



## The place of forward surgical teams in the system of medical support of the Defense Forces of Ukraine

Verba A. V.<sup>1</sup>, Moskaliuk O. V.<sup>2</sup>, Zvenigorodska G. Yu.<sup>1</sup>, Dovgan I. I.<sup>2</sup>, Verba N. A.<sup>2</sup>, Babiy V. Yu.<sup>2</sup>

<sup>1</sup>National Pirogov Memorial Medical University, Vinnytsya, Ukraine

<sup>2</sup>Military Medical Clinical Center of Central region, Vinnytsya, Ukraine

### ARTICLE INFO

Received: 15 March 2021

Accepted: 16 April 2021

UDC: 614.2:355.617

### CORRESPONDING AUTHOR

e-mail: ovmoskov@gmail.com

Moskaliuk O. V.

*The article highlights the authors' view on the peculiarities of providing surgical care in the system of medical support of the Defense Forces of Ukraine and identifies problems that need to be addressed at the organizational level. The existence of the armed conflict in eastern Ukraine, which has been going on since 2014, and the experience of the medical service gained over the years, encourages the creation of new structures that bring medical care closer to the wounded. This, in turn, allows you to keep the rule of the "golden hour", because the lack of medical care for 1 hour increases mortality by 10-15%. The purpose of the work is to develop new structures of the medical forces of the Armed Forces of Ukraine to improve the efficiency of medical care at the second level of medical care. Tactical-special training was conducted, which worked out the main issues of deployment and operation of the advanced surgical team, as a separate stage of medical care. During the practical part, the scope of medical care was analyzed and standardized depending on the operational situation. The issues of terminology are considered in the work, definitions of separate terms are given and their semantic loading is specified. The authors considered the structure and organization of the work of advanced surgical support groups, qualitative characteristics of medical care at the stages of medical evacuation of the second level of medical care, its scope and content, options for strengthening medical care. Variants of application of advanced surgical groups in the conditions of the armed conflict of low intensity and local war - the conflict of high intensity are covered. The obtained results indicate that the creation of an advanced surgical team allows to bring medical care closer to the line of combat. The mobility of the group provides the opportunity to be directly near the center of sanitary losses.*

**Keywords:** system of medical support, role of medical care, forward surgical team.

### Introduction

The provision of medical care and treatment of wounded and sick servicemen in a special period should be carried out in amounts that best meet the basic medical standards of peacetime [18].

The basis of medical support (MS) of troops in a special period is a modern system of medical and evacuation measures, which provides timely, consistent and hereditary to the wounded (injured) the necessary medical and diagnostic measures in combination with their evacuation at the stage of medical evacuation (medical support levels), where they provide the necessary level of medical care, full treatment and rehabilitation with the use of designated forces and means of medical service [1, 2, 10, 13].

*The stage of medical evacuation (SME)* is an organizational and tactical concept that characterizes the

set of forces and means of medical service (medical units, mobile and inpatient military hospitals, hospitals, research institutes, etc.) and supply units (communications, food and food, transport, etc.), which are deployed on the routes of medical evacuation for the reception, sorting of the wounded and sick, providing them with a certain level of medical care.

*The level of medical support* is an integrated concept that defines the functional capabilities of the SME to provide a certain level of medical care and medical support of troops, deployed in the operational space and integrated into a single department [5].

*The level of medical care* of a certain level is ensured by compliance with the standards and protocols of medical care adopted for SME.

The function of medical care is the ability to timely medical evacuation "on their own" [2, 5, 9], nutrition, replenishment or replacement of medical personnel and supply of medical equipment to medical and military units of lower level of medical care.

The level (type) of medical care is a predetermined amount and content of medical care on SME, which includes reception, sorting, medical and diagnostic measures for the wounded, injured and sick, as well as preparing them for return to service or further medical evacuation.

Taking into account the introduction of NATO standards in the Armed Forces of Ukraine [11, 17], medical support of personnel involved in military operations is provided at four levels, which determine the quality of medical care at SME, its level, scope and content established time standards, as well as evacuation and transport features of the wounded [6, 7, 10].

