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Psychological resilience and mentalization of military surgeons under combat stress: a multidisciplinary approach to overcoming emotional burnout

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Abstract. Background. Military surgeons work in extreme conditions where limited resources, constant time constraints, and life-threatening situations are part of everyday reality. This situation requires not only impeccable professional training, but also a high level of psychological resilience, the ability to adapt quickly, and to act effectively under pressure. The purpose of the study is to conduct a retrospective analysis of scientific sources on psychological resilience and mentalization ability in military surgeons as factors contributing to reducing the level of emotional burnout in combat stress conditions and to prove the effectiveness of a multidisciplinary approach to maintaining the mental health of medical personnel. **Materials and methods.** The study was based on an analysis of domestic and foreign scientific works using the PubMed and Google Scholar databases for 2008–2025, as well as a bibliometric, analytical, systematic, and statistical approach. The literature search was conducted using the keywords: “military surgeons”, “adaptation to combat, extreme conditions”, “emotional burnout”, and “psychological resilience”. A survey of 18 military surgeons (Role 1) was conducted to establish professional burnout syndrome using the validated diagnostic method of O. Chaban and the questionnaire “Adaptability-200”. Data processing was performed using Excel and Statistica software, and statistical reliability of the results was verified using Spearman’s nonparametric rank correlation coefficient. **Results.** Correlation analysis using Spearman’s rank correlation coefficient revealed a statistically significant linear relationship between the questionnaire score and the age of respondents, as well as their work experience, indicating the influence of these factors on the formation of emotional burnout syndrome. The results of the study of psychological stability and adaptive potential showed the presence of the following characteristics in the study sample: 20.0 % of respondents demonstrated signs of nervous and mental instability; 40.0 % had reduced communication potential; 20.0 % exhibited reduced level of moral and ethical normativity; 20.0 % reported a low level of military and professional focus; 20.0 % had pronounced deviant behavioral traits; 20.0 % showed markers of increased risk of suicidal behavior. The data obtained indicate the need for systematic psychological support for personnel and the implementation of targeted correctional and rehabilitation programs within the military medical environment. **Conclusions.** Preserving the human resources of military medicine, particularly surgeons, is a strategic task for Ukraine’s defense system. The effectiveness of medical care in combat zones is largely determined by the professional training and psychological resilience of personnel working in high-risk conditions with limited resources.

Keywords: military surgeons; emotional burnout; psychological resilience; adaptation to combat and extreme conditions; resource scarcity; multidisciplinary approach; mentalization



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Introduction

Modern armed conflicts, in particular the full-scale war in Ukraine, have placed new demands on the professional activities of military medics, especially surgeons working in combat zones. Military surgeons operate in conditions of increased risk, limited time, lack of resources, and constant threat to life, which requires not only a high level of professional skill, but also the ability to adapt psychologically and manage stress [1].

The issue of medical personnel adaptation to extreme conditions has become particularly important in light of the armed conflicts of recent decades. Studies show that military surgeons are regularly exposed to stressors such as mass casualties, resource constraints, emotional exhaustion, and traumatic events, which contribute to the development of post-traumatic stress disorder (PTSD), burnout, and professional maladjustment [2, 3].

At the same time, highly developed professional skills, algorithms for action in critical situations, and a system of psychological support help reduce the negative impact of combat stress on the effectiveness of military surgeons [4].

Building resilience and developing self-regulation skills are key factors in maintaining the combat readiness of medical personnel in wartime [5].

Thus, research into the psychophysiological, professional, and organizational aspects of military surgeons' activities in combat conditions is extremely relevant for improving the effectiveness of medical care and preserving the health of the medical personnel.

The purpose of the study is to conduct a retrospective analysis of scientific sources on psychological resilience and mentalization ability in military surgeons as factors contributing to reducing the level of emotional burnout in combat stress conditions and to substantiate the effectiveness of a multidisciplinary approach to maintaining the mental health of medical personnel.

Materials and methods

The study was based on an analysis of domestic and foreign scientific works using the PubMed and Google Scholar databases for 2008–2025, as well as a bibliometric, analytical, systematic, and statistical approach. The literature search was conducted using the keywords: “military surgeons”, “adaptation to combat, extreme conditions”, “emotional burnout”, and “psychological resilience”. A survey of 18 military surgeons (Role 1) was conducted to establish professional burnout syndrome using the validated diagnostic method of O. Chaban and the questionnaire “Adaptability-200”. Data processing was performed using Excel and Statistica software, and the statistical reliability of the results was verified using Spearman's nonparametric rank correlation coefficient.

Results

Based on the results of a survey of military surgeons who served in combat zone and provided surgical care in conditions of resource scarcity, an assessment was made of their level of professional burnout [6] and degree of adaptation to extreme professional stress [7].

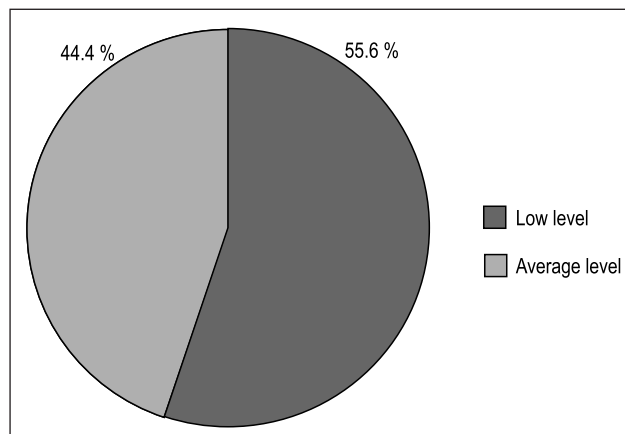


Figure 1. Levels of occupational burnout risk among military surgeons

The assessment was carried out using a standardized psychodiagnostic questionnaire that provides an integrated quantitative indicator of professional burnout syndrome in the range from 0 to 87 points. A higher total score is considered as a higher level of burnout symptoms.

