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SYSTEMATIC REVIEW

Systematic review: Comparative analysis of international approaches to the organisation of emergency departments at the primary health care level

Revisión sistemática: Análisis comparativo de los enfoques internacionales de la organización de los servicios de urgencias en la atención primaria de salud

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ABSTRACT

The study aims to review the different systems of emergency care in North American, European, and Pan-Asian countries and to perform a comparative analysis of these modes of organisation. The emergency care systems of Kyrgyzstan, Germany, the United States of America, the United Kingdom, South Korea, Turkey and the United Arab Emirates were analysed, and it was determined that the Anglo-American and Franco-German model of emergency care is currently dominant in the world. The main difference with the system built in Kazakhstan is that ambulance brigades in the above countries consist of nursing staff, in these countries there is a double triage of patients at the stage of call and the stage of distribution of patients in the emergency department, and the last main difference is that the emergency department in Kazakhstan is organised based on an emergency room and does not include intensive care, dynamic observation, there is no diagnostic unit and palliative care unit. Another difference is the training of non-medical services in the comparison countries, such as police and firefighters, who have the necessary basic skills to provide emergency care. This study will help in the future to use foreign experience in the organisation of emergency care in the Republic of Kazakhstan, which may have a positive impact on the quality and speed of emergency care.

Keywords: Healthcare; Management; Paramedic; Paramedic Training; Patient Transport.

RESUMEN

El estudio pretende examinar los distintos sistemas de atención de urgencias en países norteamericanos, europeos y panasiáticos y realizar un análisis comparativo de estos modos de organización. Se analizaron los sistemas de atención de urgencias de Kirguistán, Alemania, Estados Unidos, Reino Unido, Corea del Sur, Turquía y Emiratos Árabes Unidos, y se determinó que el modelo angloamericano y franco-alemán de atención de urgencias es actualmente el dominante en el mundo. La principal diferencia con el sistema construido en Kazajstán es que las brigadas de ambulancias de los países mencionados están formadas por personal de enfermería, en estos países existe un doble triaje de pacientes en la fase de llamada y en la fase de distribución de pacientes en el servicio de urgencias, y la última diferencia principal es que el servicio de urgencias en Kazajstán está organizado sobre la base de una sala de emergencias y no incluye cuidados intensivos, observación dinámica, no hay unidad de diagnóstico ni unidad de cuidados paliativos. Otra diferencia es la formación de los servicios no médicos en los países de la comparación, como

la policía y los bomberos, que tienen los conocimientos básicos necesarios para prestar atención de urgencias. Este estudio ayudará en el futuro a utilizar la experiencia extranjera en la organización de la atención de urgencias en la República de Kazajstán, lo que puede repercutir positivamente en la calidad y rapidez de la atención de urgencias.

Palabras clave: Sanidad; Gestión; Paramédico; Formación Paramédica; Transporte de Pacientes.

INTRODUCTION

In the field of emergency medical care, countries worldwide have developed and implemented a variety of approaches to the organisation of emergency departments. These differences are determined by the medical system, cultural factors, and the availability of resources. How effectively emergency departments are organised determines the success of the medical intervention and even saves patients' lives.[1] Elsewhere, the fact that in the last 5 years, the lethality from cardiovascular has increased several times, and one of the factors of this growth is the delay of medical care at the prehospital stage.[2]

The organisation of the system of emergency medical care is one of the most important aspects of health care in any country and the results of further specialised care directly depend on it, so for example, mortality in car accidents in Nigeria, according to K.E. Amaefule et al., directly correlates with the speed of first aid.[1] In case of incorrect approaches to this issue, serious problems arise, such as increased workload on ambulance crews, so according to K.M. Turlanov and A.T. Musaev the number of ambulances calls for the period from 2015 to 2020 increased by 12 %, while the number of personnel increased by exactly 12 brigades.[3] Therefore, the government of Kazakhstan has recently emphasised the development of family medicine.[4,5] Even with this step, the system of emergency care in Kazakhstan has several significant shortcomings, such as the lack of special training in first aid for non-medical personnel, triage of patients by dispatchers who often do not have proper medical education, emphasis on the pre-hospital stage of care, which significantly increases the burden on the few staff of ambulance brigades.[6,7]

