

HEALTH, ENVIRONMENT, DEVELOPMENT

CRITICAL PUBLIC HEALTH COMPETENCIES IN THE TRAINING OF FUTURE DOCTORS: AN ASSESSMENT OF EDUCATIONAL IMPERATIVES UNDER MARTIAL LAW

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Summary

This article examines the issue of developing critical public health competencies within the training system for future doctors in Ukraine under conditions of prolonged martial law. The author emphasises that the traditional focus of medical education on peacetime clinical skills is insufficient to meet modern challenges. Based on bibliosemantic analysis and a cross-sectional study of students, key crisis factors are identified: infrastructure deficits, epidemiological threats, psychosocial problems, risks of CBRN incidents, exacerbation of chronic non-communicable diseases, managerial and economic dysfunctions, and demographic changes. In light of these challenges, educational imperatives are outlined, including mastering the skills of medical triage, infection control, providing psychological first aid, responding to environmental and occupational risks, managing chronic conditions, crisis management, and analysing demographic trends. The author justifies the need to integrate these competencies into curricula by shifting from a disciplinary model to an integrated competency-based approach that combines clinical, military medical, and psychosocial training.

Key words: professional competencies, public health, future doctors, wartime challenges, higher medical education, martial law, medical students, educational programmes.

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1. Introduction

Ukraine's healthcare system operates under prolonged martial law, creating a complex set of unprecedented organisational and resource challenges. The transformation of the medical sector, initiated in the pre-war period, now requires comprehensive and rapid adaptation to new epidemiological, socio-demographic and infrastructural risks. In these circumstances, the

public health paradigm is becoming increasingly important, as it directs the healthcare system towards maintaining the population's viability and responding to the complex risks of wartime (*Law of Ukraine No. 2573-IX, 2022*).

Traditionally, undergraduate training for students at medical higher education institutions has been focused primarily on developing clinical competencies relevant to peacetime conditions. The conditions of martial law demonstrate that every doctor, regardless of their chosen specialisation, assumes the role of an active participant in the public health system. Healthcare workers face tasks that go beyond routine clinical practice, in particular, medical triage during mass influxes of casualties, ensuring infection control in accommodation centres for internally displaced persons, responding to chemical, biological, radiological and nuclear threats, as well as providing basic psychosocial support to the population in conditions of widespread societal (*Myroniuk et al., 2023*).

It is important to bear in mind that even after the active phase of hostilities has ended, the legal regime of martial law and the associated risks will persist for a long time. Under such conditions, the medical education system requires a proactive approach and the inclusion in curricula of competencies aimed at preparing students to work in crisis situations (*World Health Organization, 2023*). An important element of such integration is assessing students' attitudes regarding their subjective readiness to work in new conditions and identifying potential gaps in their training."

The development of professional competencies among students at higher education medical institutions remains one of the key topics of academic discussion in contemporary literature. Over the last decade preceding the full-scale invasion, academic discourse focused on the European integration-oriented modernisation of medical education and the gradual transition from the 'social medicine' model to the concept of 'public health'.

The works of T. S. Gruzieva and O. Ya. Antoniuk (*Gruzieva and Antoniuk, 2023*) provide a thorough analysis of the core competencies of future doctors, among which the prevention of chronic non-communicable diseases, the promotion of a healthy lifestyle, and the mastery of biostatistics are identified as key. The issue of aligning theoretical training with practical skills in healthcare organisation featured prominently in the research by I. A. Golovanova and co-authors (*Golovanova et al., 2021*), as well as in the works of V. G. Guryanov (*Guryanov and Lyakhovchenko, 2020*). The COVID-19 pandemic has become a key factor in rethinking the professional role of the doctor, clearly demonstrating the importance of established infection control skills, as reflected in the works of Yu. V. Voronenko and co-authors (*Voronenko et al., 2021*). At the same time, G. O. Slabkyi and I. S. Myroniuk (*Myroniuk et al., 2020*) emphasised in their studies that educational programmes retain signs of inertia, which slows down their adaptation to modern requirements.

Despite the thoroughness of existing scientific research, the vast majority of it analyses the structure of public health competencies in the context of stable socio-economic development. Competency models developed in the pre-war period prove insufficiently responsive to conditions of permanent infrastructure destruction, mass internal migration, deep psychological trauma among the population, and potential threats of the use of weapons of mass destruction. The question of whether pre-war educational standards can be correctly extrapolated to conditions of prolonged martial law remains open.

2. Aim, subject and methods of the study

The aim of the study is to provide a scientific justification for the priority of critical public health competencies in the training of future doctors and to assess the educational imperatives necessary for adapting curricula to the conditions of prolonged martial law in Ukraine.

To achieve this aim, the following tasks have been formulated:

1. To analyse the main challenges that determine the state and dynamics of Ukraine's public health system in the context of military operations.
2. To identify a list of critical public health competencies required for future doctors during the war and post-war periods.
3. To establish the conceptual and methodological foundations that will ensure the updating of educational and professional programmes in line with current requirements.
4. To justify and propose innovative educational technologies capable of ensuring the accelerated development of public health competencies among students.
5. To draw conclusions and outline prospects for further scientific research.

To achieve the set objective and fulfil the research tasks, a comprehensive methodological approach was employed, integrating bibliosemantic, medical-sociological and statistical methods. The study was conducted in accordance with the key bioethical principles enshrined in the World Medical Association's Declaration of Helsinki, which ensured the ethical correctness of all stages of the work

A cross-sectional descriptive study was conducted. The object of the study was the subjective assessment of the need for critical competencies in public health. The sample included 30 fourth- and fifth-year medical students who had fully completed the core course in "Social Medicine and Public Health".

