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The Role of N.V. Sklifosovsky Research Institute for Emergency Medicine in Providing Medical Assistance to Victims of the Earthquake in Armenia in 1988

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ABSTRACT The article presents unforeseen difficulties in organizing the deployment of the emergency room, dressing rooms, resuscitation units and operating rooms in the hospital of Maralik, which received victims of the earthquake.

We considered options for sorting the victims, depending on the severity of the condition, the urgency in the implementation of resuscitation and surgical interventions. We also paid attention with the psychological state of victims and determined the procedure for transporting victims to specialized hospitals of the other cities of Armenia and our country.

The creation of a state system of medical, social and ecological protection in the country from possible natural disasters and man-made disasters is an actual issue.

Keywords: emergency situations, earthquake, emergency medical care

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BACKGROUND

The authors of this article recall the crushing destruction of homes, industrial and public buildings, bridges, many kilometers of railways and highways, hospitals and clinics, and other facilities. In memory of the 30-year-old tragedy, the authors report the active participation of the medical staff of N.V. Sklifosovsky Research Institute for Emergency Medicine in elimination of the medical effects of the earthquake in Armenia.

The aim of the study: to present the experience gained by the team of N.V. Sklifosovsky Research Institute in the period of the occurrence of numerous natural and man-made disasters, in the organization and provision of skilled medical care to victims in the disaster area and specialized medical care to victims at the Institute.

The objectives of the study: to show the capabilities of a multidisciplinary scientific and medical team in emergency situations, when the need for real medical assistance to victims significantly exceeds its capacity or requires to worl under extreme conditions.

MATERIAL AND METHODS

On December 7, 1988, at 11:41 pm an earthquake of about 9.5 magnitude occurred in the north of the Armenian SSR with the epicenter in Spitak and Leninakan and severe destruction in Kirovakan, Stepanavan and rural settlements located in the direct neighbourhood.

After 2–2.5 hours from the moment of the earthquake, the Ministry of Health of the Armenian SSR created the Republican headquarters of health care for the victims and ordered to form the local medical headquarters on earthquake relief in Spitak, Leninakan, Kirovakan, Stepanavan, Ani, and Talin.

Having received the news of the earthquake, the leadership of the USSR Ministry of Health urgently sent a message about a natural disaster to medical institutions and surgical research institutes and organized an urgent collection of medical teams for departure to Yerevan.

The management of N.V. Sklifosovsky Research Institute for Emergency Medicine gathered a group of multi-disciplinary specialists and sent them to Armenia. On December 7, 1988, approximately on 11 pm they arrived at the village hospital of Maralik and began to organize and provide medical assistance to victims.

The structure of this group included the following employees of the N.V. Sklifosovsky Research Institute:

	Name		Job title
1	Vladislav Georgiyevich Teryayev	-	Director
2	Boris Mikhaylovich Gazetov	-	Head of the Scientific Department for Disaster Medicine
3	Mikhail Milhaylovich Abakumov	-	Employee of the Department of the Emergency Surgery of Chest Organs
4	Vladimir Igorevich Potapov	-	Senior Researcher of the Scientific Department for Disaster Medicine
5	Marina Georgiyevna Goryainova	-	Senior Researcher of the Scientific Department for Disaster Medicine
6	Igor Leonidovich Kovalenko	-	Senior Researcher of the Department of Multisystem and Multiple Trauma
7	Boris Emilyevich Kostsov	-	Physician of the Department of Multisystem and Multiple Trauma
8	Karen Rubenovich Dzhagrayev	-	Employee of the Department of the Emergency Surgery of Chest Organs
9	Igor Anatolyevich Kirdyanov	-	Physician of the Surgery Department no. 1
10	Aleksandr Olegovich Koch	-	Physician of the Anesthesiology Department
11	Georgy Arkadyevich Deyev	-	Physician of the Anesthesiology Department
12	Erns Markovich Ganopolsky	-	Physician of the Anesthesiology Department
13	Galina Nikolayevna Rumyantseva	-	Surgical Nurse of the Operational Block of the Department of Planned Surgery
14	Natalya Petrovna Bobysheva	-	Surgical Nurse of the Operational Block of the Department of Planned Surgery
15	Irina Petrovna Leonova	-	Surgical Nurse of the Operational Block of the Department of Planned Surgery
16	Natalya Vasilyevna Laricheva	-	Surgical Nurse of the Operational Block of the Department of Planned Surgery
17	Galina Iskanderovna Romashkina	-	Nurse of the Anesthesiology Department
18	Galina Vladimirovna Makarenko	-	Nurse of the Anesthesiology Department
19	Natalya Dmitriyevna Dyomochkina	-	Nurse of the Anesthesiology Department
20	Nadezhda Fyodorovna Yevstigneyeva	-	Nurse of the Anesthesiology Department

The group of specialists also included E.R. Sahakyan, an assistant in the Department of Emergency Medical Care, L.D. Bykovnikov, an assistant of the Department of Neurosurgery of N.A. Semashko MMDI and V.V. Kizhaikin, deputy head of the Civil Defense Department of the Dzerzhinsky District of Moscow.

