THE STATE SYSTEM FOR MONITORING AND EVALUATION OF OCCUPATIONAL EXPOSURE IN THE REPUBLIC OF BELARUS

Larisa ROZDYALOUSKAYA
lrozdyalouskaya@gmail.com

Alena NIKALAYENKA
nikolaenko67@gmail.com

Scientific Practical Hygiene Center
Ministry of Health, Minsk, Belarus

Poster ID: 199

INTRODUCTION

Belarus national system for monitoring and accounting the occupational exposure doses began in the 1960s as a database for occupational dose records, based on the radiation hygiene regulatory requirements and managed by the State Sanitary Inspection Service (Gossannadzor). In 1998 the Law of the Republic of Belarus "On Radiation Safety of Public" defined creation and operation of the Unified State Monitoring and Accounting System for individual exposure doses (USMAS) as one of the functions of the state in the field of ensuring radiation safety. The Law defined that the USMAS was intended to monitor individual exposure doses of the citizens of Belarus resulting from use of radiation sources, as well as due to medical exposure, natural radiation and man-made radiation background. The Ministry of Health of the Republic of Belarus (MoH) was tasked to organize maintenance and operation within the USMAS of the State Dose Register (SDR). The system has been since constantly developed and improved in response to new developments in the international and national standards and taking into account recommendations of the IAEA Peer Review Missions in Belarus.

The paper presents an overview of how the newly upgraded USMAS operates within the Belarus radiation protection system, followed by brief discussion of its limitations, challenges and need for further development.

LEGISLATIVE FRAMEWORK

In Belarus the dosimetry surveillance of workers, exposed to ionizing radiation is regulated by the Law on Radiation Safety [1] and radiation hygiene regulations [2,3,4], which oblige the Source Users to control the exposure of their workers and monitor the doses of external and internal exposure. The Source Users should keep records of the annual effective and, if necessary, annual equivalent doses, the effective dose for 5 consecutive years, as well as the total accumulated dose for the entire period of worker professional activity. The individual doses should be registered in the individual dosimetric record cards, which are maintained for each worker subject to individual dose monitoring. The card includes:

- Name of the organization, address, phone
- Personal data: full name, first name, maiden name, date of birth, sex, home address and phone
- Job title
- Place of work: work sector and the specific area within the sector
- Record of working with radiation sources:
  - length of service in the current organization
  - full period of employment and total exposure dose before starting work in the current organization
- Work conditions: job characterization and description, radionuclides, open or sealed sources, work class, state of aggregation of a radioactive substance, maximum one time activity at workplace
- Type of dosimeter
- Dose Data: External whole body doses and "other doses" (dose from internal exposure, extremity dose, lens dose) in month, quarter and annual.

In the event of transfer of a worker to another organization a copy of his individual card with the dose records should be transferred to a new place of work. In the case the worker is sent to another organization temporarily, the second organization enters data on his radiation doses into a copy of his individual card and returns the card copy to the sending organization. In case of termination of labor relations, the card must be handed over to the worker.

According to regulation [4] the employers are required to ensure that radiation workers are provided with individual dosimeters for assessing external exposure doses under normal operation conditions and in the event of an accident. The criterion for starting individual dosimetry monitoring of external exposure is the assignment of workers to the category "personnel".

The results of radiation monitoring should be reviewed periodically in order to demonstrate compliance with the established dose limits and to develop measures to reduce the exposure doses, if appropriate.

Compliance with the requirements of the radiation-hygiene regulations, including review of monitoring programmes, is checked by Gossanadzor institutions when issuing and renewing a permit for work with radiation sources (sanitary passport), and further - when exercising sanitary supervision. A sanitary passport is issued for a period of three years.

The radiation hygiene regulations [3,4] prescribe that Source Users should submit the data on individual dose of exposure of their workers to the State Dose Register (SDR), functioning within the frame of USMAS. The updated procedure for operation and maintenance of USMAS is established by two MoH regulations: "Procedure for Registration and Control of Exposure Dose to Personnel under Normal Operation of Man-Made Radiation Sources" and "Procedure for Recording Exposure Doses of the Population and Workers", entered into force in 2017 and 2020 respectively [5,6].

UNIFIED STATE MONITORING AND ACCOUNTING SYSTEM - USMAS

The USMAS operates on three levels:

Radiation control services (RCS) of the institutions and organizations, using radiation sources in their practice - Source User level;

Regional centers of control and accounting doses of exposure (RegC), functioning on the base of the province centers of hygiene, epidemiology and public health of MoH - Reginal level;

State Dose Register (SDR), functioning under auspices of Republican Scientific and Practical Center of Radiation Medicine and Human Ecology of MoH – National Level.

