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Article

Who is More Likely to Complete the Appointments, and What Factors Determine the Appointment Wait Time?

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Abstract: Background: Digital health significantly affects healthcare delivery. Moreover, empirical studies on the utilization of telehealth in Dubai are limited. Accordingly, this study examines the utilization of telehealth services in Dubai Health Authority (DHA) facilities and the factors associated with telehealth appointment completion and turnaround time. **Methods:** This cross-sectional study examines patients who used telehealth services in DHA from 2020 through 2021 using 241,822 records. A binary logistic regression model was constructed to investigate the association between appointment turnaround time as a dependent variable and patient and visit characteristics as independent variables. **Results:** Of the total scheduled telehealth visits, more than three-quarter (78.55%) were completed. Older patients, non-Emiratis, patients who had their visits in 2020, patients who had video visits, and those who sought family medicine as a specialty had a shorter turn-around time to receive their appointment. **Conclusions:** This study identifies several characteristics associated with the turn-around time. Moreover, technological improvements focusing on specialties that can readily be addressed through telehealth and further research in this domain will improve service provision and support building an evidence base.

Keywords: Telehealth; telemedicine; Dubai Health Authority (DHA); wait time; turn-around time; appointment completion

1. Introduction

Use of Information and Communication Technologies (ICT) has helped improve access to healthcare services [1]. The effect of ICT on healthcare service delivery increased significantly during the novel coronavirus disease 2019 (COVID-19) pandemic [2]. The increasing use of telehealth services is a significant modality through which ICT influences healthcare service delivery. Telehealth refers to the use of electronic ICT to facilitate the delivery of healthcare between patients and healthcare providers over long distances [3]. Telehealth can be used to exchange information related to the diagnosis, treatment, and prevention of diseases and injuries between patients and healthcare professionals, or for research and educational purposes [4]. While telemedicine and telehealth are often

used interchangeably, some studies distinguished between the two terminologies; the former refers to clinical services provided by physicians while the scope of the latter expands to include non-clinical services, such as tele education for patients and care providers [5,6].

Many health systems worldwide quickly transitioned to telehealth services during the pandemic to sustain service provision and protect patients and healthcare workers [5-10]. In the United States, for example, the share of telehealth visits in the total outpatient visits increased more than 13-fold—from less than 1% in 2019 to more than 13% in 2020 [11]. Similarly, many countries in the Gulf Cooperation Council region either adopted or activated telehealth services during the pandemic to contain the virus and continue providing healthcare services [12,13]. Both the Kingdom of Saudi Arabia and Kuwait have substantially demonstrated the use of mobile applications instead of in-person visits and enhanced telehealth system's infrastructure [14].

Similarly, in the United Arab Emirates (UAE), the pandemic has accelerated the application of telehealth and has become commonplace in health service provision in outpatient setting [15, 16]. The Dubai Health Authority (DHA), the government entity that oversees healthcare in the Emirate of Dubai, ensured continued healthcare service provision in its facilities during the pandemic [17]. In 2017, DHA issued its first clinical guidelines for the use of telehealth in Dubai health facilities with revised standards and guidelines in 2021 [17-19]. It ensured that telehealth covered a wide range of services, including general health consultations, laboratory test requests, and medication refills, COVID-19-related services, dental services, and follow-ups [20].

While the use and adoption of telehealth in the UAE has increased significantly, information on the characteristics and community utilization of telehealth in the UAE, and particularly in the emirate of Dubai, is limited. Hence, this study aimed to examine the characteristics of telehealth visits and the sociodemographic characteristics of patients who utilized telehealth services in DHA facilities between 2020 and 2021. Moreover, this study examines patients who were more likely to complete their appointments as well as the factors associated with the turnaround time (TAT) among telehealth services users at DHA facilities. We believe this study will contribute to building an evidence base to expand the role of telehealth and optimize its performance in the government sector.

