Received: 3 July 2018 / Accepted: 5 September 2018 / Published online: 31 October 2018

**UDC: 616-083.98 - 614.88**

# TRIAGE SYSTEM: LITERATURE REVIEW, PROBLEMS AND SOLUTIONS IN KAZAKHSTAN

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**Abstract**

**Introduction**: The indicator of the state of health of the country's population directly depends on the quality of emergency care. At present, the first steps are being taken in implementation the triage system in the emergency rooms in Kazakhstan, therefore a new specialty of a "emergency doctor" has been introduced.

**Purpose:** analysis of the triage systems in different countries with a view to inducing the interest of the medical community in Kazakhstan to use formal sorting systems in emergency departments.

**Methods**: the search for relevant scientific publications was carried out in databases of evidence-based medicine (PubMed, Cochrane Library, ResearchGate). A total of 809 literary sources were found, 50 of which were selected for further analysis. Inclusion criteria: studies performed in people, published in English, Turkish, Russian, as well as full versions of articles. Exclusion criteria: summary of reports, newspaper publications, personal messages.

**Results:** Numerous studies have shown that the sorting of patients depends on the patient's clinical characteristics, vital signs, severity of the condition and immediate complications. An analysis of the existing sorting scales showed that these scales are five-leveled and adapted to the region and the health care system, but there is no single universal scale.

**Conclusion:** For the implementation of the Triage system in Kazakhstan, it is necessary to conduct additional studies and create guidelines on sorting systems, train medical personnel in sorting methods and incorporate the triage system into medical education programs.

***Key words:*** *triage, emergency department, scales of triage.*

**Резюме**

# ТРИАЖ СИСТЕМА: ОБЗОР ЛИТЕРАТУРЫ, ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ В КАЗАХСТАНЕ

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**Введение:** Показатель состояния здоровья населения страны напрямую зависит от качества неотложной помощи. В настоящее время предпринимаются первые шаги по внедрению сортировочной системы в отделениях неотложной помощи в Казахстане, также была введена новая специальность «врача неотложной помощи».

**Цель:** анализ сортировочных систем в разных странах с целью привлечения интереса медицинского сообщества в Казахстане к использованию формальных сортировочных систем в отделениях неотложной помощи.

**Методы:** поиск соответствующих научных публикаций проводился в базах данных доказательной медицины (PubMed, Cochrane Library, ResearchGate). Было найдено 809 литературных источников, из которых 50 были отобраны для дальнейшего анализа. *Критерии включения:* исследования, проводимые людьми, опубликованные на английском, турецком, русском языках, а также полные версии статей. *Критерии исключения:* резюме докладов, газетные публикации, личные сообщения.

**Результаты.** Многочисленные исследования показали, что сортировка пациентов зависит от клинических характеристик пациента, жизненных признаков, тяжести состояния и непосредственных осложнений. Анализ существующих шкал сортировки показал, что эти шкалы пятиступенчатые и адаптированы к региону и системе здравоохранения, но не существует единой универсальной шкалы.

**Заключение**. Для внедрения системы Triage в Казахстане необходимо провести дополнительные исследования и разработать руководящие принципы по системам сортировки, обучить медицинский персонал методам сортировки и включить систему сортировки в программы медицинского образования.

***Ключевые слова**: сортировка, отделение неотложной помощи, шкалы сортировки.*

**Түйіндеме**

# НАУҚАСТАРДЫ САРАЛАУ ЖҮЙЕСІ: ӘДЕБИЕТТІК ШОЛУ, ҚАЗАҚСТАНДАҒЫ МӘСЕЛЕЛЕР ЖӘНЕ ОЛАРДЫ ШЕШУ.

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**Кіріспе:** Еліміздің тұрғындарының денсаулық көрсеткіші жедел медициналық көмек сапасына тікелей байланысты. Бүгінгі таңда Қазақстанда науқастарды саралауды енгізуде алғашқы қадамдар жасалуда, сондықтан «жедел жәрдем дәрігері» жаңа мамандығы енгізілді.

**Мақсаты:** Әртүрлі елдерде саралау жүйелерін талдау арқылы Қазақстандағы медицина қауымдастығының саралау жүйелерін пайдалануға қызуғышылықты арттыру.