The main tool for collecting primary data was a specially designed questionnaire, "Assessment of the priority of critical public health competencies for future doctors under martial law". The questionnaire contained 20 closed and semi-closed questions, structured on a nominal scale and grouped into six key domains, which reflected the main aspects of the competencies being assessed. A key feature of the instrument was the inclusion of an open-ended "Your own answer" option for each question, which enabled content analysis and allowed for the identification of non-obvious ("blind") areas in the training of medical students.

The raw data was systematised and organised using MS Excel spreadsheets, ensuring the accuracy of subsequent statistical processing. Descriptive statistics are presented in the form of absolute (n) and relative (%) frequencies, which allowed for a generalisation of the structure of respondents' answers

3. Research findings

The implementation of the initial research tasks required a systematic analysis of the key challenges affecting Ukraine's public health system in the context of full-scale military aggression. A bibliosemantic analysis of scientific sources and reports from international organisations made it possible to identify four key groups of crisis factors that significantly alter the content and structure of the competency model for the modern healthcare worker.

The first group of crisis factors consists of an infrastructure crisis and a shortage of healthcare resources. This encompasses the widespread destruction of medical facilities, disruptions to the logistics of supplying essential medicines (insulin, painkillers, antibiotics) and an exacerbation of staff shortages due to the migration of healthcare workers. Such conditions lead to a shift from a model of planned treatment to disaster medicine, even in relatively safe regions (*Lukashuk, 2023*). In these circumstances, the key competencies for a doctor become clinical triage and the effective management of limited resources.

The second set of crisis factors comprises epidemiological threats associated with mass internal population displacement. The displacement of millions of citizens has led to a sharp

increase in the burden on the primary healthcare system in host communities. The concentration of people in temporary accommodation – modular towns, hostels, shelters – combined with disruptions to routine immunisation schedules and limited access to safe drinking water, creates the conditions for outbreaks of infectious diseases, particularly intestinal infections, tuberculosis and vaccine-preventable infections (*Ministry of Health of Ukraine, 2024*). In these circumstances, expertise in infection control and epidemiological surveillance becomes particularly important.

Key crisis determinants also include the large-scale psychosocial challenges arising from the war. Chronic stress, the grief of losing loved ones, the destruction of homes, as well as the rapid increase in the number of veterans and civilians with amputations are fuelling an epidemic of post-traumatic stress disorder, anxiety and depressive disorders. The specialist psychiatric care system lacks the resources to fully cater for such a large number of patients (*Khaustova and Pinchuk, 2022*). Under these circumstances, competencies in providing first psychological aid and basic psychosocial support become an educational imperative for future doctors and are integrated into general clinical practice.

The next group of crisis factors consists of environmental and occupational risks caused by the impact of hostilities. The use of modern weaponry, the destruction of industrial facilities leading to the formation of chemical hazard zones, the widespread mining of agricultural land, and the constant threat of CBRN incidents (chemical, biological, radiological and nuclear) are creating a new landscape of occupational and environmental health issues. Furthermore, the extremely high physical and psycho-emotional strain on healthcare workers and rescue personnel highlights the problem of occupational burnout and maintaining work capacity in extreme conditions (*Nahorna et al., 2021*).

An extremely important challenge, which is becoming particularly relevant in the context of modern warfare, is the exacerbation of chronic non-communicable diseases. The suspension of preventive check-ups and screening programmes, postponed medical consultations, interruptions in treatment, and the decompensation of conditions caused by prolonged stress lead to an increase in complications of chronic non-communicable diseases and a rise in hospitalisation rates (*Kornatskyi et al., 2021*). Under such conditions, competencies in continuous monitoring, risk stratification and the management of patients with chronic conditions in resource-constrained settings become crucial.

Administrative, economic and organisational dysfunctions, which have been exacerbated by the war, remain a significant challenge. The operation of healthcare facilities during power cuts, the need for rapid adaptation to changes in the Medical Guarantees Programme, and coordination between civilian and military healthcare facilities create additional barriers to ensuring the continuity of medical care. This highlights the importance of expertise in crisis management, the organisation of medical care, and the effective use of financial and material resources.

Alongside others, a systemic challenge that remains significant in today's reality is profound demographic shifts and the deterioration of macro-level indicators of public health. Hidden excess mortality, accelerated population ageing and a steady decline in birth rates pose long-term risks to the functioning of the healthcare system and the social sector (*Libanova, 2022*). Under such conditions, competencies in analysing demographic trends, forecasting demand for healthcare services, and developing preventive strategies aimed at supporting the health of vulnerable groups take on particular importance.

Based on a bibliosemantic analysis of scientific sources and reports from international organisations, we have systematised and organised a classification of challenges in the public health system, structured by domains, each of which forms a specific educational requirement for future doctors in accordance with defined critical competencies (tab. 1).

