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REVIEW

Overview of the current electrophysiology (EP) state of affairs in Russia

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Abstract

Russia is the largest country in the world based on the landmass, covering more than one-eighth of the earth's inhabited area. Russia faces challenges in electrophysiology (EP) care including insufficient and uneven financing, complicated system for identifying optimal treatment for individual patients, relative paucity of reasonable educational and certification scope for electrophysiologists, suboptimal national statistical data gathering regarding heart rhythm disorders and EP devices in use, and weak networking of medical information. In comparison with the average level of EP utilization in ESC countries, Russia utilizes around 50% in pacemaker; 10% in ICD; 8% in cardiac resynchronization therapy; 55% in ablations; and 45% in AF ablations. As projected, Russia has the biggest unmet demand in EP procedures, so-called developmental potential in the European region. Nearly 37% of implanted single-chamber and 63% dual-chamber devices are manufactured outside of Russia. The price of the Russian devices is slightly (by 10–20%) lower than the one imported and they are readily provided for patients by the Russian Ministry of Health. Based on the analysis of the data available, we suggest some strategies for the improvement of the EP care in Russia. Solutions include the institution of formal EP education and standardization of it, development of international educational, and scientific collaboration; implementation quality-assessment tools for professional knowledge and skills; wide application of national medical databases and collection of heart rhythm disorders' statistics; growth of financial support of electrophysiology and transparent distribution of financing between state/municipal and private medical centers; enhancement of medical care accessibility countrywide; development of technologies for local EP devices production; and collection of data regarding usage and effectiveness of it.

Keywords Health care · Russia · Arrhythmia care · High-tech medical care · ICD · CRT · Electrophysiology · Devices

1 Introduction

Every country has unique features that will affect the delivery of health care. In Russia, the most significant challenge for medical care is its vast territory (17 million km^2), that accounts for one-eighth of the inhabited world, and low population density (147 million residents yield 8.6 inhabitants per 1 km^2). Largely concentrated population centers such as Moscow and St. Petersburg with populations of over 12 million and 5 million respectively and sparsely inhabited areas in central Russia naturally lead to a system of centralized management and *relative isolation of regions*. Furthermore, the unique language of Russia promotes isolation of the health system from the influence of nearby countries in Europe or China [1].

Cardiovascular disease is the leading cause of death globally and is the primary cause of death in Russia. Within cardiology, electrophysiology has rapidly developed into an essential component of cardiovascular care with the development of established therapies that improve symptoms and save lives. Successful treatment of heart rhythm disorders depends on the coordinated collaboration of a multidisciplinary team of electrophysiologists, cardiologists, nurses, physiologists, radiologists, pharmacologists, and technical specialists. As in other countries, in Russia, state-of-the-art care in electrophysiology requires significant investment in manpower and financial

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resources that can strain the overall health care system. These stresses will likely be magnified as advanced technologies in electrophysiology continue to rapidly evolve over the next several years. In this paper, we analyzed the current state of electrophysiology (EP) care delivery in the Russian Federation with the aim to identify potential directions and avenues for improvement.

2 Methods

A comprehensive search of literature from online and academic publications in Russian and in English was performed. Data on the country indicators were taken from published online databases of the Ministry of Health of Russia, the Federal State Statistic Service of Russia, the European Heart Rhythm Association (EHRA), and the World Health Organization. During this research, the following limitations were revealed: relatively scarce and non-transparent statistical data and financial indexes available online or in published papers.

3 Cardiovascular care: current situation and recent trends

Like the majority of countries, Russia has a predominance of heart diseases among causes of death of middle-aged and elderly people. After the introduction of a concerted cardiovascular disease prevention initiative, cardiovascular mortality rates in Russia have been declining since the mid-2000s, but still remains one of the highest in the world, at 320 per 100,000 (no. 9 worldwide as of 2015) [2]. According to a World Health Organization (WHO) report in 2015, Russia was third among Eastern Europe countries suffering the most from ischemic heart disease disability-adjusted life years (DALY) per 1000 population aged 30–69 years old (Fig. 1) [3]. DALY is a measure of overall disease burden, expressed as the number of years lost due to ill health, disability, or early death. The high cardiovascular morbidity, especially prominent in comparison with nearby European countries, served as a basis for several additional governmental initiatives in the field of health care [4, 5].

