https://doi.org/10.47183/mes.2024-26-4-98-103

THE ROLE OF INFORMATION SUPPORT IN IMPROVING MEDICAL SUPPORT FOR SEAFARING PERSONNEL

Tatyana V. Yakovleva[1], Olga Yu. Turenko[1], Valeriy M. Kolabutin[2], Vyacheslav A. Ratnikov[2,3]✉, Gennadiy M. Orlov[2], Svetlana S. Moskaleva[2], Victor P. Gorelov[2]

[1] Federal Medical and Biological Agency, Moscow, Russia

[2] Sokolov Northwestern District Scientific and Clinical Center, St. Petersburg, Russia

[3] Saint Petersburg State University, St. Petersburg, Russia

Introduction. Managing the process of collecting, analyzing, and systematizing the results of medical examinations of seafaring personnel in medical organizations of the Federal Medical and Biological Agency (FMBA) of Russia requires development of a specialized information system.

Objective. To carry out a comprehensive analysis of the activities of FMBA organizations, to develop on its basis and implement into practical use an information system for ensuring the continuity of all types of medical support for seafaring personnel; to create a digital Register of the results of medical examinations of seafarers.

Materials and methods. During the 2014–2023 period, the principles of organizing the work of medical organizations that provide medical care to seafaring personnel were studied. A methodology for recording the results of medical examinations of seafarers with the purpose of forming an information Register was developed. An analysis of medical support provided to people working on ships in 2023 was conducted based on the reports of FMBA structural units, including 35 health centers, 70 ship doctors, and 14 doctors of diving medicine.

Results. In March 2023, the Head Center for Health Protection of Seafarers, FMBA, implemented a pilot project on creation of a Register in the Northwestern Federal District. Within its framework, a methodology for generating a seafarer identification number in the Register was developed and 26,125 records of information about persons who underwent preliminary and periodic medical examinations were analyzed. The implementation of the proposed methodology for the formation of registers in all districts allowed an information system in the amount of 38,993 conclusions to be drawn based on medical examinations conducted in 2022–2023.

Conclusion. A single informational resource in conjunction with the Register for all 35 medical organizations that provide medical support to seafaring personnel, including conducting preliminary and periodic medical examinations, forms the basis for further improvement of scientific approaches to the organization and development of maritime and diving medicine in the Russian Federation.

Keywords: maritime medicine; industrial medicine; information support; Federal Medical and Biological Agency; FMBA; Register of medical examinations of seafaring personnel

For citation: Yakovleva T.V., Turenko O.Yu., Kolabutin V.M., Ratnikov V.A., Orlov G.M., Moskaleva S.S., Gorelov V.P. The role of information support in improving medical support for seafaring personnel. *Extreme Medicine*. 2024;26(4):98–103. https://doi.org/10.47183/mes.2024-26-4-98-103

Funding: the study was carried out without sponsorship.

Potential conflict of interest: Tatyana V. Yakovleva is a member of the Advisory Board of "Extreme Medicine". The other authors declare no conflict of interest.

✉ Vyacheslav A. Ratnikov ratnikov@med122.ru

Received: 6 Sep. 2024 **Revised:** 21 Oct. 2024 **Accepted:** 24 Oct. 2024

РОЛЬ ИНФОРМАЦИОННОГО СОПРОВОЖДЕНИЯ В СОВЕРШЕНСТВОВАНИИ МЕДИЦИНСКОГО ОБЕСПЕЧЕНИЯ ПЛАВСОСТАВА

Т.В. Яковлева[1], О.Ю. Туренко[1], В.М. Колабутин[2], В.А. Ратников[2,3]✉, Г.М. Орлов[2], С.С. Москалева[2], В.П. Горелов[2]

[1] Федеральное медико-биологическое агентство, Москва, Россия

[2] Северо-Западный окружной научно-клинический центр им. Л.Г. Соколова Федерального медико-биологического агентства, Санкт-Петербург, Россия

[3] Санкт-Петербургский государственный университет, Санкт-Петербург, Россия

Введение. Управление процессом получения, анализа и систематизации результатов медицинских осмотров плавсостава в медицинских организациях ФМБА России требует создания специальной информационной системы.