Table 1

Classification of key challenges for the public health system and corresponding educational imperatives for future doctors

Challenge domain	Key influencing factors	References	Comments and implications for the trainee's competencies
Infrastructure and resource shortages in healthcare facilities	The collapse of the hospital network, disruption to the supply of medicines, and staff attrition	I.S. Myronyuk et al. [8] O. M. Lukashuk [9]	The focus is shifting from routine care to disaster medicine. Imperative: proficiency in medical triage and the management of limited resources is becoming a core skill for doctors of any speciality.
Epidemiological safety and infection control	Mass internal migration, overcrowding in shelters, reduced coverage of routine vaccination.	Annual report of the Public Health Centre of the Ministry of Health of Ukraine [10]	Increased risk of outbreaks of vaccine-preventable and intestinal infections. Imperative: doctors must be prepared to implement infection control measures in non-hospital settings and conduct population surveillance.
Mental health and psychosocial support	Chronic war-related stress, PTSD in combatants and civilians, loss of loved ones, rehabilitation.	O.O. Khaustova, I.Ya. Pinchuk [11] All-Ukrainian Mental Health Association [12]	An epidemic of mental disorders exceeding the capacity of specialist care. Imperative: every doctor must possess the skills to provide first psychological aid and basic psychosocial support at the primary healthcare level.
Occupational medicine, CBRN threats (chemical, biological, radiological, nuclear) and the environment	Risks of the use of weapons of mass destruction, environmental pollution due to the destruction of industry, and burnout among healthcare professionals.	A. M. Nahorna et al. [13] V. V. Chorna [14]	The new landscape of environmental and occupational health, and the need to protect staff. The imperative: the ability to diagnose and respond to atypical incidents (CBRN) and to master techniques for preventing occupational burnout.
Exacerbation of chronic non-communicable diseases	Suspension of screening programmes, postponed visits to the doctor, decompensation of conditions due to stress.	V.M. Kornatsky et al. [15]	A shift in the pattern of morbidity towards advanced stages of cancer and cardiovascular emergencies. Imperative: strengthening competencies in the management of chronic conditions in the context of limited access to diagnostics.
Administrative, economic and organisational challenges	Operation of healthcare facilities during power cuts, changes to the Medical Guarantees Programme, coordination with healthcare facilities	Resolution of the Cabinet of Ministers of Ukraine No. 1464 [16]	The need for rapid adaptation to changes in funding and infrastructure operations. Imperative: Mastery of crisis management, strategic planning and inter-agency coordination.
Demographic shifts and macro indicators	Hidden excess mortality, changes in age structure (ageing population), declining birth rates.	E. M. Libanova [17]	Long-term impact on the need for geriatric and palliative care. Imperative: the doctor must understand the macro-context of demographic changes to forecast the need for medical services.

A synthesis of the crisis factors and current public health challenges presented demonstrates a profound transformation in the requirements for the competency model of the modern doctor in wartime conditions. In these circumstances, updating the content of medical education, focused on developing robust, practically relevant competencies for working in conditions of uncertainty and multidimensional risks, takes on particular importance.

Updating educational and professional programmes in the current context requires a shift from the traditional disciplinary model to an integrated approach that combines clinical training with military-medical, crisis and psychosocial components.

The methodological basis for such an update is the competency-based approach, which involves not simply adding individual topics, but rethinking the logic of learning through the integration of real-life wartime scenarios, interdisciplinary modules and practices focused on readiness to act in crisis situations. This rethinking of the content of educational and professional programmes involves the formation of a holistic educational framework in which clinical, military-medical competencies and public health options are structured as complementary elements, ensuring the future doctor's readiness to act in conditions of prolonged crises.

We propose basing the update of educational and professional programmes on three fundamental principles:

- 1) the concept of the 'Resilient Physician' (*Epstein and Krasner, 2013*),
- 2) the principle of spiral integration of crisis competencies (*NATO Standardisation Office, 2019*),
- 3) the model of 'Public Health as a Tool of National Security' (*Hushchuk et al., 2021*).

The 'Resilient Physician' concept defines the need to train doctors capable of maintaining professional effectiveness and psychological resilience in situations of prolonged stress, uncertainty and resource constraints. The integration of this approach into educational and professional programmes involves the introduction of cross-cutting modules in occupational medicine, aimed at preventing professional burnout, developing self-regulation skills in extreme conditions, and maintaining work capacity under conditions of resource scarcity. The implementation of this principle ensures that future doctors develop the ability to maintain professional reliability and effectiveness in prolonged crisis situations, which is a necessary condition for the functioning of the healthcare system in wartime."

The Spiral Curriculum approach to crisis competencies involves the gradual, phased integration of military medical and crisis-related aspects into the educational process, starting in the early years of study and systematically increasing the complexity of the content as training progresses. Implementation of this approach involves a transition from basic elements – such as first aid, the fundamentals of public health in conflict settings, and the bioethical aspects of working in crisis situations – to the mastery of complex competencies, including casualty triage, response to mass casualties, and CBRN threats in the final stages of training. The introduction of this principle is consistent with leading approaches to the training of military medics in NATO countries, where a spiral training model is used to develop robust, progressively more complex crisis competencies that ensure readiness to respond to a wide range of threats.

The 'Public Health as a Tool of National Security' model envisages a reorientation of the discipline 'Social Medicine and Public Health' from theoretical analysis towards the development of practical crisis management skills and an understanding of how the healthcare system functions in conditions of armed conflict. Developing such an approach requires future doctors to grasp the architecture of interaction between civilian and military healthcare systems, including mechanisms for coordination, resource allocation and ensuring the continuity of medical care in wartime conditions. Mastering this model involves understanding the logistics of medical care within the Triad – from the battlefield to the triage point and the rear hospital – as well as mastering the mechanisms of interagency coordination between the Ministry of Health, the Armed Forces of Ukraine, the State Emergency Service of Ukraine and local authorities, which is critical for ensuring national resilience.

