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TELEHEALTH ADOPTION AMONG ENDOCRINOLOGISTS DURING THE COVID-19 PANDEMIC

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ABSTRACT

Objective: Telehealth is a timely solution for delivering health care during the coronavirus disease 2019 (COVID-19) pandemic. The practice of endocrinology is suited to provide virtual care to patients with a variety of endocrine disorders. In this survey, we aimed to gauge the adoption of telehealth practices during the COVID-19 pandemic among endocrinologists in the United States (U.S.).

Methods: This was a cross-sectional, online survey-based study. Members of the Facebook group “Endocrinologists” were invited to participate in the survey. Characteristics of respondents and their rates of adoption of telehealth were described and analyzed for statistically significant associations using the Pearson chi-square test.

Results: A total of 181 physicians responded to the survey. The majority of respondents were females (75%), younger than or equal to 40 years of age (51%), employed (72%) either by a private group/hospital or by an academic setting, worked in an urban area (88.4%), and were adult endocrinologists (93%). With the COVID-19 outbreak, more than two-fifths (44.2%) of participants switched to completely virtual visits, and an additional 44.2% switched

to a majority of virtual visits, with some in-person visits in the outpatient setting. Additionally, there was a significantly higher adoption rate of telehealth among endocrinologists younger than or equal to 40 years of age ($P = .02$) and among those who practiced in northeastern, midwestern, and the western geographic regions of the U.S. ($P = .04$).

Conclusion: The majority of the responding endocrinologists from the U.S. appeared to have swiftly adapted by using telehealth within a few weeks of COVID-19 being declared a national emergency. (**Endocr Pract.** 2020;26:846-856)

Abbreviations:

CMS = Centers for Medicare and Medicaid Services;
COVID-19 = coronavirus disease 2019; **PPE** = personal protective equipment; **U.S.** = United States

INTRODUCTION

Social distancing and stay-at-home order implemented in multiple states due to the rapid spread of severe acute respiratory syndrome coronavirus 2 in the United States (U.S.) has focused attention on new models of care that avoid in-person clinic visits. Telehealth involves the use of telecommunications and virtual technology to deliver health care outside of traditional health-care facilities (1). This technology has emerged as a tool to help “flatten the curve.” Additionally, telehealth liberates clinicians from the use of unwieldy, restrictive personal protective equipment (PPE). Clinicians are thus adopting alternate means of interacting with patients to avoid clinical care disruptions.

In 2015, the American Telemedicine Association created an accreditation program for online patient consultation that recognizes organizations providing online, real-time patient health services that comply with operational,

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clinical, and consumer-related standards. The program promotes patient safety, transparency of operations, and adherence to all relevant laws and regulations (2).

The Centers for Medicare and Medicaid Services (CMS) define telehealth, telemedicine, and related terms as “the exchange of medical information from one site to another through electronic communication to improve a patients’ health (3).” Under the new 1135 waiver, Medicare now pays for office, hospital, and other visits furnished via telehealth across the country and including in patient’s places of residence as of March 6, 2020. Not only physicians but also nurse practitioners, clinical psychologists, and licensed clinical social workers, will be able to offer telehealth options to their patients. Before the 1135 waiver, Medicare would only pay for telehealth on a limited basis: the person receiving the service had to be from a designated rural area and were required to go to a clinic, hospital, or certain other types of medical facilities for the remote service (3).

CMS classifies virtual visits into 3 categories: telehealth visits, virtual check-ins, and e-visits. Telehealth visits are the same as in-person visits, with interactive real-time audio-video communication between a provider at a remote site and the patient at home. Virtual check-ins are brief communication services with a practitioner via various communication technologies, including synchronous discussion over telephone or exchange of information through video or image. E-visits are non-face-to-face patient-initiated remote communications with their doctors using online patient portals (3). Electronic consultations (e-consults) are characterized as clinician-to-clinician asynchronous communications based on record review, from both inpatient and outpatient settings, that may obviate face-to-face specialist visits. E-consult programs have proliferated widely. A recent systematic analysis concluded that there might be publication bias in that positive outcomes of e-consults are more likely to be published, and a more rigorous study of e-consults is required (4-6).

