

ANNOTATION

**on the thesis of Begisbaev Temirkhan Serikbolovich on the subject:
"Ways of improvement of cardiological care for the population in the context
of the introduction of innovative technologies" for the PhD degree in specialty
6D110200 - "Public Health"**

Relevance of the research subject

Cardiovascular diseases (CVDs) are the leading cause of death worldwide. According to the World Health Organization (WHO), in 2016, 17.9 million people died from CVDs, which accounted for 31% of all deaths globally; 85% of those were caused by a heart attack and stroke. In 2015, out of 17 million of premature deaths from noncommunicable diseases (in individuals below 70 years of age), 82% of deaths were registered in countries with low and middle income and 37% of those were caused by CVDs (WHO, 2016, Roth GA, Abate D, et al. 2017).

Approximately 60% of patients with ischemic heart failure die of arrhythmias, mainly ventricular tachyarrhythmias. Randomized controlled trials have shown that antiarrhythmic drug therapy is not effective enough for patients with heart failure (Fomin I, 2016, Pick JM, Batra AS, 2017).

An implantable cardioverter defibrillator (ICD) is a battery-operated device that is placed under the skin to keep track of the individual's heart rate. Electrodes (thin wires) connect the ICD to the heart. On detection of an abnormal heart rhythm the device delivers an electric shock to restore a normal heartbeat. ICDs are very useful in preventing sudden death in patients with known sustained ventricular tachycardia or fibrillation. Studies have shown that ICDs proved to be effective in preventing cardiac arrest in patients who are at risk for life-threatening ventricular arrhythmias (Goldenberg I, Hung DT et al 2020). It is considered that the ICD allows to prevent a lethal ventricular arrhythmia successfully, with a probability of more than 98%, thereby prolonging the patient's life. Randomized clinical trials of defibrillators implanted in patients at risk of sudden death resulting from a severe left ventricular dysfunction (commonly defined as ejection fraction <30%) have shown a 20–30% reduction in overall mortality and a 50–75% reduction in sudden death (Yancy CW, Jessup M et al., 2017). Numerous randomized multicenter clinical trials have confirmed the usefulness of the implantable cardioverter-defibrillator (ICD) as the basic line for the treatment of ventricular tachyarrhythmias and prevention of sudden cardiac death (SCD) (Blagova O.V. et al. 2018).

Cardiovascular diseases, characterized by an annual increase in the morbidity rate, remain the most serious health problem in the Republic of Kazakhstan (RoK) (Iskakov E.B., 2017, Seisembekova T.Z., Nurgalieva N.K. et al., 2018). Recent years have witnessed an active implementation of high technologies for cardiological and cardiosurgical patients, including implementation of ICDs, which help reduce mortality from cardiovascular diseases. Despite the implementation of ICDs over the past five years, there is currently no research available on the effectiveness and quality of the life of

patients with implanted cardioverter- defibrillators (Kamaliev M.A., Almukhanova A.B., 2015, Almukhanova A.B., Peremitina A.D., 2018).

Thus, the improvement of cardiological care for the population in the context of the implementation of innovative technologies is a priority task for the public health care system.

Purpose of the research

To study the organization of medical care for patients with cardiovascular diseases, with indications for the implantation of a cardioverter-defibrillator and to develop practical recommendations, based on a comprehensive assessment of the effectiveness of the ICD technology.

Objects of the research:

- IHD mortality rates (I20-I25) according to ICD-10 for the period from 2011 to 2021 by gender and age group 5 years (0, 1-4, 5-9, 10-14, ..., 80+);
- Number of treated ICD cases in the RoK by age and gender
- Costs associated with ICD, medical services tariffs

Subject of the research is patient-centered medical care and the effectiveness of the ICD technology.

Objectives of the research:

1. Study the indications, efficacy, problems of using ICD for treatment of cardiovascular diseases and the quality of life of patients with an implanted cardioverter-defibrillator worldwide.
2. Assess the updated data on age-standardized mortality rate and the rates of avoidable mortality from ischemic heart disease (IHD) in the Republic of Kazakhstan.
3. Analyse the activities of medical facilities in providing patient-centered care to individuals with an implanted cardioverter-defibrillator, determine the level of patients' awareness of ICD.
4. Study the quality of patients' life with regard to their health after implantation of a cardioverter-defibrillator and compare the results with the results of other similar studies.
5. Evaluate, by using the modeling method, the cost-effectiveness of implantation of a cardioverter-defibrillator.
6. Provide practical recommendations on the improvement of medical care to patients with ICD.

Novelty of the research topic

Based on a complex analysis:

1. The data on the age-standardized mortality rate for the period from 2011 to 2021 and life expectancy (by gender) in the RoK was updated; for the first time, avoidable mortality from IHD in the Republic of Kazakhstan by age, region and type of population for the period 2015-2020 was estimated.
2. For the first time, patient-centred approaches were analysed in primary care and in the hospital, and the quality of life of patients with ICD was studied, using the EUROQOL - EQ5D tool.

