РЕФОРМУВАННЯ СИСТЕМИ ОХОРОНИ ЗДОРОВ'Я: РОЛЬ І МІСЦЕ ЗАКЛАДІВ ОХОРОНИ ЗДОРОВ'Я ТРЕТИННОГО РІВНЯ ПРИ РАДІАЦІЙНИХ НАДЗВИЧАЙНИХ СИТУАЦІЯХ В УМОВАХ ВОЄННОГО СТАНУ

З урахуванням досвіду ліквідації наслідків Чорнобильської катастрофи розглянуті роль і місце закладів охорони здоров'я високоспеціалізованого (третинного) рівня при радіаційних надзвичайних ситуаціях в умовах воєнного стану. Наведена класифікація надзвичайних ситуацій і основні сценарії радіаційних надзвичайних ситуацій (ядерний тероризм, радіаційні аварії та інциденти, застосування ядерної зброї). На досвіді Чорнобильської катастрофи наведені принципи забезпечення медичної готовності та надання високоспеціалізованої медичної допомоги при радіаційній надзвичайній ситуації. Визначено, що третинні заклади охорони здоров'я при радіаційній надзвичайній ситуації забезпечують: розробку і виконання планів та протоколів надання високоспеціалізованої медичної допомоги; організацію, безпосередню надання, координацію і контроль якості надання високоспеціалізованої допомоги; об'єднання і координацію зусиль всіх трьох рівнів закладів охорони здоров'я; інтеграцію до системи управління радіаційною надзвичайною ситуацією та аналіз і узагальнення отриманого досвіду.

Ключові слова: радіаційна надзвичайна ситуація, Чорнобильська катастрофа, воєнний стан, реформа системи охорони здоров'я, високоспеціалізований (третинний) рівень медичної допомоги.

REFORMING OF PUBLIC HEALTH SYSTEM: THE ROLE AND PLACE OF HEALTH CARE FACILITIES OF THE TERTIARY LEVEL IN RADIATION EMERGENCIES IN MARTIAL LAW

The role and place of health care facilities of the highly specialized (tertiary) level in radiation emergencies in the conditions of martial law are considered taking into account the experience of overcoming of the Chornobyl catastrophe consequences. The classification of emergencies and the main scenarios of radiation emergencies (nuclear terrorism, radiation accidents and incidents, the use of nuclear weapons) are presented. The principles of medical preparedness and providing the highly specialized medical care in a radiological emergency are presented on the base of the Chornobyl catastrophe experience. It is determined that the tertiary health care facilities in a radiological emergency should provide as follow: development and implementation of plans and protocols of highly specialized medical care; organization, direct provision, coordination and quality control of the highly specialized medical care; aggregation and coordination of efforts of all three levels of health care facilities; integration into the radiation emergency management system, and analysis and generalization of the experience gained.

Key words: radiation emergency, Chornobyl catastrophe, martial law, reforming of public health system, highly specialized (tertiary) level of medical care.
INTRODUCTION

Ukraine continues to reform public health system, which in 2020 will have to cover the tertiary (highly specialized) level of medical care. Particular attention needs to be given to determining the role and place of the tertiary health facilities in radiation emergencies in martial law.

Emergency — a situation that poses a direct danger to life, health, property and the environment, violates the normal conditions of life and activities of people and requires urgent intervention (response). Classification of emergencies is shown in Fig. 1.

The response to the accident at the Chornobyl Nuclear Power Plant was analyzed. Measures taken in the early and late periods after the accident are considered, and achievements and mistakes are assessed. The legal basis for the dose estimation and registration, and treatment of radiation effects are described. The dissemination of scientific information to the public is crucial for preventing the early and remote effects of radiation. The lessons of responding to the Chornobyl disaster as a major industrial catastrophe involving large communities showed the multifaceted nature of such an answer and identified the needs of affected areas, as well as the need for multisectoral cooperation, the establishment of national networks for dose assessment and long-term medical surveillance of affected populations. In addition to adequate resources for response, the availability of laboratory and instrumental equipment and...
trained staff is essential, providing clear, reliable information and practical advice on real health risks to the population [1].

