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Modalities of in-person and emergency remote teaching: perception and experiences of dentistry undergraduates

Modalidades de ensino presencial e remoto emergencial: percepção e vivência dos graduandos em odontologia

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ABSTRACT

Objective: The COVID-19 pandemic brought significant changes to people's daily lives, necessitating adaptations to social distancing and human activities. Among these changes, education had to adjust to minimize losses and continue the teaching-learning process. This adjustment included the adoption of technology tools, Information and Communication Technologies (ICT), and distance learning practices, requiring both students and faculty to adapt to this new reality to maintain their activities. This study aimed to investigate, from the perspective of dentistry undergraduates, the differences between courses taught remotely during the pandemic and their return to these courses as in-person teaching assistants. **Material and Methods:** A structured interview was conducted, with questions addressing the challenges faced during remote learning and the perceived differences in monitoring these same courses in the in-person modality. Both descriptive and inferential analyses were performed, including the Chi- square test of independence and Chi-square partitioning, with a significance level of $\alpha = 0.05$. **Results:** Among the difficulties reported, 76.7% of respondents mentioned concentration issues due to home environment factors, and 70% stated that emergency remote learning significantly affected their mental health. However, 53.3% of students expressed satisfaction with the courses taken through remote learning, and only 13.3% reported dissatisfaction. In the students' perception, the in-person modality is more effective and beneficial. **Conclusion:** The results of this research enabled an evaluation of the distance education provided and the utilization of the best tools identified by both students and the institution. This evaluation can help address potential gaps or deficiencies in learning generated by distance education in dentistry.

KEYWORDS

Covid-19 pandemic; Dental education; Dentistry students; Distance Education; Higher education institution.

RESUMO

Objetivo: A pandemia da COVID 19 provocou uma mudança no cotidiano das pessoas e com isso a necessidade de adaptação ao distanciamento social e nas atividades humanas. Dentre estas mudanças, o ensino de modo a minimizar os prejuízos e dar continuidade ao processo ensino-aprendizagem, foram adotadas ferramentas de tecnologia, as Tecnologias de Informação e Comunicação (TIC) e práticas de ensino à distância, fazendo com que discentes e docentes tivessem que se adaptar a essa nova realidade em vista da continuidade de suas atividades. Objetivou-se neste estudo verificar, na visão dos graduandos em odontologia, as diferenças entre as disciplinas ministradas remotamente no período pandêmico e seu retorno a elas, na forma de monitoria na modalidade presencial. **Material e Métodos:** Foi realizada uma entrevista estruturada, cujas perguntas versaram sobre as dificuldades encontradas no período de estudo remoto e as diferenças sentidas na monitoria dessas mesmas disciplinas na modalidade presencial. Tanto análises descritivas quanto inferenciais foram realizadas, incluindo o teste de independência do qui-quadrado e o particionamento do qui-quadrado, com um nível de significância de $\alpha = 0,05$. **Resultados:** Entre as dificuldades relatadas pelos entrevistados, 76,7% relataram dificuldade de concentração pela convivência no domicílio, e 70% afirmaram que o Ensino Remoto Emergencial comprometeu de maneira significativa sua saúde mental. No entanto, 53,3% dos estudantes se sentiram satisfeitos com a disciplina

cursada no Ensino Remoto, e apenas 13,3% relataram insatisfação. Na percepção dos graduandos, a modalidade presencial é mais efetiva e proveitosa. **Conclusão:** Os resultados desta pesquisa possibilitaram avaliar o ensino ofertado à distância, e o aproveitamento das melhores ferramentas apontadas pelo aluno e a instituição, sendo passível sanar possíveis lacunas ou deficiências no aprendizado geradas pelo EaD na odontologia.

PALAVRAS-CHAVE

Pandemia de Covid-19; Educação odontológica; Estudantes de odontologia; Educação a distância; Instituição de ensino superior.

INTRODUCTION

Following the global declaration of the pandemic in January of the current year, national health authorities—including the Health Services Surveillance and Monitoring Management, the General Management of Technology in Health Services, and the National Health Surveillance Agency—issued the Technical Note GVIMS/GGTES/ANVISA No. 04/2020 [1]. This document outlined prevention and control measures for health services in the care of suspected or confirmed cases of infection by the novel coronavirus (SARS-CoV-2). As a result, dentistry was significantly impacted worldwide, with decrees prohibiting elective dental procedures in multiple countries [2-4].