**Әдістері:** дәлелді медицина деректер базасында (PubMed, Cochrane Library, ResearchGate) тиісті ғылыми жарияланымдарды іздеу жүргізілді. Барлығы 809 мақалалар табылды, олардың 50-і қосымша талдау үшін іріктелді. Іріктеу критерилері: ағылшын, түрік, орыс тілдерінде жарияланған, сондай-ақ адамдарда жүргізілген мақалалардың толық нұсқалары алынды. Шығару критерилері: есептер жиынтығы, газет жарияланымдары, жеке хабарламалар.

**Нәтижелер:** Көптеген зерттеулер пациенттердің сарапануы науқастың клиникалық сипаттамаларына, өмірге маңызды көрсеткіштерге, жағдайдың ауырлығына және дереу асқынуларға байланысты екендігін көрсетті. Қолданыстағы саралау шкалаларын талдау нәтижесінде шкалалар көбінесе бес деңгейлі және өңірге, денсаулық сақтау жүйесіне бейімделген, бірақ бірыңғай әмбебап шкала жоқ.

**Қорытынды:** Қазақстанда «Триаж» жүйесін енгізу үшін саралау жүйелерін құру бойынша қосымша зерттеулер жүргізіп, медицина қызметкерлерін саралау әдістеріне оқытып, медицина бағдарламаларына енгізу қажет.

***Түйін сөздер**: триаж, жедел көмек бөлімі, саралау шкаласы.*

**Библиографическая ссылка:**

*Месова А.М., Жунусов Е.Т., Пивина Л.М., Йолсу С.* ТРИАЖ система: обзор литературы, проблемы и пути решения в Казахстане // Наука и Здравоохранение. 2018. 5 (Т.20). С. 23-30.

Messova A.M., Zhunusov Ye.T., Pivina L.M., Yolcu S. TRIAGE system: literature review, problems and solutions in Kazakhstan. *Nauka i Zdravookhranenie* [Science & Healthcare]. 2018, (Vol.20) 5, pp. 23-30.

*Месова А.М., Жүнісов Е.Т., Пивина Л.М., Йолсу С.* Науқастарды саралау жүйесі: әдебиеттік шолу, Қазақстандағы мәселелер және оларды шешу // Ғылым және Денсаулық сақтау. 2018. 5 (Т.20). Б. 23-30.

**Introduction**

There is a growing awareness throughout the world that countries may face serious problems in protecting their citizens from the growing number of health threats caused by man-made or natural emergencies and disasters. Medical workers should be properly trained and equipped with appropriate tools and communication systems to ensure the highest possible quality of care, safety and reliability before, during and after a medical emergency. In this regard, there is a growing demand and requirements for emergency medical services around the world. In order to provide quality pre-hospital care in many countries, paramedics trained in basic life support (BLS), Advanced Life Support (ALS) are being prepared, which make rapid assessment and treatment of patients and injured patients prior to their transportation to the clinic [33].

High-quality emergency care is an important part of any healthcare system. Studies have shown that 50% of patients' appeals to the emergency department are non-urgent and lead to unnecessary costs. All patients arriving at the emergency room should be evaluated, attention should be paid to conditions requiring immediate assistance. This process is called triage or sorting [7,14,23,24].

Inappropriate design of ED and long durations for care due to inefficient triage system in overcrowded emergency departments cause problems between patients and health care providers [1,13,29,43].

The triage is the process of classifying patients according to their needs for medical care, regardless of the order of the patient's stay, age, sex, socioeconomic status, insurance, nationality or religion. The triage is important, as

it reduces waiting time, increases the effectiveness of emergency care, improves patient and family satisfaction, and improves the quality of the health care system. The importance and need for sorting in the emergency department is recognized in many developed countries, but some countries still do not use the full potential of this health development trend.

Currently, the indicator of the state of health of the country's population directly depends on the quality of emergency care. Unfortunately, according to the UN report Kazakhstan has the highest mortality rate in comparison with the rest of the Central Asian countries. In Kazakhstan, the first steps are taken to apply the sorting in the emergency rooms. In this review, models of the sorting system of different countries are evaluated. The goal is to attract the attention of specialists to the use of sorting methods, conduct further research on sorting in Kazakhstan, and introduce a sorting system into medical education programs.