Since 2014, an armed conflict has been going on in the east of our country, as part of a Joint Forces Operation (JFO), and before that an anti-terrorist operation (ATO) in Donetsk and Luhansk regions. According to the authors, a critical analysis of the five-year experience of medical support of this armed conflict has identified one of the main directions for further improvement of surgical care at the second level of the Ministry of Defense of Ukraine.

*The purpose of the study* is to develop proposals on the organizational and staffing structure of military mobile hospitals based on the analysis of medical support of combat operations at the II level of medical support during ATO (JFO) and to provide advanced surgical support groups with different options.

## Materials and methods

On the basis of MMH, a tactical-special, research exercise with the deployment of an advanced surgical support group (hereinafter - ASSG) was held to strengthen the medical units of the brigade with the task of working as a separate stage of medical evacuation. The advanced surgical support group, formed by the forces, means and personnel of the MMH, is mobile and able to function autonomously.

The main tasks of the ASSG according to the plan of tactical special exercises were:

- work in a certain area of responsibility, as a separate stage of medical evacuation;
- reduced amount of surgical care (II-a), which consisted of emergency surgical measures according to the protocols of damage control surgery (DCS) with simultaneous damage control resuscitation (DCR) to restore and stabilize vital functions;
- treatment and care of postoperative wounded, their preparation for further evacuation;
- strengthening the medical service of brigades;
- providing first aid to the wounded;
- constant communication between the medical units of the brigades and the institutions of the II and III levels of

medical support.

Structural subdivisions of ASSG:

- *management* (2 people: group leader - surgeon and assistant chief - head of technical support);
- *sorting and evacuation department* (16 people: surgeon, 2 general practitioners, 2 nurses, nurse);
- *stabilization department* (5 people: 2 anesthesiologists, 2 anesthesiologists, 1 nurse);
- *operating and dressing department* with AP 2 on the basis of GAZ-66 (5 people: 1 surgeon, 1 orthopedist-traumatologist, 2 operating nurses, 1 nurse);
- *support units*: communication unit P 142 N based on GAZ-66 (3 people: 1-senior radio operator, 1-mechanic telephone operator, 1-electrician driver); technical support unit (7 people).

The total number of ASSG personnel was 38 people.

*Road transport*: special communication vehicle R-142 N based on GAZ-66; special car AP-2; special car DDA-3 on the basis of ZIL - 131 (subject to the deployment of the unit, for a period of more than 72 hours); AVC-1.7 based on GAZ-3309; KAMAZ-4310 truck - 2 cars; "LAZ 695-N" bus; ambulance Volkswagen T4 (class C); ambulance BOGDAN 2251 - 3 cars (class A).

The total number of motor vehicles is 11, including 4 ambulances.

The main functional subdivisions of the ASG deployment camp are presented in Figure 1.

*Main functional subdivisions*:

*Sorting site* (sorting tent) is designed to receive and sort the wounded. The wounded were registered, medical tactics and evacuation were determined.

*Anti-shock room* is designed to provide a set of anti-shock and resuscitation measures, preparation of the wounded for surgery and temporary stay of the seriously injured in the postoperative period (not more than 4 people) before evacuation.

*The operating room* is designed for surgical interventions for urgent indications, designed for 2 operating tables for one two-doctor or two one-doctor teams.

*Tent for bedridden* wounded who need medical supervision.

*The evacuation room* is designated for the stay of the lightly wounded before further evacuation. The location of sitting and lying wounded is possible.

According to the legend of the study, six wounded of different severity were admitted simultaneously: 1 was diagnosed with a thoracoabdominal injury, 1 with a penetrating eye wound, 1 with a gunshot fracture of the tibia without damage to the vascular bundle and 3 with a soft wound. tissues of the extremities.