Following the outbreak of coronavirus disease 2019 (COVID-19), previously known as the novel coronavirus, or 2019-nCoV in Wuhan, China, in December, 2019, the disease has spread rapidly across multiple countries. The first case was confirmed in the U.S. on January 20, 2020 (7). The World Health Organization declared COVID-19 a pandemic on March 11, 2020 (8). Following the presidential declaration of COVID-19 as a U.S. national emergency on March 13, 2020, multiple states issued stay-at-home orders on various dates (9,10). The CMS subsequently broadened access to Medicare Telehealth services for its beneficiaries to receive a comfortable range of services from their physicians without traveling to a health care facility, thereby decreasing their risk of contracting the virus and placing others at risk. On a temporary and emergency basis under the 1135 waiver, Medicare agreed to pay healthcare facilities for care rendered to its beneficiaries

via telehealth across the country, in an effort to contain the community spread of the virus (3). In Michigan, several commercial insurance plans like Blue Cross Blue Shield of Michigan, Blue Care Network of Michigan, Priority Health, Meridian, CVS Health, McLaren, and Health Alliance Plan also announced that they would provide coverage for and encouraged the use of virtual care and telemedicine (11). Additionally, as of March 27, 2020, the CMS approved the 1135 waiver in 34 states for Medicaid beneficiaries (12). On April 5, 2020, the CMS finalized policies that will increase plan choices and benefits, including allowing Medicare Advantage plans to include additional telehealth benefits (13). On April 30, 2020, CMS issued a second round of changes to support telehealth and agreed to enhance reimbursement for telephone visits (14). Many states have issued emergency waivers for providers credentialed out-of-state in response to COVID-19. Furthermore, the Federation of States Medical Boards (FSMB) offers timely assistance to help provide essential information that is needed to verify licenses and credentials for physicians and other health care professionals wishing to practice across state lines to treat patients in areas heavily impacted by COVID-19 (15).

Policy responses to expanding telehealth are an appropriate step to help address this pandemic with severe socioeconomic sequelae in the U.S. and abroad. According to the New York Times database as of May 27, 2020, more than 1.7 million people across the U.S. tested positive for the virus, and more than 100,000 people have lost their lives (16). However, as telehealth use expands, insights about its adoption rates in various practice settings and geographic locations will be invaluable. The purpose of this study was to describe the rates of adoption of telehealth among endocrinologists and to explore practitioner characteristics.

METHODS

Survey Design and Administration

We developed a web-based survey using Google Forms. The survey was distributed to endocrinologists in the Facebook group “Endocrinologists.” This private group allows membership by invitation only and had 2,233 endocrinologists as members when the survey was administered, with more than 95% of the members working in the U.S. (confirmed by the Group Administrator). The questionnaire included 11 single-selection, multiple-choice questions with an additional section to leave comments and suggestions (Suppl. Fig. 1). This survey was considered exempt from review by the MidMichigan Health Institutional Review Board. All 11 questions were mandatory. The Comments and Suggestions section was optional. The survey link was released on April 2, 2020, with reminders sent on April 3 and 7, 2020. The survey was closed on April 7, 2020. Responses were obtained anonymously, and no incentive was provided for survey comple-

tion either by the authors or by Facebook. Survey responses were collected and electronically stored by Google Forms and made accessible by password. A total of 214 responses were received. A data quality check identified multiple responses from a single responder. After removing duplicates, the final total was 181 responses. The entire survey is available online and can be accessed by requesting permission from the author(s).

