

# FUNDAMENTALS OF PREVENTION OF THORACIC ORGAN DISEASES IN MILITARY PERSONNEL

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## Abstract

The article examines contemporary principles for the prevention of thoracic organ diseases among military personnel during active military service. A comprehensive approach is presented, encompassing organizational, medical, and sanitary-hygienic measures aimed at reducing morbidity and preventing complications. Particular emphasis is placed on the early detection of pathology using modern imaging techniques (chest radiography and multislice computed tomography [MSCT]), the prevention of infectious complications in chest trauma, and the avoidance of chronic obstructive pulmonary disease (COPD) development. Key strategies discussed include smoking cessation, vaccination against influenza and pneumococcal infection, physical training, adaptation to climatic and geographic conditions of service, and psychological support for personnel. The critical role of adherence to sanitary-hygienic standards and the integration of advanced diagnostic technologies within the military medical support system is highlighted. The conclusion underscores the necessity of an interdisciplinary and multi-level approach to the prevention of thoracic organ diseases in order to preserve the health and combat readiness of military personnel.

**Keywords:** Preventive medicine; Thoracic diseases; Military personnel; Military medicine; Chronic obstructive pulmonary disease (COPD); Vaccination; Chest trauma; Thoracic radiography; Multislice computed tomography (MSCT); Hygiene measures; Respiratory tract infections.

## Introduction

The principles of preventing thoracic organ diseases in military personnel encompass a comprehensive set of measures aimed at reducing disease risk, enabling early detection of pathology, and creating conditions to prevent infectious diseases and other conditions adversely affecting respiratory health.

**Early Detection and Diagnosis of Thoracic Organ Diseases** Effective prevention relies heavily on regular medical examinations incorporating modern diagnostic methods, including chest radiography and multislice computed tomography (MSCT). These techniques enable timely identification of diseases at early stages—such as tuberculosis, pneumonia, or chronic lung diseases - thereby reducing severity and the likelihood of complications [1].



**Prevention of Complications from Chest Trauma** Multiple chest wounds remain an unavoidable occurrence in military service. Despite significant advances in treating injuries involving disruption of the musculoskeletal framework across various types of chest trauma, mortality rates remain high, ranging from 18.7–30%, and in certain regions of the Siberian Federal District, reaching 36–45%. Both deviations from established algorithms for medical care in chest injuries and improper execution of procedures can lead to infectious complications. It is now well established that the vast majority of patients with chest wounds require pleural cavity drainage for decompression, and failure to perform this is considered a serious error. Wide thoracotomies should be reserved for a limited number of patients, justified by clear indications and performed within appropriate timeframes. To prevent pulmonary infectious complications - primarily pneumonia -adequate respiration, effective coughing, and early respiratory activity must be achieved in the first hours after restoration of consciousness and muscle tone. Comprehensive postoperative analgesia is also essential. The condition of the lymphatic region, particularly in the affected area, plays a central role in detoxification processes. Consequently, the development of methods to prevent purulent-inflammatory complications in thoracic wounds using lymphotropic approaches remains a pressing challenge in surgery [11].

**Prevention of Chronic Obstructive Pulmonary Disease (COPD)** Chronic obstructive pulmonary disease (COPD) is characterized by persistent airflow limitation that is not fully reversible. Airflow limitation typically progresses and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases.

**Smoking Cessation** Smoking cessation has been shown to slow the progression of bronchial obstruction. Therefore, treatment of tobacco dependence is relevant for all patients with COPD. The most effective approaches include counseling by medical personnel (individual and group sessions) combined with pharmacotherapy. Three treatment programs for tobacco dependence exist: short-term (1–3 months), long-term (6–12 months), and harm reduction programs. Pharmacotherapy is recommended when physician counseling proves insufficient. Its use should be carefully considered in individuals smoking  $\geq 10$  cigarettes per day, adolescents, and pregnant women. Contraindications to nicotine replacement therapy include unstable angina, untreated duodenal peptic ulcer, recent acute myocardial infarction, and cerebrovascular events [12].

**Vaccination and Prevention of Infectious Diseases** Vaccination against influenza and pneumococcal infection is a key component of preventing thoracic organ diseases, particularly under military service conditions. Vaccination reduces the incidence of respiratory tract infections, especially in settings with high morbidity and limited sanitary conditions [2].

**Education and Awareness Raising** Increasing military personnel's awareness of the risks of thoracic organ diseases and appropriate preventive measures represents an important step in disease prevention. Educational programs focused on smoking cessation and healthy lifestyle maintenance help reduce risks of lung and respiratory tract diseases [3].



**Control of Working and Rest Conditions** Ensuring optimal working and resting conditions for military personnel is essential to minimize exposure to adverse factors. This includes adherence to sanitary-hygienic standards, protection from extreme cold or hot air, and monitoring air pollution levels and other risk factors [4].

**Use of Modern Diagnostic and Treatment Equipment** Advanced diagnostic methods, such as MSCT, facilitate not only diagnosis but also ongoing health monitoring of military personnel. Such equipment enables high-precision examinations, ensuring timely disease detection and, consequently, early treatment [5].

**Methods for Preventing Thoracic Organ Diseases in Military Service Conditions** Military personnel are frequently exposed to elevated risks of thoracic organ diseases due to constant physical exertion, stressful situations, and specific climatic-geographic conditions of service.

