Attitudes and Barriers of Point of Care Ultrasound Implementation among Primary Health Care Physicians In KSA, Eastern Province 2019-2020

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Abstract

Background: Point of care ultrasonography (POCUS) refers to a limited ultrasound protocol performed by a clinician at a patient's bedside. POCUS is being described as the stethoscope of the future . It is a tool that progressively being integrated into the family physician's toolbox.

Methods: The sample will include a total of approximately 440 physicians. Out of them, 128 physicians from Al Dammam Sector, 98 physicians from Al Qatif sector, 72 physicians from Al Khobar sector, and 142 physicians from the family medicine training residency program.

Our findings were limited to governmental PHC physicians and did not include the private sector.

Results: The physicians in this study were general practitioners (163 = 40.6%), family medicine training residents (154 = 38.4%), family medicine specialists (50 = 12.5%), family medicine consultants (34 = 8.5%). The physicians were from three different sectors in the eastern province; Qatif sector 142 (35.4%), Dammam sector 154 (38.4%), Khobar sector 105 (26.2%)61.3% of physicians have got POCUS training, most of them have obtained the training within two years or more. While 38.7% didn't get any training at all

Currently, around 15% of the physicians are using POCUS in their practice, 85% are not using POCUS in their practice. After appropriate training, 83% of the physicians were willing to use POCUS and introduce it into their practice.

Conclusions: study revealed that approximately 83% of PHC physicians were willing to use POCUS and introduce it into their practice as they thought the availability of equipment, hands-on training, bedside teaching, and collaboration with other specialties were most important requirements to implement POCUS in PHC. In addition, the lack of training was biggest barrier to adopt POCUS in PHC, followed by unavailability of ultrasound machines and the equipment, lack of knowledge and inability to interpret ultrasound images. Finally, there was a statistically significant association between physician's attitude, requirements to implement POCUS and barriers in adopting POCUS in clinical practice.

Keywords: ultrasonography, approximately, Khobar, consultants, Dammam

1. Introduction:

Primary health care centre is a cornerstone of health care management system. It offers professional medical care for individuals. Primary Health Care physicians are the first line defence in the PHC as they give comprehensive and continuing health care to all individuals in the community. They deal with variety of cases for which they may use different investigations and diagnostic tools to make a proper diagnosis.

The standard diagnostic tools that primary health care physicians have used at the bedside are stethoscopes, otoscopes, and ophthalmoscopes for physical examination. Imaging devices, such as an ultrasound, help physicians surely to see the organs inside the patients instead of listening to them. (1)

Ultrasound is a non-invasive imaging modality used in the diagnosis of multiple diseases. Point of care ultrasonography (POCUS) refers to a limited ultrasound protocol performed by a clinician at a patient's bedside. It is obtaining a more generalized result and identifying many conditions such as aortic aneurysm, gallstone, deep venous thrombosis and pleural effusion.(2)

POCUS is being described as the stethoscope of the future. (1) It is a tool that progressively being integrated into the family physician's toolbox. Many family physicians have used ultrasound in maternity care. It can be used to estimate many conditions and answer specific questions relating to a patient's health after a relatively brief training period by generalist with a small easy tool. Also, it has a great traction in the last few years as a method to quickly and cost-effectively assessing many

conditions. (3)

POCUS first used in the 1990s by emergency physicians who established the Focused Assessment with Sonography in Trauma (FAST) scan (4)(5). Since that time, POCUS has extended to other practice as family medicine physicians and have an essential role in the primary health care setting, but it is not replacing formal diagnostic imaging.

In a study that has been done at the University of Vermont LARNER College of Medicine in 2019, the results identified 5% of providers were currently using POCUS in their practice for OB/Gyn, musculoskeletal exam and joint injections. On the other hand, 78% of providers would like to use it. More than 70% of providers believed that POCUS will increase the rate of health care delivery and increase patient satisfaction. The limitations of the study were availability of surveys for few days only, small sample population of the University family physicians, and response rate was approximately 43%. In conclusion, they recommended to expand the survey to all primary health care providers throughout the state of Vermont and to evaluate interest in the use of handheld ultrasound devices compared to classic larger machines. Lack of time and training, as well as lack of equipment, were important barriers to the use of point of care ultrasound in general practice. (6)