After sorting and registration, three patients were sent to anti-shock room, where get a set of anti-shock measures. After that, surgical interventions were performed: first - to the wounded with thoracoabdominal injury, secondly - to the wounded with skeletal trauma. The lightly wounded were treated in a special AP-2 car. The victim with a

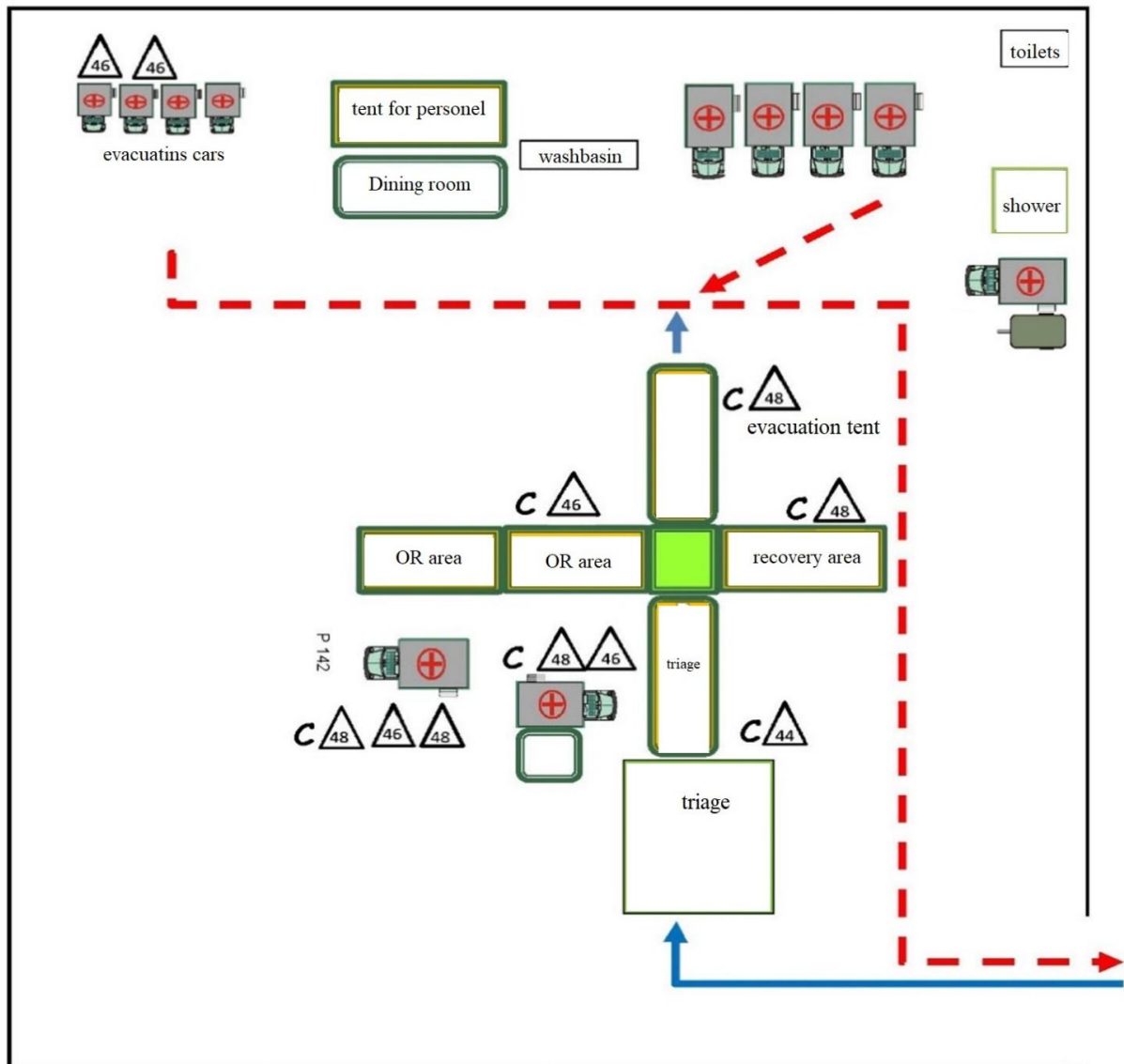


Fig. 1. Deployment scheme of the advanced surgical support group.

penetrating eye injury was given a set of anti-shock measures with subsequent evacuation, primarily to provide specialized medical care.