The medical response to radiation emergencies in Ukraine is carried out in the framework of the WHO’s Radiation Emergency Medical Preparedness and Assistance Network, REMPAN [2]. The system of optimization of medical care to the population in a large-scale radiological accident (based on the experience of the Chornobyl catastrophe consequences cleaning up) is scientifically justified [3]. Medico-biophysical support for the transformation of the “Shelter” Object of the State specialized enterprise “Chornobyl Nuclear Power Plant” (ChNPP SSE) to the ecologically-safe system is carried out within the framework of the BIOMED Project in the Shelter Implementation Plan, SIP [4–6].

In the State Institution «National Research Center for Radiation Medicine of National Academy of Medical Sciences of Ukraine», regular training of medical response to civil protection under various radiological scenarios (NPP accident, “dirty bomb” in the metropolis, accident at a research reactor in the metropolis) are regularly conducted. The principles of medical provision of antiterrorist operation in a radiation emergency are scientifically grounded [7]. The system of mental health protection in radiation accidents on nuclear reactors and the use of “dirty bomb”, and tactical nuclear weapons is proposed [8–10]. The program of radiation-hygienic monitoring for radiological protection of a person in radiation accidents and acts of nuclear terrorism has been developed [11].

Ukraine is a nuclear state with a highly developed nuclear power complex. In the electricity power industry of Ukraine, the generating capacity of nuclear power plants (NPPs) is approximately 24.5%. In critical winter periods, the share of NPP accounts for more than 40% of the electricity produced in Ukraine. By the number of nuclear reactors, Ukraine ranks ninth in the world and fifth in Europe. Ukraine has 4 nuclear power plants with 15 power units, one of which, Zaporizhzhya NPP with 6 power units with a total capacity of 6,000 MW is the most powerful in Europe [11]. In addition, in Ukraine, there is ChNPP withdrew from operation with new confinement over the destroyed IV unit («Shelter» Object), two research reactors (in
Севастополі), спецкомбінати з відкритими джерелами іонізуючого випромінювання та підприємства з переробки урану. Багато таких підприємств розташовано на територіях, де введено воєнний стан (головні — Запорізька та Південно-Українська АЕС), або безпосередньо на тимчасово окупаційних територіях (рис. 2). Вперше у світі введено воєнний стан на територіях, де розташовані АЕС та інші ядерні об’єкти. Потенційні радіаційні надзвичайні ситуації на них носитимуть транснаціональний характер.

Все це створює передумови навмисного або випадкового руйнування ядерних об’єктів під час воєнних дій та створення терористичної атаки з використанням об’єктів атомної промисловості та/або застосуванням диспергуючого радіологічного пристрою («брудної бомби»).

Сценарії радіаційних надзвичайних ситуацій
Наводимо основні сценарії радіаційних надзвичайних ситуацій у порядку ризику їх виникнення з урахуванням поточних геополітичних обставин [7, 9, 10].

Radiation Emergency Scenarios
We give the main scenarios of radiation emergency situations at the risk of their occurrence, taking into account current geopolitical circumstances [7, 9, 10].
Scenario 1. Nuclear terrorism («Nuclear Intimidation»)

➤ «Dirty bomb» (dispersing radiologic device):
➢ accidental or deliberate destruction of an ammunition during a military operation of a nuclear power plant or other civilian facility working with radioactive materials;
➢ seizure of a nuclear power plant or other civilian facility working with radioactive materials, mines and explosions;
➢ «dirty bomb» as a shell of radioactive materials for a conventional non-nuclear ammunition.

➤ One state’s blackmail of another threat to the use of nuclear weapons;

➤ Nuclear bomb:
➢ stolen or captured from the stockpiles of nuclear-weapon states;
➢ handmade nuclear bomb.

➤ Environmental pollution:
➢ spray of radioactive materials from airplanes and helicopters;
➢ dissolution of radioactive materials in drinking water sources;
➢ mixing of radioactive materials with food, beverages and other products.

At present, an important direction in radiation safety is emergency preparedness and emergency response to the inadvertent spread of radioactive substances, as manifestations of nuclear terrorism. Such an extension may be aimed at both individuals and large numbers of people («dirty bomb»). Famous examples are the incident with Litvinenko (2006) [which can also be considered as a radiological incident with intentional radiotoxicological intervention] and the discovery of a Cs-137 container packed with Chechen extremists in the Ismayilovsky Park in Moscow in 1995. The current legislation does not provide for the detection and adequate response of such events (restriction of access, definition of scale, deactivation, identification of exposed persons, and their dosimetric and medical support, etc.). The application of optimal radiation and hygiene monitoring procedures can reduce the time to determine the magnitude and significance of such events, and substantiate the applicability of appropriate countermeasures and mitigation procedures for these events to humans.