Another study about POCUS use among family medicine residents found that it was easy to learn and use, as well as it improved diagnostic sensitivity, and patients were satisfied. The result showed that majority of participants agreed to continue using POCUS in their daily practices. (1)

According to research done on European countries, it found that eight out of 12 countries were having their national societies for the use of ultrasound in general practice. Three out of the 12 states reported that use of ultrasound was integrated into their undergraduate medical education. In seven out of the 12 countries, practitioners were reimbursed for ultrasound scans. Lack of time, training, and financial aspects were significant common barriers across countries. (7)

In addition to being cost-effective, POCUS is superior to clinical evaluation and alternative diagnostic methods in many lung pathologies, including pleural effusion, pulmonary edema, pneumonia, and pneumothorax. (2) POCUS is better than clinical evaluation in

differentiating abscess from cellulitis. (8)

A comparison was done between ultrasonography and computed tomography scans in a study for assessment of suspicious renal stones in the emergency department, and it found that initial diagnoses with POCUS reduced the number of computed tomography scans by 59%, without changing outcomes. (9)

Other study done at 2008 of Medicare data for musculoskeletal magnetic resonance imaging

indicated that 45% of primary diagnoses could have been made with ultrasonography. (10)

Another value of POCUS is its ability to accelerate screening as well as increase access to imaging in primary care settings. An example includes abdominal aortic aneurysm screening using POCUS, which has a sensitivity of 99% to 100% and takes less than four minutes to complete. (11)(12). Moreover, POCUS evaluation of the lower extremities looking for deep venous thrombosis has a sensitivity of 95% and a specificity of 96%, in less than four minutes. (13)(14)

The Systematic Review conducted regarding POCUS in General Practice revealed that POCUS has the capacity to be of a great valuable tool that can be cost effective by the hands of primary health care

practitioners. (15)

Ultrasound implementation into undergraduate medical students during their 1st year of medical education is feasible and may improve their overall physical examination skills and improve their satisfaction as well.(16)

Patient care by the general practitioner changed in most of the patients following upper abdominal ultrasound. Abdominal ultrasound reduced the number of referrals to a medical specialist, and more patients could be reassured by their primary health care provider. (17)

The analysis involved 15 articles that found few papers described the role of ultrasonography in general practice. Several authors agreed that ultrasound scans performed by GPs accelerated diagnoses and enables fast and efficient treatments to be implemented on the patient directly or referred to a proper specialist. Many problems remain to be solved. Mostly, educating general practitioners and changing the manner of their training, essentially making them aware of the benefits and availability of ultrasound. (18)

General practitioners in PHC performing point-of-care ultrasound examinations of Ascites, gallstone, abdominal aorta, intrauterine pregnancy or gestational age had very high sensitivity and very high rate of inter-rater agreement compared with radiologist. (19)

2. Study rationale / Justification:

POCUS is a simple tool that reduces health care cost and improves outcomes for the patients' care, safety, decreases the costs of care.

When applied correctly, it shows that it can confirm the diagnosis or narrow a differential diagnosis, decrease treatment time.

POCUS can reduce delays in the care treatment and it also reduces the burden on radiology or emergency department.

Globally, there were few studies about POCUS in primary care sitting, which had a lot of limitations. On the other hand, up to researcher knowledge, there is no studies have been done in Saudi Arabia and Arabian Gulf countries. The current project is made to answer the following research question:What are the **attitudes** and **barriers** of point of care ultrasound implementation among primary health care physicians in **eastern province, KSA**?

3. Study Aim:

Evaluated state of POCUS use within primary health care physicians and identified their attitudes and barriers for its implementation.

Objectives:

-To evaluated state of POCUS use within primary health care physician. -To assess physician's attitudes regarding POCUS implementation among practicing primary health care physicians in eastern province, KSA.

-To identify the barriers to implementation POCUS among primary health care physicians in eastern province, KSA.

-To measure the relationship between the attitudes and barriers of point of care ultrasound implementation among practicing primary health care physicians in eastern province, KSA.

Methodology:

1. Study Design:

an analytic Cross-sectional Study.