Despite the common goals of providing prompt medical intervention, countries employ unique methods and strategies based on their medical structures and resources, such as the establishment of geriatric urgent care centres. For example, some countries focus on centralised systems where specialised urgent care centres are concentrated, while others prefer a decentralised approach with resources distributed locally.[8,9] Comparative analyses of approaches from different countries identify successful strategies and best practices that can be adapted and implemented in other health systems. This is especially important in today's world, where globalisation and the exchange of experience contribute to improving the quality of health services. Today, in an era of globalisation and rapid exchange of information, collaborative research, and adaptation of experiences from different countries are becoming key elements of modern healthcare. This enriches the understanding of how health care can be best organised and delivered, enables a shift towards more effective treatments and reduces risks for patients. Moreover, benchmarking also enables the identification and resolution of problems faced by different health systems. This may include overcoming barriers to access to care, improving the quality of health services and optimising financial resources.[10]

The study aims to analyse different strategies of emergency department organisations in different countries, to identify their main characteristics, advantages, and disadvantages. General trends in the development of emergency care systems will also be considered and recommendations will be offered to improve approaches to the organisation of this important area of medical practice, to further use the experience of foreign countries in improving the emergency care system in the Republic of Kazakhstan.

METHODS

Eligibility criteria

Studies focusing on emergency department organisation at the primary care level were included. The inclusion criteria encompassed articles published between 2000 and 2024. The exclusion criteria were articles not related to emergency care or primary care settings.

Information sources

A comprehensive search of scholarly literature was undertaken in leading electronic databases such as PubMed, Google Scholar, and Medline. In addition, official reports and records from international health agencies such as the World Health Organisation (WHO) and national health authorities in various nations were examined.

Search strategy

The search was conducted using a rich range of keywords and phrases covering various aspects of the

organisation of acute care at the primary care level. Such keywords and phrases include “emergency medical care”, “primary health care”, “health care organisation”, “international approaches” and many others, given their importance in analysing and comparing global health practices and policies.

Selection process

A systematic literature review method was used for a thorough comparative analysis. This methodological approach provided an opportunity not only to evaluate studies and publications from different sources but also to carry out a structured analysis of them, with a focus on identifying key trends and differences in the organisation of emergency care at the primary health care level.

Data collection process

After the collection of all the necessary materials, a systematic analysis phase followed, considering a variety of relevant parameters. The analytical process covered a variety of aspects, including but not limited to the organisational structures and functional aspects of the acute care systems of different countries.

Data items

The study examined in detail the structure of healthcare facilities, the specialisation of emergency departments, and their relationship with other parts of the healthcare system. An in-depth assessment of the training and professional development requirements of emergency medical personnel was conducted.

Study risk of bias assessment

Compliance with training standards set by medical organisations and regulatory bodies was checked. The requirements for the content and duration of educational programmes were analysed.

Synthesis methods

The synthesis of information from different sources was carried out, which included integrating the information obtained from the literature, summarising the selected facts, and analysing and evaluating different perspectives, arguments, and data to identify their strengths and weaknesses and to determine which of them were most relevant to this study.

Reporting bias assessment

Research was conducted on a variety of methods used to educate and train medical staff, including hands-on simulations, online courses, and many others, to identify best practices and their application in different countries.

Certainty assessment

The role and effectiveness of accreditation and certification systems for medical personnel in different countries and their impact on ensuring a high level of qualification of specialists were analysed.

Ethics and dissemination

Ethical principles and norms were emphasised during the research process. This study strictly respects the principle of confidentiality when dealing with data and information coming from public sources.

RESULTS

The final qualitative synthesis comprised studies that investigated emergency care systems in several countries, including Kyrgyzstan, Germany, the United States of America, the United Kingdom, South Korea, Turkey, and the United Arab Emirates (Table 1). The included studies addressed a wide range of issues concerning the organisation of emergency rooms at the primary health care level. The investigation identified two major models of emergency care organisations worldwide: the Anglo-American model and the Franco-German model. Furthermore, some countries in the Pan-Asian region developed novel ways that integrated components of two models.

The organisation of emergency departments (EDs) can vary significantly, from country to country, depending on the medical system, legislation, availability of resources and cultural sensitivities.[16] Nevertheless, there are general principles that guide the organisation of emergency departments around the world.