2. Materials and Methods

Study Setting, Design and Data Source

This cross-sectional retrospective study uses secondary data of patients who received care using the “Doctor for Every Citizen” (DEC) telehealth modality at the DHA between March 2020 and July 2021. The DEC, hereafter referred to as telehealth services, enables all UAE citizens and residents to remotely receive a telehealth visit from expert physicians via a video/voice call, without the need to physically visit a health facility [21]. Moreover, DEC is accessible 24/7, aiming to achieve the highest levels of expert virtual health communication [21]. Although the service was launched in early 2020, it has been expedited by the COVID-19 pandemic. The process of telehealth visit starts with an appointment booking, after which the patient logs in to their DHA application on their smartphone to select DEC. Patients are then automatically connected and prompted to start a video/voice call with the physician [22]. Every patient who received telehealth services at DHA had a record of the visit documented in their electronic medical records (EMRs). A total of 241,822 records were extracted retrospectively from March 2020 to July 2021, reviewed, analyzed, and included in this study.

Variables and Measures

The EMRs comprised data related to patients' socio-demographics and visit characteristics. The patients' sociodemographic characteristic variables analyzed were age, gender, and nationality. Patients were grouped according to their age: under 18, 18-24, 25-44, 45-59 and 60 years and above. Nationality was dichotomized into Emirati (UAE citizens)

and non-Emirati for all other nationalities. The visit characteristic variables analyzed included provider specialty, visit status, total number of visits, TAT, and appointment completion status. Visit types were grouped into audio-only (telephone) and audiovisual (video). Wait time or TAT was defined as the duration (in days) from the appointment request date to the date the patient received the telehealth service. Appointment completion status was categorized as canceled if the scheduled appointment did not turn into actual care received (i.e., patient not seen by a physician) or completed otherwise (i.e., patient seen by a physician). Cancellation reasons were further grouped into patient-related reasons (e.g., financial reasons, positive COVID-19 diagnosis or non-emergency complaints), provider-related reasons (e.g., attending conference, training, meeting, or the physician went on emergency leave), and technical system-related reasons (e.g., technology, resource maintenance, web/app cancellation, or system error). Providers' specialties were listed by the frequency of visits for the five top consulted specialties, and the remaining specialty visits were grouped under 'others.'

Statistical analysis

Data coding and management, and analysis were conducted using IBM SPSS (Version 22.0, SPSS, IBM Corp, USA) and Stata (Version 17, Stata Corporation, College Station, TX). Relative frequencies were reported for categorical variables. The chi-square test was used for binary and categorical variables to examine the association in a bivariate analysis. After testing for skewness and kurtosis, the median values for appointment TAT were calculated to minimize the effect of noise and outliers. The level of significance was set at 5% ($p < 0.05$), and confidence intervals (CIs) were calculated at 95%. A binary logistic regression model was constructed to examine the association between appointment TAT (≤ 2 days or ≥ 3 days) as an outcome of interest, with patients and visit characteristics as independent variables. Adjusted Odds Ratios (OR) were reported to reflect the strength of the association. The study protocol was approved by the Dubai Scientific Research Ethics Committee of the Dubai Health Authority (reference number DSREC-03/2022-08).

3. Results

Table 1 shows the demographic characteristics of patients who scheduled telehealth visits according to their appointment status. Of the 241,822 scheduled telehealth visits, 189,951 (78.55%) were completed per schedule, and the remaining (21.45%) were incomplete or canceled. Among the patients who scheduled telehealth visits, 57.81% were females, 67.08% were Emirati, and 42.16% were aged 25–44 years (mean \pm SD = 38.6 \pm 19.5 years).

Table 2 shows the visit characteristics of the patients who scheduled telehealth services according to the appointment status. Of the total scheduled appointments, 55.88% were scheduled in 2021. Regarding appointment TAT (wait time), 71.27% of the patients had to wait two days or less, and the remaining (28.73%) had to wait for three or more days from the booking date to see a provider. Of the total scheduled telehealth visits, 67.09% were audio-video visits. Family medicine was the most visited specialty (69.60%), followed by dental and oral surgery (9.23%), psychiatry and psychology (4.78%), and all other specialties (16.39%).