2. Study sitting & Time:

The study conducted in Primary Health Care Centres (PHCCs) of Eastern province, KSA (Al Qatif, Al Dammam, and Al Khobar). The study

will involve 29 centres in Al Qatif, 30 centres in Al Dammam and 12 centres in Al Khobar from November 2019 to May 2020

3. Study Sample, Inclusion/Exclusion criteria:

All practicing physicians (General practitioners, Certified family physicians, and Residents) in Al Qatif, Al Dammam and Al Khobar PHCCs approached on their working places without disturbing the workflow.

With exclusion of non-practicing physicians (less than 2 clinics / week), physician on leave and those who are outside the area during time of study.

5. Sampling technique and sample size:

A Convenient sample included all primary health care physicians and to calculate response rate later.

The sample included a total of approximately 440 physicians. Out of them, 128 physicians from Al Dammam Sector, 98 physicians from Al Qatif sector, 72 physicians from Al Khobar sector, and 142 physicians from the family medicine training residency program.

6. Instruments & Data collection methods:

The study was conducted by a self-administered questionnaire that consists of 4 parts; Background, Current use, Barriers, and Attitude.

Validity of the questionnaire

The questionnaire was designed initially from the pervious study in University of Vermont about Barriers to Implementation of POCUS in Primary Care and many questions were modified and newly created as well.

The Questionnaire reviewed by ten expert physicians and possible modification of some questions is to be expected.

Pilot study

Testing the reliability, validity, understandability, and suitability of the language used in the questionnaire which conducted through the questionnaire being distributed to 30 family medicine residents from Al Ahsa sector.

The results of the pilot excluded from the final research results.

Result:

The total number of participants involved in this study was 440 from primary health care physicians with response rate of 91.1% (401 responders).

Table 1: Socio-demographic characteristics of the primary care physician (n=401)

	Mean	Standard deviation	Minimum	Maximum
Age	34.17	7.036	24	62
Years of experience	7.34	6.485	1	40
Average Patient encounter per working day	25.59	12.445	7	60
Number of clinics coverage per week	8.32	1.929	2	10
Gender	**Frequency**		**Percent**	
Male	144		35.9	
Female	257		64.1	
Nationality	**Frequency**		**Percent**	
Saudi	380		94.8	

Non-Saudi	21	5.2
Marital status	**Frequency**	**Percent**
Single	56	14.0
Married	333	83.0
Widow	2	0.5
Divorced	10	2.5
Job title	**Frequency**	**Percent**
General practitioner	163	40.6
Family Medicine training resident	154	38.4
Family medicine specialist	50	12.5
Family medicine consultant	34	8.5
PHC center sector	**Frequency**	**Percent**
Qatif sector	142	35.4
Dammam sector	154	38.4
Khobar sector	105	26.2
Type of clinics	**Frequency**	**Percent**
General clinic	264	65.8
Family medicine clinic	300	74.8
Chronic disease clinic	195	48.6
Maternal clinic	133	33.2
Well baby clinic	152	37.9
Geriatric clinic	71	17.7

Table 1 shows that:

94.8% of these physicians were Saudi. Their ages ranged between 24 and 62 years, most of them were females, 257_(64.1%). Most of them were married (333). The mean of their experience is 7.34. The number of clinic coverage per week has also varied between 2 to 10 clinics every week. The number of patients' encounter was between 7 to 60 patients daily. The physicians in this study were general practitioners (163 = 40.6%), family medicine training residents (154 = 38.4%), family medicine specialists (50 = 12.5%), family medicine consultants (34 = 8.5%). The physicians were from three different sectors in the eastern province; Qatif sector 142 (35.4%), Dammam sector 154 (38.4%), Khobar sector 105 (26.2%). The types of clinics coverage were variant, 65.8% in a general clinic, 74.8% in a family medicine clinic, 48.6% in a chronic disease clinic, 33.2% in a maternal clinic, 37.9% in a well-baby clinic, 17.7% in a geriatric clinic.

