

# The use of electronic devices and relative levels of Nomophobia within a group of Italian nurses: an Observational Study

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## ABSTRACT

**Background:** In healthcare, the use of smartphones and other electronic devices are becoming important tools among health professionals. Thanks to these devices, there are new methods of assistance. However, if used incorrectly, they may cause distraction during clinical practice. The excessive use of such devices has generated a new form of addiction in the workplace named nomophobia, a phobia still little explored in literature. We reported an analysis of the frequency and method of use of these electronic devices.

The primary aim of the research was to investigate the level of dependence on electronic devices (nomophobia) and the digital habits of nurses. Secondary aim of the study was to evaluate the possible association between nomophobia and distraction in the workplace.

**Methods:** A transversal multicenter study was conducted on a sample of Italian nurses, using the Nurses' Use of Personal Communication Devices Questionnaire and the Nomophobia Questionnaire (NMP-Q).

**Results:** 34.1% of the sample (n=184) declared that they used smartphones and other electronic devices a moderately during working hours. 20.2 % (n=109) used them frequently and 8.9% (n=48) uses devices during working hours constantly. However, 44.0% (n=222) never uses health apps for patient medical assistance, the 32.9% (n=166) never uses learning apps or apps for professional development. 16.6% (n=87) admit that the use of these devices negatively affected their working performance (mean 80.5; SD 40.1). Study participants showed moderated levels of nomophobia (media=50.34; SD=29.0).

**Conclusion:** The results of the study demonstrate the scarce use of such electronic tools to implement adequate care among Italian nurses. Nomophobia can have significant impact on the risk of making mistakes. Future studies should examine not only nurses but also other help professionals and support staff, to bring out an underestimated dimension.

*Key words:* nurse, nomophobia, distraction, smartphone, addiction, mhealth

## INTRODUCTION

In the last decade, technological advances have undergone a big step forward with the invention of smartphones, which are indispensable everyday objects [1].

According to recent data, it is estimated that on a worldwide level one person in five has a smartphone and around 6% of the population owns a tablet [2]. Therefore, the majority of the world's population uses electronic devices to communicate [3] with an estimated of 56% in the United States [4], 72% in Germany [5] and 79% in Switzerland [6]. Since the number of people using technological devices has increased [7], it is important to investigate any impact on public health.

In clinical practice, for example, a new frontier of medical support, called "eHealth", is emerging. This term refers to the use of technological instruments to provide health-related information, resources and services regarding health. An area of development in which there is a that sees collaboration of the medical informatics and public health for improving patient care [8]. This new method has led to the creation of new apps directed to medical use, electronic medical records, websites, online discussion groups, with the aim of collecting important medical data [9].

Among healthcare professionals, the use of smartphones has become an integral part of working life and has transformed many aspects of clinical practice, causing a rapid growth in health related apps and software. According to the Mobile Health Market Report 2013-2017, about 500 million people used healthcare apps for smartphones until 2015 [10]. Therefore, mHealth (mobile health) apps are becoming more relevant and of growing interest, providing information on many pathologies (such as autism, Parkinson's, dementia), their prevention and how to change the lifestyle. These apps also help patients and caregivers to manage and treat the disease, thereby improving safety and autonomy [11, 12].

Within this framework, these instruments are used not only for working related activities but also for social networks, games and online shopping [13].

In a study on 825 members of Academy of Medical Surgical Nurses, [14], it was observed that personal calls, medical online news and using social networks were among the most frequent activities.

Thus, the growing spread of healthcare apps, the expansion of the web and social networks, leads several students to analyze how smartphones can be an integral part of working life during clinical practice.

Even though these new technologies might bring many positive aspects, they do in fact demonstrate a negative effect on working life, increasing the chance of mistakes and distractions.

Among the point in favor are better communication between patients and nurses [15], an easier access to patient clinical data [16, 17] and the ability to make

clinical decision more quickly [18].

Wang et al. [19] demonstrated that the use of a smartphone positively affects employee work performance; improving collaborative effectiveness and flexibility in addressing work related issues. In addition, smartphones have been shown to improve clinical practice, experience and learning [7]. However, the prolonged use can cause a multitude of negative effects [16], e.g. postponing important tasks, such as medical assistance, creating distraction during patient care activities, and increasing possible clinical errors [20], accumulating tasks and interruptions of work, which can cause emotional exhaustion of employees. It can also create stress and invasion of privacy [21]. According to some researchers, attitudes dependent on these devices cause distraction [22] and this leads to a lack of attention and worse short-term memory retention.