Accessibility: EDs should guarantee accessibility to all patients, regardless of their social status, financial means, or place of residence. This implies that EDs are evenly distributed throughout the area and provide care 24 hours a day, 7 days a week. Also important is the process of triage (triage) of patients in ED to determine the severity of their condition. This helps to prioritise care according to urgency. The triage steps include admission and registration of patients. On admission, the patient is registered and basic information about

their medical history and condition is provided. Assessment of urgency also plays a huge role. Specially trained staff (most commonly nurses or paramedics) assess the patient's condition using standardised tools such as the Triage Priority Scale. This allows a certain level of urgency to be assigned to each patient. Based on the level of urgency determined in the previous step, patients are assigned to the appropriate service areas. The most urgent cases are serviced first. After triage and initial assessment, patients undergo further medical examinations and receive appropriate medical care according to their condition.[17]

Table 1. Summary of papers under review

Author(s)	Year	Language	Results
K.M. Turlanov and A.T. Musaev[3]	2017	Russian	In Kazakhstan, dispatchers' low qualification skills lead to numerous false calls, prolonged ambulance response times for patients, and inadequate severity classification of patient conditions. The number of calls per ambulance crew in the city of Osh exceeds the norms by at least 35 %.
B.A. Abeuova et al.[5]	2021	Russian	About 2000 primary care physicians were trained in family medicine to reduce the burden on emergency departments in Kazakhstan.
G.K. Omukeeva and T.Ch. Chubakov[6]	2021	Russian	Report on the need for additional education in the field of emergency care to improve the qualifications of emergency physicians and nursing staff.
M. Ebinger et al.[11]	2021	English	Due to rational dispatch of specialised teams it was possible to reduce mortality from ischemic stroke in the city of Berlin by 10 %.
M. Christ et al.[12]	2010	English	The implemented system of 5-stage triage of patients showed 95 % accuracy in determining the severity of patients' condition in Germany, which is an impeccable result.
S.S. Rathore et al.[13]	2009	English	A study states that in 2009 in the United States of America, mortality from heart attack in the first 30 minutes is 3 %, while after 90 minutes this figure reaches 4,8 %.
A.H. Lee et al.[14]	2023	English	In the United States of America since July 2021 the waiting time for care in the emergency department has decreased by 16 %.
W.M. Jang et al.[15]	2021	English	The study presented data on the system of optimal transport time to the hospital, where the area around the institution was divided into districts depending on the travel time to the hospital, during the study it was found that people living outside this area have poorer survival rates in life-threatening situations than those who live near the hospital.

EDs should be equipped with highly qualified medical staff, including doctors, nurses, and emergency medical technicians.[18,19] Modern medical equipment, including diagnostic and therapeutic tools, should be available to ensure quality care in ED.[20-22] Most countries have standards and protocols for patient care in EDs that regulate the processes of care. EDs often cooperate with other services such as fire, police, and rescue services to ensure a coordinated response to emergencies. Medical staff working in the ED should receive regular education and training to ensure that they are prepared to provide emergency medical care in a variety of situations.[23,24] EDs should assess and monitor the quality of care provided to ensure that quality standards are met. These principles are followed in all countries.

Commonwealth of Independent States system

ED systems in the countries of the Union of Independent States (CIS) face several serious challenges that affect the quality and efficiency of care in situations requiring immediate intervention. Despite similar medical legacies and similar challenges, each country has its specific challenges in emergency care.[25,26] Inadequate funding and resources are the main reasons for the poor quality of emergency care in many CIS countries, as there is a lack of funding and resources to maintain effective NRM systems in these countries. This can lead to an insufficient number of health workers, and insufficient availability of medical equipment and transport. An example can be used from Ukraine, where the salary of an emergency physician in 2000 was below $200, which significantly reduced the quality of services provided.[27]

The lack of modern technologies significantly hampers the provision of qualified assistance. Some CIS countries face the problem of outdated medical technologies and equipment. This can significantly complicate the diagnosis and treatment of patients in emergencies.[28] Lack of coordination and communication also affects the speed of patient transport to a specialised facility and the speed of specialised care. there is often a lack of effective coordination between different emergency services, hospitals, and other medical facilities. This can lead to delays in care and deterioration of patients' condition. According to a sociological survey from 2023 in Kazakhstan among paramedics, almost all of them reported difficulties in communication with other specialists, especially at night and during official holidays, which is one of the reasons for the poor quality of primary emergency care in this country.[29] Quality of education and training of health professionals: Often the

quality of training of health professionals in CIS countries can be poor, which affects the quality of emergency care. It is also not uncommon for health professionals to encounter insufficient practical training to deal with emergencies.[30]

