords of logistic models in the resources related to the field of telemedicine, and knowledge has an important place in the resources related to the field of telemedicine.

Conclusion: The results showed that the position of knowledge and knowledge management in the field of telemedicine, considering its little history, but the exponential growth during these years is very impressive, and since knowledge logistics models are related to the resources of this field, therefore It can be considered a new and practical concept in this field.

Keywords: telemedicine, knowledge logistics, telemedicine knowledge logistics, knowledge management.

Introduction

Today, with the progress achieved in information and communication technology, the possibility of collaborative activities and cooperation in virtual environments has been achieved. Collaborations and collaborative activities in virtual environments provide the basis for sharing people's knowledge, and this can be done from three aspects of knowledge management, namely knowledge transfer, knowledge sharing, and knowledge discovery in telemedicine. can be investigated. In fact, virtual activities provide the possibility of creating a knowledge network, and this makes it possible to access more specialized knowledge in less time and at a lower cost[1].

In the digital age and especially in the conditions of the epidemic of the dreaded Coronavirus, the importance of the medical field and its activities in the digital and virtual environment is clear to everyone. Telemedicine, which is related to this topic, means the use of information and communication technology to provide Healthcare services between service providers and service recipients from a distance. The British Telemedicine Association considers telemedicine to be the provision of medical services using information and communication technology by professional experts to exchange information in the field of diagnosis, treatment, prevention of diseases, and conducting research, and in fact, telemedicine Far is the intersection of medicine with information technology and remote communication[2].

Telemedicine can be seen as information and communication technology to create, improve or

accelerate health services in combination with network and a computer system, which requires the transmission of text, image, sound, video, or converted electrical signals. By using multimedia tools, telemedicine brings a kind of temporal and spatial independence to the field of medical services and requires very strong infrastructures[3].

However, there are challenges in telemedicine. Among other things, this phenomenon requires receiving or sharing tacit knowledge and turning it into explicit knowledge. Since tacit knowledge is a personal component and sometimes people are not aware of having tacit knowledge or sometimes they think about sharing their knowledge, also because information and communication technology is based on collective participation in activities and processes. are social and since such an environment sometimes limits the capacity to attracting, growing, and maintaining the personal identity of the involved agents, therefore this can be an important factor in establishing communication between people and using their tacit knowledge[1].

Due to the changes and advances that have occurred in medical sciences, healthcare systems have also faced economic and managerial challenges and limitations, hence the attention and use of technologies It is new and of course necessary knowledge in the healthcare system. Among them, telemedicine was mentioned, which was invented in 1970, and after that, telenursing was introduced, whose advantages can be improved access and remote medical care and easy access in rural areas. He pointed out to specialists, reducing costs related to the treatment and care of patients, creating care services on a wide geographical level, and reducing the need to transfer patients to medical centers[4].

According to the definitions and the concept of telemedicine, it is understood that what happens in this process is the transfer and sharing of the knowledge of specialists and medical staff to those who need it, i.e. patients, to provide Healthcare and prevention. control and treatment of diseases. In fact, this process is specifically related to the tacit and personal knowledge of people and it seeks to identify, receive, store, share and finally use this knowledge, and in this process, tacit knowledge is used until it is applied, external and It becomes explicit knowledge. Since knowledge management is proposed and used as a tool to transform and exchange knowledge, it can have special importance in telemedicine.

"In a process definition, knowledge management is a set of continuous processes ((recognition/acquisition)), ((audit/organization)), ((dissemination/development)) and ((application/creation)) of knowledge to create or Accelerating the movement in the direction of organizational effectiveness; this definition has focused on eight interconnected and continuous processes"[5].

The role of knowledge in the intelligence of activities and the emergence of wise and intelligent behaviors is not hidden from anyone. Therefore, knowledge management and especially knowledge sharing are important, and the two key concepts in this field are knowledge flow and knowledge logistics. The importance of knowledge flow is that if knowledge does not flow, it will not grow and will wear out. However, the knowledge that flows grows and produces new knowledge, and in fact, creating the flow of knowledge is one of the fundamental goals of knowledge management[6].