Source User level

In accordance with [5] the RCS of Source User creates "Information card on the exposure doses of workers exposed during normal operation of man-made radiation sources", which summaries in the prescribed form the annual dose data of all radiation workers in the organization. Source User has to transmit the information card to the respective RegC in electronic and paper format by March 15 of the year following the reporting one.

Reginal level

The RegC collects and processes the data, enclosed in the information cards of the Source Users and creates an electronic database of exposure doses of the workers of their region. The RegC submits the electronic database along with the hard copies of the information cards to the SDR by April 15 of the year following the reporting year.

National level

The SDR staff verify and process information provided by RegCs, create national database of occupational exposure doses, analyze the results and prepared an analytical report. The report is to be submitted to MoH not later than the 5th of June of the year following the reporting year.

STATE DOSE REGISTER

Main objectives:

- To provide a safe and secure long-term dose record keeping
- To facilitate a prompt identification of any exceeding dose limit
- To facilitate verification of compliance with the methodological and informational requirements accounting for individual exposure doses
- To provide support to national authorities in controlling and safekeeping occupational dose records including dose analysis and notifying of overexposures
- To provide data to carry out studies on exposure trends, in order to identify potential possibilities for reducing levels of occupational exposure

Emergency workers module

There is a specific module in the SDR devoted to the management of the exposure doses of emergency workers. It is designed to record the doses of all persons, involved in responding the accident or emergency, including first responders and those involved in response occasionally, from third parties.

The data availability and storage period

Results of individual occupational doses are kept in the SDR constantly.

The SDR provides with analytical materials on occupational exposure doses the MoH and Republican Scientific and Practical Center of Radiation Medicine and Human Ecology annually.

State Authorities, Legal Entities and individuals can receive information in electronic or paper form upon request within their competence and according to legislative requirements on personal data protection.

EXAMPLES OF THE SDR APPLICATIONS

It is long established practice in Belarus that all persons working with radiation sources or even may have a temporary contact with them are provided with individual thermoluminescent dosimeters (TLD), regardless of the expected dose of exposure. The SDR keeps the records of all dosimetric results (coverage 100 %). Currently the database contains monitoring records from 14057 workers in 2438 organizations, using radiation sources for medical, industrial and miscellaneous purposes.

Evaluations on the base of the SDR data allow:

- ⇒ To obtain the basic data on distribution of radiation facilities by branch of activity (Fig.1)
- ⇒ To assess the impact of new techniques or technologies on the exposure doses (Fig.2)
- ⇒ To evaluate/compare the level of occupational exposure in similar sectors of work but in different regions (Fig.3)
- ⇒ To consider doses and the number of workers for different dose intervals in mSv (Fig.4)
- ⇒ To compare exposure levels of workers from particular sector according to job category (Fig.5)
- ⇒ To provide insight into the most significant exposure situations and the main factors influencing dose distributions and trends
- ⇒ To identify emerging issues and opportunities for improvement that may require more attention and scrutiny;

STEPS FOR IMPROVEMENT

There is also intention to use the SDR for investigative work and research in the area of radiation protection. However, ongoing research in the area has revealed the insufficiency of the SDR information to support work on improving the effectiveness of occupational exposure control and other relevant studies. Studying the influence of the exposure conditions on the dose formation are hardened by a lack of data about work place and exposure details: an accurate job characterization, type of source of exposure, using protective means, dosimetry methods, etc.

Medical and scientific research to reduce the risks of occupational exposure has been hindered by the lack of any link between the data on individual exposure dose of a worker in the SDR and his health data.

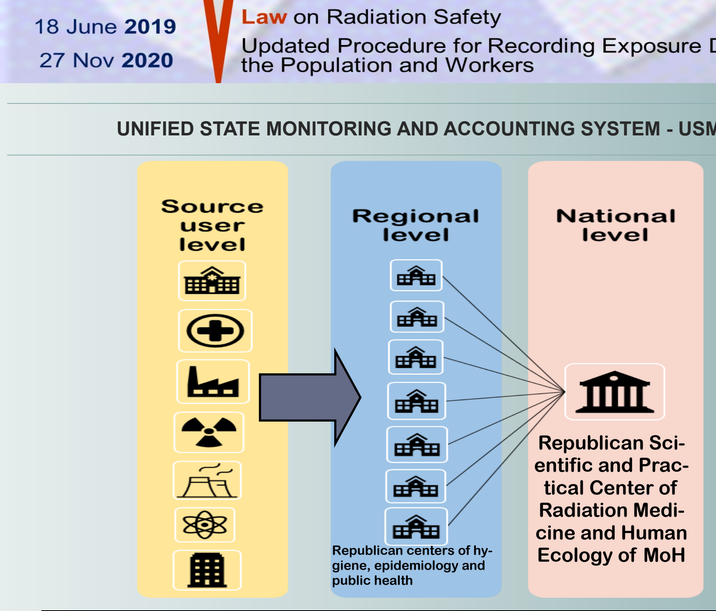
In view of these issues, the need and possibility of upgrading the existing USMAS and supplementing the SDR format with additional data is permanently discussed by the experts in radiation protection. A priority for on-going work in this area includes finding a way to allow using the SDR to *demonstrate* the effectiveness of ALARA, evaluate the applied practices and the radiation protection measures and to provide reliable data for assessing individual radiation risks of different job categories.

