PROSPECTS FOR USING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE RUSSIAN HEALTHCARE SYSTEM
NON-COMMUNICABLE DISEASES (NCD) ARE THE MOST IMPORTANT CAUSE OF MORTALITY IN ALL COUNTRIES:

71% of all deaths in the world

4 TYPES OF DISEASES

- Cardiovascular diseases (every third death in the world)
- Cancer diseases
- Respiratory diseases
- Diabetes
- Other diseases (Alzheimer's disease, Parkinson's disease)

Main GOAL is to reduce the total mortality rate of these diseases by 25% until 2025.

DIRECTIONS:
- Comprehensive prevention
- Risk factors prediction
- Informing the population about suspected diseases at an early stage

https://apps.who.int/iris/handle/10665/274512
The National goal: Increasing the Russians’ life expectancy to 80 years by 2030
Mechanism: Reduction of preventable morbidity and mortality to save 230 thousand lives by 2024

CARDIOVASCULAR MORTALITY REDUCTION
Cases per 100 ths. population

Prevention
Ministry of Russian Health System:
«Prevention is an absolute priority of Russian Healthcare. Moreover, prevention is understood as general and individual measures system related to the formation of a healthy lifestyle and the implementation of the “high risk” strategy» -


Contribution of primary and secondary prevention to reducing mortality from CVD in various populations (according to the method IMPACT, Capewell S, Critchley J, Unal B.)

Research data from 17 countries

Risk factors management: 56%
Treatment: 39%
Uncertain factors: 5%

51% of the reasons that influence on the development of diseases depend on the patient. These are the adjustable risk factors. Prevention and screening are aimed at their identification.
Global AI Medical Market

106 STARTUPS TRANSFORMING HEALTHCARE WITH AI

Predicted Growth for Healthcare with AI, $ billion

CAGR, %

52%

Key directions and economic effects

<table>
<thead>
<tr>
<th>Directions</th>
<th>economic effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assisted Robot Surgery</td>
<td>40 bill $</td>
</tr>
<tr>
<td>Virtual assistants</td>
<td>20 bill $</td>
</tr>
<tr>
<td>Administrative support</td>
<td>18 bill $</td>
</tr>
<tr>
<td>Fraud detection</td>
<td>17 bill $</td>
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<tr>
<td>Reducing mistakes in drug therapy</td>
<td>16 bill $</td>
</tr>
<tr>
<td>Processing data from medical devices</td>
<td>14 bill $</td>
</tr>
<tr>
<td>Clinical assistance</td>
<td>13 bill $</td>
</tr>
<tr>
<td>Preliminary substitution of diagnoses</td>
<td>5 bill $</td>
</tr>
<tr>
<td>Intelligent diagnostics, image processing</td>
<td>3 bill $</td>
</tr>
</tbody>
</table>

Prerequisites for Developing AI in Medicine

American experts' survey results:

- Artificial intelligence 55%
- CRISPR genome editing 19%
- Blockchain 5%
- Robotics 3%
- Immunotherapy 19%

Main challenges for the future of the global healthcare:

1. **Increase in life expectancy**: as a result, the large and growing number of older residents.
2. **Incidence rate**: particularly relates to chronic non-communicable diseases, as well as aggravation of diseases associated with unhealthy lifestyles.
3. **Lack of medical staff**: that will create demand for various digital assistants.

https://www.cbinsights.com/research/top-healthcare-analysis/
Russian Healthcare Managers' Survey

### Prospects for AI Development in Russian medicine

#### The most promising areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Expected percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The search for risk factors, forecasting the development of diseases</td>
<td>27%</td>
</tr>
<tr>
<td>Automatic image recognition application in diagnostics, identify of pathological detection etc</td>
<td>23%</td>
</tr>
<tr>
<td>Improving management efficiency of health, medical statistics</td>
<td>18%</td>
</tr>
<tr>
<td>Patient monitoring, remote observation of patients using wearable devices or personal medical devices</td>
<td>11%</td>
</tr>
<tr>
<td>Automatic decoding of the results and the formation of ready-made protocols (conclusions)</td>
<td>6%</td>
</tr>
<tr>
<td>Clinical trial’s including population-based</td>
<td>5%</td>
</tr>
<tr>
<td>Development of new drugs, survey methods and treatment</td>
<td>5%</td>
</tr>
<tr>
<td>Assistant to prescribe treatment</td>
<td>3%</td>
</tr>
<tr>
<td>Formation of a holistic DSS (decision support system) for physicians</td>
<td>2%</td>
</tr>
</tbody>
</table>