In general, there are two significant components in knowledge sharing. The first is the transfer of knowledge, which means conveying an idea to another person, and this idea is the knowledge of the person, and it must be coded in a way that can be transferred in any form. The second is the interpretation of knowledge, which requires the ability to integrate the received signs with the background knowledge of the individual in such a way that the two are compatible with each other and this compatibility is of a logical type so that the idea is accepted based on the basic values of the recipient [7].

Despite the importance of knowledge management, the existing tools and operational approaches in the knowledge management process have so far been unable to provide an integrated solution to support the provision of knowledge needed by the organization and to perform better knowledge management, which is a challenge in knowledge logistics. There is discussion and attention. Smirnov believes that in an activity to create awareness and information about the current situation and correct management in any organization, an important thing is to share knowledge, and therefore the knowledge must be given to the right person at the right time. correct, with the correct purpose and to be transferred from integrated distributed sources, which the summation of these items are under the title of knowledge logistics[8].

Therefore, considering the goal of telemedicine to provide advice to patients and those in needs, in transferring medical and therapeutic knowledge from specialists to those in need of that knowledge, we can point out the importance of knowledge management in this field. On the other hand, knowledge logistics has been proposed as a new concept in knowledge management and it specifically deals with the transfer and sharing of knowledge in a specific framework, and in fact, it covers a cycle from identifying knowledge needs to solving problems and meeting needs. therefore, it can help as an important pillar in the direction of performing and improving the telemedicine process.

Methods
The current research was applied and carried out using a scientific method. At first we review the existing sources with related keywords such as logistics, knowledge logistics, medical knowledge logistics, telemedicine, knowledge and telemedicine, knowledge logistics and telemedicine in various databases such as Google, Google Scholar, Sid, etc. Then we investigated the research and sources published in this subject area to determine the limits, importance, and application of knowledge logistics in telemedicine. Also, in the second part of the article, to determine the relationship between

the two concepts of knowledge and knowledge logistics with telemedicine, we searched for the terms Knowledge Logistic and Telemedicine on march 3, 2022 in the Scopus and PubMed databases and provided analyzes from each database until the number of resources Published in this concept to be specified. So, in this article, we are looking for answers to two questions.

1. What is the importance and application of knowledge logistics in telemedicine?

2. What is the amount of resources published in Scopus and PubMed databases on the subject of knowledge logistics and telemedicine?

To answer the first question, the sources of this field will be examined and reviewed to determine the conceptual scope of each concept and their common points.

Literature Review

First question: What is the importance and application of knowledge logistics in telemedicine?

To answer the first question, the sources of this field will be examined and reviewed to determine the conceptual scope of each concept and their common points.

What is logistics?

Logistics is adapted from the Greek root Logistikos and includes a part of the chain processes that include the forward and backward flow, storage of goods, services, and information from the point of origin to the destination and in the direction of solving It efficiently plans, implements and controls the needs of customers[9]. The Logistics Management Association considers logistics as a process for planning and control to manage the flow of materials, services, and information, based on which two points should be considered in the definitions of logistics in general, and it includes paying attention to the need The client and the dependency of this process is a starting point and an ending point[10].

Logistics generally deals with how to supply materials within or between organizations in such a way that timely delivery of products and services needed to customers (internal or external) of the organization is possible. Therefore, in logistics, an input includes raw materials, additives, and semi-finished goods that are purchased and stored, then delivered to production units and subsidiary stores, and finally, the final goods are stored until be available to the sales department. Knowledge sharing is the input of knowledge logistics in organizations, which leads to concrete solutions or final products for customers. Therefore, logistics performance measures include time reduction, complete delivery, reliability, quality, price, flexibility, and the possibility of customization by the customer to increase revenue through service efficiency and cost reduction[7]. Supporting users' activities intelligently is the main goal of knowledge logistics, which is based on three points: the needs of each specific user, the available knowledge resources, and the analysis of the current situation in the environment[8].

