

Determinants of Telemedicine Implementation in Selected Hospitals of Iran

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Abstract— Background: For the successful implementation and optimal use of telemedicine technology, the success factors and necessary infrastructure such as broadband technology, tools and computer hardware, software update, remote communication systems, and training facilities have to be considered. Survey the feasibility of implementing telemedicine is the main purpose of the present study that was performed in selected hospitals of Iran in 2016.

Materials and Methods: This study was a practical research that was done in descriptive-analytic method. Selected hospitals of Iran constituted the study environment. Data collection tool was a questionnaire that contains five sections and 44 questions. Data were gathered by questionnaire of survey of physicians and nurses as the main group of users of telemedicine technology from selected hospitals.

Results: Based on the findings, there was no technical infrastructure (19%) and financial requirements (18/4%), for telemedicine implementation. Also, problems with insurance and reimbursement of costs and shortage of technical staff, discussed as the main obstacles and medical staff resistance and licensing problems were considered as the insignificant obstacles to the implementation of this technology.

Conclusion: Despite the existence of organizational and cultural elements and support the executive and specialists from the implementing telemedicine in hospitals, there are obstacles such as lack of video conferencing equipment, lack of broadband internet, and insufficient funds to purchase necessary systems and therefore selected hospitals are not able to provide telemedicine services.

Keywords-Telemedicine, Implementation, Determinants, Hospital

I. INTRODUCTION

In recent years, health care organizations to compete with other organizations and obtain an acceptable score in audits need to attract more customers and also have consent of them. For consumer satisfaction in the field of health, healthcare organizations should increase the quality of services. One way to improve the quality of health services is using of the achievements in the field of updated information technology and information systems to provide health care (1). The purpose of health care organizations from applying these achievements and use of health care systems to improve

workflow, reduce costs and ultimately improve the quality of care (2).

Rapid advances in information technology are faced with fundamental changes in life and workplaces around the world (3). On the other hand, access of patients to health care and the need for the physical presence of the provider and the patient in one place, including the challenges that health care organizations have faced in the last decade. With recent advances in information and communication technology and to enhance the quality and speed of healthcare delivery to patients, telemedicine technology has been proposed as a new approach to solve these problems (4).

Telemedicine is a general term in the field of health information technology in different ways to maintain or improve the exchange of medical information on the patient's health status. Some of these methods could be noted as electronic exchange of radiological images, Tele-monitoring, medication reminder by sending an electronic message between doctors and patients, diagnosis and treatment results via video conferencing (6,5). Lack of healthcare centers and specialists providing care in remote areas, needing to quickly delivery for some emergency patients, and for saving time and costs, are the important reasons to implement and use of telemedicine in developing countries (8, 7).

For the successful implementation and optimal use of telemedicine technology, the necessary infrastructures and success factors such as broadband, update software and hardware, telecommunicate of images, and virtual training should be considered (9) and by using multimedia tools and update technologies (PACS¹, CPOE², and management dashboards) arise a time and place independence in the field of medical services (10). Four factors are involved in telemedicine success: motivation of healthcare providers, appropriate technical infrastructure, continuous investment and experienced personnel (11). According to the urgent need of telemedicine technology to high-speed Internet, low-bandwidth is a common problem in developing countries and Iran. The problems faced by developing countries for the use of telemedicine discussed in the literature that one of these

¹ Picture Archiving and Communicating System

² Computer-aided Physician Order Entry

problems can be pointed to network stability, lack of access to the Internet outside the major cities and the high cost of Internet access (12-14).

In the other hand, these countries faced with great difficulty to providing medical services and healthcare due to lack of technical infrastructure and experts. According to investigations, the three countries America, England and Canada among the primary countries in providing healthcare services with using of telemedicine technology. For example, %60 of United States medical institutions usage of telemedicine technology (however just provide remote consultation). These numbers are %57 in UK and %45 in Canada (13). In a telemedicine project that is underway at the University of Texas in United States, a trained nurse who is only health officials in remote town, has communicate with specialists at the University Hospital via special examination and diagnosis devices and this way will prevent a few trips from the city residents (14).

According to what we said, hospitals in the country should initially consider implementing the use of telemedicine technology for providing infrastructure such as technical issues, context of telecommunications, audio and video technology and Internet network. Also, our country by having many rural areas is facing a shortage of medical specialists in various fields, and this is going directly refer to specialists and generally the patient who has problems. Given the importance, advantages, features and difficulty of telemedicine implementation, this study review the determinants and feasibility of telemedicine implementation in selected hospitals of Iran.

