To See or Not to See in Telemedicine? A Cross-Sectional Study on Physicians' Attitude Toward Video and Audio Consultation During The COVID-19 Times.

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Abstract

Background: BACKGROUND To mitigate the effect of the COVID-19 pandemic, the healthcare systems all over the world implemented telemedicine technologies to respond to the growing need of the healthcare services during these unprecedented times. In the UAE, video and audio consultations have been widely adapted to deliver health services during the pandemic. However, little is known about the physicians' attitude and perception of the quality of the clinical consultation and the perceived professional productivity when using video or audio telemedicine solutions.

Objective: OBJECTIVE To evaluate whether differences exist in physician's attitude and perception of video and audio consultation when delivering telemedicine services during the COVID-19 pandemic

Methods: METHODS This was a survey-based cross-sectional study conducted between November and December 2020 on physicians from Abu Dhabi outpatient departments who used telemedicine services during the COVID-19 pandemic. The survey used a 5-point Likert scale to measure physician's attitude and perception of video and audio consultation with reference to the quality of the clinical consultation and the professional working productivity. Descriptive statistics were used to describe physician's sociodemographic characteristics (age, sex, designation, clinical specialty, duration of practice, previous experience with telemedicine) and telemedicine modality (video vs. audio consultation). Regression models were used to describe the association between telemedicine modality and physicians'

Results: RESULTS When compared to audio consultation, video consultation was associated significantly with physicians' confidence toward managing acute consultations (OR=1.62, 95%CI: 1.2-2.21, p=0.002), and an upward trend to provide patient education during the virtual consultation (OR=2.21, 95%CI: 1.04-4.33, p=0.039). There was no statistically significant difference in physician's confidence toward managing chronic and follow-up consultations during video or audio consultation (OR= 1.35, 95% CI: 0.88 - 2.08, p=0.17). Video consultation was less likely to be associated with reduced overall consultation (OR= 0.69, 95% CI: 0.51-0.93, p= 0.016) and reduced patient note documentation time when compared to face-to-face visits (OR= 0.48, 95%CI: 0.36-0.65, p <0.001). Previous experience with telemedicine was associated significantly with lower perceived risk of

misdiagnosis (0.46, 95% CI: 0.3 - 0.71, p <0.001), and an increased physician-patient rapport (OR= 2.49, 95% CI: 1.26 - 4.9, p= 0.008).

Conclusions: CONCLUSION These results indicate that video consultation should be adopted frequently in the remote clinical consultation. Previous experience with telemedicine was associated with two times higher confidence in treating acute conditions, less than a half of the perceived risk of misdiagnosis, and an increased ability to provide patient with health education and physician-patient rapport. Our findings suggest that video consultation contributes to the quality of the virtual clinical care, and a telemedicine curriculum needs to be applied across the clinical training programs.

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Title: To See or Not to See in Telemedicine? A Cross-Sectional Study on Physicians' Attitude Toward Video and Audio Consultation During The COVID-19 Times.

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Key Words: Telemedicine; Clinical Decision-Making; Video Consultation; Audio Consultation; Perception; Outpatient Department (OPD); Communication; Clinical Training; United Arab Emirates

ABSTRACT

BACKGROUND To mitigate the effect of the COVID-19 pandemic, the healthcare systems all over the world implemented telemedicine technologies to respond to the growing need of the healthcare services during these unprecedented times. In the UAE, video and audio consultations have been implemented to deliver health services during the pandemic.

OBJECTIVE To evaluate whether differences exist in physician’s attitude and perception of video

and audio consultation when delivering telemedicine services during the COVID-19 pandemic.

METHODS This was a survey-based study conducted on a cohort of 880 physicians from Abu Dhabi outpatient departments who used telemedicine services during the COVID-19 pandemic between November and December 2020. A total of 623 physicians responded, yielding a response rate of 70.8%. The survey used a 5-point Likert scale to measure physician's attitude and perception of video and audio consultation with reference to the quality of the clinical consultation and the professional working productivity. Descriptive statistics were used to describe physician's sociodemographic characteristics (age, sex, physician's designation, clinical specialty, duration of practice, previous experience with telemedicine) and telemedicine modality (video vs. audio consultation). Regression models were used to describe the association between telemedicine modality and physicians' characteristics with the perceived outcomes of the virtual consultation.

RESULTS When compared to audio consultation, video consultation was associated significantly with physicians' confidence toward managing acute consultations (OR=1.62, 95%CI: 1.2-2.21, p=0.002), and an increased ability to provide patient education during the virtual consultation (OR=2.21, 95%CI: 1.04-4.33, p=0.039). There was no statistically significant difference in physician's confidence toward managing chronic and follow-up consultations when using video or audio consultation (OR= 1.35, 95% CI: 0.88 - 2.08, p=0.17). Video consultation was less likely to be associated with reduced overall consultation time (OR= 0.69, 95% CI: 0.51-0.93, p= 0.016) and reduced patient note documentation time when compared to face-to-face visits (OR= 0.48, 95%CI: 0.36-0.65, p <0.001). Previous experience with telemedicine was associated significantly with lower perceived risk of misdiagnosis (0.46, 95% CI: 0.3 - 0.71, p <0.001), and an increased physician-patient rapport (OR= 2.49, 95% CI: 1.26 - 4.9, p= 0.008).

