Knowledge Of Trainee Physicians About The Implementation Of Telemedicine In Health Institutions

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Abstract

The student with new technology needs learning models different from the traditional ones, being telemedicine a support tool for education. The objective is to evaluate the knowledge of telemedicine of students who are doing their social service. It is a descriptive, observational and cross-sectional study, the data were collected through a structured and validated instrument using Microsoft Forms applied to 113 social service interns. The results show that 52.2% (59) know little about telemedicine. It is concluded that it is essential for medical schools to formally implement telemedicine in their curricula.

Keywords: physicians, telemedicine, telemedicine, knowledge, social service, technology.

RESUMEN

El estudiante con nueva tecnología necesita modelos de aprendizaje diferentes a los tradicionales, siendo la telemedicina una herramienta de apoyo para la educación. El objetivo es evaluar el conocimiento hacia la telemedicina de alumnos que se encuentran realizando el servicio social. Es un estudio descriptivo, observacional y transversal, los datos se recabaron a través de un instrumento estructurado y validado utilizando Microsoft Forms aplicado a 113 pasantes de servicio social. Los resultados muestran que 52.2% (59) conoce poco sobre la telemedicina. Se concluye que es primordial que las escuelas de medicina implementen de manera formal la telemedicina en su currícula.

Palabras clave: médicos, telemedicina, conocimiento, servicio social, tecnología

INTRODUCTION

In recent decades the imminent technological advances in all environments of life, have generated the birth of new strategies and models of life, especially in the educational context. During the last years, the emergence of the knowledge society allows the access to different sources of information in an immediate and permanent way, propitiating that the development of the teaching-learning process generates infinite knowledge.

The emergence of telemedicine is intended not only to support and facilitate medical care when the participants are in different geographical locations, but also as a tool for continuing education of professionals at all academic levels through the use of ICT in all specialties and medical settings such as gynecology, radiology, psychiatry, surgery, dermatology, cardiology, neurology, to name a few. Therefore, the following question arises: What is the knowledge towards telemedicine of the students who are doing their social service?

The objective of this research is to explain the degree of knowledge that students who are performing social service have in relation to telemedicine in order to determine the usefulness and impact of including it in the training of students as an effective strategy in the teaching-learning process, and it can be seen as an instrument of permanent didactic and academic support, contributing to the constant evolution of medical education that is developing in the current context of globalization.

Currently, professors face several obstacles in the educational process of future physicians, among which are demographic and health care changes, as well as medical advances that have generated an increase in the demand for admission

to medical schools (Parra and Hernández, 2021). Every day, medical schools strive to provide their students with more clinical experiences, thus increasing their contact with patients, "however, there are growing challenges in clinical teaching such as time pressure, competition between the demands of students, the needs of patients and the administrative apparatus of health care facilities. The above, becomes more evident given the increase in the number of students, lack of resources, unfriendly clinical environment and the decrease in the number of patients" (Quevedo, 2019).

Derived from the above, the use of telemedicine in the clinical academic environment would contribute to have access to joint consultation care of general practitioners with specialists, as well as to generate the knowledge of social services students in the diagnosis and treatment of various diseases at the primary care level, as well as to carry out an adequate teleconsultation and learn how the primary care physician interacts with the specialist. On the other hand, teleconsultation cases can be used in order to implement teacher-student discussion strategies to strengthen the development of basic competencies in medical social service interns, such as being able to interpret diagnoses to indicate the appropriate treatment according to the knowledge acquired and to be able to communicate it effectively to patients (Cáceres, Castro, Gómez, & Puyana, 2011).

So far there are no studies that use telemedicine as a permanent teaching strategy in universities, however, some international students suggest that telemedicine could be used as an effective educational tool, such as the program of the National University of Colombia related to telemedicine that carries out teleconsultations in more than fifty health institutions in the country, in specialties such as otorhinolaryngology, gynecology, internal medicine, neurology, dermatology, urology, psychiatry, infectology, orthopedics, pediatrics and cardiology (Cáceres, Castro, Gómez and Puyana, 2011).

The medical social service intern is immersed in a culture that fully involves technology so using ICT and particularly telemedicine can encourage him to improve what he has learned and strengthen his competencies in the medical area (Sarkar, 2012). This study aims to contribute to the constructivist theory of learning, since telemedicine provides the learner to engage with many contexts of life, developing authentic tasks in a meaningful way in the context and supports collaborative work for the construction of knowledge based on socialization.