On December 11, 1988, the second group of specialists, S.A. Strakovsky (the Department of Multisystem and Multiple Trauma), S.V. Sergeyev (Emergency Trauma), I.I. Shimanko (head), A.A. Nazarenko, A.A. Yar-Magomedov (the Department for Treatment of Acute Renal and Hepatic Failure) arrived in the branch of the B.V. Petrovsky All-Russian Scientific Center of Surgery in Yerevan in order to organize a dialysis center and treat victims with crush syndrome.

By the time we arrived, there were 82 victims in the 84 beds that the hospital had. There were A. Akopyan, (chief doctor), who had worked in this position for only 2 days, G. Khachatryan (head of the Surgical Department), G. Zakharyan (head of the Gynecological Department) and two nurses. Before our arrival at the hospital, there was no water supply and electricity, the patients were bandaged and injected with pain medications.

Employees of the N.V. Sklifosovsky Institute, who arrived in Armenia, having many years of experience in providing emergency medical care for mass admission of patients (air crashes, traffic accidents, poisoning, technological disasters), skills in treating the wounded in hospitals in Lebanon, Angola, in eliminating the medical consequences of the earthquake in El Asname (Algeria), providing emergency medical care to victims of disasters in Arzamas, Nalchik, Sverdlovsk, in the fire of the hotel "Russia" in Moscow and in other cases, began their organized and planned work, taking into account the current situation [1].

With the help of the village administration, local residents, relatives of the victims, the power supply was restored. The water was delivered in tanks on a personal “Niva” car by V. Nazaryan, the forensic doctor of the hospital.

After examining 82 patients in hospital beds, 32 patients housed in the canteen of an electromechanical toy plant, the leaders of the group V.G.Teryaev, B.M. Gazetov and V.V. Kizhaikin drew up an operational plan for the upcoming work.

The team was divided into 4 groups.

The first group of our employees (B.M. Gazetov, I.P. Leonov, E.M. Ganopolsky, N.P. Bobysheva) together with the village administration had to bring the hospital building into a working, functional state (electricity, water supply, laundry sterilization, repair of anesthesia equipment).

The second group (M.M. Abakumov, K.R. Dzhagrayev, N.V. Laricheva, N.F. Evstigneyeva) started preparing operating unit with two operating rooms, a preoperative room and two intensive care wards (sterilization of instruments, installation of a repaired anesthesia device). One of the operating rooms was set aside for abdominal and traumatological operations, the second one was for the primary surgical treatment of wounds and small-volume operations [2].

The continued flow of victims in need of surgery determined the organization of another operating room, where a large dressing table was placed (nothing else was found!). The gynecological office was adapted for casts application.

The third group of specialists (I.A. Kirdyanov, I.L. Kovalenko, B.E. Kostsov, G.I. Romashkina) made a round of the clinical department of the hospital and identified 28 patients with various injuries of the upper and lower extremities, pelvis, head and chest in need of surgery. They were operated on urgently with appropriate transfusion therapy and adequate anesthesia.

The fourth medical group (L.O. Kokh, G.A. Deyev, G.V. Makarenko, N.D. Demochkina) examined the injured on the beds, deployed in the canteen and the plant together with local doctors, and outlined for each of them a specific amount of conservative therapy. Three victims with suspected internal bleeding were urgently operated.

A timely, well-thought-out organization of the reception of victims allowed us to provide medical assistance to 810 victims within two days.

The injured victims were sorted by M.G. Goryainova, the experienced traumatologist, L.D Bykovnikov, the neurosurgeon and N.V. Laricheva, the nurse, as well as the head of the Surgical Department of the hospital G. Khachatryan, who helped our doctors to overcome the language barrier when examining the victims.

Most of the victims were in a state of stupor or deep obtundation. Indifference to everything around was noted. The injured lay motionless, their frozen-like look was often replaced by involuntary floating movements of the eyeballs, many of them moaning, unable to bear the pain.

Young people with minimal damage reluctantly made contact with the medical staff in contrast to the elderly victims with significant injuries. They answered questions slowly, monotonously, extremely reluctantly, after repeated reminders [3].