In order to interpret and summarize the results, the values obtained were conditionally divided into risk levels according to the specified ranges (Fig. 1):

1. A low risk of developing professional burnout syndrome (0–29 points) indicates minimal emotional and physical exhaustion, as well as a high ability to adapt to professional stress. Ten respondents (55.6 %) who are military surgeons were included in this category. Their individual scores ranged from 24 to 29 points, demonstrating the presence of adequate mechanisms of psychological stability and effective adaptation to the extreme conditions of professional activity.

2. The average risk level (30–59 points) reflects the presence of moderate psycho-emotional stress (pre-illness), which, although not reaching a clinically significant level, indicates potential threats to the psycho-emotional state and the need for psychoprophylactic measures. Eight respondents (44.4 %) fell into this group. In most of them (6 people), the level of burnout was at the lower end of the average range — from 30 to 32 points (75.0 %).

The data of two surgeons who showed the highest scores among the entire sample — 40 points each (25.0 %) — deserve special attention. These results may indicate pronounced psycho-emotional tension (signs of illness), which is already close to a high risk of developing burnout syndrome, which may be the result of:

- intense and prolonged exposure to combat stress factors;
- a high level of responsibility for the lives of the wounded in conditions of limited resources;
- significant professional experience with accumulated experience in critical situations;
- overwork due to staff shortages, which is especially common during wartime.

All respondents show signs of burnout. The overall average score was 27.50 ± 14.12 , with a margin of error of 3.33.

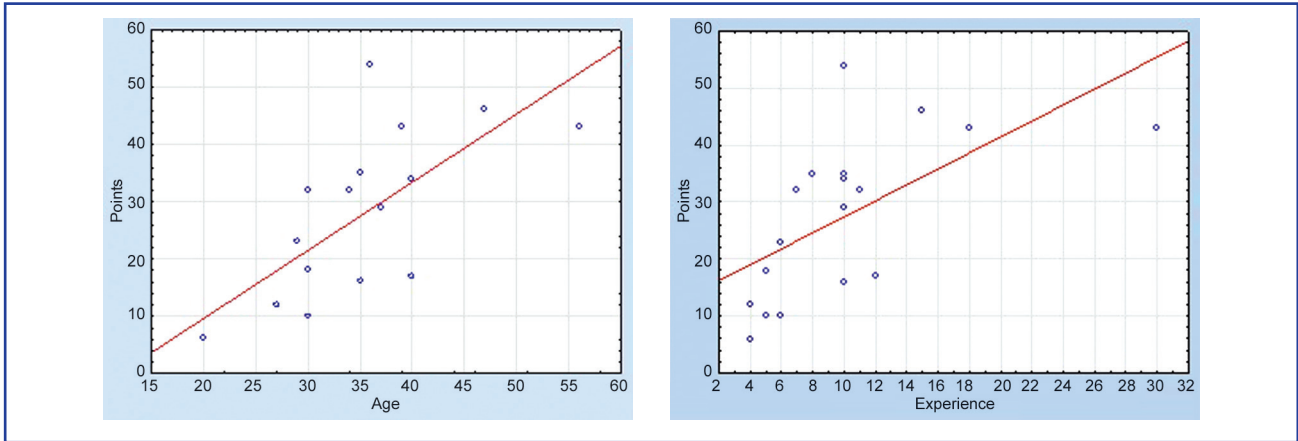


Figure 2. Correlation analysis according to Spearman's rank correlation coefficient for the formation of professional burnout syndrome

The minimum score was 6, and the maximum score was 54. Considering the number of questions related to each factor, the most influential symptoms were professional dissatisfaction (6.17 ± 4.90), emotional and volitional symptoms (5.56 ± 3.55), symptoms of fatigue and feeling of lack of time (3.33 ± 1.28), depersonalization and derealization (3.5 ± 3.0) (Table 1).

Table 1. Factor analysis of professional burnout among military surgeons (points)

Symptoms	M \pm m
Symptoms of professional dissatisfaction	6.17 ± 4.90
Emotional and volitional symptoms	5.56 ± 3.55
Symptoms of fatigue and feeling of lack of time	3.33 ± 1.28
Symptoms of depersonalization and derealization	3.5 ± 3.0
Asthenic-depressive symptoms	2.28 ± 2.05
Symptoms of anxiety	1.89 ± 1.23
Symptoms of the need for solitude and withdrawal from people	2.22 ± 1.48
Symptoms of dissatisfaction with monetary compensation	1.61 ± 1.79
Symptoms of the desire for rest	1.17 ± 0.79
Symptoms of positive moral attitudes toward dedication to work	0.28 ± 1.18

Correlation analysis according to Spearman's rank coefficient revealed a clear linear dependence of the questionnaire score on the age of respondents and their work experience in terms of developing emotional burnout syndrome: the correlation coefficient r_s was 0.69 and 0.71 for age and work experience, respectively ($p < 0.05$) (Fig. 2, 3).

The influence of respondents' age and work experience on the quantitative assessment of the questionnaire, and thus the chances of developing burnout syndrome is demonstrated visually using a wafer plot diagram (Fig. 3).

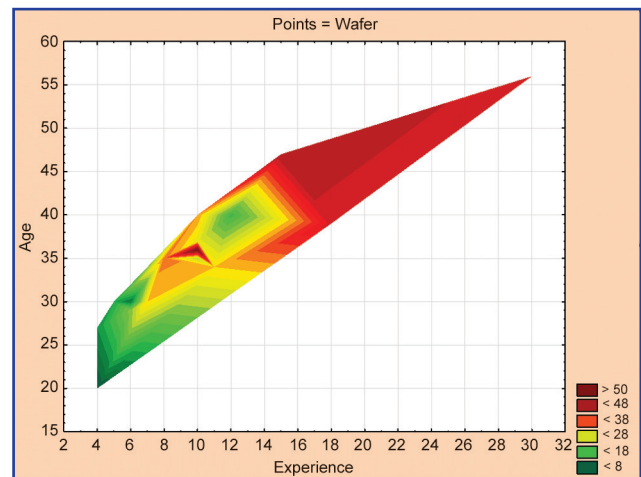


Figure 3. Visual demonstration of the influence of age and experience of military surgeons on the development of professional burnout syndrome

The research data shows that a significant proportion of respondents are in a state of chronic emotional exhaustion, although a critical level requiring immediate clinical intervention has not yet been reached. At the same time, the trend toward increasing burnout is evident and requires preventive attention from military medical and psychological services.