Statistical Analyses

Statistical analysis was performed using SPSS v.25 (IBM Corporation, Chicago, IL). Consistent with the exempt status claimed from the Institutional Review Board, there were no respondent identifiers in the raw data. For descriptive purposes, frequencies and percentages for each level of the response were computed for each question. For inferential analyses, age brackets were recoded to 2 levels: younger than or equal to 40 years and older than 40 years. This age adjustment was formulated with the intent to explore whether newer endocrinologists are more apt to adopt a new change such as telehealth. Regarding gender, the one respondent who chose not to identify as either a male or female, was excluded from the inferential analyses. One reason was that inferential modeling would not have worked at such a low frequency for this response. The other purpose was that there was no ethical bearing in terms of the representation of minority and vulnerable populations in the context of our study. The state within which the respondents practiced was recoded into 4 geographic regions: Midwest, Northeast, South, and West, based on the U.S. census bureau's distribution of states. The type of practice was classified as rural or urban and as private practice versus employed. Private practice included owners and partners of private practice, while the employed group included employment by a hospital/group or an academic institution. Other characteristics elicited in the survey included: prior experience with telehealth before the COVID-19 outbreak, telehealth experience in residency or fellowship, patient population (adults, pediatrics, or combined), type of practice (employed versus private practice), and overall satisfaction on a scale of 1 to 10 with telehealth.

The "outcome" or the target variables were the adoption of telehealth in outpatient settings and the adoption of telehealth in inpatient settings. The response options "100% virtual visit" and "majority virtual visits, some in-person visits" were combined to assess the adopters of telehealth. Likewise, the response options "100% in-person visits" and "majority in-person visits, some virtual visits" were combined to assess the nonadopters of telehealth. A cross-tabulation was performed between the levels of each of the explanatory characteristics and the adopter versus nonadopters of telehealth, both for outpatient and inpatient settings. To explore statistically significant associations of these categorical measures, a 2-tailed Pearson chi-square test was used. If the expected cell frequencies were

below 5, Fisher exact test was used to confirm statistical significance.

RESULTS

Data on Survey Respondents

A total of 181 physicians responded to the survey, representing a response rate of 8%. The characteristics of the survey respondents are summarized in Table 1. The majority of respondents were females (75%), more than half were younger than 40 years (51%), and all major geographic regions in the U.S. were represented. Based on employment type, the majority of physicians (72%) were either employed by a hospital/group or employed in an academic setting. The majority (88%) were located in an urban area. Regarding the type of patients managed, 93% were adult endocrinologists.

Characteristics	N (%) ^a
Age	
≤30 years	1 (0.5)
31-40 years	93 (51)
41-50 years	68 (37)
51-60 years	16 (9)
61-70 years	3 (2)
71-80 years	0 (0)
≥80 years	0 (0)
Sex	
Females	136 (75)
Males	44 (24)
Prefer not to say	1 (0.5)
Employment type	
Private practice: owner	23 (13)
Private practice: partner	28 (15)
Employed: academic setting	41 (23)
Employed: private hospital/group	89 (49)
Practice setting^b	
Urban	160 (88)
Rural	21 (12)
Practice patient type	
Only adults	168 (93)
Only pediatrics	6 (3)
Both	7 (4)

^aThe total may not be always 100% due to rounding.
^bThe Census Bureau identifies urbanized areas of population of 50,000 or more people; "rural" encompasses all population, housing, and territory not included within an urban area.

Data on Telehealth

Out of the 181 respondents, 8% had telehealth experience during their residency and fellowship training. In total, 89% of the responders had no telehealth experience before the COVID-19 outbreak, either during or after residency and fellowship training. With the COVID-19 situation, in the outpatient setting, more than two-fifths (44%) switched to completely virtual visits, an additional 44% switched to majority virtual visits, with some in-person visits, and 11% performed a majority of in-person visits and some virtual visits. Only 0.55% continued with only in-person visits in the outpatient setting. On the other hand, in the inpatient setting, more than half (61%) of respondents did not have an inpatient practice. An additional 11% did only virtual visits, 10% did majority virtual and some inpatient visits, 5% did majority in-person and some virtual visits, and 12% did only in-person visits. Data on televisits are presented in Table 2.

Data on Overall Physician Satisfaction with Telehealth

The majority (86.5%) of the responding endocrinologists provided a rating of 6 or above out of 10 for overall satisfaction. Data on overall satisfaction are presented in Table 3.

Inferential Analyses on the Association of Respondent Characteristics and Adoption of Telehealth

Inferential analyses showed statistically significant associations between adopters of telehealth and 2 characteristics of the respondent endocrinologists: age and geographic region.

