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From global practice to national strategy: horizon scanning tools for healthcare transformation in Russia

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ABSTRACT

Horizon scanning (HS) in healthcare is a strategic framework designed to identify and evaluate emerging medical technologies with the potential to significantly influence health systems. In response to rapid scientific and technological advancements, and the increasing demand for long-term forecasting, HS has been institutionalized in many settings, allowing for its integration into national healthcare planning and policy development.

International experience demonstrates that the systematic application of HS contributes significantly to evidence-based decision-making in healthcare. By enabling the timely identification and evaluation of emerging technologies, HS helps mitigate potential risks, supports proactive policy responses, and enhances the overall efficiency and responsiveness of healthcare systems.

In the Russian Federation, some HS activities are underway; however, they are not yet institutionalized, do not involve all key stakeholders, and are not supported by advanced technological platforms such as artificial intelligence or big data analytics. This limits the country's capacity for strategic foresight and long-term innovation planning in healthcare. The adoption of an integrated HS framework could substantially improve system efficiency by facilitating timely access to high-impact innovations, enhancing resource allocation, and informing evidence-based health and pharmaceutical policy. Strengthening collaboration with international organizations and BRICS partners could support the development of common methodological

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approaches, promote shared technology assessment priorities, and reinforce collective readiness for emerging health challenges. The use of advanced analytical tools would further enable the integration of HS into national decision-making and contribute to building a resilient, proactive system for anticipating technological change.

Key Words: medical innovation; early awareness; health technologies; artificial intelligence; strategic forecasting; health technology assessment; technology trends

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Introduction

Horizon scanning (HS) in healthcare is an essential element of strategic planning, aimed at improving access to innovative technologies and strengthening population health. HS involves systematic identification of health technologies that are new, emerging or becoming obsolete and that have the potential to effect health, health services and/or society[1]. This process helps to identify potential challenges and opportunities for the healthcare system, thereby enabling more timely and effective responses. In the context of rapid technological advancement and evolving demographic trends, early identification of factors that may affect health systems is essential. Some authors consider HS to be part of an early awareness and alert system[2], which aims to detect, filter, and prioritize new and breakthrough health technologies – or novel applications of existing ones – and to assess or predict their potential impact on health outcomes, health systems, and society. This is followed by the dissemination of relevant information to support decision-making [1].

In the 1980s, the need for a more proactive approach to managing technological innovation in HS was first articulated. It was recognized that waiting to address new technologies only after their consequences had materialized was insufficient. This led to the proposal of a structured system for the early identification and assessment of emerging health technologies – an "early warning system" – designed to inform decision-makers in advance [2]. The development of the early awareness and alert system concept progressed through a series of seminars in the Netherlands, Sweden, and Denmark during the 1990s. These seminars identified a shared interest in exchanging information about new health technologies, their evaluation, and their integration into healthcare systems. This collaborative effort led to the formal establishment of the EuroScan International Network in 1999. EuroScan is a global network that collects and shares information on emerging health technologies, supporting evidence-based decision-making and the adoption of effective and safe innovations. The network also serves as an international forum for developing methods for the early identification and assessment of new technologies and their impact on healthcare systems [1]. The activities and contributions of EuroScan will be discussed in more detail below.

HS was initially introduced as the first stage in the health technology assessment (HTA) process and was conducted by HTA agencies or aca-

[1] HTA Glossary. Horizon scanning. HTA Glossary website. Accessed 05.02.2025. https://htaglossary.net/horizon-scanning
[2] HTA Glossary. Early awareness and alert system. HTA Glossary website. Accessed 05.02.2025. https://htaglossary.net/early-awareness-and-alert-system

demic institutions to systematically evaluate the potential impact of new and emerging health technologies on healthcare systems. This approach was adopted in countries such as the United Kingdom, Sweden, Norway, France, the Netherlands, Canada, and Australia. Today, there is a clear trend toward expanding the functions of these centers, involving a broader range of stakeholders across the healthcare system, and actively integrating innovative technological platforms e.g., artificial intelligence (AI) into HS activities [3-5].