Table 2: Current status of POCUS use within primary care physician (n=401)

Last POCUS training	**Frequency**	**Percent**
None	155	38.7
Less than 6 months	19	4.7
6month-2yaers	87	21.7
More than 2 year	140	34.9
Type of training	**Frequency**	**Percent**
Undergraduate medical school	120	29.9
Bedside teaching	85	21.2
Continuing Medical Education (CME)	34	8.5
Practical course with implementations	38	9.5
Web base online course	13	3.2
Self-learning via books and online resources	62	15.5
Certified program for medical ultrasonography qualification	3	0.7
Part of radiology rotation during residency program	75	18.7
Current use POCUS in the practice	**Frequency**	**Percent**
Yes	60	15.0
No	341	85.0
Frequent use POCUS in the practice	**Frequency**	**Percent**
Never	341	85.0
Once a week or more	39	9.7
Daily	9	2.2
Average of patients' referral to the hospital for an ultrasound	**Frequency**	**Percent**
Not at all	81	20.2
Once a month or more	159	39.7
Once or twice a week	143	35.7
Everyday	18	4.5
Average of patients' referral to other PHC for an ultrasound	**Frequency**	**Percent**
Not at all	118	29.4
Once a month or more	108	26.9
Once or twice a week	151	37.7
Everyday	24	6.0

Table 2 shows that:

(61.3%) have got POCUS training, most of them have obtained the training within two years or more. While 38.7% didn't get any training at all. Most of the training been obtained during undergraduate medical school (29.9%), and the minority of physicians (0.7%) have certified in ultrasonography program. Currently, around 15% of the physicians are using POCUS in their practice, 85% are not using POCUS in their practice. On average of referral to the hospital for an ultrasound, 20.2% of physicians do not refer patients while 39.7% refer patients once or more per month, 35.7% refer patients once or twice per week, only 4.5% refer patients every day. On the other hand, the average of referral to other primary health care centers that offer ultrasound service,29.4 % of physicians do not refer patients at all while 26.9 % refer patients once or more per month, 37.7% refer patients once or twice per week, only 6 % refer patients every day.

Tables 3: Attitude regarding POCUS implementation (n=401)

Attitude regarding POCUS implementation	**Mean**	**Standard Deviation**	**Direction**
Think POCUS safe on patients	4.25	1.057	Strongly Agree
Think POCUS is easy to learn	3.41	1.016	Agree
Think POCUS can facilitate patient care	4.19	1.009	Strongly Agree
Think POCUS improving your ability to make accurate diagnosis	4.15	1.041	Strongly Agree
Think POCUS is a cost-effective technique	3.80	1.134	Agree
Think POCUS will increase the patients' satisfaction	4.14	1.051	Strongly Agree
Think POCUS is essential skill to be used in daily practice	3.84	1.088	Agree
Think POCUS implementation will increase number of patients that receive recommended screening	3.85	1.015	Agree
Think POCUS training in undergraduate education will improve clinical practice	3.86	1.141	Agree
Think POCUS training in residency program will improve clinical practice	4.21	1.042	Strongly Agree
After appropriate training, would you be willing to introduce point care ultrasound into your practice		**Frequency**	**Percent**
Yes		333	83.0
No		16	4.0
Not sure		52	13.0

Table 3 shows that:

All of the questions gained a positive attitude toward using POCUS. The mean rating for POCUS safety regarding usage on patients was 4.25. The mean for easy to learn was 3.41. Many also agreed that POCUS would increase patient satisfaction (4.14). However, most physicians thought that training in residency would greatly improve POCUS use in clinical practice (4.21). After appropriate training, 83% of the physicians were willing to use POCUS and introduce it into their practice. 13% were not sure yet, and only 4% said they would not use it.

Tables 4: Attitude regarding requirements for POCUS implementation (n=401)

Requirements to implement POCUS in primary care practice	Mean	Standard Deviation	Direction
Continuous medical education (CME)	3.86	1.107	Agree
Hand-on training courses	4.28	1.022	Strongly Agree
Bedside teaching	4.22	1.010	Strongly Agree
Presence of policy pathway	3.82	1.033	Agree
Presence of guideline	4.10	1.032	Strongly Agree
Availability of equipment (machine,probs,gel,..etc.)	4.36	1.011	Strongly Agree
Collaboration with other specialties (radiology, emergency medicine, OB/Gyn … etc.)	4.20	1.004	Strongly Agree
Recommendation by a professional organization (like AAFP, ACP, etc.)	4.00	1.032	Strongly Agree

Table 4 shows that:

The mean of all the responses for each statement evaluating the participants' attitude toward the requirements of POCUS implementation in PHC. The most important requirements to note were: availability of equipment (4.36), hands-on training (4.28), bedside teaching (4.22), and collaboration with other specialties (4.20), presence of guideline (4.1%), recommendation by a professional organization (4.0%), CME (3.86%), presence of policy pathway (3.82%).

