Safety of medical personnel in the world

Danuta Rak

Master, e-mail: danuta_projektyiszkolenia@wp.pl, ORCID: 0009-0006-2172-2936

3DR design and training studio, Poland

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Abstract

Medical personnel are exposed to many risks, meeting the requirements for ensuring an adequate level of safety is extremely difficult due to the complexity of healthcare in different countries. In addition, there are new threats, such as the SARS-CoV-2 coronavirus pandemic, which also caused the death of medical staff in contact with this virus on a daily basis, and from 2022, the war in Ukraine, which forced medical staff to adapt to previously unknown conditions for treating patients and face the real threat of bombing cities, lack of electricity, access to water, treatment in shelters and field conditions. It is also important to understand the issue – safe medical staff – safe patient. Another new threat to medical staff is also medical innovations – modern technologies, treatment methods in medicine and the need to train medical staff also in terms of their own and patients' safety. The level of safety of medical personnel can be considered in three organizational, technical and human categories. In building an appropriate level of safety, it is important to make the staff aware of the importance of the "safety culture" and the knowledge that each person working as medical staff is responsible for the level of safety not only for their own, but also for patients and non-medical staff. The level of safety of medical personnel can be considered in three organizational, technical and human categories. In building an appropriate level of safety, it is important to make the staff aware of the importance of the "safety culture" and the knowledge that each person working as medical staff is responsible for the level of safety not only for their own, but also for patients and non-medical staff. The level of safety of medical personnel can be considered in three organizational, technical and human categories. In building an appropriate level of safety, it is important to make the staff aware of the importance of the "safety culture" and the knowledge that each person working as medical staff is responsible for the level of safety not only for their own, but also for patients and non-medical staff.

Key words: medicine, epidemic, war, safety.

Introduction

Medical staff are persons authorized under separate regulations to provide health services and a person who has acquired professional qualifications to provide health services in a specific scope or in a specific field of medicine. Colloquially, medical staff is also called "white staff" solving medical and social problems.

In general, medical staff can be divided into categories (The Agency for Health Technology Assessment and Tariff System): Doctors, Medical physicists, Resident doctors, Technicians (radiology, electro radiology, etc.), Nurses and midwives, Occupational therapists, Perfusionists, Medical lifeguards, Psychologists, psychotherapists, addiction therapists, Nutritionists, Speech therapists, Physiotherapists, rehabilitators, technicians, Rehabilitation, masseurs, master of rehabilitation, Other non-medical personnel (orderlies, registrars, medical secretaries, guardian.), Other non-medical personnel, Administrative, management, Interns.

The above division of medical personnel applies to the modern division into categories. At the turn of the 17th and 18th centuries, the Italian physician Bernardino Ramazzini discovered the connection between health problems and the performance of medical activities by "white personnel". The observations of the Italian doctor became the foundation for the creation of modern asepsis. The

professional work of medical personnel is exposed to a number of factors that may adversely affect the health of medical personnel. Factors in the working environment of medical staff can be divided into:

Biological factors: the cause may be infections, transmitted by patients or other medical personnel, they may have an allergenic or toxic effect.

Chemical agents: medical staff is constantly in contact with chemical agents, such as drugs, disinfectants, anesthetics. These factors can cause acute poisoning, they are sensitizing, toxic, mutagenic, they can cause disorders of resistance to infections.

Physical factors: these physical factors include ionizing radiation, non-ionizing radiation (optical - ultraviolet, and in the radio frequency range), vibrations, audible noise – alarm signals, noise from vehicles.

Factors related to the way the work is performed – work in a standing position, work in the operating block, shift work (day and night).

Psychosocial factors – the work of medical staff is exposed to strong stressors, work with dying people, work with people with pain, cancer patients, work with disabled people.

Hazardous factors – direct contact with these factors by medical personnel can cause injury or death. These factors of medical staff include factors of air accidents (related to the practice of the air ambulance service), road accidents (work in rescue teams in ambulances), factors caused by accidental needle sticking, electrical, thermal and acute poisoning factors.