Additionally, results from **Tables 1 and 2** highlight the differences between completed and canceled appointments for patients. Females (78.88%) completed more appointments than males (78.09%) did, and patients aged 18–24 years had the highest completed appointment rate (79.07) compared with other age groups. Emirati nationals (80.35%) completed their appointments more frequently than the non-Emiratis did (74.87%). The appointments scheduled in 2020 (83.14%) had a higher completion frequency than those scheduled in 2021 (74.92%). Appointments with a shorter TAT (≤ 2 days) had higher completion rates (79.65%) than those with a TAT of ≥ 3 days (75.82%). Dental and oral surgery specialties had the highest appointment completion frequency (84.72 %) among all other specialties.

Table 3 shows the demographic and visit characteristics of patients who completed telehealth services through TAT appointments. The median TAT was one-two days for many of the demographic and visit characteristics examined. However, some provider specialties, such as neurology, had the highest median TAT (26 days), followed by psychiatry and psychology (19 days). Similarly, males and females had almost similar TAT values. Patients in the age group 25 – 44 years had a shorter TAT of ≤ 2 days compared with the other groups (77.85%). Non-Emiratis had a shorter TAT (≤ 2 days) than Emiratis (78.39%). Generally, TAT was shorter in 2020 (≤ 2 days) than in 2021 (88.65%). Patients who had video visits had a shorter TAT (≤ 2 days) than those who had telephone visits.

Table 4 shows the results of the multiple logistic regression model with adjusted ORs to examine factors associated with TAT. After adjusting for all the variables in the model, the oldest age group (≥ 60 years) had the lowest odds of waiting for more than two days to see a telehealth provider compared with the youngest age group of <18 years (OR 0.39, 95%CI:0.38, 0.42). Additionally, non-Emiratis had lower odds of waiting for more than two days to see a telehealth provider compared with Emiratis (OR 0.93, 95%CI:0.91, 0.96). In contrast, patients who used telehealth services during 2021 (OR 3.23, 95%CI:3.14, 3.32) and those who used the telephone modality (OR 7.28, 95%CI:7.05, 7.52) had higher odds of waiting for more than two days compared with those in 2020, and those who had video visits, respectively. Regarding provider specialty, dental and oral surgery specialties had the highest odds of wait time (three or more days) compared with family medicine (OR 4.57, 95% CI 4.37,4.79), followed by neurology (OR 3.81, 95%CI:3.54, 4.10), and dermatology (OR 3.73, 95%CI:3.49, 3.99). All aforementioned predictors showed significant associations with appointment TAT at the level of $p < 0.001$. **Figure 1** shows the top reasons for using telehealth services at DHA during the COVID-19 pandemic. Seeking providers' consultation (11.8%) was the most common reason, followed by COVID-19 related (8.65%) and medication refills (4.65%). **Figure 2** shows the reasons for cancelling the telehealth visits. Patient-related and system-related reasons were reported in approximately half of incomplete cases. One out of 10 (9.9%) cancellations was attributed to providers' causes. The remaining patients (43.2%) were classified as undefined or unspecified. **Figure 3** shows the trend and timeline of telehealth utilization monthly during the COVID-19 pandemic. This shows that the trend of telehealth visits during the study period aligned well with the peak in COVID-19 cases in the UAE. In 2020, the highest number of telehealth visits was in April, whereas in 2021, most visits were scheduled in March and June, respectively.

3.2. Figures, Tables

Tables

Table 1. Demographic characteristics of patients who scheduled a telehealth visit at DHA, by appointment status, March 2020 – July 2021.

	Appointment Status			P value*
	Completed N (Row %)	Canceled N (Row %)	Total N (Column %)	
Gender				
Male	79,667 (78.09)	22,351 (21.91)	102,018 (42.19)	< 0.001
Female	110,284 (78.88)	29,520 (21.12)	139,804 (57.81)	
Age Group				
<18 years	27,440 (78.76)	7,398 (21.24)	34,838 (14.41)	0.018
18 -24 years	17,341 (79.07)	4,590 (20.93)	21,931 (9.07)	
25 -44 years	79,818 (78.28)	22,144 (21.72)	101,962 (42.16)	
45 – 59 years	35,429 (78.86)	9,497 (21.14)	44,926 (18.58)	
≥ 60 years	29,923 (78.40)	8,242 (21.60)	38,165 (15.78)	
Nationality Group				

Emirati	130,354 (80.35)	31,872 (19.65)	162,226 (67.08)	< 0.001
Non-Emirati	59,597 (74.87)	19,999 (25.13)	79,596 (32.92)	
Total	189,951 (78.55)	51,871 (21.45)	241,822 (100.00)	

*P value for Chi square test significant at < 0.05.