In the outpatient setting, the odds of adopting telehealth were 3.08 times higher if the physician was younger than or equal to 40 years of age versus if they were older than 40 years of age. Additionally, the adoption rate for telehealth was distinctly lower among endocrinologists in the southern states. The odds for adoption of telehealth was 3.21 times higher in regions other than the South.

In the inpatient setting, the adoption of telehealth appeared low in the South and also in the West. There were only 4 respondents from the West, making interpretation challenging.

No other characteristic of the respondents in the survey, as in rural versus urban, employed versus private practice, adult versus pediatric patients served, and satisfaction with use of telehealth, was found to be statistically significant in regard to an association with the adoption of telehealth. Data on inferential analyses are presented in Table 4.

Characteristics	N (%)^a
Televisits experience prior to COVID-19 crisis	
Televisits experience during residency and fellowship training	
Yes	15 (8)
No	166 (92)
Televisits experience prior to COVID-19 crisis	
Yes	20 (11)
No	161 (89)
Televisits during COVID-19 crisis	
Out-patient visit type	
100% virtual visits	80 (44)
Majority virtual visits, some in-person visits	80 (44)
Majority in person visits, some virtual visits	20 (11)
100% in-person visits	1 (0.5)
No out-patient work	0 (0)
In-patient visit type	
100% virtual visits	20 (11)
Majority virtual visits, some in-person visits	18 (10)
Majority in-person visits, some virtual visits	10 (5)
100% in-person visits	22 (12)
No in-patient work	111 (61)
Abbreviation: COVID-19 = coronavirus disease 2019.	
^a The total may not be always 100% due to rounding.	

Table 3
Overall Satisfaction Rate (n = 181)

Score	N (%) ^a
1	0 (0)
2	1 (0.5)
3	5 (2.7)
4	6 (3.3)
5	12 (6.6)
6	17 (9.3)
7	50 (27.6)
8	46 (25.4)
9	26 (14.3)
10	18 (9.9)

^aThe total may not be always 100% due to rounding.

Other Observations

There were 42 comments from the respondents. The predominant theme was unreliability or lack of internet coverage at the patient's end or issues with software (n = 12). The next most frequent themes were a lack of insurance coverage for telehealth visits (n = 5) and billing confusion or claim rejections. A respondent observed telehealth visits as reasonable future means for follow-ups after laboratory results. Two respondents thought timely retrieval of laboratory results was also a barrier. Complex patients or new patients were deemed to be poor candidates for telehealth in the future. Other undesirable features of telehealth visits included more exhaustion than a regular office day, being time-consuming to set-up, having an impersonal nature, and resulting in an inability to perform a physical exam. Some respondents appreciated the flexibility that telehealth offers. Although some respondents observed telehealth's integration for some patient types as a viable option in the future, none of them observed telehealth as a replacement for office visits.

DISCUSSION

Our results indicate that telehealth is a popular solution for delivering care during the COVID-19 outbreak among endocrinologists in the U.S.

Clinical care for patients and their families with chronic illnesses such as diabetes and other hormonal disorders now requires social distancing for the patient's safety as well as for the protection of healthcare workers and other nonclinical staff. Second, stay-at-home orders instituted in several states are augmenting the demand for telehealth. Third, telehealth will decrease the need for avoidable use of PPE and thereby reduce the impact of the prevailing scarcity of PPE.

Evidence accumulated over the recent years supports the use of telemedicine in multiple clinical specialties in

terms of prevention, clinical outcomes, convenience, satisfaction, and cost-effectiveness (17-21). Similar to cardiologists providing Holter monitoring and clinical pharmacologists providing continuous ambulatory blood pressure monitoring, endocrinologists have championed telecare using continuous glucose monitoring (CGM) (22-26). Endocrinologists have long been comfortable in remotely managing and communicating information (glucose values, electrolytes, ketones) (27). Endocrinologists, similar to practitioners of certain other specialties, are particularly well-suited to combine video visits with remote monitoring of glycemia and diabetes management. The current events also suggest that we need to revise our training curricula to include the ability to deliver telehealth. Of note, very few physicians in training seemed to have telemedicine as part of their curriculum. Training programs will need to be revamped to allow endocrinologists to be active in population health. Endocrinologists will also be incentivized to incorporate telemedicine into their practices, pending appropriate compensation for telehealth visits.