Threats caused by dangerous factors come to the fore in the era of the COVID-19 pandemic or other pandemics – the work of medical staff in a hurry, the rapid influx of patients, the need to take quick responses to save lives, etc., as well as in the event of the outbreak of war in Ukraine in 2022, where many countries also sent their medical staff for humanitarian aid, treatment of gunshot wounds, treatment as a result of injuries resulting from the outbreak of war. Working in areas occupied by the army, where hospitals, schools, churches were bombed, working in equal conditions without access to water and electricity, are all real threats to the medical staff providing aid and saving the lives of patients as well as other medical personnel. Mention should also be made of terrorist and bioterrorist attacks, in which hospitals and healthcare facilities are often attacked, it is worth mentioning these threats during mandatory safety training. In addition, there are related to the use of innovations in 3D programs, 3D, 4D or even 5D printing and virtual reality. In the further part of the article, I will deal with factors dangerous for medical personnel, caused by crisis situations and scientific and technological innovations.

Dangerous factor for medical staff – pandemics, crisis situations in the world that decimate medical staff

In 2009, the H1N1 influenza virus was detected spreading around the world and an epidemic broke out in Mexico, which spread rapidly in the Americas to Europe, parts of the East and New Zealand, which led the WHO (World Health Organization) to declare PHEIC(Public Health Emergency of International Concern) on April 25, 2009, 73 countries declared an outbreak and over 26,000 laboratory-confirmed cases. 2014-2015 is the time of the fight against Ebola in South Africa, only until July 2014, following 1,400 Ebola cases and 800 deaths, this epidemic had three phases and claimed thousands of lives, including medical workers. From 2019 to June 2022 is the fight against the COVID-19 SARS-CoV-2 pandemic. The global death toll related to COVID-19 was 14.91 million in the 24 months between January 1, 2020 and December 31, 2021, which is 9.49 million more deaths than those reported worldwide as directly related to COVID-19. The impact of the pandemic spanned several waves, each characterized by unique regional distribution, mortality levels, and factors. Twenty countries, representing approximately 50% of the world's population, account for more than 80% of the estimated global excess mortality from January 2020 to December 2021. These countries are Brazil, Colombia, Egypt, Germany, India, Indonesia, Islamic Republic of Iran, Italy, Mexico, Nigeria, Pakistan, Peru, Philippines, Poland, Russian Federation, South Africa, United Kingdom of Great Britain and Northern Ireland, Turkey, Ukraine and USA (WHO). The COVID-19 pandemic also caused the death of thousands of victims, including medical staff.

World crises have a huge impact on the safety of medical staff the World Health Organization (WHO) is alerting about crisis situations in Afghanistan, where there is a lack of life-saving supplies, health services for the Afghan population, as well as a continuous response to COVID-19. There is a similar system in Ethiopia, more than 20 million people suffer from the conflict that began in 2020, the population in Tigray is in the worst situation, it is raving about humanitarian aid, medicines, food, health care services and water and sanitation infrastructure. There are only 3% of health facilities in Tigray, which are unable to meet the health needs of the local population. Drug shortages make it impossible to monitor HIV and diabetes cases. Medical staff has limited supplies, which reduces access to health services for mothers and children, causing complications and more deaths. Another place where medical staff is facing a socio-political crisis is Syria, over 12.2 million people need health care, due to the political crisis and the COVID-19 pandemic, the health care system has been heavily burdened. More than half a million children are chronically malnourished and lack access to medicines, health services, sanitation and running water. As a result of the political crisis and the COVID-19 pandemic, the health care system has been heavily burdened. More than half a million children are chronically malnourished and lack access to medicines, health services, sanitation and running water. As a result of the political crisis and the COVID-19 pandemic, the health care system has been heavily burdened. More than half a million children are chronically malnourished and lack access to medicines, health services, sanitation and running water.

Significant threats to medical personnel are ongoing armed conflicts around the world. Examples of such armed conflicts are the tensions around Taiwan and the growing China-US conflict, conflicts in the Republic of Congo or African countries, and also until 2017 armed conflicts in Iraq. Currently, the worldwide emergency situation from 2022 to the present in Ukraine causes many opportunities to come into contact with dangerous factors, very urgent health services are needed, psychological health needs, rehabilitation, access to health care points are also becoming priorities. This extraordinary situation in Ukraine caused by the war with Russia forces medical personnel to work in difficult conditions, without water, electricity, lack of adequate supplies of medicines, who are unable to function safely in healthcare facilities. This situation does not only concern medical personnel from Ukraine, but also applies to medical personnel from around the world who have decided to provide assistance in the field of medical services in the event of an extraordinary situation, which is the war in Ukraine. Therefore, proper and quick organization of work and hospital infrastructure and humanitarian aid points is also required.