Table 2. Visit characteristics of patients who scheduled a telehealth visit at DHA, by appointment status, March 2020-July 2021.

	Appointment status			P value*
	Completed N (Row %)	Canceled N (Row %)	Total N (Column %)	
<i>Appointment scheduled date (year)</i>				
2020	88,708 (83.14)	17,985 (16.86)	106,693 (44.12)	< 0.001
2021	101,243 (74.92)	33,886 (25.08)	135,129 (55.88)	
<i>Appointment TAT</i>				
≤ 2 days	137,281 (79.65)	35,076 (20.35)	172,357 (71.27)	< 0.001
≥ 3 days	52,670 (75.82)	16,795 (24.18)	69,465 (28.73)	
<i>Visit type</i>				
Video visits	127,382 (78.51)	34,862 (21.49)	162,244 (67.09)	0.523
Telephone visits	62,569 (78.63)	17,009 (21.37)	79,578 (32.91)	
<i>Provider specialty</i>				
Family Medicine	132,230 (78.56)	36,078 (21.44)	168,308 (69.60)	< 0.001
Dental & oral surgery**	18,918 (84.72)	3,413(15.28)	22,331 (9.23)	
Psychiatry & Psychology	9,387 (81.15)	2,180 (18.85)	11,567 (4.78)	
Dermatology	6,882 (73.38)	2,496 (26.62)	9,378 (3.88)	
Neurology	5,685 (78.75)	1,534 (21.25)	7,219 (2.99)	
Others***	16,849 (73.20)	6,170 (26.80)	23,019 (9.52)	
Total	189,951 (78.55)	51,871 (21.45)	241,822 (100.00)	

* P value for Chi square test significant at < 0.05.

TAT; Turn around time

**Dental and Oral Surgery includes Dental, Oral maxillofacial Surgery & Orthodontics.

*** Others include the following specialties Cardiology, Cardiothoracic Surgery, Endocrinology (Endocrinology & Diabetes), General Surgery (General Surgery, Bariatrics & Hand Surgery & Plastic Surgery), Hematology (Hematology & Thalassemia), Home Health Services, Internal medicine (Internal medicine, Infectious Diseases, Geriatric Medicine, and Rheumatology), Nutrition (Dietitian and Nutrition), Neurosurgery, Obstetrics and Gynecology (Gynecology & Obstetrics), Oncology and Nuclear Medicine, Ophthalmology, Trauma, and Orthopedic Surgery, Otolaryngology (Otolaryngology & Audiology), Pediatrics (Pediatric Gastroenterology and Pediatric Neurology), Physical therapy and Rehabilitation (Occupational therapy & Physical Therapy and Rehabilitation), Pulmonology, Vascular Surgery. .

Table 3. Patient and visit characteristics of patients who completed a telehealth visit at DHA, by turn-around time (TAT), March 2020-July 2021.

	Appointment TAT in days				P value*
	Media n TAT	≤ 2 days N (Row %)	≥ 3 days N (Row %)	Total N (Column %)	
<i>Gender</i>					
Male	1	57,485 (72.16)	22,182 (27.84)	79,667 (41.94)	0.034
Female	1	79,796 (72.36)	30,488 (27.64)	110,284 (58.06)	
<i>Age Groups</i>					