Цель. На основании комплексного анализа результатов работы медицинских организаций ФМБА России разработать и внедрить в практическое применение информационную систему для обеспечения бесшовной преемственности в оказании всех видов медицинского обеспечения плавсостава, создать цифровой регистр медицинских освидетельствований плавсостава.

Материалы и методы. За период 2014–2023 гг. изучены организационные принципы работы медицинских учреждений, оказывающих медицинскую помощь плавсоставу. Отработана методика организации персонифицированного учета результатов медосмотров данного контингента для формирования регистров. Анализ работы по медицинскому обеспечению лиц, работающих на судах, выполнен по итогам деятельности 35 здравпунктов, 70 судовых врачей, 14 врачей водолазной медицины в структуре ФМБА России в 2023 году.

Результаты. В Головном центре охраны здоровья моряков ФМБА России в марте 2023 года реализован пилотный проект по созданию регистра в Северо-Западном федеральном округе, разработана методика формирования идентификационного номера моряка в регистре, изучено 26 125 записей сведений о лицах, прошедших предварительные и периодические медицинские осмотры. Использование предложенной методики формирования регистров во всех округах позволило получить в информационной системе данные о медицинских освидетельствованиях за 2022–2023 гг. в количестве 38 993 заключений.

Заключение. Единый информационный ресурс в комплексе с регистром по всем 35 медицинским организациям, осуществляющим медицинское обеспечение плавсостава, в том числе проведение предварительных и периодических медицинских осмотров, составляет основу для дальнейшего совершенствования научных подходов к организации и развитию морской и водолазной медицины в Российской Федерации.

Ключевые слова: морская медицина; промышленная медицина; информационное обеспечение; Федеральное медико-биологическое агентство; регистр медицинских освидетельствований плавсостава

Для цитирования: Яковлева Т.В., Туренко О.Ю., Колабутин В.М., Ратников В.А., Орлов Г.М., Москалева С.С., Горелов В.П. Роль информационного сопровождения в совершенствовании медицинского обеспечения плавсостава. *Медицина экстремальных ситуаций*. 2024;26(4):98–103. https://doi.org/10.47183/mes.2024-26-4-98-103

Финансирование: работа выполнена без спонсорской поддержки.

Потенциальный конфликт интересов: Яковлева Т.В. — член редакционного совета журнала «Медицина экстремальных ситуаций». Остальные авторы заявляют об отсутствии конфликта интересов.

✉ Ратников Вячеслав Альбертович ratnikov@med122.ru

Статья поступила: 06.09.2024 **После доработки:** 21.10.2024 **Принята к публикации:** 24.10.2024

INTRODUCTION

In recent years, the question of restoring a unified system of medical support for maritime and river fleet workers in Russia has been discussed at various governmental levels [1]. Although existing previously, this system has disintegrated into individual companies and organizations as a result of adverse social and economic changes in the country.

These requirements are outlined in the International Labour Organization (ILO) convention adopted in 2006 and were ratified in the Russian Federation in 2012. Currently, the Russian Federation lacks a unified approach to the organization of information support for medical surveillance of marine specialists [2]. Medical organizations of Federal Medical and Biological Agency (FMBA) of Russia involved in medical examination of seafaring personnel apply the Unified Departmental Medical Information and Analytical System of FMBA of Russia (hereinafter referred to as UDMIAS), as well as medical information systems integrated with UDMIAS (hereinafter referred to as MIS) [3].

In the above systems, accounting of performed periodic and preliminary medical examinations was implemented in accordance with the order of the Ministry of Health of Russia as of 28.01.2021 No. 29n "On Approval of the Procedure for mandatory preliminary and periodic medical examinations of employees, provided for in part four of Article 213 of the Labor Code of the Russian Federation, the list of medical contraindications to work with harmful and (or) hazardous production factors, as well as work in the performance of which mandatory preliminary and periodic medical examinations are carried out" [4].

