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PREVENTION OF CARDIOVASCULAR DISASTERS AT OPERATORS OF CONTROL PANELS OF NUCLEAR POWER PLANTS

About 18 million people die prematurely annually from cardiovascular diseases in the world [1], most from myocardial infarction (coronary heart disease) and cerebral stroke (15.2 million premature deaths in 2016) [2]. In Ukraine, cardiovascular diseases cause 2/3 of all premature deaths [3].

There are more than 300 risk factors for myocardial infarction and cerebral stroke [4; 5], the most significant of which are: behavioral (physical inactivity, tobacco smoking, alcohol abuse, overeating fats, sugar and kitchen salt, refusal to undergo a medical examination and the necessary correction of arterial hypertension, hypercholesterolemia, hyperglycemia, hyperhemoglobinemia, higher sport achievements, residence in areas where qualified medical care is unavailable), physiological/pathophysiological (distress, arterial hypertension, cardiac arrhythmias and conduction disorders, obesity, diabetes mellitus, atherosclerosis, age 60+, transient ischemic attacks, myocardial

infarction and stroke in anamnesis vitae, sleep apnea, thromboembolic diseases, hyperhomocysteinemia, the use of oral contraceptives and hormone replacement therapy after menopause, with hypofunction or after resection of the endocrine glands), genetic (family history of Andersen-Farby disease, transient ischemic attacks, heart attack and stroke), environmental factors (air pollution with sulfur and nitrogen dioxin, carbon black, Benzo(a)pyrene, formaldehyde, ammonia, etc.). Many factors have a greater or lesser effect depending on gender, race and combination of these factors.

Occupational stressful situations are among the risks of cardiovascular accidents, which happen for the first time. Such cases in the work of operators of control panels of energy enterprises have not been studied enough [6]. At 15 blocks of nuclear power plants (hereinafter – NPPs) of Ukraine, the IAEA licensed more than 400 operators [7], with an average of 26 operators per unit. More than a thousand operators of control panels work at thermal power plants in Ukraine. More than 442 nuclear reactors operate at NPPs in 30 countries of the world [8], each of which is controlled from 20 to 30 operators in shifts. Given the number of staff and high levels of stress, we assume [9; 10] that cases of acute circulatory disorders are possible, even despite the mandatory and fairly strict medical examinations [11]. However, most materials on medical and psychological examinations of this category of workers do not publish, or restrict access to them – they put the stamp «For administrative use» on them (for example, [12]). At the same time, the safety of nuclear facilities is constantly publicly discussed. For Ukraine, such issues are of particular importance given the burden of the consequences of the Chernobyl accident in 1986 [13]. The safety of the operator of the NPP control panel and its performance in stressful emergency situations can affect the outcome of an emergency.

Despite technological progress, it is impossible to replace NPP's operators with robots and automation [14; 15]. During the control of the NPP processes, the operators of the control panels experience large psycho-emotional loads, which increase significantly during emergency situations [16]. Presumably in the next decade there will be more

emergencies, as the electrical equipment is worn out, it is not being replaced with a new one after the end of its life, only modernization and repairs [17]. Due to the wear of the equipment, it is necessary to control more parameters of its operation. For each operator, the load on control and management is increasing. The issues of the number of information channels and attention points that actively track the exit of technical parameters beyond the boundaries of safe operation of equipment are being actively investigated [15].

During emergency situations, operators experience distress for several hours. This time is enough for a cardiovascular catastrophe to occur, which may be incorrectly estimated or not even noticed by the victim himself. That is why there is a technique for identifying symptoms of stroke on the FAST scale (Face – Hand – Speech – Time), which operators do not have time to use during emergencies. You should also remember about painless forms of cerebral strokes and myocardial infarction.

In order to preserve the health and life of the operators of NPP control panels during emergencies, and to minimize the risks of emergencies adverse outcome, we propose the introduction of a new full-time post of medical controller at each NPP. His duties should include: monitoring the physical condition of all shift operators according to portable diagnostic devices for monitoring blood pressure, pulse, ECG, respiratory rate and pupillary reflexes [9], removing the injured operator from work to replace him with another employee (in case of hypertensive crisis, cerebral stroke or myocardial infarction). It is also necessary to continue research on the reasonable limits of the information load on each operator of the NPP control panel.

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