After receiving medical treatment, the victims with eye injuries and thoracoabdominal injuries were evacuated before the evacuation, the injured with shin bones were placed in a tent for temporary stay, and the lightly injured were in the evacuation tent.

### Results

During the ATO (JFO), with a small number of average daily sanitary losses (about 10 wounded), they made adjustments to the deployment scheme, while the medical company of the brigade, as a stage of medical evacuation never deployed. The wounded, after receiving the first level of medical care, were taken to the military mobile hospitals (MMH) with a delivery time of 2-4 hours. Some of the

wounded who needed surgical care for urgent indications (up to 1 hour) were admitted to communal medical institutions (CDH), which were reinforced by nursing teams (surgeon, anesthesiologist, operating room nurse, anesthesiologists). At the same time, diagnostic, medical, personnel, and communal resources of medical institutions were used. In essence, these are advanced surgical teams that work on the basis of inpatient facilities.

In addition, a theoretical field support team capable of working in the field, based on the brigade's medical company, using its support units, was theoretically envisaged. This would allow medical companies to provide first aid and carry out emergency surgical measures (II-a) in the amount of damage control surgery (DCS), stabilize their condition and prepare for evacuation to the MMH. But the Armed Forces of Ukraine have no practical experience in building such a version of the Ministry of Health.

*The second level of medical care* involves the provision of surgical care for urgent and delayed indications in a military mobile hospital by surgeons within 2-4 hours after injury. The following tasks are assigned to the medical units of the second level: evacuation "on oneself" and sorting of the wounded and sick; resuscitation, stabilization and supportive treatment of those wounded, injured and sick who need further evacuation; treatment of the wounded and sick with short periods of recovery; regulated list of surgical care measures to save life, limbs and organs of vision, intensive care, dental care, laboratory and radiological examinations, transfusions of blood and blood substitutes in accordance with the standards of emergency medical care. Includes reduced and complete surgical care. The reduced volume (II-a) consists of urgent surgical measures according to the protocols of damage control surgery (DCS) with simultaneous DCR to restore and stabilize vital functions, and full - of urgent and delayed II (a+b) surgical measures.

To meet the basic criteria of timeliness of medical care [2, 5, 9], in anticipation of significant sanitary losses of the surgical profile, civilian hospitals (CDH, CH) or medical companies of teams can be strengthened by advanced surgical support groups. They are formed in order to bring surgical care closer to the battle formations, are maintained and operate at military mobile hospitals.

During the local war with the use of all Armed Forces, with the formation of the front line and active combat operations, when the average daily sanitary losses (SL) can reach two to three thousand wounded, one of the factors affecting the timeliness of surgical care will be organizational and staffing structure mobile hospitals with advanced surgical support teams (ASSG) as part of reinforcement units.

We propose to consider 3 options for the use of ASSG: stationary (A), field (B) and as a stage of medical evacuation (C).

ASSG (letters A) - is designed to provide surgical care for urgent indications (level II), in order to reduce the time from injury to surgery. It is not designed to perform self-deployment, and does not perform the function of evacuation "on its own". If it is possible to provide surgical care on the basis of a civilian hospital (CDH), the latter is reinforced by the advanced surgical group of the letter A.

The ASSG-A includes: medical staff - 4 servicemen (surgeon - 1 (group commander), orthopedist-traumatologist - 1, anesthesiologist - 1, general practitioner (possibly surgeon) - 1); paramedics - 3-4 servicemen (operating nurse - 1, anesthesia nurse - 1, nursing nurse - 1); technical staff - 2-3 people (driver-nurse - 1-2, driver-telephone operator - 1). Personnel 8-10 servicemen.

Readiness for work should be 1-2 hours after arrival at the deployment site, the ability to perform up to 10 surgeries per day and intensive care for 2-4 wounded for 6 hours. Logistical support and security of the unit should be provided by the forces and means of MMH.