Going forward, the Ministry of Health of the Republic of Belarus will continue to enhance the SDR management so as it might play fully its prescribed role and better address research tasks as well as regulatory and operational needs.

International Conference on Occupational Radiation Protection (CN-300)
Geneva, Switzerland; 05-09 September 2022

Establishing and Update of USMAS

1998	**Law** on Radiation Safety of Public
1999	Governmental **Decree** "On the unified state system of control and accounting individual doses of exposure"
13 Jan **2000**	Ministry of Health Resolution "On measurers to be taken for **organization** of operation of the State Dose Register"
30 May **2003**	Ministry of Health Resolution "On measurers to be taken for **operation and functioning** of the State Dose Register
3 Jan **2005**	Ministry of Health Resolution "On measurers to be taken for **further operation and functioning** of the State Dose Register
19 June **2017**	Updated Procedure for Registration and Control of Exposure Dose to Personnel under Normal Operation of Man-Made Radiation Sources
18 June **2019**	**Law** on Radiation Safety
27 Nov **2020**	Updated Procedure for Recording Exposure Doses of the Population and Workers



INFORMATION CARD ON THE EXPOSURE DOSES

Who submits the information	To whom the information is provided	Submission deadline	Frequency of submission
Source Users	Regional centers of control and accounting doses of exposure (RegC)	15 March	Annually
Regional centers of control and accounting doses of exposure (RegC)	Republican Scientific and Practical Center of Radiation Medicine and Human Ecology (State Dose	15 April	

№	Full name	Date of birth	Sex	Subdivision	Category of worker*	Position	Measurement period		Radiation Source		Effective dose, mSv/year		Equivalent dose, mSv/year	
							Dosimeter		Type	Radionuclide	External exposure	Internal exposure	Part of the body**	Dose
							given	withdrawn		device				
A	1	2	3	5		6	7	8	9	10	11	12	13	14

* (1) -- for workers who have worked for the entire reporting year; (2) - for workers seconded in the reporting year; (3) - in case of dismissal of a worker; (4) - in case of retirement of a worker; (5) - in case of death of a worker
**(1) - gonads; (2) - lens; (3) - skin; (4) 4 - brushes, feet.

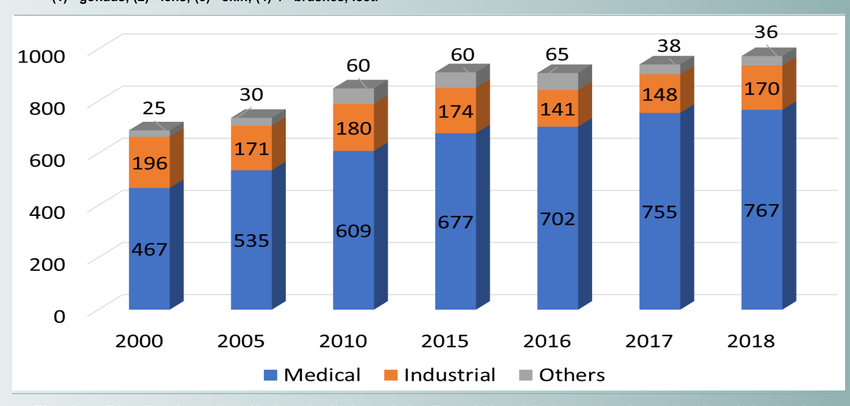


Fig. 1 — Distribution of radiation facilities of the Republic of Belarus by branch of activity in the period 2000–2018

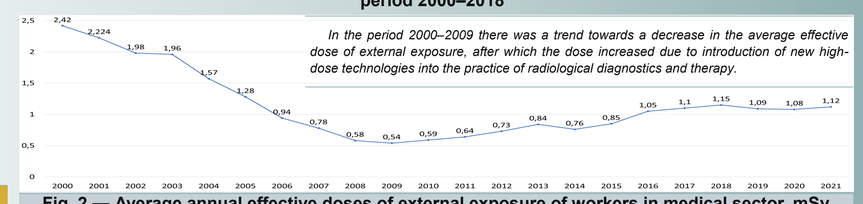


Fig. 2 — Average annual effective doses of external exposure of workers in medical sector, mSv