These factors are typical for military surgeons who work in an extremely stressful environment, where constant tension, rapid decision-making on matters of life and death, and a lack of time and resources create extremely high psychological pressure. In addition, constant contact with traumatized military personnel, difficult clinical cases, moral dilemmas, and emotional involvement significantly reduce internal reserves of adaptation.

The results of the study confirm that the specificity of the professional activity of military surgeons is a combination of high professional responsibility, the need to make quick decisions in conditions of uncertainty, and physical

and emotional overload. The combination of these factors objectively increases the risk of professional burnout even in experienced specialists.

To assess the level of psychological stability and personal adaptation potential of military surgeons who provided surgical care in the combat zone, it was proposed to conduct a survey using the multilevel personal questionnaire "Adaptability-200" [7].

The professional activity of military surgeons is characterized by a high degree of psycho-emotional stress and the need to make quick decisions in critical situations, accompanied by significant responsibility for the lives and health of the wounded. In such conditions, the assessment of the adaptive resources and psychological stability of specialists becomes particularly important.

An analysis of the reliability scale of responses revealed that 20.0 % of surgeons demonstrated a high level of objectivity and sincerity in their responses, indicating adequate self-perception and openness. A total of 40.0 % of the study participants showed a generally sufficient level of sincerity, but with signs of social desirability, which may indicate a certain correction of responses in the direction of socially acceptable attitudes. For the remaining 40.0 % of respondents, the results need to be interpreted with caution due to a pronounced desire to demonstrate socially acceptable behavior, which may significantly affect the reliability of the data obtained (Fig. 4).

The study found that the average behavioral regulation score was 46.9 points, indicating a generally sufficient level of regulatory mechanisms for adaptive behavior among military surgeons. In 60.0 % of respondents, an average and sufficient level of neuropsychic stability was established, which ensures the preservation of professional effectiveness even under conditions of intense psycho-emotional stress. These surgeons are able to maintain self-control, make informed decisions, and maintain optimal performance in stressful situations, which is especially important for effective functioning in a combat zone (Role 1).

20.0 % of the respondents showed a high level of tolerance to stress factors, which is extremely valuable in professional activities related to surgical interventions in combat conditions, where uncertainty, risk, and physical overload are dominant factors. Such specialists, as a rule, demonstrate high emotional self-regulation, the ability to mobilize resources in critical circumstances, and rapid adaptation to a changing external environment.

At the same time, 20.0 % of participants showed signs of behavioral and neuropsychiatric instability, manifested in reduced stress tolerance, rapid exhaustion, and difficulties in adapting to new or complex conditions. In such cases, adaptation processes may be dysfunctional, potentially posing the risk of impaired professional performance and the development of psychological maladjustment, especially in conditions of chronic or combat stress.

According to the questionnaire, the communicative potential of military surgeons averaged 14.8 points, which corresponds to the overall average level of communicative competence development. 40 % of respondents demonstrated a sufficient level of communication skills, allow-

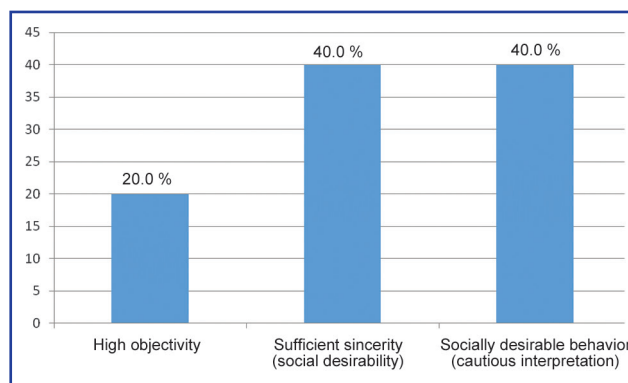


Figure 4. Analysis of the reliability scale among military surgeons

ing them to interact effectively with colleagues, coordinate team actions, and engage in constructive professional communication under pressure and time constraints.

20.0 % of military surgeons had a high level of communicative flexibility, the ability to easily establish interpersonal contacts, maintain a positive psychological climate in the team, and respond adequately to social stimuli. This contributes to stable interpersonal relationships and effective teamwork under stressful conditions.

At the same time, 40.0 % of respondents demonstrated a reduced level of communicative potential, which may indicate difficulties in building interpersonal relationships, low flexibility in communication, and limited ability to interact openly. Such characteristics may complicate effective professional activity in a team, reduce the level of social support, and affect adaptation in extreme conditions. At the same time, in most cases, reduced communicativeness was not accompanied by pronounced maladjustment, and participants demonstrated the ability to respond adequately to constructive criticism and partially self-correct their behavior.

Moral and ethical normativity as a component of personal adaptation potential averaged 10.2 points in the sample, of respondents, which corresponds to the average level of socialization and moral orientation. In 60.0 % of military surgeons, a sufficient level of moral normativity can be observed, which manifests itself in an orientation towards socially acceptable patterns of behavior, adherence to ethical standards of professional activity, and discipline. Such specialists are able to function effectively within the social norms and requirements of military service.

20.0 % of participants demonstrated a high level of moral and ethical normativity, indicating internal integration of moral values, willingness to subordinate personal interests to group (team) needs, a high level of responsibility, and motivation to adhere to professional ethical standards.

