Assessment of telemedicine by physicians at Prince Sultan Military Medical City.

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Abstract

Background and Purpose: Telemedicine is the remote diagnosis and treatment of patients by means of telecommunications technology. The perception of physicians' determination on telemedicine, regarding its effectiveness, accessibility, and barriers that are challenging to them and their patients, was evaluated by employing these parameters for telemedicine application in Prince Sultan Military Medical City. Methods: Telemedicine was assessed by using a well-designed questionnaire which, was distributed during April 2015. 101 physicians belonging to 24 departments were involved. Results: Three quarters who were positively convenient and satisfied supported TMC effectiveness parameters. Similar records were observed in response to Accessibility services, Barriers and challenges but, felt technical, organizational, communicational and cultural difficulties. Demographic variables were significantly ($p \leq 0.018$, $p \leq 0.000$, $p \leq 0.021$, $p \leq 0.000$, $p \leq 0.033$ and $p \leq 0.027$) associated with TM quality and traditional care, patients more satisfied by TM, overall quality rate of TM, services access enhanced in TM, patient perception difficulties during TM and communication difficulties during tm with age, respectively; significantly ($p \leq 0.009$, $p \leq 0.021$, $p \leq 0.000$ and $p \leq 0.027$) associated with TM allows prompt intervention, overall quality rate of tm, services access enhanced in tm and experience communication difficulties during tm with gender, respectively; significantly ($p \leq 0.038$, $p \leq 0.004$, $p \leq 0.045$ and $p \leq 0.001$) associated with TM allows prompt intervention, TM provides psychological support, TM accepted by patients and time saving accessibility with the degree origin, respectively whilst, significantly ($p \leq 0.007$, $p \leq 0.007$, $p \leq 0.003$, $p \leq 0.002$, $p \leq 0.035$, $p \leq 0.048$ and $p \leq 0.034$) associated with technical quality of TM consultation, TM comfortability, TM allows prompt intervention, TM provides psychological support, TM accepted by patients, services access enhanced in TM and patients concerns with privacy and security with residency training, respectively. Conclusion: Although telemedicine is promising and Ministry of Health allocated a huge budget, but the practicing physicians still feel some drawbacks with concerning patients, regarding aspects of services and qualities, efficiency and barriers concerning full implementation measures.

Keywords: Telemedicine, Perception, Health Providers, Saudi Arabia.

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Introduction

Telemedicine (TMC) is the use of electronic information to communicate technologies to provide and support healthcare when distance separates the participants [1-3]. The Greek word "*Tele*" for "distance" and Latin word "*mederi*" for "to heal" refer to the origin of the previous explanation of TMC" [4]. "Healing by wire" was mentioned by Time magazine. It was thought to be "futuristic" and "experimental," initially but, it became a reality now [2,5]. There is increasing use of TMC in many countries, its basic concept are becoming more widely known within the medical profession and the specialists can view patients during examination without travelling of the patient to the medical center [5].

Telemedicine, a term coined in the 1970s, which literally means "healing at a distance", signifies the use of information and communication technologies (ICTs), to improve patient outcomes by increasing access to care and medical information. Recognizing that there is no one definitive definition of telemedicine the World Health Organization has adopted the following broad description: "The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of diseases and injuries, research and evaluation, and for the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities" [4,5].

Although the concept of TMC is centuries old, its adoption has been very slow due to multitude of barriers. History of TMC can be traced back to the mid to late 19th century when electrocardiograph data were transmitted over telephone wires [6,7]. TMC, in its modern form, started in the 1960s mainly in the military and space technology sectors [6,8]. Use of television in facilitating consultations between psychiatric specialists and general practitioners were early steps in TMC [9], and hospital expert medical advice transfer to medical centers [10].

Telemedicine was restricted to services delivered by physicians only, and telehealth services by other health professionals in general, but, for the purpose of this report, telemedicine and telehealth were synonymously and interchangeably used [11].

The developed countries routinely provide TMC services that mostly focus on diagnosis and clinical management whilst, low-income countries apply TMC to link health-care providers in tertiary care centers with referral hospitals specialists [12]. A variety of barriers do limit the implementation of low-cost TMC applications in underserved communities [13].

There is great potential improvising, service delivery and reduction in diagnoses variability as well as clinical and management of health care services [6,12]. In order to overcome these challenges telemedicine must be regulated by definitive and comprehensive guidelines, which are applied widely, ideally worldwide [14]. Concurrently, legislation governing confidentiality, privacy, access, and liability needs to be instituted [15].