II. METHODS

Current research was descriptive - analytical study which was done in 2016. Research community was located at general hospitals in 5 cities in North, South, East, West and Centre of Iran that two hospitals were studied from each city. Data were gathered by questionnaire of survey of physicians and nurses as the main group of users of telemedicine technology from selected hospitals. Stratified random sampling was used with proportional allocation. In this way that in first step we estimated the total number of physicians and nurses in selected hospitals (700 persons) and then with using the following formula we select totally 250 persons were recruited from five hospitals (table 1).

$$n_h = \frac{N_h}{N} * n$$

In the above formula, N is total number (700 persons), N_h : existence number in each hospital, n: number of selected samples and n_h : number of samples that selected of each hospital.

Instrument of data collection was a researcher-made questionnaire that was designed by review of related articles (5, 9, 10, 11, 14). The questionnaire included 5 parts and 44 questions that the first part containing demographic information (3 questions), second part containing questions

related to technical infrastructure required for telemedicine technology (10 questions), third part containing questions related to financial requirements for the implementation of telemedicine technologies (9 questions), the fourth part containing questions related to organizational and cultural factors in implementation of telemedicine technologies (11 questions), and fifth part containing questions related to implementation obstacles of telemedicine technology (12 questions).

TABLE 1 Number of samples from selected hospitals

City	Hospital	Total number	Number of samples
Rasht	17 Shahrivar	60	22
	Amiralmomenin	67	24
Tehran	Emamkhomeyni	84	30
	Shohada	95	34
Zabol	Amiralmomenin	65	23
	Emamkhomeyni	70	25
Bandarabbas	Dr. Shariati	56	20
	Sh.Mohammadi	62	22
Kermanshah	Emamkhomeyni	68	24
	Emamreza	73	26
Total		700	250

The validity of the content and structure of the used tools was measured by four experts of health information management. The internal consistency reliability was determined to using Cronbach's alpha (0.83). For analyze of telemedicine implementation obstacles in SPSS software, options of questions were scored (Yes: 3, partly: 2 and No: 1). The results of data analysis by using of descriptive statistics (mean and standard deviation) and inferential statistics (Pearson correlation coefficient, t-test and ANOVA) were presented in the form of tables and graphs.

III. RESULTS

According to current research findings, insurance problems and repay the low costs and lack of medical and technical staff were trivial to implement this technology as the main obstacles and resistance in barriers to licensing problems. Regarding to use of telemedicine by the physician specialty and department of studied hospitals was priorities the providing training, counseling, admission, care and surgery telemedicine technology (Table 2).

Results related to the IT department employee access to technical infrastructure telemedicine technology showed that all centers surveyed had access to the Internet and the access to all the units have been possible. But the possibility of communication was low between different parts of the system

in some hospitals. Also, most hospitals are not equipped in fiber optic communication systems, copper cable, small electromagnetic waves and also the medical equipment to implement video conferencing. The results showed that costs was not allocated to ADSL, funding to hire technical staff and funding for maintenance and updates telemedicine systems in most surveyed hospitals. According to research findings, the Board of Directors, Chief Executive Officer and doctors are supported in most evaluated centers of Telemedicine implementation. Figure 1 show the various requirements and response percent for implementing telemedicine in selected hospitals.

TABLE 2 Obstacles to the implementation of telemedicine

Obstacles	Yes	Partly	No
Lack of technical staff	80.4	19.6	0
The initial cost	82.6	15.2	2.2
Insurance and repayments problems	89.1	6.4	2.2
Current costs	71.7	17.4	8.7
Lack of medical staff	56.5	35.7	7.8
Medical staff resistance	26.1	56.5	17.4
Education	69.6	28.3	2.2
Attitude of the personnel	41.3	47.8	10.9
Time limitation	32.6	52.2	13
Confidentiality	32.6	47.8	17.4
Competition	23.9	63.3	23.9

IV. DISCUSSION

Current advances have led to change in information technology and telecommunications in most aspects of human life. These changes have also considerable impact on the delivery of health care and medical science and caused new needs and new services in this area. One of these important changes is telemedicine technology (15). The aim of this study was to evaluate the necessary infrastructure to implement telemedicine technology in the Hospital.

One of the strong points in selected hospitals was the favorable administrative and organizational culture for implementing telemedicine. According to the role of senior managers in the development of policies and strategic plans, a comprehensive understanding of these managers to design and policy development related of telemedicine technology is necessary. Therefore, we can say that one of the important obstacles to the implementation of telemedicine is cultural factors such as the health care provider’s and patient resistance, which these problems have been fixed in hospitals. Herein related study showed that the majority of surveyed people emphasize to the administrative culture for the successful implementation of telemedicine (11). Also, Kimberly et al, has pointed to the importance of organizational culture in 2015 and this factor was crucial to the successful telemedicine implementation (13).

