Original Research Article

Telemedicine during Covid-19 Pandemic in Saudi Arabia:Oral and Maxillofacial Surgeons' Knowledge and Implementation

ABSTRACT

Telemedicine can significantly improve health care delivery for patients with limited access to medical services. Innovative uses of this kind of technology in the provision of healthcare is increasing with the emergence of the virus causing the disease COVID-19, there is an urgency to expand the use of technology to help people who need routine care.

aim of this study is to assess oral and maxillofacial surgeons' knowledge of telemedicine and its applications. Second, during the COVID-19 pandemic, their ability to incorporate telemedicine into their clinical practice.

This is a cross sectional study conducted among oral and maxillofacial surgeons in Saudi Arabia from November 2020 to January 2021. A self-administered questionnaire was distributed among the selected surgeons using online platform that includes; socio demographic characteristics, knowledge of telemedicine technology, used of telemedicine before and during COVID-19 and security of telemedicine technology. All statistical analyses were performed using SPSS version 21.

Results

A total of 69 surgeons were recruited. 52.2% males vs 47.8% females. The knowledge of the surgeons regarding telemedicine was moderate among 43.5%, 40.6% were poor and 15.9% were classified as good knowledge (mean: 11.6; SD: 4.12, out of 20 points). Surgeons who were working in the private clinic ($F=2.982$; $p=0.027$), those who had heard of telemedicine ($T=4.987$; $p<0.001$) and those who implemented telemedicine at a current workplace before COVID-19 ($T=3.873$; $p<0.001$) had significantly better knowledge score than the rest.

Conclusion

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While there was an increased in the implementation of telemedicine used during the COVID-19 pandemic

however, the om surgeon's knowledge about it seems to be little.

Keywords

Telemedicine, Knowledge, Oral and Maxillofacial surgeons, COVID-19

Introduction:

Telemedicine, a term invented in the 1970s, is characterized as "the provision of healthcare services, where distance is a major consideration, by all healthcare providers using information and communication technology for the sharing of actual information for detection, care, and control of illness and injuries, study and evaluation, and education programs of health care providers, all in the service of improving the health of the people and communities" [1, 2]. It refers to the use of information systems in healthcare delivery, such as smartphones, email, video conferencing, and other networking technology, to provide and facilitate clinical treatment remotely [3,4]. Telemedicine encompasses not only distant patient monitoring and diagnosis, but also e-learning mechanisms for delivering education to health care staff and patients, as well as teleconsultation facilities. This applies to any consultation between physicians or between physicians and patients that takes place over a network or video connection (e.g., Facetime, intranet, Internet, Skype, etc.), as opposed to "in person" therapy, in which no ICT is used to handle the contact between the patient and the practitioner [5].

Telemedicine in dentistry is referred to as "Teledentistry," and it is the method of networking, exchanging digital knowledge, providing remote consultations, workup, and examination [6]. Although teledentistry is still in its beginnings in terms of dental professionals' use of it, its inclusion in the field of medicine suits its meanings [7,8]. Teledentistry started as a military initiative in 1994 with the aim of improving healthcare services, enhancing dental education, and establishing dentist–laboratory communications [9]. Teledentistry is a form of oral healthcare that makes use of electronic media to enable dentists to communicate with one another from afar. Dental practitioners may exchange patient information using a teledentistry network. Multiple providers may share radiographs, periodontal and hard tissue charting, treatment notes, photos, and any other required diagrams or details. Patients, especially those in need of a professional consultation, will benefit greatly from this exchange of knowledge [9]. Teledentistry in oral and maxillofacial surgery helps with differential diagnosis, care, follow-up, and disease control, and thereby improves patient care quality without needing the involvement of a maxillofacial surgeon in isolated places [10].

The current outbreak of coronavirus disease 19 (COVID-19), a coronavirus-associated respiratory conditions disease, is the third known spill over of an animal coronavirus to humans. Telemedicine has the ability to assist by allowing patients to receive compassionate treatment while limiting their proximity to other critically ill patients [12].

With the advent of the disease-causing virus COVID-19, innovative applications of this type of technology in healthcare are rising. There is an urgent need to increase the use of technology to assist people who require regular treatment. Limiting viral transmission in the population, as well as limiting exposure to other patients and workers, can help to slow the spread of the virus [13].