< 18 Year	2	17,335 (63.17)	10,105 (36.83)	27,440 (14.45)	< 0.001
18 - 24	2	11,157 (64.34)	6,184 (35.66)	1,734 (19.13)	
25 - 44	1	62,138 (77.85)	17,680 (22.15)	79,818 (42.02)	
45 - 59	1	24,945 (70.41)	10,484 (29.59)	35,429 (18.65)	
60 +	1	21,706 (72.54)	8,217 (27.46)	29,923 (15.75)	
Nationality groups					
Emirati	1	90,565 (69.48)	39,789 (30.52)	130,354 (68.63)	< 0.001
Non-Emirati	1	46,716 (78.39)	12,881 (21.61)	59,597 (31.37)	
Year of appointment date					
2020	1	78,633 (88.64)	10,075 (11.36)	88,708 (46.71)	< 0.001
2021	2	58,648 (57.93)	42,595 (42.07)	101,243 (53.29)	
Visit type					
Telephone visit	10	17,585 (28.10)	44,984 (71.90)	62,569 (32.94)	< 0.001
Video visit	1	11,9696 (93.97)	7,686 (6.03)	127,382 (67.06)	
Provider's specialty					
Family medicine	1	126,355 (95.55)	5,875 (4.44)	132,230 (69.61)	< 0.001
Dental & oral surgery**	8	3,607 (19.06)	15,311 (80.93)	18,918 (9.95)	
Psychiatry & Psychology	19	1,598 (17.02)	7,789 (82.97)	9,387 (4.94)	
Dermatology	12	1,224 (17.78)	5,658 (82.21)	6,882 (3.62)	
Neurology	26	706 (12.41)	4,979 (87.58)	5,685 (2.99)	
Others ***	8	3,791 (22.49)	13,058 (77.51)	16,849 (8.87)	
Total	1	137,281 (72.27)	52,670 (27.23)	189,951 (100.00)	

*P value for Chi square test.

* significant at < 0.05 TAT; Turn around time.

** Dental and Oral Surgery includes Dental, Oral maxillofacial Surgery & Orthodontics.

*** Cardiology, Cardiothoracic Surgery, Endocrinology (Endocrinology & Diabetes), General Surgery (General Surgery, Bariatrics & Hand Surgery & Plastic Surgery), Hematology (Hematology & Thalassemia), Home Health Services, Internal medicine (Internal medicine, Infectious Diseases Geriatric Medicine, and Rheumatology), Nutrition (Dietitian and Nutrition), Neurosurgery, Obstetrics and Gynecology (Gynecology & Obstetrics), Oncology and Nuclear Medicine, Ophthalmology, Trauma, and Orthopedic Surgery, Otolaryngology (Otolaryngology & Audiology), Pediatrics (Pediatric Gastroenterology & Pediatric Neurology), Physical therapy and Rehabilitation (Occupational therapy & Physical Therapy and Rehabilitation), Pulmonology, Vascular Surgery. .

Table 4. Binary Logistic regression analysis for the factors associated with Turn Around Time for patients who completed telehealth visits at DHA, March 2020 – July 2021.

Characteristics	Odds Ratio (OR)	(95% CI)	P value
Gender			
Male	Reference		
Female	1.01	(0.98, 1.04)	0.513
Age Group			
< 18 years	Reference		
18 – 24 years	0.83	(0.78, 0.87)	< 0.001
25 – 44 years	0.70	(0.67, 0.73)	< 0.001
45 – 59 years	0.64	(0.61, 0.67)	< 0.001
≥ 60 years	0.39	(0.38, 0.42)	< 0.001
Nationality groups			
Emirati	Reference		
Non-Emirati	0.93	(0.91, 0.96)	< 0.001

<i>Year of appointment date</i>			
2020	Reference		
2021	3.23	(3.14, 3.32)	< 0.001
<i>Visit type</i>			
Video visit	Reference		
Telephone visit	7.28	(7.05, 7.52)	< 0.001
<i>Provider specialty</i>			
Family medicine	Reference		
Dental & oral surgery	4.57	(4.37, 4.79)	< 0.001
Dermatology	3.73	(3.49, 3.99)	< 0.001
Psychiatry & Psychology	3.09	(2.92, 3.28)	< 0.001
Neurology	3.81	(3.54, 4.10)	< 0.001
Other specialties	3.26	(3.12, 3.41)	< 0.001

CI, Confidence Interval at 95%; P value < 0.05; .