An ambulance paramedic in the CIS countries is trained for 2 to 4 years and has basic skills in first aid and prescribing medications, is a versatile worker who can lead an ambulance team independently or assist an ambulance doctor when working in specialised teams. In Kyrgyzstan, Kazakhstan, Russia and other CIS countries, emergency care is controlled by the health department and is decentralised, with local authorities responsible for each region. When a call is received, the dispatcher determines the category of urgency, which includes 4 groups: 1 category of urgency – up to ten minutes, 2 category of urgency – up to fifteen minutes, 3 category of urgency – up to thirty minutes, 4 category of urgency – up to sixty minutes. After determining the urgency, the dispatcher decides which ambulance brigade to send to the call, in case of 3 and 4 categories a specialised medical brigade is called, which includes an ambulance doctor, a paramedic and an ambulance attendant, if necessary, in case of 1 and 2 categories a paramedic brigade is called, which includes a paramedic and an ambulance attendant. When deciding on hospitalisation, the team sends information to the dispatcher, who transmits the data to the nearest hospital with an emergency department, where further necessary specialised care is provided.[31] It should be noted that some CIS countries are successfully working to improve their emergency care systems by introducing modern technologies, training medical specialists, and improving coordination of services. However, for many countries, the challenges related to financing, accessibility and coordination remain relevant, which require a systematic approach to reforming the emergency medical care system.

Germany system

In Germany, each state independently regulates emergency medical services, which usually divides their sphere of influence into districts or independent cities ("Kreis" or "kreisfreie Stadt"). Municipalities, including both smaller communities ("Gemeinden") and cities ("Städte"), are responsible for the organisation of emergency medical services ("Rettungsdienst") and emergency response ("Katastrophenschutz"), as well as for equipping them with equipment and medicines.[32] Services of fire and rescue services, and emergency medical aid are fixed by law and are available to every citizen of Germany, regardless of the level of wealth. In independent cities, which have their infrastructure independent from the federal state, the Fire Prevention Office ("Amt für Brand- und Katastrophenschutz") is responsible for emergency care.[33] In contrast to the fire service, the task of providing emergency medical care, although legally obligatory, is not always performed directly by the county. In such a case it is organised as a "municipal emergency medical service" ("County EMS"). In some cases, local municipalities provide authority to provide and regulate emergency services through a full-time fire service. However, emergency medical services can also be provided by non-profit organisations and private companies.[34] In Germany, emergency medical services can be provided by the following organisations such as the local fire service, the county emergency agency, the Red Cross, and independent organisations such as the German Army Joint Medical Services, Johanniter-Unfall-Hilfe, the German Life Saving Society and others.

This variety of organisations providing emergency medical care in Germany ensures flexibility and diversity in responding to different medical situations and patient needs. Notarzt is a physician working in the field of emergency medicine and is obligatorily certified in critical care medicine by the State Chamber of Physicians. This certification requires completion of a mandatory period of internship in critical care medicine, additional training in anaesthesiology and critical care management, and successful completion of an examination to obtain this qualification. In principle, the Notarzt position is available to all physicians who have completed the certification process.[35] Upon arrival on the scene, the Notarzt assumes all on-scene physician responsibilities, acts as the team leader, and provides medical direction to all other emergency medical personnel. Emergency physicians are dispatched to the scene together with the paramedic team according to certain standard call criteria (indication catalogue, "Notarzt-Indikationskatalog"). These criteria include myocardial infarction, breathing difficulties, potentially serious injuries, unconsciousness, life-threatening poisoning, and the need for anaesthesia. In addition, paramedics may request the assistance of an emergency physician through dispatch. Usually, an emergency doctor arrives at the scene of an accident in a special vehicle called a Notarzt-Einsatzfahrzeug (abbreviated NEF, emergency vehicle).

Two emergency medical care professions exist in Germany and are regulated and protected by federal legislation: Rettungsassistent (two-year education, outdated since the end of 2014) and Notfallsanitäter (three-year education, in force since 2015). There are also specialisations of an auxiliary nature, such as Emergency Medical Technicians at the Medical Brother level (EMT), Rettungssanitäter and Rettungshelfer, who are support staff and do not have higher education. The training programme for Emergency Medical Technicians (Rettungssanitäter) is 6 months and includes theoretical training, practice in a hospital, and practice in ambulance crews, followed by a one-month final course with a state examination. The Rettungshelfer is essentially an intermediate stage on the way to becoming a fully qualified Rettungssanitäter. The level of this qualification

usually includes a 2-month theoretical course, and one month of practice in ambulance crews, without a state examination.[36] Depending on the region, persons with the Rettungshelfer qualification are drivers of emergency patient transport vehicles, with the Rettungssanitäter being the head of the team. In most German regions, for the provision of emergency medical services, persons with the qualification Rettungssanitäter often act as emergency vehicle drivers and assist the Rettungsassistent and Notfallsanitäter.