ASSG (letter B) - is designed to provide surgical care for emergency indications (II-a), based on the medical company of the team, deployed as SME, in order to reduce the time from injury to surgery. It is not intended for self-deployment, and the function of sorting, evacuation "on yourself", sanitation, all types of support are performed by the relevant units of the medical company of the brigade.

The ASSG-B consists of: medical staff - 5 servicemen (2 surgeons) (including the group commander), 1 orthopedist-traumatologist, 1 anesthesiologist, 1 general practitioner (possibly a surgeon); medical staff - 6-7 servicemen (operating nurse - 2, anesthesia nurse - 2, nursing nurse (registrar) - 2, radiologist - 1), technical staff - 9-10 people (drivers, paramedics, telephone mechanic, etc.). Personnel 20-22 servicemen.

Readiness for work should be 2-4 hours after arrival at the deployment site, the ability to perform up to 10 surgeries per day and intensive care for 4-6 people for 6 hours with the possibility of autonomous work for 72 hours. Logistical support and security of the unit should be provided by the forces and means of medical company brigades, medicines and property - MMH.

ASSG (letters C) - is designed to provide surgical care for urgent indications (level II), early stabilization of the seriously injured and evacuation on the principle of "from yourself". It is deployed as an independent SME on medical evacuation routes during active hostilities, accompanied by massive sanitary losses, at a distance of 12-16 km from the line of contact in order to strengthen the medical service of the military and is actually the first line of MMH deployment. The tasks of ASSG-C are: medical sorting, perioperative resuscitation measures, direct surgical care in a certain amount, postoperative care and stabilization of the wounded, further evacuation of the wounded, support of interaction with medical units and units in the area of responsibility of ASSG-C.

The ASSG-C consists of: the head of the ASSG (surgeon); medical staff - 7 servicemen (surgeon - 2, orthopedist-traumatologist - 2, anesthesiologist - 2, general practitioner - 1); paramedics - 12 servicemen (operating nurse - 3, anesthesiologist nurse - 2, registrar nurse - 2, surgical patient care nurse - 3, clinical laboratory assistant - 1; X-ray laboratory assistant - 1); technical staff - 18 people (drivers, paramedics, telephone mechanic, etc.). The personnel are 38 - 40 servicemen.

Readiness for work should be 4-6 hours after arrival at the deployment site, the ability to perform up to 15-20 surgeries per day and intensive care of 6-8 wounded for 6 hours. Logistical support, all types of medical support and security of the unit should be provided by the forces and means of MMH.

## Discussion

Advanced surgical groups or their analogues existed in the Armed Forces of many countries. During World War II, experts from the US Armed Forces proposed the concept

of mobile surgical units that would be able to perform 100 operations on wounded servicemen near the front line [12]. After completing the tasks, these units provided time to restore their combat capability (rest of personnel, renewal of medical supplies). Later, the Royal British Army's Medical Service introduced the first advanced surgical teams in the British Airborne Division, which was involved in the operation in North Africa [15]. In 1982, the British Armed Forces used advanced surgical teams during an operation in the Falkland Islands [14].

Prior to the widespread introduction of advanced surgical teams, the main surgical facility (saving lives, stabilizing the wounded in the field) was the Mobile Army Surgical Hospital (known as MASH). These hospitals were widely used during World War II, the Korean War, and the Vietnam War. At the same time, due to the cumbersome deployment and lack of mobility, MASH hospitals have ceased to meet the requirements of modern military conflicts (US invasion of Grenada, Gulf War) [5].

Following the low-scale use of MASH hospitals in Panama, Haiti and Kosovo, these Level 2 hospitals have been almost completely supplanted by advanced surgical teams (FST, FRSS, MFST) [4, 12, 15].

Modern advanced surgical teams are highly mobile surgical units that are designed to provide medical support to brigades (regiments, units of Special Operations Forces), namely to carry out surgical interventions in the amount of "damage control" aimed at saving lives and limbs. According to US logistical support principles, advanced surgical teams are typically used as Level 2 medical care units to provide primary surgical care for combat injuries to wounded evacuated directly from the military or from medical mouths during the initial phase of a military operation and deployed. at a distance of 3-5 km from the advanced combat units (units) [3]. After the stabilization of the operational situation, it becomes possible to deploy combat support hospitals (known as CSHs), where it is possible to provide expanded surgical care [14, 15].