The rapid spread of the virus and the resulting need for social isolation, coupled with concerns about maintaining educational activities, prompted the Ministry of Education (MEC) to issue Ordinance No. 343/2020 [5]. This ordinance authorized the temporary replacement of in-person classes with digital alternatives during the health emergency.

To comply with regulations and ensure the safe continuation of the teaching-learning process, educational institutions adopted Information and Communication Technology (ICT) tools to support remote education [6]. However, in dentistry programs, laboratory and clinical training are essential components that cannot be fully replaced by ICT. As a result, dentistry curricula were restructured to prioritize theoretical content while clinical and laboratory activities were postponed until the return to in-person instruction [7].

Consequently, programs offering theoretical content resumed their academic activities. To support faculty adaptation and ensure effective content delivery, institutions implemented several measures, including providing training in remote teaching tools and ICT use. Student-centered initiatives were also introduced, such as distributing SIM cards for internet access, loaning laptops, and offering academic support online. These actions aimed to ensure continuity in education while prioritizing safety—an approach referred to as "emergency remote education" or "emergency remote teaching activities" [8,9].

Considering the challenges faced, the potential deficits in the teaching-learning process, and the need to identify strategies for improvement, this study aims to investigate, from the perspective of dentistry undergraduates, the differences between courses delivered remotely during the pandemic and their subsequent return as in-person teaching assistants. Additionally, it seeks to highlight and encourage the use of tools that enhanced educational experience, promoting students as active participants in their learning journey and reinforcing the role of educational institutions in fostering autonomy and the construction of knowledge.

MATERIALS AND METHODS

Study design and sample population

This study followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational studies [10] and analyzed data collected between 2020 and 2021. It employed a descriptive, exploratory, and cross-sectional design with a quantitative approach, aiming to assess the perceptions of dental undergraduates who served as teaching assistants in courses initially taken remotely during the COVID-19 pandemic and later revisited in person.

The sample consisted of 30 undergraduate dental students who had participated as teaching assistants in courses originally delivered remotely in 2020/2021 and subsequently attended these same courses in person, as documented by the Technical Undergraduate Section (STG). The

sampling method was probabilistic and interest-based, involving all eligible students who had served in this capacity during the specified period. A total of 38 registered assistants were identified through STG records and invited to participate; 30 students consented and were included in the study.

Inclusion criteria comprised students who had taken specific courses during the emergency remote learning period and later assisted in those same courses upon the return to in-person instruction. Exclusion criteria included students who had not participated in any teaching assistantships or had assisted in courses that were not predominantly delivered remotely (i.e., with less than 50% of activities conducted online).

Eligible students were invited to participate after receiving detailed information about the study and providing written informed consent. Interviews were conducted in person at mutually agreed times to avoid disrupting academic activities. Only students whose teaching assistantships had been formally approved by institutional authorities were interviewed.

Ethical considerations

This study was approved by the Research Ethics Committee for Research Involving Human Subjects (CEPH) (CAAE: 65655422.9.0000.0077; Opinion No. 5.892.717), in accordance with the ethical principles and regulatory standards established by Resolution No. 196/96 of the National Health Council.

Data collection

Outcome

Data were collected using a structured questionnaire developed for this exploratory research. The instrument assessed participants' demographic and academic backgrounds, interpersonal relationships, social context during the isolation period, remote learning experiences, and perceptions of differences between remote and in-person teaching assistantships. The questionnaire comprised 25 closed-ended questions and was adapted from the study by Moimaz et al. [11].

Following data collection, responses were entered into a pre-formatted Microsoft Excel spreadsheet. Descriptive analyses, including absolute and relative frequencies, were performed. Results were presented in tables, charts, and graphs to facilitate interpretation.

One potential risk identified was the possibility of participant identification. To address this, confidentiality protocols were strictly followed, and all responses were anonymized. Only the research team had access to the questionnaires. Personal data were recorded exclusively in the Informed Consent Form (ICF), which was securely stored and accessed only by the principal investigator. Printed versions of the questionnaires were used, and only anonymized data were transferred to digital format to reduce the risk of data breaches.