At the same time, 20.0 % of respondents showed a reduced level of socialization, characterized by the dominance of personal interests over collective ones, a lower willingness to submit to group (team) norms, and a potential tendency toward individualistic or non-conformist behavior patterns. This can complicate the process of social adaptation and interaction in the context of the rigid organizational structure

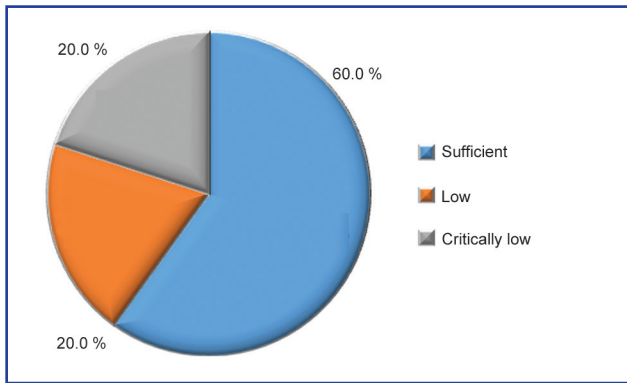


Figure 5. Level of combat stress resilience among military surgeons

of military service, especially in situations that require clear team coordination.

Additional indicators of the psychological functioning of military surgeons were determined:

1. Military-professional orientation.

The average score on the military-professional orientation scale was 16.5, which indicates a predominantly sufficient level of professional motivation among the respondents. 80.0 % of surgeons showed a pronounced orientation toward professional activity, manifested itself in a positive attitude toward military service, an understanding of its significance, and a willingness to continue professional careers in conditions of increasing demands and risks. These participants demonstrate a formed professional identity and internal motivation to realize themselves within chosen profession.

At the same time, 20.0 % of military surgeons showed a low level of military-professional orientation, which may indicate insufficient satisfaction with professional activities, doubts about further stay in the military medical system, as well as the risk of professional burnout. In some cases, there is a tendency to distance from one's professional role, which is a critical factor in the formation of adaptation difficulties in the future.

Therefore, attention should be paid to measures to support professional motivation and prevent emotional exhaustion, in particular through the implementation of psychological support programs, professional mentoring, and corrective work with respondents who show signs of professional maladjustment.

2. Tendency to deviant behavior.

The average score on the scale of propensity for deviant behavior was 16.8 points. 60.0 % of respondents showed no signs of deviant behavior, indicating stable social norms and values, a high level of self-control, and constructive strategies for interpersonal interaction. These individuals demonstrate socially acceptable behavior and a low likelihood of destructive reactions in critical situations.

However, 20.0 % of military surgeons had isolated manifestations of aggression, impulsivity, or reduced self-control in their social behavior. Such signs may be a reaction to chronic psycho-emotional stress, professional stress, or maladjustment. Another 20.0 % of respondents

showed pronounced deviant traits, potentially indicating a risk of inappropriate responses in frustrating situations, a tendency to violate social norms, aggressive and confrontational behavior, and difficulties in establishing effective communication.

These results justify the need for in-depth psychological diagnosis and individual corrective work aimed at preventing deviant behavior and forming socially adaptive behavior patterns in military service.

3. Level of suicide risk.

The average score on the suicide risk scale was 8.9 points, which corresponds to a low level of threat of suicidal behavior among most participants. In 80.0 % of surgeons, there are no pronounced signs of destructive tendencies or manifestations of emotional maladjustment associated with suicidal intentions. These military personnel are usually characterized by a stable emotional background, the presence of a supportive social environment, and adaptive mechanisms for overcoming difficulties.

However, 20.0 % of respondents showed individual markers of increased suicide risk, including signs of interpersonal isolation, emotional exhaustion, difficulties in regulating stress, or low self-esteem. Although these manifestations are not critical, they can become relevant in crisis situations, particularly in conditions of combat stress, loss, or physical exhaustion. In such cases, the risk of transitioning to destructive forms of behavior increases.

These data indicate the advisability of organizing systematic psychological monitoring and individual support for military personnel who show signs of emotional instability, with the aim of early prevention of crisis situations and potential suicidal actions.

According to the results of the study, the average level of combat stress resistance among the military surgeons surveyed was 71.93 points, which corresponds to a satisfactory level (level 3) according to the criteria for assessing this parameter. This indicates the general ability of most respondents to maintain functional mental stability under the influence of combat and extreme factors, the effectiveness of professional activities in conditions of increased risk and emotional stress.

60.0 % of military surgeons were found to have a sufficient level of resistance to combat stress, which indicates the presence of established adaptation mechanisms, a high degree of personal maturity, the ability to regulate emotions, and to mobilize internal resources in combat conditions. Such specialists are able to effectively perform professional tasks in life-threatening conditions, high uncertainty, and information overload. They maintain critical thinking, quick decision-making, and adequate behavioral responses in complex situations.

20.0 % of respondents demonstrated low resistance to combat stress, indicating a barely acceptable level of adaptability that only partially meets the requirements of military activity in critical circumstances. Such individuals may experience periodic signs of maladjustment: emotional instability, sleep disturbances, decreased concentration, and difficulty making decisions in uncertain situations. These manifestations are usually not systemic, but with further

exposure to stressors, they can lead to the development of acute or chronic stress reactions.

The most vulnerable group was another 20.0 % of military surgeons who were found to have critically low levels of resistance to combat stress. In such cases, there are clear signs of nervous and mental instability, emotional exhaustion, increased sensitivity to frustration factors, and an inability to mobilize internal resources in difficult circumstances. These respondents are characterized by a reduced threshold of psycho-emotional endurance, which significantly complicates adaptation to combat conditions and may pose a threat to professional effectiveness in extreme situations (Fig. 5).