Figures

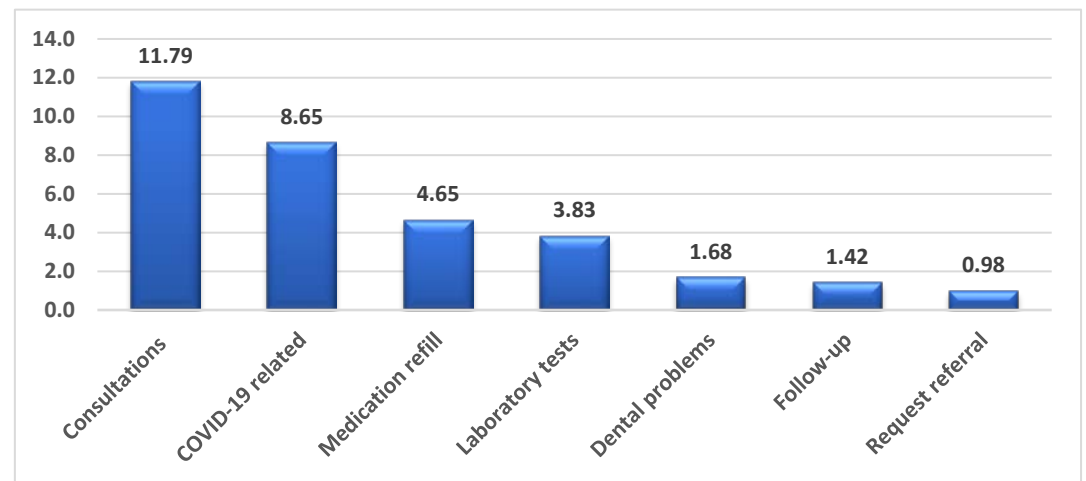


Figure. 1 Top reasons for seeking telehealth visits at DHA from March 2020 – July 2021 (%).

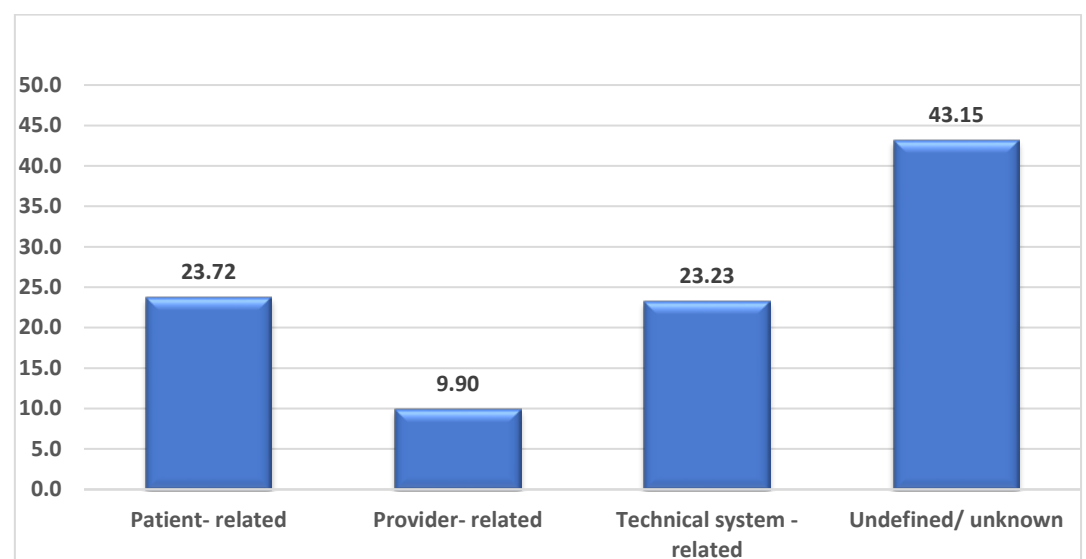


Figure. 2: Reasons for canceled telehealth visits at DHA, March 2020 – July 2021 (%).