The formation of advanced surgical groups in the structure of the Medical Forces of the Armed Forces of Ukraine is particularly acute in the context of the existing armed conflict on the territory of Ukraine.

Thus, the advanced surgical support groups (ASSG) provide the provision of surgical care at the second level, stabilization of the wounded with subsequent evacuation to the SME of higher levels of medical care. They are formed by military-mobile hospitals and perform tasks as part of the latter or in separate groups. The best option for the deployment and use of ASSG is the use of modern surgical modules of the container type, or special vehicles [8, 16].

The order for the deployment of the ASSG and the unit to which the ASSG is attached are issued by the head of the medical service of the troop group.

*Possibilities of ASSG:*

- rapid deployment and approach of surgical care to

the line of combat at a distance of 12-16 km;

- provision of surgical care at the second level, which includes:

- for soft tissue injuries: primary surgical treatment of the wound with the achievement of stable hemostasis; fasciotomy for massive muscle damage; limb immobilization;

- in case of chest injuries: drainage of the pleural cavity with intense pneumothorax; thoracotomy for ongoing bleeding, heart injuries, damaged large bronchi;

- in case of combat trauma of the abdomen: laparotomy of the wounded with damage to internal organs in severe and extremely serious condition by the technology of damage control surgery (bleeding control and contamination control);

- for skeletal trauma: application of plaster casts, external fixation devices for pelvic fractures of type B and C, for fractures of the thigh and shin, fasciotomy at the risk of compartment syndrome;

- for injuries of the genitourinary system: nephrostomy, epicystomy, nephrectomy - in cases of injuries of IV-V degrees according to AIS;

- in case of injuries of the main vessels: ligation of vessels in compensated ischemia, temporary shunting in decompensated ischemia, amputation in irreversible ischemia;

- in case of massive third-degree burns of the extremities and chest, striped incisions in the extremities and necrotomy to ensure the completeness of the excursion of the chest.

The ASSG should include surgeons, orthopedists, traumatologists, anesthesiologists, general practitioners, operating room nurses, anesthetists, nurses caring for surgical patients, and personnel of support units.

The quantitative composition of the ASSG (group letters) should depend on the operational and tactical circumstances, the possibility of providing medical care and the decision of the head of the medical service of the group.

Readiness for work, depending on the kit, the seasons should range from 2 to 4 hours upon arrival at the deployment site, with the ability to perform up to 10 surgeries per day (letters A and B) and up to 20 surgeries (letters C). Possibility of simultaneous intensive care for 4 wounded (letters A and B) and up to 8 people (letters C) for 6 hours. Inventory is designed for autonomous work up to 72 hours.

Execution of X-ray and laboratory examinations by the forces and means of ASSG is possible when deployed in versions (letters B and C).

Logistical support and security of the unit is provided by the forces and means of VMG during deployment in variants (letters A and C), during deployment in variant (letters B) by forces and means of Medrb and MMH.

ASG is a stable unit with a clear and unchanging organizational and functional structure. The rapidity of possible changes at the tactical level may necessitate

improvements in the organization of the unit, which requires further analysis and development of options to improve ASG.

### Conclusion

1. The advanced surgical support group strengthens the stages of medical evacuation of the first level of medical support and brings surgical care closer to the line of contact

with the enemy, to reduce the evacuation route of the wounded and implement the concept of "golden hour" in combat.

2. In the face of rapid changes in medical and tactical circumstances, the advanced surgical support team must be autonomous, mobile and equipped with standard regular equipment and compact medical equipment.