Horizon scanning tools

There is currently no universally accepted methodology for conducting HS; however, the strategies employed across countries and international organizations share common features and can be systematized[3] [4-9]. HS systems may be oriented toward either short-term (up to 5 years) or long-term (more than 5 years) horizons, which in turn influences the selection of specific methodological approaches. The key stages of the HS process include identification (signal detection), filtration, prioritization, assessment, dissemination, and ongoing updating/monitoring[4,5] [3].

The identification of health technologies is a complex process that involves the use of multiple methods. Below, we outline the most commonly applied approaches.

1. Literature reviews and analysis of scientific publications: This is the primary method used in HS, and all organizations engaged in HS activities rely on the analysis of published scientific data. This type of analysis can be further categorized into the following subtypes:
   - Bibliometric analysis: a quantitative method for analyzing scientific publications to identify emerging trends and priority areas of research and development in healthcare, with particular relevance to the pharmaceutical sector. This approach enables the detection of the most actively explored domains within medical science.
   - Systematic reviews: a structured search of clinical studies and other relevant literature (including conference and symposium abstracts), with a description of their findings. This may involve critical appraisal and, where appropriate, evidence synthesis such as meta-analyses or indirect comparisons. This type of analysis not only helps to identify innovative medical technologies but also allows for an assessment of their potential impact on patient outcomes.

   The analysis of published literature, including completed clinical trials, is among the most resource-intensive methods used in HS. Nevertheless, it provides essential inputs for subsequent health economic evaluations, such as identifying clinically relevant criteria for efficacy and safety of the technology under consideration. However, exclusive reliance on published clinical studies may result in missed opportunities to identify technologies that are still in earlier stages of development.
2. Analysis of clinical trial registries and databases: The analysis of clinical trial registries – such as ClinicalTrials.gov and other national or international platforms – allows for the early identification of ongoing and planned clinical studies involving novel health technologies. Monitoring

[3] Research Report: A Systematic Review of Methods for Health Care Technology Horizon Scanning. Content last reviewed July 2019. Effective Health Care Program, Agency for Healthcare Research and Quality, Rockville, MD. Accessed 05.02.2025. https://effectivehealthcare.ahrq.gov/products/horizon-scan/research-2013

[4] Wild, C. and Langer, T. (2006): Horizon Scanning System (HSS). An Overview. HTA-Projektbericht 02. Accessed 05.02.2025. https://eprints.aihta.at/586/

[5] Oortwijn W. Facing the dynamics of future innovation: The role of HTA, industry and health system in scanning the horizon. Accessed 05.02.2025. https://htai.org/global-policy-forums-background-papers.

these registries and tracking study outcomes supports the detection of innovations at the earliest stages of their development.

Compared to bibliometric analysis, this approach provides insights into technologies that are likely to reach market authorization over a longer-term horizon.

3. Patent database analysis: Patents are widely regarded as indicators of future technological directions, making them a valuable source of information within HS frameworks. The volume and thematic focus of patent filings can serve as predictors of which technologies are likely to become dominant in the marketplace in the coming years. For instance, the increasing number of patents related to gene and cell therapies suggests substantial future potential in these areas. Patent databases—such as those maintained by the World Intellectual Property Organization (WIPO), the United States Patent and Trademark Office (USPTO), the European Patent Office (EPO), and others – offer global coverage, which is particularly relevant for the healthcare sector operating across international markets. These resources facilitate the assessment of patentability and commercialization potential in different countries and regions.

   The analysis of patent databases enables the identification of innovative medical technologies at the earliest stages of their development.

4. Conducting expert surveys: Expert involvement in HS is possible at various stages and makes it possible not only to validate the results obtained but also to identify unmet clinical needs that may not be evident to researchers and developers of medical technologies. This contributes to more targeted HS , focused on addressing specific medical challenges, and also enables HS institutions to set priorities more effectively.