However, the mentioned guiding document lacks a procedure for preliminary and periodic medical examinations of persons working on ships. It should be noted that other regulatory acts of the Russian Federation did not fully present the procedure for medical examinations of shipboard personnel. The only current document establishing medical contraindications to work on a ship was the Decree of the Russian Federation Government as of 24.06.2017 No. 742 "On approval of the list of diseases that prevent work on marine vessels, inland navigation vessels, as well as on mixed (river-sea) navigation vessels" [5].

In order to meet the requirements of the time, at the end of 2022, the Ministry of Health of Russia issued the order No. 714n dated 01.11.2022 "On Approval of the Procedure for medical examination for medical contraindications to work on a ship, including chemical and toxicological studies of the presence of narcotic drugs, psychotropic substances, and their metabolites in the human body, and the form of a medical report on the absence of medical contraindications to work on a ship." This order defined a procedure for medical examination of seafaring personnel and created prerequisites for optimal organization of accounting of the results of medical examinations of shipboard personnel in information systems, based on reliable statistical data [6]. The timeliness of this activity agrees with the opinion of a number of authors who have carried out a comprehensive legal monitoring of national normative and methodological documents regulating the activities of seafarers' health care centers, assessed the normative regulation of the issue of medical support of crewmembers and stressed the need to regulate the principles of organization of medical care and sanitary and hygienic support of ships during voyages, taking into account the modern achievements of medicine and informational technologies, including distant ones [7, 8].

Thus, the accounting of preliminary and periodic medical examinations of seafaring personnel in the UDMIAS information systems and medical information systems integrated with UDMIAS used by medical organizations of FMBA has become particularly relevant.

In this study, we aim to develop and implement an information system to ensure continuity in the provision of all types of medical support to seafaring personnel with the creation of a digital Register of their medical examinations based on a system analysis of the activities of FMBA medical organizations.

MATERIALS AND METHODS

For the period from 2014 to 2023, specific aspects, shortcomings, and prospects of information support of medical care for seafaring personnel were studied. Data on the morbidity of swimming and diving personnel for the year of 2023 were systematized.

An analysis of the data set reflecting the activity of FMBA medical organizations (MOs) on medical care of seafaring personnel in 2023 showed the presence of 35 health posts (HP), 70 shipboard doctors, and 14 doctors of diving medicine. A questionnaire survey of information systems of all MOs integrated in the study was conducted. In order to ensure effective medical support to seafaring personnel, to coordinate interaction between the profile FMBA departments and subordinate institutions, as well as to create an information resource reflecting the results

of implemented activities, the Head Center for Health Protection of Seafarers (hereinafter referred to as the Head Center) was established in 2021 on the basis of Sokolov Northwestern District Scientific and Clinical Center by the order of the Head of the FMBA of Russia.

One of the main tasks of the Head Center is to provide information and analytical support for the health protection of shipboard personnel, in particular, to create and maintain a register of medical organizations and a digital Register of medical examinations of seafaring personnel, as well as to create, improve, and provide data and technological support for the information system.

In 2022, the Head Center set a task for FMBA medical organizations to organize personalized registration of medical examinations of seafaring personnel and to supply this information for compiling a Register. Due to the varying degrees of technical readiness of MOs in terms of running personalized registration of medical examinations for seafaring personnel using a medical information system (MIS), the Head Center provided them with the necessary information tools, as well as with a prototype module based on the MIS used in Sokolov Northwestern District Scientific and Clinical Center.

RESULTS

The conducted research established that creation of a unified health monitoring circuit for seafaring personnel and divers in the system of FMBA of Russia requires analysis of aggregate information reflecting the results of MO activities in all Federal districts.