In a study by Cho S. e Lee [23], more than half of student nurses admit being distracted during clinical practice due to smartphones use. In addition, those with a stronger addiction to smartphones, tend to have greater chance of distraction, reduced learning ability [7] and worse academic performance.

A study conducted in United States on a sample of U.S. nurses shows that they may not be able to accurately assess when it is appropriate to use their smartphones and change their behavior accordingly [24]. In addition, although they acknowledge that they have observed how other healthcare professionals have lost relevant clinical information due to their distraction from using smartphones, staff are not aware of their own [7].

The threats to the patient privacy, the loss of security and confidentiality of personal data and the loss of a connection between the nurses and the patients become only few of the negative effects of prolonged smartphone use in the healthcare system.

However, there is a new variable to take into account, and this is the risk of developing intense feeling of anxiety and distress caused by the fear of remaining disconnected from the web. This situation is called Nomophobia. Nomophobia is considered a disorder of the digital society age and it is referred to anxiety, emotional instability, aggressiveness, discomfort, and difficulty in concentration, all caused by the inability to use the smartphone [25].

The main characteristics of nomophobia are the impulsive use of the smartphones [26], the constant control for new notifications of calls or messages, feeling anxious or nervous at the thought of losing the smartphone or when it not available nearby, keeping the phone always on and not having many social interactions [25].

According to questionnaire conducted by Stewart Fox-Mills, over 13 million British citizens suffer from nomophobia. It would also seem, according to a questionnaire conducted by SecurEnvoy that women are more concerned about losing their mobile devices (70%) compared to men (61%). However, in 2008, this trend

was reversed [25].

A study conducted in a population of engineering students in the northern Taiwan shows that smartphone addiction has several aspects similar to the drug-related disorders, described in DSM-5 (Diagnostic and Statistical Manual of mental disorders), with obsessive-compulsive attitudes and social impairment [27]. However, behavioral addiction, including smartphone addiction, are generally difficult to define and manage, because they are linked to psychological and behavioral factors [28]. Smartphones produce tolerance, therefore to their use, because of this, users need to increase the time on their phone to feel satisfied, and they might have impulsive habits [7]. Consequently, defining the cause and symptomology of nomophobia is not easy since there are different opinions regarding this subject. Some studies refer to nomophobia as an actual addiction to smartphones [29], while other studies suggest that it can lead to strong perceptions of anxiety and distress [30] and sometimes even to suicidal attempts [31].

Although many study reported the importance of the use of technological devices in Health, few studies analyzed the effects of such devices and nomophobia during occupational activities in a population of Italian nurses.

This study explores the interaction of nomophobia and the perception of nomophobia towards oneself and others, the consequences of this disorder in the work commitment, interruption of work duties and productivity. The proposed study was tested using data collected from 540 Italian nurses from 18 Italian regions. The results extend our comprehension on how the use of smartphones might positively or negatively influence our employees in the workplace.

## METHODS

### Aim of the study

Investigating the level of dependence on electronic devices and the habits of nurses. A secondary aim was to assess the possible association between nomophobia and distraction in the workplace.

### Design

A transversal and observational multicenter study was conducted to determine the perception, frequency, attitude and mode of use of electronic devices. In addition, we investigated the relationship between addiction levels and nomophobia and workplace distraction on a sample of Italian nurses.

### Sample

A total of 540 nurses from 18 Italian regions

and divided into 4 different geographical areas, have agreed to participate: North-West Italy (Liguria, Lombardy, Piedmont), North-East Italy (Emilia-Romagna, Friuli-Venezia Giulia, Trentino-Alto Adige, Veneto), Central Italy (Lazio, Marche, Tuscany) and Southern Italy (Abruzzo, Basilicata, Calabria, Campania, Molise, Puglia, Sicily, Sardinia). All nurses belonged to the Orders of the nursing professions, which gave approval to the study and were part of the mailing list. All participants voluntary agreed to participate in the study. Nurses waiting for a first working experience were excluded. Table 1 shows patient's characteristics.