Unfortunately, not all patients have access to this technology and as physicians, we must design systems to ensure that all patients will have access to this technology in the future. Improving the internet network, especially across rural areas along with providing low cost, user-intuitive devices capable of rendering flawless connectivity, will improve gaps in telemedicine access. Reimbursement from insurance companies for service provided by telephone visits in cases where real-time audio-video is unfeasible should be encouraged and more importantly, enhanced. In due course, patients will recognize the benefits telemedicine can offer and alleviate their feelings of uneasiness toward using this novel interface.

The introduction of telehealth or virtual visits is a complex change that disrupts long-established clinical routines and workflows (28,29). Krupinski (30), in supporting seamless delivery of telehealth solutions emphasizes that telemedicine is not about the technology, but rather about the people; it is the integration of people into the telemedicine landscape that is the main difficulty. However, this study shows that endocrinologists across the country are quickly adapting to the use of telehealth with the ongoing COVID-19 crisis, elucidating the fact that "necessity is the mother of invention."

The strength of the survey is that 181 endocrinologists across the U.S. completed the survey during the early phase of the outbreak. Some physicians could not complete the survey since they were still in the process of implementing telehealth or waiting for approval from their employers when the survey was done. Notably, three-fourths were women. More than half of the participants were younger than 40 years. Additionally, 72% were employed and 38% were in a private practice environment. A significant majority of participants were adult endocrinologists practicing in urban areas.

Table 4
Frequencies of Adopters of Telehealth by Their Characteristics

Characteristics	Adoption in the out-patient setting			Adoption in the in-patient setting		
	Yes (%) (n = 159)	No (%) (n = 21)	P value	Yes (%) (n = 37)	No (%) (n = 32)	P value
Age						
≤40 years	87 (94)	6 (6)	.02 ^a	23 (53)	20 (47)	.97
>40 years	72 (83)	15 (17)		14 (54)	12 (46)	
Sex						
Female	120 (88)	16 (12)	.94	29 (57)	22 (43)	.36
Male	39 (89)	5 (11)		8 (44)	10 (56)	
Region						
Northeast	32 (100)	0 (0)	.04 ^a	12 (75)	4 (25)	.04 ^a
West	27 (90)	3 (10)		0 (0)	4 (100)	
Midwest	39 (91)	4 (9)		15 (54)	13 (46)	
South	61 (81)	14 (19)		10 (48)	11 (52)	
Practice setting						
Urban	140 (88)	19 (12)	.74	4 (50)	4 (50)	.82
Rural	19 (90)	2 (10)		33 (54)	28 (46)	
Prior telehealth experience						
Yes	141 (88)	20 (12)	.35	33 (52)	30 (48)	.50
No	18 (95)	1 (5)		4 (67)	2 (33)	
Telehealth experience in residency/fellowship training						
Yes	148 (90)	17 (10)	.07	33 (53)	29 (47)	.84
No	11 (73)	4 (27)		4 (57)	3 (43)	
Medical practice type						
Employed (Private/group or academic setting)	117 (91)	12 (9)	.11	31 (51)	30 (49)	.19
Private practice (owner or partner)	42 (82)	9 (18)		6 (75)	2 (25)	
Practice patient type						
Adults only	149 (89)	18 (11)	.33	35 (54)	29 (46)	.53
Pediatrics only	5 (83)	1 (17)		2 (40)	3 (60)	
Both adults and pediatrics	5 (71)	2 (29)		1 (100)	0 (0)	
Satisfaction with telehealth (Scale of 1 to 10)						
6 and above	136 (87)	20 (13)	.21	32 (52)	30 (48)	.31
Equal or less than 5	23 (96)	1 (4)		5 (71)	2 (29)	

^aStatistically significant per Pearson chi-square test. Note: Expected cell counts were more than 5 for all characteristics that were statistically significant. Fisher exact test was redundant for insignificant characteristics for which expected cell count was below 5.