The appearance of the victims caused a depressing impression, since many of them had recently been untrapped. First of all, their extreme dehydration was striking. The pupils of most of them were dilated, the faces and visible mucous membranes were pale gray. Many of the victims had a dry, rough tongue covered with crusts. The lips were bluish and swollen, the external jugular veins of the neck were sharply contoured. During the initial examination, the majority of victims were in a state of shock of II – III degree, with clinical manifestations (hematomas, closed fractures) of the crush syndrome. The respiration was superficial, barely visible. The pulse on the radial arteries and dorsal arteries of the feet was not determined. The pulse rate was determined on the carotid or femoral arteries. Heart sounds were muffled. The skin due to a sharp swelling of the open parts of the body and limbs was so tight that the boundaries between the anatomical areas were not determined. Attempts to catheterize the bladder with a soft catheter were unsuccessful. The experience gained in using a metal catheter in the wounded in the 1979 Middle Eastern war and in those affected by the earthquake in Algeria in 1980 made it possible to solve the problem of taking urine. The result of a urine test often resolved the question of the true diagnosis.

With such a large flow of victims, there were no enough express diagnosis kits for blood type, Rh factor, HIV, Wasserman test and liver antigens.

The management of shock in each patient required the participation of an anesthesiologist and two nurses.

After injection of morphine with atropine (intravenously, subcutaneously or intramuscularly, depending on conditions, place and time), victims without complex injuries gradually became more active, taking into account the physiological position of injured limbs and warming the body, complete rest. The lethargy disappeared, the natural coloring of the mucous membranes was restored, the pulse on the radial arteries began to be determined. The group of victims (more than 450 people) was ready for transportation 3-4 hours after hospitalization and adequate therapy and surgical procedures (dressings, immobilization and plastering of the extremities). None of the patients in this group died either in the hospital or during subsequent transportation to another hospital.

Victims with severe traumatic injuries of the extremities, and there were over 300 people, required immediate drip transfusion of anti-shock fluids. Depending on the severity of the condition, we administered an isotonic solution of sodium chloride in a volume of 400, 800 and 1,200 ml.

A large batch of Polyglyukin, Reopolyglukin, timely delivered from Yerevan, helped solve the problem of anti-shock therapy. On average, up to 800 ml of blood substitutes were consumed by each victim.

The hospital's blood transfusion room operated around the clock, with an adequate supply of blood and constant delivery of its components from Yerevan, which allowed doctors to carry out plasma and blood transfusions to victims in the required volume.

The diuresis was managed only after the infusion of two or more liters of solution. The total amount of anti-shock fluids injected on the first day after the victims were untrapped, as experience has shown, reached 3–4 liters. The intensive therapy has led to a significant improvement in the condition of the victims.

Patients with injuries of the extremities, bleeding from extensive wounds were sent through the intensive care unit to the operating room. Victims with various wounds without bleeding, requiring surgical treatment, were sent to the wards of the hospital building with subsequent transfer to the operating room. With the help of relatives, patients with closed fractures (there were only two ambulance carts in the hospital) were taken to the room where the ward was deployed for anesthesia, reposition and plaster casting. After the treatment, patients with fractures and dislocations were placed on improvised sunbeds, laid out in the courtyard of the hospital, waiting for transport for subsequent evacuation. The waiting for transport was often delayed for 6–8 h.

In 8 patients operated on before our arrival, we had to open tightly sutured wounds due to pyogenic infection and treat them again. After surgical treatment, such wounds were treated by an open method.

We operated 156 victims. The interventions were performed under intravenous anesthesia.

All patients with various wounds and injuries upon admission were injected with tetanus toxoid and antitetanic serum. Primary surgical treatment of the wound included dissection, excision of infected, non-viable edges with washing the wound with chlorhexidine digluconate and the introduction of drains (if indicated). For the prevention of pyogenic infection, rare stitches were put on the wound or left open, covering it with a sterile dressing.

In 28 victims, limb amputations were performed. The indications for limb amputation were crush and tissue non-viability [2, 4].

The medical care to victims in the hospital in the Maralik village was based on the principles of disaster medicine - to help and save the life of the maximum number of victims [5, 6]. At the same time, specialists from the N.V. Sklifosovsky Institute worked under conditions of continuing aftershocks and arrival of victims, in conditions where the need for medical care to patients and injured significantly exceeded its real medical, technical and personnel support [7].

RESULTS

Two days later, after the established general order and the emerging organization in the provision of medical care to injured persons admitted to the hospital, the group consisting of V.G. Teryaev, B.M. Gazetov, V.V. Kizhaykin and E.R. Sahakyan departed for Leninakan according to the instructions of E.I. Chazov, the Minister of Health, to carry out emergency organizational measures and create an operational emergency medical care system for untrapped victims [8, 9].