Scenario 2. Nuclear and radiological accidents and incidents

Any event with radioactive materials and radiation sources:
➤ transportation;
Storage and use:
- Accidents at NPPs and nuclear reactors;
- Theft;
- Non-owner sources;
- Intentional radiotoxicological intervention (poisoning);
- Loss.

Radiation catastrophes for nuclear power reactors are commonly known – the accident at the Three Mile Island NPP, Pennsylvania, USA, 1979; Chornobyl catastrophe, USSR, Ukraine, 1986; Fukushima Daiichi, Japan, 2011 and other accidents at nuclear facilities, including military ones.

Thus, the risk of nuclear and radiological accidents and incidents of very different scales and impacts now remains high, requiring adequate readiness and response.

Scenario 3. Tactical and strategic nuclear weapons
- Tactical (several kT in TNT equivalent):
  - Neutron bomb;
  - Bombs of free fall (gravitational);
  - Short range missiles;
  - Artillery shells;
  - Mines;
  - Oversized caliber (balls 7.62 mm, CfK252);
- Strategic > 100 kT

Events and mechanisms that explain how radiation cataclysms lead to health disorders are shown in the figure.
in Fig. 3. In any radiation situation there will be chaos with reactions to stress (including psychotic) that may be local, but can also capture a significant part of society. Radiation disasters are always accompanied by a hypertrophied perception of the risk of a radiation hazard, unlike its real component. That is, the irradiation can be quite small, but its subjective perception will be too large, which can lead to panic. Stress effects of a radiation emergency will definitely cause psychosomatic disorders. The latest along with the radiation impact will determine the socio-medical burden with cancer and noncancer health effects and psychological and psychiatric consequences of an emergency.

**Medical support and provision of tertiary (highly specialized) medical care in a radiation emergency**

The WHO Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) is a key system of highly specialized medical responses to radiation emergencies. The network serves as a platform for sharing experiences, information and good practices in the community of professionals and provides access to technical knowledge for countries where such resources are not yet available.

Tertiary (highly specialized) level of medical care in a radiation emergency includes:

➤ medical aid provided to patients and victims with diseases and injuries (potential injuries) that require special and high-tech methods of diagnosis, treatment and rehabilitation;

➤ available on outpatient (radiological triage) and in-patient stages of medical care;

➤ amount of tertiary care determined by medical indications according to modern advances in medical science and practice;

➤ in a radiation emergency, all medical care is free of charge (at the expense of the state).

**Peculiarities of the conditions and provision of the tertiary level of medical care (highly specialized) in a radiation emergency:**

➤ radiation pollution – the need for radiological protection:
Забруднені постраждалі і медичний персонал;
нерадіаційний вплив радіаційної надзвичайної ситуації:
→ охорона психічного здоров’я;
→ інтегрування до системи управління радіаційної надзвичайної ситуації:
  ➢ евакуація, переселення та ін.;
  ➢ радіаційно-гігієнічний моніторинг;
→ специфічні радіологічні медичні втручання:
  ➢ йодна профілактика;
  ➢ менеджмент променевих уражень;
  ➢ декорпорація радіонуклідів;
  ➢ радіопротектори (хімічний радіозахист).

Заклади охорони здоров’я для надання третинної (високоспеціалізованої) медичної допомоги при радіаційних надзвичайних ситуаціях, які здійснюють свою діяльність в умовах реформування – інтеграції відомчої медицини до загальної охорони здоров’я:
→ обласні лікарні;
→ центри високоспеціалізованої медичної допомоги;
→ клініки науково-дослідних інститутів Національної академії медичних наук та Міністерства охорони здоров’я України;
→ університетські клініки;
→ ліцензовані високоспеціалізовані приватні клініки;
→ лікарні Державного управління справами, Міністерства оборони, Служби безпеки України, Міністерства внутрішніх справ ін.;
→ спеціалізовані диспансери радіаційного захисту населення;
→ спеціалізовані медико-санітарні частини у містах-супутниках АЕС.

