

The burned patient in times of COVID-19: proposal derived from lessons learned

El paciente quemado en tiempos de COVID-19: propuesta derivada de las lecciones aprendidas

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Abstract

COVID-19 is a public health problem, so any burn patient who is managed as an outpatient or requires hospital management is a potential carrier of SARS-CoV-2. Burn patients are susceptible to COVID-19 due to the burn and its immunosuppressive effect, the procedures they undergo and other factors related to the burn, which makes them at high risk of contracting the disease and transmitting it, especially to the healthcare team involved in its management. Therefore, it is important to organize strategies in the services that care for burn patients during the COVID-19 pandemic. The objective of this paper is to present a proposal for response, organizational management and strategic planning in a burn unit in times of COVID-19, based on the lessons and experience acquired.

Keywords: COVID-19. Burns. SARS-CoV-2.

Resumen

La COVID-19 es un problema de salud pública, por lo que cualquier paciente quemado que se maneje como externo o que requiera manejo hospitalario es un potencial portador del SARS-CoV-2. El paciente quemado es susceptible a la COVID-19 debido a la quemadura y a su efecto inmunodepresor, a los procedimientos a los que es sometido y a otros factores inherentes a la quemadura, lo que le hace un paciente con alto riesgo de contraer la enfermedad y transmitirla, especialmente al equipo de salud que está involucrado en su manejo. Por lo anterior, es importante organizar estrategias en los servicios que atienden pacientes con quemaduras durante la pandemia de COVID-19. El objetivo de este trabajo es presentar una propuesta para la respuesta, el manejo organizativo y la planeación estratégica en un servicio de quemados en tiempos de COVID-19, basándonos en las lecciones aprendidas y la experiencia adquirida.

Palabras clave: COVID-19. Quemaduras. SARS-CoV-2.

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Introduction

At the end of 2019, in the city of Wuhan, China, a disease of unknown origin was found and named “coronavirus 2019 disease” (COVID-19), secondary to a new coronavirus that was named SARS-CoV-2¹.

Since the end of January 2020, the SARS-CoV-2 disease was spread all over the world, and the World Health Organization (WHO) declare it a pandemic on March 11, 2020. At the end of May, the disease had reached 188 countries and has caused 370,000 deaths, with the highest number of cases in the United States and Brazil. Scientists from all over the world began to intensely work on basic clinical research in order to unravel the basic characteristic of the virus and develop new therapeutic approaches. This created the need to organize care facilities and avoid more infections, including to burned patients. The constant admissions of patients with symptoms that may indicate COVID-19 infection increased in all hospitals worldwide, and they implied a higher risk both for patients in the burn unit, and the care providers. For this reason, from the beginning of the pandemic, it was necessary to develop admission protocols for new patients and monitoring of admitted patients, including burned patients².

According to research, the key tasks are the strategic coordination of services and assignment and maintenance of resources in order to maintain and protect burned system operation throughout the pandemic, and especially training all personnel in COVID-19 protection and control³.

Critical decisions regarding burned patients and procedures must be based on organizational policies and local guidelines, as well as national and international regulations, considering the availability of finite and essential resources, as well as the supply chains supporting healthcare services. National and international organizations for burn injuries are considered reliable sources of information for burn care, and their websites provide clinical information and the needs of international guidelines and standards; however, little information can be found on the websites, despite the fact that many international experts have published lessons learned or specific aspects of epidemiology and treatment of burns during the COVID-19 pandemic⁴.

The purpose of this review is to establish a proposal for the response in implementation of care processes for burned patients in COVID-19 times. There is little information regarding the organization of burn

units during the pandemic. According to the 25 articles found, we propose the recommendations according to Sackett's evidence levels.

Proposal for initial evaluation during admission

Due to the risk of infection between patients, many suggestions refer to the organization of a burn unit (Fig. 1). Within these facilities, first, it is recommended that all areas of activities (emergency room clinic, hospitalization, operating room, ICU) be divided in three areas: clean, temporarily soiled, and soiled (level of evidence 1b). Patients infected by SARS-CoV-2 whose infection has not been excluded will be admitted to the soiled or potentially soiled area, and after a 14 day quarantine period with no infection symptoms they can be transferred to the clean area. At the time of admission it is mandatory to provide an epidemiology history that includes information regarding contact with individuals diagnosed with COVID-19, respiratory symptoms (cough and dyspnea), fever, laboratory studies, and imaging studies (simple thorax computerized tomography)⁵ (evidence level 1b).