CONCLUSION These results indicate that video consultation should be adopted frequently in the remote new clinical consultation. Previous experience with telemedicine was associated with two times higher confidence in treating acute conditions, less than a half of the perceived risk of

misdiagnosis, and an increased ability to provide the patient with health education and physician-patient rapport. Additionally, these results show that audio consultation is equivalent to video consultation for providing remote follow-up care to patients with chronic conditions. These findings may be beneficial to policymakers of e-health programs in low- and middle-income countries (LMICs), where audio consultation may significantly increase access to geographically remote health services.

Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has caused an enormous burden on the healthcare system and the healthcare delivery across the world [1–4]. As social distancing and quarantining became the new normal, face-to-face clinical visits plummeted, causing the healthcare system to rapidly shift to telemedicine to leverage their response to the pandemic [5–8]. Telemedicine created new opportunities for patient care in the context of COVID-19 pandemic and therefore reduced healthcare disparities [9,10]. Telemedicine is available in various shades ranging from patient portals, emails, text messages, telemonitoring, store-and-forward, audio consultation, to real-time video consultation[10–13]. The wide variety in communication channels offer different opportunities for providers to manage patients who are in quarantine or live in remote areas, which reduces the risk of disease transmission and improve access to healthcare services [5,9,14,15].

Owing to the growing concern surrounding the risk of workplace transmission, the use of telemedicine services increased globally [16–19] and the United Arab Emirates (UAE) is no different. On March 2020, Abu Dhabi launched its first Telemedicine Virtual Outpatient Clinic (TVOC) to support the continuity of patient care [20]. It has been estimated that within only one month physicians across Abu Dhabi SEHA hospitals performed over 28,000 virtual consultations [21,22].

Studies conducted on telemedicine during the COVID-19 pandemic, while yielding meaningful insights on its role, have largely been based on physician knowledge of telemedicine in specific subspecialities, and limited to descriptive data of certain encounters rather than quantifying their association. Currently, the effect of video versus audio consultation on physicians' attitude toward telemedicine is unclear [23,24]. Moreover, barriers against its full implementation beyond the COVID-19 pandemic remain unexplored. Identifying these barriers within each modality that can prevent successful adoption by healthcare providers is essential for directing future infrastructure to modernize the health care system and improve telemedicine utilization and outcomes. In this study, we aimed to describe the physician's attitude toward the use of telemedicine services in Abu Dhabi the capital of UAE during the COVID-19 pandemic. We also aimed to explore the effects of audio versus video consultation, and physician's sociodemographic characteristics on confidence during the clinical consultation, perceived quality of care, and perceived effects of professional productivity. Future studies are needed to objectively assess the effect of telemedicine modalities on the quality of care and professional productivity, and guide future infrastructure investments to assure embracing this new opportunity to provide high quality health care to a larger number of patients in the post COVID-19 era.

Methods

Study Design and Ethics

This was a survey-based study conducted on physician in Abu Dhabi outpatient departments who used telemedicine services during the COVID-19 pandemic between November and December 2020. Ethical approval was obtained from the Institutional Review Board of Khalifa University protocol # H21-006-2020 and Abu Dhabi COVID-19 Research IRB Committee of the Department of Health in Abu Dhabi IRB reference number # DOH/CVDC/2020/1747. Surveys were administered through DOH and SEHA, which are two large health authorities in Abu Dhabi. The Institutional Review

Board or ethics committee at each participating institution approved the study protocol and survey. Electronic written consents were waived for this data-only study due to the deidentified nature of this survey. The present study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies [25].

Subjects selection, inclusion and exclusion criteria

The survey was sent to a cohort of 880 physicians in Abu Dhabi outpatient departments who met inclusion criteria which were physicians practicing in Abu Dhabi outpatient department and who used audio or video consultation during the COVID-19 pandemic from January 2020 to November 2020. Exclusion criteria were other allied healthcare professionals such as nurses, pharmacists, and technicians (as our study was investigating physicians only), or physicians who did not work in outpatient departments and who never used telemedicine during the COVID-19 pandemic. From a total of 880 physicians listed, 623 physicians responded to the survey with a total response rate of 70.8%.

Survey Development, Piloting, and Data Collection

An online structured survey which contains multiple choice questions was developed from reviewing published telemedicine surveys and their instruments [26–28]. The online survey had 6 survey components containing a total of 42 questions related to physician's perception and attitude toward telemedicine. A pilot survey was conducted by the study investigators and included a cohort of 25 Abu Dhabi physicians who frequently used telemedicine. The main online survey was built in Microsoft Forms platform (Microsoft Corporation 2018, Redmond, WA) and was sent to the outpatient department's physicians through the hospital's internal email system. To reduce the risk of attrition bias, we ensured good contact between site principal investigators and participants by sending customized invitations [29,30]. Also, a follow up email was sent one week apart from the initial date of survey distribution to remind non-responders to participate in the survey.

