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Analysis of the causes and circumstances of death in the workplace resulting from injuries and general illnesses

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Abstract. The article examines the prevalence and causes of fatal industrial accidents due to occupational injuries and common diseases at enterprises in various sectors of the economy of the Republic of Bashkortostan and develops proposals to reduce the risk of their occurrence. The paper uses the method of retrospective analysis based on the materials of the investigation of fatal accidents that occurred at the workplace in the enterprises of the republic. The analysis showed that as a result of injuries, men in the age range of 30-49 years with short work experience most often died. Falls from heights and traffic accidents dominated among the causes of death. In the workplace, men aged 50-64 died more often from common diseases due to diseases of the circulatory system. The conducted research made it possible to identify the sectors of the economy and professions with the highest risk of fatal accidents, identify the main causes and circumstances that led to deaths and develop preventive measures to minimize them.

Keywords: workplace deaths, injuries, common diseases, workers, economic sectors, prevention, cardiovascular diseases

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Introduction. Global demographic transformations, characterized by the progressive aging of the working-age population and an increasing shortage of personnel, determine the priorities of government policy to preserve the health and professional longevity of workers. In this context, workplace fatalities are significant due to the irreparable loss of qualified human capital.

The determination of predictors of life-threatening conditions that arise in the course of professional activity is the subject of close attention of the scientific community. Special importance is attached to the phenomenon of sudden cardiac death (SCD), in the genesis of which the work environment, modifiable behavioral factors and hereditary predisposition can interact [1].

The manifestation of SCD is often associated with specific stress factors of the working environment: desynchronization of circadian rhythms, extreme physical exertion, irregular shift duration and psychoemotional overstrain [2-3]. As a result, cohorts of high-risk professions are identified in the specialized literature: military personnel, pilots, locomotive engineers, etc. [4-6].

However, an isolated assessment of somatic risks without taking into account the specifics of the occupational hazard

environment does not allow us to form a complete picture of the loss of labor potential. Despite the fact that the statistical indicators of the Russian Federation demonstrate long-term trends in the reduction of general and fatal occupational injuries, a detailed analysis reveals significant industry heterogeneity [7-9]. The most critical mortality rates continue to be recorded in the construction sector, which directly correlates with the growth of high-rise buildings and the attraction of migrant workers [7, 10-12]. A similar situation is observed in the extractive industry, where a high level of injury remains [9, 10].

It should be noted that the statistical reporting system and publicly available data generated by the State Labor Inspectorate (GIT) and the Social Fund of Russia (SFR) do not differentiate deaths from common diseases from fatal accidents at work. The generated reports contain data on the total number of accidents, the number of victims, information on group cases, gradation by severity of consequences, division by type of economic activity and reasons. The format of the information provided most often involves a comparison with previous periods over several years.

Over the years, there has been a discrepancy between the GIT and SFR

statistics in terms of number, since the SFR takes into account cases based on the principle of recognizing them as insured events, this is especially important in relation to death events from common diseases that can be investigated but are not recognized as insured. There are scattered data on individual subjects of the Russian Federation, obtained as a result of additional analysis conducted by the forces of the territorial divisions of the GIT and the staff of scientific departments.

Rostrud cites data that in 2017 the share of deaths from general diseases is 85.0%, the GIT in Moscow indicates an increase in 2019-2022 in the rate of workplace deaths from somatic diseases by 18.0% compared with pre-pandemic ones. In some years, up to 68.0% of the total number of victims died as a result of common diseases in the Kemerovo Region, and up to 77.5% of the total number of victims in the Republic of Bashkortostan. In most cases, circulatory diseases were the cause of death, 85.0–94.0% [13-16].

The analysis shows that official statistics contain only isolated information on the number of fatal accidents from common diseases both in the country as a whole and in its regions, which necessitates the study of mortality rates from

common diseases as a separate aspect requiring a comprehensive analysis and an expansion of statistical information.

The purpose of the study: to assess the prevalence and causes of fatal accidents due to occupational injuries and common diseases in enterprises of various sectors of the economy of the Republic of Bashkortostan and to develop proposals to reduce the risk of their occurrence.

Materials and methods. This retrospective descriptive and analytical study was carried out by forming a continuous sample from the acts of investigation of fatal accidents at work registered by the State Labor Inspectorate in the Republic of Bashkortostan in the period from 2018 to 2024. The database included information on 869 workplace fatalities, of which 333 were caused by work-related injuries and 536 by general somatic diseases.