The year 2015 was declared "the year of struggle against cardiovascular diseases" and a broad spectrum of governmental actions was applied countrywide. The following measures to decrease morbidity and improve outcomes of cardiovascular pathology were implemented [6]: social media and internet advocacy of healthy lifestyle and risk factors screening to increase awareness of population, including even imprisoned citizens; educational activities in summer camps for children and adolescents and at workplaces for employees; health volunteering among high school and college students to distribute the healthy life awareness; organization of sport festivals nationwide; improvement of the training and education of frontline public health practitioners; development of professional conferences and intensification of international coordination between health care providers to improve professional skills of doctors; updating of guidelines for cardiovascular disease prevention and treatment; increased salary for medical professionals; early detection and treatment of cardiovascular diseases (outpatient and out-of-office screening teams); informational measures to improve adherence to treatment among affected people and accessibility of medical care (including direct cell phone contacts with target audience, patient-oriented educational workshops); development of global database of people who needs the advanced medical care (including EP); improvement of networking systems for transportation of patients with acute coronary syndromes; and some other initiatives. As a result of this initiative, the cardiovascular mortality decreased by 3.4%, and the number of cardiac care centers increased by 8.3% from 2015 to 2016 [7]. Accordingly, in 2015, Russia was included in the top ten countries identified by WHO that in the recent years had made

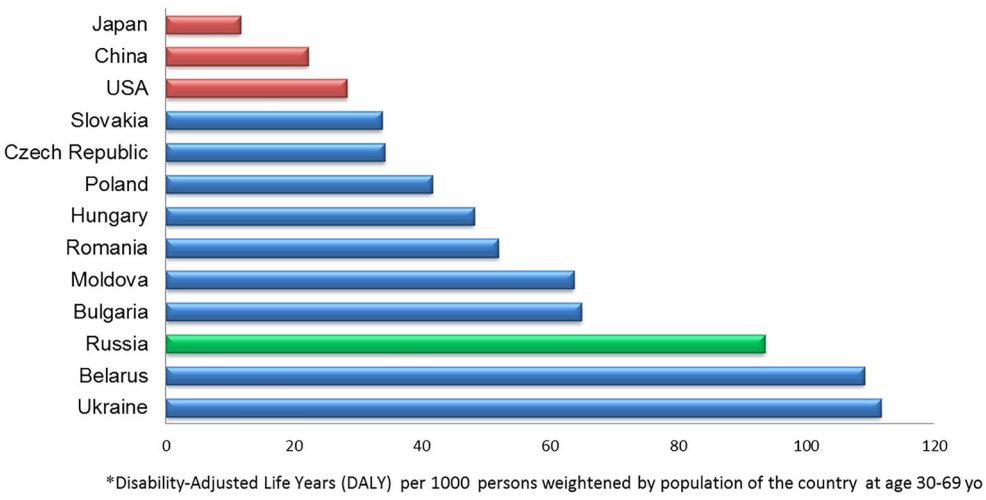

Fig. 1 Total burden of ischemic heart disease in Eastern Europe and selected countries in 2015

the greatest progress in the fight against noncommunicable diseases, including heart diseases [8].

4 Health care system: accessibility and use of high-cost electrophysiology therapies

Health care expenditure in Russia in the percentage of the national gross domestic product in 2017 was 3%, with total health care expenditure 48.5 billion USD per year (330 USD annually per capita) [4]. Russian citizens have the constitutional right to access medical care at state and municipal medical facilities free of charge. The scope of the constitutional right to get medical care free of charge is determined by the state medical benefits package. The package has two parts: the basic package and the package of care to be financed by budgetary funds. The basic package covers the everyday health needs of the population, while the budget package covers specialized and so-called high-technology medical care, the most of EP procedures fall into this category. Despite the clear theoretical separation between benefits and coverage provided by the budget package and the basic package, in practical terms, sometimes this distinction is less strict. Citizens are guaranteed the universal access to services and also, they can choose to have either private insurance or co-payment plan [9, 10] if they want a more "concierge-style" hospital environment. However, these insurance plans are rarely used as reflected by small total contributions of 7% and 3% for private insurance companies and co-payment plans respectively [10]. Moreover, only a few private insurance packages cover high-tech interventions (such as EP). There is no formal cost-sharing system through user charges for services or out-of-pocket payments which is magnified in EP care because of the potentially high costs. For the very same reason, private hospitals do not contribute meaningfully to EP care provision. The algorithm for obtaining quotes for high-tech care is confusing for the patient and provision of care often diverges with standards established by law [11]. Depending on the place of residence, the employer, personal networks, and wealth, the amount of coverage might be extremely unequal, varying from the availability of several, overlapping health care options to just access to the local public network in an underserved area. There is considerable geography-based variability in EP care coverage with up to threefold differences between South (North-Caucasian) and North (North-Western) regions in the means of medical centers quantity and procedures performed weighted by population (Figs. 2 and 3) [12].