Germany employs a wide variety of vehicle types and sizes in the German ambulance system. All of them must fulfil most of the requirements of the European standard CEN 1789. There are three main vehicle types, the Krankentransportwagen (KTW) is a large vehicle used for emergency patient transport. It complies with DIN EN 1789-A1/A2: "Ambulance for the transport of patients with one/few patients", Rettungswagen (RTW) is a larger version of the KTW, with apparatus and intensive care equipment. It complies with DIN EN 1789-C "Mobile Intensive Care", Notarzteinsatzfahrzeug (NEF) is a small vehicle for transporting an ambulance doctor to the scene of an accident. It complies with DIN 75079. In addition, the Mehrzweckfahrzeug (MZF), or multi-purpose vehicle, often called Notfallkrankenwagen (N-KTW) or Kombinationsfahrzeug (KOM), fulfils the dual function of a patient transport vehicle and a standby vehicle for emergency calls and usually corresponds to type B according to DIN EN 1789.[37]

Most of the shortcomings of primary care in Germany lie in its decentralised nature, which is characterised by low accessibility of primary emergency care in rural and small communities. There is also a problem with a shortage of medical staff, which places an additional burden on the emergency department and increases the time until qualified care is provided.[38] Another problem is the lack of normal communication between treatment facilities, which also worsens the prognosis of treatment of patients with life-threatening conditions.

USA system

The first level is the Emergency Medical Responder (EMR): many of these are voluntary and provide basic medical care, including stopping bleeding, performing cardiopulmonary resuscitation (CPR), using an automated external defibrillator (AED) and assisting with emergency deliveries. The EMR, with the support of emergency medical technicians (EMTs), can care for the patient during transport.[39] Emergency Medical Technician (EMT): includes all EMR skills as well as advanced skills in the use of oxygen and ventilation, measuring blood oxygen saturation, monitoring blood pressure without invasive techniques and administering certain medications.[40] Advanced Emergency Medical Technician (AEMT): includes all EMT skills as well as advanced use of respiratory support devices, access to intravenous and intraosseous drug administration, blood glucose monitoring and administration of additional medications.[41] Paramedic: A paramedic is a health care professional, an autonomous practitioner with advanced patient assessment skills, skilled in a variety of invasive techniques and performing a wide range of medical interventions. A paramedic is the highest level of qualification in emergency medicine, requiring additional training in emergency medicine.[42]

In the United States, ambulances are classified according to federal standards KKK-1822, which divides them into several categories. In addition, most states set their additional requirements tailored to their specific needs, Type I ambulances are built on the chassis-cab of light-duty pickup trucks, Type II ambulances are developed based on modern light-duty passenger/cargo vans, in the industry known as "ambulance vans", Type III ambulances are built on the chassis-cab of light-duty cargo vans.[43] In emergency care in the United States, communication between different emergency medical services is very well developed with the possibility of using the global positioning system and the Internet. The dispatch service is centralised and does not depend on a particular medical facility, which forms a normal interaction with ambulance crews and with medical facilities where emergency medical care is provided.[44]

United Kingdom system

Primary emergency care is provided by general practitioners (GPs) working within GP clinics. Patients can make an appointment with their GP during the day for emergencies. There are also Walk-in centres, which are urgent care centres that can be accessed without an appointment. They are staffed by nurses, and doctors and have diagnostic equipment.[45] For particularly urgent cases call an ambulance (999) or go to the emergency department of a hospital (DE). The emergency care system is similar to the American system in that it is centralised, with sufficient trained staff and clear lines of responsibility, and with good regulation of patient transport and communication between treatment facilities. There are currently ten NHS ambulance transport services in England, as well as the Isle of Wight Ambulance Service, directly managed by the NHS White Service, whose boundaries generally coincide with those of the former regional government offices. The ten services are represented by the following organisations such as Eastern Ambulance Service NHS Trust, NHS East Anglia Ambulance Service, London, North East, North West, South Central, South East Coast, South West, West Midlands, Yorkshire.[46]

Staff specialising in emergency care may be either Emergency Care Assistants (ECAs) or Emergency Care Support Workers (ECSWs). These professionals receive basic training in emergency medicine and are support

staff for the ambulance crew.[47] Ambulance Technicians, or Emergency Medical Technicians (EMTs), make up a significant proportion of the emergency care workforce. Emergency medical technicians may independently administer medications or perform certain necessary medical procedures such as venous access and others.[48] They are highly skilled in first aid and are often the main link in the ambulance team, which distinguishes the English system from the European system, where ambulance teams include emergency physicians. They have all the necessary knowledge to manage the most common emergencies and have experience in specialised cardiopulmonary resuscitation.[49] There are 2 main types of transport of personnel and patients, the first is paramedic transport, which is necessary for rapid delivery of specialists to the injured person including cars, motorbikes, and others. The second type is a van-based emergency ambulance with all the necessary equipment to provide primary care.[50]

