

Assessment of Virtual Healthcare Services among Medical Staff and Patients and the Usefulness of Creating Virtual Healthcare Application in Saudi Arabia

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ABSTRACT

Background: Virtual healthcare services defined as services concern the priority for ensuring receipt of time, integrated patient center-care. It composes of multiple services including electronic health record, mobile technology, patient health portal and telehealth such as instant audio, video and secure messaging.

Material and methods: Online questionnaires were designed to evaluate the feasibility of healthcare services by using an application. Two surveys were prepared and targeted two main groups: patients and medical staff. The participated medical staff is medical doctors, nurses, radiographers and social workers.

Results: Three benefits were mentioned by most of the participants: saving money (by 72%), providing the right care at the right time (64%), saving time (63%). Moreover, two advantages were mentioned by around two-thirds of the participants: (1) doing the virtual visit nearly at any place without the need to travel (2) being easier option for elderly people. On the other hand, "eliminating the concern about exposure to illness" was mentioned by a considerable proportion of the participants (about 40%).

Conclusion: Virtual healthcare services becoming more preferable to patients and medical staff due to its feasibility, convenient, save time and money and less direct contact to the patients due to pandemic.

Key words: Healthcare, Binomial test, Hospital

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EDITORIAL

Virtual healthcare services defined as services concern the priority for ensuring receipt of time, integrated patient center-care. It composes of multiple services including electronic health record, mobile technology, patient health portal and telehealth such as instant audio, video and secure messaging [1]. Most healthcare

systems consider strategic stages to promote the use of virtual healthcare services in order to support care and delivery coordination and access demands over extensive network of resources to enhance patients' outcome and offer the utilization of efficient system [2]. The virtual healthcare services were established by the healthcare system as a preference for care delivery. Most of systems depend on virtual healthcare services to deliver and coordinate good quality care and decrease the patient directly contact [3]. Based on vision 2030 of Saudi Arabia that state digital transformation for most of the facilities, there is a need for developing and accommodate the virtual healthcare services more in health system [4].

Virtual healthcare service is more effective when utilizing tools and integrated to the service and improve

work flow efficiency [5]. The primary care to the patients includes nurse, physician and clinical associates like laboratory and radiographer technologists [6]. This primary care team could extend to staff members from different specialty areas of service e.g. social work, nutrition, nurse, physiotherapy and psychology [1,7,8]. A good understanding of the medical staff practice and patient experience with the virtual healthcare services would help in developing and launch an application that can provide these services remotely. Up to date, the research about the virtual health care services and related application are limited in Saudi Arabia. This study aims to evaluate the experience of the patient and medical staff utilizing virtual health services and to assess the idea of creating an application for virtual healthcare services in Saudi Arabia.

MATERIAL AND METHODS

Online questionnaires were designed to evaluate the feasibility of healthcare services by using an application. Two surveys were prepared and targeted two main groups: patients and medical staff. The participated medical staff are: medical doctors, nurses, radiographers and social workers. Prior the surveys distribution, they were edited for typographic and formatting improvements. Both surveys were conducted in large hospitals in western region of Saudi Arabia including private and public hospitals. All data were collected through interviewing the participants at the hospitals and all data was distributed and arranged at excel sheet for analysis. The participation period for the survey was lasted for two months from 1 October to 1 December 2022.

The total number of the participants forms the patient and medical staff were 462 and 258 respectively. The first part in the patient's questionnaire was including general information related to gender, age, nationality, education level and the hospital type (private or governmental hospital). The second part including 9 questions related to their experience using virtual health services and expressing their opinion in creating an application for homecare services. Similarly with the practitioner's survey, the first part relating to general information like gender, age and level of education and the second part was about their experience utilizing virtual healthcare system.

Statistical analysis

Descriptive statistics and graphical presentations of the survey data were expressed as frequencies and Percentages. One-Sample Binomial Test was used to assure that the percentage of certain response (answer) within a variable (i.e., a question) has exceeded/gone below (depending on our assumption) some level. For example: percentage of those who "agree" is > 50%. The test is a series of statistical/probability calculations that would finally produce a P-value, which ranges from 0 to 1. P-value < .05 indicates statistically significant result; in other word, our assumption (or what we hypothesized)

is true. All statistical analyses were performed using IBM SPSS statistical software, version 26.