The ultimate purpose of any medical care is to maintain or improve health and well-being. Thus, how clinical applications of TMC affect the quality of care and its outcomes is a central evaluative question. The literature on quality of care, the definition encompasses the link between the processes and the outcomes of care [16], although the emphasis in recent years has been on the latter. Many studies of health care quality also search for structural aspects of quality, and in recent years, traditional quality assessment and assurance concepts and strategies in health care have been powerfully reshaped by proponents of continuous quality improvement or total quality management [17].

Patient outcomes are generally considered to include not just desired endpoints of health and eventually, the integrated, longitudinal computer-based patient records should overcome some of the difficulties in securing satisfactory shorter-and longer-term outcomes data [18]. For example in diabetic patients self-management is not so effective in the long run, whereas peers can provide the kind of ongoing support that is needed, as has been reported by Wootton [19] on the ongoing availability of support. So, peer support initial assessment found improvements in symptom management, diet, blood pressure, body mass index, and blood sugar levels for many of those taking part in the programs, and psychiatric interviews conducted over videoconferencing were reliable for assessment and treatment recommendations [20]. In the field of pediatrics, parents and children supported by care providers reported that primary care school-based telehealth was an acceptable alternative to traditional health care delivery systems [21].

TMC applications have successfully improved the quality and accessibility of medical care by allowing distant providers to evaluate, diagnose, treat, and provide follow-up care to patients in less-economically developed countries [22-24], as efficient means can be provided [25-27].

Health professional demanding expert help can access specialist opinions through TMC [12,28,29] and thus reducing the distance travelled, expenses, time, and stress [22,27,30,31] whilst, rural practitioners are motivated to serve locally [32]. TMC network aids have shown to be effective tools for connecting remote sites [30,33] and overcoming regional barriers by reversing 'brain drain' migration of human capital [23,26]. Inter-country collaboration and networking would be in the right path [22,34] through distance learning and training [22,31,35,36]. Opportunities to learn and treat seldom faced diseases by developed nations health-care providers would be available [34,37,38] and they can improve their skills and provide better services [39].

Unfamiliarity with technology language barriers are issues that can be overcome by time but, practice of medical services outside the licensed jurisdiction is one of the other barrier [40], in addition to the patient's privacy could be threatened by transmitting their files through internet whilst, income level, ethnic origin, and geographical locations do appear as access to health care determinants [41]. Developing countries barriers were highlighted as cost, inadequate or underdeveloped infrastructure, and a shortage of technical expertise and support would limit the necessary TMC technical expertise level of application [42] that demand developing these structures wide spreading and implementation [43].

Developed countries populations greater resources to access these health services with better infrastructures, whilst legal issues are important in implementation of TMC [44].

In the present study, physicians were targeted to determine their perception of TMC, regarding its effectiveness, accessibility, and the barriers and challenges facing them and their patients. The main objectives were to measure the effectiveness of TMC application in the different departments of PSMMC, employing selected parameters that challenged and faced both professionals and patients utilizing TMC.

Materials and Methods

PSMMC, formerly known the Riyadh Military Hospital (RMH) is considered as one of the most advanced medical centers in the Middle East. It is located in Riyadh city, the capital of Saudi Arabia. The hospital has a capacity of more than 1,200 beds and employs over 12,000 staff including more than 1400 physicians with different, advanced specialties. PSMMC provides health care services to the members and the families of the Saudi Arabian armed forces. TMC has been established since 2003 in PSMMC, the utilization of this unique service is not to optimal among various health care professionals. PSMMC administration has created a state-of-art infrastructure to operate this service in an efficient and effective way to help the health care professionals in managing their patients by various methods.

Study design

The assessment of TMC program was done by using a well-designed questionnaire (Appendix 1) to determine the basic attitude/opinion of physicians toward the ongoing TMC program in PSMMC. The questionnaire consisted of demographic information as well as questions about effectiveness of TMC service as perceived by the physicians, in PSMMC. The assessment was also aimed to identify information about accessibility and quality of health care. Last part of the questionnaire dealt with barriers and challenges faced by TMC program at PSMMC and the comments of the participant.

Study population

The healthcare professionals in PSMMC, target population is the physicians working in PSMMC. A purposive non-random sample of physicians was recruited to participate in this study as the survey required prior experience with TMC and the

researcher allocated the departments that have activated these services and then considered the physicians there who have been utilizing it to give their perceptions based on their actual experience. The sample size calculated by Raosoft with 5% margin of error, and confidence level 95% is 302 physicians from the following departments: Radiology, Neurosurgery, Pathology, ORL Head & Neck Surgery, Dentistry, Obstetrics and Gynecology, Medicine, Ophthalmology, Accident and Emergency, Family & Community Medicine, Surgery, Psychiatry, Oncology, Endocrinology, Nephrology, Cardiology Dentistry, Urology, Rehabilitation, Physiotherapy, Home Care, Occupational Therapy, Nursing department.