Discussion

A study by M. Ryu (2023) conducted among United States military surgeons who participated in combat operations in Afghanistan and Iraq during periods of intense combat losses found that 80.0 % of respondents were male. According to the results, 55.0 % of respondents provided surgical care during combat operations in Afghanistan, 45.0 % in Iraq, with 15.0 % of military surgeons having experience in both countries.

The study demonstrated high levels of psychological and emotional burnout associated with performing professional duties in resource-limited conditions according to medical protocols. The main factors contributing to emotional burnout were the effects of emotional stress caused by providing care to the seriously wounded, particularly in cases of multiple and combined injuries among American military personnel. Additional negative effects on the psychological state of medical personnel were caused by difficulties related to limited access to specialized care, lack of practical experience in performing certain surgical procedures, and problems in communication with the military command.

The consequences of psychological and emotional burnout manifested themselves in sleep disturbances, increased irritability, and difficulties in establishing and maintaining interpersonal relationships [8].

According to the results of a study by D.M. Modlin (2020) conducted among military surgeons, 64.0 % of respondents were men, 65.0 % were married, and 40.0 % had children. The overall level of professional burnout reached 66.0 %.

Analysis of open-ended responses showed that the main stress factor for survey participants was excessive workload due to non-clinical and administrative duties. At the same time, the most pronounced protective factor against burnout was support from colleagues. These data emphasize the need to optimize the organization of the work process and create a favorable professional environment, which are important measures for the prevention of emotional burnout among military surgeons [9].

A systematic review by A. Tam (2025) found that acute stress has a significant negative impact on the technical and non-technical skills of surgeons, both in simulation training and real clinical situations. Stress factors lead to an increase in the frequency of errors, prolongation of the duration of surgical interventions, impaired visual-motor coordination, and reduced teamwork efficiency. The main mechanisms of

this effect are cognitive overload and decreased motor accuracy, which in turn reduces the effectiveness of surgical procedures.

At the same time, experienced surgeons demonstrate a higher level of stress resistance, which is due to the automation of professional skills that allow them to maintain control and accuracy even under the influence of stress factors. It has been found that the introduction of mental practice techniques, stress management, and simulation training helps reduce the negative impact of stress on surgical activity [10].

According to a study by M. Jones (2008), during combat operations in Iraq, medical personnel of the British Armed Forces demonstrated a higher incidence of psycho-emotional disorders compared to military personnel of other specialties. Among medical personnel, 70.0 % reported psychological distress, 65.0 % had multiple somatic symptoms, and 60.0 % reported increased fatigue, particularly among men. At the same time, female medical personnel complained of fatigue less often than men (44.0 %).

The level of PTSD among medical personnel was not significantly related to the performance of professional duties, although 18.0 % of participants reported symptoms of PTSD, and 15.0 % reported alcohol abuse as a means of coping with psychological and emotional stress.

Psychological difficulties among medical personnel were largely due to low team cohesion (43.0 %), a high degree of traumatic experience (55.0 %), and difficulties in adapting after returning from the combat zone (50.0 %) [11].

According to a retrospective analysis by P. Cawkill (2015), among medical personnel of the British Armed Forces who served in combat zones in Iraq and Afghanistan, the prevalence of mental disorders such as psychological distress, PTSD, somatic symptoms, and alcohol abuse was 24.0 %, but when compared to rear located medics, the frequency of PTSD symptoms was 18.0 %. This result may be due to several factors, including the intensity of combat experience, the involvement of medical personnel in tasks that exceeded their professional skills and training, and the more difficult experience of psychological adaptation after returning from combat zones. Moreover, rear located medics more often reported feeling overwhelmed while performing their duties (60.0 vs. 45.0 % among frontline medics) and difficulties associated with returning to civilian life (53.0 vs. 39.0 %), which indicates an increased level of emotional exhaustion and vulnerability to the development of mental disorders among this category of military personnel and shows high stress resistance among military medics who served in combat zones [12].

The results of a study by A. Adler (2017) among US Armed Forces medical personnel involved in combat deployments in Afghanistan showed a high level of professional burnout. A survey conducted among military medics showed that 63.0 % of respondents reported high levels of emotional exhaustion and 55.0 % reported depersonalization, which are the main components of burnout. These indicators were closely correlated with high levels of perceived professional stressors.

The protective factors associated with lower levels of burnout were behavior focused on caring for one's own

well-being — 38.0 %, support within the team (team care) — 45.0 %, and effective leadership, particularly with an emphasis on promoting the psychosocial health of personnel — 57.0 %. These factors reduced the level of emotional burnout regardless of military rank, the presence of PTSD symptoms, and overall stress levels.

Of particular note is the impact of health-oriented leadership, which had an independent positive effect. Approximately 65.0 % of respondents who worked under such leaders reported a significant reduction in emotional burnout and improved psychosocial health [13].

A study by J. Tropic (2025) conducted among active-duty military orthopedic surgeons in the United States found emotional and professional burnout syndrome in 33.0 % of them. Among residents, this figure was significantly higher — 49.0 % compared to 26.0 % among senior physicians. Men predominated in the sample (82.0 %), while women accounted for only 18.0 %.

Analysis of the data showed that support from colleagues and management, as well as an optimal workload had a significant protective effect against the development of burnout syndrome. In particular, low levels of personal achievement were more common among general practitioners, while the likelihood of burnout was significantly lower among residents.

Regarding satisfaction with military service, only 50.0 % of doctors and 70.0 % of residents said they would choose a military career again, while 93.0 % of doctors and 86.0 % of residents confirmed their choice of orthopedics as a specialty [14].

The study conducted by V. Garbuzova (2024) was aimed at examining the psycho-emotional state of medical personnel at treatment and rehabilitation facilities for combatants involved in providing medical care in the context of full-scale aggression in Ukraine. It focuses on the impact of secondary traumatization and high levels of professional stress, which negatively affect the quality of medical services and the overall health of employees.