RESULTS

This section was divided into two subsections based on the two groups responses for the patients and practitioners.

The patients' responses

Table 1 showed the sample contained 462 patients. The sample participants are equally divided between males and females. About two-thirds of the participants are 21-40 years old, while the last third of them are older (but mostly 41-50 years old). The majority of the participants (85%) are Saudi. The biggest portion of the participants (48%) hold bachelor's degree and the second biggest portion of them (20%) hold master's degree. Approximately two-thirds of the participants (68%) were taken from public hospitals. Moreover, most of the participants (64%) have experienced the virtual healthcare services.

The virtual healthcare services were evaluated generally highly by the patients and most of the responses were agreed and strongly agreed about 80 percent of the responses for the questions concerning the following: 1) Preferring virtual healthcare services over in-person visits. 2) Recommending the use of virtual healthcare services to my family members or friends. 3) Recommending the use of healthcare application connected to homecare services for my family members or friends (Table 2). Also, for the other questions, the majority of the patients responses that the virtual healthcare services could save time/money and enhances the service quality; specifically for the following prospective: 1) In virtual healthcare services, the physician can see the patient within 15 minutes of the scheduled appointment time with no overlapping with other patients. 2) The amount of time that the healthcare provider spends with patient is adequate.

Moreover, the patients responses showed high percentage of agreement (more than 60 %) related to creating healthcare application and its potential services and benefits: 1) the patient investigation can be easily transferred through the healthcare application. 2) Creating an application related to homecare center can improve the services provided by the center and help the patient order homecare services. 3) Healthcare application contains homecare services and all patient data; this allows low-cost operation. 4) Healthcare application allows patients to take a second opinion from other physicians who are located in different regions or country. 5) The patient prefers to pay some expenses in order to save costs and efforts of travelling to the healthcare center (even if it provides better service). 6) Using specific healthcare application that links the doctors locally or globally helps diagnose and follow up patient status. 7) The privacy is respected during virtual healthcare services visit. 8) At remote or

locally area when there is lack of physicians for specific specialty, the healthcare application can provide the appropriate health organizations practice or diagnosis to patient which helps in: improving the service quality and reducing the cost (Table 2). The results showed significant results with (P-value < 0.05).

The most preferable method to access virtual healthcare appointment is online-video (by 53% of the participants), and to a lesser extent telephone-audio (by 32%), and online-audio (by 14%); Texting wasn't the preferable method for almost all the participants (Figure 1). Three benefits were mentioned by most of the participants: saving money (by 72%), providing the right care at the right time (64%), saving time (63%). Moreover, two advantages were mentioned by around two-thirds of the participants: (1) doing the virtual visit nearly at any place without the need to travel (2) being easier option for elderly people. On the other hand, "eliminating the concern about exposure to illness" was mentioned by a considerable proportion of the participants (about 40%).

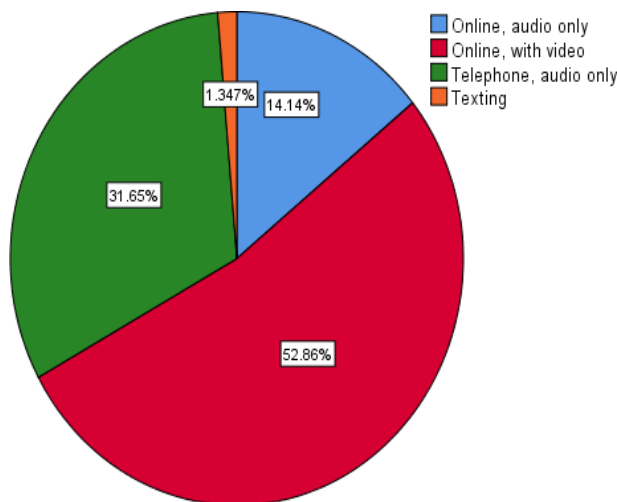


Figure 1: Demonstrated the preferable method to access virtual healthcare appointment.