Telemedicine used as part of a coherent educational approach can enable medical interns to achieve better cognitive performance and higher

achievement in relation to their learning outcomes. This pilot study is of great importance to encourage medical schools to formally include ICT-based teaching strategies and telemedicine in particular in their curricula to provide students with a range of clinical scenarios and training tools to strengthen educational training. Telemedicine can offer teachers the opportunity to change from being a distributor of knowledge to a facilitator of teaching and an evaluator of competencies, allowing students to be more active participants in their education, thus generating a well-designed educational experience with the aim of motivating them to be more engaged in their educational process (Rodríguez, Marín and Molina, 2013).

ICTs are evolving humanity in such a way that nowadays we talk about the society where knowledge and information are the basis, identified by information management, adaptation in social, economic and cultural relations, as well as in the way of thinking of individuals. Currently, worldwide, we develop in an interactive environment where Internet sites, blogs, forums and digital books take the educational role in addition to being informative, as it becomes support elements that have an indirect impact on education, manifesting in humanity a reflection of the universe using messages that travel through this great communication channel. "This medium used responsibly allows making use of the digital technological revolution, which brings with it the emergence of a new great wealth as data transformed into information, and this in turn verified and validated becomes knowledge" (Graham et al., 2012).

The student with updated and up-to-date technology requires methodology and learning environments different from those traditionally used (face-to-face), not leaving aside the primary objectives of education since they are the same and ICT are a support tool with which the teacher transforms his role from knowledge transmitter to guide and consultant, and the student on the contrary changes from a passive individual to an active learner. The concept of telemedicine is new and has developed thanks to the innovation and evolution achieved by technologies, "understanding telemedicine as the use of ICT to support and facilitate medical assistance when distance separates the participants in the process of providing health care; whose importance is causing it to be applied to many areas, having a growth parallel to the development of new technologies and being applied in different ways such as teleconsultation, telemonitoring or telesurgery, the first being the most widely used at present".

The final objective of telemedicine is not only to provide support and assistance to physicians remotely, but also to be a tool to provide training in relation to courses and workshops at all academic levels using technologies such as ICT as

a technique for the academic process, taking as a basis that currently health sciences careers in their educational programs have in mind the development of the competencies and skills necessary to meet the learning outcomes. It is correct to mention that there is information in the world bibliography that qualifies the use of telemedicine as an important part of the teaching-learning process, mainly in the area of evaluation; however, no research related to the use of teleconsultation as a tool for the development of competencies in medical interns in social service was found.

As a result of this last point, this pilot study arises, whose purpose is to generate information and knowledge about this area and to serve as a starting point for health sciences education institutions in the country to formally implement didactic methodologies that integrate telemedicine in their curricula, so that students can be immersed in many clinical situations that allow them to develop and strengthen their skills and abilities (Granda and Gutiérrez, 2016; Rienits, Teuss and Bonney, 2016).

Telemedicine applications are very varied in relation to patient management and administration, information provision and remote training of physicians and users (Castaño, Carvajal, García, & Rengifo, 2016). ICTs provide support from various environments such as research, practice and educational, contributing to generate basic services to carry out the aforementioned applications, finding among these the following:

- Tele-training. It offers the possibility of distance training to interested health personnel, by means of assisted videoconferences, keeping them updated in the different technological advances, under the guidance of highly qualified teachers.
- Teleassistance. It arises from the need to reduce costs, to reduce the difficulties of transportation to the hospital for patients who need frequent check-ups during a certain period of time. The care is provided from the patient's home or workplace, through a remote connection with the hospital, where he/she will be evaluated by trained personnel. Biotelemetry arose from this activity in order to keep track of the patient's vital signs. From this type of application, the need to store the clinical history in a database arose, facilitating the search work at the time of care.
- Telemonitoring. This is a service to provide the user with counseling and advice for health promotion, prevention, recovery or rehabilitation of diseases.
- Teleconsultation. Allows remote consultations by specialists or general practitioners, while the patient is at home or at work.

  From these basic services, five fundamental types are born and they are:

- Telediagnosis. It consists of the remote sending of data, images or signals within diagnostic limits, for example, teledermatology, teleradiology, telecardiology, telepathology, teleophthalmology, teleendoscopy, teleneurology, telecytology.
- Telemonitoring. It consists of remote or remote monitoring of vital signs, in order to provide automatic or semi-automatic surveillance or alarm services in emergencies (general), emergencies in disasters and catastrophes, for example, tele-emergency, tele-epidemiology, tele-public health, administration of health networks with tele-administration, tele-surgery (monitoring and robotized). Telemetry, telecardiology, teleophthalmology and teleneurology, teleradio and telebiosecurity are also included.
- Teletherapy. This is the remote control of equipment such as hemodialyzers and the performance of consultations.
- Telededactics. Application of networks in health education, for research, exchange of health training, existence of support groups on the Internet, continuing medical education and electronic prescription reminders.
- Social telephony: application of modern conventional telephony resources to dynamic assistance, telecommunication for disabled people, support for preventive medicine" (Cáceres, Castro, Gómez and Puyana, 2011).