The subsequent mathematical and statistical processing of the collected material included the calculation of extensive characteristics (determination of structural fractions in percentages), intensive parameters (estimation of event frequency coefficients per 1,000 employees) and was carried out using specialized analytical software packages Statistica 10.0 and Microsoft Excel 2016.

The completed study did not require the conclusion of the ethics committee.

Results and discussion. An analysis of the structure of fatal accidents at work revealed a steady trend characterized by a predominance of deaths from common diseases, the proportion of which during the follow-up period was 61.7%, compared with injuries. It was found that the vast majority of deaths from common diseases (97.1%) were due to acute cardiovascular pathology, the structure of which was dominated by sudden cardiac death and myocardial infarction (91.0%), as well as cerebrovascular disorders (6.1%). At the same time, it was revealed that 75.9% of those who died from common diseases had previously undergone regulated periodic medical examinations provided for by current legislation, and 37.0% of the deceased had a confirmed cardiological history and repeatedly (from 3 to 5 times) sought specialized medical care in the period immediately preceding death. This may indicate some shortcomings in the conduct of periodic medical examinations, examination of professional suitability. Unregulated occupational overstrain should be recognized as a significant cause of such fatal outcomes in the workplace. Despite the fact that the official parameters of labor intensity among those who died from common diseases

were often classified as acceptable, a retrospective analysis of the investigation reports allowed us to establish the facts of systematic overwork, which reached from 200 to 900 hours per year, which is especially typical for workers by profession driver, mechanic, cashier. The legal objectification of the fact of overwork and chronic overwork in judicial practice serves as the basis for the reclassification of death from a general illness into an accident related to production.

These conclusions are confirmed by judicial practice, in particular by Rulings of the Supreme Court of the Russian Federation dated 04/05/2021 No. 57-KG21-1-K1, dated 06/20/2022 No. 35-KG22-2-K2.

Differences in the age and length of service characteristics of those who died at work were revealed. If somatic disasters occur mainly in older age cohorts – 50-64 years old, with an absolute maximum in the range of 55-59 years against the background of prolonged exposure to harmful industrial factors exceeding 25 years, then 45% of workers who died from injuries had professional experience of less than one year – "novice syndrome". The age of those who died from injuries is also shifted towards younger groups: 30-39 years (31.4%) and 40-49 years (24.9%). It was found that workers who died as a result of injuries were significantly less likely to seek medical help, limited to episodes of acute respiratory viral infections. The revealed age and length of service differences were complemented by industry affiliation, confirming that the nature of the fatal outcome is determined by the specifics of the enterprise. In particular, the maximum number of fatal injuries was registered in industries with a high level of occupational risk, such as construction (0.17%) and water supply (0.11%). At the same time, the main etiological factors of death from injuries are falls from height (25.7%) and exposure to moving parts and mechanisms (16.4%). On the contrary, in the field of transport logistics (0.18%) and energy (0.15%), death in the workplace is mainly due to somatic pathology. The exception is the mining industry, which demonstrates a combined risk profile (0.14% for injuries and 0.17% for general illnesses). The leading positions of road accidents (30.2%) in the structure of fatal injuries are due to the specific features of the transport industry, which concentrates the risks of high-speed kinetics, work and rest disorders, as well as the increased responsibility of drivers for people's lives under constantly changing external working conditions.

The conducted research on statistical data on fatal workplace accidents has made it possible to identify sectors of the economy and professions with the greatest occupational risk, in respect of which dynamic monitoring of occupational mortality rates should be continued, and a set of preventive measures should be implemented.

Conclusion. Summarizing the results of the study, it should be noted that existing approaches to employee health protection need serious transformation. The concept of "Zero injury" (Vision Zero) is important, but it is not enough, it is also necessary to take into account and manage the risks of developing occupational and work-related diseases.

Strict compliance with industry occupational safety standards to reduce occupational injuries remains the main requirement, however, additional safety measures must be implemented for industries with the highest levels of workplace fatalities. In the context of preventing death in the workplace from a common disease, the primary administrative task for employers should be to strictly curb the practice of exceeding the limits of working hours regulated by labor legislation, along with ensuring physiologically sound work and rest regimes.