The results of the study showed that medical workers generally have an average level of resilience, with women showing slightly lower scores than men. According to the data for the subscales “perceived support”, “professional burnout”, “secondary traumatic stress”, and “moral distress”, these indicators are at a moderate level. At the same time, the group of nurses had a significant decrease in the feeling of support, accompanied by an increase in the level of secondary traumatization, burnout, and moral suffering. Doctors show high levels of satisfaction with compassion, while nurses and other workers have average values, with the lowest scores among nurses.

Data analysis confirmed that higher resilience is associated with greater satisfaction from compassion and better perception of support, while low resilience is a factor that increases the risk of professional burnout, secondary traumatization, and moral suffering. Thus, nurses are the most vulnerable category among medical personnel, prone to the development of professional burnout and secondary traumatization, which requires special attention to ensure their psycho-emotional support and prevention of mental disorders [15].

The ability of military surgeons to adapt to stressful factors is determined by the level of their adaptive resources, which include not only physical endurance, but also psychological readiness to work in conditions of increased risk, time constraints, and emotional pressure, which are characteristic of military field conditions. High adaptive abilities contribute to effective functioning in chronic stress inherent in combat or emergency situations.

A military surgeon is a specialist who combines general clinical competencies with the skills necessary for effective surgical care in combat conditions. Unlike civilian surgeons, their professional activity is characterized by the constant need to adapt to combat and extreme conditions, accompanied by significant logistical, organizational, and clinical limitations [16, 17].

One of the key challenges faced by a military surgeon is a shortage of resources: limited qualified personnel, lack of adequate technical support, and a shortage of medical supplies. In such conditions, surgeons are forced to make clinical decisions based on the available equipment, often improvising to preserve the viability of patients [18].

In addition, operating in remote or isolated combat zones without developed healthcare infrastructure complicates medical triage, evacuation of the wounded, and organization of postoperative care. It is particularly important for military surgeons to be able to stabilize patients' conditions until they can be evacuated to a hospital. A study by R.S. Kotwal (2018) analyzed the activities of military surgeons in Role 2 medical facilities of the US Armed Forces located in Afghanistan. According to the data obtained, among all fatal cases, 40.0 % of patients were in critical condition, 11.2 % were in serious condition, 0.8 % were in moderate condition, and less than 0.1 % were in mild condition.

Most deaths at the prehospital stage were classified as critical (66.3 %) or severe (25.9 %). At the same time, among the survivors, patients with mild (56.9 %) or moderate (25.4 %) severity of injuries prevailed.

Overall, 14.0 % of fatalities occurred during the pre-hospital phase: 5.8 % before transport and 8.2 % during transport. The remaining 86.0 % of deaths occurred in Role 2 medical facilities after evacuation.

Among fatalities for which the time of transport was documented, the median was 53.0 minutes. Meanwhile, most patients (61.7 %) were evacuated within 60 minutes after injury [19].

The specific nature of combat trauma also places an additional burden on military surgeons. In particular, combined mine-blast, gunshot, and burn injuries require a multidisciplinary approach and rapid decision-making [20]. Such injuries are often accompanied by massive bleeding, damage to large vessels, abdominal organs, the chest, or the central nervous system, which significantly complicates surgical tactics [21, 22].

The professional activities of a military surgeon in combat conditions are extremely complex and require a combination of a high level of clinical competence, adaptability to extreme circumstances, and crisis management skills. The effective functioning of military surgeons is a critical factor in reducing mortality among the wounded in combat conditions.

A study by A. Ramasamy (2010) analyzed the distribution of surgical interventions by specialty in military conditions. According to the results, orthopedic operations had the largest share — 66.0 %, while general surgical interventions accounted for 21.0 %, head and neck operations — 6.0 %, burn operations — 5.0 %, and other interventions — 4.0 %. The author also notes that the surgical workload nearly doubled during the second year of combat operations compared to the first year of the armed conflict in Afghanistan.

A. Ramasamy found that the nature of the injuries and the range of surgical skills required far exceed those typically used in clinical practice in the UK National Health Service. In this regard, various strategies are proposed for the training of future military surgeons. These include sending trainee doctors to military hospitals and introducing more targeted courses in military surgery tailored to the needs of combat conditions [23].

In a study by O. Barbier (2018), a retrospective analysis of the surgical activities of orthopedic surgeons during three large-scale French military operations (Afghanistan, Mali, Central African Republic) was conducted. The volume of surgical interventions, the nature of injuries, the status of patients, and the indications for surgery were assessed. The results of the study revealed significant variability in the volume of operations, the spectrum of pathologies, and the types of patients, which depended on the conditions of deployment of medical units.

In particular, at Role 3 medical facilities, most of the surgical activity was planned interventions, while in advanced Role 2 facilities (Mali, Central African Republic), more than 70.0 % of operations were emergency procedures. Indications for surgical interventions ranged from emergency trauma care to reconstructive limb surgery and included non-orthopedic procedures such as vascular repair and decompressive craniotomy.

O. Barbier emphasizes that the significant diversity and high level of technical complexity of the interventions performed require the training of versatile military orthopedic surgeons capable of working at the intersection of orthopedics, neurosurgery, general, and vascular surgery. This approach to training military medics has proven its relevance and effectiveness in the context of real clinical challenges arising in modern armed conflicts, ensuring the development of the competencies necessary for effective work in extreme conditions [24].

A study conducted by K. Gomes (2024) provided a comprehensive analysis of the relationship between stressors associated with military deployment, affective state, and symptoms of behavioral health disorders among United States military medical personnel who participated in combat operations. Respondents were assessed on criteria such as symptoms of PTSD, level of combat and military exposure, intensity of stress, and specific emotional state.

According to the study results, most participants (89.0 %) had a predominantly positive military experience, but a significant proportion of them encountered potentially traumatic situations. In particular, 47.0 % reported witnessing dead or seriously wounded military personnel, and 21.0 % demonstrated clinically significant symptoms of PTSD.