Data collection

The researcher distributed the questionnaire personally during the month of April 2015.

Inclusion criteria

Physicians working at the Prince Sultan Military Medical City (PSMMC), involved in TMC and willing to participate in the study were included in the study.

Outcome Measurements

Statistical analysis

The Data were analyzed using IBM SPSS Statistics 20 software for Windows (IBM Corporation, Licensors 1989, 2011). Descriptive statistics such as frequencies, means and standard deviations were used to characterize the sample and describe Physicians' experiences. The associations and relationships between Physicians socio-demographic characteristics and experiences was examined by Chi square analyses. The levels of significance of the results of this study will be used for interpretation when α=5 (P-value $\leq \alpha$).

Delimitations of the study

The delimitations of the study are the awareness, knowledge and the utilization of TMC. Most of health professionals are not aware about availability of TMC or its role in the first place. This might affect their responses, as without the awareness of the presence of this service and how it can be utilized by the healthcare professionals, they might not use it efficiently, in optimal ways, delivering these health services.

Results

A total of 101 physicians participated in the study and completed the questionnaire that was distributed to the different departments of PSMMC.

General and demographic information

Male physicians, middle-aged, with Saudi nationality, 15 years of experience, Arabic speaking citizens, consultants, outside Saudi Arabia degrees, outside Saudi Arabia residency training and no Another Health Facility TMC prior experience, were a majority of nearly or more than two thirds, with leading majorities in group specialties of Medicine and Surgery.

The general and demographic results showed that different age group of physicians at Prince Sultan Military Medical City (PSMMC) has participated in the study. Physicians who were middle-aged had participated majorly, with more than half, followed by the junior ones, then their senior colleagues, respectively (Table 1).

Gender analysis showed that male physicians participated in the TMC program majorly by 77% as compared to female physicians (23%) (Table 1). Saudi physicians were majority (65%) and those who were participating in the study wee commonly with less than 15 years of experience (70.2%). Only 2.6% of physician having experience of more than 30 years had participated in this study. Rest all physicians were between 16-30 years of experience (Table 1).

Results also showed that the Arabic speaking citizen physicians (84.5%) had participated than the other Arabs. The participation of English speaking doctors were comparatively very less (14.4%), whereas other than those were negligible (only 1%) (Table 1). According to job title, consultants (63.3%) were a majority, followed by registrars (11.2%) and senior registrars (9.2%) (Table 1).

More than 17 specialties (Five groups) were practicing TMC at PSMMC, and the leading majorities were the physicians

Table 1. *General and demographic information of the study based on the questionnaire.*

Variable Parameter	Values	Frequency	Percentage
Age Group (years) (n=94)	20-39	27	28.9
	40-59	56	59.8
	60 and above	11	11.7
Gender (n=100)	Male	77	77
	Female	23	23
Nationality (n=94)	Saudi	65	69.1
	Non-Saudi	29	30.9
Years of Experience (n=77)	5 years and less	15	19.5
	6-10 years	19	24.7
	11- 15 years	20	26
	16- 20 years	15	19.5
	21-25 years	4	5.2
	26-30 years	2	2.6
	> 30 years	2	2.6
Mother tongue (n=97)	Arabic	82	84.5
	English	14	14.4
	Other	1	1
Job Title (n=98)	Consultant	62	63.3
	Registrar	11	11.2
	Senior Registrar	9	9.2
	Other	16	16.3
Specialty (n=100)	Medicine, Community, Pediatrics, Occupational Ophthalmology, Nephrology-Urology, Oncology, Pathology, Psychiatry, Accident and emergency	53	53
	Surgery, ORL Head and Neck Surgery and Neurosurgery	21	21
	Radiology	11	11
	Obstetrics and Gynecology	4	4
	Rehabilitation	2	2
	Others	9	9
Degree obtained from (n=97)	Saudi Arabia	37	38.1
	Others	60	61.9
Residency training (n=94)	Saudi Arabia	31	33
	Outside Saudi Arabia	63	67
TMC AHF (n=100)	Yes	23	23
	No	77	77

of Medicine group (53%) and Surgery group (21%) followed by Radiology (11%), Obstetrics and Gynecology (4%) and Rehabilitation (2%), (Table 1).

Table 1 also showed that nearly two-thirds (61.9%) had obtained their degrees from outside Saudi Arabia, whilst 38.1% obtained them from Saudi Arabia. Similarly, residency training showed that 67% of the physicians obtained it from outside Saudi Arabia, whilst 33% got it from inside (Table 1). Nearly 77% of the physicians did not have any prior experience of TMC programs, from Another Health Facility, whilst only 23% had (Table 1).