The practitioner’s responses

Table 3 showed the characteristics of 258 practitioners, the majority about (89%) of the participants are 21-40 years old and about (95%) are Saudi. Two-thirds of the participants in this survey hold bachelor's degree, while the rest have different educational level and (99%) of the participants work in public hospitals. Figure 2 showed that 31% of the participants have the potential to serve in virtual healthcare services, while 9% can use it only under some specific services (total of both is 40%). On the other hand, most of the participants (60%) don't feel having the potential to serve in such services. Of the 78 participants who have the potential to provide the virtual service, 25 have provided with justification of their responses that can be summarized as follows: 1) Connection with patient will be easier, 2) Easy & time saving, 3) It is possible to send results. 4) Outpatient department (OPD) appointments. 5) Patients can check in and book an appointment online. 6) The availability of mobile applications like MOH SEHA FOR DOCTORS AND SEHATY. For those who provide the service only under specific situations (i.e., the 22 participants), they provide the following justifications: 1) it can be useful in diagnosing only, 2) it can be useful in dealing with images and not in interventional procedures. Moreover, for those who have no potential in providing the virtual services (i.e., the 152 participants) mention that "the need for physical contact," "communication difficulties" and "having lower job-level" as justifications.

In Table 4, most of the participants (>74%) agree that with the idea the potential advantages of creating an application for healthcare services. The results showed statistically significance (p-value <0.05) which indicate that the population agree with these items in Table 4. The medical staff believes such virtual healthcare services can save time/money and enhances quality). The most preferable method to access virtual healthcare appointment is online-video (by 53% of the practitioners), and to a lesser extent telephone-audio

Table 1: The demographic distribution for the patients group.

Variable	Categories	N	% (Total N = 462)
Gender	Male	231	50
	Female	231	50
Age	21-30	159	34.4
	31-40	157	34
	41-50	122	26.4
	51-60	20	4.3
	> 60	4	0.9
Nationality	Saudi	391	84.6
	Non-Saudi	71	15.4
Education	Secondary education or below	43	9.3
	Higher diploma	54	11.7
	BSc	220	47.6
	MSc	92	19.9
	PhD	41	8.9
Hospital sector	Resident	4	0.9
	Consultant	8	1.7
	Public	314	68
	Private	148	32

Table 2: The patient’s response about their experience with the virtual healthcare services in Saudi Arabia.

Question/Item	Strongly disagree	Disagree	Agree	Strongly agree	Total Agreement	Hypothesis	P-value
In virtual healthcare services, the physician can see the patient within 15 minutes of the scheduled appointment time with no overlapping with other patients	2.70%	14.80%	45.1%	37.4%	82.5%		0
The patient investigation (e.g., lab, physiotherapy, respiratory therapy, nursing services, radiology, etc.) can be easily transferred through the healthcare application	0.00%	18.90%	52.20%	29.00%	81.10%		0
The amount of time that the healthcare provider spends with patient is adequate	3.00%	8.10%	57.60%	31.30%	88.90%		0
Creating an application related to homecare center can improve the services provided by the center and help the patient order homecare services (e.g., lab and radiology tests to complete the diagnosis)	2.70%	12.80%	53.50%	31.00%	84.50%		0
Healthcare application contains homecare services and all patient data; this allows low-cost operation (e.g., travelling and accommodations during the treatment journey that may decrease the financial burden on patient and governments)	2.70%	16.20%	45.80%	35.40%	81.10%		0
Healthcare application allows patients to take a second opinion from another physicians who is located in different regions or country	1.30%	11.80%	52.20%	34.70%	86.90%	Agreement % > 50	0
The patient prefers to pay some expenses in order to save costs and efforts of travelling to the healthcare center (even if it provides better service)	2.70%	8.80%	63.30%	25.30%	88.60%		0
Using specific healthcare application that links the doctors locally or globally helps diagnose and follow up patient status	2.70%	9.80%	63.60%	23.90%	87.50%		0
The privacy is respected during virtual healthcare services visit	9.80%	20.50%	38.40%	31.30%	69.70%		0
At remote or locally area when there is lack of physicians for specific specialty, the healthcare application can provide the appropriate health organizations practice or diagnosis to patient which helps in: improving the service quality and reducing the cost	6.70%	9.40%	46.50%	37.40%	83.80%		0
I prefer virtual healthcare services over in-person visits?	2.70%	13.80%	51.20%	32.30%	83.50%		0
I Would recommend using Virtual healthcare services to my family members or friends	5.70%	4.00%	49.80%	40.40%	90.20%		0
I Would recommend using healthcare application connected to homecare services for my family members or friends	1.30%	7.70%	46.50%	44.40%	90.90%		0