To explain the place of logistics in knowledge management, it should be noted that knowledge management has structural goals and process goals. The structural goals of knowledge management include the correctness and up-to-dateness of knowledge content, its location, the form of information carriers (ease of implementation) and the availability of the best type of knowledge, and the process goals of knowledge management in the direction of adjusting knowledge, effective distribution in business sectors, sharing Saving knowledge is its effective and efficient storage and creating effective and efficient combinations of knowledge. In this regard, knowledge logistics support some knowledge management processes such as the distribution and storage of knowledge to create a flow or create stagnation of knowledge[7].

On the other hand, among the applications of knowledge logistics in digital organizations, it can be mentioned to facilitate mediation between knowledge and people to establish a relationship between people who need knowledge and people who can provide that knowledge. The second is to facilitate the discovery of knowledge by creating a knowledge map or the structure of knowledge collection to organize internal and external awareness. The third is facilitating the internalization of knowledge, which is achieved by facilitating the extraction of knowledge from the knowledge base[8]. It is generally understood that what happens in knowledge logistics is the flow of knowledge, that the flow of knowledge leads to sharing knowledge, and that sharing knowledge is one of the components of knowledge management[6].

Since an important factor in various areas of human life, such as business, industry, Healthcare, etc., is the speed in the decision-making process, and since decisions are made based on knowledge, therefore, it is a matter It is vital to deliver the necessary information at the right time, which is addressed by knowledge logistics and provides the conditions for searching, acquiring and integrating knowledge from distributed sources in the information network environment[11].

Knowledge logistics in the health system

Knowledge management in health system is faced with challenges such as a lack of awareness of the importance and potential of knowledge management in Healthcare, motivation and commitment of employees, usability, building trust, confidentiality and security measures, and lack of integration between systems. based on information technology such as telemedicine, electronic health records, decision support systems, etc. One of the challenges in the healthcare sector is the cost issue. The available reports show the high amount of expenses in the treatment and care departments. For example, in the United States until 2013, the total health costs included 18.4% of the gross national product. Canada spent $148 billion on Healthcare in 2006, triple the amount adjusted for inflation in 1975. Chronic diseases also increase the cost of health services. For example, according to the World Health Organization, the death rate from chronic diseases worldwide in 2005 was estimated at 35 million out of 58 million annual global

deaths. Therefore, these costs have made governments around the world think of creating solutions to reduce these costs[12].

One of the prominent differences between healthcare organizations and other organizations is having goals to improve patient protection and reduce medical errors, and also the use of advanced technologies in providing services requires experienced and trained staff. Therefore, the need to share knowledge and manage it and how to use knowledge management in these organizations is essential, and knowledge management is considered an important tool in these organizations. Because the field of health is knowledge-oriented and health is considered one of the indicators of development[13]. That knowledge sharing and transfer are important in knowledge logistics.

"It is necessary to use the learnings obtained from executive and research activities to develop services in every department and field, including the field of health and treatment. Information, lessons learned, experiences, knowledge and technology are the most valuable and strategic assets of organizations. The Ministry of Health, Treatment and Medical Education, in terms of the type of activities and duties, their importance and extent, benefit from experts, managers, and employees with experience in their specialized fields, who have knowledge, skills, and experiences. If the knowledge of these people is correctly identified and managed, it can play an effective role in improving management and quality, increasing efficiency, reducing costs, and ultimately improving the performance of management, especially the strategic management of the country's health"[14].

Because Healthcare is provided by different groups of people such as family doctors, specialists, nurses, radiology technology technicians, laboratory technicians, social workers, psychologists, consultants, and also third parties such as hospital managers and Clinics, financial managers, and human resources are done, and the Ministry of Health and Medicine, pharmaceutical companies, health service insurance companies, active groups, educational organizations, research societies, etc. are also involved in Healthcare, hence The knowledge created by each of them is different and can help others in providing Healthcare[12].