**The aim of the study:** analysis of the triage systems in different countries with a view to inducing the interest of the medical community in Kazakhstan to use formal sorting systems in emergency departments.

**Search strategy:** the search for relevant scientific publications was carried out in databases of evidence-based medicine (PubMed, Cochrane Library, ResearchGate). The following search engines were used in the literature search process: Pubmed, Google. We used the following search strategy in Pubmed (("triage" [MeSH Terms] OR "triage" [All Fields] AND ("emergency department" [Subheading] OR "emergency department" [All Fields] OR "triage scale" [All Fields] 2008/08/30 "[PDat]:" 2018/08/30 "[PDat] AND" humans "[MeSH Terms] AND (" infant "[MeSH Terms] OR" child "[MeSH Terms] OR" adolescent "[MeSH Terms]))). The search depth in Pubmed was 10 years. The following filters were used: free full text, 10 years, humans, child.Inclusion criteria: studies performed in people, published in English, Turkish, Russian, as well as full versions of articles.

**Searching results:** A total of 809 literary sources were found, 50 of which were selected for further analysis.

**Scales of triage**

Various sorting scales have been developed in order to classify the patients of the emergency department consistently and to achieve acceptable results. The Triage scale usually has 3 to 5 categories, algorithms or protocols or diagnoses are used as reference points for decision making [33]. Currently, there are computer programs and websites that help to make a decision very quickly. All scales have the principle of distribution of patients based on the patients' need for medical care. The most common in the world practice are scales ESI (the Emergency Severity Index), ATS (the Australian Triage Scale), CTAS (the Canadian Emergency Department Triage and Acuity Scale), RETTS (the Rapid Emergency Triage and Treatment System), MTS (the Manchester Triage System), SATS (the South African Triage Score), FRENCH (French Emergency Nurses Classification at Hospital).

**Australian Triage Scale (ATS)**

The most commonly used Australian scale of medical sorting (English Australasian Triage Scale, ATS). This scale has been used since 1994. It consists of 5 levels, of which 1 is critical (resuscitation), and 5 are the least critical (not urgent) [50,2] (table 1).

***Table 1.***

**The categories of Australian scale of medical sorting**

| Level | Description | Time of care |
|---|---|---|
| 1 | Resuscitation | 0 minute |
| 2 | Emergency | 10 minute |
| 3 | Urgent | 30 minute |
| 4 | Semi-Urgent | 60 minute |
| 5 | Nonurgent | 120 minute |

Sorting is performed by a trained nurse and the decision is made based on the clinical symptoms of the patient. The complex of physiological parameters of the patient is evaluated: airway patency, external respiration function, blood circulation, level of consciousness, severity of pain syndrome, neurological and vascular symptoms, mental status, severity of eye damage. The advantage of this scale is due to the presence of short algorithms, based more on clinical symptoms and not requiring a triage sister to a deeper analysis of the situation.

In the works of Yousif et al. the advantage of the Australian grading scale (ASA) in the distribution of patients in the emergency department compared with the Australian National Sorting Scale was shown [50].

Also in Australia, the Toowoombian Traumatic Adult Trial (TTTV) is used, which consists of computerized algorithms for making clinical decisions. This scale was well received and is a reliable alternative to the previously existing Triage scale. TTTV includes categories of ASN, but associated clinical indicators are widely used to assess and categorize patients with trauma [12].

**The ESI (the Emergency Severity Index)**

The ESI scale is widely used in the US. The nurse assesses the degree of emergency (level 1 or 2 emergency), and the levels 3, 4, 5 (not emergency) receive assistance depending on the capacity of the institution. The patients of the first level are those who need to restore airway patency, cardiopulmonary resuscitation, with signs of severe respiratory failure, deep depression of consciousness, continuing massive bleeding. These patients receive help immediately, others quickly depending on the doctor's ability. The difference from the other scales is that the assistance depends on the capacity of the institution [8, 15-18, 27, 37, 39, 40, 42, 49].