The assessment of risk factors such as combat experience, stress levels, and PTSD symptoms explained 39.0 % of the variation in negative affect among respondents. At the same time, for positive affect, these factors, together with indicators of overall military experience and psychological resilience, accounted for 28.0 %.

No significant differences were found between male and female medical personnel in terms of the impact of the factors studied on the development of positive and negative affect. The researchers emphasize that the pronounced negative emotional reaction in a significant proportion of military medical personnel may be a consequence of PTSD, which, with appropriate rehabilitation programs, can be effectively treated even in a combat zone. Social support plays a special role in maintaining emotional stability during military missions, correlating with positive changes in the affective state of medical personnel [25].

A study by A.L. Peterson (2019) found that 18.0 % of military medical personnel reported a significant impact of combat operations on their emotional and mental state. At the same time, more than three times as many respondents (67.0 %) noted that their condition was significantly affected by medical-specific stress factors associated with the performance of professional duties in combat conditions.

Approximately one in ten military medics tested positive for PTSD, and about one in twenty had a diagnosis confirmed by strict diagnostic criteria. Further analysis showed that both the intensity of medical stressors and combat factors were statistically significantly associated with the severity of PTSD symptoms. At the same time, the impact of medical stressors showed a stronger association with the development of PTSD than combat ones, and this trend persisted under both minimal and strict diagnostic criteria. The results indicate that although combat stressors remain a significant risk factor in military medical personnel, they are more likely to experience intense psychological stress associated with the treatment of severely injured patients, particularly those with amputations, severe burns, and gaping wounds. This leads to an increased risk of developing clinically significant PTSD in 5.0–10.0 % of military medics, even with the availability of prevention and treatment programs designed primarily for combat units [26].

The results reported by C. Leners (2014) indicate high levels of psychological resilience among all military surgeons surveyed who participated in providing medical care in combat conditions. In particular, a significant relationship was found between components of professional quality of life (job satisfaction, emotional exhaustion, level of compassionate stress) and the level of psychological resilience. Significant differences in professional quality of life were found depending on combat experience, indicating the important influence of this factor on the psychological state and professional well-being of military doctors. The researcher emphasizes the need to pay special attention to supporting the psychological resilience of military surgeons, which is an important factor in their readiness to perform complex tasks in combat zones. Timely identification and support of the psychological resilience of military doctors significantly increases the effectiveness and readiness of

military medical units, which remains one of the main challenges for the Ministry of Defense [27].

In military medicine, especially in combat situations, mentalization — the ability to understand both one's own behavior and the behavior of others through the prism of mental states such as emotions, desires, beliefs, and intentions — is critical to effective communication and mutual understanding between medical personnel and patients who are often traumatized both physically and psychologically [28, 29].

For military surgeons working in extremely stressful, risky, and unpredictable combat conditions, the ability to mentalize becomes an important tool for maintaining psychosocial relationships with patients and colleagues. Studies show that high levels of mentalization ability among healthcare professionals are associated with better therapeutic outcomes, lower levels of emotional burnout, and a more stable attachment style [30].

In the context of combat conditions, it also helps maintain morale, prevent isolation, and support team (multidisciplinary) effectiveness [31].

In addition, developing mentalization skills in military surgeons can reduce the risk of professional deformation, strengthen emotional regulation in critical situations, and promote more effective clinical decision-making, even in conditions of informational uncertainty [32].

A study by C. Choufani (2021) indicates that mastering the skills necessary for military surgery often exceeds the capabilities of standard civilian medical training, especially in conditions of limited resources and complex combat situations. One of the most effective ways to gain such experience is to participate in internships that are specifically adapted to the operational conditions of future missions.

C. Choufani (2021) conducted a survey among military surgeons who underwent internships during their initial professional training. Most respondents (88.4 %) indicated that the internship significantly increased their operational readiness to provide medical care in combat situations, with 83.6 % rating this impact as significant. In addition, 88.4 % of participants supported the idea of introducing this format as a mandatory part of the training of future military surgeons.

The results obtained demonstrate the importance of continuous training for the development of both clinical and technical skills, as well as for familiarization with the organizational aspects of working in field hospitals, the specifics of the contingent, and the nature of injuries that occur in combat conditions. This training format is a highly effective tool for developing the competencies of military surgeons and provides invaluable experience that cannot be replicated in standard medical practice [33].

According to data from S. Korol (2023), since 1993, more than 3,000 surgeons and more than 7,000 medical specialists from the Ministry of Defense medical facilities have been trained within the framework of the Armed Forces of Ukraine's medical service training system, of which 20.0 % have undergone training in the form of field cycles. The Department of Military Surgery at the Ukrainian Military Medical Academy (Kyiv) regularly organizes courses and

training sessions with international participation, involving specialists from Ukraine's partner countries. In particular, specialized events are held such as Current Issues in Combat Surgical Trauma, aimed at training surgeons from military mobile hospitals and advanced surgical teams.

These programs focus on mastering modern high-tech and minimally invasive methods of diagnosis and treatment: endoscopy, laparoscopy, ultrasound technologies, interventional sonography, radiology, spiral computed tomography, and magnetic resonance imaging. The goal of these activities is to improve the quality of surgical care for combat injuries and to ensure the standardization of medical protocols and standards in the context of military conflicts [34].

According to J. Shumaker (2024), the Operation Gunpowder simulation program provided targeted training for Ukrainian medical professionals to provide care in armed conflict situations with limited resources. During the program, three main obstacles to the effective work of Ukrainian military medicine were identified: limited resources, logistical problems, and time constraints. In particular, Ukrainian medics are forced to keep patients and provide them with vital assistance for long periods, which can last from several hours to several days due to prolonged combat operations and the constant threat from enemy drones.