   At the same time, validation of HS results is critically important, as clinical experts are best positioned to assess whether new developments and technologies will be applicable in real-world clinical settings. They can also determine which innovations have the highest potential for successful integration into clinical practice, taking into account national and regional specificities – thus improving the likelihood of their commercialization and acceptance by physicians and patients.

   Expert surveys may be conducted using the following methods:

   - Delphi method: collection of expert opinions through a series of questionnaires, enabling consensus on the potential value of a new medical technology for the healthcare system.
   - Focus groups and strategic sessions: organized discussions with healthcare professionals (clinicians, health administrators, etc.), scientists, researchers, and industry representatives to gather information on new technologies and assess their potential significance for the system.

5. Technology scouting and market analysis: Technology scouting involves the active search for new health technologies within universities, research institutions, biotechnology companies, and startups. This enables early identification of potential technological breakthroughs that may significantly impact the healthcare sector. Technology scouting supports informed investment decisions by assessing which innovations hold the greatest potential to improve clinical practice and expand access to healthcare services.

   The analysis of published market reports, future market projections, and investment trends allows for the evaluation of a product's potential commercial success, its alignment with the existing ecosystem, and the anticipated costs associated with its market introduction.

These tools help forecast challenges associated with the implementation of innovation. Market analysis can identify barriers to market entry, such as regulatory constraints, integration challenges within existing healthcare infrastructure, or limited demand for certain technologies. Technology scouting, in turn, can highlight technological risks – for example, a lack of readiness for large-scale application or unresolved concerns regarding safety and effectiveness during the development phase.

6. Monitoring regulatory agencies for health technology approvals: Monitoring the activities of regulatory agencies – such as the U.S. Food and Drug Administration (FDA), the European Medicines Agency (EMA), and others—is also an important element of HS, as it allows for tracking new approvals and market authorization applications for health technologies. In addition, the analysis of reports from international regulators enables companies and research organizations to plan their development strategies more effectively and minimize risks by considering existing regulatory guidance. It also helps anticipate changes in the sector and supports more informed decision-making in the development and commercialization of health technologies.
7. Building partnerships across healthcare systems: Establishing partnerships with all key stakeholders in the healthcare system is essential to strengthening HS activities and ensuring their relevance to real-world needs. Patient organizations, in particular, play a critical role in identifying unmet medical needs and providing insight into technologies currently in use in clinical practice. Their input helps align HS efforts with the actual experiences and priorities of patients.

   The healthcare industry also serves as an important partner, offering early access to information about technologies under development. Companies can contribute insights into innovations at various stages of the research and development (R&D) pipeline –from preclinical concepts to late-stage products – thereby supporting more accurate forecasting and timely assessment. Collaboration with industry stakeholders enhances the comprehensiveness of HS and enables proactive engagement with technologies well before they reach regulatory review or market authorization.

   Involving academia, regulators, payers, healthcare providers, and professional associations further reinforces the HS ecosystem, facilitating the triangulation of evidence, validation of findings, and alignment with broader health system goals.
8. Data mining and use of AI: AI and digital technologies are playing an increasingly important role in HS processes. They enable the processing of vast volumes of data and the identification of hidden trends, thereby improving the overall efficiency of HS. Big data analytics significantly enhances the effectiveness of HS by automating routine tasks, allowing real-time analysis of data from diverse sources, and applying machine learning algorithms to detect latent patterns and trends, as well as to forecast future developments based on historical data.

   Machine learning plays a central role in data analysis and the prediction of technological trends. The main machine learning methods used in HS include:
   - Supervised learning – the use of labeled datasets to train models for predicting future events;
   - Neural networks – the use of multilayer neural architectures to analyze complex data, enabling classification and clustering (i.e., grouping data based on shared characteristics and uncovering hidden patterns);

- Natural language processing – technologies that allow automated analysis of textual information from various sources, such as scientific publications, patents, and news outlets.