**Manchester Scale of Medical Sorting**

Manchester's triage scale is also widely used using the severity index of urgency. This sorting scale consists of 52 block diagrams, based on the main complaints of the patient. The next step is the use of 6 key discriminators: the threat to life (difficult airway, lack of breathing and circulation), pain, bleeding, consciousness, temperature, severity of the disease [9, 10, 25, 38, 44]. In addition to the six basic ones, there are about two hundred discriminators in flowcharts, allowing quickly and with a high degree of reliability to determine the "colour" of the patient.

**Canadian Medical Grading Scale**

For day-to-day emergencies in Canada, the Canadian Triage and Acute Scale (CTAS) is now being used for all incoming patients. This system categorizes patients both in

traumatic and in physiological condition, and ranks them according to severity from 1 to 5 (where 1 is the highest). This model is used by both paramedics and emergency nurses, as well as in some cases on admission [3, 5, 6, 19, 28, 47].

In addition to clinical signs, CTAS is widely used to assess the state of various scales, for example, ISS, the Glasgow coma scale. Triage sister must assess not only the severity of violations of vital functions, but also the severity and specifics of the injury, a burn surface area, the severity and characteristics of pain. A large set of criteria significantly increases the reliability of the scale, but the algorithm becomes quite complex and voluminous.

**FRENCH scale**

In France, the FRENCH (FRench Emergency Nurses Classification at Hospital) scale is used. In the emergency ward medical triage doctor performs a reception (fr MAO -. Médecin d'accueil et d'orientation) and nurse organizing and receiving (French IOA -. Infirmière d'organisation et d'accueil).

The scale consists of two tables. In the first table there is a general description of the severity of the condition, the time of rendering assistance. In the bottom line there is an asterisk; its presence in the symptom in the second table requires a more intensive approach to sorting, diagnosis and treatment (Table 2).

*Table 2.*

**French scale.**

| Level | Description | Waiting time |
|---|---|---|
| 1-red | Severe disease with a negative prognosis for life in a short time | Immediately |
| 2-orange | Disturb function of vital organs or their traumatic defeat with a threat to life; possible development of such disorders within a few hours | 20 minute |
| 3-blue | Damage or functional impairment, which is likely to worsen within 24 hours. A clinical situation that justifies the use of several types of hospital resources. Possible hospitalization. | 60 minute |
| 4-green | A non-severe disease or damage to the body, which requires the use of at least one hospital resource. Hospitalization is unlikely. | 120 minute |
| 5-yellow | No damage or functional impairment. Hospitalization is not needed. | 240 minute |
| * | An intensive symptom or violation of a vital parameter that requires quick action regardless of the prognosis | |

The second table is a list of symptoms that are grouped based clinical approach (cardiac, respiratory, neurological, infectious, endocrinological, toxicological, trauma and other groups). Combining information from two tables allows you to select the necessary set of France also created a telephone system for medical sorting for the urgent call of doctors in its medical centers on 15 free national medical hotlines. "Medical Doctor Regulator" decides what will be the most effective solution - emergency telemedicine or dispatch of an ambulance, general practitioner, or a doctor + nurse + ambulance, hospital mobile intensive care unit (English). Mobile Intensive Care Unit, MICU) [30,41].

**Triage scale in Germany**

The German medical sorting system also uses four, sometimes five colour codes to indicate the urgency of care. As a rule, each ambulance is equipped with a folder or a bag with colored ribbons or medical sorting cards. The urgency is denoted as follows [34]: activities for a given clinical case.

In Hong Kong, medical sorting in the Accident & Emergency Departments is performed by experienced registered nurse, the patients are divided into five categories of medical sorting [21] (Critical, Emergency, Urgent, Partially urgent (Semi-urgent), Unlimited).

In the UK and Europe, the process of medical sorting is sometimes similar to the American one, but the categories differ (Table 3) [22,45,46,4]:

*Table 3.*

**German system of medical sorting.**

| Category | Meaning | Consequences | Examples |
|---|---|---|---|
| T1 (I) | Acute danger to life | Immediate help, fast transportation | Arterial disease, internal hemorrhage, severe amputation |
| T2 (II) | Serious injury | Constant supervision and prompt assistance, transportation as soon as possible | Minor amputations, soft tissue injuries, fractures and dislocations |
| T3 (III) | Minor injury, or without injury | Assistance when it is convenient, transport and / or leave where possible | Minor lacerations, dislocations, abrasions |
| T4 (IV) | Without, or with little chance of survival | Observations and, if possible, the administration of analgesics | Severe trauma, uncompensated blood loss, negative result of a neurological examination |
| T5 (V) | Died | Collection and protection of corpses, identification, whenever possible | Fatalities on arrival are reduced from categories T1-4, lack of independent breathing after release of the respiratory tract |

Dead - patients who have a score of 0 to 2 injuries do not need help.