Effectiveness of TMC as perceived by physicians

The study showed that, 55.8% of the physicians rated the technical quality of consultation as fair, 31.6% good, 8.4% excellent and 4.2% as poor (Table 2). Nearly half of the physicians (47.4%) were of the opinion that TMC deliver the same quality of care as compared to the traditional care, while 35.8% rated it, not as good as traditional care. Only 9.5% of the physicians rated it as better option in quality of care, compared to traditional care and 7.4%, were not sure (Table 2).

More than two thirds of the physicians (67.7%) were somewhat comfortable with TMC consultation, whilst, 16.1%, were very comfortable. Very less 8.6% were somewhat uncomfortable and only 7.5% were very uncomfortable (Table 2). TMC consultation improves the patient health according to more than two thirds (72.6%) and more than a quarter (26.3%) believed that TMC consultation does not affect or change the health status of the patient. However, 1.1% believed that TMC consultation had a negative effect on the patient health (Table 2).

Regarding that TMC supported reduction in the duration of surgery, maximum number of physicians have got nearly similar scores (47.9% and 43.8%) in their disagreement and agreement, respectively, whilst, very few have scored equal (4.1%) in their extreme, strong disagreement and strong agreement (Table 2).

A majority of the participants (77.2%) agreed that TMC could overcome the inconvenience of going to a doctor, against 18.5% who disagreed, whilst the very few extremes, who strongly agreed and those who strongly disagreed, have got equal (2.2%) scores (Table 2).

A majority of the participants (86%) agreed that TMC allowed prompt intervention, against 7.5% who disagreed, whilst the very few extremes, who strongly agreed and those who strongly disagreed, have got equal (3.2%) scores (Table 2).

A majority of the participants (87.1%) agreed that TMC could provide psychological support, against 8.6% who disagreed, whilst the few extremes, who strongly agreed have got 3.2% and those who strongly disagreed, have got only 1.1% (Table 2).

A majority of the participants (88.4%) agreed that TMC was accepted by patients, against 6.3% who disagreed, whilst the few extremes, who strongly agreed have got only 2.1% and those who strongly disagreed, have got 3.2% (Table 2).

Regarding that patients were more satisfied by TMC, compared to face to face consultations, those who agreed scored 46.3%, whilst those who disagreed scored 37.9%. Those who strongly disagreed 15.8% (Table 2).

A majority (more than 3 quarters) of the participants (75.5%) agreed that TMC enhanced privacy and security of data, against 21.3% who disagreed, whilst the few extremes, who strongly agreed have got 2.1% and those who strongly disagreed, have only 1.1% (Table 2).

A majority (nearly 3 quarters) of the participants (71%) rated the overall quality of TMC as Fair, against 11.8% who rated it as poor, whilst 10.8% rated it as good and 6.5% rated TMC as excellent (Table 2).

Accessibility within TMC Services

With respect to the query that TMC can enhance access to health care services, a majority (nearly 2 thirds) of the participants (64.2%) stated 'Yes, to some extent' whilst, 20% stated 'Yes, Definitely'. Those who opposed this scored 14.7% for 'No, don't think so' statement and only 1.1% for 'Not at all' statement (Table 3).

Regarding the query that TMC is more convenient than direct consultation, 40.4% stated 'Yes, more convenient' whilst, nearly equal (42.6%) to it, stated 'About the same'. Those who opposed this scored 17% for 'No, less convenient' statement (Table 3).

With respect to patients feeling difficulties during TMC, a majority of about three quarters (74.7%) of the clinicians stated 'Yes, some difficulty' whilst, more than one fifth (20.9%), who opposed this, stated 'No, not at all'. Few physicians (4.4%) stated 'Yes, much difficulty' (Table 3).

Regarding patients worries about their privacy during TMC, a majority (nearly 3 quarters) of the participants (73.1%) stated 'Yes, slightly worried' and 9.7% admitted 'Yes, worried', whilst, 17.2% stated 'Not worried' (Table 3).

Regarding that TMC saved time, a nearly two thirds majority (62.4%) said 'Yes' and less than a third (32.3%) said 'No' whilst, few (5.4%) said 'Almost the same' (Table 3).

Barriers and challenges faced by physicians utilizing TMC

Regarding technical difficulties that might affect the quality of care by TMC, a majority of 83% of the participants acknowledged 'Sometimes' and 11.7% admitted 'Often', whilst, 5.3% opposed it by stating 'Not at all' (Table 4).

Regarding Organizational difficulties for TMC, a majority of 81.9% of the participants acknowledged 'Sometimes' and 13.8% admitted 'Often', whilst, 4.3% opposed it by stating 'Not at all' (Table 4).

Regarding Communication difficulties during TMC, a majority of 87% of the participants acknowledged 'Sometimes' and 8.7% admitted 'Often', whilst, 4.3% opposed it by stating 'Not at all' (Table 4).