Study Variables and Outcomes

This was a self-administered survey that gathered data on physician's sociodemographic characteristics including age, sex, telemedicine modality, clinical specialty, physician designation, number of years in practice, and past experience with telemedicine. We also gathered data using a 5-point Likert scale on (1) physician's current experience with telemedicine; (2) perceived quality of the virtual clinical consultation; (3) satisfaction with telemedicine; (4) perceived professional productivity compared to traditional face-to-face visits; (5) willingness to use telemedicine after the pandemic; and (6) perceived barriers to telemedicine use. Data on these six components was gathered in order to better understand the telemedicine experience during the Covid-19 pandemic and to gain insights into the preparedness of the digital healthcare response for any potential crisis.

We defined "acute remote care consultation" as any remote consultation made for the first time due to an urgent medical complaint or a new disease onset or a follow- up case that has not been seen for more than six months. While "chronic remote care consultation" was defined as any remote follow-up consultation made within six months of the initial in-person visit for a long term medical condition [31].

Statistical Analysis

Differences between video and audio consultation were investigated on various outcome variables which were fold in two main parts. While the first set of outcomes was related to the perceived quality of clinical consultation, the second set of outcomes was testing physician's professional productivity with telemedicine over face-to-face consultations.

Descriptive statistics characterizing the study cohort were reported as frequency and percentages for all variables. To compare responses to survey questions among video and audio consultation, we performed Chi-square statistical test at a significance level of 0.05

We used ordered logistic regression analyses to investigate the association between outcome

variables and modality adjusting for confounding factors such as socio-demographic characteristics. A forced-entry approach was adopted to consider the variance inflation factor (VIF) diagnostic to prevent unreliable estimates of coefficients and odds ratios due to high correlations among predictor variables. Considering the high VIF in the *year of practice* variable (VIF > 4), we excluded it and confirmed that multicollinearity is not a concern in the final models (VIF = 1.51). Further, the Akaike information criterion (AIC) was used to check models fittingness after exclusion of the "*year of practice"* variable. Survey questions included a five-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. However, due to limited observations towards the extreme ends of the scale (*strongly agree* and *strongly disagree*), we merged *strongly agree* and *agree* under positive direction, and *strongly disagree* and *disagree* under negative direction together as these two statements were found to involve the same attitude continuum toward the question[32], and were collapsed into '*disagreement'*, '*neutral'* and '*agreement'*. In regression models, results were reported as odds ratios (ORs) with 95% confidence intervals (CI) and $p < 0.05$ indicating statistical significance. Analyses were performed using STATA 16.1 (Stata Corp LLC, USA).

Results

Overall, 623 physicians completed the survey of whom 347 (55.7%) conducted only audio consultation and 276 (44.3%) conducted only video consultation during the COVID-19 pandemic. The sociodemographic descriptive characteristics of the two groups were summarized and compared in Table1.

Table 1 Physician socio-demographic characteristics and descriptive statistics by modality

SOCIODEMOGRAPHIC CHARACTERISTICS	**Audio consultation**	**Video consultation**	**Total**	***P* VALUE**
	n (%) 347 (55.7)	**n (%) 276 (44.3)**	**n (%) 623 (100)**	
Sex				0.04
Female	163 (46.97)	107 (38.77)	270 (43.34)	
MALE	184 (53.03)	169 (61.23)	353 (56.66)	
Age range, year				0.521
<39	87 (25.07)	59 (21.38)	146 (23.43)	
40-49	138 (39.77)	116 (42.03)	254 (40.77)	

50-59	83 (23.92)	62 (22.46)	145 (23.27)	
60+	39 (11.24)	39 (14.13)	78 (12.52)	
Specialty				0.223
Internal Medicine	213 (61.38)	186 (67.39)	399 (64.04)	
Surgical Specialties	38 (10.95)	22 (7.97)	60 (9.63)	
Family Medicine	76 (21.9)	48 (17.39)	124 (19.9)	
OTHERS [A]	20 (5.76)	20 (7.25)	40 (6.42)	
Physician rank				0.127
GP	62 (17.87)	41 (14.86)	103 (16.53)	
Resident	8 (2.31)	3 (1.09)	11 (1.77)	
Specialist	189 (54.47)	175 (63.41)	364 (58.43)	
Consultant	88 (25.36)	57 (20.65)	145 (23.27)	
Number of years in practice				0.324
<4	16 (4.61)	10 (3.62)	26 (4.17)	
5-9	52 (14.99)	33 (11.96)	85 (13.64)	
10-20	132 (38.04)	124 (44.93)	256 (41.09)	
>20	147 (42.36)	109 (39.49)	256 (41.09)	
Past experience with telemedicine				0.09
Never Used	256 (73.78)	219 (79.35)	475 (76.24)	
Used Few Times	75 (21.61)	41 (14.86)	116 (18.62)	
Used Frequently	16 (4.61)	16 (5.8)	32 (5.14)	