The Ministry of Health (MOH) newly established an e-Health system that supports the use of telemedicine in aimed at improving the quality and actability of health care services among patients and healthcare providers, especially in rural areas. In order to attain the objectives of telemedicine, the Ministry of Health

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(MOH) initiated the Saudi Telemedicine Network (STN), a nationwide initiative encompassing all healthcare facilities, in partnership with Canada Health Infoway and the Ontario Telemedicine Network [14].

The aim of this study is to assess oral and maxillofacial surgeons' knowledge of telemedicine and its applications. Second, during the COVID-19 pandemic, their ability to incorporate telemedicine into their clinical practice.

Methodology:

A cross-sectional survey study was carried out in Saudi Arabia, from November 2020 to January 2021. Ethical clearance number (SRPSSC approval/F-2020-5005) has been taken from Qassim University, dental college, ethical research committee.

Study Participants:

The study sample includes 200 oral and maxillofacial surgeons in different regions in Saudi Arabia who works in hospitals, private clinics, and universities. with consecutive sampling method. The only inclusion criteria was any oral and maxillofacial surgeons in Saudi Arabia who were able to contact during the data collection period. So our study involves professionals such as consultants, specialists, registrar, and residents. Following approval of the Ethical Committee a web-based questionnaire was sent to the participants through e-mails and social media services. A total of 69 participants fill the questionnaire with a response rate of 34.5 %.

The present study questionnaire consists of :

1. Demographic data

2. Knowledge of telemedicine technology

3. Using telemedicine before and during COVID-19

4. Security of telemedicine technology

Scoring Criteria

The knowledge toward the use of telemedicine technology was drawn from 4 quetions discussed in figure 1 with a 5-point Likert scale categories ranging from “very low” coded as 1 to “very high” coded as 5. The total score had been calculated by adding 4 questions. The scores generated has a minimum of 4 points and a maximum of 20 points which indicates that the higher the score the higher the knowledge toward the use of telemedicine technology. By using 50% and 75% of the total score points to determine the level of knowledge respondents were classified as poor knowledge by the score range of 4 – 10 points, >10 to 15 points were moderate and >15 to 20 points were considered as good knowledge level.

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Statistical analysis

The data were shown as frequency, percentage, mean and standard deviation, whenever appropriate. Between comparisons, Mann Whitney U test or Kruskal Wallis test were applied. Normality distribution had performed by using Kolmogorov-Smirnov test and Shapiro Wilk test. Data follows abnormal distribution. Thus, non-parametric tests were applied. All statistical analyses were performed using the (SPSS) software. P values <0.05 were considered statistically significant.

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Results:

Table 1: Socio demographic characteristics of the surgeons (n=69)

Study data	N (%)
Gender	
• Male	33 (47.8%)
• Female	36 (52.2%)
Nationality	
• Saudi	44 (63.8%)
• Non-Saudi	25 (36.2%)
Educational level	
• Master degree	31 (44.9%)
• PhD	38 (55.1%)
Position	
• Specialist	39 (56.5%)
• Consultant	30 (43.5%)
Years of experience	
• 1 – 5 years	28 (40.6%)
• 6 – 10 years	22 (31.9%)
• >10 years	19 (27.5%)
Workplace	
• Hospital	20 (29.0%)
• Private Clinic	17 (24.6%)
• College	32 (46.4%)
Work region	
• Qassim	23 (33.3%)
• Riyadh	11 (15.9%)
• Dammam	16 (23.2%)
• Others	19 (27.5%)
Heard about telemedicine	
• Yes	51 (73.9%)
• No	18 (26.1%)

This study enrolled 69 surgeons to measure their knowledge about telemedicine before and during COVID-19. Table 1 presented the socio demographic characteristics of the 69 surgeons. More than a half were females (52.2%) and nearly two-third were Saudis (63.8%). With regards to educational level, 55.1% had PhD degree. With respect to their position, 56.5% were specialists with 40.6% had 1 – 5 years of experience. Furthermore, 46.4% were working at University hospital and one third of them were in Qassim. In addition, 73.9% had heard about the world “telemedicine”.