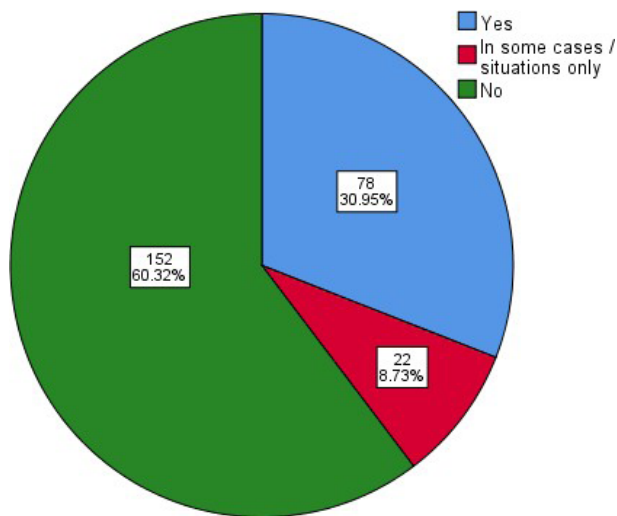


Figure 2: The practitioner’s responses for the question related to the potential to serve within the virtual health services.

(by 32%), and online-audio (by 14%); Texting wasn't the preferable method for almost all the participants (Figure 3).

Approximately two-thirds of the medical staff has mentioned (from their experience) that the virtual healthcare services are used for regular check-ups. One-half of the participants (or slightly less/more) have mentioned (from their experience) that the virtual healthcare services are used for initial/follow up consultation, requesting a prescription, reviewing a test results and medical diagnosis pr advice. About 40% of

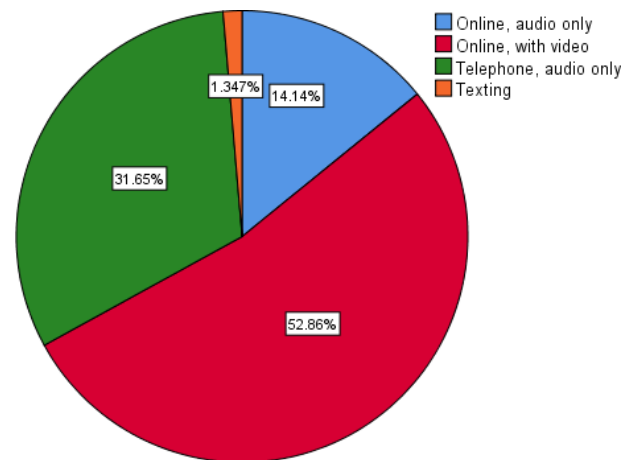


Figure 3: Shows the preferable method to access virtual healthcare appointment.

the participants have mentioned (from their experience) that the virtual healthcare services are used for treatment of therapy, and 23% of them have mentioned that the services are used to seek for referral.

Two benefits were stated by the majority of the participants i.e. saving time (by 95%), saving money (92%). Other benefits were "being in own home/surroundings" by 60% of the participants. Some other benefits were mentioned by slightly more than half of the participants, namely, safe/high quality, being in own home/surroundings and spending less off-work time. Also valid, and they are mentioned by 34-53% of