[a] Others refer to speech therapy, dental, PM&R, rehabilitation, anesthesia, emergency, occupational therapy, radiology, aviation and occupational health, periodontist, women center, nutrition, urgent care, prosthodontics, critical care

Sociodemographic Characteristics

Compared to physicians who used audio consultation, physicians who used video consultation were males (61.23% vs. 53.03%, p=0.04), middle aged [40-49 years (42.03% vs 39.77%), 50-59 years (22.46% vs. 23.92), +60 years (14. 13% vs. 11.24%), p= 0.52], had a different pattern of specialty distribution with majority belonging to internal medicine subspecialities (67.39% vs. 61.38%, p= 0.23). Additionally, physicians who used video consultation were mostly specialists with 10-20 years of experience in practice. In relation to previous experience with telemedicine modalities, there was a variation in responses. The majority of physicians who used video consultation during the COVID-19 pandemic reported that they have never had an experience using this form of telemedicine (79.35% vs. 73.78%, p= 0.09), conversely, the proportion of physicians who reported frequent use of video consultation was higher than the proportion for audio consultation (5.8% vs. 4.61%, p=0.09).

Perceived Quality of Clinical Care Provided

Physician's agreement with the following statements was assessed: (1) I was confident in managing acute conditions; (2) I was confident in managing chronic conditions; (3) I was able to answer my patients' questions; (4) I was able to provide health education to patients; (5) I had an impression of misdiagnosis risk during the teleconsultation. The percentages of physicians who agreed, disagreed, or were neutral about the statements were summarized in Table 2**.** Overall, more than half of physicians who used video consultation agreed they were confident in diagnosing acute condition (p=0.01), confident in diagnosing chronic conditions (p= 0.08), and able to provide patient health education during the clinical consultation which was significantly higher than physicians who used audio consultation (p= 0.006). However, there was no statistically significant difference in the perceived risk of misdiagnosis (p= 0.405), and providers ability to address the patient's questions (p= 0.258) among those who used video or audio consultation. Remarkably, the proportion of male physicians who believed that telemedicine raises the likelihood of misdiagnosis was higher than the proportion of female physicians (p= 0.021) (please see supplementary Tables 1,2,3).

Table 2 Comparison of survey responses on the perceived quality of clinical care provided by modality

Perceived Quality of Clinical Care Provided	Audio Consultation	Video Consultation	Total	*P* Value
	n (%)	n (%)	n (%)	
Confidence in managing acute consultations				0.01
Disagree & Strongly Disagree	85 (24.5)	47 (17.03)	132 (21.19)	
Neutral	121 (34.87)	85 (30.8)	206 (33.07)	
Agree & Strongly Agree	141 (40.63)	144 (52.17)	285 (45.75)	
Confidence in managing chronic and follow-up consultations				0.081
Disagree & Strongly Disagree	20 (5.76)	6 (2.17)	26 (4.17)	
Neutral	50 (14.41)	39 (14.13)	89 (14.29)	
Agree & Strongly Agree	277 (79.83)	231 (83.7)	508 (81.54)	
Ability to answer patient's questions				0.258
Disagree & Strongly Disagree	9 (2.59)	3 (1.09)	12 (1.93)	
Neutral	36 (10.37)	23 (8.33)	59 (9.47)	
Agree & Strongly Agree	302 (87.03)	250 (90.58)	552 (88.6)	
Ability to provide patient health education				0.006
Disagree & Strongly Disagree	15 (4.32)	1 (0.36)	16 (2.57)	
Neutral	36 (10.37)	24 (8.7)	60 (9.63)	
Agree & Strongly Agree	296 (85.3)	251 (90.94)	547 (87.8)	
Perceived risk of misdiagnosis with Telemedicine				0.405
Disagree & Strongly Disagree	47 (13.54)	35 (12.68)	82 (13.16)	
Neutral	84 (24.21)	80 (28.99)	164 (26.32)	
Agree & Strongly Agree	216 (62.25)	161 (58.33)	377 (60.51)	

Perceived Professional Productivity

The overall response to this survey section varied across the entire sample, with no statistically significant difference in the physician-patient rapport among those who used video or audio consultation when compared to face-to-face visits (p= 0.952) Table 3. Interestingly, when compared to face-to-face visits, the proportion of physicians who perceive that telemedicine reduces the overall documentation time (p<0.001) and increases the total number of patient consults (p=0.013) was

significantly higher among physicians who used audio consultation than video consultation. The proportion of female physicians who agreed that telemedicine decreases the overall documentation time and increases the total number of patient consults was substantially higher than the proportion of male physicians who agreed (p= 0.008, p<0.001) (please see supplementary Tables 4,5,6).