Priority 1 - patients who have a score of injury from 3 to 10 (a revised injury scale), and require immediate attention.

Priority 2 - patients who have a score of injury 10 or 11, and can wait for a short time before transport to a final medical evaluation.

Priority 3 - patients who have a score of injury 12 (highest score), and can wait for transportation from the scene:

Turkey has 3-level triage system, patients are categorized as emergent (red), urgent (yellow) and non-urgent (green) (Table 4) [32,35].

*Table 4.*

**Turkish system of medical sorting.**

| Level | Time of care |
|---|---|
| Red (1 category) | Immediately |
| Red (2 category) | Untill 10 minute |
| Yellow (1 category) | Less than30-60 minute |
| Yellow (2 category) | Less than hour |
| Green | Less than 2 hours |

*Table 5.*

**Categories of urgency.**

| |
|---|
| **I category:** The patient's condition, which poses an immediate threat to life, requiring immediate medical attention. Time of arrival is less than 10 min. |
| **II category:** Patient's condition, presenting a potential threat to life without medical care. Time of arrival is less than 15 min. |
| **III category:** Patient's condition, presenting a potential threat to health without medical assistance. Time of arrival is less than 30 min. |
| **IV category:** Patient's condition caused by acute illness or exacerbation of a chronic disease, without sudden and severe violations of organs and systems, in the absence of an immediate threat to the life and health of the patient. Time of arrival is less than 60 min. |

*Table 6.*

**Classification of categories due to diagnosis.**

| | |
|---|---|
| **1 category** | Loss of consciousness (any genesis)<br>Stop breathing<br>Cardiac arrest<br>Foreign body of the respiratory tract<br>Shock<br>Convulsions<br>Chest Pain<br>Paresis and plethysmus (first arising)<br>Psychosis of different etiology<br>Multiple injuries and wounds with bleeding<br>Wounds with bleeding<br>Isolated trauma (head, neck) with bleeding<br>Extensive burns and frostbite<br>Bites (stinging) of animals and insects (threat of development of anaphylactic shock)<br>Electric trauma<br>Vomiting with blood<br>Childbirth with complications<br>Transportation of tissue (tissue parts), organs (parts of organs) for subsequent transplantation |
| **2 category** | Call on the place of threat of terrorist attack<br>Disturbance of consciousness, with a tendency to further oppression<br>Pronounced violations of external respiration<br>Heart rhythm disturbance<br>Hemodynamics is unstable. High risk of shock (crisis)<br>High temperature in children under 3 years old is higher than 38° C<br>Rash with a high temperature<br>Isolated trauma with bleeding<br>Poisoning with toxic substances<br>Atypical pain. (suspected acute coronary syndrome)<br>Headache in pregnant women<br>Vomiting + loose stool with severe signs of dehydration |
| **3 category** | Isolated trauma without bleeding<br>Abdominal pain (sharp abdomen)<br>High temperature, not self-stopping<br>Watch at mass events<br>Physiological birth<br>Abdominal pain in pregnant women (threat of abortion)<br>Limited burns and frostbite in children |

| | |
|---|---|
| **4 category** | Exacerbations of chronic diseases, without obvious signs of life threatening<br>Acute inflammatory diseases of the skin and subcutaneous tissue<br>Light injuries (shallow wounds, burns, bruises, abrasions)<br>Pain syndrome caused by chronic disease<br>Vomiting + loose stool with mild signs of dehydration caused by food poisoning<br>Vomiting in pregnant women (up to 12 weeks)<br>Acute urinary retention caused by chronic diseases of the urinary system<br>Urine with an admixture of blood<br>Inflammatory diseases after childbirth, abortions<br>Foreign bodies other than respiratory tract<br>Conditions requiring medical manipulation in the context of primary health care organizations or hospitals |

**Triage in Kazakhstan**

According to the proposed order of the Ministry of Health of the RK "Rules for the provision of emergency medical care in the Republic of Kazakhstan", 2017, the categories of urgency of the call are shown in Table 5,6 [31].