The questionnaire provided during triage must include the following questions⁶:

- Direct contact with a COVID-19 positive person or suspected to be positive.
- If the patient has been vaccinated, type of vaccine and number of doses.
- Temperature increase or use of any medication to reduce fever.
- Presence of chills.
- Sudden throat pain.
- Cough.
- Shortness of breath.
- Loss of taste.
- Loss of sense of smell.
- Sudden muscle pain.

The following hospital admission criteria to a burn unit are:

- Burned body surface are > 20% in adults and > 10% in children.
- Associated inhalation injury, severe perineal, hands or face burns.
- Electric and chemical burns.
- Lack of social support for outpatient management.

A real time polymerase chain reaction test (RT-PCR) is recommended with a sample obtained by nasal/oropharyngeal swabbing for all new patients admitted (evidence level 1b), for admitted patients with

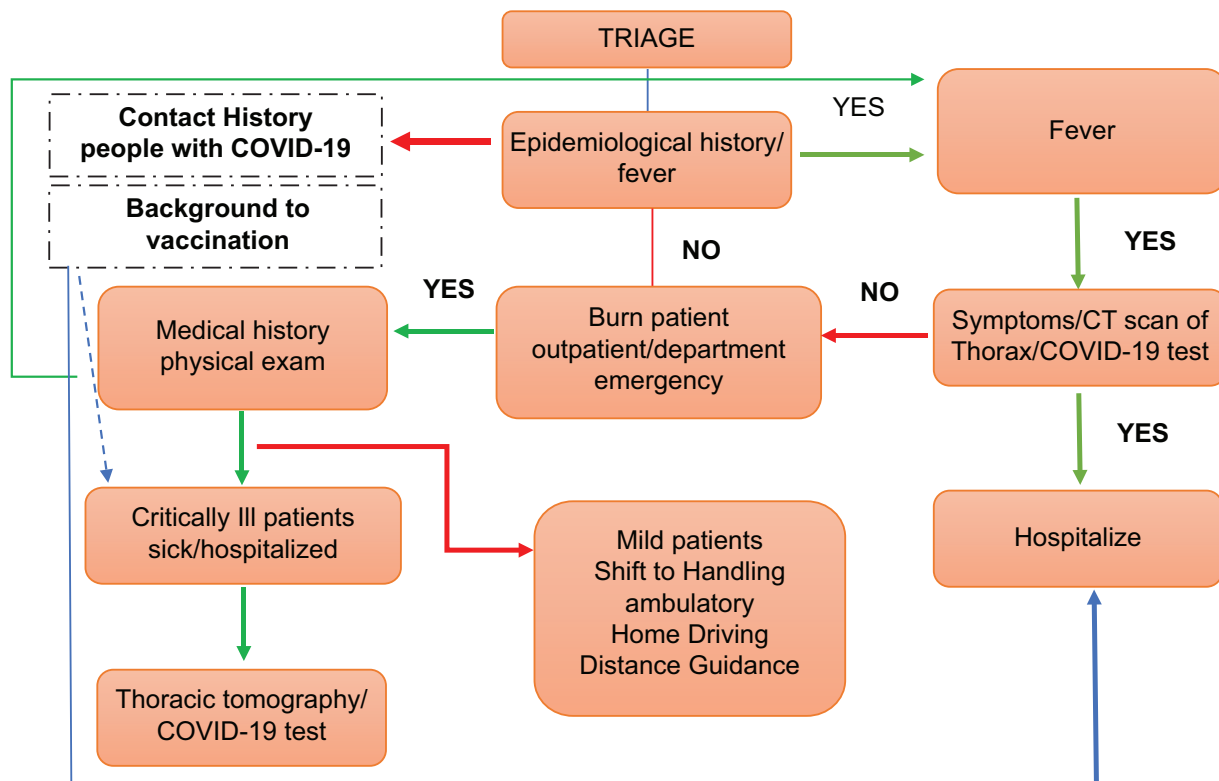


Figure 1. Admission protocol for patients during the COVID-19 epidemic.

burns and conditions similar to influenza or severe acute respiratory diseases within 5 day before a scheduled surgery (emergency surgery not to be delayed for lack of testing), for all high-risk burned patients and healthcare providers or who have been in direct contact with positive cases within the previous 5-10 days, regardless of symptoms⁷ (evidence level 1b).