Загальні принципи охорони здоров’я при радіаційних надзвичайних ситуаціях в умовах воєнного стану:
→ готовність і планування;
→ ефективний менеджмент;
→ адекватне матеріально-технічне забезпечення;
→ оперативність, невідкладність і активність;
→ найактивніша участь у забезпеченні управління радіаційною надзвичайною ситуацією;
→ співробітництво з військовими та рятувальниками;
→ радіаційно-гігієнічний моніторинг;
→ оцінка шкоди здоров’ю;
→ інтеграція з первинною медичною допомогою;
→ доступність до всіх верств населення;
→ співробітництво з урядовими і нічого неорганізаціями;
→ навчання і контроль факівцями;
→ перевага середньо- і довготривалої стратегії;
→ контроль ефективності.

Contaminated both victims and medical personnel;
→ non-radiological impact of a radiation emergency:
  ➢ mental health protection;
→ Integration into the radiation emergency management system:
  ➢ evacuation, relocation, etc.;
  ➢ radiation-hygienic monitoring;
→ specific radiological medical interventions:
  ➢ iodine prophylaxis;
  ➢ radiation damage management;
  ➢ decontamination of radionuclides;
  ➢ radioprotectors (chemical radioprotection).

Health care institutions to provide tertiary (highly specialized) medical care in radiation emergencies, which carry out their activities in the context of reform – the integration of medical care in general health:
→ Regional hospitals;
→ Centers of highly specialized medical care;
→ Clinics of the Research Institutes of National Academy of Medical Sciences and the Ministry of Health of Ukraine;
→ University Clinics;
→ licensed, highly specialized private clinics;
→ hospitals of State Administration of Affairs, Ministry of Defense, Security Service, Ministry of Internal Affairs, Ministry of Infrastructure, etc.;
→ specialized dispensaries for radiological protection of the population;
→ specialized medical and sanitary units in the cities-satellites of nuclear power plants.

General principles of health protection in radiation emergencies in martial law imposition include:
→ readiness and planning;
→ effective management;
→ adequate logistics;
→ efficiency, urgency and activity;
→ the most active participation in ensuring radiation emergency management;
→ cooperation with military and rescuers;
→ radiation-hygienic monitoring;
→ assessment of health damage;
→ integration with primary care;
→ accessibility to all segments of the population;
→ cooperation with governmental and non-governmental organizations;
→ training and supervision by specialists;
→ the advantage of medium- and long-term strategy;
→ control of efficiency.
Scientific substantiation of the principles of medical provision for a radiological emergency is based on its own Chornobyl experience and the experience of other radiation accidents and incidents [3, 7–10], as well as with the use and adaptation of international guidelines for medical, psychological and psychiatric escorting of radiation emergencies [13, 14]. The following methods of research support are applied: systematic approach, bibliosemantic, statistical, graphical, sociological, and expert assessments [3].

The experience of coping with the Chornobyl disaster shows the following [3]:
➢ absence of prediction of an accident of this magnitude;
➢ imposition of the disaster burden on the medical and sanitary unit of the ChNPP without involving the forces of the territorial health authorities;
➢ lack of system and organizational principles for the provision of medical care;
➢ priority of socio-psychological factors of conditions of human vital activity in the formation of health;
➢ continuous improvement of the readiness of all forces and means of health care;
➢ the need for social and medical interventions and public discussion with the observance of the principle of social justice.

Evacuation. In the first days after the Chornobyl disaster, 135,000 people were evacuated. The following medical and biophysical evacuation problems arose:
➢ uncertainty of medical examination;
➢ unpredictable distribution of flows of people and cattle;
➢ lack of overalls and personal protective equipment;
➢ unsuitability of dosimetric devices;
➢ lack of even the simplest medical documentation;
➢ unsuitability of temporary fumigation points;
➢ absence of standards of permissible radiation pollution.

Modern problems of possible evacuation:
➢ «Chornobyl» problems;
➢ radiation and hygienic decision support;
➢ by what forces (Ministry of Defense, State Service of Emergency Situations, enterprise, independently, etc.);
Emergency iodine prophylaxis. Intervention with stable iodine is carried out according to the following criteria:
➢ WHO, 1999: infants, children, teens, pregnant women – 10 mGy for thyroid gland; adults up to 40 years old – 100 mGy for thyroid, adults «40+» – 5 Gy;
➢ NRB (Norms radiationaln No. 99/2009): children 100 mGy on thyroid, adults – 250 mGy on thyroid;
➢ IAEA, 2014 – 50 mGy for thyroid gland [15].