Problems with insurance and reimbursement of costs and shortage of technical staff, discussed as the main obstacles and medical staff resistance and licensing problems were considered as the insignificant obstacles to the implementation of this technology. On the implementing of a new technology in organizations the initial investment and human and financial resources should be considered and combined with experienced and technical personnel because the equipment without appropriate and efficient people was not efficiency. Also, the formation of strategic teams and use of qualified consultants to carry out of telemedicine infrastructure field studies, creating the way for improving organizational culture and skills training to physicians and specialists in order to use of this technology to accelerate progress and implement telemedicine technology. Investments and use of up-to-date health care delivery systems can improve the delivery of healthcare and can also be helpful to return of investment. Cook in a study that was consistent with the findings of this study, point to the conclusion that use of telemedicine technology requires cost and funding, skilled workforce and administrative culture in health care organization and all issues related to these cases should be investigated and resolved (21).

Based on the current results of this study, the necessary technical infrastructure did not exist to implement telemedicine in study centers. Such basic infrastructure was not considered in the study centers as video conferencing, fiber optic and copper cable. From the perspective of most population of study, affecting factors on technical infrastructure needed did not have to technology telemedicine in reviewed hospitals. Given to importance of issue raised and

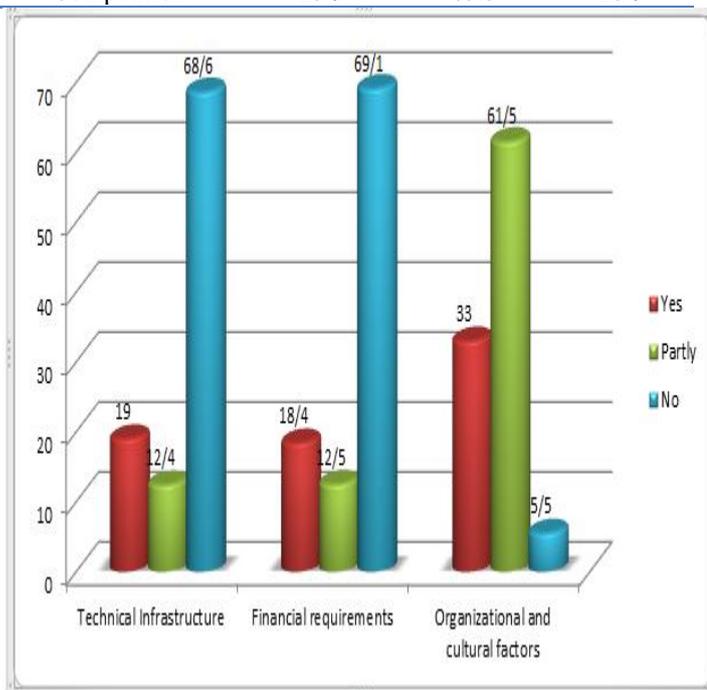


FIGURE 1 Response percent about various items for implementing telemedicine

according to that study centers were selected from all parts of the country and also according to the development plan and health systems in many hospitals in the country, is proposed that coincide with the goals related to health priorities in hospitals attention should necessary in infrastructure for the development of new technologies, especially remote medical. In a similar study, 85% of surveyed centers of Shiraz University Medical have video conferencing equipment and 15 percent of centers were not these facilities (16). Also, Mengistu et al, introduce in a similar study, obstacles to the widespread use of telemedicine to lack of resources, poor infrastructure telecommunications (broadband) human factors and organizational standards and policies and socio-economic issues. This study emphasizes that telemedicine cannot be successful in the absence of technical infrastructure and continue to his work (17).

This current study showed that necessary financial requirements should be considered to telemedicine implementation. In this field, Debnath et al showed that financial constraints, lack of infrastructure, concerns about the forensic and resistance to change were the important concerns to telemedicine implementation (18). Other similar study showed that the majority of experts, shortage of technical staff, initial costs, lack of medical staff and the reimbursement of insurance problems are obstacles on the establishment and development of this system in hospitals (19). The findings of the same study also showed that the most important obstacles in order to priority by the physician shortage of technical staff, initial cost, insurance problems and reimbursement, current costs and a shortage of medical staff (12).

V. CONCLUSION

Despite exist of organizational and cultural elements and support of executive and physicians from implementing telemedicine in selected hospitals, because of obstacles such as lack of video conferencing equipment, lack of broadband connectivity services and insufficient funds to purchase and implement the systems necessary to implement telemedicine, studied hospitals are not able to provide services telemedicine. Due to significant growth in the use of computer systems and Internet access in most health centers in the country, we can be claimed that with supply the said requirements and apply the appropriate policies, implement of telemedicine technology will be possible in the near future.

ACKNOWLEDGMENT

Not applicable

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