According to medical sorting, 3 groups of patients are conventionally identified:

- the first group (green zone) - patients requiring minor medical care, released home for further outpatient treatment, as well as patients entering planned hospitalization;

- the second group (yellow zone) - patients who do not require emergency and emergency medical care, who are on a bed in the waiting room (or left under observation in the waiting room for several hours), as well as to clarify and differentiate the diagnosis;

- the third group (red zone) - patients who need emergency and emergency medical care in the admission department.

**Discussion:**

Numerous studies have shown that the sorting of patients depends on the patient's clinical characteristics, vital signs, severity of the condition and immediate complications [48, 11, 22].

An analysis of the existing sorting scales showed that these scales are adapted to the region and the health care system, but there is no single universal scale. Many scientists express the idea that existing triage systems need to be improved [11]. Due to this, the international Triage system is constantly improving.

Five-level triage systems are valid and reliable methods for assessment of the severity of incoming patients' conditions by medical staff in the emergency department. They should be used in emergency departments of Kazakhstan to assign treatment priorities in a structured and dependable fashion.

*Difficulties in implementing the Triage system in Kazakhstan*

There are some difficulties in the implementation of the Triage system in Kazakhstan:

1. Development of public trust in the system. For many years in Kazakhstan, first aid was provided mainly by doctors. Nurses in most cases are not involved in the decision-making process when sorting. In the minds of people, it was fixed that only a doctor could qualify for first aid. Among the population there may be a lack of confidence in paramedics and even nurses when sorting. In this connection, explanatory work with the population about the advantages of the Triage system is needed.

2. Strengthening of human resources. Preparationof specially trained paramedics, nurses, emergency doctors to provide qualitive medical care. Unfortunately, emergency doctor as an speciality is not popular in Kazakhstan due to low salary, higher exposure rates to violence, overcrowding, lack of sufficient employee rights, inadequate education (absence of residency in speciality «Emergency doctor»), simplicity in prosecuting against doctors.

3. Infrastructural changes in the emergency departments. For the use of sorting in hospitals, a special area and modern equipment for sorting are required.

Given the above difficulties, it is necessary to develop a plan of measures for the implementation of the Triage system in Kazakhstan, which should include the following items:

1. It is necessary to develop the guidelines containing action algorithms, criteria for setting priority patients and dividing them into categories for the Republic of Kazakhstan.

2. Prepare emergency specialists: paramedics, nurses and doctors. Evaluate the effectiveness of training programs for professionals, taking into account the application of skills learned in practice.

3. It is necessary to create public organizations to clarify the importance of sorting, with an emphasis on the fact that patients will have priority based on the severity of the problem, not other factors.

4. Reconstruction of buildings should be carried out, with allocation of the area for carrying out the Triage, with provision of appropriate equipment.

5. It is necessary to conduct further studies on the triage scales introduced in Kazakhstan. Carrying out analysis of the three-pronged solutions and the subsequent outcome is an important qualitative indicator of the health system.

**Conclusion:**

The implementation of a triage system in Kazakhstan will solve many problems, such as congestion of patients, improve the quality and effectiveness of medical care, thereby reducing mortality in the future. Low quality of medical care and patient dissatisfaction is evident in cases where sorting methods are not applied. Therefore, the Triage system in Kazakhstan should be applied and improved. It is also necessary to prepare emergency department medical specialists.

**The authors confirm that:**

*Messova A.* has made substantial contributions in literature survey AND drafting the first version of the manuscript and Final approval of the version to be published.

*Zhunusov Ye.T.* has made substantial contributions to the conception and design of the work; AND Drafting the work and Final approval of the version to be published.

*Pivina L.M.* has made substantial contributions in Drafting the work and Final approval of the version to be published.

*Yolcu S.* was the scientific supervisor during the entire study period, literature review, advised on the design of the study and writing up the paper.

Authors confirm that there is no conflict of interest.

*Disclosure.* The authors declare no conflicts of interest.

*Funding:* there is no funding received for this work.

None of the blocks of this article was published in other print publications and was not submitted for consideration by other publishers.

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