There are many methodologies that apply telemedicine in the teaching and learning process, among them:

- Audio conferences. These are conferences conducted via telephone, sometimes combined with internet-based instruction, in order to provide visual aids.
- Videoconferencing. Allows real-time interaction between participants; somewhat similar to face-to-face, requires technical infrastructure.
- Teleconference. A conference conducted via television or video technology, sometimes erroneously used to refer to conferences conducted via telephone.
- Satellite transmission. Used for one-to-many communication, suitable for reaching large audiences.
- Video instruction. Usually as an asynchronous recording and replay of a face-to-face instructional format.
- E-mail. Used for basic text-based information, also used for file exchange.
- Internet/computer-assisted learning. Use of a computer to access Internet sites instead of a manual one.
- Internet/electronic performance support systems. Electronic or on-line performance aids, such as guide-based problem solving algorithms.

- Asynchronous online classes. Virtual online classes that allow anywhere and anytime access to learning activities.
- Virtual synchronous classes over the Internet. Real-time interactions with other online users through tools such as chats, videoconferences and direct audio conferences, interactive digital boards.
- Internet transmissions. Allows video presentations on any computer, but requires high bandwidth for proper execution.
- Handheld computers. Service point capable of accessing practical guides, reference materials and the Internet.
- Human patient simulators. Simulate physical findings and/or physiological responses for a variety of medical conditions or clinical scenarios.

In recent decades, advances in the medical field, as well as changes in primary health care, have increased the demands on health care schools; traditional teaching methods where the teacher was the transmitter of knowledge are changing into models where the student is the main protagonist and takes control of learning, changing to a curriculum where competencies are the basis, prioritizing learning outcomes and not the process, in order to obtain better effectiveness and efficiency in education, thus adapting to the pedagogical, social and scientific challenges, allowing better opportunities for learning to be authentic, self-directed and interactive, arousing active participation through repetitive practices as well as encouraging student motivation.

With the increase of technologies in the field of education and the Internet, virtual educational resources for teachers have greatly increased, allowing the integration of virtual learning in medical education programs, which is the result of a plan designed according to the needs that begins with a situational diagnosis and ends with the integration of these. However, some institutions have determined its use as a parallel solution to expand or update the curriculum, although it is recommended to initiate this strategy in an integrated manner to generate benefits through hybrid teaching (Fernández, 2021).

In undergraduate medical education, Internet-assisted learning provides students with materials for self-study and collaborative learning; in the case of graduate education, the Accreditation Council for Graduate Medical Education in the United States established six core competencies to which it can be applied; in continuing medical education, physicians with daily clinical obligations can use it to attend electronic conferences.

The broad and complex educational content in medicine, in conjunction with the lack of virtual learning experts and resources, make the creation of centers of excellence implementing this type of teaching reasonable, as such places

would have the ability to offer many services, including "system deployment and administration, teacher training, content development assistance, design of learning pathways and programs, support and marketing, monitoring, maintenance, research, and consulting" (Piquer, Bartoll, Martín, & Fayos, 2018).

MATERIALS AND METHODS

This is a descriptive, observational and transversal research conducted at the Tampico School of Medicine "Dr. Alberto Romo Caballero" of the Autonomous University of Tamaulipas. The population is made up of 180 interns of the career of Medical Surgeon who are performing their social service in the period from August 2021 to July 2022, according to the information provided by the Head of Social Service of the institution. As for the selection of the sample, we randomly selected 113 interns, who voluntarily accepted to participate.

For the collection and analysis of the information, the sample was taken from the population of medical surgeon interns during the period August 2021 to July 2022. The method used was a questionnaire and the instrument to collect data was a structured and validated questionnaire using Microsoft Forms; the survey consists of 16 questions including gender and 15 multiple choice items, having 30 minutes as maximum time to be answered. To carry out this research, the protocol was registered in the postgraduate and research area of the institution, obtaining the approval of the Research and Research Ethics Committees of the faculty.

The data obtained were processed in the SPSS 21.0 statistical program. After collecting the data, we proceeded to work with the different variables related to the objectives of the study. All the data obtained from the social services students were coded so that they could be analyzed in the program and tables and charts were prepared using descriptive statistics with measures of central tendency and percentages.

RESULTS

The gender distribution of respondents was 57 women (50.4%) and 56 men (49.6%) as shown in Table 1.