The primary data received from FMBA medical organizations revealed the impossibility of separating exclusive information on the seafaring personnel from the total amount of data on preliminary and periodic medical examinations. This was certainly a precondition for obtaining unreliable demographic data and results on the morbidity of seafaring personnel. Interaction with the MOs also showed that personalized records of medical examinations of seafaring personnel were not carried out; sometimes, only paper records were kept.

At the first stage, a conceptual approach to the implementation and exploitation of an information and analytical system of maritime medicine was outlined, including the introduction of standard protocols for data exchange with MO medical information systems, installation and configuration of licensed software, creation of information resources and measures to ensure information security.

Pursuant to the order of the Ministry of Health of Russia from 01.11.2022 No. 714n [6], a pilot project to create a Register in the Northwestern Federal District (NWFD) was launched in 2022 and implemented in March 2023. The structure of the information support system for maintaining the Register of maritime medicine center was developed, see Fig. 1.

A methodology for forming a seafaring personnel identification number in the register consisting of 12 digits was developed. In the format of “12XXXX-XXXXXX-XXXXXXXXX”, the first two numbers denote the subject of the Russian Federation, in which the seafarer underwent a physical examination, “XX34-5XXXXXXXX-XXXXXX” the third-fifth numbers — the MO registration number in the MO register, “XXXXX-X678-9ABX” the sixth to eleventh numbers — the seafarer serial number, “XXXXX-XXXXX-XXXXXXC” the twelfth number — the control sum of the previous numbers (Fig. 2).

At first, the results of compiling a Register in the NWFD were obtained (Fig. 3). As shown in Fig. 3, at the first stage, 26,125 records of information on persons who underwent preliminary and periodic medical examinations were collected by the MOs in the Northwestern Federal District and forwarded to the Head Center.

An analysis of the data presented in Fig. 3 shows that the data contain generalized information on both members of the seafaring personnel and employees of shore-based services working for JSC Atomflot and FSUE Rosmorport. After excluding the shore service employees from the database, 8,259 records were included in the Register based on the attribute of attachment to a watercraft, which amounted to 32% of the previously submitted data. Unique codes of information on seafaring personnel from 7800-0000-0016 to 7800-0001-2277 in accordance with the above-mentioned methodology were inserted in the respective records (Fig. 2). The results of the pilot project were presented at a meeting of the Maritime Medicine Section of the Scientific and Expert Council of the Maritime Board of the Government of the Russian Federation in May 2023 in Vladivostok.

At the next stage, a Register of medical organizations of FMBA of Russia, engaged in medical support of seafaring personnel, including preliminary and periodic medical examinations of this contingent, was created. The Register included 35 FMBA medical organizations located in 8 Federal Districts. The map of their location is shown in Fig. 4.

Based on the results of the pilot project, regulations on the provision of information by medical organizations concerning the results of medical examinations of shipboard personnel to the Head Center for Health Protection of Seafarers, FMBA (hereinafter referred to as the Regulations) were finalized.

The methodological documents developed in the course of the project, as well as a prototype module based on the MIS used by Northwestern District Scientific and Clinical Center named after L.G. Sokolov, were implemented in 2023 in the work of all the FMBA medical organizations included in the register. Since December 2023, these measures have made it possible to provide a complete personalized record of data on periodic and preliminary medical examinations of seafaring personnel, medical reports on the absence of contraindications to work on a watercraft, collection, reconciliation, and analysis of statistical data on the morbidity of seafaring personnel, which fully meets the modern requirements of the health care system [9].