Picture 1 – An example of the organization of the work of medical staff during operations with insufficient lighting in a medical field hospital – Karbala hospital war in Iraq – photos come from the private archive of dr hab. Eng. Marek Magniszewski on the basis of a separate consent

Picture 2 – An example of a hospital container infrastructure with equipment – Karbala hospital war in Iraq – photos come from the private archive of dr hab. Eng. Marek Magniszewski on the basis of a separate consent

There is also an epidemic of smallpox (monkey pox) in world emergencies. Most of the cases reported so far have been identified through sexual health or other health services in primary or secondary care settings, and have mainly, but not exclusively, involved men who have sex with men (Mpox (monkeypox)). Another very significant threat to medical personnel is famine and drought in the Horn of Africa, food insecurity and shortages caused by lack of food cause disease, complications and, as a result, a consistent population. People are getting weaker and less resistant to diseases, often they postpone the purchase of food than medicines. Health services are also lacking, with the WHO preparing the region in case of epidemics of diseases such as measles and malaria, as well as counteracting the consequences of malnutrition and actions in the field of sexual health and treatment of diseases such as HIV and tuberculosis.

From the above-described crisis situations in the world as well as examples of epidemic outbreaks in various parts of the world, it is not difficult to draw conclusions on how easy it is for medical personnel to come into contact with various biological and dangerous factors. In the described cases, the medical staff also lost their lives.

Medical personnel of air medical transport and personnel of marine and tropical medicine – real threats

The emergency medical service is a mission consisting of arrival, transport and return to the home port, performed using an aircraft in accordance with the air carrier's certificate, the purpose of which is to provide medical assistance in a state of emergency, when immediate and fast transport is essential:

1) sick or injured and other persons directly concerned, or

2) medical personnel, or

3) biological materials and materials or devices used to provide health services (Aviation law – section 5. Aviation personnel).

Transporting the patient on board the plane is the fastest means of transport for the patient. A serious accident, sudden illness or extraordinary crisis situation in the country make it necessary to use air medical transport. In order to ensure proper medical care, the patient should be provided with access to qualified medical personnel and equipment of medical planes and helicopters. Regardless of whether we are dealing with the transport of patients in a passenger plane or in a medical helicopter, the patient should be taken care of by competent medical personnel, who should first of all take care of their own safety in order to be able to help an injured or sick person or properly transport biological material or material for providing health services. The most vulnerable to dangerous events are medical personnel authorized to work in the Helicopter Emergency Medical Services (HEMS) or Emergency medical services (EMS) personnel working on passenger aircraft or helicopter air ambulance (HAA) personnel. Performing medical work in air ambulance services is associated not only with biological, physical and chemical hazards in which medics can meet in healthcare facilities,

but it is primarily work related to air operations, where there are a number of different threats. Part of this work is performed on the apron of the airport or airstrip, and part on board the aircraft. The main threats to medical staff will include: or Emergency medical services (EMS) personnel working on passenger aircraft or helicopter air ambulance (HAA) personnel. Performing medical work in air ambulance services is associated not only with biological, physical and chemical hazards in which medics can meet in healthcare facilities, but it is primarily work related to air operations, where there are a number of different threats. Part of this work is performed on the apron of the airport or airstrip, and part on board the aircraft. The main threats to medical staff will include: or Emergency medical services (EMS) personnel working on passenger aircraft or helicopter air ambulance (HAA) personnel. Performing medical work in air ambulance services is associated not only with biological, physical and chemical hazards in which medics can meet in healthcare facilities, but it is primarily work related to air operations, where there are a number of different threats. Part of this work is performed on the apron of the airport or airstrip, and part on board the aircraft. The main threats to medical staff will include: where medics can meet in healthcare facilities, but it is primarily work also related to air operations, where there are a number of different threats. Part of this work is performed on the apron of the airport or airstrip, and part on board the aircraft. The main threats to medical staff will include: where medics can meet in healthcare facilities, but it is primarily work also related to air operations, where there are a number of different threats. Part of this work is performed on the apron of the airport or airstrip, and part on board the aircraft. The main threats to medical staff will include:

- hazards related to the airport apron, landing pads, moving vehicles, including vehicles supplying aircraft with fuel, cargo handling vehicles, emergency service vehicles that do not move at high speed but can lead to serious injuries to medical personnel, collisions with other vehicles that may cause fuel leaks and lead to an explosion;
- hazards caused by moving parts of aircraft engines and propellers – these hazards may appear on the front and side of the engine. The motors produce a strong blast or "suction zone" which can kill a worker upon entering the danger zone.

Medical personnel may also not notice the rotating propellers:

- another very serious threat is very high noise caused by aircraft engines above 120 dB, which may drown out another approaching vehicle;
- there are also general hazards, i.e. slips, falls, when the apron is wet or icy, these general hazards can also include lighting – some areas of the airport or landing site may be poorly or not lit at all, which may result in an increased number of falls, slips, etc. or entry into the danger zone with propellers or aircraft engines running.

Work on board an aircraft will pose threats to medical personnel caused by, for example, air turbulence, which may lead to uncontrolled needle sticking, touching infectious material, aggression of a patient who does not tolerate the flight well, spillage of chemical, infectious material. In addition, medical staff is exposed to general risks, i.e. work in the passenger zone – lack of sufficient disinfection of passenger seats, items of other passengers that can cause infections and infections, the same situation also applies to luggage lockers, as well as the use of one toilet and the lack of sufficient protection against infectious biological waste or sudden change of time zone syndrome, travel to countries with a different climate and sanitary conditions, exposure to motion sickness. These are, of course, the main and general hazards for aviation personnel, and emergency landing situations in various conditions and locations as well as aviation disasters and incidents must also be taken into account. While these threats may seem to be assigned only to a specific group of aviation personnel, they concern all categories of aviation personnel who often accompany the patient in transporting him to another hospital, as well as, as already mentioned, social crisis situations and the provision of appropriate humanitarian aid. The Polish Medical Air Rescue continues the tradition of pre-war and post-war medical aviation in Poland. The current organizational form of LPR has been operating since 2000. In Poland, air ambulance bases are located in the following voivodships: Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Łódzkie, Małopolskie, Mazowieckie, Opolskie,

Podkarpackie, Podlaskie, Pomorskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie, and Zachodniopomorskie.

Picture 3 – Air Rescue Base with helicopter equipment in Sanok, province Podkarpackie – Poland – EC135 helicopter photos come from Danuta Rak's private archive

Another important branch of medicine where there are unusual threats is marine and tropical medicine. In Poland, this field is taught by one of the oldest universities in Poland and Europe – the Medical University of Gdańsk, which has an independent Institute of Maritime and Tropical Medicine. Doctors specializing in marine and tropical work in various means of water transport and shipping and in countries with different climates, conducting or participating in transport performed by means of water transport, sea and inland navigation, fishing, work on drilling platforms and off-shore units and also perform their work under elevated pressure conditions. The main task of medical personnel working in the field of marine and tropical medicine is to benefit from advances in knowledge in the field of marine and emergency medicine, medical personnel should also recognize any hazards carried out from or under water. Medical personnel specializing in marine and tropical medicine should be aware of the risks associated with the division of this specialization, namely the risks associated with:

- maritime medicine – work on various means of water transport, shipping, on fishing and inland vessels, drilling platforms and off-shore units, tele-medicine, radio-counseling, transport of patients at sea, occupational exposure, occupational pathology, rescue of survivors, evacuation and air transport of patients, psychology in maritime transport, certification on health, ability to work, accidents and diseases acquired at work on sea and inland ships, sanitary supervision in sea ports;
- diving and hyperbaric medicine – the impact of increased pressure on the human body, decompression accidents, pressure injuries, other diving diseases, decompression rules, prevention of diving diseases, hygiene of diving and staying in hyperbaric facilities, the use of increased oxygen pressure in the treatment of diseases from other fields of medicine, research and certification on the health condition of people working in hypertension;
- tropical medicine – therapy and prevention of tropical diseases, preventive vaccinations, hygiene in tropical countries, physiology and psychology of work in tropical countries, dangerous plants and animals in tropical countries, vectors of transmission diseases, field epidemiological research, epidemiological studies, examinations and certificates on health, acquired diseases and ability to work in people leaving for and returning from countries with different climatic conditions;
- travel and tourism medicine – threats affecting the health of medical personnel, the course of disease entities in travel conditions, travel-related diseases, sanitary protection of state borders, travel hygiene, travel accidents, health aspects and hygiene in qualified and extreme tourism;
- recognition, prevention and treatment of internal diseases and related risks;
- epidemiology.