Recently introduced network technologies and consumer satisfaction assessment tools are aimed to eliminate this gap in medical care availability. Regardless of these pitfalls, the overall picture is as follows: in 2016, Russia had 142 interventional electrophysiology medical centers, with data on EP procedures performed and 10-year trends provided in Table 1 and Figs. 4 and 5 [9, 13]. In comparison with the average in ESC countries, the utilization of EP care in Russia is around 50% in PM; 10% in implantable cardioverter defibrillator (ICD); 8% in cardiac resynchronization therapy (CRT); 55% in ablations; and 45% in AF ablations.

During the last decade, there has been a general increase in the number of all EP procedures, but more recently there has been a plateau in procedure volume and a decrease in 2016 compared to 2015. This change can be attributed to the decrease in gross domestic product. Although Russia is getting closer to mean European "EP usage," a considerable gap still exists, and it is especially prominent in the most expensive therapies such as ICD and CRT, where the differences are almost tenfold. The

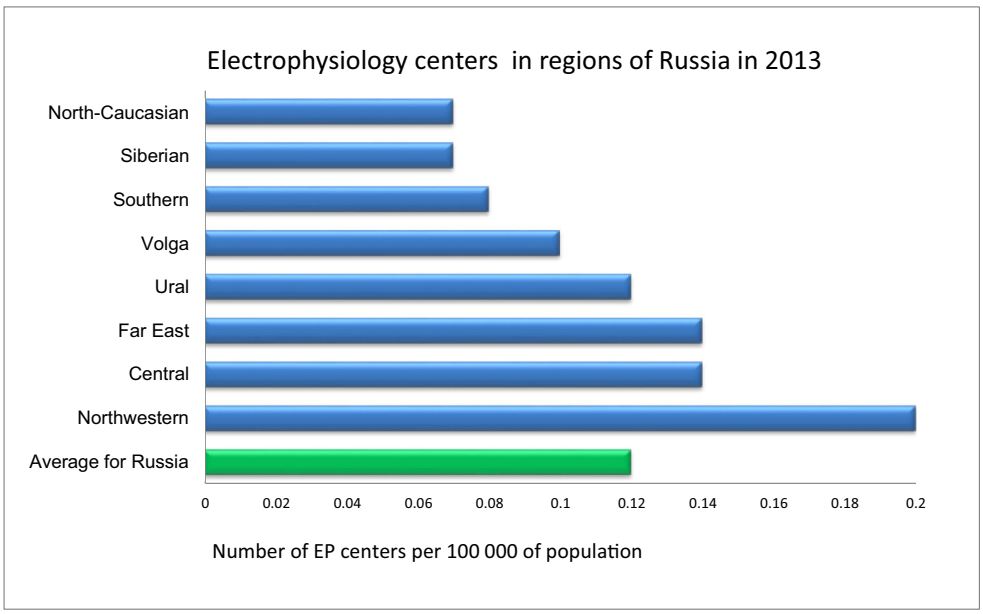

Fig. 2 Electrophysiology centers in the region of Russia in 2013

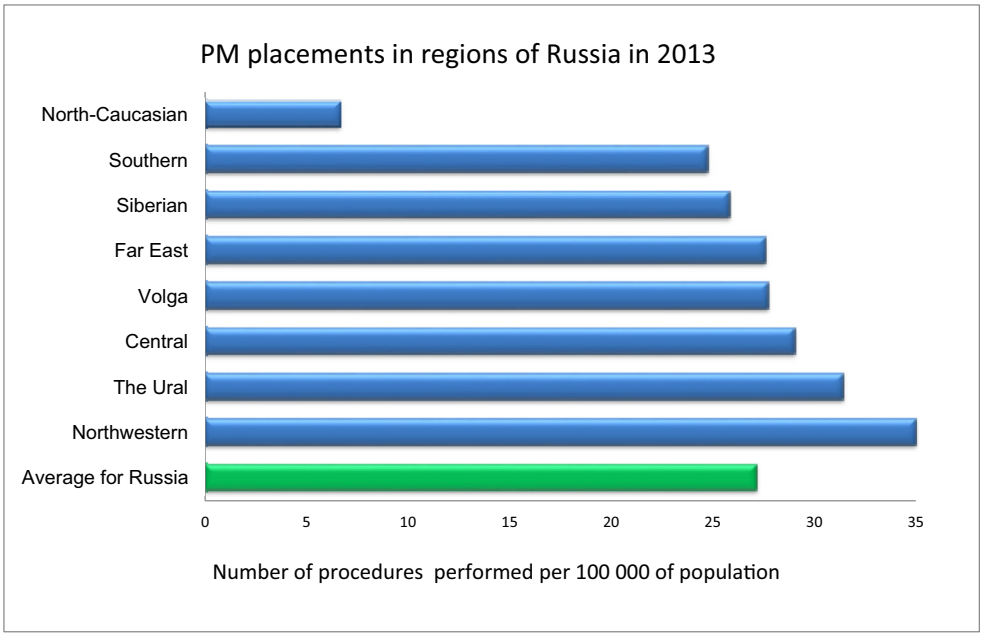

Fig. 3 PM placements in the region of Russia in 2013

major reason for a low number of ICD and CRT implantations can be a relatively high price of the imported devices and the absence of local Russian manufacturers.