The scope of data storage in the register of medical examinations of seafarers was developed and justified: a seafarer’s passport data (32 fields) and medical data on the medical examination performed in accordance with the order of the Ministry of Health of Russia No. 714n dated 01.11.2022 (60 fields), including data on the medical care provided, therapeutic and preventive measures, results of laboratory and instrumental tests. The included information was rather extensive and formed not only in the MOs

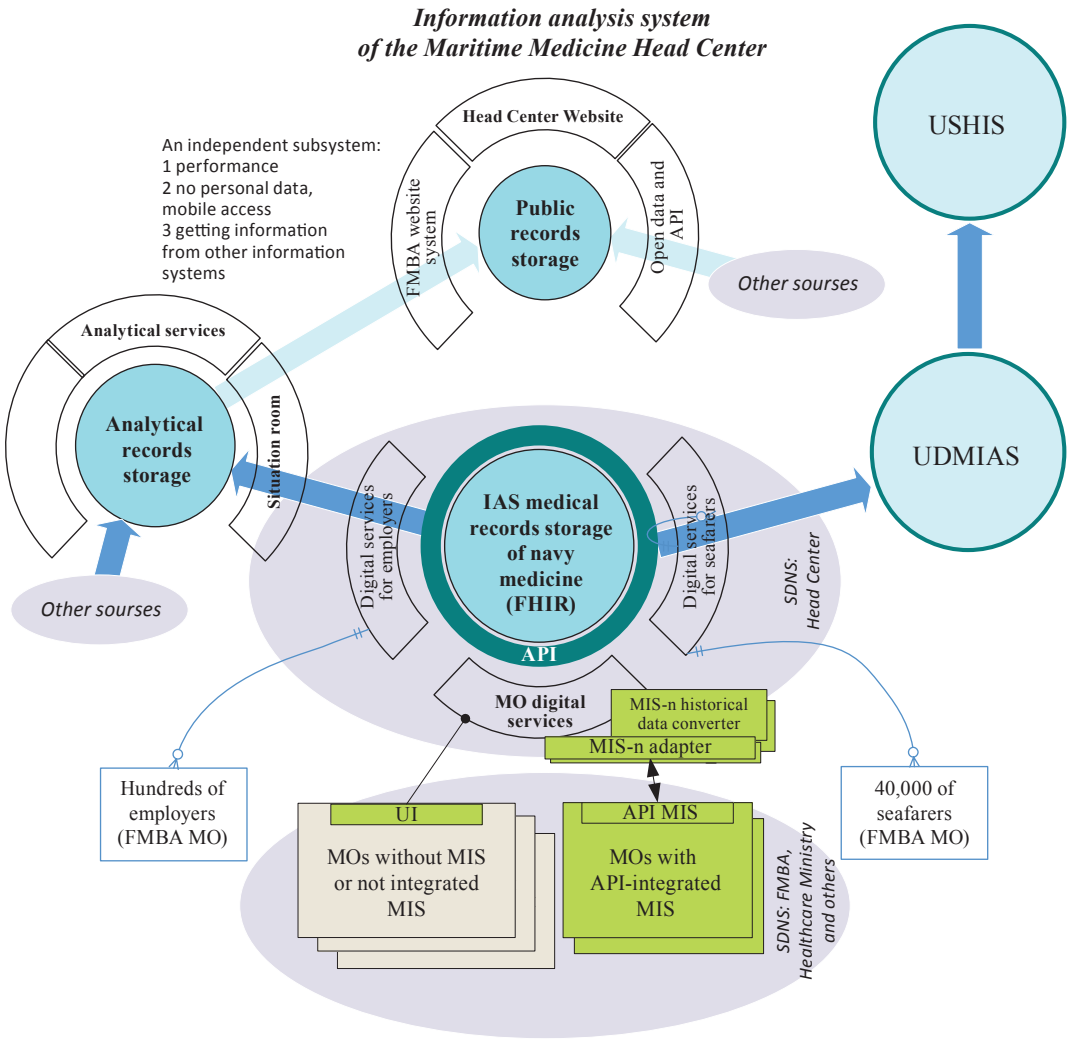


Figure prepared by the authors using their own data

Fig. 1. Schematic diagram of the prototype of the information and analytical system of the Head Center

conducting seafaring personnel medical examinations. Therefore, it was decided to obtain complete medical data upon request in Uniform State Health Information System (USHIS) and UDMIAS, without storing it in the Register. The composition of the Register of medical data is shown in Fig. 5.