### Procedures for data collection

This study was conducted from January to August 2019. Data were collected through the filling in of a questionnaire, transmitted through a link to all the presidents of the Order of the nursing profession on a national level (n=103). An email was sent to all the Presidents of the Orders to present the study and to formally request participation in the questionnaire. After obtaining authorization from the Presidents, each nurse in the orders was sent an email containing a brief presentation of the questionnaire and a link to the online questionnaire.

### Data sources

The questionnaire consists of three sections: the first section aimed at collecting socio-demographic data (Region, province, age, gender, working role, years of experience, qualification and work area); the second part consists of a questionnaire called "Nurses, Use of Personal Communication Devices Questionnaire" [32], composed of 18 items designed to investigate the phenomenon of the use of personal communication devices within the sample population.

The third part consists of the "Nomophobia Questionnaire (NMP-Q)", a questionnaire on nomophobia developed and validated by [33] especially smartphones. This study sought to contribute to the nomophobia research literature by identifying and describing the dimensions of nomophobia and developing a questionnaire to measure nomophobia. Consequently, this study adopted a two-phase, exploratory sequential mixed methods design. The first phase was a qualitative exploration of nomophobia through semi-structured interviews conducted with nine undergraduate students at a large Midwestern university in the U.S. As a result of the first phase, four dimensions of nomophobia were identified: not being able to communicate, losing connectedness, not being able to access information and giving up convenience. The qualitative findings from this initial exploration were then developed into a 20-item nomophobia questionnaire (NMP-Q). The questionnaire includes 20 items that use

**TABLE 1. Sample characteristics (n=539)**

	N (%)
<b>Age (average, ds)</b>	33.86 – 13.111
Gender	
Male	144 (26.7)
Female	395 (73.3)
<b>Qualification</b>	
Regional diploma	119 (22.1)
University diploma	33 (6.1)
Doctor of Philosophy (Ph.D)	10 (1.9)
Master's degree (MSc)	72 (13.4)
Bachelor's degree (BSc)	305 (56.6)
<b>Geographical distribution</b>	
Northern Italy	254 (47.6)
Central Italy	93 (17.4)
Southern Italy	187 (35.0)
<b>Working areas</b>	
Surgical area	69 (12.9)
Critical area	127 (23.8)
Management / administrative area	31 (5.8)
Maternal / children's area	16 (3.0)
Multi-specialty medical area	74 (13.9)
Geriatric-rehabilitation medical area	112 (21.0)
Territorial area	70 (13.1)
Prevention and safety	24 (4.5)
Services (radiology, pathology and laboratory medicine)	10 (1.9)
<b>Professional role</b>	
Nursing coordinator	51 (9.5)
Nursing manager	11 (2.0)
Nurses	476 (88.5)
<b>Years of working experience</b>	
1-5	189 (35.1)
6-10	59 (11.0)
11-15	50 (9.3)
16-20	47 (8.7)
21-25	73 (13.6)
26-30	48 (8.9)
Over 30	72 (13.4)

the Likert scale from 1 to 7, with 1 being 'completely disagree' and 7 'completely agree'. The questions were aimed at investigate the levels of addiction to electronical devices and are divided in four main topic: "not being able to access information" (1-4), "renouncing to commodities" (5-9), "not being able to communicate" (10-15) and "losing connection" (16-20). The total score was obtained by adding the number of each item of the questionnaire, which allows a range score from 20 to 140 points. The highest score correspond to a higher level to nomophobia. The results provide with answers ranging from normal and healthy tendencies (0-20), light version of nomophobia (21-59) which causes no real issue to the person, levels that might start to be

considered as a warning sign (60-99) and from 100 to 140 there might be cases of actual damage within the work place and personal life and with feelings of anxiety when not in contact with a personal device.

All sections of this questionnaire were digitalized through a Google drive platform.

### Ethical Consideration

The ethical characteristics of the study were set out in the questionnaire presentation. Participation in the study, being free and voluntary, was considered as an expression of consensus. It was made explicit that the participation

was voluntary and that they could refuse participation to the protocol whenever they wished.

Those who were interested in participating were given an informed consent form, which recalled the voluntary nature of participation, as well as the confidentiality and anonymity of the information. In addition, to ensure that the questionnaires were anonymous and to enable participants to be identified, a sequential identification number (ID) was assigned to each registered participant.