The treatment methods for heart rhythm and conduction disorders are chosen in accordance with the Russian national guidelines for EP Investigations, Catheter Ablation, and Implantable Device Application [14]. The guidelines are developed and updated by the committee of experts of the Russian Scientific Society of Arrhythmology, Electrophysiology, and Pacing (RSSA) and led by Professor A. Revishvili. Recommendations are based on the guidelines of the ACC, AHA, ESC, EHRA, and the Canadian and wide spectrum of local European guidelines, so the criteria and approaches to the patient care do not differ from the standards of care worldwide.

There are several local Russian producers of the EP devices (Elestim-Cardio, Baykal, Vega et al.). The devices produced by these companies are single- and dual-chamber or biventricular pacemakers with or without rate adaptation. There is no industry in Russia that produces ICD devices, and no data available regarding the use of locally produced CRT devices. The price of the Russian devices is slightly (by 10–20%) lower than the one imported and they are readily provided for patients by the Russian Ministry of Health. The disadvantage of this type of devices is the absence of openly published data regarding their long-term safety and efficacy. This leads to the reluctance of some patients to give consent for such a type of therapy. Nearly 37% of implanted single-chamber and 63% dual-chamber devices are manufactured outside of Russia [15].

5 Specialty training, certification, and CME of health care providers in the Russian EP field

The system of cardiac health care in Russia today has a number of fundamental differences when compared to those in America and Europe. There are only two EP-affiliated basic specialists: cardiologist and cardiovascular surgeon. Historically, some competitiveness existed between surgeons and internists [7]. The first EP procedures were performed by surgeons and later by cardiologists. At present, EP interventions can be performed by both, but the proportion of cardiologists performing EP procedures has increased and cardiologists now account for 80% of all catheter ablations [10, 16]. Medical school education requires 6 years of training after high school. The required period of postgraduate training to perform cardiac device implantation is 3 years in cardiology or cardiothoracic surgery usually without the EP laboratory

Table 1 Number of EP procedures performed countrywide in Russia and ESC member countries in 2016

	PM	ICD	CRT	Ablations total	Ablations AF
Russia (totally)	36,462	1418	995	22,608	7219
Russia (per mln)	256	10	7	159	51
ESC countries (per mln)	524	101	85	288	110

PM pacemakers, *ICD* implantable cardioverter defibrillator, *CRT* cardiac resynchronization therapy, *AF* atrial fibrillation

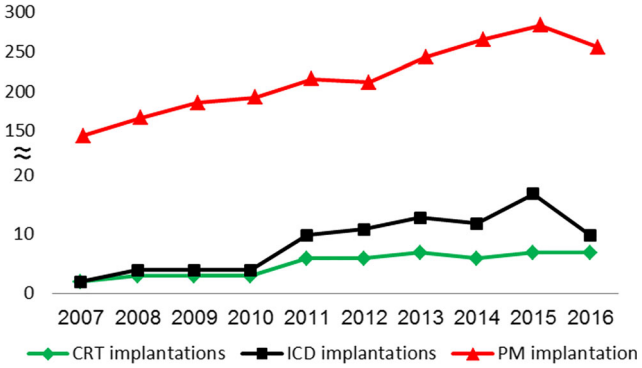

Fig. 4 Trends in the annual numbers of EP procedures in Russia (per min inhabitants)

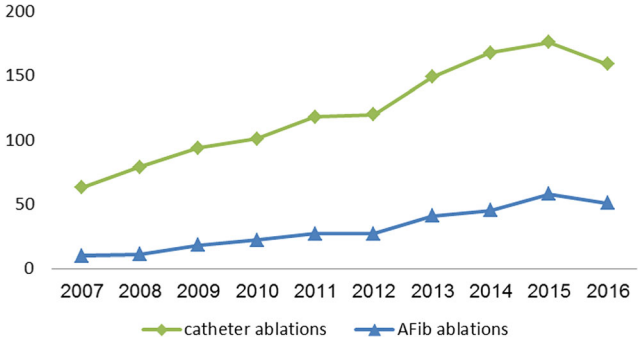

Fig. 5 Trends in the annual number of EP procedures in Russia (per min inhabitants)

exposure. As there is no standardized EP education or board certification available, the skills required for the professional activity are usually obtained by personal tutoring in the mode of practice-based learning and are not independently evaluated. Board recertification should be taken every 5 years and usually requires attending a 1-month-long CME workshop. The absence of narrow EP specialization also creates uncertainty among referring cardiologists and sometimes delays the appropriate treatment of patients [7].