Based on these approaches, a conceptual matrix for the modernisation of the educational and professional programme was proposed (tab. 2).

Table 2

Conceptual matrix for integrating crisis competencies into the training structure for future doctors.

Core section of the educational and professional programme (Competence domain)	Proposed additions/modules (Adaptation to martial law)	Methodological rationale and international experience
I. Organisation of medical care and management	Module ‘Crisis management in health-care facilities’: working during black-outs, mass casualty triage, logistics of limited resources.	Adaptation of the Israeli model for preparing hospitals to operate under rocket fire (Israeli Medical Corps. <i>Hospital Preparedness for Mass Casualty Events</i> . Tel Aviv, 2021).
II. Epidemiology and Sanitary and Hygiene Control	Module ‘Epidemiology of emergencies and CBRN response’: infection control in accommodation facilities for internally displaced persons, iodine prophylaxis, decontamination in the event of chemical exposure.	Use of WHO and CDC protocols for responding to biological and chemical threats in conflict zones (WHO. <i>CBRN Risk Management in Health Facilities</i> . Geneva, 2023).
III. Social determinants of health and bioethics	Module: ‘Military Bioethics and Working with Vulnerable Groups’: the ethics of triage (utilitarian logic), the specific nature of communication with internally displaced persons, veterans and survivors of captivity/torture.	Based on the principles of military medical ethics and international humanitarian law (International Committee of the Red Cross (ICRC). <i>Health Care in Danger: The Responsibilities of Health-Care Personnel Working in Armed Conflicts</i> . Geneva, 2020).
IV. Mental Health and Psychosocial Support	Module ‘Basic Psychosocial Support at the Primary Care Level’: initial psychological support, screening and referral of patients with post-traumatic stress disorder (mhGAP protocols).	Implementation of the National Programme for Mental Health and Psychosocial Support / on the initiative of O. Zelenska (Kyiv: Ministry of Health, 2023).

The set of outlined methodological principles forms an updated framework for medical training, focused on resilience, the phased development of crisis competencies, and the integration of public health into the national security system. The implementation of these principles requires not only changes to the content of educational and professional programmes, but also the updating of teaching tools, making the introduction of innovative educational technologies a key condition for effective medical training in the face of modern challenges.

The paradigm of martial law demands intensified training. Traditional lectures and seminars do not develop crisis management skills. What is needed here is immersion, stress resilience and instant decision-making. The further development and modernisation of educational programmes and the corresponding educational process is impossible

without the systematic application of digital, simulation and analytical solutions, which ensure the practical implementation of these principles and shape a new quality of professional training.

Based on the Conceptual Matrix for the Modernisation of Educational and Professional Programmes (tab.2), we have summarised and proposed an optimal case study of innovative technologies.

Consequently, the implementation of the next task of our study was based on the premise that the development of critical professional competencies under martial law must be carried out at an accelerated pace, with the greatest possible approximation to the real-world conditions of the healthcare system's operation. The traditional academic model of teaching social medicine, focused primarily on the passive acquisition of information, demonstrates limited effectiveness in conditions of systemic crisis and does not ensure the necessary level of readiness for specialists to work in extreme situations.

An analysis of contemporary scientific and methodological literature confirms a shift in the educational paradigm within the medical sector towards active, practice-oriented and immersive teaching methods, which facilitate the simulation of complex situations, the development of clinical reasoning and the formation of robust decision-making skills.

As noted by B. S. Zimenkovsky and co-authors (*Zimenkovskiy et al., 2018*), the implementation of a competence-based approach involves the use of educational technologies that simulate real-life professional situations and require learners to make independent managerial decisions in a context of uncertainty. In turn, M. I. Marushchak and co-authors (*Marushchak et al., 2016*) emphasise the high effectiveness of simulation technologies in developing stress resilience, teamwork skills and rapid response, which are key components of professional training for specialists in the field of disaster medicine.

A comprehensive study by O. O. Bondarenko and co-authors (*Bondarenko et al., 2017*) confirms that the use of case-based learning ensures the integration of theoretical knowledge in public health – in particular epidemiology and biostatistics – into practical scenarios for responding to emergencies. This approach fosters the development of analytical thinking, data handling skills, and decision-making abilities in complex situations. The importance of project-based learning for the development of organisational competencies and inter-agency collaboration skills is highlighted in the works of O. V. Svyryda (*Svyryda, 2018*), where students act as developers of local public health programmes, modelling real management processes and coordination mechanisms between different sectors.

Of particular importance in conditions of martial law is the experience of using tactical simulation and hybrid simulation (a combination of realistic manikins with actors simulating patients) for training in medical triage and effective communication in crisis situations (*Gudima et al., 2019*). Such technologies enable the simulation of stressful conditions approximating real combat situations, which helps to develop operational skills, increase stress resilience and refine algorithms for interaction among members of the medical team.

By contextualising the results of the source analysis with our proposals for updating the educational and professional programme (see Table 2), we have developed the Optimal Case of Innovative Technologies (OCIT) learning 'Resilience-2030' (see tab.3). The OCIT is not merely a structured list of modern methods, but a coherent, internally consistent system of educational tools, in which each element is relevantly correlated with a specific domain of crisis competencies and aimed at their targeted development.