For thyroid blockade from radioactive iodine, 100 mg of stable iodine (130 mg of potassium iodide or 170 mg of potassium iodate).

Information policy. The main disadvantage of providing medical aid to the population at the Chornobyl NPP accident (April 26, 1986) was the lack of official information. The Republican Commission for the Elimination of the Consequences of the Accident, which was established after the first May’s demonstration 1986, remained silent until May 7.

Information policy in case of a radiation emergency in martial law imposition:
1. Timeliness (prompt, efficiency, operativeness);
2. Objectivity;
3. Professionalism and prudence;
4. Ensuring national information security = preventing mass manipulation, fake news, provocations, gossip and rumors and disclosure of official, state and military secrets:
   ➢ control of mass media (mobile communication, social networks, Internet, TV, radio, print);
5. Prevention and fighting panic.

Рисунок 4. Механізми реалізації інформаційної політики при великомасштабній радіаційній аварії [3]
Figure 4. Mechanisms of information policy implementation for large-scale radiation accident [3]
Mechanisms for implementing an adequate information policy for large-scale radiation accident are shown in Fig. 4. The main thing is constructive interaction of population and ministries, departments and public institutions. The sources of information are the information department of the nuclear power plant and experts of departments, ministries and public organizations. Information is disseminated through formal and informal channels and educational work.

Scheme of development of a large-scale accident at the nuclear power plant and basic protection measures are given in Table 1. It should be noted that the role of tertiary (highly specialized) medical facilities will be determinative at all stages of the development of radiation emergency situations and will include the provision and control of radiation monitoring and special measures.

### Table 1

<table>
<thead>
<tr>
<th>Phases of accident</th>
<th>Stages of emergency plan</th>
<th>Exposure sources</th>
<th>Main types of exposure</th>
<th>Radiological characterization (periods)</th>
<th>Measures and their application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EARLY</strong></td>
<td>I</td>
<td>Radioactive cloud, precipitation on the body</td>
<td>Zovnishche (zagalne), internal (inhaled)</td>
<td>Notifikatsiya (+), shelter (+)</td>
<td>Spiovshchenia (+), ukrytiya (+), zainst oganiv dijakh i tyla (+), iodoprofilaktika (+)</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>Radioactive cloud, body composition, precipitation on the ground, food chain</td>
<td>Zovnishche (zagalne), intrachishma (inhaaled), external (general), internal (inhaled)</td>
<td>Evakuisiya (+), dietitniy strategiyi (+)</td>
<td>Shifer to evacuation (+), respiratory and body protection (+), iodine prophylaxis (+)</td>
</tr>
<tr>
<td><strong>INTERMEDIATE</strong></td>
<td>III</td>
<td>Opadani na zemli, chovnyi lançok</td>
<td>Zovnishche, intrachishma (inhaled), through the intestinal tract</td>
<td>Dekontsyvatsiya teritoryi (+), restricted access to controlled areas (+)</td>
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<td></td>
<td>IV</td>
<td>Opadani na zemli, chovnyi lançok</td>
<td>Zovnishche, intrachishma (inhaled), through the intestinal tract</td>
<td>Dekontsyvatsiya teritoryi (+), restricted access to controlled areas (+)</td>
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**Notes.** + necessary; “applicable, but need to evaluate the ratio of ‘benefit-harm’.”
and hygiene monitoring and special radiological and other highly specialized and high-tech medical care.

The main stages of the *strategy of management of medical measures at a large-scale accident at the nuclear power plant* include [3]:

- **preventive (preparatory) measures:**
  - risk assessment and management:
    - information support;
    - potential risk prediction;
    - analysis of options and managerial decisions;
  - preparation for a possible accident:
    - development of risk minimization plans;
    - training institutions and medical personnel;
    - preparation of the population and its groups;
  - risk limitation:
    - adjusting operational plans;
    - increased readiness of the forces and means of health care;

- **response to an incident:**
  - counteracting the development of the accident:
    - medical provision of evacuation from hazardous areas;
    - medical maintenance of the population in control areas;
    - organization and coordination of interaction;
  - cleaning up of consequences:
    - preventive measures:
      - radiation-hygienic and sanitary control;
      - preparation of recommendations for public administration bodies;
    - medical and diagnostic measures:
      - organization of medical care for the victims and evacuated;
      - organization of dispensary observation;
      - organization of scientific research;
      - sanitary and educational work:
        - regular population informing of the accident, consequences and measures for their liquidation;
        - organization of advisory points of radiation control.