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Figure 1: Knowledge about telemedicine technology

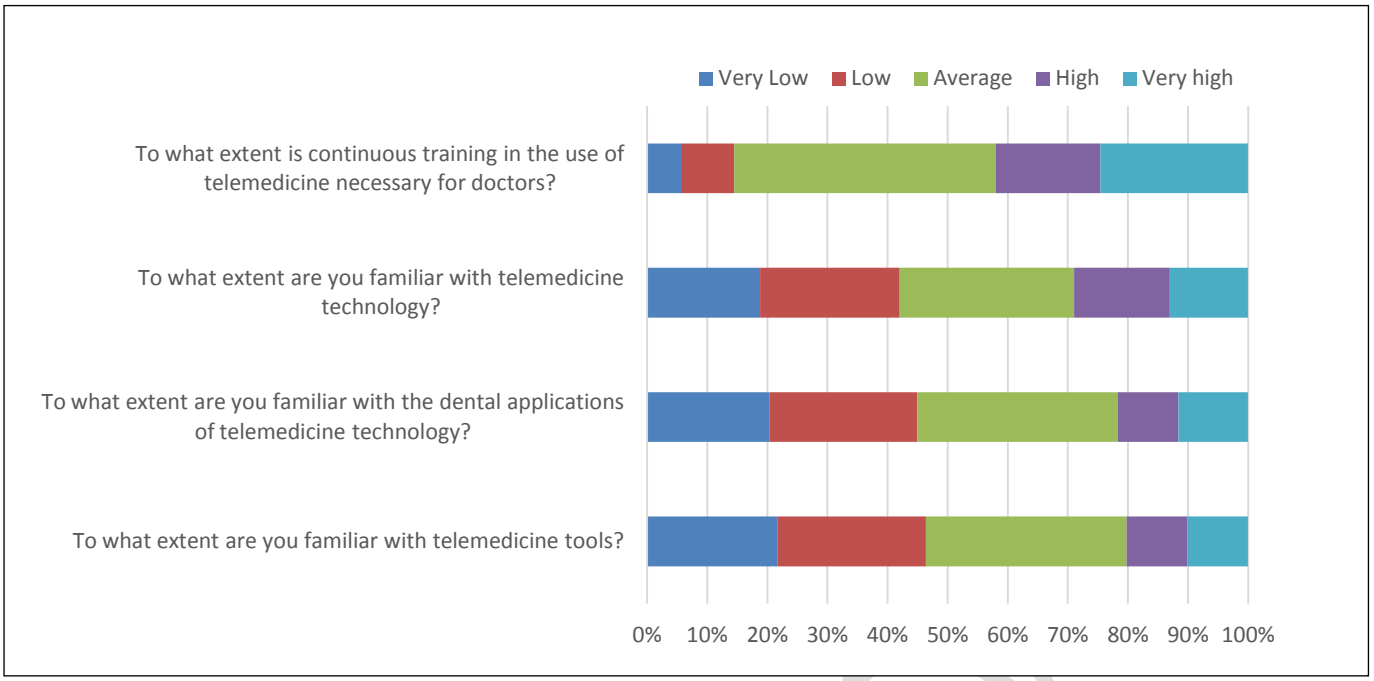

Figure 1 showed the assessment of knowledge about telemedicine technology. Following the results, the knowledge of surgeons was high to very high in a question related to "To what extent is continuous training in the use of telemedicine necessary for doctors?" However, they showed poor knowledge related to the questions of "To what extent are you familiar with telemedicine tools" and "To what extent are your familiar with dental applications of telemedicine technology".