The results obtained were used to compile a general Register for all 35 FMBA medical organizations that provide medical support to seafarers, including data on preliminary and periodic medical examinations (Table 1).

In the 2022–2023 period, 38,993 records on medical examinations of seafarers were processed (Table 1). The work is underway: at the end of the first quarter of 2024, 9504 more medical examinations were conducted by all


МЕДИЦИНСКОЕ СВИДЕТЕЛЬСТВО О СОСТОЯНИИ З

Seafarer Information 7800-0000-2801

Информация о моряке (лице, работающем на судне)

Surname: Nikitin First name: Oleg

Фамилия Имя

Figure prepared by the authors using their own data

Fig. 2. Seafarer identification number on the health status medical certificate

RESULTS: uploading data to the Register of medical examinations of seafarers and the Register of Medical Organizations

1. uploaded seafarers' examinations

№	Institution name	dirty data	net data	%
1	Head Center for the Seafarers' Health Protection Sokolov Northwestern District Scientific and Clinical Center	3 166	1 227	39%
2	Semashko Northern Medical Clinical Center	18 758	5 318	28%
3	Murmansk Multidisciplinary Center	4 201	1 714	41%
	TOTAL	26 125	8 259	32%

2. registered medical organizations

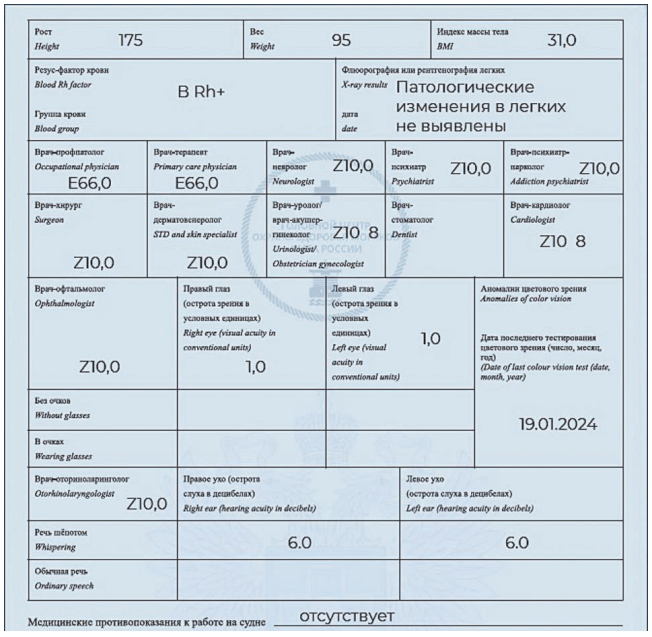
№	Institution name	code	seafarers' codes
1	Head Center for the Seafarers' Health Protection Sokolov Northwestern District Scientific and Clinical Center	78000	c 7800-0000-0016 no 7800-0001-2277
2	Semashko Northern Medical Clinical Center	29000	c 2900-0000-0012 no 2900-0005-3188
3	Central Medical Sanitary Department No. 58	29001	-
4	Murmansk Multidisciplinary Center	51000	code not allocated

Figure prepared by the authors using their own data

Fig. 3. Results of compiling a Register of seafaring personnel medical examinations in the MOs of FMBA of Russia in the Northwestern Federal District

Figure prepared by the authors using their own data

Fig. 4. Schematic location of 35 FMBA medical organizations engaged in medical support of seafaring personnel.