Therefore, modeling clinical guidelines and recommendations provided by professional institutions based on statistical models and experiences from clinical or epidemiological trials can help doctors in evidence-based medicine. Because such analyses, modeling, and decisions are realized based on the patient's condition, medical history, and genetic information, and if clinics and individuals apply structured data sets and information related to each person's medical history and treatments. have access, they can benefit from effective results in similar cases. The result of this is the integration of medical data and the mechanisms of discovering latent knowledge. In such a way that this integration leads to a new generation of electronic health systems for personalizing disease prevention, diagnosis, and treatment[15].

One perspective of knowledge management and knowledge logistics in the field of health is the formation of virtual communities through which patients share their tacit knowledge derived from experience about their clinical situation and conditions to gain insight into the patient experience. and his treatment as well as the effect of drugs on the patient. Virtual communities are an opportunity for continuous electronic education, which is essential in Healthcare. In this context, health 2 and the Semantic web can be mentioned by following the principles of web 2, in which health and Healthcare are done interactively and with collaborative ideas. In this section, system users, patients, professionals, and stakeholders are involved in improving the Healthcare system by using social networks, web 2, and the Semantic web. In this regard, a few things can be mentioned. These include Sermo1, a community of doctors to share information and collaborate, DoubleCheckMD2, a patient-oriented application for side effects of medications, Vitals3, which helps patients find doctors and give their opinions about doctors, PatientsLikeMe4, for patients with life-threatening conditions. Is. The goal and trend in health 2 are to increase collaborations between doctors, and patients and to create new relationships between patients and doctors and research organizations[12].

The importance of knowledge logistics in health and telemedicine

A review of the available sources showed that logistics generally seek to plan, implement and control the efficiency of services and information from the point of origin to the destination to meet the needs of customers for the timely delivery of products and services required by customers (domestic or foreign). The organization is based on the three components of the requirements of each specific user, the available knowledge sources, and the analysis of the current situation in the environment in line with the general goal of creating a flow or stagnation of knowledge.

On the other hand, the application of knowledge logistics in organizations and digital and online businesses includes facilitating the mediation between knowledge and people, facilitating the discovery of knowledge, and facilitating the internalization of knowledge. In addition to that, especially since in matters such as medicine for the identification, treatment and prevention of diseases, speed is an important factor in the decision-making process, and since decisions are made based on knowledge, it is therefore a vital issue. And it is important to deliver the necessary information to the right person at the right time. This issue is placed in the framework of knowledge logistics as a new concept of knowledge management.

Considering the knowledge-oriented nature of the health field and to protect the patient and reduce medical errors, and because the use of advanced technologies in providing services requires experienced and trained employees, and because the knowledge created by each of the prominent people involved in