Statistical analysis

Statistical analyses were conducted using JAMOVI software (version 2.3.17, available at https://www.jamovi.org), adopting a significance level of $\alpha = 0.05$. Both descriptive and inferential analyses were performed, including the Chi-square test of independence and Chi-square partitioning.

The internal consistency of the questionnaire was assessed using Cronbach's alpha. The interpretation of alpha values followed the classification proposed by Landis and Koch [12]: 0.81–1.00 (almost perfect consistency), 0.61–0.80 (substantial), 0.41–0.60 (moderate), 0.21–0.40 (fair), and 0.00–0.20 (slight).

RESULTS

The sample comprised 30 undergraduate students, as shown in Table I. Among the participants, 21 (70%) were female. The mean age was 22.3 years (± 2.8). Regarding socioeconomic status, 33.3% of the respondents reported a monthly family income above six minimum wages, and 21 students (70%) stated that they did not experience economic hardship during the pandemic.

The questionnaire was divided into three thematic sections based on the structure and interrelation of the questions. In Part I (Interpersonal relationships and social context during social isolation and remote learning), students reported various challenges encountered during distance education. The most frequently cited difficulty was a lack of concentration due to the home environment, with 76.7% of participants agreeing that the residential setting

Table I - Characteristics of participating students (n = 30). Chi-square independence test[a] Chi-square partition test[b]

	N	%	p- value
Age (mean)	22.3	(2.8)	
Gender[a]			
Female	21	70.0	0.114
Male	9	30.0	
Course of assistantship[b]			
Anatomy	3	10.0	0.582
Biochmistry	4	13.3	
Restorative dentistry	5	16.7	
Pharmacology	1	3.3	
Histology	6	20.0	
Public Health Dentistry	2	6.7	
Oral Pathology	2	6.7	
General Pathology	2	6.7	
Fixed Partial Prosthetics	1	3.3	
Periodontics	2	6.7	
Radiology	2	6.7	
Residents in the same household[b]			
1-2 people	6	20.0	**<0.0001***
3-5 people	23	76.7	
6 or more people	1	3.3	
Monthly family income[b]			
1-2 minimum wages	1	3.3	**0.045**
3-5 minimum wages	12	40.0	
6 or more minimum wages	10	33.3	
Prefer not to answer	7	23.3	
Did you experience an economic crisis?[a]			
Yes	9	30.0	0.114*
No	21	70.0	

* means a statistical significant difference

interfered with their focus during synchronous classes (p = 0.01). Additionally, 70% reported that their attention was divided with other personal responsibilities, such as remote work or household tasks (p = 0.042). Furthermore, 70% of students indicated that remote learning significantly affected their mental health during the social isolation period (p = 0.012). Most students (over 90%) reported having reliable internet access and easy access to electronic devices for study purposes (p < 0.0001) (Table II).

In Part II (Experiences and achievements during remote learning), 86.7% of participants indicated that digital tools were not perceived as obstacles (p = 0.013). However, difficulties in maintaining focus during remote learning were reported by 73.4% of students (p = 0.009). A significant portion (73.3%) also expressed discomfort turning on their cameras and asking questions during synchronous sessions (p = 0.011). Moreover, 80% of students reported feeling unprepared or insecure about returning to in-person academic and clinical activities following the remote learning period (p = 0.0009) (Table III).

In Part III (Comparison between in-person and remote learning), 96.6% of students reported changes in their learning approaches when transitioning back to in-person instruction (p < 0.0001). The review of content in the in-person modality was considered a key factor in their academic development by 90% of participants. Additionally, 63.4% reported feeling disadvantaged when comparing remote

Table II - Distribution of responses for Part I (Interpersonal relationships and social context during social isolation and remote learning), n=30. p-value obtained using the Chi-square partition test