Pan-Asian region system

Countries in the Asia-Pacific region have unique emergency medical services (EMS) systems that are very different from the Franco-German or Anglo-American models. Ambulance calls are made via a special number, or via the Internet or emergency phones that are located near crowded areas, the dispatcher is most often a fire station dispatcher, except in Turkey and the United Arab Emirates, where local police departments take over this function. Specially trained dispatchers provide information to ambulance crews, as well as guidance to unqualified people on how to act in a given situation, and basic first aid skills are available to all emergency services, including the police.

Most often, ambulance stations in Taiwan, Singapore and South Korea are located within fire brigades, which is a significant difference from the emergency care systems in other countries. The UAE and Turkey have organised stand-alone ambulance stations that are located near or at clinics with an emergency department. Staff in ambulance crews are organised based on the Anglo-American system. In South Korea and Singapore, a brigade consists of a registered nurse and a specialised medical technician. In Taiwan and Singapore, there are motorised first aid brigades that can be the first on-call emergency team to provide primary care, most often a paramedic. In Thailand and Turkey, the team also includes an ambulance doctor. All personnel undergo the required amount of training according to the legal framework of a particular country. In South Korea, medical technicians undergo 2 types of programmes, the basic course includes 320 hours of training in basic cardiopulmonary resuscitation and the administration of simple drugs such as bronchodilators, saline solutions, and others. Another programme includes 2 years of training at a medical college, with in-depth training in each type of life-threatening condition and ambulance team coordination. Singapore has a similar training but only 2640 hours of training. In Turkey, an ambulance doctor undergoes a full cycle of training like other specialists; in the Arab Emirates, paramedics undergo a 6-month training course.

For all the above-mentioned countries, the ambulance brigades include 3 types of transport which consist of rapid response brigades comprising motorbikes of type 1, cars with 1 specialist and ambulance brigades comprising paramedics and paramedical staff of type 2, and type 3 comprising specialised brigades with an ambulance doctor and a paramedic (Turkey). In general, the differences in this system of emergency care are based solely on the positioning and interaction of ambulance crews and medical institutions, as in the above countries they are independent and often located outside the medical institution, which significantly reduces the response time to the call, but increases the load on emergency departments in the hospital, also for this system is not characterised by triage of patients before admission to the hospital and there are often cases of unjustified transport of the patient to the department not in the hospital.

Overall, the system in South Korea, UAE, Turkey, and Singapore is unique and has many advantages. This study identified 3 dominant models of emergency care organisation, which include Anglo-American, Franco-German and mixed forms. The Anglo-American system is based on the principle of bringing the patient to a specialist, which explains the absence of specialised medical teams in the USA and in England, whereas in Germany and France, specialised teams always include a specialist with a higher medical education. However, these systems have some disadvantages, for example, in the Anglo-American system there are problems with unnecessary hospital admissions and overcrowding in emergency departments, while the number of staff in the emergency department itself is in short supply.

DISCUSSION

According to all the data obtained in the course of the study, it is possible to say that the difference between the organisation of emergency care in the countries of Europe, America and the Pan-Asian region lies not only in the equipment of ambulance crews but also in a completely different approach and principles of pre-hospital care. Today, two main historical models of emergency medical care organisations can be distinguished. These two models, known as the Anglo-American and Franco-German medical systems, represent unique approaches to emergency medical care and have their distinctive characteristics.

Anglo-American model: This system is often associated with the United States and the United Kingdom,

where it has a long history of development. In this model, the key emphasis is on the separation of emergency medical care from routine medical care, where the main principle of emergency care is to stabilise the patient until skilled specialist care is provided. The system includes an ambulance service, private and public hospitals, and regulation through insurance companies. This approach focuses on individual patient responsibility for insurance and access to health care.[39]

Franco-German model: France and Germany are examples of countries where the Franco-German model of emergency care is emerging. This model emphasises universal access to care and public funding of the health care system. It emphasises the provision of quality emergency care regardless of the insurance status of patients. Both these models have their advantages and disadvantages and face their challenges and changes over time. Comparative analyses of these systems help to identify best practices and learn from the experiences of other countries to improve the quality of emergency care and ensure its accessibility in a global context.[33]