The *basic principles of emergency planning of medical protection* in the event of an accident at the nuclear power plant include [3]:

1. Distribution of protective measures for preventive and curative-diagnostic ones with the priority of the first to minimize the adverse consequences for the health of the population while reducing the volume of treatment and diagnostic measures;
2. Distribution of protective measures for two executive periods: preparation and implementation of
planned and operational measures to increase their promptitude and effectiveness while implementing in the early and middle phases of the accident;
3. Separation of protection measures in the emergency (emergency) and second queue, which may be postponed until the first to ensure the greatest adequacy and effectiveness of the protection measures in their consistent phased implementation;
4. Multivariate introduction of first-priority planned measures of protection, depending on the meteorological situation and the scale of the accident, to optimize the projected areas of possible radiation pollution, to implement emergency measures in them in the immediate phase of the accident;
5. Orientation of planned protective measures, which are held in the preparatory period for the maximum possible scale of the accident, in order to achieve the adequacy of pre-prepared measures for protection in the event of a radiation accident of any magnitude;
6. Optimization of the involved forces and means, their phased incorporation into cleaning up measures with the development and refinement of the emergency situation in order to increase the efficiency and effectiveness of the used forces and means with the simultaneous reduction of adverse psychological consequences as a result of inadequate frequency and volume of medical measures;
7. A two-stage system of medical measures in the period of mass evacuation of the population to ensure the adequacy of all types and volume of medical care in the two main stages of medical evacuation: the first medical and qualified (specialized) medical aid.

Basic countermeasures for health disorders in radiation emergency include [7, 10]:
➤ prompt, consistent and objective informing of the population about a radiation emergency;
➤ people’s training on behavior in such situations;
➤ government readiness for the situation;
➤ reasonable intervention;
➤ psychological support;
➤ the socio-economic advantage to be a «survivor», and not being a «victim»;
➤ constructive, professional and optimistic media approach;
➤ prevention, rehabilitation and treatments;
➤ social rehabilitation.

Scientific and practical bases of medical aid provision for victims of radiation emergencies
➤ integrative approach;
➤ biopsychosocial paradigm;
➤ effective prevention and social rehabilitation and rehabilitation.

The model of the nationwide mental health system affected by radiation emergencies is shown in Fig. 5.

On the basis of the above, tertiary health care facilities in case of a radiation emergency are provided with:
➤ development and implementation of plans and protocols for provision of highly specialized medical care;
➤ organization, direct provision, coordination and quality control of the provision of highly specialized care;
➤ uniting and coordinating the efforts of all three levels of health care institutions;
➤ integration into a radiation emergency management system;
➤ scientific analysis and generalization of the experience gained.

It is advisable to submit bills on radiation emergencies. Cooperation with the military and anti-terrorist services of Israel, Switzerland, the USA and other countries is extremely relevant. A program is required for the development of medical and psychological and psychiatric responses to radiation emergencies and ongoing responses to various radiological scenarios.
СПИСОК ВИКОРИСТАНЬОЇ ЛІТЕРАТУРИ

1. Базыка Д., Бель Д., Чумак А. Уроки Чернобыля: рассмотрение для правительства по улучшению радиационной безопасности населенного пункта.


5. Логановский К. М., Рушак Л. В. Науково-практичне обґрунтування медичного й психологічного реагування при радіаційних аваріях, ядерному тероризму і застосуванні тактичної та соціальної медичної інформації та патенто-кліцензійної роботи. Київ, 2014. 27 с.

REFERENCES


3. Loganoovsky KO, Morozov OM. [Scientific substantiation of the principles of medical care to the population in the conditions of a large-scale radiation accident (based on experience of cleaning up of the consequences of the Chernobyl catastrophe)] [author’s abstract of the dissertation]. Kyiv: Research Center for Radiation Medicine of National Academy of Medical Sciences of Ukraine; 2012. 39 p. Ukrainian.


13. Всемирная организация здравоохранения. Психическое здоровье в чрезвычайных ситуациях. Женева : ВОЗ, 2005. WHO/MSD/MER/03.01. 8 с.

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