Table 3

Optimal Case of Innovative Technologies (OCIT) learning for the intensive development of public health crisis competencies

Domain of crisis competencies (according to the OPP matrix)	Proposed innovative learning technology	Specifics of implementation under martial law and references to experience	Educational impact and intensification
I. Crisis management in healthcare facilities and triage	High-tech simulation of 'Mass Casualty' scenarios.	Conducting training sessions in an 'immersive design' format using manikins, make-up, and sound/light effects simulating a blackout. Adaptation of the START/Triage protocols (<i>A. A. Gudyma et al.</i>)	Intensive training in the skills of immediate medical triage and decision-making under conditions of stress and time constraints.
II. Epidemiology of emergencies and CBRN response	Tabletop exercises and VR simulation.	Simulation on a map of a real city of the spread of a chemical cloud or a cholera outbreak in a centre housing internally displaced persons. Students, playing the roles of a chief medical officer, an epidemiologist and a representative of the State Emergency Service, develop a response plan (<i>World Health Organization, 2017</i>)	Safe (simulation-based) practice of action protocols for radiological and chemical threats, visualisation of the consequences of incorrect decisions.
III. Crisis Communication and Psychosocial Support	The 'Standardised Patient' method and hybrid simulation.	Use of specially trained actors (simulating post-traumatic stress disorder, aggression, panic) combined with mannequin-based training. Patient triage (mhGAP protocols implementation (<i>World Health Organization, 2016</i>)).	Adaptation of educational practices from Israel and the US regarding training in empathy and communicating crisis news in conflicts. Building a doctor's communicative resilience.
IV. Social determinants and bioethics	Socially-oriented project-based learning (Service-Learning).	Students develop and implement real-world social projects (e.g. a hygiene education programme for internally displaced children, environmental monitoring of de-occupied territories). Based on global experience in medical education (<i>Seifer, 1998</i>)	Fostering social responsibility and a deep understanding of the needs of vulnerable groups through direct interaction.

As shown in tab.3, the OCIT 'Resilience-2030' emerges as a holistic, systematically structured model of innovative training, in which each teaching method is purposefully aligned with a specific domain of crisis competencies. This structural alignment ensures the targeted nature of pedagogical influence and helps avoid fragmentation in the development of future specialists' professional readiness. The proposed technologies – ranging from simulations of mass casualties in the domain of crisis management and triage, VR modelling of CBRN threats, hybrid simulations for the development of crisis communication, to service-based learning in the field of social determinants – form a coherent system aimed at the intensive development of competencies critical for working in conditions of martial law. This approach allows us to proceed to the analysis of the empirical data from our study, specifically the results of a student

survey regarding the prioritisation of specific competencies in the field of public health.

To identify subjective educational imperatives and assess readiness to work under martial law, we surveyed 30 fourth- and fifth-year students who had just completed a 90-hour core module in ‘Social Medicine and Public Health’.

To systematise the data set, the results of the quantitative analysis (absolute and relative frequencies of the most common responses), as well as the results of the qualitative content analysis of open-ended responses (Option ‘D’), are summarised in tab. 4.

Table 4

**Summary assessment of the priority of critical public health competencies
among medical students (N=30)**

Section / Questionnaire question	Dominant response (Top 1 and Top 2)	Abs. (n)	(%)	Key insights from open-ended responses (Option ‘D’)
1	2	3	4	5
Block I. Epidemiological safety				
Q1. Competence in infection control	A. Prevention of outbreaks in IDP settlements	18	60.0%	‘Early detection and field epidemiological surveillance’
P2. Sanitation and hygiene priority	A. Safe drinking water	24	80.0%	“Organisation of emergency water supply systems”
P3. CBRN response	A. Decontamination in the event of chemical contamination	19	63.3%	<i>“Comprehensive preparedness and algorithms for the initial assessment of CBRN patients”</i>
Block II. Organisation of care				
P4. Care in the event of resource shortages	A. Medical triage skills	26	86.7%	<i>‘Integration of medical protocols of the Armed Forces of Ukraine and civilian medicine’</i>
P5. The least developed format	A. Coordination of civilian and military healthcare facilities	21	70.0%	<i>“Horizontal inter-agency coordination (resource diplomacy)”</i>
P6. Telemedicine	A. Absolutely critical (front-line areas)	23	76.7%	<i>“A tool for access in conditions of limited physical access”</i>
P7. Occupational health	A. Prevention of burnout among healthcare professionals	29	96.7%	<i>“Supporting key professions to sustain the system”</i>
Block III. Mental health				
Q8. The most pressing challenge	B. Referral of patients with post-traumatic stress disorder	12	40.0%	<i>‘Mass PTSD and chronic stress masquerading as somatic complaints’</i>
	A. Providing initial psychological support	10	33.3%	
Q9. Priority of psychological support	B. For healthcare workers themselves	15	50.0%	<i>“Introduction of mandatory staff de-stressing programmes”</i>
P10. Delivering bad news	B. I understand the theory, but need training	18	60.0%	<i>‘The need for regular crisis communication simulations’</i>
	A. Fully prepared (SPIKES protocol)	8	26.7%	

Table 4 (Continued)