Picture 4 – Examples of real threats during the travel of medical personnel to countries with different climatic and sanitary conditions – Iraq desert – photos come from the private archive of dr hab. Marek Magniszewski, Eng., based on a separate consent

Medical staff representing the specialization in the field of marine and inland medicine is obliged to participate in preventive examinations, procedures related to marine and tropical medicine, travel medicine and occupational medicine. In addition, medical staff should undergo training in innovation, especially in the field of telemedicine, tools for notifying other emergency services or providing assistance at a distance.

Bioterrorism in medicine – a threat to health security.

Bioterrorism is a huge threat to the health and life of individuals as well as a threat to the security of countries, including emergency and medical security. State security is a phenomenon that is very often subject to analysis. Modern terrorist weapons are biological weapons, weapons that can be easily and cheaply produced and multiplied. Bioweapons are considered the most dangerous of weapons and the cause of mass deaths. This type of terrorism is aimed at the use of pathogens, disease-causing entities, biological creations or microorganisms that cause the inability or limitation of life functions. Bioterrorism is the threat of using diseases, killing people, destroying animals or plants with viruses, fungi, toxins that are produced by living organisms in order to cause panic, paralysis of the rescue services as well as huge economic losses. The charges used in the described bioterrorist attacks were pathogenic microorganisms, i.e.: anthrax bacilli, smallpox viruses, toxins, e.g. botulinum. Pathogenic pathogens used as biological weapons may also pose a threat to medical personnel, causing:

- high mortality, hemorrhagic fever;
- a large outburst of panic, which can increase the number of victims rapidly;
- threats resulting from the ease of obtaining mass production of biological weapons – during the Ebola Epidemic in 2015, cases of tissue harvesting from deceased people suffering from the virus were confirmed;
- threats resulting from the ease of spraying viruses and pathogens;
- threats resulting from the invisibility of weapons during an attack, weapons that are easy to carry and difficult to detect;
- a long asymptomatic period, prolonged and inaccurate diagnosis of the disease, which results in a greater number of deaths;
- lack of effective treatment, vaccines.

These are only general threats resulting from bioterrorist attacks that can cause death and permanent loss of health for medical personnel. The safety of the medical sector is strictly protected by epidemiological procedures. These risks affect healthcare professionals around the world.

Innovations used in medicine – a threat to the safety of medical staff at work

Various categories of medical personnel benefit directly and indirectly from modern technologies in medicine. This applies to both people working in the medical industry and patients. An example of modern technologies used in medicine is:

- 3D printing;
- smartphone apps;

- artificial intelligence;
- robotics in medicine,
- software and CAD software;
- virtual reality VR;
- technologies for facial recognition and biometric features;
- online platforms;
- IT solutions in the field of tele-medicine and modern systems for notifying emergency medical services;
- voice assistants.

Each of these modern technologies has its beginning in the design phase and most of them can be assigned projects in AutoCAD software. If we have a 3D model, we can easily print it on a 3D printer or use it for virtual reality applications. Deserves attention another social innovation that does not occur systematically in Poland is the "Jeden Guzik" service. It is available in the Nordic countries, Spain, Italy and the UK. It consists in the fact that sick people, lonely, disabled, deprived of care, infirm, receive a special digital device permanently installed on their body in the form of a large electronic button. In the event of malaise, fainting or a sudden illness (or for any other reason), after pressing the button, an electronic signal is sent to the operator responsible for the local sanitary and rescue services. A public or non-public operator immediately sends an ambulance or paramedics, who are usually non-public subcontractors of such a service. The system is supported by GPS so as to quickly locate the victim. Another very good example is the "Catch your breath" application available in many European Union countries (e.g. Spain, Sweden, and Great Britain), whereby living with a dependent person, you can apply for public funding for a place in a public care institution. Other examples of modern innovative solutions are models and 3D prints for medicine, namely prostheses for reconstruction after injuries, skin patches, printing tablets, printing organs, anatomical models, skull implants, etc. The 4D modeling technology has also developed very strongly, models under the influence of external factors such as heat, light, humidity, electric current or pressure can change their shape and properties.