Рост / Height: 175	Вес / Weight: 95	Индекс массы тела / BMI: 31,0		
Резус-фактор крови / Blood Rh factor: B Rh+; Группа крови / Blood group		Флюорография или рентгенография легких / X-ray results: Патологические изменения в легких не выявлены; дата / date		
Врач-профпатолог / Occupational physician: E66,0	Врач-терапевт / Primary care physician: E66,0	Врач-невролог / Neurologist: Z10,0	Врач-психиатр / Psychiatrist: Z10,0	Врач-психиатр-нарколог / Addiction psychiatrist: Z10,0
Врач-хирург / Surgeon: Z10,0	Врач-дерматовенеролог / STD and skin specialist: Z10,0	Врач-уролог/ врач-акушер-гинеколог / Urinologist/ Obstetrician gynecologist: Z10 8	Врач-стоматолог / Dentist	Врач-кардиолог / Cardiologist: Z10 8
Врач-офтальмолог / Ophthalmologist: Z10,0	Правый глаз (острота зрения в условных единицах) / Right eye (visual acuity in conventional units): 1,0	Левый глаз (острота зрения в условных единицах) / Left eye (visual acuity in conventional units): 1,0	Аномалии цветового зрения / Anomalies of color vision; Дата последнего тестирования цветового зрения (число, месяц, год) / (Date of last colour vision test (date, month, year): 19.01.2024	
Без очков / Without glasses				
В очках / Wearing glasses				
Врач-оториноларинголог / Otorhinolaryngologist: Z10,0	Правое ухо (острота слуха в децибелах) / Right ear (hearing acuity in decibels)		Левое ухо (острота слуха в децибелах) / Left ear (hearing acuity in decibels)	
Речь шёпотом / Whispering	6.0		6.0	
Обычная речь / Ordinary speech				
Медицинские противопоказания к работе на судне: отсутствует				

Figure prepared by the authors using their own data

Fig. 5. Composition of medical data in the Register of medical examination of seafaring personnel

MOs, with the total number of the seafaring personnel in the Register having reached 39,333 persons. It should be noted that the data on the number of seafaring personnel is preliminary, changing dynamically and requiring additional verification with information from medical organizations due to technical errors in the dates of birth, insurance numbers, personal account numbers, and a number of other documents.

CONCLUSION

The need to restore a unified system of medical services for seafaring personnel is determined by the fundamental document in the field of national maritime policy, i.e., the Maritime Doctrine of the Russian Federation [10]. In the context of changing geopolitical landscapes, the development of maritime medicine becomes the state's priority, with the main role entrusted to the FMBA of Russia.

Systematization of the personal data of seafaring personnel for all 35 medical organizations, providing medical support to this contingent, the use of standard effective tools within a single information contour of the FMBA of Russia, the development of a single information resource will form the basis for further improvement of scientific approaches to the organization and development of maritime and diving medicine in the Russian Federation.

Therefore, the introduction of a unified information system in the structure of FMBA medical institutions is an important step towards the implementation of the Maritime Doctrine of the Russian Federation. The issues of medical care for seafaring personnel fully comply with the requirements of the Convention of the International Labor Organization.

Table 1. Indicators of medical data included into the Register of medical examination of seafaring personnel

№	Indicator	Quantity, units
1	Number of medical organizations in the Register of Medical Organizations and on the Maritime medicine website	35
2	Number of data fields per seafaring personnel in the Register — personal and medical	32 + 60
3	Number of seafaring personnel medical examinations in the Register:	
3.1	For 2022 (information from 20% of medical organizations for half a year)	9949
3.2	For 2023 (information from 100% of medical organizations by the end of the year)	29,044
3.3	Total for 2022–2023	38,993