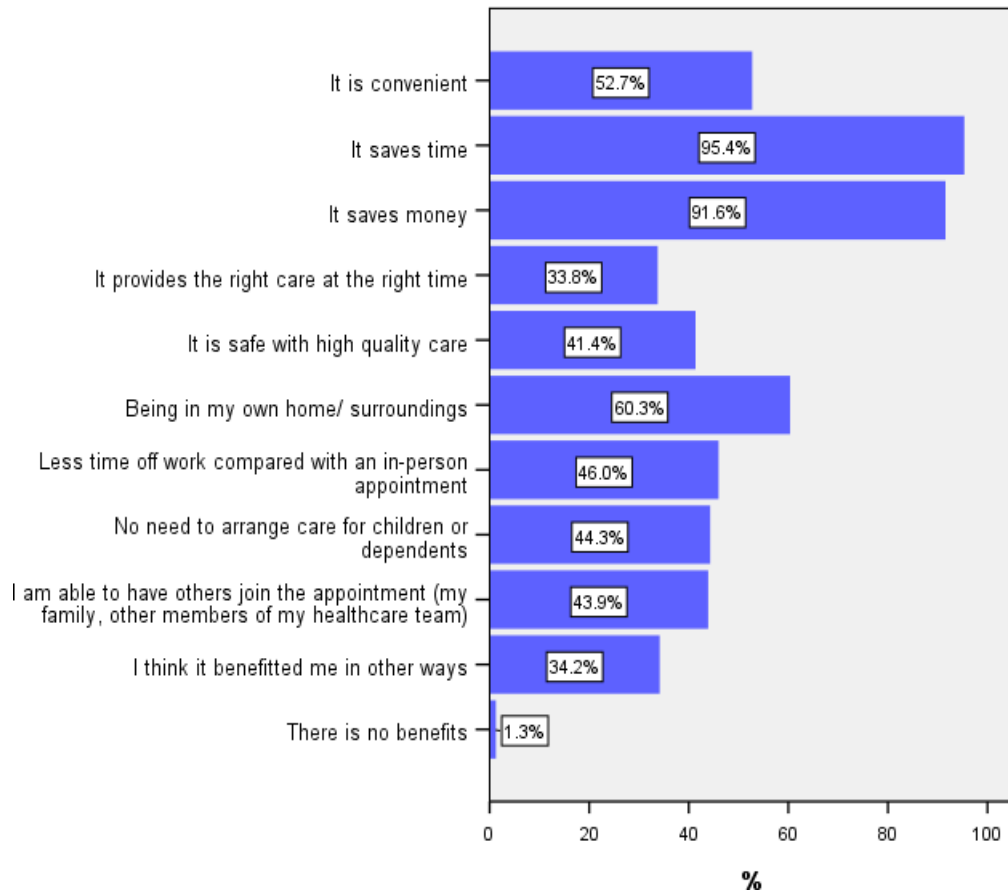


Figure 4: Shows the benefits of using virtual healthcare application services.

Table 3: The demographic distribution for the practitioner’s group.

Variable	Categories	N	% (N = 258)
Gender	Male	134	51.9
	Female	124	48.1
Age	21-30	114	44.2
	31-40	116	45
	41-50	24	9.3
	51-60	3	1.2
	>60	1	0.4
Nationality	Saudi	246	95.3
	Non-Saudi	12	4.7
Profession/specialty	Doctor/ specialist	67	26
	Intern student	15	5.8
	Neurosurgery	3	1.2
	Nurse	32	12.4
	Radiographer (X-ray, Ultrasound, MRI, etc.)	121	46.9
	Social worker	14	5.4
Education	Speech pathologist	6	2.3
	BSc	172	66.7
	Higher diploma	6	2.3
	MSc	19	7.4
	Resident	31	12
Job sector	Consultant	27	10.5
	Not specified	3	1.2
	Public	256	99.2
	Private	2	0.8

the participants (Figure 4). For a question related to the listed advantages of using virtual healthcare services,

most of the participants (60%+), while "reducing/ eliminating the need for office space/staff" having the

Table 4: The practitioner’s responses for creating an application of virtual healthcare services.

Question/Item	Strongly disagree	Disagree	Agree	Strongly agree	Total Agreement	Hypothesis	P-value
Creating an application related to homecare center can improve the services provided by the center and help the patient order homecare services (e.g., lab and radiology tests to complete the diagnosis)	9.30%	0.00%	55.00%	35.70%	90.70%		0
Healthcare application contains homecare services and all patient data; this allows low-cost operation (e.g., travelling and accommodations during the treatment journey that may decrease the financial burden on patient and governments)	0.00%	0.00%	55.00%	45.00%	100.00%		0
Healthcare application allows patients to take a second opinion from another physicians who is located in different regions or country	0.00%	0.00%	48.80%	51.20%	100.00%		0
The patient prefers to pay some expenses in order to save costs and efforts of travelling to the healthcare center (even if it provides better service)	10.50%	15.10%	39.90%	34.50%	74.40%	Agreement % > 50	0
Using specific healthcare application that links the doctors locally or globally helps diagnose and follow up patient status	8.10%	0.00%	57.00%	34.90%	91.90%		0
In virtual healthcare services, the physician can see the patient within 15 minutes of the scheduled appointment time with no overlapping with other patients	2.30%	1.20%	45.30%	51.20%	96.50%		0
The patient investigation (e.g., lab, physiotherapy, respiratory therapy, nursing services, radiology, etc.) can be easily transferred through the healthcare application	0.00%	1.20%	47.30%	47.30%	98.80%		0
The privacy is respected during virtual healthcare services visit	0.00%	17.10%	44.60%	38.40%	82.90%		0
At remote or locally area when there is lack of physicians for specific specialty, the healthcare application can provide the appropriate health organizations practice or diagnosis to patient which helps in: improving the service quality, reducing the cost	1.20%	0.00%	42.60%	56.20%	98.80%		0