In such a case, the question should be asked – can such innovative solutions and technologies used in medicine pose a threat to medical personnel? Will new forms of threats arise?

The answer is not clear, on the one hand, innovations and digitization in medicine change the face of medicine and facilitate the work of medical staff by reducing the number of threats, it is a different medical world compared to 20 or 30 years ago. On the one hand, access to the Internet of applications significantly sped up interpersonal relations and the exchange of experiences, on the other hand, they greatly reduced them. Shallow relationships in medical teams lead to a lack of communication, team conflicts, which is the cause of stress, misunderstandings and accidents at work. Medical staff abusing the Internet, new innovative technologies will be exposed to faster contact with dangerous factors in the event of lack of access in the event of crisis situations. What until now seemed intuitive thanks to the application and modern technology, in the absence of them, it causes a greater number of threats and mishaps, which will be caused by human factors. The "virtual world" for medical personnel can lead to serious psychosomatic consequences. Another real threat is "excluded" countries with limited access to the Internet, innovative technologies and tools. In the event of encountering modern solutions with the simultaneous lack of training and appropriate knowledge in the use of technological solutions, these solutions can threaten the lives of medical staff and patients.

Materials and Methods

Materials on the safety of medical staff were developed on the basis of the collections of the British National Library in London, Polish literature, review, research and review articles from PubMed, Scopus, libra.ibuk.pl, Web of Science as well as own literature and database collections.

Results

When analyzing the above threats, an important issue will be the level of security culture or, in other words, the level of organizational culture. Safety culture refers to compliance with processes, standards, laws, rules related to safety and avoidance of errors by medical professionals in the provision of healthcare. In medicine, a culture of safety is associated with ensuring a high level of treatment for patients.

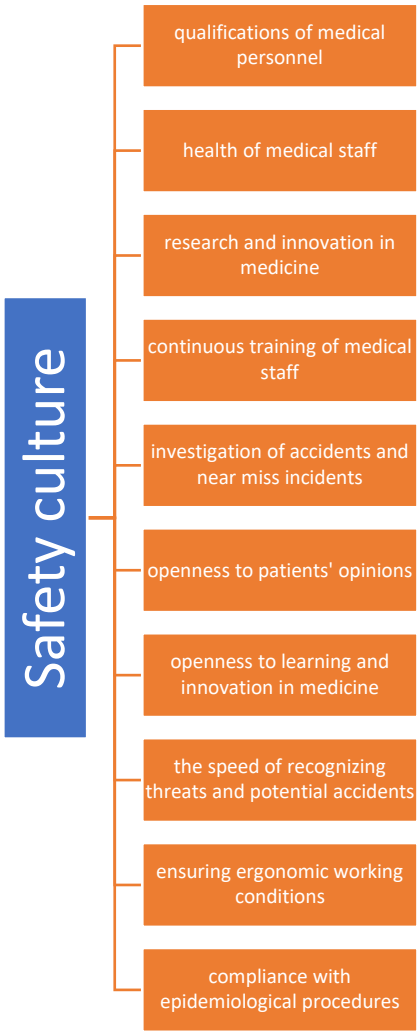

Figure 1 – Multi-level pyramid of factors influencing the level of safety culture of medical personnel in the world

Safety culture is primarily the awareness of medical staff that each of us is responsible for the level of safety as well as the level of safety of patients and their visitors. It is important that medical staff know how to take care of their own safety first before they can help others. Safety must take precedence over operational and financial objectives. Proper organization of work, drawing conclusions from accidents at work, near misses, as well as ensuring appropriate human, organizational and technical resources have a fundamental impact on the safety of medical personnel. Other categories that should be followed when shaping the safety culture are the factors shown in the diagram:

Figure 2 – Factors shaping the safety culture of medical personnel in the world

Significant threats to ensuring an appropriate level of safety culture will be the crisis situations described in the article, ensuring an appropriate level of humanitarian aid, including threats caused by long-range transport (air transport, water transport), threats to medical personnel caused by traveling to countries with different climate or sanitary conditions, threats to work carried out from water or under water, including the use of modern telemedicine solutions, threats related to epidemics, real threats of war, including those caused by the use of biological weapons. The threat caused by modern solutions of science and technology is significant.