#### Expected effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Expected percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI will improve the efficiency of the health system</td>
<td>23%</td>
</tr>
<tr>
<td>Improve quality of care (doctors working)</td>
<td>14%</td>
</tr>
<tr>
<td>Reduce medical errors</td>
<td>14%</td>
</tr>
<tr>
<td>Reduce the burden for doctors</td>
<td>13%</td>
</tr>
<tr>
<td>Reduce the number of complications of diseases, severe forms</td>
<td>12%</td>
</tr>
<tr>
<td>Reduce health care costs</td>
<td>9%</td>
</tr>
<tr>
<td>Reduce the number of deaths</td>
<td>9%</td>
</tr>
<tr>
<td>Reduce the number of medical staff</td>
<td>6%</td>
</tr>
</tbody>
</table>

Our Main Obstacles

- Unwillingness of medical staff to trust artificial intelligence: 16%
- Lack of ready-made solutions on the market: 15%
- The development is a complicated and expensive task: 14%
- Legislative restrictions: 13%
- Lack of necessary clinical trials: 13%
- Conservatism of medical staff: 12%
- Lack of funding: 10%
- Ethical problems: 3%
- Insecurity of AI: 2%
- Inefficiency of AI: 1%

[Link to article: http://webiomed.ai/en/blog/what-russian-healthcare-managers-are-thinking-about-artificial-intelligence/]
Projects in Russian Regions

19 Regional pilot projects

Industry projects:
- Association “National base of medical knowledge”
- FMBA of Russia
- Competition of innovative projects "National Technological Initiative" (NTI)
- Skolkovo’s resident
The Association of Developers and Users of Artificial Intelligence Systems in Medicine (National Medical Knowledge Base). The goals of the Association are to bring together market participants and support the developments of CDSS market and artificial intelligence systems for healthcare.

- To accelerate the introduction of advanced Artificial Intelligence Market Development for Healthcare
- Consolidation in the Russian developments, access to international markets
- Ensuring equal access to validated biomedical data for Russian developers of Clinical Decision Support systems (CDSS)
- Improving the efficiency of healthcare, reducing mortality, morbidity and medical errors, implementation of new innovative health care technologies
- Establishing an accessible, variable, and extensive expert environment for the development and practical application of digital technology in the healthcare system.

https://nbmz.ru/
First, Do No Harm

- The oldest principle of medical ethics
- The heated discussion has unfolded in the professional community

Safety comes first

To remove unnecessary barriers to market entry
The meeting of the round table «Registration of software as a medical device: problems and solutions» Moscow, 25th September, 2018
NBMK together with the Skolkovo Foundation and the NeuroNet Scientific Research Institute

The meeting of the round table «Digital healthcare. Formation of regulatory tools for a medical software» Moscow, 21th November, 2018
NBMK in cooperation with the Federation Council

The meeting of the round table «Software as a medical device: problems of circulation» Moscow, 21th May, 2019
NBMK in cooperation with the Roszdravnadzor

**NBMK Proposals**

- To establish more transparent and clear criteria for classifying software as a medical device.
- To establish criteria for determining the potential risk using of a medical software
- To simplify the preparation procedure and time for registration of a medical software product
- To simplify re-registration of new software versions
GOAL: to compare both methods to CVD risk prediction based on extracted EHR data - machine learning and traditional risk scales

ML TECHNOLOGY

ELECTRONIC HEALTH RECORD → UNSTRUCTURED DATA → NLP → DATA SET → NEURAL NETWORKS

CLINICAL DECISION SUPPORT SYSTEM (CDSS)

RESULT

CONCLUSION

✓ The machine learning outperformed a traditional clinically-used predictive model for CVD risk prediction.
✓ This approach was used to create a CDSS. It uses both methods: traditional risk scales and models based on neural network. The system can calculate the CVD risks automatically and recalculate immediately after adding new information to the EHR.
Media about AI

Artificial Intelligence helps physicians to identify dangerous diseases

In Yamal, artificial intelligence examined 30 thousand patients

Artificial intelligence has increased the detection of cancer risk factors
https://ntinews.ru/in_progress/likbez/kak-iskusstvennyy-intellekt-pomogaet-vracham-v-rabote-.html

Increase in the identification of heart disease risk factors
https://www.kommersant.ru/doc/3984543

Will artificial intelligence replace doctors?
http://www.topnews.ru/news_id_129732.html

CDSS must be implemented in healthcare

AI finds those who have a risk of a heart attack.

«Artificial Intelligence in medicine»
Regional Scientific and Practical Conference was held in April, 2019.
http://conf.nbmz.ru/
Thank you for your attention!