Patient care is different, therefore, modeling clinical guidelines and recommendations and forming virtual communities in the framework of knowledge logistics to share knowledge from successful experiences can individualize disease prevention, diagnosis and treatment in telemedicine. help. In this regard, the following conceptual model is proposed.
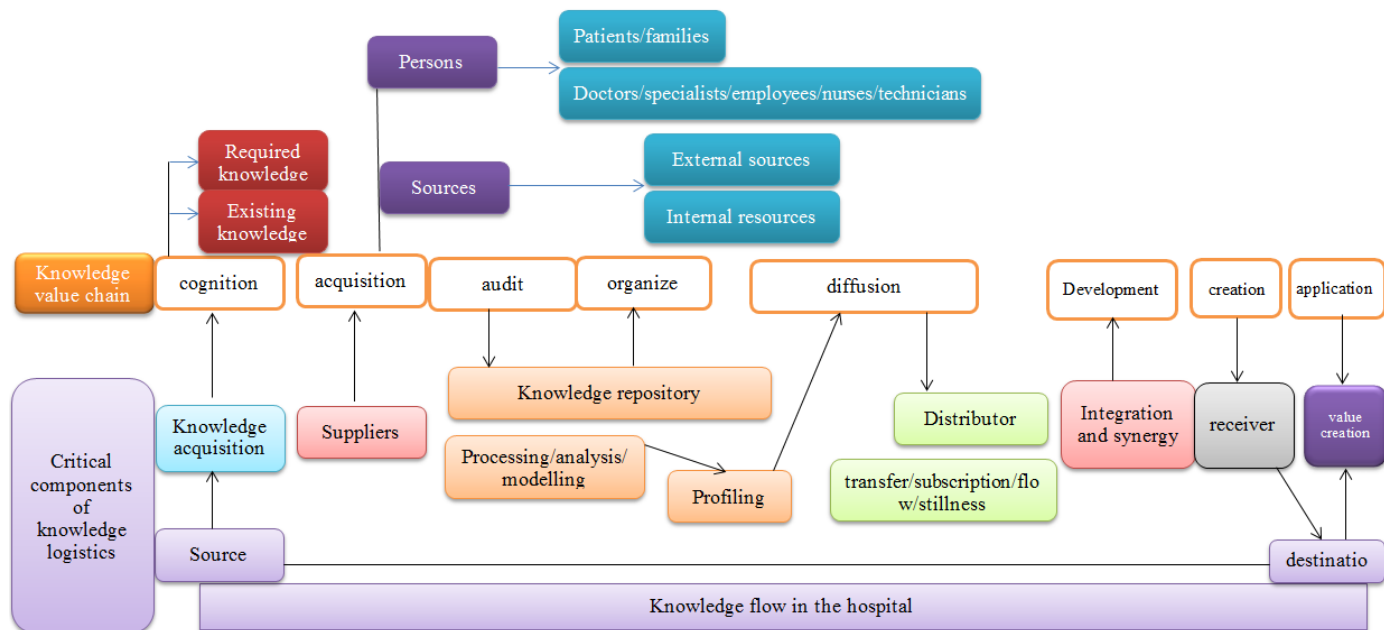

figure 1. Conceptual model of knowledge logistics

According to the definitions and review of related sources and as shown in Figure 1, knowledge logistics is a process that seeks to create a flow of knowledge from the source to the destination. In fact, logistics starts from the identification of the need and finally leads to the solution of the problem. Knowledge logistics has several critical components that start in a sequence of knowledge acquisition and identification of the required knowledge and then identify the knowledge suppliers to identify the required knowledge of the problem. After preparing the knowledge, it is stored in the knowledge reservoir for processing, analysis and modeling. The output of this step can be profiling of knowledge models based on user needs. In this stage, with the identification of knowledge patterns and knowledge needs, knowledge flows through specific distributors. An essential component in the externalization of knowledge is the integration of knowledge and synergy so that new knowledge is created and reaches the hands of the end users and those in need of knowledge. What is important as the output of knowledge logistics is that the transferred knowledge should cause value creation.

By goals of telemedicine and its function, it can be concluded that telemedicine can be included in the mentioned model and be carried out within the specific framework of knowledge logistics. In this way, in addition to online consultations in telemedicine, due to possible limitations in providing specialists who have to spend a lot of time in this process, it is possible to identify the knowledge required for this process in the framework of knowledge logistics. And he documented them and by going through the mentioned steps, he finally reached the modeling so that the intended users can benefit from the existing knowledge when needed in cases where there are specific and repeated trends without the need to spend extra time and money. turn around It should be noted that in this process, one of the sources of knowledge can be patients who can help doctors and other patients by recording their experiences of disease records, treatment methods, prescription drugs, and their side effects.

Second question
What is the amount of resources published in Scopus and PubMed databases on the subject of knowledge logistics and telemedicine?