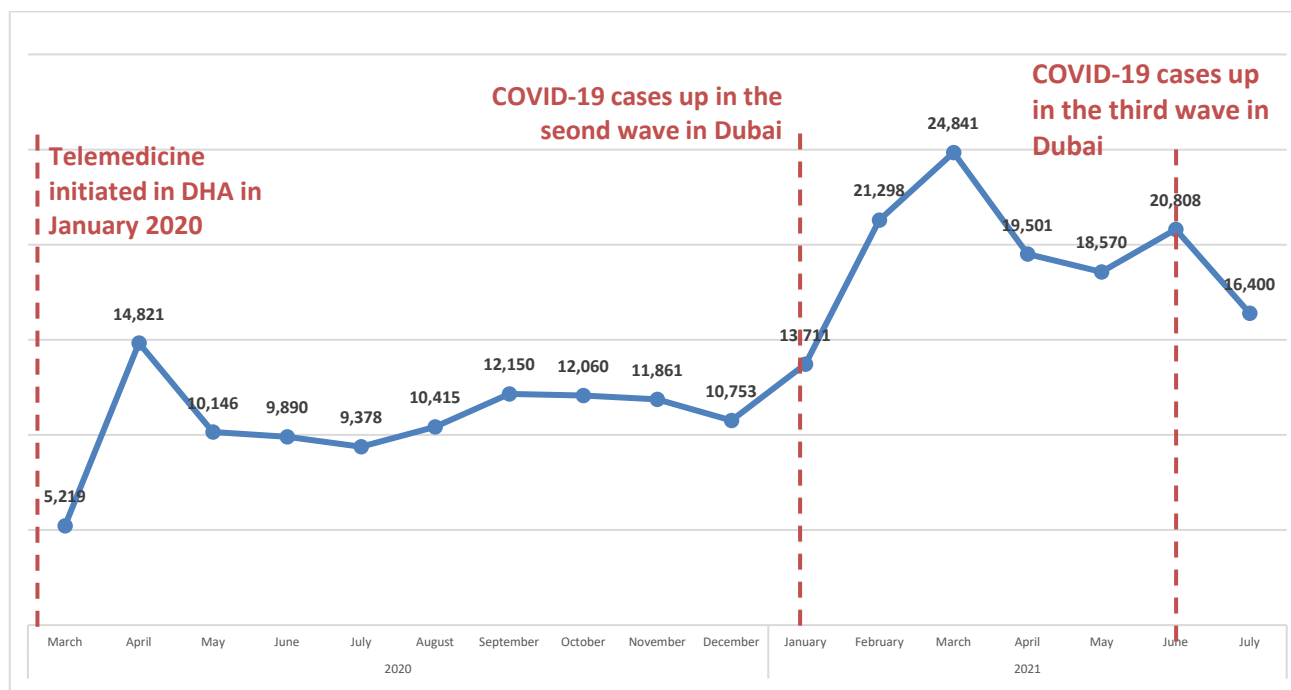


Figure. 3 Trend/ timeline of telehealth utilization by month during the COVID-19 pandemic from March 2020 – July 2021

4. Discussion

A higher proportion of patients who scheduled for telehealth and completed their visits between 2020 and 2021 were females, Emiratis, and in the age group of 25-44 years. Additionally, more visits were completed in 2020, which had a shorter waiting time of two days or less from appointment requested to appointment received, were conducted via video, and sought family medicine as a specialty. Overall, older patients, non-Emiratis, patients who had their visits in 2020, patients who had video visits, and those who sought family medicine as a specialty had a shorter waiting time of two days or less to receive their appointment. Therefore, age, nationality, year of appointment date, type of visit, and provider specialty were sensitive factors to changes in TAT, from requested to received. Notably, consulting a healthcare provider was among the top reasons for using telehealth, with the highest peak of telehealth utilization being in March 2021.

Evidence demonstrates a positive attitude and general acceptance of telehealth services in the UAE population. Factors including sociodemographic and clinical characteristics were significantly associated with the utilization of telehealth services during the pandemic [23]. The sociodemographic characteristics of our findings are consistent with other findings conducted nationally and internationally, where telehealth users were more likely to be females and younger [23, 24]. Another comparative study found that older patients may use telehealth more than visiting primary healthcare centers [15]. This can be explained by the fact that older people are encouraged to be at home and use telehealth services for their safety. Moreover, our results illustrated that the top reasons for seeking telehealth services in the government sector were consultations, COVID-19-related and medication refill, which is consistent with another study conducted in the UAE during the same period [23].