At the regulatory level, it is necessary to review the requirements for conducting a special assessment of working conditions (SAUT), namely, a return to mandatory assessment of the severity and intensity of the labor process at all workplaces subject to SAUT, without any exceptions. The list of parameters to be evaluated should be reduced to the volume provided by the "Guidelines for the Hygienic assessment of factors of the working environment and the labor process. Criteria and classification of working conditions". In this case, an objective picture of the degree of influence of occupational risk factors on the employee's health will be obtained, which will allow for the implementation of targeted measures to prevent occupational-related somatic pathology.

Of particular importance is the approximation of primary health care to work facilities by creating medical and sanitary units, paramedic health centers at industrial facilities and shift camps equipped with electrocardiographs, defibrillators, ambulances.

The main measures in case of sudden cardiac death that increase the survival rate of patients include early detection of SCD, timely call for medical attention, and the immediate onset of chest compression and defibrillation. In this regard,

medical personnel should be trained in first aid methods, cardiopulmonary resuscitation using defibrillators.

The systematic and coordinated implementation of the proposed set of medical and organizational measures will create a reliable barrier to reduce accidents at work, thereby ensuring the preservation of strategic labor potential.

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Incidence of work disability due to circulatory system diseases in the Russian Federation in the early post-pandemic period

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High mortality rates from diseases of the circulatory system, coupled with labor shortage, account for special attention to studying health of the working population. The study aims to compare rates of sickness absence from work due to diseases of the circulatory system in the Russian Federation between the pre-pandemic and early post-pandemic periods.

Materials and methods. Based on data from the annual statistical reporting form No. 16-VN, *Information on causes of sickness absence*, we calculated and analyzed the number of episodes of sickness absence from work due to circulatory system diseases (CSD) and the number of days lost per 100 employed population by sex, as well as the mean duration of an episode in the years 2015–2019 and 2023 in the Russian Federation. The number of episodes per 100 employed population was calculated for five-year age cohorts in the range of 15 to 59 years and for the cohort aged 60 years and older.

Results. We established a statistical increase in post-pandemic rates of sickness absence among workers of both sexes in the age groups under 30 with a simultaneous decrease in older workers.

Conclusions. The statistical significance of differences in pre- and post-pandemic sickness absence rates is partly due to their low variability before the pandemic of COVID-19. To reduce mortality from circulatory system diseases, employers are advised to pay special attention to the circulatory health of younger workers when developing and implementing corporate wellness programs.

Keywords: sickness absence, diseases of the circulatory system, post-pandemic period, age and sex-specific characteristics.

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Introduction. Results of numerous studies conducted worldwide demonstrate a significant impact of the spread of the novel coronavirus disease (COVID-19) on population health. Both short- and long-term adverse effects of SARS-CoV-2 on the cardiovascular system have been proven [1, 2, 3-5].

Demographic challenges and labor shortage in the country determine the relevance of studying health effects of COVID-19 in workers. Given that diseases of the circulatory system are the leading cause of death in the working-age population, establishing the influence of the novel coronavirus disease on sickness absence due to circulatory diseases is of paramount importance [6-9].

The study **aims** to compare sickness absence from work due to diseases of

the circulatory system in the Russian Federation between the pre-pandemic and early post-pandemic periods.

Materials and Methods. We analyzed data from the annual statistical reporting form No. 16-VN, *Information on causes of sickness absence*, and compared the average rates of sickness absence due to circulatory system diseases (CSD) in the Russian Federation between the years 2015–2019 and 2023. Form 16-VN contains information on the number of days and episodes of CSD-related sickness absence, based on which intensive sex- and age-specific rates were calculated. Since open statistical data resources provide no age and sex structure of the working population, we applied an approach that is based on the size of employed

population to calculate intensive indicators [10-12]. Taking into account age- and sex-specific patterns of sickness absence, we calculated the number of episodes of sickness absence and the number of days lost due to CSD per 100 employed population, as well as the mean duration of an episode in the years 2015–2019 and 2023 for men and women separately. The number of episodes per 100 employed population was calculated for five-year age cohorts in the range of 15 to 59 years and for the cohort aged 60 years and older. The Kolmogorov-Smirnov test established the normal distribution of data for 2015–2019. We calculated mean values (M) for all the above indicators for the time span of 2015–2019 and their growth rates in 2023 compared to pre-pandemic