1	2	3	4	5
Block IV. Social determinants				
Q11. The most vulnerable group	A. People with disabilities and those with reduced mobility	20	66.7%	<i>‘Patients dependent on life-support equipment’</i>
Q12. Role in rehabilitation	B. Active participation in care pathways	25	83.3	<i>“Coordination of a multidisciplinary team”</i>
P13. Impact of migration (IDPs)	D. All factors act simultaneously (complex)	22	73.3%	<i>“Complex pressure at all levels of the healthcare system”</i>
Block V. Bioethics and communication				
Q14. The bioethical problem of war	A. Withholding resuscitation from one person for the sake of another	24	80.0%	<i>‘The dilemma of the fair allocation of resources (Rationing)’</i>
Q15. Combating disinformation	A. The doctor as an opinion leader (debunking fake news)	23	76.7%	<i>“Debunking myths through blogs by evidence-based doctors”</i>
P16. Effective communication channels	B. Telegram channels and community social media	15	50.0%	<i>‘Specialised medical chatbots for initial triage’</i>
	C. Communication via the family doctor	10	33.3%	
Block VI. Educational needs				
Q17. Level of preparedness	B. Adequate, but I need practice	20	66.7	<i>‘Lack of adaptation of theory to real clinical scenarios’</i>
Q18. Section for expansion in the curriculum	A. Disaster medicine, triage, mass casualties	21	70.0%	<i>‘The Specifics of Triage in Surgery and Paediatrics’</i>
P19. Preferred training format	A. Compulsory simulation training	20	66.7%	<i>“Integration of simulations into clinical rotations in years 5–6”</i>
Q20. Barriers to emergency medical services	B. Insufficient interdepartmental coordination	10	33.3%	<i>‘The cumulative impact of staff shortages and coordination gaps’</i>
	A. Chronic underfunding	9	30.0%	

A detailed analysis by competence domains revealed the following features:

1. Epidemiological safety and sanitary and hygiene control. The survey results demonstrate that students have a deep understanding of epidemiological risks during wartime. The vast majority (80%) recognise access to safe drinking water as a priority in conditions of infrastructure destruction. Regarding infection control, 60% of respondents focus their attention on areas where large numbers of internally displaced persons are concentrated. The students' open-ended responses deserve particular academic attention, as they articulate the need for skills in 'early field epidemiological surveillance' and 'algorithms for the initial assessment of CBRN patients', indicating a demand for a shift from passive monitoring to active field epidemiology.

2. Organisation of medical care and resource management. This domain recorded the highest level of consensus. Medical triage skills were deemed absolutely critical by 86.7% of respondents. An unprecedentedly high figure (96.7%) was recorded for the question regarding the importance of occupational medicine (prevention of burnout), which demonstrates that students recognise the critical importance of preserving human resources. Content analysis of

open-ended responses (Option 'D') revealed a unique insight: students highlight the problem of horizontal inter-agency coordination ('resource diplomacy'). Traditional programmes teach vertical hierarchy, whereas the reality of war requires doctors to be able to independently coordinate actions with the State Emergency Service of Ukraine, the Armed Forces of Ukraine and volunteers in chaotic conditions.

3. Mental health and psychosocial support. This section revealed the greatest variation in responses and identified a critical 'blind spot' in training. Although students understand the importance of the issue (working with post-traumatic stress disorder was identified as a priority by 40% and providing first psychological aid by 33.3%), their practical readiness remains low. 60% of respondents noted that they are familiar with the theory of delivering bad news but feel a severe lack of practical experience. A qualitative analysis revealed a profound observation by the students: 'mass post-traumatic stress disorder is masked by somatic complaints', which shifts the burden of primary psychiatric diagnosis onto general practitioners. Moreover, 50% of students believe that medical professionals themselves are in need of priority psychological support (staff decompression).

4. Social determinants of health and rehabilitation. Students clearly articulate the new role of the general practitioner – not merely a dispatcher, but an active coordinator of a multidisciplinary rehabilitation team (83.3%). As expected, the least mobile sections of the population were identified as the most vulnerable group (66.7%); however, in their open-ended responses, students expanded this concept to include 'patients dependent on life-support equipment', which is a direct consequence of energy terrorism and blackouts.

5. Bioethics, communication and information hygiene. War is radically transforming bioethical principles. 80% of future doctors recognise that the main ethical dilemma of our time is the need to deny resuscitation to one patient for the sake of another. In their own comments, students describe this as the 'dilemma of the fair distribution of resources (rationing)', which contradicts the classical individualistic approach. In the information sphere, 76.7% of respondents are prepared to take on the role of opinion leaders to debunk medical misinformation, using modern channels (Telegram, blogs).

6. Self-assessment and educational needs (Requests regarding educational and professional programmes). The concluding section confirms the hypothesis of our study: 66.7% of students rate their theoretical training as adequate but feel a pressing need for practical adaptation. 70% of respondents call for a significant expansion of modules on disaster medicine and triage. 66.7% chose compulsory simulation training as the optimal training format. Students see the main obstacle to the public health system not only as underfunding (30%), but also as a systemic management crisis – insufficient inter-agency coordination (33.3%).

The results of the survey (see tab.4) confirm that the proposed OCIT 'Resilience-2030' closely aligns with students' actual educational needs, as the identified priorities—medical triage, CBRN preparedness, crisis communication, psychosocial support, inter-agency coordination and the prevention of professional burnout – fully correlate with the domains of competence embedded in the case structure. Students clearly articulate the need to move from theoretical models to practice-oriented formats, as reflected in the dominance of requests for simulation training (66.7%), the expansion of modules on disaster medicine (70%) and the acquisition of crisis management skills in resource-constrained environments. The insights identified – 'resource diplomacy', the masking of post-traumatic stress disorder as somatic complaints, the need for staff decompression, and the need for CBRN assessment algorithms – demonstrate that students think in terms of the real challenges of wartime, and thus, OCIT serves not only as a pedagogical model but also as a systemic tool for adapting educational and professional

programmes to contemporary crisis conditions. Thus, the research findings empirically confirm the feasibility of implementing OCIT as an optimal framework for the intensive development of crisis competencies in the field of public health.