### Analysis of data

Descriptive analyses were conducted for qualitative and quantitative variables through the use of the Software Statistical Package for Social Science (SPSS) version 17. The continuous variables were synthesized using the averages and standard deviation (DS) and the categorical variables through frequencies and percentages. In addition, contingency tables were analyzed and a chi-square test were carried out to ascertain the presence of relationship between the attitudes of the participants to the use of electronic device and levels of nomophobia.

## RESULTS

### Sample demographic characteristics

The sample consisted of 539 nurses, 395 (73.3%) female and 144 (26.7%) male. The average age of participants was 33.8 years (DS=13.1). Geographical data were: 47.6% (n=254) were from Northern Italy, 17.4% (n=93) were from Central Italy, 35.0% (n=187) from Southern Italy. 35.1% (n=189) had working experience between 1 and 5 years, 13.6% (n=73) between 21-25 years and 13.4% (n=72) have over 30 years of experience. 56.6% (n=305) had a bachelor's degree. 23.8% (n=127) worked in critical areas.

### Frequency and use of electronic devices during working hours

The study shows a positive attitude of nurses towards the use of personal communication devices. 33.6% (n=181) were totally positive, 29.4% (n=158) slightly positive, 20.1% (n=108) neutral, 12.6% (n=68) slightly negative and only 4.3% (n=23) of nurses were expressly negative. They were also asked to indicate how often they used these devices, excluding breaks and lunch hours. 34.1% (n=184) declared that they use their mobile phones sometimes, 20.2% (n=109) use it more often, 8.9% (n=48) use it constantly, 32.7%

(n=176) use it rarely, 4.1% (n=22) never use it during working hours. Among the survey subjects, 13.3% (n=69) never use it for searching for pharmaceuticals references. 40.5% (n=205) never access protocols related to work, 32.9% (n=166) never access sites for educational and professional development (Table 2).

### Distraction by smartphone and smartphone perception

The analysis shows that the use of these devices negatively influenced the working performance, with a percentage equal to 20.1% (n=108); therefore 8.5% (n=46) nurses made errors during their clinical practice. 152 nurses (28.3%) confirmed that they saw their colleagues make mistakes during working hours; 89 (16.5%) admitted they lost important clinical information because they were distracted by the use of such device. Similarly, 46.0% (n= 247) stated that they saw colleagues losing important clinical documents for the same reason (Table 3).

### Nomophobia

The average of nomophobia score in this sample test was around 50.34 with a standard deviation of 29.032. Splitting the score into classes of nomophobia, results that: 5.9% (n=31) had a score of 20 (nomophobia absent); 66.2% (n=347) had a ranking within 21-59 (light nomophobia), 21% (n=110) between 60 e 99 (moderate nomophobia) and lastly, 6.9% (n=36) between 100 e 140 (severe nomophobia). The results obtained allow us to conclude that the sample tends to exhibit frequent light or moderate levels of nomophobia (Table 4).

The nomophobia scores were then according to other variables examined by comparing the averages through variance analysis.

It results that the Nomophobia score is associated with the feeling of being negatively influenced by personal performance. Whomever answers "yes" to question V.1 (has the use of an electrical device ever negatively influenced your performance as a nurse?) has an average score of 70.30 (DS 43.29) compared to the average 45.34 (DS 21.52) to whomever answers "no" (F=70.31;  $p = 0.000$ ).

Again, it emerges that the Nomophobia score is associated with the feeling of making mistakes due to the distraction induced by the use of the device. Whomever answered "yes" to the question V.3 (have you ever committed a mistake [...] because you were distracted by your personal communication device?) has an average score of 80.52 (DS 40.18) compared to the average score of 47.58 (DS 26.15) for those who answered "no" (F=57.52;  $p = 0.000$ ).