Table 5: Barriers in adopting POCUS in clinical practice (n=401)

Barriers in adopting POCUS in clinical practice	Mean	Standard Deviation	Direction
Ultrasound machine unavailability	4.21	1.061	Strongly Agree
Equipment unavailability	4.07	1.077	Strongly Agree
Lack of knowledge	4.09	1.038	Strongly Agree
Lack of interest	2.90	1.253	(Neutral) Disagree
Lack of training	4.28	.964	Strongly Agree
Inability to interpret the images	3.93	1.053	Agree

Limited need	2.64	1.161	Disagree
Time consuming	3.04	1.258	(Neutral) Agree
Legal concerns	2.95	1.175	(Neutral) Disagree
No radiologist in PHC	3.54	1.241	Agree
No expert persons in ultrasonography at PHC	3.86	1.150	Agree
Lack of guideline or protocol pathway	3.71	1.056	Agree
Underestimating from other specialties	3.39	1.142	Agree
Unrewardable practice	3.22	1.214	Agree

Table 5 shows that:

The means of each statement's responses of the barriers for POCUS implementation. According to the responses, lack of training (4.28), unavailability of ultrasound machines (4.21), and the equipment necessary to use it (4.07), lack of knowledge (4.09), and inability to interpret ultrasound images (3.93). While few physicians considered limited need for POCUS use (2.64), lack of interest (2.90) or legal concerns (2.95) as barriers.

Table 6: Correlations between mean of implementations attitude, requirements attitude and barriers (n=401)

		Mean of implementations attitude	**Mean of requirements attitude**	**Mean of implementation barriers**
Mean of implementations attitude	Pearson Correlation	1	.717**	.292**
	P-value		<.001	<.001
Mean of requirements attitude	Pearson Correlation	.717**	1	.492**
	P-value	<.001		<.001
Mean of implementation barriers	Pearson Correlation	.292**	.492**	1
	P-value	<.001	<.001	

Table 6 shows: Statistically significant correlations were noted between mean of implementations attitude, requirements attitude and barriers ($p < 0.001$). The attitude of POCUS implementation has a strong positive association to requirements of physicians regarding POCUS use in clinical practice, while it has a weak positive association to barriers of POCUS implementation. The requirements of physicians regarding POCUS use had a moderate positive association to barriers of POCUS implementation.

Discussion:

This study was conducted to assess the current status, physicians' attitude, regarding POCUS use among PHC physicians in eastern province of KSA. The study aimed to determine requirements to implement POCUS in primary care sitting and to highlight on the obstacles and barriers in adopting POCUS in clinical practice. Before this study, there was no clear data about attitude of PHC physicians regarding POCUS and barriers in adopting POCUS in their clinical practice in the eastern region.

We describe POCUS use in PHC for the first time in Saudi Arabia. The study involved 440

physicians who are practicing in PHCC of eastern province with response rate reaches more than 90%. the study covers current status, barriers, requirements and attitude implementations regarding use POCUS in PHC.

We found that the mean age of the participant physicians in our study was 34 years, with an average of 7 years' experience. All of the participants were practicing physicians in their clinics. Moreover, the questionnaire was distributed in PHCs of Qatif, Dammam, and Khobar sectors. This data will give a deeper understanding of the outlook on POCUS in multiple aspects, and taking into consideration a variety of ages and levels of experience in the medical field.

Based on collected data, most of the physicians didn't receive any ultrasound training. Among those physicians who received training, the majority have their last training two years or more before conducting the current study. The most type of POCUS training provided to the physicians was during their undergraduate medical school. However, only 15% of the physicians ever used POCUS during their practice, while the rest never used it. The use of POCUS was highly infrequent, with only nine physicians taking advantage of POCUS daily. 80% and 70%, were the percentages of referring the patients for an ultrasound to the hospitals and other PHCs, respectively.

Our study revealed the attitude towards the POCUS implementation among PHC physicians in the eastern province of KSA. Around 84% of the physicians were willing to introduce POCUS in their clinical practice after appropriate training. Most physicians agreed the POCUS is easy to learn, improve their ability to make accurate diagnosis, and cost-effective technique. The POCUS can facilitate the patients care and increase their satisfaction. They believed the introduction of POCUS training in their undergraduate study and residency programs would improve their clinical practice. They thought that POCUS is an essential skill to be utilized in their practice in favor to increase the number of patients that receive screening.