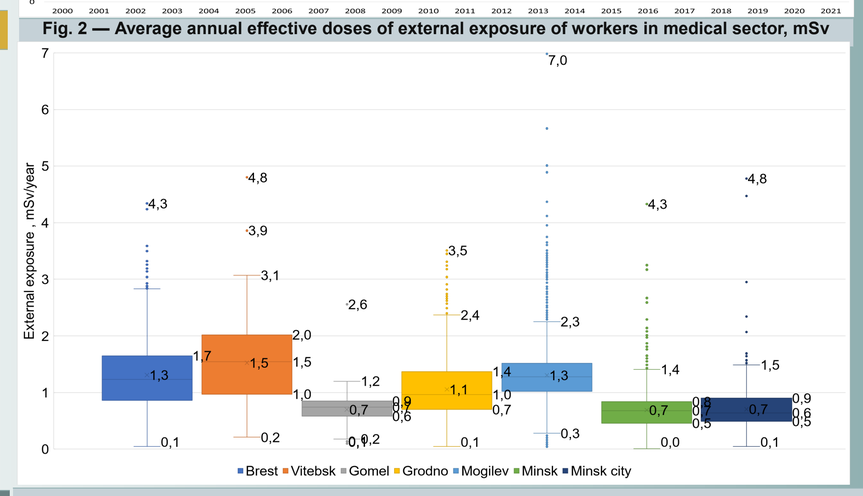


Fig. 3 — Individual exposure doses of radiation workers in medical institutions by regions of the Republic of Belarus, mSv/year

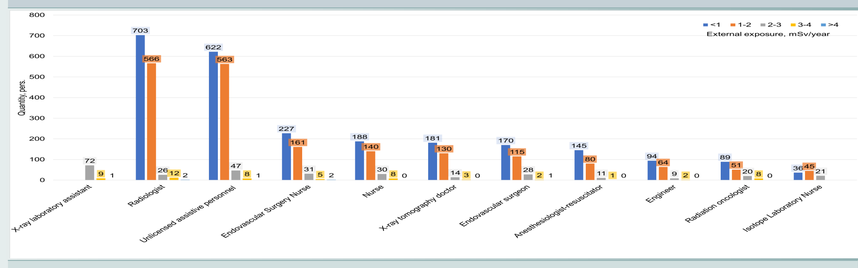


Fig. 4 — Distribution of medical personnel by dose intervals and job category (2021)

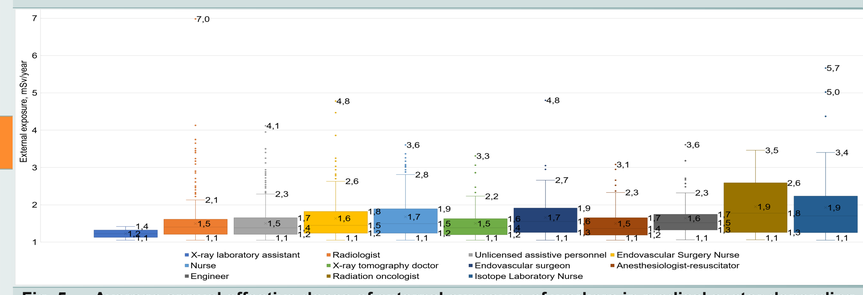


Fig. 5 — Average annual effective doses of external exposure of workers in medical sector depending on job category

REFERENCES

1.Law of the Republic of Belarus of June 18, 2019 No. 198-З "On Radiation Safety"

2.Specific Sanitary and Epidemiological Requirements for the Maintenance and Operation of Radiation Facilities, approved by the Resolution of the Council of Ministers of the Republic of Belarus No. 168 on March 24, 2020 (SSER-2020)

3.Sanitary Norms and Rules "Requirements for Ensuring Radiation Safety of Personnel and Population in the Implementation of Activities for the Use of Atomic Energy and Sources of Ionizing Radiation", approved by the Resolution of the Ministry of Health of the Republic of Belarus of December 31, 2013 No. 137 (OSP -2013)

4.Sanitary norms, rules and hygienic standards "Hygienic Requirements for the Design and Operation of Nuclear Power Plants", approved by the Resolution of the Ministry of Health of the Republic of Belarus of March 31, 2010 No. 39 (SP AES-2010)

5.Resolution of the Ministry of Health of November 27, 2020 No. 110 "On the procedure for recording exposure doses of the population and personnel".

6.Resolution of the Ministry of Health of June 19, 2017 No. 668 " On approval of the procedure for registration and control of exposure doses of workers, emergency workers and population within frame of the Unified state monitoring and accounting system for individual exposure doses"