There are many limitations in our study that should be acknowledged. First, there is obvious selection bias in that younger, employed endocrinologists will likely be more comfortable with information technology and digital platforms and are more likely to respond to the surveys. Only the Facebook group received the survey. Second, the differential dates of declaration of a state of emergency by the individual states may have led to a spec-

trum of answers based on their practice scenarios. Third, our sample size may not have been adequately powered to detect differences in the adoption of telehealth. In addition, we did not explore other reasons not to adopt telehealth. Fourth, in the survey, virtual visits were defined as “real-time audio-video interface.” However, 4 respondents conducted only telephone visits, 1 respondent performed only chart review/e-consult for inpatients, and 1 respon-

dent had to switch to phone visits due to frequent telehealth platform issues.

It is also clear that the payment systems for health care delivery need to be reformed to incentivize participation by both the public and the clinician community. Although there is no agreement on how healthcare should be reformed, a hybrid model of face-to-face in-person and remote telemedicine interactions will undoubtedly be a key component.

CONCLUSION

Our cross-sectional survey showed that the majority (88%) of responding U.S. endocrinologists quickly adapted by switching either entirely or at least partially to telehealth in the outpatient setting within the first few weeks after COVID-19 was declared a national emergency. More than four-fifths of the endocrinologists provided an overall satisfaction rating for telehealth of 6 or above out of 10. We believe optimal integration with the existing electronic medical record, patient acceptance, and appropriate reimbursement from insurance companies will be some of the essential drivers for telehealth to be established as part

of routine care in the post-COVID-19 era. We should also explore whether public funding for internet access for low income, rural populations, or other populations with poor access would be a real cost-value proposition.

With the increasing reliance on artificial intelligence, telehealth will become a routine component of population health. Accountability, quality of care, patient privacy and satisfaction need further study and exploration. The current landscape will have a significant impact on how we transform our age-old customs of practicing and caring for our patients by incorporating high-tech workflows. Endocrinologists must change and adapt to survive and endure.

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DISCLOSURE

The authors have no multiplicity of interest to disclose.

Supplementary material begins on next page.

**Telehealth
Telehealth Adoption Among Endocrinologists During COVID-19 Crisis**

#1: Your Age

- ≤30 years
- 31-40 years
- 41-50 years
- 51-60 years
- 61-70 years
- 71-80 years
- ≥81 years

#2: Sex

- Female
- Male
- Prefer not to say

#3: I work here

- Alabama
- Alaska
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- Florida
- Georgia
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota

- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming
- Washington DC

#4: I practice in the following setting (The Census Bureau identifies Urbanized Areas of population of 50,000 or more people; “Rural” encompasses all population, housing, and territory not included within an urban area).

- Urban
- Rural

#5: I did Tele visits prior to COVID-19

- Yes
- No

#6: I did Tele health during residency/fellowship training

- Yes
- No

#7: Current Practice Type

- Private Practice: owner
- Private Practice: partner
- Employed: Academic setting
- Employed: Private Hospital/Group

#8: Patients managed currently

- Only Adults
- Only Pediatrics
- Both Adults and Pediatrics

#9: Out-Patient Visits type during COVID-19 (virtual visits: real-time audio-video interface)

- 100% virtual visits
- Majority virtual visits, some in person visits
- Majority in person visits, some virtual visits
- 100% in person visits
- No Out-Patient work/100% in patient endocrinology

#10 In-Patient Visits (Hospitalized patients) during COVID -19

- 100% virtual visits
- Majority virtual visits, some in person visits
- Majority in person visits, some virtual visits
- 100% in person visits
- No In-patient work for me

#11: What is your overall satisfaction Rate of Tele visits
(1 being worst and 10 being best)

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

#12: Any Comments/Suggestions

Suppl Fig. 1. Web-based survey questionnaire. Please Note: For Q5, Q6, Q9, and Q10, we acknowledge that the terms telehealth, televisits, and virtual visits were used and may be interpreted differently by the respondents. Our intention was to capture data on televisits.

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