Intrahospital procedures

For patients with burns on > 50% of the total body surface, the usual procedures are dressing change, fluid replacement, central venous access placement, orotracheal intubation, and tracheotomy, and personal protection measures were established at three levels (evidence level 1a):

- Level 1: patients with fevers, systematic protection measures that include surgical mask, hand washing, and use of protective eyewear if necessary. If personnel remains in the same section as patients with fevers, use of surgical caps and coats with an additional layer of disposable clothing, mandatory use of gloves, and protective footwear.
- Level 2: management of patients with suspected SARS-CoV-2 infection or confirmed infection, use

of N95 masks, protective covers for footwear, face, faceshields, or protective eyewear.

- Level 3: procedures that may potentially spray particles, such as orotracheal intubation, tracheotomy, bronchoscopy, electrocautery, and high-velocity tools (motor saw, dermatome), all aforementioned strategies are mandatory, and an extra layer of protective gloves is required. These procedures should be performed in quarantine rooms, preferably in negative pressure isolation⁸.

Asymptomatic patients or patients with mild symptoms can be discharged if they remained asymptomatic for 10 days during quarantine, with the recommended quarantine time at home of 7 days, and tests should be repeated 7 to 12 days after the first positive test; for patients that still test positive with this second test, a third test will be administered within 5 to 7 days (evidence level 1b). Ensuring that all resources and personnel are adequately organized to face the pandemic without neglecting burned patients is essential (Fig. 2)⁹.

Healthcare personnel organization

Each room responds to an emergency under the direction of the Emergency Response System of each

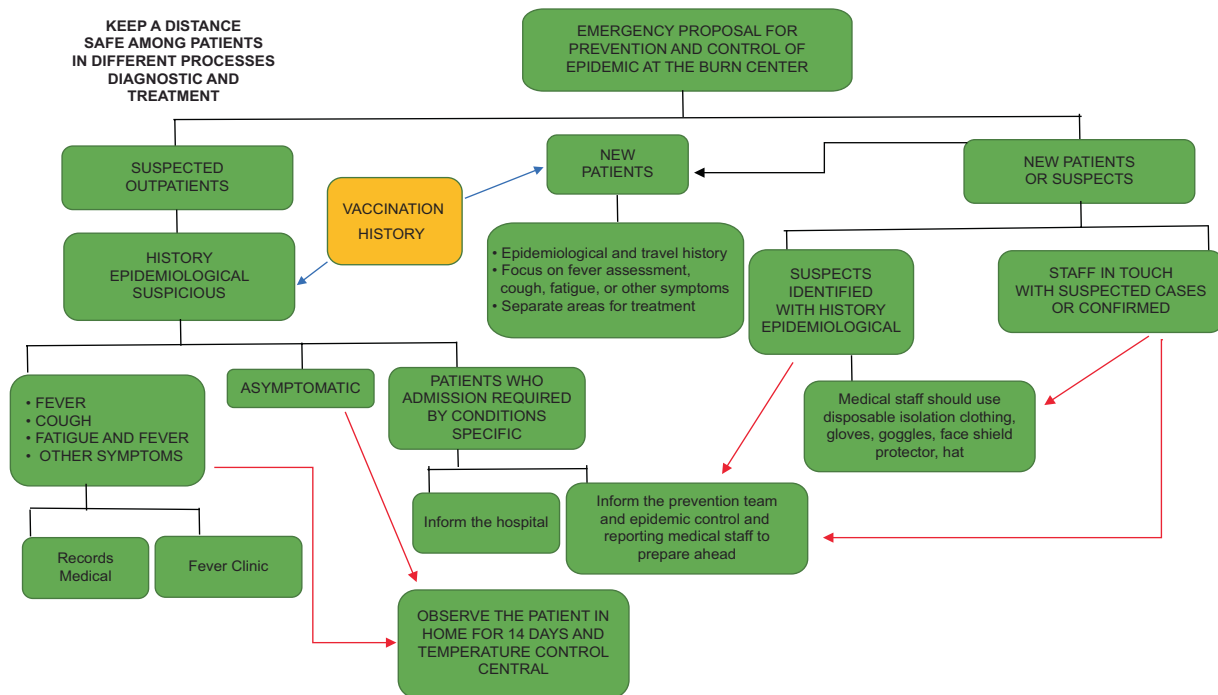


Figure 2. Epidemic prevention and control plan.