Table 3 Comparison of survey responses on perceived professional productivity by modality

Perceived Professional Productivity	Audio Consultation	Video Consultation	Total	*P* Value
	n (%)	n (%)	n (%)	
Patient's rapport more than face-to-face visits				0.952
Disagree & Strongly Disagree	228 (65.71)	179 (64.86)	407 (65.33)	
Neutral	83 (23.92)	69 (25)	152 (24.4)	
Agree & Strongly Agree	36 (10.37)	28 (10.14)	64 (10.27)	
Reduced overall consultation time more than face-to-face visits				0.066
Disagree & Strongly Disagree	80 (23.05)	84 (30.43)	164 (26.32)	
Neutral	94 (27.09)	77 (27.9)	171 (27.45)	
Agree & Strongly Agree	173(49.86	115 (41.67)	288 (46.23)	
Reduced overall documentation time more than face-to-face visits				<0.001
Disagree & Strongly Disagree	84 (24.21)	104 (37.68)	188 (30.18)	
Neutral	77 (22.19)	77 (27.9)	154 (24.72)	
Agree & Strongly Agree	186 (53.6)	95 (34.42)	281 (45.1)	
Increased total number of consulted patients more than face-to-face visits				0.013
Disagree & Strongly Disagree	89 (25.65)	95 (34.42)	184 (29.53)	
Neutral	112 (32.28)	94 (34.06)	206 (33.07)	
Agree & Strongly Agree	146 (42.07)	87 (31.52)	233 (37.4)	

Working experience, Satisfaction and Barriers to Telemedicine

The majority of physicians who used video consultation agreed that they received sufficient

technological support during the virtual consultation, which was significantly higher than those who used audio consultation (76.45% vs. 53.60%, respectively, p<0.001).

There was no statistically significant difference in the satisfaction with the quality of the clinical consultation among physicians who used video consultation compared to those who used audio consultation (p=0.066).

When assessing the barriers to telemedicine, physicians who used audio consultation reported that "inability to see the patient during the consultation" was a significant barrier to the quality of the remote clinical consultation (p=0.001), preferred not to use telemedicine services due to low payment and reimbursement rates (p=0.004), were unable to confirm the patient identity during the audio consultation (p= 0.038), and reported lack of training as a barrier to using telemedicine services to provide patient with remote care (p<0.001) (see supplementary Tables 7,8,9).

Multivariate Analysis

In the multivariate model, video consultation was associated with significantly improved confidence toward managing acute conditions (OR=1.62, 95%CI: 1.2-2.21, p=0.002), and increased perceived ability to provide patient education (OR=2.21, 95%CI: 1.04-4.33, p=0.039), while male sex was associated with lower perceived ability to provide patient education during the virtual consultation (OR= 0.48, 95% CI: 0.27-0.84, p=0.01). There was no statistically significant difference in physician's confidence in managing chronic or follow-up conditions among physicians who used audio or video consultation Table 4. Additionally, previous experience with telemedicine presented as frequent use was associated significantly with higher confidence in diagnosing acute conditions (OR= and lower perceived risk of misdiagnosis (OR= 0.46 95%CI: 0.31 - 0.68, p <0.001). Our analysis also shows that video consultation was associated significantly with a perceived increase in overall consultation time, overall documentation time, and reduction in overall number of patients consulted when compared to face-to-face clinical visits. While previous experience with telemedicine was associated significantly with a perception of increased physician-patient rapport,

and perception of increased total number of patients consults when compared to face-to-face visits.

Table 5.

Table 4 Adjusted multivariate analysis for perceived quality of clinical consultation