9. Scenario planning and trend analysis: Scenario planning is a comprehensive process that enables the modeling and evaluation of various possible future developments and the associated risks, based on key trends and uncertainty factors such as shifting epidemiological patterns, economic dynamics, regulatory changes, and more. It is typically conducted in the form of foresight sessions involving multidisciplinary experts, including representatives from regulatory bodies and patient organizations.

   Scenario planning incorporates trend analysis, which involves the study of broad, long-term, and global shifts that impact demographics and the healthcare system as a whole.

   Within the context of HS, scenario planning helps healthcare stakeholders prepare for an uncertain future by exploring different possible trajectories. This tool enables companies, public institutions, and research organizations to develop flexible strategies, reduce risk, and make more informed decisions – ultimately facilitating the successful adoption of innovation and the long-term strengthening of the healthcare system.
10. Monitoring conferences and exhibitions: Attending and monitoring presentations and posters at major scientific conferences, as well as participating in trade and industry exhibitions, can also be valuable for identifying research activities and the development of new health technologies.

Naturally, determining an effective strategy for the identification of new health technologies requires the use of a combination of methods in each specific case. The value of each method varies depending on the objectives and focus of HS (for example, the area of interest may be limited to pharmaceuticals, surgical interventions, or diagnostic methods). To assess the appropriateness and value of specific methods, as well as to evaluate and aggregate HS results, tools such as multi-criteria decision analysis may be applied [10, 11].

The next stages of HS include the filtration and prioritization of health technologies. Filtration may be conducted according to a range of criteria, including: the effectiveness of the technology, the size of the target patient population (expected to be affected by the technology), degree of innovation, availability of current alternatives, disease severity, strength of evidence on efficacy and safety, organizational impact, alignment with healthcare policy priorities, development stage, feasibility, ethical and social implications, and expected time to implementation. HS typically considers a time horizon of 2–15 years. This reflects the fact that technologies expected to have an impact within less than 2 years are often already in late stages of development, while forecasts beyond 15–20 years tend to be too distant and uncertain to be actionable.

Technologies selected through filtration are subsequently prioritized (i.e., ranked based on their relevance to the healthcare system). Prioritization methods may include both qualitative and quantitative approaches, scoring and ranking, risk analysis, the Delphi method, public consultations, and expert involvement. The aim of prioritization is to select technologies based on their potential clinical and economic impact, as well as other predefined criteria [5].

Impact assessment may be conducted as a rapid analysis or as an in-depth evaluation that incorporates both clinical and economic aspects. The assessment includes forecasting the adoption of technologies, evaluating their impact on clinical outcomes, infrastructure, and costs, as well as analyzing potential ethical and social implications.

Dissemination of information includes the publication of electronic and print reports, the creation and maintenance of databases on emerging technologies, and the preparation of regular informational bulletins.

National models and institutional approaches to horizon scanning in healthcare

In many countries, HS in healthcare is carried out within the framework of HTA agencies and tends to be fragmented, focusing primarily on evaluating the potential impact of new technologies on reimbursement systems. The time horizon is typically limited to no more than 5 years [12].

Italy [13] serves as a prominent example, where since 2006 a structured short-term HS program has been implemented to monitor the emergence of new medicinal products and to provide the national regulator the Italian Medicines Agency (Agenzia Italiana del Farmaco, AIFA) with information at three key stages – 36, 18, and 12 months prior to expected EMA market authorization. While this system supports early preparedness and resource planning, it is narrowly focused on pharmaceuticals and technologies close to market entry.

Similar models are in place in Norway, Sweden, the Netherlands, France, Australia, Canada, New Zealand, and South Korea [9, 12, 14].

Unlike many other countries, the United Kingdom [15] has developed a more centralized approach to HS that is embedded within the structure of the National Health Service (NHS).