**TABLE 2. The use of electronic devices during working hours**

	<b>N (%)</b>
<b>V.1 Accessing drug references.</b>	517
Always	26 (5.0)
Often	127 (24.6)
Sometimes	223 (43.1)
Rarely	72 (13.9)
Never	69 (13.3)
<b>V.2 Accessing work-related protocols.</b>	506
Always	12 (2.4)
Often	41 (8.1)
Sometimes	107 (21.1)
Rarely	141 (27.9)
Never	205 (40.5)
<b>V.3 Accessing work-related apps that assist my patient care.</b>	505
Always	15 (3.0)
Often	42 (8.3)
Sometimes	91 (18.0)
Rarely	135 (26.7)
Never	222 (44.0)
<b>V.5 Calling or check/sending text messages or e-mails to other members of the healthcare team.</b>	518
Always	43 (8.3)
Often	73 (14.1)
Sometimes	117 (22.6)
Rarely	146 (28.2)
Never	139 (26.8)
<b>V.6 Reading online news.</b>	507
Always	22 (4.3)
Often	68 (13.4)
Sometimes	88 (17.4)
Rarely	129 (25.4)
Never	200 (39.4)
<b>V.7 Calling or check/sending text messages or emails to family or friends.</b>	514
Always	23 (4.5)
Often	61 (11.9)
Sometimes	119 (23.2)
Rarely	208 (40.5)
Never	103 (20.0)
<b>V.8 Online shopping</b>	505
Always	10 (2.0)
Often	13 (2.6)
Sometimes	32 (6.3)
Rarely	45 (8.9)
Never	405 (80.2)
<b>V.9 Accessing to Social Network</b>	504
Always	22 (4.4)
Often	26 (5.2)
Sometimes	54 (10.7)
Rarely	118 (23.4)
Never	284 (56.3)
<b>V.10 Playing online games.</b>	508
Always	11 (2.2)
Often	7 (1.4)
Sometimes	13 (2.6)
Rarely	41 (8.1)
Never	436 (85.8)

**TABLE 3. Use of electronical tools and related error**

	N. (%)
<b>V.1 Has the use of a personal communication device ever negatively effected your performance as a nurse?</b>	538
Yes	108 (20.1)
No	430 (79.9)
<b>V.2. Have you ever witnessed another nurse colleague’s personal communication device use negatively effect their performance?</b>	537
Yes	335 (62.4)
No	202 (37.6)
<b>V.3 Have you ever made a medical error (defined as an adverse effect of care, including a near miss or a sentinel event) because you were distracted by the use of your personal communication device?</b>	539
Yes	46 (8.5)
No	493 (91.5)
<b>V.4 Have you ever witnessed a nurse colleague make a medical error (defined as an adverse effect of care, including a near miss or sentinel event) because they were distracted by cell phone/texting?</b>	538
Yes	152 (28.1)
No	386 (71.7)
<b>V.5 Do you think you have ever missed an important piece of clinical information because you were distracted by the use of your personal communication device?</b>	539
Yes	89 (16.5)
No	450 (83.5)
<b>V.6 Have you ever witnessed a colleague miss an important piece of clinical information because they were distracted by their personal communication device while working?</b>	537
Yes	247 (46.0)
No	290 (54.0)

**TABLE 4. Class of Nomophobia**

	SCORE	N (%)
<b>Absent</b>	20	31 (5,9)
<b>Slightly</b>	21-59	347 (66,2)
<b>Moderate</b>	60-99	110 (21,0)
<b>Severe</b>	100-140	36 (6,9)

A significant, but very weak correlation is present between the Nomophobia score and years of working experience (Spearman’s Rho = -0.097; p = 0.027).

## DISCUSSION

The aim of this study was that to investigate the frequency of use, the degree of addiction (nomophobia) and the associated distraction within an Italian nursing population. In this study, it was observed how nurses positively consider the use of electronical devices.

In addition, most of the participants reported that they were not distracted at work and that they were no negatively influenced by the use of smartphones. However, they reported that they noticed their colleagues being

negatively affected. This result is coherent with other studies of different professions. In particular, this strong discrepancy was found by the study made by [34], tested on residents and their physicians as well as the study of [35] where clinical vigilance is essential to patient care, the potential distraction of cell phones may be especially problematic. However, the extent of this as an issue is currently unknown. Therefore, the purpose of this study was to (1, conducted on a population of perfusionist. This may due to the fact that distraction caused by smartphones can be perceived as a productive break that is difficult to be admitted or maybe because nurses are not aware of the errors that can occur when using a smartphone [36]social appearance anxiety, and social media use on nursing students’ nomophobia levels. This study was conducted with 755 undergraduate nursing students. Sociodemographic data were evaluated using percentages and means. The effect of problematic Internet use, social appearance anxiety, and social media use on nomophobia levels was assessed by simple linear regression analysis. The mean age of participants was 21.4 ± 1.3; 82.5% were female, and 59.7% (n = 450).