Leninakan was divided into 10 sectors covering the territories which were highest concentration of people (train station, bus station, Hospital № 1 etc.) was observed. In these sectors, LIAZ buses, converted into a “mobile hospital” to accommodate 15 stretchers, and an ambulance with a driver and a medical worker to perform urgently. Each vehicle was equipped with a sufficient number of medicines and dressings were placed. The vehicles were staffed by doctors and paramedical staff. Communication with hospitals and the ambulance station was organized voluntarily by a group of rescuers from the Crimea. As an additional linear control for the work of the entire system used one ambulance, which was an experienced doctor and nurse. Created "mobile hospitals" and stations of ambulance helped 150-200 patients per day.

The volunteer work of students of Perm Medical Institute was very noticeable.

Now, when the picture of multi-pass organizational measures to provide medical assistance to victims and patients

is being recreated, it is hard to believe that it took only two days to create this system!

Everyone worked around the clock!

The medical care system developed by us in Leninakan functioned for another 3 months after our departure to Moscow.

A group of employees of the N.V. Sklifosovsky Research Istitute for Emergency Medicine headed by prof. I.I. Shimanko arrived in Yerevan, on December 11, 1988, and took part in the deployment of the dialysis center, examining and treating victims with injuries to the upper and lower extremities, crush syndrome, and also performed evacuation sorting and "resuscitation dialysis" to transport patients to Moscow.

After working in Armenia for 12 days, upon arrival in Moscow, the medical crew of the N.V. Sklifosovsky Research Istitute for Emergency Medicine returned and continued activities in clinical departments and research departments, providing specialized assistance to 73 victims who arrived from Armenia.

On December 8, 1988, prof. L.L. Stazhadze created a headquarters at the Institute that worked around the clock, which solved most of the issues with medical care for the victims, the economic support of their relatives, the paperwork and the organization of their transportation to Armenia [9].

At the same time, the heads of departments and departments urgently compiled a list of the missing equipment and tools needed for the examination and treatment of victims with different stages of crush syndrome development, and presented them to the Medical Equipment Department of the USSR.

The invaluable assistance of the USSR Ministry of Health and our colleagues from other medical institutions was felt during the entire stay of victims at our Institute. Substantial assistance was provided by the leadership of the 4th General Directorate of Health under the USSR. Ministry of Health. N.V. Sklifosovsky Research Istitute for Emergency Medicine was supplied with modern medicines, thus the doctors of the institute managed to create an appropriate sanitary and epidemic regime in the wards where the injured were located and avoid infectious complications. Considerable assistance was provided by colleagues from England, Switzerland, Sweden, Spain. Thanks to them, Fresenius artificial kidney devices, bedside monitors, dialyzers and dialysis fluid, disposable syringes and much more have appeared at the Institute.

On December 11, 1988, victims of the earthquake who were in various hospitals in Moscow were transferred to the N.V. Sklifosovsky Research Istitute for Emergency Medicine for the continuation of a unified, specialized treatment by the order of the leadership of the USSR Ministry of Health. Reception and sorting of victims was carried out by prof. V.P. Okhotsky, S.G. Musselius and V.I. Potapov [4].

According to recommendation of acad. A.I. Vorobyov, the method of intermittent plasma exchange was performed in victims of the earthquake, including numerous patients with crush syndrome.

The use of fresh frozen plasma in plasmapheresis in a large number of victims gave an excellent clinical result.

The experience of treating more than 200 people with crush syndrome acquired in the laboratory of acute renal and hepatic failure N.V. Sklifosovsky Research Istitute for Emergency Medicine, as well as quickly created detoxification center on the basis of the trauma unit of the Institute for patients with extensive traumatic injuries, requiring amputation of limbs, complicated by acute renal failure, using a mix of active methods of detoxification and correction of disturbed homeostasis parameters, enterosorption and lymphosorption, filtration and dialysis methods, hyperbaric oxygenation and physiohemotherapy (magnetic, ultraviolet) allowed to organize an adequate treatment in a short time at a mass admission of victims from Armenia [4, 10].

Clinical and physiological methods (tetrapolar reoplethysmography method, radioisotope methods) provided a basis for assessing structural and functional changes in the function of vital organs in crush syndrome, monitor the efficacy of treatment and predict the course of traumatic injuries.

Early therapeutic exercises with simultaneous addition of physiotherapy, acupuncture, vibromassage and percutaneous neuroelectrostimulation significantly improved the condition of patients and helped stabilize hemodynamics and external respiration.

CONCLUSION

After the earthquake in Armenia, the the earliest possible creation of a state system of medico-social and medico-ecological protection of our country against possible natural disasters and man-made disasters has become the primary task.

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