### References

- [1] Antypenko, V. S., Humanenko, E. K., & Eriukhyn, Y. A. (2004). *Военно-полевая хирургия [Military field surgery]*. СПб: Фолиант - SPb: Folio.
- [2] Bilyi, V. Ya., & Zarutskiy, Ya. L. (2018). *Военно-польова хірургія [Military field surgery]*. Київ, "Фенікс - Kyiv: "Phoenix".
- [3] Bilyi, V. Ya., Zarutskiy, Ya. L., Denysenko V. M., & Sobko I. V. (2005). Основні положення військово-медичної хірургічної доктрини [The main provisions of the military medical doctrine]. *Військова медицина України - Military medicine of Ukraine*, (1), 20-28.
- [4] Bohman, H. R., Stevens, R. A., Baker, B. C., & Chambers, L. W. (2005). The US Navy's forward resuscitative surgery system during Operation Iraqi Freedom. *Military medicine*, 170(4), 297-301.
- [5] Borden Institute, Center and School of Medical Administration of the United States Army. (2015). *Невідкладна військова хірургія (переклад з англ.) [Emergency Military Surgery (translated from English)]*. Київ, Видавничий дім "Наутилус" та Мистецька агенція "Наш Формат" - Kyiv: "Nautilus" Publishing House and "Nash Format" Art Agency.
- [6] Headquarters, department of the army. (2003). *Employment of Forward Surgical Teams: Tactics, Techniques, and Procedures (FM 4-02.25)*. Washington: CreateSpace Independent Publishing Platform.
- [7] Injuries, V. (2013). *Emergency War Surgery Fourth United States Revision 2013*. Borden Institute US Army Medical Department Center and School Fort Sam Houston, Texas Office of The Surgeon General United States Army Falls Church, Virginia.
- [8] Khalyk, S. V., Rychka, O. V., & Kozeev, E. S. (2007). Проблемные вопросы разворачивания мобильного военного госпиталя во время научно-практических учений (г. Винница, 2006 г.) [Problematic issues of deploying a mobile military hospital during scientific and practical exercises (Vinnitsa, 2006)]. *Проблеми військової охорони здоров'я - Problems of health protection*, (18), 136-144.
- [9] King, B., & Jatoi, I. (2005). The mobile Army surgical hospital (MASH): a military and surgical legacy. *Journal of the national medical association*, 97(5), 648-656.
- [10] Kravchenko, O. V., Vadiuk, M. I., & Sereda, I. K. (2006). *Принцип застосування мобільного військового госпіталю Збройних Сил України: Навч. посіб. [The principle of application of the mobile military hospital of the Armed Forces of Ukraine: Textbook]*. К.: УВМА - K.: UVMA.
- [11] Manual, F. (1994). Manual 8-55: Planning for Health Service Support. Washington, DC, US Department of the Army.
- [12] Pratt, J. W., & Rush Jr, R. M. (2003). The military surgeon and the war on terrorism: a Zollinger legacy. *The American journal of surgery*, 186(3), 292-295.
- [13] Roshchin, H. H. (2005). *Мобільний медичний загін державної служби медицини катастроф територіального рівня: Методичний посібник [Mobile medical detachment of the state service of disaster medicine of the territorial level: Methodical manual]*. Київ, 2005 - Kyiv, 2005.
- [14] Schoenfeld, A. J. (2012). The combat experience of military surgical assets in Iraq and Afghanistan: a historical review. *The American journal of surgery*, 204(3), 377-383.
- [15] Stinger, H., & Rush, R. (2006). The Army forward surgical team: update and lessons learned, 1997-2004. *Military medicine*, 171(4), 269-272.
- [16] Ushakov, Y. B., Murashev, N. V., & Sydorov, V. A. (2002). Современные мобильные медицинские комплексы для оказания квалифицированной медицинской помощи [Modern mobile medical complexes for the provision of qualified medical care]. *Военно-медицинский журнал - Military Medical Journal*, 323(12), 55-60.
- [17] Verkhovna Rada of Ukraine. (2004). *Воєнна доктрина України [Military doctrine of Ukraine]*. К.: Офіційне видання Верховної Ради України - K.: Official publication of the Verkhovna Rada of Ukraine.
- [18] Zarutskiy, Ya. L., & Shudrak, A. A. (2014). *Вказівки з військово-польової хірургії [Guidelines for military field surgery]*. К.: СПД Чалчинська НВ - K.: SPD Chalchynska NV.