Regarding Cultural issues that might affect the quality of care, a majority of 79.3% of the participants acknowledged 'Sometimes' and 7.6% admitted 'Often', whilst, 13% opposed it by stating 'Not at all' (Table 4).

Regarding that TMC practice can affect the normal functioning of Health Care professionals, a majority of 53.8% said 'Yes' and a slightly less (46.2%) said 'No' (Table 4).

Table 2. *Effectiveness of TMC as perceived by physician based on questionnaire.*

Parameters	Effectiveness Values	Frequency	Valid Percent
Technical Quality (n=95)	Excellent	8	8.4
	Good	30	31.6
	Fair	53	55.8
	Poor	4	4.2
Quality of care delivered (n=95)	Better	9	9.5
	About the same	45	47.4
	Not as good	34	35.8
	Not sure	7	7.4
Comfortability during TMC (n=93)	Yes, very comfortable	15	16.1
	Yes somewhat	63	67.7
	No, somewhat uncomfortable	8	8.6
	No, very uncomfortable	7	7.5
Feeling that TMC consultation influences the health status of patients (n=95)	Improved health	69	72.6
	No change	25	26.3
	Negative effects on health	1	1.1
TMC can reduce the duration of surgery (n=73)	Strongly disagree	3	4.1
	Disagree	35	47.9
	Agree	32	43.8
	Strongly agree	3	4.1
TMC can overcome the inconvenience of going to doctor (n=92)	Strongly disagree	2	2.2
	Disagree	17	18.5
	Agree	71	77.2
	Strongly agree	2	2.2
TMC allows prompt intervention (n=93)	Strongly disagree	3	3.2
	Disagree	7	7.5
	Agree	80	86
	Strongly agree	3	3.2
TMC can provide psychological support (n=93)	Strongly disagree	1	1.1
	Disagree	8	8.6
	Agree	81	87.1
	Strongly agree	3	3.2
TMC accepted by patients (n=95)	Strongly disagree	3	3.2
	Disagree	6	6.3
	Agree	84	88.4
	Strongly agree	2	2.1
Patients more satisfied by TM as compared to face to face consultations (n=95)	Strongly disagree	15	15.8
	Disagree	36	37.9
	Agree	44	46.3
TMC enhances privacy and security of data (n=94)	Strongly disagree	1	1.1
	Disagree	20	21.3
	Agree	71	75.5
	Strongly agree	2	2.1
Rate the overall quality of TMC (n=93) k	Excellent	6	6.5
	Good	10	10.8
	Fair	66	71
	Poor	11	11.8

Regarding Patients expressions concerning their privacy and security issues, a majority of 59.1% of the participants acknowledged 'Not at all' whilst, 37.6% admitted 'Sometimes' and 3.2% opposed it by stating 'Often' (Table 4).

Correlation of age of the participants and implementation of TMC

Based on statistical analysis of the age variable in correlation with the effectiveness, barriers and accessibility of TMC, as perceived by participants it was found (Table 5) that the parameters (5.1, 5.2, 5.3, 5.4, 5.5 and 5.6) were directly associated with the age with high significance ($p \leq 0.018$, $p \leq 0.000$, $p \leq 0.021$, $p \leq 0.000$, $p \leq 0.033$ and $p \leq 0.027$, respectively). Whereas no significant associations were found between the age of the physicians and the other parameters of effectiveness, barriers and accessibility of TMC.

Table 3. *Accessibility within TMC Services based on the questionnaire.*

Parameters	Accessibility Values	Frequency	Valid Percentage
Can TMC enhance access to health care services? (n=95)	Yes Definitely	19	20
	Yes to some extent	61	64.2
	No don't think so	14	14.7
	Not at all	1	1.1
Is TMC more convenient than direct consultation? (n=94)	Yes more convenient	38	40.4
	About the same	40	42.6
	No less convenient	16	17
Do patients feel difficulties during TMC? (n=91)	No not at all	19	20.9
	Yes some difficulty	68	74.7
	Yes much difficulty	4	4.4
Do patients worry about their privacy during TMC? (n=93)	Yes worried	9	9.7
	Yes slightly worried	68	73.1
	Not worried	16	17.2
Does TMC save time? (n=93)	Yes	58	62.4
	No	30	32.3
	Almost the same	5	5.4

Correlation of gender of the participants and implementation of TMC

Significant associations between the gender and the effectiveness, barriers and accessibility of TMC were found (Table 6) in the parameters (6.1, 6.2, 6.3 and 6.4) with high significance ($p \leq 0.009$, $p \leq 0.021$, $p \leq 0.000$ and $p \leq 0.027$, respectively). Males were predominantly associated with the significant parameters than the females. Whereas, no significant correlations were observed among the other parameters of the study.