hospital and the higher administrative agency, according to the model of the infection control team. The director and head nurse are responsible for controlling and preventing infections; the team will be comprised of the chief doctor of the hospital, a nursing leader, clinical infections and laboratory specialists, and microbiology personnel (evidence level 3b)¹⁰.

It is important to inform all healthcare professional of personnel safety and detection, and to update them on infection prevention and control. All members must be familiar with the use of personal protective equipment, and trained on how to manage infected patients, disposal of dressings, and use of a ventilator. The workforce must be structured in order to reduce non-productive assistance to hospitals. Weekly COVID-19 tests for members of the burn teams may aid in preventing future infections in hospitals through asymptomatic healthcare personnel. In addition, it is important to emphasize that all healthcare personnel must have a complete immunization schedule for COVID-19¹¹ (evidence level 5).

Organization according to burn degree

- Non-severe burns: first aids, such as cooling the burn with water for 20 minutes, followed by placement of clean dressing at home. Professional training can be provided to patients during a videocall consultation.

- Severe burns: as a precaution, each emergency patient should be treated as a COVID-19 positive. All patients must have their temperature checked, and asked about travel history, close contact with a positive case, or COVID-19 symptoms within the last 2 weeks, as well as immunization history. If the patient is positive, healthcare personnel will be notified so that necessary measures are taken. Only one family member per patient is allowed in order to avoid overcrowding. If inhalation burn is suspected and advance management of the airway is necessary, an N-95 mask must be used in addition to the complete personal protective equipment. At the time of admission, informed consent will be obtained for the risk of COVID-19 infection and the risks associated with surgical procedures (evidence level 1b) (Fig. 3).

Organization and prioritization of surgical procedures

The *Royal College of Surgeons* and *American College of Surgeons* in Ireland provide a complete guide for the classification and organization of non-emergency surgical procedures, and prioritization of procedures in burned patients (Table 1).