Table prepared by the authors using own data

References

1. Mosyagin IG, Kazakevich EV, Kvetnoy IM. The role and place of Maritime medicine in healthcare in Russia. *Marine medicine*. 2019;5(1):17–29 (In Russ.). https://doi.org/10.22328/2413-5747-2019-5-1-17-27
2. 94th session International Labour Organization. Maritime Labour Convention of 2006 on work in sea navigation. Geneva; 2006.
3. Bumaj OK, Ivanchenko AV, Abakumov AA, et al. Legal framework preparation of the medical and sanitary services provided to the crew personnel at sea and river crafts: the analysis of problems, suggestions and opportunities. *Extreme Medicine.* 2017;59(1):65–77 (In Russ.). EDN: YHCZDN
4. Order of the Ministry of Health of the Russian Federation No. 29n. On approval of the procedure for conducting mandatory preliminary and periodic medical examinations of employees provided for in Part Four of Article 213 of the Labor Code of the Russian Federation, the list of medical contraindications to work with harmful and (or) hazardous production factors, as well as work during the performance of which mandatory preliminary and periodic medical examinations are carried out. Moscow: Ministry of Health; 28.01.2021 (In Russ.).
5. Resolution of the Government of the Russian Federation No. 742. On approval of the list of diseases that prevent work on sea vessels, inland navigation vessels, and mixed (river-sea) navigation vessels. Moscow: Government of the Russian Federation; 24.06.2017 (In Russ.).
6. Order of the Ministry of Health of the Russian Federation No. 714n. On approval of the Procedure for conducting a medical examination for the presence of medical contraindications to work on a vessel, including chemical and toxicological studies of the presence of narcotic drugs, psychotropic substances and their metabolites in the human body, and the form of a medical report on the absence of medical contraindications to work on a vessel. Moscow: Ministry of Health; 01.11.2022. (In Russ.).
7. Voronkova SV, Abakumov AA, Torshin GS, Malinina SV, Andrusenko AN, Grabskii YuV. Regulatory and legal bases for the establishment and functioning of seafarers' health protection centers in the Russian Federation. *Russian Journal of Occupational Health and Industrial Ecology.* 2023;63(9):586–95 (In Russ.). https://doi.org/10.31089/1026-9428-2023-63-9-586-595
8. Barankina TA, Fetisov AO, Valeyeva RM, Kurbanova SN, Yakimenko ON. Medical care provided for the river fleet shipboard crews. *Russian Medicine.* 2020;26(5):283–91 (In Russ.). https://doi.org/10.17816/0869-2106-2020-26-5-283-291
9. Mosyagin IG, Popov AM, Chirkov DV. The Navy doctrine of Russia: Humans are the priority. *Marine medicin*. 2015;1(3):5–12 (In Russ.). EDN: WIMWXR
10. Decree of the President of the Russian Federation No. 512. On approval of the Maritime Doctrine of the Russian Federation. Moscow: Government of the Russian Federation; 31.07.2022 (In Russ.).

Authors' contributions. All the authors confirm that they meet the ICMJE criteria for authorship. The most significant contributions were as follows. Tatyana V. Yakovleva — the concept and design of the study, general guidance; Olga Yu. Turenko — the concept and design of the study, editing and text writing; Valeriy M. Kolabutin — the concept of the study; Vyacheslav A. Ratnikov — information collection, data processing, text writing; Gennadiy M. Orlov — information collection, data processing; Svetlana S. Moskaleva — information collection, data processing; Victor P. Gorelov — text writing.

AUTHORS

Tatyana V. Yakovleva, Dr. Sci. (Med.)
yakovleva_tv@fmba.gov.ru

Olga Yu. Turenko, Cand. Sci. (Med.)
https://orcid.org/0000-0003-0056-495X
turenkoou@fmba.gov.ru

Valeriy M. Kolabutin, Cand. Sci. (Phys.-Math.)
https://orcid.org/0009-0004-6437-667X
vkolabutin@gmail.com

Vyacheslav A. Ratnikov, Dr. Sci. (Med.),
https://orcid.org/0000-0002-9645-8408
ratnikov@med122.ru

Gennadiy M. Orlov, Cand. Sci. (Phys.-Math.)
https://orcid.org/0000-0002-6281-0151
orlov@med122.ru

Svetlana S. Moskaleva
https://orcid.org/0000-0003-1563-5255
moss261966@gmail.com

Victor P. Gorelov, Cand. Sci. (Med.)
https://orcid.org/0000-0003-4829-7029
vpgorelov@gmail.com