Discussion

Forecasts of new applications

It is expected that the issues discussed in the article will be permanently introduced into the system of educating medical personnel in the world. The prognosis regarding the introduction of innovations for medical personnel will also be very important, and procedures for the use of technical and scientific innovations for the medical industry will be created, their increasing implementation in the training of medical personnel, as well as the implementation of these technological and scientific innovations in crisis situations.

Comparison with other possibilities on the market

Material resources ensuring the level of safety of medical staff and patients can be compared with other possibilities on the market. To ensure modern and innovative material resources, we will include medical equipment and tools, individual and collective protection equipment as well as IT and telemedicine solutions. In general, it can be said that there are many material resources on the

market that meet the safety requirements, for which the manufacturer is responsible. What material resources will be purchased by health service providers depends on the investment outlays as well as on the financial resources allocated for the education and training of medical staff at various levels. The main causes of unequipped workplaces include: unfamiliarity with the regulations on manual transport work, non-ergonomic workstations, health care buildings not adapted to work safety requirements, lack of knowledge on the ergonomic performance of professional activities. Undertaking these activities on a daily basis will allow these resources to be included in the normal work rhythm of medical workers, will improve working conditions, reduce the number of hazards and accidents at work.

Conclusions

Medical personnel should be vigilant towards threats, and near misses, they should be able to report them before they become serious threats or accidents. It is important that the medical staff react quickly to all dangerous events and that minor errors can be easily corrected. The causes of accidents at work are human, organizational, and technical factors. Therefore, it is important to shape the appropriate level of occupational safety of medical staff, which consists of employee attentiveness, the appropriate hierarchical organizational structure of health care facilities, ensuring an appropriate financial level for material resources that improve working conditions, training of medical staff, implementation of innovative solutions, problem-solving, analysis of potentially accidental events and accidents at work. Medical staff should strive for constant improvement of working conditions because the safety of patients and their visitors depends on their level of safety. The openness of medical staff to continuous education and training will help to avoid real threats and will also allow medical staff to prepare for crisis situations and unusual situations, but very real in today's world. The complexity of the level of health care means increased vigilance for staff and training in the event of emergencies or emergencies.

References

A generic risk assessment and planning tool for all hazards to mass gatherings. World Health Organization Publishing, Geneva 2023.

Aviation law – section 5. Aviation personnel [access to version from: November 10, 2022 to: December 31, 2029]

HeRAMS Mali Status Report December 2022: Communicable Disease Services. World Health Organization Publishing, Geneva 2022.

Maintaining COVID-19 infection prevention and control measures in healthcare facilities: Policy brief. World Health Organization Publishing, Geneva 2022.

Occupational hygiene in nursing and medical rescue. Edited by Bartosz Bilski. Medical University of Karol Marcinkowski in Poznań. Poznan 2016.

Regulation of the European Parliament and of the EU Council of 25 May 2020 amending Regulation (EC) No 1008/2008 on common rules for the operation of air services in the Community, in connection with the COVID-19 pandemic.

Regulation of the Minister of Transport, Construction and Maritime Economy of 19 November 2013 on ground handling at airports (Journal of Laws of 2018, item 1287).

Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19), World Health Organization Publishing House, Geneva 2020.

Safety of patients and medical staff. Ergonomic conditions. Medical University of Silesian Paists in Wrocław, Wrocław 2020.

Weekly epidemiological record. World Health Organization Publishing, Geneva 2023.

WHO. Available from : https://www.who.int/data/stories/global-excess-deaths-associated-with-covid-19-january-2020-december-2021 [accessed July 17, 2023]

Mpox (monkeypox). Available from : https://www.who.int/emergencies/situations/monkeypox-oubreak-2022 [accessed July 17, 2023]