4. Conclusions

Based on the bibliosemantic study conducted and the results of the content analysis of the questionnaire for students, the following conclusions have been drawn:

1. Full-scale war has radically transformed the structure of determinants affecting the public health system, forming a new configuration of infrastructural, epidemiological, psychosocial, environmental, CBRN and demographic risks. The combination of these factors necessitates a review of traditional competency-based models for medical training, as pre-war standards do not reflect the scale and dynamics of contemporary crisis challenges.

2. Based on bibliosemantic analysis and empirical survey data, a list of critical competencies has been identified that are priorities for future doctors during wartime and the post-war period: medical triage, infection control in non-hospital settings, CBRN preparedness, basic psychosocial support, crisis communication, prevention of professional burnout, and inter-agency coordination skills. The high level of consensus in students' responses (70–96.7%) confirms that it is precisely these competencies that form the core of a doctor's professional readiness in the context of the multidimensional risks of wartime.

3. The methodological basis for developing crisis competencies should be a shift from the traditional disciplinary model to an integrated, simulation-oriented and immersive approach, which brings the learning process closer to the real conditions of wartime. The survey results (66.7% requesting simulation training; 70% indicating a need to expand modules on disaster medicine) confirm the necessity of systematically introducing high-tech simulations, tactical scenarios, VR modelling and service-based learning as core training tools.

4. The proposed OCIT 'Resilience-2030' is an optimal systemic model for the accelerated development of crisis competencies, as it ensures a targeted alignment between professional training domains and innovative learning technologies. Its structure – ranging from mass casualty simulations and VR modelling of CBRN threats to hybrid simulations of crisis communication and service-based learning – replicates real wartime scenarios and meets the educational needs of students, as recorded in the survey results.

5. The results of the student survey empirically confirm the relevance of the identified crisis competencies and demonstrate a high demand for practice-oriented, simulation-based and integrated training. The consolidated responses of the respondents (70–96.7%) indicate that future doctors recognise the critical importance of triage skills, CBRN preparedness, crisis communication, psychosocial support and the prevention of professional burnout. The insights identified – 'resource diplomacy', the masking of post-traumatic stress disorder as somatic complaints, and the need for field epidemiological surveillance algorithms – confirm the necessity of adapting educational and professional programmes to real wartime scenarios and are consistent with the structure of the OCIT 'Resilience-2030'.

6. Prospects for further research lie in the scientific validation of the effectiveness of the OCIT 'Resilience-2030' and the development of standardised tools for assessing the crisis competencies of future doctors. It is necessary to conduct educational experiments comparing the results of traditional and simulation-based training, to create OSCE stations for triage, CBRN preparedness and crisis communication, as well as the development of standardised rubrics and checklists to measure levels of resilience, psychosocial support and inter-agency coordination.

Such research will provide the basis for the large- ation of the model and its integration into updated educational and professional programmes.

References

1. Bondarenko, O. O., Petruk, N. S., & Shponka, I. S. (2017). Experience of implementing a teaching method based on the principle of case-based learning. *Medical Education*, (4), 13–18. <https://doi.org/10.11603/me.2414-5998.2017.4.8292>
2. Cabinet of Ministers of Ukraine. (2022). Certain Issues Regarding the Implementation of the Programme of State Guarantees for Medical Care for the Population in 2023: Resolution of the Cabinet of Ministers of Ukraine No. 1464 of 27 December 2022 ('Legislation of Ukraine' database). <https://zakon.rada.gov.ua/laws/show/1464-2022-%D0%BF>
3. Chorna, V. V. (2020). Motivation and work capacity of mental health professionals as predictors of their psychological well-being. *Environment and Health*, (4), 53–62. <https://doi.org/10.32402/dovkil2020.04.053>
4. Coordination Centre for Mental Health of the Cabinet of Ministers of Ukraine. (2023). All-Ukrainian Mental Health Programme 'How Are You?' (initiated by O. Zelenska). <https://howa-reu.com/>
5. Epstein, R. M., & Krasner, M. S. (2013). Physician resilience: what it means, why it matters, and how to promote it. *Academic Medicine*, 88(3), 301–303. <https://doi.org/10.1097/ACM.0b013e318280cff0>
6. Golovanova, I. A., Belikova, I. V., Lyakhova, N. O., & et al. (2021). Organisational and pedagogical approaches to the study of the discipline 'Public Health' by students of higher medical education. *Medical Education*, (2), 25–30. <https://doi.org/10.11603/me.2414-5998.2021.2.12270>
7. Gruzueva, T. S., & Antoniuk, O. Ya. (2023). Medical and social rationale for improving the organisation of prevention and control of chronic non-communicable diseases in the context of the development of the public health system. *Clinical and Preventive Medicine*, (5), 90–99. <https://doi.org/10.31612/2616-4868.5.2023.13>
8. Gudima, A. A., Tsymbaliuk, H. Y., Kashuba, M. O., & et al. (2019). Organisation of simulation training in pre-medical care in emergency situations. *Medical Education*, (3), 34–38. <https://doi.org/10.11603/me.2414-5998.2019.3.9749>
9. Guryanov, V. G., & Lyakhovchenko, O. A. (2020). Statistical justification of the need to develop practical competencies among healthcare organisers at the postgraduate level. *Bulletin of Social Hygiene and Healthcare Organisation of Ukraine*, (2), 35–41. <https://doi.org/10.11603/1681-2786.2020.2.11326>
10. Hushchuk, I. V., Ruden, V. V., & Haiduk, A. B. (2021). System-forming principles of public health as a priority component of national security. *Environment and Health*, (1), 16–24. <https://doi.org/10.32402/dovkil2021.01.016>
11. Khaustova, O. O., & Pinchuk, I. Ya. (2022). Coping with the hardships of war. *Psychosomatic Medicine and General Practice*, 7(1), Article e0701357. <https://doi.org/10.26766/pmgrp.v7i1.357>
12. Kornatskyi, V. M., Tretyak, I. V., Revenko, I. L., & et al. (2021). Public health and cardiovascular diseases: an analytical and statistical guide. State Institution 'M. D. Strazhesko National Scientific Centre Institute of Cardiology'. <http://www.strazhesko.org.ua/upload/2021-posibnyk-zdorovya.pdf>