Correlation of origin of degree of the participants and implementation of TMC

The association between the degree of origin of the participants and TM implementation factors, effectiveness, barriers and accessibility (Table 7), showed that the parameters (7.1, 7.2, 7.3 and 7.4) were of high significance ($p \leq 0.038$, $p \leq 0.004$, $p \leq 0.045$ and $p \leq 0.001$, respectively). Whereas no significant associations were found in the remaining parameters for effectiveness, barriers and accessibility.

Correlation of participant's place of residency training (within and outside the Kingdom) and implementation of TMC

Cross tabulation analysis (Table 8) for the association between the residency training of the participants and the effectiveness, barriers and accessibility of TMC showed that the parameters (8.1, 8.2, 8.3, 8.4, 8.5, 8.6 and 8.7) were directly associated with the residency training with high significance ($p \leq 0.007$, $p \leq 0.007$, $p \leq 0.003$, $p \leq 0.002$, $p \leq 0.035$, $p \leq 0.048$ and $p \leq 0.034$, respectively). Whereas no significant associations were found between the residency training of the physicians and the other parameters of effectiveness, barriers and accessibility of TMC.

Discussion

The demographic information of study participants at PSMMC

***Table 4**. Barriers and challenges faced by physicians utilizing TMC based on the questionnaire.*

Barriers and challenges	Values	Frequency	Valid Percent
Technical difficulties that might affect the quality of care by TMC (n=94)	Not at all	5	5.3
	Sometimes	78	83
	Often	11	11.7
Organizational difficulties for TMC (n=94)	Not at all	4	4.3
	Sometimes	77	81.9
	Often	13	13.8
Communication difficulties during TMC (n=92)	Not at all	4	4.3
	Sometimes	80	87
	Often	8	8.7
Cultural issues that might affect the quality of care (n=92)	Not at all	12	13
	Sometimes	73	79.3
	Often	7	7.6
Can TMC practice affects the normal functioning of Health Care professionals? (n=93)	Yes	50	53.8
	NO	43	46.2
Patients expressions concerning their privacy and security issues (n=93)	Not at all	55	59.1
	Sometimes	35	37.6
	Often	3	3.2

***Table 5.** Correlation of age of the participants and implementation of TMC.*

5.1 Age in Years Vs TM Quality and Traditional care								
Values	Better	About the same	Not as good	Not Sure	Total	**Chi-Square Analysis**		
Total	8	43	32	6	89	Value	df	Significance
Percentage	9.00%	48.30%	36.00%	6.70%	100.00%	15.289	6	0.018
5.2 Age in Years Vs Patients more satisfied by TM								
Values	Strongly disagree	Disagree	Agree	Total	**Chi-Square Analysis**			
Total	13	35	42	90	Value	df	Significance	
Percentage	14.40%	38.90%	46.70%	100.00%	25.582	6	0	
5.3 Age in Years Vs Overall Quality Rate of TM								
Values	Excellent	Good	Fair	Poor	Total	**Chi-Square Analysis**		
Total	5	10	64	9	88	Value	df	Significance
Percentage	5.70%	11.40%	72.70%	10.20%	100.00%	14.927	6	0.021
5.4 Age in Years vs Services Access Enhanced in TM								
Values	Yes, definitely	Yes, to some extent	No, I don't think so	Not at all	Total	**Chi-Square Analysis**		
Total	17	59	13	1	90	Value	df	Significance
Percentage	18.90%	65.60%	14.40%	1.10%	100.00%	27.727	6	0
5.5 Age in Years Vs Patient Perception Difficulties During TM								
Values	No, not at all	Yes, they had some difficulty	Yes they had much difficulty	Total	**Chi-Square Analysis**			
Total	19	66	3	88	Value	df	Significance	
Percentage	21.60%	75.00%	3.40%	100.00%	10.456	6	0.033	
5.6 Age in Years Vs Communication Difficulties during TM								
Values	Not at all	Sometimes	Often	Total	**Chi-Square Analysis**			
Total	4	76	7	87	Value	df	Significance	
Percentage	4.60%	87.40%	8.00%	100.00%	11.006	4	0.027	

showed that TMC has been practiced by physicians of all age groups with maximum number of participants in the range 40-59 years age group. Also based on this study it is evident that TMC is participated majorly by Saudi clinicians who were having a 6 to 15 years of experience. Preference of TMC majorly by male clinicians, was also observed in various other studies [45]. As the study has been practiced majorly by the native Arabs it is observed that Arabic speaking clinicians who were educated and trained abroad have taken up TMC in a better way. Among the clinicians, consultants, of all the departments have practiced TMC, however the medicine, surgery and radiology department clinicians were more involved in TMC. It is also interesting to see that clinicians who have no prior experience in TMC have performed appreciably in their participation in this study. Outcome of the demographic information of this study was coinciding with similar previous studies that implemented TMC in eastern Saudi Arabia [46].