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	p-value
Remote learning during social isolation significantly affected my mental health.	9 (30.0)	**12 (40.0)**	6 (20.0)	3 (10.0)	0 (0.0)	**0.012***
Living in a residential environment during social isolation hindered my concentration during synchronous classes.	8 (26.7)	**15 (50.0)**	1 (3.3)	5 (16.7)	1 (3.3)	**0.001***
I had access to quality internet during remote learning.	**23 (76.7)**	4 (13.3)	1 (3.3)	2 (6.7)	0 (0.0)	**<0.0001***
Access to electronic devices used as study tools was not an obstacle for me.	**23 (76.7)**	6 (20.0)	0 (0.0)	1 (3.3)	0 (0.0)	**<0.0001***
During remote learning, I shared my focus and attention with personal activities, such as remote work or household and family tasks..	**12 (40.0)**	9 (30.0)	4 (13.3)	2 (6.7)	3 (10.0)	**0.042***

* means a statistical significant difference

Table III - Distribution of responses for Part II (Experiences and achievements during remote learning), n=30. p-value obtained using the Chi-square partition test

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	p-value
The use of digital tools during Remote Learning was a challenge for me.	1 (3.3)	3 (10.0)	6 (20.0)	**14 (46.7)**	6 (20.0)	**0.013***
During Remote Learning, I felt disadvantaged regarding exams conducted on digital platforms.	3 (10.0)	5 (16.7)	8 (26.7)	9 (30.0)	5 (16.7)	0.504
Maintaining focus during Remote Learning was a challenge for me.	**14 (46.7)**	8 (26.7)	4 (13.3)	2 (6.7)	2 (6.7)	**0.009***
I had full access to elective courses and extracurricular activities during Remote Learning and do not feel disadvantaged in this regard.	5 (16.7)	5 (16.7)	5 (16.7)	11 (36.7)	4 (13.3)	0.397
I felt embarrassed to turn on the camera and express my doubts during Remote Learning classes.	**12 (40.0)**	10 (33.3)	5 (16.7)	2 (6.7)	1 (3.3)	**0.011***
With the return to in-person activities, I did not feel prepared or confident for classroom activities and clinical experiences.	**12 (40.0)**	**12 (40.0)**	1 (3.3)	5 (16.7)	0 (0.0)	**0.0009***

* means a statistical significant difference

learning with traditional classroom instruction ($p = 0.023$), and 70% stated that their academic development was negatively impacted in the courses taken remotely ($p = 0.019$). In-person learning was perceived as more effective and beneficial by 83.3% of the students ($p = 0.0003$), and 80% found in-person seminars and activities more enjoyable and dynamic ($p = 0.001$). Half of the participants considered remote assistantship experiences to be more limited than their in-person counterparts ($p = 0.0002$) (Table IV).

Regarding overall satisfaction, 53.3% of students reported being satisfied with the courses

Table IV - Distribution of responses for Part III (Comparison between in-person and remote teaching), n=30. p-value obtained using the Chi-square partition test

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	p-value
During in-person monitoring, I observed changes in learning methods compared to Remote Learning	**19 (63.3)**	10 (33.3)	1 (3.3)	0 (0.0)	0 (0.0)	**<0.0001***
I feel disadvantaged when comparing the teaching method offered in the in-person modality to Remote Learning.	5 (16.7)	**14 (46.7)**	3 (10.0)	6 (20.0)	2 (6.7)	**0.023***
The lack of clinical and laboratory activities negatively impacted my academic development.	10 (33.3)	10 (33.3)	6 (20.0)	3 (10.0)	1 (3.3)	0.051
Reviewing the content in the in-person modality was a key aspect of my academic development	**22 (73.3)**	5 (16.7)	1 (3.3)	2 (6.7)	0 (0.0)	**<0.0001***
While following the course in the in-person modality, I realized that I did not grasp the content as effectively during Remote Learning.	7 (23.3)	10 (33.3)	3 (10.0)	7 (23.3)	e3 (10.0)	0.287
The monitoring provided a completely different perspective of the course I had during Remote Learning.	4 (13.3)	10 (33.3)	8 (26.7)	5 (16.7)	3 (10.0)	0.328
I believe there was a gap in my academic development regarding the courses I could not revisit in the in-person modality.	10 (33.3)	**11 (36.7)**	4 (13.3)	5 (16.7)	0 (0.0)	**0.019***
During monitoring, I observed that the classes were not overly long and tiring, thanks to the breaks and dynamism of in-person teaching	8 (26.7)	7 (23.3)	5 (16.7)	10 (33.3)	0 (0.0)	0.066*
I consider the in-person teaching modality to be more effective and beneficial than Remote Learning.	**15 (50.0)**	10 (33.3)	3 (10.0)	2 (6.7)	0 (0.0)	**0.0003***
During monitoring, I witnessed more enjoyable and dynamic activities and seminars compared to those in Remote Learning.	11 (36.7)	**13 (43.3)**	3 (10.0)	3 (10.0)	0 (0.0)	**0.001***
I realized that the monitoring method during Remote Learning was limited compared to my in-person monitoring experience	**13 (43.3)**	5 (16.7)	12 (40.0)	0 (0.0)	0 (0.0)	**0.0002***