highest percentage (82%).

DISCUSSION

This study aims to evaluate the experience of the patient and medical staff utilizing virtual health services and to assess the idea of creating an application for homecare centers in Saudi Arabia.

The statistical analysis of this project showed that the medical staff and patients prefer using virtual healthcare services over the in-person visits because of time spent on each session and the ability of transferring patients’ data e.g. lab, radiology and medicine results and appointments. Also, the advantages of virtual healthcare services were including the convenient of not using stationary place e.g. office or clinic, avoiding travel expenses to the patient and the physician can spent 15 minutes with the patients without overlapping in the schedule. However, the obstacles that encounter the medical staff were the lack of emotional connection and poor quality connection. Based on previous studies, several advantages were recorded for utilizing virtual health services such as: it helps in redistribute the work, less trips to the clinic for the patients. In addition, medical staff prefer VHR over traditional tools and improve care delivery, clinical workflow and patients outcome [1]. A study was conducted in rural remote area in Canada summarize the benefits of using virtual healthcare services on these areas. For medical staff, working away from the clinical allow for more interacting with their families. Additionally, the schedule time for serving the patients is flexible compared with in clinic resulting in reducing the control over working hours and perceived cost of low autonomy. For patients, utilizing virtual health services would provide long call duration with the physician due to long chats that make the patient more comfortable. However, this could overburden the

physician because of the long sessions with the patients [9]. Based on this project, both groups (medical staff and patients) suggest that the accessibility to VHR and its functionality and the knowledge of VHR for both groups determine the performance of the VHR [10,11]. Many literature review discuss the performance measure for primary care [12-16].

The studies related to virtual health application are limited in Saudi Arabia and most of international studies related to virtual healthcare services were based on COVID-19 pandemic experience specially not generalized. The idea of creating an application that provide multiple services to the patients would help in enhance the diagnosis efficiency by delivering accurate patients information such as lab, radiology and medicine tests. Such an application could decrease the operational cost to the patients and governments. Patient in remote area would be beneficial of such application by consulting high qualified doctors remotely and take second opinion. In South Africa, the healthcare applications went beyond the pandemic to include some health services such as preventing Malaria and enhancing child and maternal health throughout the pandemic [17]. Pillay and Motsoaledi stated a mobile application called Mom Connect that offer maternal and child care by connecting the health services to pregnant women [18]. Moreover, Grobbelaar, et al. confirmed that this application improves the consultation and health communication for the patients during the pandemic period [19]. Another application named MalariaConnect was launched for virus containment and utilized in monitoring and reporting in order to enhance the notification in some province of the country [20]. Also, Vula application was launched for medical services for the patient like referral, medical chats and consultations [21]. Besides these applications, an application named Signapps was developed to provide healthcare services remotely. It

offers multiple services such as patient management and coordination, referral management secure patient data storage predictive analytics, reporting and secure messaging [22]. These studies are concurred with our proposed application. However, most of the applications are focused on disease e.g. COVID-19 or Malaria. In this project, the proposed application includes consultations, appointments, transferring results for radiology and laboratory etc and it could expand its options to improve the services to the patients. The main challenge is the need for good platform for internet connection due to the poor quality connection in some regions.

CONCLUSION

Virtual healthcare services becoming more preferable to patients and medical staff due to its feasibility, convenient, save time and money and less direct contact to the patients due to pandemic. Creating an application that can provide bundle of medical services virtually would be handful to the patients and improve the quality of healthcare system.

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