Evacuation delays contribute to situations where medical professionals must provide treatment outside of standard CLS (systemic flightworthiness) protocols, particularly to maintain patient stability. As a result, Ukrainian medical professionals have acquired the necessary knowledge and skills to stabilize patients, particularly in critical areas such as hemodynamic monitoring, sepsis treatment, and respiratory control. At the same time, they have learned to effectively distribute scarce medicines and work as a team, performing important functions within the medical service.

Ukrainian military surgeons mastered a number of key skills, including optimizing patient management in complex operational and tactical situations, developing leadership competencies, and improving interdisciplinary teamwork. All these skills are aimed at improving the effectiveness of medical care in combat conditions, which are characterized by time constraints, limited resources, and a large number of wounded. Researchers emphasize the importance of international cooperation and the use of simulation technologies as a key element in improving military medical training, highlighting their effectiveness in developing the robust clinical and organizational skills necessary for effective work in crisis situations [35].

The practical significance of the data obtained lies in the need to develop and implement targeted psychological support programs, in particular:

- regular psychodiagnostic assessment of military surgeons and all medical personnel;
- organizing regular monitoring of the psycho-emotional state, especially for individuals with low or critically low levels of psychological resilience;
- conducting supervision and psychological relief groups after staying in a combat zone;

— implementing psychological training programs aimed at developing stress resistance and increasing the adaptive potential of military medics;

— involving specialists in military and crisis psychology in psychoprophylactic and corrective work;

— conducting training on the development of self-regulation, relaxation, crisis response, and effective communication skills in stressful conditions.

Considering the level of resistance to combat stress is key when making decisions about assigning personnel to high-risk positions, as well as when planning measures to preserve the mental health of military personnel.

Conclusions

1. Preserving the human resources potential of military medicine, particularly surgeons, is a strategic task for Ukraine's defense system. The effectiveness of medical care in combat zones is largely determined by the professional training and psychological resilience of personnel working in high-risk conditions with limited resources.

2. Correlation analysis according to Spearman's rank coefficient revealed a clear linear dependence of the questionnaire score on the age of respondents and their work experience on the formation of emotional burnout syndrome.

3. The study of psychological resilience and adaptive potential showed that 20.0 % of participants have signs of nervous and mental instability, 40.0 % reported a reduced level of communicative potential, 20.0 % exhibited a reduced level of moral and ethical normativity, 20.0 % have a low level of military-professional orientation, 20.0 % reported pronounced deviant behavioral traits, 20.0 % have markers of increased suicidal risk, indicating the need for targeted psychological support and the implementation of correctional programs in the military-medical environment.

4. The development of international cooperation and the introduction of simulation technologies in the training of military medics is a promising direction for improving readiness for action in extreme conditions. Such approaches allow for the formation and improvement of clinical thinking, rapid decision-making, and interaction skills in stressful situations.

Prospects for further research. It is planned to continue research in this area aimed at studying the real impact of stress on military medics and personnel and to develop preventive measures.

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Вінницький національний медичний університет імені М.І. Пирогова, м. Вінниця, Україна

Психологічна стійкість та менталізація військових хірургів в умовах бойового стресу: мультидисциплінарний підхід до подолання емоційного вигорання

Резюме. Актуальність. Військовий хірург працює в екстремальних умовах, де обмежені ресурси, постійний брак часу і загроза для життя є частиною щоденної реальності. Така ситуація вимагає не лише бездоганної професійної підготовки, а й високого рівня психологічної стійкості, здатності швидко адаптуватися й ефективно діяти під тиском. **Мета:** провести ретроспективний аналіз наукових джерел щодо психологічної стійкості та менталізації військових хірургів як чинників, що сприяють зниженню рівня емоційного вигорання в умовах бойового стресу, й обґрунтувати ефективність мультидисциплінарного підходу до збереження психічного здоров'я медичного персоналу. **Матеріали та методи.** Дослідження базувалося на вивченні вітчизняних та зарубіжних наукових праць із баз даних PubMed і Google Scholar за період 2008–2025 рр. з використанням бібліосемантичного, аналітичного, систематичного, статистичного підходів. Пошук літератури здійснювали за наступними ключовими словами: military surgeons, adaptation to combat, extreme conditions, emotional burnout, psychological resilience. Проведено обстеження 18 військових хірургів (Role 1) для встановлення синдрому професійного вигорання за валідизованою діагностичною методикою О. Чабана та опитувальником «Адаптивність-200». Обробку даних виконано в програмах Excel та Statistica, статистичну вірогідність результатів оцінено за допомогою непараметричного рангового критерію Спірмена. **Результати.** Кореляційний аналіз із використан-

ням рангового коефіцієнта Спірмена виявив статистично значущу лінійну залежність між бальною оцінкою за опитувальником і віком респондентів, а також їхнім трудовим стажем, що вказує на вплив цих чинників на формування синдрому емоційного вигорання. Результати дослідження психологічної стійкості та адаптаційного потенціалу засвідчили наявність наступних характеристик: у 20,0 % респондентів виявлено ознаки нервово-психічної нестійкості; у 40,0 % — зниження комунікативного потенціалу; у 20,0 % — зменшення рівня морально-етичної нормативності; у 20,0 % — низький рівень військово-професійної спрямованості; у 20,0 % — виражені девіантні поведінкові риси; у 20,0 % — маркери підвищеного ризику суїцидальної поведінки. Отримані дані говорять про необхідність системної психологічної підтримки персоналу та впровадження цілеспрямованих корекційно-реабілітаційних програм у межах військово-медичного середовища. **Висновки.** Збереження кадрового потенціалу військової медицини, зокрема хірургів, є стратегічним завданням системи оборони України. Ефективність медичного забезпечення в зоні бойових дій значною мірою визначається професійною підготовкою та психологічною стійкістю персоналу, який працює в умовах високого ризику й обмежених ресурсів.

Ключові слова: військові хірурги; емоційне вигорання; психологічна стійкість; адаптація до бойових та екстремальних умов; дефіцит ресурсів; мультидисциплінарний підхід; менталізація