The National Institute for Health and Care Research (NIHR) Innovation Observatory[6], operating under the NHS and hosted by Newcastle University, plays a pivotal role in HS by informing healthcare policy, regulation, and research strategy. The Observatory monitors future pharmaceuticals, medical devices, and diagnostic technologies starting from the patent stage, often up to ten years before potential clinical adoption. The early identification of new health technologies typically begins three years prior to expected market authorization, aiming to compile data 24–30 months before anticipated launch. For novel medicines and advanced therapies, HS reports are generated 20 months before the expected marketing authorization, and 15 months in advance for new indications of already approved products. The Observatory's core areas of activity include:

- HS and analytics: it systematically identifies and analyzes scientific and technological trends using diverse data sources, such as scientific literature, patents, and market intelligence. The Observatory also engages patient organizations and clinical experts to improve the relevance of its forecasts. Two primary approaches are used: general routine "horizontal scanning" and in-depth thematic reviews in clinical areas with known unmet needs or high healthcare demand.
- Assessment and recommendations: based on collected evidence, the Innovation Observatory evaluates the potential benefits and risks of emerging technologies. The resulting recommendations support decision-making by government bodies, industry, and academic institutions regarding the adoption and advancement of innovations.
- Support for research and development: the Observatory collaborates with universities, research institutes, and commercial partners, providing access to data and insights that guide the development of new products and technologies, ranging from basic science to applied innovation.
- Education and knowledge dissemination: through training programs, workshops, and conferences, the Innovation Observatory raises aware-

[6] NIHR Innovation Observatory. Newcastle upon Tyne: NIHR Innovation Observatory. Accessed 05.02.2025. https://io.nihr.ac.uk/

ness and understanding of new technologies among stakeholders, helping to foster an innovation-ready ecosystem.
- Strategic planning and policy development: drawing on its data and analytics, the Observatory contributes to long-term strategic planning and the formulation of policy recommendations aimed at strengthening innovation systems at both regional and national levels.

The Observatory also offers access to tools, databases, reports, and dashboards developed through its programs to support translational research[7]. This enables researchers and developers to apply cutting-edge methods and evidence to accelerate the integration of innovations into clinical practice.

Brazil was the first among BRICS countries to take steps toward the systematic implementation of HS in healthcare. In 2011, the National Committee for Health Technology Incorporation (CONITEC) was established, and beginning in 2014, in collaboration with scientific institutions, it began developing HS mechanisms for the early identification of new health technologies with potential impact on the national Unified Health System (SUS). Between 2014 and 2018, CONITEC developed and introduced various analytical tools, including internal reports, early alerts, and briefing documents on emerging technologies. These materials became an important resource for informing healthcare authorities and supporting decisions regarding the incorporation of new technologies into the healthcare system [16].

One of the key milestones was the launch of the RADAR platform in 2014, designed to disseminate analytical information on novel and emerging technologies. Developed by the Ministry of Health in collaboration with other institutions, the platform enabled timely communication with the medical community about technological changes, contributing to greater transparency and proactive innovation management in healthcare [17].

Brazil's experience demonstrates that institutionalizing HS within the national regulatory framework not only facilitates the evaluation of promising technologies but also supports their managed introduction – helping ensure the sustainability of the system in a rapidly evolving technological landscape. According to publicly available data, HS in other BRICS countries is not institutionalized and is not carried out on a regular or systematic basis. Unlike Brazil, where HS is integrated into national health governance, in India, China, Russia, South Africa, and the UAE, HS-related activities are conducted within isolated research projects or by individual institutions. To date, none of these countries have established centralized national mechanisms for the continuous identification and assessment of emerging health technologies.

International organizations and initiatives in horizon scanning

World Health Organization

The World Health Organization (WHO) plays an active role in international HS initiatives. The Global Health Futures Forum brings together experts to discuss future challenges and opportunities in healthcare. Its key areas of focus include conducting research and analyzing future health trends, coordinating efforts and sharing experiences across countries, and developing strategic planning and innovation implementation recommendations for WHO Member States [18].