Moreover, this study also shows how the perception of oneself and others changes. Nurses do not realize that they are distracted by their smartphone and consequently do not believe they are, a perception that changes when

it is referred to the others. Therefore, it was revealed that nurses admit to using communication devices during working hours and during clinical practices, albeit in different ways. The use of smartphones may indicate that nursing professionals need to share their emotional stress in order to relieve the emotional fatigue associated with work, or it may be due to the “fear of getting lost”, and not staying connected [37]; as well as the need to looking up information on pharmaceuticals or a way to communicate with other members of the team [26] we describe smartphone-related activities for nurses’ work and nonwork purposes; analyzed the differences between smartphone use and nurses’ age, gender, and working environment; and observed the influences that personal digital devices have on nurses’ performance. We conducted a cross-sectional and correlational study. A convenience sample of nurses was recruited, composed of 256 nurses, mostly women (74.6%, as this allows them to get more information and resolve any professionals doubts for making clinical decisions [38].

It is interesting, however, that the majority of participants rarely try to access to “medical information connected to work” and most of them never or rarely access to “work-related protocols”.

The use of devices could also be related to nomophobia [39], thus we explore the levels of nomophobia in the interviewed nursing population. The average score obtained were 50.34, with a DS of 29.032, thus demonstrating slight level of nomophobia.

Finally, we observed how nomophobia itself could affect performance and possible errors during clinical care. According to a study by Pucciarelli et al. [26] we describe smartphone-related activities for nurses’ work and nonwork purposes; analyzed the differences between smartphone use and nurses’ age, gender, and working environment; and observed the influences that personal digital devices have on nurses’ performance. We conducted a cross-sectional and correlational study. A convenience sample of nurses was recruited, composed of 256 nurses, mostly women (74.6% , communication devices do not reduce work-related stress or do not improve the ability to concentrate. The analysis of correlation, in fact, showed that nomophobia negative influences the performance of nurses, and that errors are made during clinical practice [26] we describe smartphone-related activities for nurses’ work and nonwork purposes; analyzed the differences between smartphone use and nurses’ age, gender, and working environment; and observed the influences that personal digital devices have on nurses’ performance. We conducted a cross-sectional and correlational study. A convenience sample of nurses was recruited, composed of 256 nurses, mostly women (74.6%. The results, however, tend to be lower than scores obtained from other similar studies performed in Spain and Portugal, where the studied population shows higher nomophobic levels [40]. Finally, we also find a correlation between years of experience and addiction.

In light of these results, it is important to increase

awareness and education on the optimal use of these devices. There is also the need to create rules that regulate and limit the use of smartphones in the clinical context, to ensure appropriate care for patients being cared for.

### Limits

The results of the study should take into account certain limitations, including the choice of electronic dissemination of the questionnaire, which may have excluded nurses with a reduced computer background. In addition, although it involves a large and heterogeneously distributed sample across the national territory, it is not possible to generalize the data to the whole category. Finally, possible distortions may be related to not wanting to declare possible errors committed by distraction during working hours.

### CONCLUSIONS

The results of the study permit us to carry out various evaluations of the phenomenon of nomophobia in the Italian nursing population. The analysis of the results showed that the use of personal devices can cause distraction and thus increase the incidence of errors in the clinical practice.

In view of the physical, psychological and social consequences that these devices produce, and for a proper intervention and protection, it seems essential to correctly intervene and raise awareness and greater attention to the use of such devices, with the need to create rules that regulate and limit their use in the clinical context, to ensure appropriate care for assisted patients. It is extremely important to educate healthcare professionals about the potential risks that can arise from their distraction.

It would be interesting to explore smartphone addiction-levels of other medical professionals, in order to evaluate the psychological damage that nomophobia can cause. Future studies should also investigate other types of technological addiction that are growing in our society, such as “vamping” (the need to participate in online groups replacing real life meetings), the real and potential cause of errors in the health care system. Overall, it is necessary to promote awareness and information activities on this phenomenon in order to develop specific knowledge and a greater awareness of it, useful to design and implement coping strategies.

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