Some telehealth services could not be completed owing to many reasons. The reasons can be categorized as patient-related, technical system-related, provider-related, and other unknown reasons. Some studies attributed this to the unfamiliarity of patients with telehealth services, the need for physical examination, and limited insurance coverage. While insurance coverage is unlikely to be the case in our study as the majority of our sample comprised UAE nationals who were covered by the government, the other two

reasons need to be investigated [23,24]. Moreover, other reasons that could result in incomplete telehealth appointments include the healthcare model and how the services were provided, or the trust and confidence in the physician providing the service [23-25].

Regarding TAT, patients had to wait for a median of one day for a video visit. This seems to be a shorter waiting time compared with the time of an in-person before COVID-19 pandemic in Dubai. One study illustrated that the average waiting time to see a physician at a primary healthcare center in Dubai was 35 days before COVID-19 [27]. Moreover, our analysis indicates that patients seeing a family physician are less likely to wait compared with other specialties that follow the same pattern for in-person visits [28-32].

Although other specialties, such as dental and oral surgery, neurology, and dermatology have longer waiting times, psychiatric and psychological services are crucial, especially in light of the mental health challenges and concerns associated with the pandemic. Psychiatry and psychology can be addressed through telemedicine. However, other specialties may need more in-person medical attention. Therefore, ensuring that the psychological needs of a population are met by establishing adequate services and providers and mental health professionals per population is necessary. It is worth mentioning that longer waiting time can have grave consequences on the mental and physical health of patients; it may worsen the symptoms of depression and develop self-harm ideation [23, 24, 33].

Our study has some limitations. The data were extracted only from the government sector in Dubai; therefore, they cannot be generalized to the private sector or other emirates. Moreover, owing to the retrospective nature of the study, we were limited by the number of variables available for analysis. Notwithstanding these limitations, our study has several strengths, especially in that it has policy implications for the future use of telehealth services in the emirate of Dubai. The study researchers grouped the factors into patients' (sociodemographic characteristics) and healthcare system levels (visit characteristics) in relation to the TAT. Furthermore, this completion rate and TAT analysis have not been examined in a regional context before and have been minimally examined elsewhere. Additionally, the power of this study stems from the relatively large sample size and uniqueness of the dataset examined.

5. Conclusions

Our study, to the best of our knowledge, is among the few studies that examine the utilization of telehealth services, considering appointment completion and TAT in association with patients' characteristics and visit characteristics in the emirate of Dubai. Our results demonstrate that age group, nationality group, year of appointment date, visit type, and provider specialties are significant factors in understanding the utilization of telehealth services, especially during the COVID-19 pandemic. Overcoming the technological challenges is imperative when dealing with logistical hurdles experienced by end users. These improvements should consider friendly use of telehealth services as well as quality of information fed in the system. An advanced information feeding will help extract and analyze better information, which will have significant policy implications. Physicians' recommendations and best practices will help mitigate future technological challenges [34].

Telehealth has improved accessibility to health services. Numerous studies have discussed the cost-effectiveness of this technology on some specialties than others. Therefore, cost and funding models may require revision after considering the different cost analysis types [35-37]. Given that our findings illustrate differences in turn-around-time between specialties, this study supports the need for earlier tele-psychiatric assessment and interventions to contain mental health symptoms and potential suicidal thoughts among patients who require psychiatric and psychological services. Furthermore, cost-effectiveness, mixed methods, and qualitative studies are recommended to understand telemedicine utilization in the context of Dubai and the UAE.

6. Patents

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Abbreviations: DEC: Doctor for Every Citizen, **DHA:** Dubai Health Authority, **EMR:** electronic medical records, **ICT:** Information and Communication Technologies, **ORs:** Odds Ratios, **TAT:** turnaround time, **WHO:** World Health Organization.

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