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Table 2: Used of Telemedicine before and during COVID-19 pandemic (n=69)

Variables	Before N (%)	During N (%)
Implemented telemedicine at the current workplace	41 (59.4%)	52 (75.4%)
Type of communication used for telemedicine		
• WhatsApp	26 (63.4%)	36 (69.2%)
• Twitter	09 (22.0%)	13 (25.0%)
• Facebook	04 (09.8%)	02 (03.8%)
• Video conference application	14 (34.1%)	22 (42.3%)
Health providing services when using telemedicine		
• Follow up	29 (70.7%)	41 (71.9%)
• Consultation	24 (58.5%)	33 (57.9%)
• Diagnosis	10 (24.4%)	16 (28.1%)
• Treatment	08 (19.5%)	10 (17.5%)
• Other	01 (02.4%)	07 (12.3%)
Number of patients benefitted from telemedicine		
• ≤5	10 (24.4%)	13 (22.8%)
• 6 – 10	15 (36.6%)	16 (28.1%)
• 11 – 20	05 (12.2%)	08 (14.0%)
• >20	11 (26.8%)	20 (35.1%)
In your opinion , do you think there is increase in need of telemedicine during current pandemic	--	65 (94.2%)

Table 2 described the used of telemedicine before and during COVID-19 pandemic. It can be seen that the implementation of medicine increased from 59.4% before pandemic to 75.4% during the pandemic. With regards to the type of communication used for telemedicine, WhatsApp was the most commonly used application before (63.4%) and during (69.2%) COVID-19 pandemic, followed by video conference application (before: 34.1% vs during: 42.3%). The most commonly mentioned providing services when using telemedicine was for follow up (before 70.7% vs during: 71.9%), followed by consultation (before: 58.5% vs during: 57.9%). In can be further noticed that the patients benefitted from telemedicine increases on the cases of more than 20 patients (before: 26.8% vs 35.1%). Furthermore, nearly all (94.2%) thought that there was an increased rate of telemedicine used during the pandemic.

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Figure 2: Security of telemedicine technology