Table 1. Distribution by gender

	Frequency	Percentage	Valid percentage	Cumulative percentage
Female		50.4	50.4	50.4
Male		49.6	49.6	100.0
Total		100.0	100.0	

In relation to the questionnaire applied to the medical interns of social services, the perception, knowledge and attitudes towards telemedicine were analyzed for each item as shown in tables 2 to 19.

Table. 2 For you, what is telemedicine?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Medical act performed without physical contact		20.4	20.4	20.4
ICT contact with a physician for updating and/or learning purposes.	5	4.4	4.4	24.8
Use of ICT for the preparation of a patient's clinical record		17.7	17.7	42.5
How to provide healthcare services to remote patients		1.8	1.8	44.2
Provision of health care services in cases where distance is a critical factor.	63	55.8	55.8	100.0
Total		100.0	100.0	

Table 3. For you, what do you consider to be the degree of development of telemedicine worldwide?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Under		23.9	23.9	23.9
Medium	52	46.0	46.0	69.9
High		27.4	27.4	97.3
Very high		2.7	2.7	100.0
Total		100.0	100.0	

Table 4. What do you consider to be the degree of development of telemedicine in Mexico?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Very low		9.7	9.7	9.7
Under		53.1	53.1	62.8

Medium		29.2	29.2	92.0
High		8.0	8.0	100.0
Total		100.0	100.0	

Table 5. How often do you use telemedicine to perform a certain procedure?

	Frequency	Percentage	Valid percentage	Cumulative percentage
I use it frequently in my professional practice	5	4.4	4.4	4.4
I have used it between 1 and 3 times	42	37.2	37.2	41.6
I have used it between 11 and 20 times		6.2	6.2	47.8
I have used it between 4 and 10 times		14.2	14.2	61.9
I have never used telemedicine		38.1	38.1	100.0
Total		100.0	100.0	

Table 6. If you have used telemedicine at least once, how satisfied were you?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Very dissatisfied		23.9	23.9	23.9
Dissatisfied		7.1	7.1	31.0
Fair or acceptable satisfaction	45	39.8	39.8	70.8
Satisfied		23.0	23.0	93.8
Very satisfied		6.2	6.2	100.0
Total		100.0	100.0	

Table 7. If you have practiced telemedicine, did it help you to have better benefits with patients?

	Frequency	Percentage	Valid percentage	Cumulative percentage
I did not obtain any benefit in patients		27.4	27.4	27.4
I obtained very little benefit in patients		15.0	15.0	42.5
I obtained an acceptable benefit in patients	43	38.1	38.1	80.5
I obtained good benefits		15.9	15.9	96.5

I obtained excellent benefits		3.5	3.5	100.0
Total		100.0	100.0	

Table 8. According to your opinion, does telemedicine generate benefits in the value chain of Mexican healthcare institutions?

	Frequency	Percentage	Valid percentage	Cumulative percentage
None		2.7	2.7	2.7
Under		11.5	11.5	14.2
Medium	45	39.8	39.8	54.0
High	45	39.8	39.8	93.8
Very high		6.2	6.2	100.0
Total		100.0	100.0	

Table 9. According to your opinion, what would be the main benefits of implementing telemedicine in healthcare institutions?

	Frequency	Percentage
Reaching places that cannot be reached through the health center.		53.98
Specialized care for emergency patients located in remote or difficult to access areas.	46	40.71
Faster service	63	55.75
Increased patient satisfaction		23.01
Remote home care	45	39.82
Decrease in overall mortality		6.19
Depopulation of health care facilities' on-call services		7.96
Clinical effectiveness in pandemics		40.71
Increase in healthcare profits		21.24
Better positioning with respect to the competition		12.39
Improved service processes		42.48
Cost reduction		26.55
Utility to provide regular guidance and advice in some medical specialties.		34.51

Do you know of health institutions that are implementing telemedicine in Mexico?

	Frequency	Percentage	Valid percentage	Cumulative percentage

Between 1 and 3		44.2	44.2	44.2
Between 4 and 6		5.3	5.3	49.6
Between 7 and 10		1.8	1.8	51.3
More than 10 institutions		1.8	1.8	53.1
None		46.9	46.9	100.0
Total		100.0	100.0	

In your opinion, what would be the risks of implementing telemedicine for patient consultation?

	Frequency	Percentage
Economic		17.70
Errors in the determination of diagnoses	82	72.57
None		3.54
Loss of the doctor-patient relationship		77.88
Low effectiveness		29.20
Replacement of medical personnel		24.78
Information security	46	40.71

Table 12. What advantages do you find in telemedicine for patients?