* means a statistical significant difference

offered via remote learning, and only 20% expressed dissatisfaction ($p = 0.001$). Half of the sample reported satisfaction with the remote learning experience provided by the institution, with only 13.3% indicating dissatisfaction ($p < 0.0001$). When evaluating in-person assistantships, 60% of students reported being very satisfied, and only one student (3.3%) reported dissatisfaction ($p < 0.0001$) (Table V).

The total agreement score from the questionnaire ranged from 35 to 71, with a mean of 48.5 (± 9.4). The satisfaction score ranged from 4 to 10, with a mean of 6.1 (± 1.6). A 10% floor effect was observed in Part I, and no ceiling effect was identified. Internal consistency of the agreement items was classified as substantial (Cronbach's $\alpha = 0.79$), with variation between sections: fair for Part I ($\alpha = 0.38$), moderate for Part II ($\alpha = 0.45$), and substantial for Part III ($\alpha = 0.76$). The internal consistency for satisfaction items was considered fair ($\alpha = 0.36$) (Table VI).

DISCUSSION

Higher education in Brazil is currently characterized by a predominance of female

Table V - Distribution of responses to satisfaction questions (n=30).* p-value obtained from Chi-square partition test

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	p-value*
Experience and Achievements During Remote Learning						
What is your level of satisfaction with the course taken in the Remote Learning methodology?	3 (10.0)	**16 (53.3)**	5 (16.7)	6 (20.0)	0 (0.0)	**0.001***
What is your level of satisfaction with the Remote Learning offered by your educational institution?	0 (0.0)	**15 (50.0)**	11 (36.7)	4 (13.3)	0 (0.0)	**<0.0001***
Comparison Between In-Person and Remote Learning						
What is your level of satisfaction with the in-person monitoring methodology?	18 (60.0)	11 (36.7)	0 (0.0)	1 (3.3)	0 (0.0)	**<0.0001***

* means a statistical significant difference

Table VI - Descriptive Analysis and Internal Consistency of the Questionnaire (n=30)

	N° of items	Possible Score Range	Score Range	Floor Effect*	Ceiling Effect**	Mean (SD)	Alfa de Cronbach
Agreement Items:	22	22-110	35-71	0 (0.0)	0 (0.0)	48.5 (9.4)	0.79
I. Interpersonal Relationships and Social Context During Social Isolation and Remote Learning	5	5-25	5-15	3 (10.0)	0 (0.0)	9.2 (2.4)	0.38
II. Experience and Achievements During Remote Learning	6	6-30	10-22	0 (0.0)	0 (0.0)	16.1 (3.2)	0.45
III. Comparison of Face-to-Face vs Remote Learning	11	11-55	14-39	0 (0.0)	0 (0.0)	23.3 (6.4)	0.76
Satisfaction items	3	3-15	4-10	0 (0.0)	0 (0.0)	6.6 (1.6)	0.36

*Number (%) of responses with the minimum score. **Number (%) of responses with the maximum score.

students [13], especially in disciplines related to care and assistance. Health and wellness fields exhibit higher rates of female enrollment [14]. In line with this national trend, the present study found a high prevalence of female participants (70%), supporting the ongoing feminization of Dentistry programs [15].