Next, to answer the second question, we searched for the terms knowledge logistics and telemedicine in Scopus and PubMed databases. Figure 2 shows the number of resources published in this field in the Scopus database.
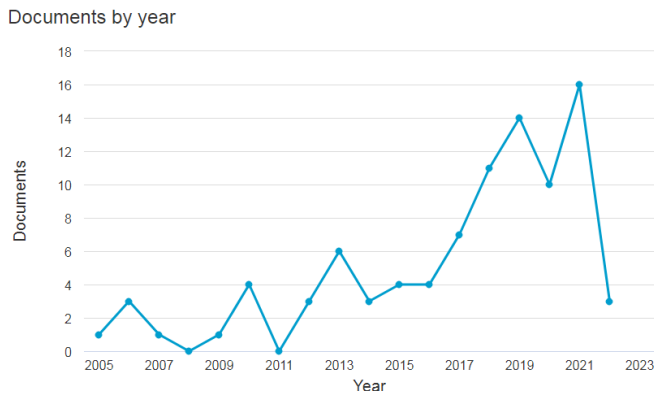
figure 2. The trend of resource growth in the Scopus database.

In fact, the search for the mentioned phrase led to the retrieval of 91 related results in the Scopus database, and as Figure 2 shows, the concept in question is a new concept with a history of nearly two decades, and it has had an upward trend during these years, and this indicates its importance. Attention to this concept is in the sources published in recent years. Figure 3 shows the contribution of different countries in the production of resources in this area.
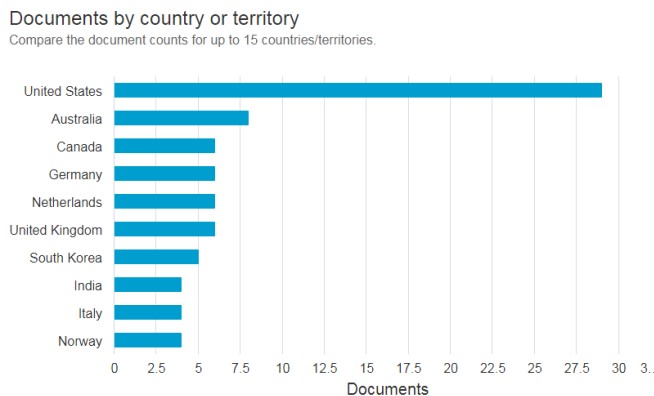

Figure 3. The contribution of different countries in the production of related resources in the Scopus database.

As Figure 3 shows, the United States has the highest source production rate in this field, and India, Italy, and Norway are tied for eighth place. Also, in general, the search term knowledge management and telemedicine represented a number of 1617 sources, the results of which are presented in Figure 4.
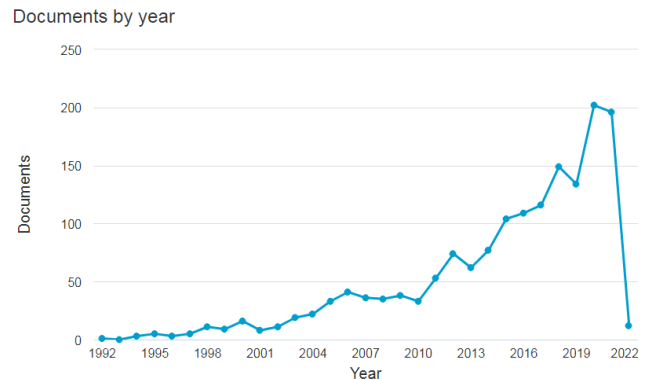

Figure 4. The growth trend of resources related to knowledge management and telemedicine in the Scopus database.