Our study revealed the most important requirements to implement POCUS in PHC were the availability of equipment (88%) and the training include the hands-on training course (87%), bedside teaching (85.8%), and CME (71.5%) which have been agreed by majority of the physicians. In contrast, survey in The University of Vermont showed training guideline (80%) and acquisition of equipment (70%) were the most prerequisites to adopt POCUS in a primary care practice.

Our study showed biggest barriers in adopting POCUS in PHC clinical practice were the lack of training (mean: 4.28 out 5), unavailability of an ultrasound machines (4.21) and the equipment necessary to use it (4.07). These results were similar to the findings in the survey of The University of Vermont.

On the other hand, few physicians considered limitation of need (22.4%), lack of interest (33.1%) or legal concerns (30.7%) as barriers to implement POCUS in PHC clinical practice.

The most important point to clarify is that the investigator found the training, and the availability of machines and equipments were the most important requirements to implement POCUS in a PHC. Meanwhile, the lack of training, and the deficiencies of machines and equipments were the most important barriers for adopting POCUS in a clinical practice as well.

In comparing with POCUS use in emergency sitting, there was a study about use and education of POCUS in pediatric emergency in Saudi Arabia, showed bedside teaching (96.3%), attending course (88.8%) were most helpful tools to learn POCUS for physicians. Other teaching methods might help to learning were a self-learning by using YouTube videos, using special website, and using special applications for smartphone. The emergency physicians noticed the main reasons for not using POCUS in their practice were the limited training (86.3%) followed by the lack of time, the unavailability of machine, the limitation need and the patient uncooperation.

Another study done at a tertiary care emergency department in Qatar, found the availability of dedicated time, the equipment, the supervision, and the training were important methods to enhance POCUS use. The participants order hand on course (93.3%), and bedside teaching (87.8%) to improve their ultrasonography skills. Also, it showed the lack of time, the appropriate training, and the availability of qualified personnel were barriers that noted.

There was a statistically significant association between physician's attitude, requirements to implement POCUS and barriers in adopting POCUS in clinical practice. These results support that improvement of PHC physicians' attitude toward POCUS plays a major contributing factor to facilitate clinical practice of POCUS.

Limitations

Our findings were limited to governmental PHC physicians and did not include the private sector.

Conclusions:

This study was conducted to assess the current status, physicians' attitude, regarding POCUS use among PHC physicians in the eastern province of KSA and the conclusions came out from the present study revealed that approximately 83% of PHC physicians were willing to use POCUS and introduce it into their practice as they thought the availability of equipment, hands-on training, bedside teaching, and collaboration with other specialties were most important requirements to implement POCUS in PHC. In addition, the lack of training was biggest barrier to adopt POCUS in PHC, followed by unavailability of ultrasound machines and the equipment, lack of knowledge and inability to interpret ultrasound images. Finally, there was a statistically significant association between physician's attitude, requirements to implement POCUS and barriers in adopting POCUS in clinical practice.

Recommendations:

1) The investigator recommended that similar studies be applied with a larger sample size and should be conducted in different parts of Saudi Arabia to identify a real picture about current status, physicians' attitude, regarding POCUS use among PHC physicians.

2) Intervention study to determine efficacy and safety of POCUS in our sitting.

3) Strengthen the health infrastructure at the level of PHCCs through the following strategies:

a) Establishment of training courses for the purpose of increasing knowledge at the level of doctors about POCUS in PHC for the purpose of activating the role of PHCCs generally and the physician specifically in this issue.

b) Workshop and bedside teaching to train the physicians to perform and interpret POCUS in PHC practice.

c) Necessary ultrasound machines and supplies for POCUS equipments (gel, appropriate probes ...etc.)

d) Establishment POCUS national guideline recommendation and to be followed by policy pathway to facilitate collaboration with other specialties

e) Encourage long term education and continuous medical education for physicians in PHCCs

4) Encourage the family and general physicians to use POCUS by reward reinforcement.

5) Integrate POCUS into medical school and family medicine residency curricula.

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