- **Physical Training and Exercises** Regular physical training strengthens the respiratory system and reduces the risk of thoracic organ diseases. Incorporating aerobic exercises—such as running, swimming, or cycling—into training programs improves lung ventilation and overall respiratory function [6].

- **Adaptation to Climatic-Geographic Conditions** Military personnel often operate in diverse climatic zones, which can impact health. Prevention includes measures to facilitate adaptation to extreme conditions, such as appropriate protection against overheating or hypothermia, safeguarding against harmful air pollutants, and optimizing recovery conditions [7].

- **Adherence to Sanitary-Hygienic Standards** In military settings, strict compliance with basic hygiene norms is particularly critical. This includes regular handwashing, use of personal hygiene products, proper nutrition, and maintenance of sanitary conditions in living and working areas. Such measures reduce the risk of respiratory tract infections [8].

- **Psychological Support** Stress and psychological overload can impair immune function, rendering military personnel more susceptible to infectious diseases, including those of the thoracic organs. Psychological support and stress-reduction activities are vital preventive elements [9].

- **Use of Medical Preparations** In certain cases, prophylactic medications—including antiseptics and antibiotics—may be prescribed to prevent infections. These are especially important in high-risk settings, such as combat zones or areas with large personnel concentrations [10].

**Organizational-Clinical Algorithm for Prevention and Medical Surveillance** To enhance the effectiveness of preventing thoracic organ diseases in military personnel, implementation of a stratified surveillance system accounting for individual risk factors and service conditions is advisable. This approach enables rational resource allocation, reduces morbidity, and prevents complications—particularly in units with high personnel density and increased respiratory load.



**1. Risk Stratification (Initial Selection):** Individuals at elevated risk should include those with one or more factors: active/past smoking, frequent acute respiratory viral infections (ARVI), chronic respiratory diseases, prior pneumonia, service in dusty/smoky/chemically aerosol-laden environments, frequent hypothermia, or barracks living conditions. For this category, expanded preventive measures and diagnostics are justified, including functional respiratory assessment and immunization based on epidemiological indications.

## 2. Preventive Screening and Early Diagnosis:

- **Tuberculosis (TB):** Systematic screening in risk groups should include symptom assessment and, if indicated, chest radiography; active case-finding programs may incorporate computer-aided detection (CAD) systems to improve detection rates and standardize interpretation [13].
- **COPD/Chronic Symptoms:** For personnel with prolonged cough, dyspnea, and/or significant smoking history, spirometry is essential to confirm bronchial obstruction and monitor intervention effectiveness (including smoking cessation) [14].
- **Imaging:** When planning repeat studies, dose optimization principles should be followed, and diagnostic protocols applied strictly according to clinical indications—particularly in young individuals and during follow-up—to minimize cumulative radiation exposure without compromising clinical efficacy.

## 3. Standardized Preventive Pathway (Proposed):

- Annual primary examination: history + risk factor assessment + physical examination + basic laboratory tests per local protocol.
- In the presence of risk factors/symptoms: chest radiography (and MSCT if indicated), spirometry, pulmonologist consultation.
- Suspected TB: active case-finding pathway (symptoms → radiography/CAD → rapid molecular tests if indicated) [13].

**Vaccination Prophylaxis and Management of Respiratory Outbreaks in Units** High crowding, shared quarters, and intensive contacts in military units facilitate rapid spread of respiratory infections. Prevention must therefore combine individual and group measures.

**1. Influenza Vaccination:** Annual vaccination is a core measure against seasonal outbreaks, with particularly high priority in organized collectives and for medical personnel. Recommendations call for annual immunization of individuals aged  $\geq 6$  months in the absence of contraindications; optimal timing is before the seasonal rise (typically September–October, with continuation throughout the season) [15].

**2. Pneumococcal Vaccination:** Pneumococcal immunization is crucial for preventing severe pneumonia and complications in at-risk groups. Current adult regimens favor conjugate vaccines (e.g., PCV15, PCV20, or PCV21) based on age and risk factors. When PCV15 is used, a subsequent PPSV23 dose is generally required; after PCV20 or PCV21, additional PPSV23 is typically not needed [16]. Regimen specification should follow departmental protocols and individual indications.



**3. Non-Pharmacological Measures and Outbreak Prevention:** To reduce transmission in barracks and training centers, enhance ventilation, microclimate control, separation of flows during ARVI symptoms, early isolation of cases, hand hygiene, respiratory etiquette, and mask availability during seasonal rises. Sanitary education of personnel and promotion of adherence to preventive measures are of particular importance.

**Smoking Cessation as a Key Factor in Reducing COPD and Respiratory Infection Risk** Smoking remains one of the most significant modifiable risk factors for chronic lung diseases and adverse outcomes of respiratory infections. An effective preventive program in military settings must include not only information but structured medical support for tobacco dependence: brief motivational counseling (individual/group), pharmacotherapy when needed (nicotine replacement therapy, varenicline, bupropion, etc.) per clinical protocols and considering contraindications, and ongoing monitoring with relapse prevention. International strategic documents emphasize that smoking cessation is the most effective intervention for slowing chronic bronchial obstruction progression and reducing exacerbation frequency [14].

### Conclusions

The fundamentals of preventing diseases in military personnel under various conditions require a comprehensive approach incorporating organizational, medical, and hygienic measures.

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