	Frequency	Percentage
Comprehensive care from the very first moment		36.28
Faster diagnosis		23.89
Improved public health management in the event of pandemics		59.29
None		2.65
Do not share common areas with sick patients	43	38.05
No borders		56.64
Reduces the need for travel by patients and family members	86	76.11

Have you had telemedicine training?

	Frequency	Percentage	Valid percentage	Cumulative percentage
None		31.0	31.0	31.0
Little		42.5	42.5	73.5
Regular		18.6	18.6	92.0
Quite		8.0	8.0	100.0
Total		100.0	100.0	

Table 14. Your training in telemedicine has been in:

	Frequency	Percentage	Valid percentage	Cumulative percentage
Consulting		28.3	28.3	28.3
A formal undergraduate or graduate academic program		27.4	27.4	55.8
One or more conferences		30.1	30.1	85.8
One or more courses of more than 20 hours	5	4.4	4.4	90.3
One or more workshops of less than 20 hours		9.7	9.7	100.0
Total		100.0	100.0	

Table 15. How satisfied are you with the telemedicine training you have had?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Very dissatisfied		19.5	19.5	19.5
Dissatisfied		18.6	18.6	38.1
Fair or acceptable satisfaction		41.6	41.6	79.6
Satisfied		18.6	18.6	98.2
Very satisfied		1.8	1.8	100.0
Total		100.0	100.0	

Do you know of any higher education institutions that are training in telemedicine in Mexico?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Between 1 and 3		42.5	42.5	42.5
Between 4 and 6		9.7	9.7	52.2
Between 7 and 10		6.2	6.2	58.4
More than 10 institutions		1.8	1.8	60.2
None	45	39.8	39.8	100.0
Total		100.0	100.0	

How much do you know about telemedicine?

	Frequency	Percentage	Valid percentage	Cumulative percentage
Nothing		12.4	12.4	12.4
Little		52.2	52.2	64.6
Something		28.3	28.3	92.9
Quite		7.1	7.1	100.0
Total		100.0	100.0	

The survey was designed with the support of judges who are experts in the field, and its content validity was assessed by 21 judges from different national and international private and public institutions with vast experience in the technological area (Table 18).

Table 18. Data on the Competence of Judges in the medical area (n=21).

		Frequency	Percentage
Genre	Men		81.0 %
	Women		19.0 %
Education	Full Doctorate		52.3 %
	Incomplete doctorate	1	4.8 %
	Master's Degree		28.5 %
	Specialization		9.6 %
	Bachelor's Degree	1	4.8 %
		Media	D.E.
Age		48.90	12.69
Conferences by invitation		57.38	90.28
Level of experience as reviewer (1-4)		3.24	0.87
Years of experience	Teaching	16.62	9.20
	Research	15.33	9.41
Publications	Articles	23.05	20.00
	Books	2.19	4.08
	Chapters	6.52	7.42
	Papers	64.86	83.22
Continuing education	Courses	59.43	117.46

The reliability of the instrument was determined through the application of Cronbach's Alpha coefficient, whose value obtained shows that the survey values are adequate for internal consistency (Table 19).

Table 19. Cronbach's Alpha value of the instrument

Cronbach's alpha	N of elements
.860	

DISCUSSION

So far there are no studies that use telemedicine as a permanent teaching strategy in universities, however, some studies at the international level suggest that telemedicine could be used as an effective educational tool, such as the telemedicine program of the National University of Colombia that performs teleconsultations in more than 50 hospitals in the country, in specialties such as: internal medicine, pediatrics, psychiatry, dermatology, gynecology, orthopedics, cardiology, neurology, infectology, urology and otorhinolaryngology (Cáceres, Castro, Gómez & Puyuna, 2011).

Undergraduate students are immersed in a culture that fully involves technology so using ICT and telemedicine in particular can motivate them towards better learning and development of competencies in the medical area (Sarkar, 2012), as telemedicine provides the student with contact with multiple representations of reality, developing authentic tasks in a meaningful way in context and supports the collaborative construction of learning through social negotiation.

CONCLUSIONS

Advances in relation to ICT innovation have generated a society where technological knowledge is present in almost all environments of our daily lives, resulting in individuals ceasing to be digitally illiterate and promoting the assertive integration of technological strategies in all their activities, allowing a great growth in all areas of life, especially in the field of health.

Telemedicine has gradually been implemented as a support element for medical education. It is essential that medical schools and faculties nationwide implement didactic methodologies based on ICT in their curricula, in order to allow students easy access to a large number of clinical cases and training tools that strengthen their training, constantly supporting their self-learning and knowledge through academic stimuli, in favor of the development of skills and competencies helping in medical updating.

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