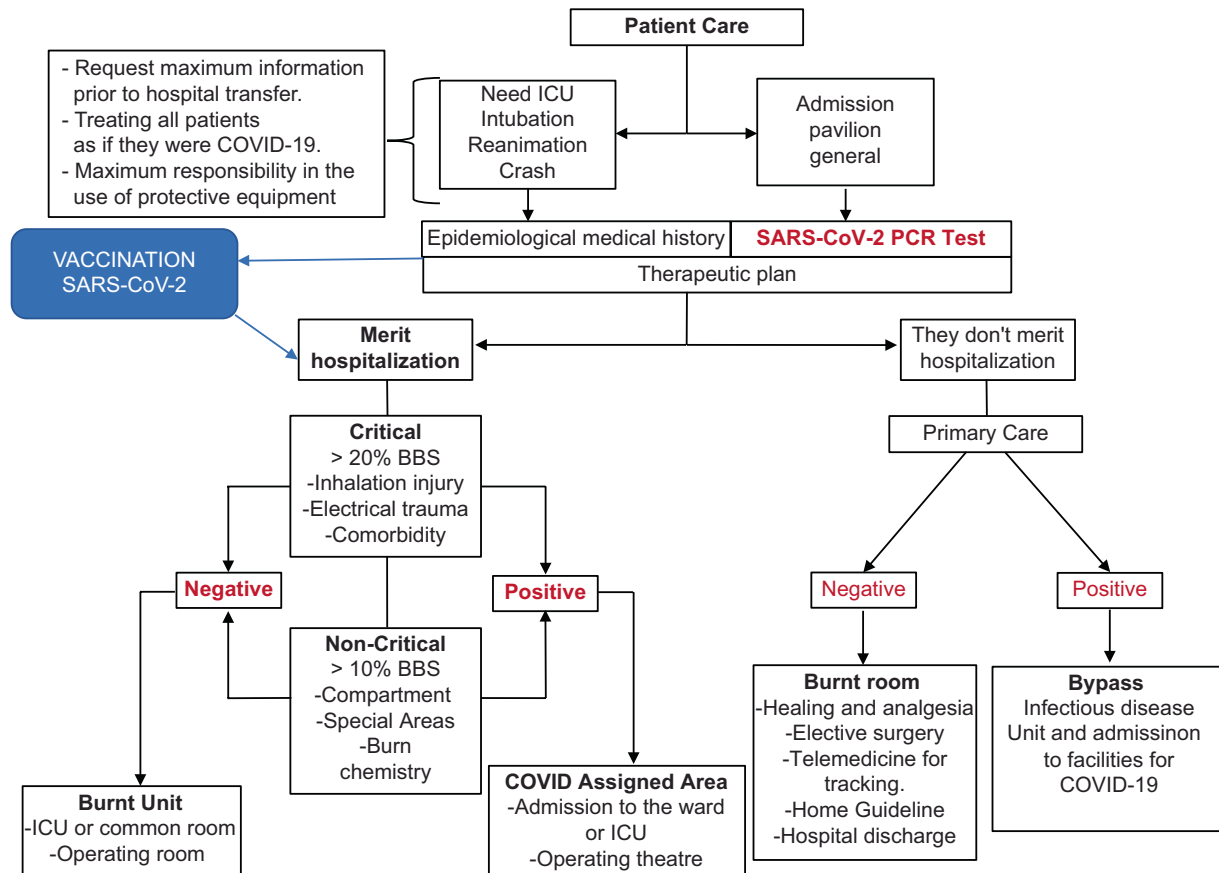


Figure 3. Care algorithm for burnt patients during COVID-19 times. BBS: burned body surface; ICU: intensive care unit.

Prevention inside the operating room

All medical personnel inside the operating room must strictly implement standard protection measures and hand-washing hygiene according to the Centers for Disease Control and Prevention of the United States for airborne infections or transmitted by droplets. The use of N95 respirators is recommended for both the anesthesiology and surgery teams. If the patient is infected, all measures to reduce fluid splashing and contamination must be adopted, and surgery time must be minimized by the use of adequate devices, such as staples, as several studies have found that the viral load remains in all bodily fluids and the electrocauterization smoke, and therefore, it is important to minimize generating smoke, and avoid using electrocautery. Kampf et al.¹² found that SARS-CoV-2 survives on surgery surfaces for up to 9 days, and this carries the risk of contaminating other operating rooms, but it can be inactivated efficiently by the use of surface disinfecting procedures with ethanol 62-71%, hydrogen peroxide 0.5%, or sodium hypochlorite

0.1% in 1 minute. Generally, operating rooms use a positive pressure flow; however, while operating on a patient with confirmed or suspected COVID-19 infection, negative pressure is recommended, and if not available, a minimum of 30 minutes must be allowed for complete air exchange between surgeries¹³.

Postoperative management

Patients must remain quarantine during the postoperative period with an assigned nurse. Rehabilitation measures can be deferred in order to avoid exposure to other professionals.

Sanitizing system

Personnel must follow strict hand washing hygiene measures in order to improve infection prevention, and the room must be sterilized and ventilated by an air sterilizer three times a day, for over 30 minutes each time; central air conditioning must be avoided. The preferred sanitizing products for the operating table

Table 1. Systematization of care times in burn patients during the COVID-19 pandemic

Emergency procedures, care during the first 24 h	Urgent procedures, care in 72 h	Procedures that can be deferred for up to 4 weeks	Procedures that can be deferred for up to 3 months	Procedures that can be delayed for more than 3 months
Tracheostomy	Amputation	Severe functional impairment causing neck	Eschar review	Other contractures and scars due to burns
Endotracheal intubation	Debridement of necrotic or infected tissue	and joint contracture	Laser procedure	Effects from limb trauma (scars, reconstruction)
Bleeding control	Deep dermal burn that require debridement and covering	Microstomy	Joint and neck contractures	Breast reconstruction, cleft lip and cleft palate surgery
Placement of thoracic tube	Deep burn with exposure of critical structures	Ectropion causing corneal exposure	Limb contractures	Benign injuries
Fiber optic bronchoscopy			Elective skin graft	
Fasciotomy			Elective flap surgery	
Escharotomy			Hair loss correction	
Central venous access			Body deformity correction	

are 1000 mg/l of chlorine and 75% of alcohol; for the floors, a disinfecting solution containing 1000 mg/l of chlorine is recommended for no less than 30 minutes each time.