Students encountered numerous challenges during the pandemic, many of which were intensified by existing socioeconomic disparities. These challenges had a direct or indirect impact on the mental health of university students [16]. In this context, students reported experiencing anxiety, depression, stress, and difficulty concentrating, all of which impaired their ability to engage effectively in virtual learning environments [17]. These findings confirm the broader understanding that Remote Learning during the pandemic had a detrimental effect on students' psychological well-being.

The overlap between domestic and academic environments further complicated students' routines. Sharing study spaces with the home setting during social isolation made it difficult to establish boundaries between academic obligations and personal life [16]. As a result, students struggled to separate educational demands from family responsibilities, negatively affecting academic focus and performance.

Despite these difficulties, most students in the sample reported having access to quality electronic devices and stable internet connections during Remote Learning. This contrasts with broader challenges in the Brazilian context, where technological infrastructure and internet access have limited the effectiveness of distance education [16,18]. Although studies such as that by Medeiros et al. [19] reported difficulties with digital tools among dentistry students at public universities, the participants in the present study did not identify technological access as a barrier.

Clinical activities represent a foundational element in dental education, essential for the development of technical and professional competencies. Several participants expressed concerns regarding insufficient preparation and lack of confidence in performing clinical procedures—an issue similarly reported by Novaes et al. [20]. In contrast, Medeiros et al. [19] found that students felt adequately prepared for the transition back to in-person clinical settings. This divergence may reflect institutional differences in curriculum design, support resources, and individual experiences during the Remote Learning period.

Although students expressed general satisfaction with the Remote Learning strategies adopted by the institution, most perceived in-person education as more effective and rewarding. These findings are consistent with other studies reporting that undergraduate students often view Remote Learning experiences as inferior to in-person instruction [19], and that face-to-face interaction remains the preferred and most effective modality [11].

An interesting aspect of the Remote Learning experience involved students' reluctance to turn on their cameras or ask questions during synchronous classes, largely due to feelings of embarrassment. While this limited interaction, digital platforms still contributed meaningfully to the learning process [16]. As noted by Pereira et al. (2020) [21], technological tools can have a positive impact on education when thoughtfully integrated into teaching strategies.

Students who revisited the same courses in an in-person format as teaching assistants reported significant improvements in the learning experience. They described in-person mentoring as more dynamic and engaging, especially in terms of activities and seminars. These findings reinforce the role of mentoring in enhancing interpersonal relationships and academic support. As noted by Costa et al. [22], mentorship strengthens connections between mentors and mentees, while Antunes et al. [23] highlight the mentor's function as both an academic guide and a role model.

Overall, the pandemic negatively affected students' mental health and disrupted their academic routines. Although institutional tools supported content comprehension during Remote Learning, in-person instruction was perceived as more effective and conducive to learning. Participants benefited from reliable internet and adequate devices, and did not identify technological barriers as significant challenges. Comparing both modalities, students expressed higher satisfaction with in-person mentoring, which offered clearer academic development advantages and more engaging educational experiences. The shift back to face-to-face learning highlighted marked improvements in students' perceptions of their own learning processes.

CONCLUSION

The tools provided by the institution for Remote Learning contributed to students' understanding of the course content. However, according to students' perceptions, in-person learning was considered more effective and beneficial for academic development. The findings of this study contribute to the ongoing improvement of the teaching-learning process in dental education, supporting the implementation of more effective, student-centered strategies that integrate the strengths of both remote and in-person modalities.

Author's Contributions

YKNG: Conceptualization; Data Curation; Writing – Original Draft Preparation; Writing – Review & Editing. IMC: Conceptualization; Writing – Original Draft Preparation. TSB: Formal

Analysis, Data Curation. FAF: Conceptualization; Data Curation; Writing – Review & Editing. AAB: Supervision; Writing – Original Draft Preparation; Writing – Review & Editing .SCT: Project Administration Resources; Conceptualization; Data Curation; Formal Analysis; Writing – Original Draft Preparation.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Regulatory Statement

This study protocol was reviewed and approved by Research Ethics Committee involving Human Beings of the São Paulo State University (UNESP), Institute of Science and Technology, São José dos Campos, SP, Brasil - CAAE: 65655422.9.0000.0077, Report: 5.892.717.

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