In 2002, in Russia, the Russian Scientific Society of Arrhythmology, Electrophysiology, and Pacing (RSSA), a national public organization which promotes conduction and implementation of scientific research, development of national guidelines, international coordination, and professional education of members of this society, was founded. The biennial International Congress on Electrical Stimulation and Clinical Electrophysiology of Heart held by this organization and the Journal of Arrhythmology are the national platforms for professional dialogs of electrophysiologists. More than 1500 physicians attend this conference. The European Heart Rhythm Association (EHRA) promotes standards for the training and offers certification of EP specialists to assure high-quality care all over European countries. The RSSA recommends EHRA certification for health care providers, but the fraction of EHRA-certified electrophysiologists is negligible nowadays (10 out of 89, by the data as of 2016) [10]. A project based on the collaboration of EHRA and RSSA "EHRA in Russia" was launched in 2016. It is aimed at the promotion of the education of EP specialists in Russia. Currently, 3-day educational workshops with Russian translation, if required, are offered in different regions of Russia. In addition to lectures, the courses provide a variety of hands-on practical anatomical and clinical educational opportunities.

6 National data collection

Effective use of information technology in health care requires a centrally guided information system to keep a prompt account of personal medical records. It is an important potential contributor for improving the quality of medical care, and for providing reliable data for solving key administrative issues for the health segment. For more than a decade, the most advanced Russian hospitals have been using digital patient records, but this has been the result of local initiative rather than national government projects. Each medical center had adopted a variety of software available for patient records from different providers, but there is not any encryption protocols used to protect the privacy of patient records. Annual nationwide statistic reports of the Ministry of Healthcare of Russian Federation do not contain separate data regarding heart rhythm disorders; therefore at present, it is impossible to estimate the contribution of these conditions to the total cardiovascular morbidity and mortality [17]. International device producers track their products in Russia in the same way as they do in other countries and no data are currently available regarding recalls of devices made in Russia. On the other hand in 2011, the database of patients with heart rhythm and conduction disorders was provided by the Center of Surgical and Interventional Arrhythmology of the Ministry of Health of the Russian Federation which is collecting information about EP devices placed and procedures performed nationwide. Currently, this is the only database available. By providing timely feedback for the Ministry of Health at the regional level, this data support proper planning of the EP care. Federal and regional health care managers have started paying the focused attention to this medical field. The increasing financial support allowed the modernization of EP equipment in hospitals. The supply with catheters and devices as well as the financing of the EP procedures is gradually increasing.

This also allowed monitoring the EP care with intention of quality control and improvement of strategies of medical care for this group of patients. This is just one example of "Big Data" concept utilization [18]. It is still a lot of space to move forward on the road of standardization of patient records nationwide to promote continuity of patient care among a vast variety of medical care providers.

7 Conclusions

Despite the obvious progress in health care provision in Russia for the last several years, several weaknesses in the field of EP care remain. The general themes for areas of improvement are financial, educational, and organizational. Russian electrophysiology is the developing subdivision of cardiology, with considerable potential for growth. As projected, Russia has the largest population among European countries and the biggest unmet demand in EP procedures, so-called developmental potential in the European region—the number of procedures needed to attain the mean ESC area level [8]. The average ESC area level is the only available tool nowadays to evaluate the demand for EP procedures in Russia, given the absence of officially gathered statistical data regarding arrhythmia morbidity. Although this indicator is useful, it likely overestimates the real EP demand in Russia, due to shorter life expectancy in the country, its relatively younger population, with the demand for some EP procedures unevenly distributed with skewness towards the senior people. The main directions for the improvement of EP medical care are institution of formal EP education and standardization of it, development of international education and scientific collaboration; implementation of quality assessment tools for professional knowledge and skills; wide implementation of national medical databases and collection of heart rhythm disorders' statistics; growth of financial support of electrophysiology and transparent distribution of financing between state/municipal and private medical centers; enhancement of medical care accessibility countrywide (implementation of patient-friendly algorithms for provision of high-tech care); development of technologies for local EP device production; and collection of data regarding usage and effectiveness of it.

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