The effectiveness of TMC as perceived by physicians was found more positively fair in their responses to the query of technical quality, as more than three quarters of the clinicians presumed fairness and goodness of TMC practice. Whereas, the responses to quality of patient care reflected mixed opinions in either TMC or the conventional approach. It is very interesting to see that large numbers of physicians were convenient and comfortable with the TMC approach and its influence in improving health care. 'Reduction in duration of surgery' when implementing TMC was both agreed and disagreed about, equally, by clinicians. A strong positive impression was observed among clinicians that TMC can influence the patient

Table 6. *Correlation of gender of the participants and implementation of TMC.*

6.1 Gender Vs TM Allows Prompt Intervention								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	3	7	80	3	93	Value	df	Significance
Percentage	3.20%	7.50%	86.00%	3.20%	100.00%	11.591	6	0.009
6.2 Gender Vs Overall Quality Rate of TM								
Values	Excellent	Good	Fair	Poor	Total	**Chi-Square Analysis**		
Total	6	10	66	11	93	Value	df	Significance
Percentage	6.50%	10.80%	71.00%	11.80%	100.00%	14.927	6	0.021
6.3 Gender Vs Services Access Enhanced in TM								
Values	Yes, definitely	Yes, to some extent	No, I don't think so	Not at all	Total	**Chi-Square Analysis**		
Total	17	58	11	0	86	Value	df	Significance
Percentage	19.77%	67.44%	12.79%	0.00%	100.00%	27.727	6	0
6.4 Gender Vs Experience Communication Difficulties during TM								
Values	Not at all	Sometimes	Often	Total	**Chi-Square Analysis**			
Total	4	74	5	83	Value	df	Significance	
Percentage	4.82%	89.16%	6.02%	100.00%	11.006	4	0.027	

Table 7. *Correlation of Origin of degree of the participants and implementation of TMC.*

7.1 Degree Origin Vs TM Allows Prompt Intervention								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	3	7	79	3	92	Value	df	Significance
Percentage	3.30%	7.60%	85.90%	3.30%	100.00%	8.435	3	0.038
7.2 Degree Origin Vs TM Provides Psychological Support								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	1	8	80	3	92	Value	df	Significance
Percentage	1.10%	8.70%	87.00%	3.30%	100.00%	13.276	4	0.004
7.3 Degree Origin Vs TM Accepted by Patients								
Values	Yes, definitely	Yes, to some extent	No, I don't think so	Not at all	Total	**Chi-Square Analysis**		
Total	5	6	59	3	73	Value	df	Significance
Percentage	6.80%	8.20%	80.80%	4.10%	100.00%	8.031	4	0.045
7.4 Degree Origin Vs Time saving Accessibility								
Values	Not at all	Sometimes	Often	Total	**Chi-Square Analysis**			
Total	56	30	5	91	Value	df	Significance	
Percentage	61.50%	33.00%	5.50%	100.00%	14.087	2	0.001	

care by overcoming the inconvenience of going to doctor and also allow prompt intervention in emergency conditions. Also a majority of clinicians accepted that TMC could provide psychological support to the patients. Doctors also were confident, as more than three quarters of them were sure about patients' acceptance and satisfaction with TMC. The privacy and security of clinical data was found to be well maintained by TMC than conventional treatment whilst, the perception of the overall quality of tele-medical treatment was graded as fair. This response of the clinicians to TMC health care might open up a positive approach on its implementation [47].

There were mixed responses to the accessibility of TMC services among both clinicians and patients. More than three quarters of the clinicians realized that TMC could enhance access of patients to health care services. Previous studies have concluded and supported this [46-48]. About three quarters of the clinicians realized that TMC was more convenient, but they felt some difficulties, even problems, concerning the patients in its implementation. In addition to this, patients also might have been worried to some extent about their privacy. These difficulties, problems and patient privacy could be overcome in the near future by more practice and implementation of TMC in all medical departments by all physicians. Difficulties in TMC application has been reported in the findings of Rogrove et al. [49]. With respect to all the previous notations about the difficulties and worries of the participants, concerning their patients, it is interesting to see that nearly two thirds affirmed that TMC could save time. This has been reported by previous works [50].

The technical difficulties, organizational difficulties, communication difficulties and cultural issues were found to be the major barriers and challenges faced by the physicians in implementation of TMC. It was found that the majority (more than three quarters) of them had difficulties in dealing with patients through TMC. Even though, the majority of clinicians being Arabs (Arabic was their mothers' tongue) and accordingly, they were not having any language barriers, more than three quarters sometimes faced communication difficulties. Whilst, a majority, scoring more than three quarters, believed that cultural issues would affect the quality of care given by TMC. These notations have extensively been discussed by previous investigators [51].