As Figure 4 shows, the history of producing common resources between the two fields of knowledge management and telemedicine is longer and nearly three decades and the resources published during these years have been growing. It is necessary to explain that the decrease in the amount of resources in the forms in the last year is because the relevant search was done at the beginning of 2022, and therefore the exact number of resources for each year can be decided when the year is over. Finally, the result of searching the mentioned term in the PubMed database is presented in Figure 5.
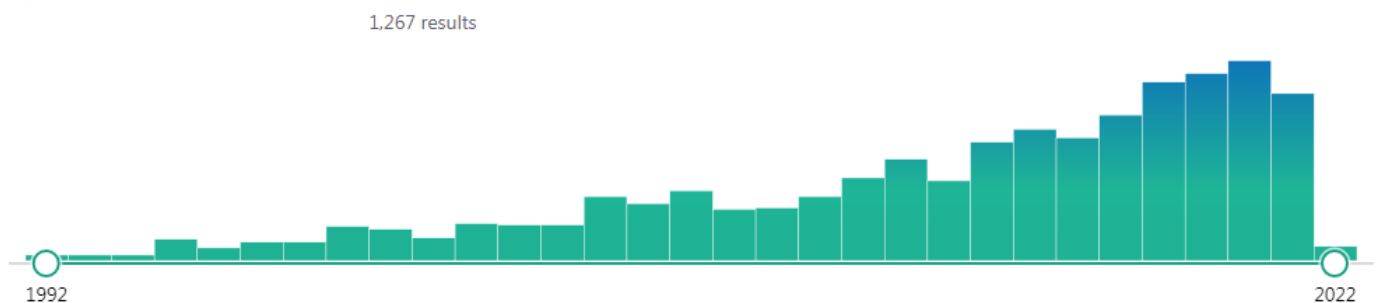

Figure 5. The growth trend of resources published in the field of knowledge logistics and telemedicine in the PubMed database

As Figure 5 shows, the growth trend of resources related to knowledge logistics and telemedicine in the PubMed database has a history of nearly three decades and longer than in the Scopus database. Also, the growth of resources in these years has generally been on the rise.

Also, the output analysis of bibliographic information of Scopus database retrieval results using VOSviewer software to display the bibliographic analysis of sources published in the mentioned field is presented below. Figure 6 shows the authors and their communication network, Figure 7 shows the highly cited authors, Figure 8 shows the bibliographic pairs and Figure 9 shows the co-citation rate of sources in this field.
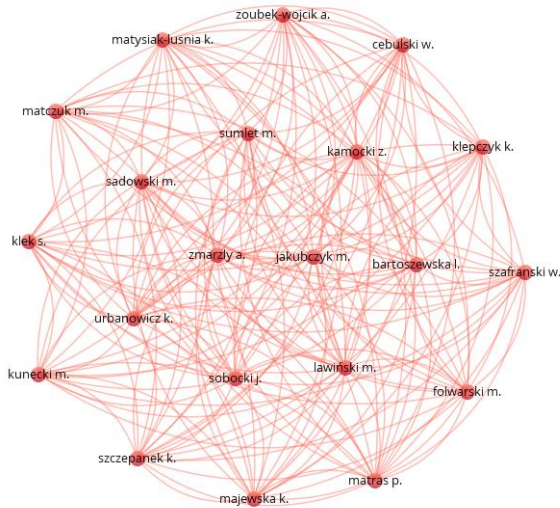
Figure 6. Authors and their communication network and co-authorship
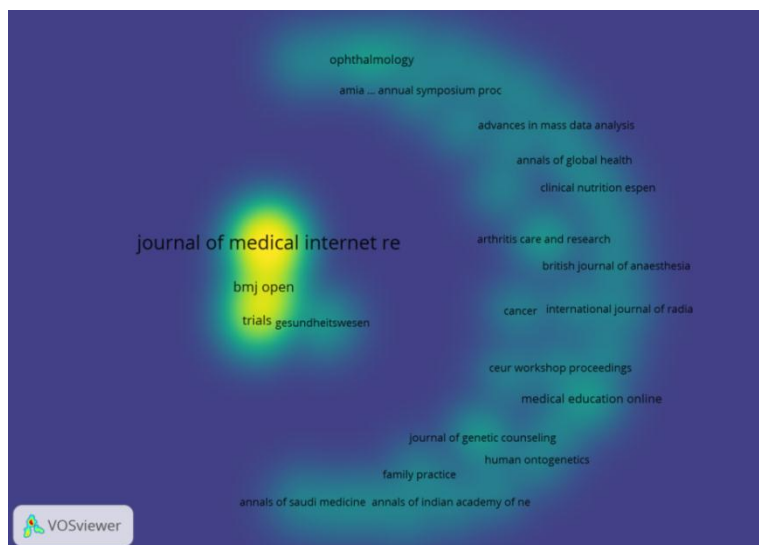