13. Libanova, E. M. (2022). *The war with Russia: how to deal with the demographic consequences*. *Economy of Ukraine*, (12), 3–19. <https://doi.org/10.15407/economyukr.2022.12.003>
14. Lukashuk, O. M. (2023). *Monitoring the state of public health as an object of public administration in the context of full-scale war in Ukraine*. *Economics, Management and Administration*, (2), 150–155. [https://doi.org/10.26642/ema-2023-2\(104\)-150-155](https://doi.org/10.26642/ema-2023-2(104)-150-155)
15. Marushchak, M. I., Lykhatskyi, P. H., Fira, L. S., & et al. (2016). *Simulation-based learning in medicine – an integral part of the training of specialist doctors*. *Medical Education*, (4), 73–76. <https://doi.org/10.11603/me.2414-5998.2016.4.7302>
16. Ministry of Health of Ukraine, State Institution ‘Centre for Public Health of the Ministry of Health of Ukraine’. (2024). *Annual report on the state of public health in Ukraine and the epidemiological situation for 2023*.
17. Myronuk, I. S., Slabkyi, H. O., & Bilak-Lukianchuk, V. Y. (2020). *Training public health masters: an analysis of domestic experience and challenges*. *Modern Medical Technologies*, (2), 36–40. [https://doi.org/10.34287/MMT.2\(45\).2020.6](https://doi.org/10.34287/MMT.2(45).2020.6)
18. Myronuk, I. S., Slabkyi, H. O., Shcherbinska, O. S., & Bilak-Lukianchuk, V. Y. (2023). *The consequences of the war with the Russian Federation for public health in Ukraine*. *Ukraine. Health of the Nation*, (3), 100–106. <https://doi.org/10.32782/2077-6594/2023.3/17>
19. Nahorna, A. M., Sokolova, M. P., & Kononova, I. G. (2021). *Occupational health of health-care workers in Ukraine: current status and challenges*. *Ukrainian Journal of Occupational Medicine*, 17(2), 95–104. <https://doi.org/10.33573/ujoh2021.02.095>
20. NATO Standardisation Office. (2019). *Allied joint doctrine for medical support (AJP-4.10) (Edition C, Version 1)*. NATO. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908272/AJP-4.10_Edition_C_Version_1.pdf
21. Seifer, S. D. (1998). *Service-learning: Community-campus partnerships for health professions education*. *Academic Medicine*, 73(3), 273–277. <https://doi.org/10.1097/00001888-199803000-00015>
22. Syvryda, O. V. (2018). *Innovative teaching methods in vocational education (project-based learning)*. *Medical Education*, (4), 77–80. <https://doi.org/10.11603/me.2414-5998.2018.4.9326>
23. Verkhovna Rada of Ukraine. (2022). *On the Public Health System: Law of Ukraine No. 2573-IX of 06.09.2022* (‘Legislation of Ukraine’ database). <https://zakon.rada.gov.ua/laws/show/2573-20>
24. World Health Organization. (2016). *mhGAP intervention guide for mental, neurological and substance use disorders in non-specialised health settings: Mental Health Gap Action Programme (mhGAP) (Version 2.0)*. <https://iris.who.int/handle/10665/250239>
25. World Health Organization. (2017). *WHO simulation exercise manual: A practical guide and tool for planning, conducting and evaluating simulation exercises for outbreaks and public health emergency preparedness and response*. <https://iris.who.int/handle/10665/254751>
26. World Health Organization. Regional Office for Europe. (2023). *Public health in Ukraine: situation analysis and priorities in the context of war*. WHO. <https://iris.who.int/handle/10665/366562>
27. Voronenko, Yu. V., Tolstanov, O. K., & Klimenko, O. V. (2021). *The experience of the COVID-19 pandemic as a catalyst for change in the training of medical personnel on epidemiological safety issues*. *Ukraine. Health of the Nation*, (2), 12–18. <https://doi.org/10.24144/2077-6594.2.1.2021.233512>
28. Zimenkovskiy, B. S., Hrezhgotskyi, M. R., & Lutsiuk, O. D. (2018). *Contemporary features of the medical education paradigm in Ukraine*. *Medical Education*, (2), 61–64. <https://doi.org/10.11603/me.2414-5998.2018.2.8797>