Variables	Confidence in managing acute consultations		Confidence in managing chronic and follow-up consultations		Ability to answer patient questions		Ability to provide patient health education		Perceived risk of misdiagnosis with telemedicine	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Modality										
video vs. audio consultation	1.62 (1.2 - 2.21)	0.002	1.35 (0.88 - 2.08)	0.174	1.6 (0.94 - 2.74)	0.083	2.02 (1.19 - 3.41)	0.009	0.81 (0.58 - 1.12)	0.204
Sex										
male vs. female	0.84 (0.61 - 1.16)	0.289	0.76 (0.48 - 1.2)	0.242	0.57 (0.32 - 1.02)	0.058	0.48 (0.27 - 0.84)	0.01	1.23 (0.87 - 1.74)	0.246
Age range, y										
40-49 vs. < 39	0.9 (0.6 - 1.36)	0.621	1.16 (0.66 - 2.04)	0.611	1.06 (0.52 - 2.13)	0.876	1.66 (0.85 - 3.25)	0.136	1.23 (0.8 - 1.89)	0.351
50-59 vs. < 39	0.95 (0.6 - 1.51)	0.828	1.53 (0.79 - 2.94)	0.204	1.49 (0.67 - 3.33)	0.333	1.34 (0.65 - 2.76)	0.435	1.11 (0.67 - 1.82)	0.683
60+ vs. < 39	0.82 (0.46 - 1.44)	0.485	1.7 (0.74 - 3.94)	0.213	1.11 (0.43 - 2.92)	0.825	2.17 (0.81 - 5.82)	0.125	0.85 (0.47 - 1.54)	0.597
Specialty										
Surgical Specialties vs. Internal Medicine	1.42 (0.83 - 2.41)	0.197	1.06 (0.51 - 2.2)	0.87	0.95 (0.41 - 2.19)	0.901	1.42 (0.59 - 3.37)	0.433	1.11 (0.62 - 1.99)	0.714
Family Medicine vs. Internal Medicine	1.46 (0.92 - 2.32)	0.107	1.38 (0.69 - 2.74)	0.364	1.56 (0.61 - 3.95)	0.35	1.26 (0.56 - 2.87)	0.576	0.67 (0.42 - 1.09)	0.104
Others vs. Internal Medicine	1.52 (0.79 - 2.94)	0.21	0.18 (0.09 - 0.37)	<0.001	0.21 (0.09 - 0.49)	<0.001	0.36 (0.16 - 0.84)	0.018	0.54 (0.29 - 1.03)	0.063
Physician rank										
Resident vs. GP	1.03 (0.33 - 3.19)	0.963	0.74 (0.16 - 3.34)	0.697	0.3 (0.06 - 1.47)	0.138	0.66 (0.11 - 3.77)	0.637	1 (0.31 - 3.23)	0.994
Specialist vs. GP	1.34 (0.81 - 2.2)	0.255	0.93 (0.46 - 1.87)	0.842	0.7 (0.28 - 1.74)	0.445	0.67 (0.29 - 1.57)	0.358	1.2 (0.72 - 2)	0.475
Consultant vs. GP	0.99 (0.56 - 1.75)	0.96	0.48 (0.22 - 1.06)	0.07	0.49 (0.17 - 1.36)	0.172	0.57 (0.21 - 1.51)	0.258	1.18 (0.65 - 2.15)	0.58
Past experience with Telemedicine										
used few	1.31 (0.88	0.1	0.79 (0.48	0.3	1.36 (0.69	0.3	1.43 (0.74	0.2	0.46 (0.31	<0.

times vs. never used	- 1.93)	82	- 1.33)	79	- 2.7)	75	- 2.77)	91	- 0.68)	001
used frequently vs. never used	2.12 (1.04 - 4.33)	0.039	1.37 (0.46 - 4.1)	0.568	3.65 (0.48 - 27.63)	0.21	1.26 (0.36 - 4.41)	0.713	0.45 (0.22 - 0.91)	0.027

Table 5 Adjusted multivariate analysis for perceived professional productivity

Variables	Patient's rapport more than face-to-face visits		Reduced overall consultation time more than face-to-face visits		Reduced overall documentation time more than face-to-face visits		Total number of consulted patients more than face-to-face visits	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Modality								
video vs. audio consultation	1.07 (0.76 - 1.49)	0.707	0.69 (0.51 - 0.93)	0.016	0.48 (0.36 - 0.65)	<0.001	0.66 (0.49 - 0.89)	0.006
Sex								
male vs. female	0.69 (0.48 - 0.99)	0.042	1 (0.73 - 1.39)	0.983	0.72 (0.52 - 1)	0.048	0.6 (0.43 - 0.82)	0.002
Age range, y								
40-49 vs. < 39	1 (0.64 - 1.56)	0.987	0.75 (0.5 - 1.13)	0.166	0.8 (0.53 - 1.2)	0.282	0.81 (0.54 - 1.22)	0.318
50-59 vs. < 39	1.4 (0.84 - 2.32)	0.198	1.15 (0.72 - 1.84)	0.564	0.89 (0.56 - 1.43)	0.635	1.1 (0.7 - 1.76)	0.673
60+ vs. < 39	1.31 (0.7 - 2.44)	0.392	1.25 (0.7 - 2.21)	0.448	1.4 (0.78 - 2.53)	0.262	1.26 (0.72 - 2.21)	0.419
Specialty								
Surgical Specialties vs. Internal Medicine	2.03 (1.15 - 3.59)	0.015	1.08 (0.64 - 1.81)	0.778	0.94 (0.56 - 1.59)	0.829	1.2 (0.73 - 1.97)	0.476
Family Medicine vs. Internal Medicine	0.93 (0.56 - 1.53)	0.766	1.3 (0.83 - 2.03)	0.26	1.34 (0.84 - 2.15)	0.224	1.19 (0.75 - 1.89)	0.463
Others vs. Internal Medicine	1.45 (0.74 - 2.84)	0.273	0.74 (0.41 - 1.36)	0.34	0.78 (0.42 - 1.44)	0.426	1.22 (0.65 - 2.28)	0.543
Physician rank								
Resident vs. GP	1.45 (0.46 - 4.63)	0.526	0.97 (0.33 - 2.88)	0.962	0.99 (0.3 - 3.25)	0.981	0.76 (0.23 - 2.51)	0.653
Specialist vs. GP	0.85 (0.51 - 1.43)	0.544	0.99 (0.61 - 1.6)	0.967	1.11 (0.67 - 1.82)	0.69	0.91 (0.56 - 1.48)	0.698
Consultant vs. GP	0.46 (0.25 - 0.86)	0.016	0.61 (0.35 - 1.05)	0.075	0.66 (0.37 - 1.17)	0.155	0.59 (0.33 - 1.03)	0.062