Discharge and follow up

In order to discharge a patient, burn criteria, as well as COVID-19 and quarantine criteria must be taken into account. Follow up after discharge can be conducted via telehealth, video visits on the website or smartphone for advice. Physical therapy is an essential component for burn care, and remote guided therapy can be a safe and convenient method of implementing physical therapy when necessary without sharing equipment until they are sanitized¹⁴ (evidence level 2b).

Transporting and receiving patients

Cases referred from other facilities must be discussed in a video or conference call before moving the patient, and they must be adequately classified in order to determine the environment and time of the move. Telehealth has been used for triage and clinic; decision making for trauma and burned patients in plastic surgery have proven to be convenient, reliable, and inexpensive. In places where such systems do not exist, this is an opportunity to set them up, and once the pandemic is over, they can be immensely helpful in providing timely care, and they are cost-effective for patients. During the pandemic, adaptation of burn unit is key to ensure that a successful recovery will restore high-quality medical care services¹⁵ (evidence level 5).

Immunization to prevent SARS-CoV-2 infection

SARS-CoV-2 prevention vaccines are considered to be the most promising approach to stop the pandemic. At the end of 2020, several vaccines were available for use in different parts of the world, more than 40 candidate vaccines were in human trials, and over 150 were in preclinical trial phases. The WHO keeps an updated list of candidate vaccines being evaluated. A complete immunization schedule is recommended for both healthcare professionals and the general population, as this will be a factor in the severity of patients that require hospitalization¹⁶ (evidence level 5).

Discussion

The WHO, during the period of time when the quarantine measures, social distancing, and later on other more strict methods, such as lockdowns, were implemented, predisposed people to spend more time at home, and consequently, there was greater exposure to sanitizing products that contain ethanol, isopropyl alcohols, or hydrogen peroxide in different concentrations, and these toxic and flammable substances can cause burns¹⁷.

An increase in the incidence of burn injuries in the home during the COVID-19 pandemic has been reported, 85% compared to the 60% that was observed in 2019, probably derived from the prolonged isolation and avoiding hospital visits for fear of exposure to the SARS-CoV-2 virus^{18,19}. Injuries caused by friction belts (treadmills, stationary bikes) have also increased in patients that exercise at home, caused when children place their hands near or under the moving belt²⁰.

Quality of life for burn survivors requires maintaining ongoing connection with a burn unit with follow up in

the community after discharge, as well as participating in support systems, which are limited resources during this pandemic, since, with the quick beginning of the pandemic, access to medical care and elective reconstructive surgery is restricted. Quarantine and the limited capacity for social contact may exacerbate post-traumatic stress disorder and depression, and hinder recovery from burn even more. Although the recommendation is the use of the Internet or telephone to access support programs and virtual visits, the majority of the population is at risk due to the lack of equipment and financial resources to participate²¹.

The year 2020 has brought unprecedented changes to the healthcare industry worldwide, and virtual clinics may become commonplace for patient care.

Burned patients require a different, and often more complex, form of care, as they may have challenging psychological needs, scar management issues, and long-term effects that cannot be treated remotely. There are countless articles in current literature citing the benefits of remote visits for physicians, but there has been no discussion on whether they meets the needs of burned patients²².

Factors that influence hospital stays of patients admitted to burn units are the severity of the burns, complications in the hospital, comorbidity, and the social and economic status of patients²³.

Conclusions

As we approach the second wave of the pandemic, many countries need to reflect on our experience during the first wave in order to protect our operation and assignment time, and to continue to ensure timely and effective outpatient and in-patient care²⁴.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical disclosures

Protection of people and animals. The authors declare that no experiments have been made on human beings or animals for this research.

Data confidentiality. The authors declare that they have followed the protocols of their work center regarding the publication of patient data.

Right to privacy and informed consent. The authors declare that no patient data appears in this article.

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