Correlation of age range groups showed that the major (40-59 y, 56, 59.8%) one has reflected the effectiveness of TMC by having a positive association with the provided Quality of Care in TMC, Satisfaction of patients, Overall quality of TMC, Enhancement of Service access, Patients perception of

Table 8. *Correlation of participant's place of training (within and outside the Kingdom) and implementation of TMC.*

8.1 Residency Training Vs Technical Quality of TM Consultation								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	7	29	50	3	89	Value	df	Significance
Percentage	7.90%	32.60%	56.20%	3.40%	100.00%	12.081	3	0.007
8.2 Residency Training Vs TM Comfortability								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	13	60	8	6	87	Value	df	Significance
Percentage	14.90%	69.00%	9.20%	6.90%	100.00%	12.085	3	0.007
8.3 Residency Training Vs TM Allows Prompt Intervention								
Values	Yes, definitely	Yes, to some extent	No, I don't think so	Not at all	Total	**Chi-Square Analysis**		
Total	3	7	79	3	92	Value	df	Significance
Percentage	3.30%	7.60%	85.90%	3.30%	100.00%	13.702	3	0.003
8.4 Residency Training Vs TM Provides Psychological Support								
Values	Not at all		Sometimes	Often	Total	**Chi-Square Analysis**		
Total	1	7	78	3	89	Value	df	Significance
Percentage	1.10%	7.90%	87.60%	3.40%	100.00%	14.362	3	0.002
8.5 Residency Training Vs TM Accepted by Patients								
Values	Strongly disagree	Disagree	Agree	Strongly agree	Total	**Chi-Square Analysis**		
Total	3	5	80	2	90	Value	df	Significance
Percentage	3.30%	5.60%	88.90%	2.20%	100.00%	8.606	3	0.035
8.6 Residency Training Vs Services Access Enhanced in TM								
Values	Yes, definitely	Yes, to some extent	No, I don't think so	Not at all	Total	**Chi-Square Analysis**		
Total	17	58	14	1	90	Value	df	Significance
Percentage	18.90%	64.40%	15.60%	1.10%	100.00%	7.894	3	0.048
8.7 Residency Training Vs Patients Concerns with Privacy and Security								
Values	Not at all	Sometimes	Often		Total	**Chi-Square Analysis**		
Total	54	31	3		88	Value	df	Significance
Percentage	61.40%	35.20%	3.40%		100.00%	8.652	3	0.034

difficulties and communication difficulties. This observation suggest a positive inclination of participants in this age group towards TMC. Correlation of age with TMC practice has been discussed and evaluated by Ibrahim et al. [52]. On the basis of gender it was found that male participants showed significant positive response towards TMC by having a strong correlation for prompt intervention, overall quality rate, enhanced access to services, and communication difficulties. These findings suggest that the implementation of TMC was preferred mostly by the male participants than the female participants and this preference in interest has been reflected and affirmed by previous investigators [46,52,53]. Also it is interesting to observe that attitudes and practices like prompt intervention, psychological support, access to service and the time saving aspects of TMC have been strongly associated with places where the degree was obtained, reflecting those who had obtained the degree from abroad (less than two thirds) showed positive correlation with TMC implementation.

Participants residency training also influenced the choice of implementation of TMC, and those who were trained outside the kingdom (two thirds) were more associated than the ones trained within the country. Technical quality of TMC consultation, comfortability, ability for prompt intervention, psychological support, acceptance of TMC by patients, access to medical service, patients privacy concern and security issues were positively influenced with residency training type. All these association markers are strong determinants for more wide and stronger implementation of TMC in more departments and more hospitals in Riyadh and other regions of the Kingdom. These findings were reported by other works in the Middle east and Near East [53].

Limitations

Time is crucial as the primary researcher has to start analysis with the collected questioner to present the research, also some departments returned the questionnaire forms blank as they are not aware of the TMC service availability which resulted in the reduced respondent count.

Conclusion

TMC services is excellent, well implemented in developed countries and prove to be cost effective. In Saudi Arabia it is available and functioning well in few medical centers. Based on the results of this study we strongly recommend that TMC services should be provided to all the medical departments and for all the health professionals of PSMMC to use this tool in evaluating, following up and consulting their patients at home. This will have impact on the in hospital services as it will reduce the long waiting lists for the outpatients clinics, reduce the risk of hospital born infection to the chronic, immune compromised and pediatrics patients. It will cut off the cost of outreach visits of the physicians and make them more available in the hospital.

Contribution of authors

"I declare that this work was done by the author named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the author".

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