3. For the first time, the results of the economic efficiency of ICD in the RoK were provided, using the Markov model, and a comparative analysis involving similar international research results, was carried out.

Basic provisions of the thesis

1. Implantable cardioverter-defibrillators can significantly prolong the life of patients with the risk of sudden cardiac death, thereby contributing to the reduction of the mortality rate, including avoidable death from IHD, whose rates are higher in a younger age than the estimated life expectancy in the RoK.

2. Important aspects of successful implementation of the innovative ICD technology in practical healthcare are as follows: accessibility, patient-centered care, the attitude of the medical personnel and the patient's awareness of the implanted devices, which requires systematic measures on their improvement.

3. A comprehensive assessment of the ICD technology, with the help of modern multifactorial methods, will allow to substantiate the economic benefits and efficacy of this type of treatment in the healthcare system in the Republic of Kazakhstan.

Practical value of the research

1. The results of the study are intended for use by healthcare authorities, heads of medical facilities, arrhythmologists and primary health care physicians in the frame of communication and education of patients that require ICD and of those who have already had it installed; with the purpose of improvement of integrated medical aid to patients with ICD in primary medical care and at the hospital stage; with the purpose of monitoring the condition of patients after the ICD surgery, as well as monitoring the cost-effectiveness of the technology and introduction of new devices under the Compulsory Social Medical Insurance or State Guaranteed Medical Aid packages. They can also be used in the process of teaching students and qualification upgrading training for doctors and nurses.

2. Methodological recommendations were developed and implemented in medical treatment and preventive facilities in Kyzyl-Orda, Kostanay regions, the city of Almaty (acts of implementation are available).

3. An appropriate certificate was received on information registration in the state register of rights to objects, protected by the copyright legislation.

Resume

1. The country has a higher rate of avoidable death (preventable + treatable) from IHD at a younger age than the estimated life expectancy (70.2 in 2020), in particular, in individuals beyond 55 in Atyrau, Kostanay, Pavlodar, West Kazakhstan region and Nur-Sultan, and in individuals beyond 60 - in Karaganda, Aktobe, Mangystau, Turkestan, East Kazakhstan region, North Kazakhstan region and Shymkent.

2. The number of new ICD implantations and replacements in Kazakhstan is slowly growing. The new S-ICD (subcutaneous) technology, widely used in the developed countries, has not received an adequate support due to the high cost of the device, the lack of the reimbursement option and unavailability of the stimulation function.

3. At the primary health care level, difficulties were identified in obtaining medical care associated with the duration of waiting for an appointment with GPs and narrow specialists and the lack of free medications. 66.6% of respondents failed to have cardiological rehabilitation after ICD implantation. Patients' satisfaction with the attitude of the medical personnel in the hospital is higher in comparison with that in primary care.

4. There is insufficient communication and education of patients with ICD in medical facilities, particularly, on issues pertaining to the benefits and disadvantages of ICD, actions required from the patient and the carer in case of an ICD shock, the impact of ICD on the patient's daily activity, recommendations on postoperative wound care, administration of drugs after the discharge from the hospital. At the same time, in addition to the above, patients wished to receive more information on ICDs, learn to perform exercise tolerance testing, get consultations of a psychologist, including for family members as well.

5. When comparing the results of our own research on the quality of life of patients with ICD with other studies results, no significant deterioration in the quality of life associated with health was identified.

6. Discounted total quality-adjusted years of life (QALYs) in the ICD group and in the control group were 6.48 and 4.98, correspondingly. The cost-effectiveness coefficient gain made 3,791,604 tenge, which is below the willingness to pay threshold and indicates the cost-effectiveness of using an ICD as a primary method of prevention of SCD in healthcare in Kazakhstan.

Approbation of work

The main results, provisions and conclusions of the work were discussed and reported to:

1. International scientific and practical conference "Modern science and education: state, problems, prospects" (Ukraine 2021).
2. IX International Scientific and Practical Conference "International Scientific and Practical Conference scientific horizon in the context of social crises" (Tokyo 2021).
3. IV Global Public Health Conference "GLOBEHEAL 2021" (Sri Lanka 2021).

Related publications

The following materials have been published on the subject of the research: 7 scientific publications; 1 article in an international scientific journal, included in the Scopus database; 3 articles published in journals recommended by the Committee for Quality Assurance in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan; 3 articles in collections of conference materials; methodological recommendation; 1 certificate information registration in the state register of rights to objects protected by the copyright law.

Scope and structure of the thesis

The thesis consists of an introduction, 6 chapters, conclusion, resume, practical recommendations and the list of references which includes 193 items.

The thesis is presented on 128 pages of typewritten text, is illustrated with 23 tables, 22 figures and contains 7 appendices.