The difference with the Franco-German system of organisation is small and, in many respects, similar to post-Soviet countries, Kazakhstan also has a state system of health care financing, emergency departments are located based on hospitals, and ambulance crews include doctors. The principal differences are the training of specialists; in Germany, an ambulance dispatcher has experience working in an ambulance brigade and is familiar with many life-threatening conditions, which allows for classifying the severity of the condition at the stage of the call, and also provides the necessary information of the first aid to the patient for the patient's environment, also dispatchers have the opportunity to refer the patient to a family doctor in case of non-serious health problems.[37] Also, all emergency services, from firefighters to police and security guards in public places, have basic ambulance skills; in addition, family medicine is widely developed, with specialists having both basic surgical skills and basic resuscitation skills.[35,51]

Kazakhstan has also been implementing this service for the last 20 years. In Kazakhstan, dispatchers have low qualification skills, which is reflected in the number of false calls, the increase in the duration of waiting for an ambulance by the patient, as well as the lack of rational classification of the severity of the patient's condition, which also aggravates the situation. In Germany, effective triage during emergency calls has significantly reduced pre-hospital mortality rates and eased the burden on healthcare professionals. This approach to dispatching specialized teams in Berlin resulted in a 10 % decrease in mortality from ischemic stroke.[11]

In total, 3 types of ambulance brigades operate in Kazakhstan – general, paramedic and specialised brigades.[2] The specialised and general-purpose brigade includes an ambulance doctor, and the number of these brigades prevails over paramedic brigades, while in Germany, on the contrary, the number of brigades with paramedics is several times higher than that of doctors.[37] In Kazakhstan, the main principle of emergency care is to provide the maximum amount of care before arrival at the hospital, whereas in Germany the emphasis is on the rapid delivery of the patient to the emergency department.[4] There is also a difference in the organisation of the emergency department in these countries. In Kazakhstan, there is no emergency department as such; its role is taken over by the emergency room, as well as surgery and intensive care units. Specialists such as surgeons, anaesthetists, therapists, gynaecologists, and others are on duty in the emergency room. When a patient is admitted to the hospital, the emergency room doctor distributes patients by disease profile and calls a specialised specialist, who then determines further tactics.[7] In Germany there is a specialised emergency department with doctors retrained in emergency medicine, these specialists have skills in both surgical and drug treatment of life-threatening conditions, this department has all the necessary diagnostic capabilities, such as computer tomography, ultrasound machines, laboratory, and beds for monitoring the patient's condition, as well as the presence of shock operating rooms, palliative care and intensive care wards.[35] At the hospital stage, triage of patients is also performed, with preference given to patients in severe condition.[17,52]

In Kazakhstan, in most cases, assistance is rendered to everyone in a row, as there is no triage at the prehospital stage as such, the ambulance team doctor can warn doctors about the arrival of a heavy patient, but due to the workload of the emergency room it is not always possible to properly organise assistance to heavy patients, but there are no clear triage criteria and specialised systems for assessing the severity of the condition.[4] Also in some European countries, there are emergency departments that exist separately from the treatment department, which significantly relieves the burden of hospitals and allows them to provide care in hard-to-reach regions, also in these institutions often work with young professionals under the supervision of a mentor, which significantly improves their professional skills.

A completely different system of organisation is represented in the Anglo-American system of first aid. Kazakhstan has a public funding system, while in America the emergency care system may be more fragmented due to the diverse structures and funding models.[53] An important element here is the availability of medical services and regulation of the health care system. In contrast to Kazakhstan, all ambulance crews provide a minimal amount of pre-hospital care, and the main principle of care is to stabilise the patient's condition until arrival at the emergency department, so all ambulance crews in America and England consist of many specialised medical technicians and paramedics, as well as basic first aid skills of police, firefighters and other

various services.[41] Dispatchers in America also have experience as medical technicians and have the right to refuse the arrival of a team based on their personal experience. In Kazakhstan, the dispatcher does not have the right to refuse the arrival of a team, which forces specialists to arrive at calls where the patient's condition does not require emergency measures.[4]

The organisation of emergency departments does not differ from that in Germany and includes observation, intensive care, shock operating rooms and a diagnostic unit. The huge number of emergency medical personnel and proper triage of patients at the stage of call and admission to the hospital reduces the time for the arrival of the brigade to the patient to 10 minutes, while in Kazakhstan this figure hardly tends to 20 minutes.[8] In the United States in 2009, mortality from heart attacks within the first 30 minutes was 3 %, increasing to 4.8 % after 90 minutes. This underscores the importance of timely hospitalisation within 60 minutes in Kyrgyzstan for improving survival chances following myocardial infarction.[13] However, the most important problem of the American system is the overload of the emergency department, as the number of incoming patients is not controlled in any way and is based solely on territoriality. Kazakhstan also has a problem of emergency room overload, but due to lack of staff, low skills and population growth, this problem is only getting worse.