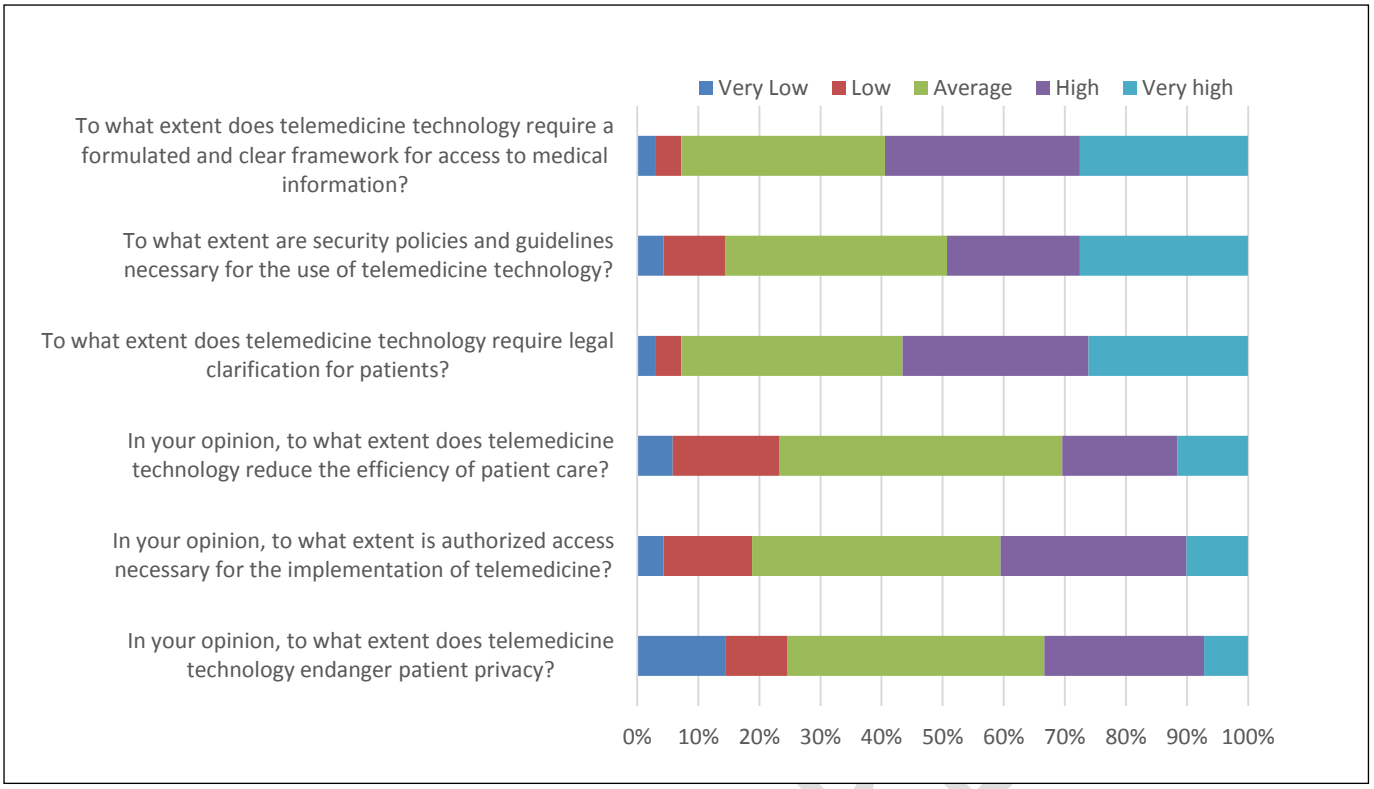

Figure 2 depicted the security of telemedicine technology. It was revealed that the surgeons rated high to very high for the question of "To what extent does telemedicine technology require a formulated and clear framework for access to medical information?", followed by "To what extent are security policies and guidelines and necessary for the use of telemedicine technology?" and "To what extent does telemedicine technology require legal clarification for patients?".

Table 3: Descriptive statistics of the knowledge toward telemedicine **(n=69)**

Knowledge	**N (%)**
Level of knowledge	
• Poor	28 (40.6%)
• Moderate	30 (43.5%)
• Good	11 (15.9%)
Knowledge Score (mean ± SD)	11.6 ± 4.12

Table 3) The descriptive statistics of the knowledge toward telemedicine technology. Based on the results, the mean knowledge score was 11.6 (SD 4.12) out of 20 points with poor, moderate and good knowledge has been detected among 40.6%, 43.5% and 15.9%, respectively.

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Table 4: Statistical Association between the knowledge score and the socio demographic characteristics of the surgeons (n=69)

Factor	Knowledge Total Score (20) Mean ± SD	F/T-test	P-value
Gender [a]			
• Male	11.8 ± 4.53	T=0.458	0.923
• Female	11.4 ± 3.75		
Nationality [a]			
• Saudi	11.1 ± 4.29	T=-1.190	0.117
• Non-Saudi	12.4 ± 3.74		
Educational level [b]			
• Master degree	12.3 ± 4.12	T=1.241	0.192
• PhD	11.0 ± 4.08		
Position			
• Specialist	10.9 ± 4.05	T=-1.525	0.119
• Consultant	12.4 ± 4.12		
Years of experience [b]			
• 1 – 5 years	11.0 ± 3.81		
• 6 – 10 years	10.8 ± 4.41	F=2.293	0.104
• >10 years	13.3 ± 3.93		
Workplace [b]			
• Hospital	10.6 ± 4.37		
• Private clinic	13.6 ± 3.83	F=2.982	**0.027 ** **
• College	11.2 ± 3.85		
Work region [b]			
• Qassim	11.8 ± 3.48		
• Riyadh	10.8 ± 3.76	F=0.965	0.322
• Dammam	10.5 ± 4.91		
• Others	12.7 ± 4.31		
Heard about telemedicine [a]			
• Yes	12.8 ± 3.87	T=4.987	**<0.001 ** **
• No	8.00 ± 2.33		
Implemented telemedicine at a current workplace before COVID-19 [a]			
• Yes	13.0 ± 3.90	T=3.873	**<0.001 ** **
• No	9.46 ± 3.51		
Implemented telemedicine at a current workplace during COVID-19 [a]			
• Yes	11.9 ± 4.46	T=1.426	0.223
• No	10.4 ± 2.87		

[a] P-value has been calculated using Mann Whitney U test.
[b] P-value has been calculated using Kruskal Wallis test.
** Significant at p<0.05 level.

Table 4): When measuring the association between the knowledge score and the socio demographic characteristics of surgeons, it was found that surgeons who were working at private clinic (F=2.982; p=0.027), those who have heard about telemedicine (T=4.987; p<0.001), those who implemented telemedicine at a current workplace before COVID-19 (T=3.873; p<0.001) showed significantly more

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knowledge than the other groups. Other socio demographic characteristics did not show significant effect when compared to the knowledge score including, gender, nationality, educational level, position, years of experience, work region and implemented telemedicine at a current workplace during COVID-19 (all $p>0.05$).