Figure 7. Highly cited authors

Figure 8. Bibliographic couples

Figure 9. Co-citation of sources

According to Figure 7, it is clear that Anderson has been the most prolific author in this field over the years. According to Figure 8, the Journal of Medical Internet Research has a stronger relationship with BMC Medical Informatics and Decision Making. And finally, according to Figure 9, J Med Internet Res has the strongest co-citation rate with other journals. However, apart from presenting the bibliographic data of this field, what is important and should be at the center of attention is the co-occurrence rate of related keywords of the two mentioned fields. Figure 10 and Figure 11 show this.

Figure 10. Co-occurrence of logistics keyword

Figure 11. Co-occurrence of knowledge keyword

The analysis of the co-occurrence rate of the keywords in the mentioned sources according to Figure 10, showed the application of logistic models in the sources related to the field of telemedicine, and in fact, the logistic models of knowledge had connections with several related sources. Also, according to Figure 11, it is clear that knowledge has an important place in the resources related to the field of telemedicine. Therefore, from the summary of the forms presented, it should be noted that the position of knowledge and knowledge management in the field of telemedicine, considering its small history, but the exponential growth during these years is very significant, and since the knowledge logistics models have connections in the sources of this field, so it can be considered as a new and practical concept in this field.

Conclusion

As it is known, the field of medicine and the health system is important in any era, and especially in times of special and widespread diseases, it involves people in a much more concrete way. The current era is both the era of the Corona epidemic and the digital era. The characteristic of the digital era is its transformation, and in this regard, every organization should associate itself with this transformation to have the necessary flexibility against changes. The health system has not been far from the developments of the digital age, and telemedicine is one of its fruits. Considering the problems in accessing specialist doctors, especially for deprived areas, as well as the need to observe social distance and quarantine restrictions, telemedicine is a very important element to overcome such restrictions. Since the health system is a field of knowledge, the review of related sources in this research showed the importance and application of knowledge logistics in telemedicine. Because conducting telemedicine in the format and model of knowledge logistics can include a process of identifying the need, identifying and registering the required knowledge resources, and establishing the appropriate communication at the appropriate time between the possessors of knowledge and those in need of it, so that finally lead to solving the problems and needs of users. The findings from the answer to the second question also indicated the importance and relevance of the resources of the two subject areas of telemedicine and knowledge management, which in addition to scientometric analyzes in communication networks, high-quality authors, bibliographic couples and Citing the sources, the co-occurrence of the words of these two fields was shown in the mentioned sources.

Considering the relationship between these two fields, the present research can provide a background for future research by forming and determining the conceptual framework of knowledge logistics in telemedicine, with a knowledge-oriented and logistic approach to the implementation and implementation of medicine. Remote payment. This framework is important because it starts from the recognition of the need and includes the solution to the problem, therefore, with a knowledge management approach, past and present experiences can be used for future problems and challenges.

Conflict of Interests

The authors have no conflicts of interest.

Review Highlights

What Is Already Known?

In general, it was found in this research that the process of publishing resources related to health and knowledge management has connections and common points. Based on this, it was found that it is possible to establish a connection between the new concepts of these two fields, namely telemedicine and knowledge logistics. In fact, the review of sources showed that telemedicine can be implemented in the framework of knowledge logistics to be done in a more effective and efficient way.

What This Study Adds?

In the proposed conceptual model, which is the result of the review of sources and can be completed in future research and obtain the necessary validity and reliability, it was found that knowledge logistics can establish the flow of knowledge in telemedicine in a process from identifying the need to meeting the need. . As mentioned earlier, this topic can deliver the required knowledge to the right person and from the right sources at the right time. This research showed the connection between these two fields and it was found that the process of publishing the resources of these two fields has the ability to create commonality between these two concepts. In this regard, it is suggested to identify the nature of knowledge required in telemedicine as well as knowledge management processes in telemedicine in future research.

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