Past experience with Telemedicine								
used few times vs. never used	1.46 (0.96 - 2.23)	0.078	0.96 (0.66 - 1.41)	0.847	0.96 (0.65 - 1.41)	0.843	1.46 (0.99 - 2.14)	0.054
used frequently vs. never used	2.49 (1.26 - 4.9)	0.008	1.72 (0.84 - 3.54)	0.138	0.8 (0.41 - 1.57)	0.522	2.81 (1.38 - 5.71)	0.004

Discussion

Principle Findings

This analysis of 623 physicians shows that video consultation was independently associated with a 62% increase in confidence toward managing acute conditions and that physicians who used video consultation were two times more likely to provide patient education during the virtual consultation. Moreover, previous experience with telemedicine was associated with two times increase in confidence in managing acute conditions, and 55% reductions in the perception of risk of misdiagnosis. Surprisingly, more than one-third (37.68%) of physicians who used video consultation did not agree that telemedicine reduces the overall consultation time, and about one-third (34.42%) did not agree that telemedicine increases the overall number of patient consults when compared to face-to-face visits. Additionally, those who had previous experience with telemedicine were 2.5 times more likely to build rapport with their patients and 2.8 times more likely to perceive that telemedicine increases the total number of patients consults when compared to face-to-face consultations.

The COVID-19 pandemic provided sufficient incentive for the healthcare system to shift to virtual care to minimize the exposure to the novel respiratory virus[19,33] and ultimately, as Portnoy et.al said, “the only virus one can get while doing telemedicine is a cyber virus”[34,35]. The presence of these different modalities of telemedicine provided different opportunities for patients to connect to their health care provider, with rapid implementation of video and audio consultation partially due to the availability of smartphones and ubiquity of videoconferencing applications with cameras now

being an essential feature of these cell phones [36–42].

Although data on physician experience and outcome quality with each modality is limited, our first key finding suggest that when evaluating a patient for the first time or with a condition of sudden onset there is an added value of using video call applications to evaluate the patient's general state of health which is pivotal to the clinical decision making process [43,44]. Because medical presentations can vary in acuity and thus warrants different management approaches, physicians may need a real-time modality to better see the patient, view the site of pathology, discuss treatment options, address patient's concerns, and to promote compliance with the treatment regimen. Video consultation can proximate real-life visits to a great extent as both physician and patient can interact with each other simultaneously; thus it breaks the psychological distance by allowing facial expressions and body language to be observed and interpreted, promoting empathic communication and physician-patient rapport [45]. Therefore, a video consultation may be preferable when consulting a new patient for the first time as physicians feel more confident in making diagnostic and treatment decisions. However, when evaluating follow-up patients with chronic diseases or for medication refill, video and audio telemedicine may be both of an equal quality and have similar outcomes as has been shown in our study and previous studies [35,46–48]. These results may also help policy makers in low and middle income countries (LMIC) with applying reasonable protocols for selecting either video or audio consultations for patients who live in geographically remote areas or who require frequent follow-ups [49]. For instance, video consultation could be used for new or mild to moderate medical presentations where a real-time evaluation is needed, while audio consultation could be reserved for follow up patients with chronic medical conditions, or for patients with non-urgent medical problems who need to travel for long distances at out-of-pocket costs [50]. In this course, a double triage system may be needed where a triage nurse consults with the patient who requests a telemedicine appointment and assess the patient's triage level using the Triage and Acuity Scale (TAS) before recommending an office visit or video or audio call consultation for the

patient. [51]

The second key finding is that previous experience with telemedicine was associated with lower perceived risk of misdiagnosis. In this respect, the more physicians were trained on telemedicine the more confident they were in making a clinical diagnosis and the lesser the impression of a medical malpractice they had. The result of this study emphasizes the need to increase telemedicine competencies in residency training and other clinical programs. For example, it is important to provide a formal education on best practices on how to remotely assess patient's chief complaint, vital signs and do a remote physical examination before placing physicians in virtual clinics as prior experience with telemedicine can increase readiness and preparedness to do virtual consultation. This is intuitive specially for physicians who frequently use telemedicine such as internal medicine and family medicine physicians.[52] Our findings are consistent with previous studies.[53–55] In a study by Ha et al., found that physicians who had a structured educational program in telemedicine reported higher confidence in addressing the clinical consultations than physicians who did not receive an educational program.[56] Another study by Moore et al. indicated that lack of training on telemedicine was a barrier to provide telemedicine services among family medicine residents. [52]