Discussion:

While emerging of telemedicine was 4 decades from now, sudden emerging of covid-19 necessitates its virtual presence and usage to keep social distancing in the medical field.

Oral and maxillofacial surgery like other specialties is affected strongly during this pandemics . presence of telemedicine in the form of surgeon to patient , surgeon to surgeon communications, and delivering of knowledge through continuous education can play important role in this difficult time .

The purpose of the present study is to evaluate the knowledge of the oral and maxillofacial surgeons regarding telemedicine (TM) technology and its implementation during COVID-19 pandemic in Saudi Arabia. The level of knowledge toward the used of TM technology is moderate which was among 43.5% of the oral and maxillofacial surgeons while 40.6% were classified as poor knowledge and only 15.9% had good knowledge level. The mean knowledge score was 11.6 (SD 4.12) out of 20 points. These results are consistent with the paper of Albarrak et al.[14] as they reported that 46.1% of the physicians had average knowledge about TM and most of them showed positive perception about it and willing to adopt it in their clinical practice. This had also been documented by Shoman et al.[15] where they accounted 50.5% of the health workers were aware of the telehealth. On the other hand, Biruk and Abetu,[16] reported that health professionals in North West Ethiopia demonstrated better knowledge toward TM. Results indicated that, 37.6% of the health professionals exhibited good knowledge whereas in our paper only 15.9% were classified as good knowledge level which was lower than the previous report. Furthermore, we noted that being a private clinic oral and maxillofacial surgeon, being aware of telemedicine and being a telemedicine initiator before the pandemic were the factors associated with increased knowledge.

In relation to the implementation of TM at the current workplace, our result noted an increase of TM usage before and during the pandemic. Before the pandemic, we noticed that there was 59.4% who implemented TM in the form of diagnosis , consultations , follow up , treatment and others. Whereas during the pandemic

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it rose up to 75.4%. Other literatures did not demonstrate comparisons of TM use before and during the pandemic whilst, in a paper of Kalidayan et al.[24] they indicated that there were 58.1% of the physicians had used some form of TM during the COVID-19 pandemic. [19,20] WhatsApp has been one of the favorite public application since 2009. [22,23,24] And moreover according to this study one more additional characteristic can be added to this application , as this study showed that Whattapp is the most commonly used application related to TM before and during the pandemic was WhatsApp (before: 63.4% vs during: 69.2%), followed by video conference application (before 34.1% vs during: 42.3%). These results are consistent with the paper of Kaliyadan et al.[18] Based on their accounts, the most frequently used application during TM was WhatsApp, followed by Zoom meeting and Microsoft Teams. Likewise, in a paper of Helou and colleagues,30 [21] they reported that physicians in Lebanon had used WhatsApp for telehealth before and during the pandemic which was comparable with our results. In USA, [19] clinicians used Google hangouts as well as zoom application for TM which was also compatible with previous reports. It can be further noted that the most commonly mentioned services in using TM before and during the pandemic was follow up, followed consultation and most of the surgeons agreed that there was an increased in need of TM during the pandemic.

Oral and Maxillofacial surgeons who are participated in this study rated high to very high that TM technology require a formulated and clear framework for access to medical care and they were also agreed that the security policies and guidelines are necessary for the use of TM technology. On the other hand, surgeons showed moderate perception that TM technology reduce the efficiency of patient's care, authorized access necessary for the implementation of TM

Conclusion :

Although there was a rise in the use of telemedicine during the COVID-19 pandemic, om surgeons' knowledge of the technology appears to be little. Surgeons who were working in the private clinic, those who implemented telemedicine in their workplace before the pandemic and those who have heard about it were likely to have better knowledge about telemedicine technology than the other surgeons. It is very important to address the gaps in the knowledge toward telemedicine technology. Surgeons who have sufficient knowledge about it are more than ready to bring telemedicine forward and help create institutional

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change. Thus, this study warrant further researches to validate the knowledge of surgeons regarding telemedicine used and evaluate the factors associated with it.

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