A system of emergency medical care that is characterised by a mixed approach can be observed in the pan-Asian region. This approach combines elements of decentralisation and some similarities with the Anglo-American system. On the one hand, the emergency care system in this region is characterised by a decentralised format of care delivery. In some countries, such as the UAE, South Korea and Singapore, ambulance crews consist exclusively of nursing staff. Specialised medical care, on the other hand, is provided mainly in emergency departments, which is a distinctive feature compared to emergency care in Kazakhstan, where specialised medical teams exist. It is also worth noting that ambulance crews in the UAE, South Korea and Singapore are poorer equipped with medicines than in Kazakhstan.[54] It was discovered that the system of optimal transit time to the hospital, which divides the area around the institution into districts based on travel time, results in lower survival rates for persons living outside of this designated area compared to those living near the hospital.[15] In Kyrgyzstan, however, delivery time is often not dependent on proximity to a health facility, with ambulance crews travelling from one call to another, wasting a huge amount of time and resources.

On the other hand, there are several similarities with the Anglo-American healthcare system in this region. For example, in the countries mentioned above, there are various organisations and structures, such as fire stations in South Korea and small outpatient centres that also provide emergency services. This helps to relieve pressure on hospitals and allows for more efficient triage and referral of patients as early as pre-hospital care.[11] Each system has its advantages and disadvantages. The effectiveness of emergency care depends on many factors, including the level of qualification of medical personnel, availability of medical infrastructure, funding, and coordination. But it is worth noting that in the countries of Europe, the USA, UAE, and South Korea the system of triage and communication between different services such as police, and firemen is well developed, it is also important that in these systems there is an opportunity to get a consultation from other hospitals, which allows to better select tactics and prescribe adequate treatment.[55,56] It is important to consider the cultural and social specificities of each country when designing an emergency care system to ensure the highest standard of care for the population.

This systematic review found few limitations in both the evidence analysed and the review process. Evidence was primarily collected from observational research, government reports, and expert opinions, with few high-quality randomised controlled trials explicitly comparing emergency care systems across nations. Variability in emergency care performance measurement and reporting, combined with cultural, economic, and geographical variables, hampered direct comparisons and generalizability. Furthermore, because emergency care systems are always evolving, older findings may not fully reflect current practices. The review's scope was broad, restricting in-depth analysis and standardising the quality judgements of many evidence categories. Future research should prioritise robust comparison studies, standardised performance indicators, and evaluations of specific interventions to educate global emergency care practice, policy, and future directions, with a focus on low- and middle-income nations.

CONCLUSIONS

Considering the information obtained during this study and according to literature sources, the system of emergency care in Kazakhstan is organised according to a modified Franco-German type, where the main approach is the principle of getting the doctor to the patient and providing the best possible help before arriving at the hospital. However, given the small number of medical staff, lack of adequate funding and the absence of an emergency department as such, this system has a very low efficiency, which is manifested in the low qualifications of emergency personnel, the shortage of staff in this sector, and most importantly the long waiting time for the arrival of an emergency team (up to 20 minutes) and unjustified transport of patients to the emergency room, which further deteriorates the work of this service in Kazakhstan.

In Europe, the USA, UAE, and South Korea there are no such problems, as these systems are supported by the

state, and well-developed emergency personnel, in addition to medical institutions, emergency department functions can be taken by fire stations, independent emergency departments, as well as private companies, which is very underdeveloped in post-Soviet countries. The emergency department in these countries is also a multifunctional centre with all the necessary facilities for emergency surgical and therapeutic care, as well as observation and palliative care rooms, which is a significant difference from post-Soviet hospitals.

The data obtained in the course of the study suggest that the system of emergency care in Kazakhstan requires reform to create a more appropriate option, considering current funding opportunities and the creation of a talent pool, which will increase the inflow of specialists into the sector and improve the quality of emergency care. However, it is necessary to research the implementation of this or that model of emergency care to create an optimal option that will maximally comply with international standards.

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CONFLICT OF INTEREST

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