The third key finding of this study is that video consultation was associated with a perceived increase in overall consultation time, increased documentation time, and decreased total number of patients consults. It is plausible that video call consultation had longer durations due to several reasons including technical difficulties related to internet connection, poor audio/speaker quality, disruption to the conversation flow, and difficulties with guiding a remote physical examination. In face-to-face interactions people see and hear each other words as they are produced. While when using video platforms, actions and words are heard milliseconds later. These delays although small but are meaningful and can interfere with the conversation flow and result in miscommunication, hence consumes longer time in attempt to understand patient problem and physician instruction[14,57,58] Moreover, during video consultations the physician may guide the patient through a remote physical

examination which may increase the duration of the clinical consultation. Subsequently, it is expected that the total number of patients consults per day to drop due to increased duration of consults in a limited clinical schedule.

The fourth key finding of this study is the identification of elements representing barriers to telemedicine. Physician's inability to see the patient during the remote consultation could restrict patient tele-examination where a guided remote assessment of the underlying condition is not feasible due to limited interaction with the virtual interface on the one hand and patient's difficulty to follow the examination instructions without visually seeing the provider's technique on the other hand [59]. Moreover, the inability to see the patient during the clinical consultation could raise serious security and privacy issues since the physician may not be able to confirm the patient's identity during the remote consultation emphasizing the need of guidelines for identity management and security consideration to protect the patient's privacy not only during audio consultation but also video consultation. Additionally, reimbursement issues with audio and video consultation need to be acknowledged as it does not appear to preferentially attract health care providers to deliver telecare services. The current payment plans have been confusing as the telemedicine provider needs to consider different private and governmental insurance plan policies when making a remote consultation [60]. This confusion has been also a major deterrent to using telemedicine services. Furthermore, the relative difference in cost between telemedicine visit and a comparable office visit has been one of the barriers to using telemedicine. If a telemedicine visit is paid lower than an equivalent office visit, physicians would be less willing to increase utilizing this service. There is a need to establish standardize regulations and billing rules to control costs. In principle, reimbursement costs for teleconsultation needs to be equivalent to office visit costs to increase adoption of telemedicine services [60]. A lack of training on how to treat a patient remotely may also be an obstacle that jeopardizes the efficiency of the virtual consultation, which must be overcome by incorporating appropriate training curriculums that are incorporated through physician training

programs.

Limitations and strength

This study has several limitations that we plan to address in future research. First it was an observational study that reflects outcomes with video and audio telemedicine at a single point in time. Second, data on what reimbursement challenges associated with each modality was not captured in detail in this study which, possibly, have biased physicians' attitude toward each modality. Third, the perception of misdiagnosis was not defined in our survey and thus was challenging to verify the association between this outcome and physician factors for physicians who used video versus audio consultation. Fourth, in this study patient's preference for video or audio consultation was not captured, and thus could have affected the number of clinical consultations for each modality and biased physicians' attitude toward the mode of remote consultation. Despite these limitations, our study has several strengths. To our knowledge, this study was one of the first comprehensive telemedicine studies in the Middle East Region that captured a nationally representative sample of physicians who used telemedicine and had a high survey response rate. Additionally, our study measured the difference in physician attitude toward telemedicine by modality type which is informative for policy making decisions.

Conclusion

The COVID-19 experience highlighted the important role of telemedicine in emergency response. While we may not be able to precisely predict the exact diagnostic outcomes with each telemedicine modality, however, there is a growing body of evidence suggesting that video consultation is associated with improved physician confidence in managing acute conditions, and greater ability to provide patient education during the virtual consultation. The study demonstrates that when managing chronic conditions or follow-up patients remotely, audio consultation is as appropriate as video consultation to healthcare providers. These findings may be helpful for health policy makers in low-to-middle income countries to provide ample health care access for patients with chronic and

non-communicable disease. Previous experience with telemedicine was associated with improved physician confidence in case management, lower perceived risk of misdiagnosis, increased ability to provide patients with health education, and better physicians-patient rapport. It is likely that the telemedicine services will stay, and as we build our telehealth system, it is intuitive to prioritize the "new" normal and implement a structured telemedicine curriculum in physicians training programs and prepare them for virtual consults. It is also necessary to acknowledge the barriers to telemedicine and create solutions and regulations to ease these obstacles and increase the service adoption rate.

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Conflict of Interest
All authors declare no personal or financial or professional conflict of interest in this study.

Abbreviations
AIC: Akaike information criterion

CI: Confidence Interval

COVID-19: Coronavirus disease 2019

DOH: Department of health

LMIC: Low-to-middle-income countries

OR: Odds Ratio

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

TAS: Triage and Acuity Scale

UAE: United Arab Emirates

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