[7] ScanMedicine. Accessed 01.02.2025. https://www.scanmedicine.com/

Organisation for Economic Co-operation and Development

The Organisation for Economic Co-operation and Development (OECD) actively engages in HS initiatives within the healthcare sector. Through its Strategic Foresight unit, the OECD employs HS to systematically detect early signs of potentially significant developments, particularly in science and technology, to anticipate their future impacts on healthcare systems[8].

In its 2017 report, "New Health Technologies: Managing Access, Value and Sustainability," the OECD reviewed various technology foresight and HS studies. The report highlighted the importance of these methodologies in identifying emerging technologies likely to transform healthcare within the next five to ten years. It also discussed national initiatives in HS, emphasizing the role of such activities in preparing health systems for new technological advancements [19].

Furthermore, the OECD has developed frameworks for anticipatory governance of emerging technologies, advocating for the use of robust tools such as HS, advanced data analytics, forecasting, and technology assessment. These tools are employed to anticipate future developments and inform policy-making processes, ensuring that health systems are equipped to manage upcoming innovations effectively[9].

As noted above, EuroScan [3] brings together organizations engaged in HS to improve methodologies and facilitate the exchange of information on emerging and new health technologies, thereby supporting the faster adoption of effective innovations across countries. Despite its name, the network includes members from around the world, including Brazil, Malaysia, Canada, Australia, and others, fostering the exchange of best practices and analytical approaches. EuroScan focuses primarily on ensuring access to up-to-date information to support decision-making, mitigate risks, and optimize resource allocation in healthcare. The organization employs both proactive and reactive monitoring strategies, including surveillance of scientific literature, patent activity, and clinical trial data. EuroScan also works actively with regulators and stakeholders, adapting implementation approaches and promoting the sustainable integration of innovation into health systems.

International horizon scanning initiative

The International Horizon Scanning Initiative (IHSI)[10] was established in 2019 as an independent organization that delivers early intelligence on emerging pharmaceutical innovations to its participating countries. The initiative originated from the Beneluxa collaboration – a cross-border alliance in healthcare involving Belgium, the Netherlands, Luxembourg, Austria, and Ireland – yet IHSI functions independently, enabling countries to join without being part of Beneluxa. Initial IHSI members included Belgium, the Netherlands, Denmark, Ireland, Norway, Portugal, Sweden, and Switzerland, with several other countries expressing interest in participation.

The IHSI model, developed by the Belgian Health Care Knowledge Centre (KCE), involves the systematic identification and assessment of medicines expected to significantly impact healthcare systems. The central implementation unit produces high-impact reports and maintains a

[8] Organisation for Economic Co-operation and Development (OECD). Strategic foresight. Accessed 03.02.2025. https://www.oecd.org/en/about/programmes/ strategic-foresight.html

[9] OECD. Strategic Foresight. OECD website. Accessed 04.02.2025. https://www.oecd.org/strategic-foresight/

[10] International Horizon Scanning Initiative (IHSI). Horizon scanning system. IHSI website. Accessed 05.02.2025. https://ihsi-health.org/horizon-scanning-system/

shared database that supports decision-making on pricing, reimbursement, budget planning, and access strategies. These outputs are directly used by national health authorities and payers to anticipate clinical and financial consequences of new therapies and to align healthcare system readiness with innovation trajectories.

IHSI represents a strong example of how countries can pool resources and expertise to conduct structured, forward-looking HS that directly informs national health policy. Its model offers a useful reference for BRICS countries, which could benefit from establishing a joint HS platform to monitor global pharmaceutical developments, strengthen local decision-making capacity, and support regional innovation planning and access strategies.

Horizon scanning in the Russian healthcare system: current gaps and strategic needs

At present, a systemic HS process has not been widely adopted in the Russian healthcare system. In contrast to advanced international practices—where HS is actively employed to anticipate change and guide healthcare systems in adapting to future challenges – Russia has yet to integrate this tool at the national level. This hampers the ability to account for long-term trends and potential technological breakthroughs in decision-making and planning.

Although a national HTA framework was introduced in 2014, it remains largely reactive. Assessments are typically initiated by applicants—primarily pharmaceutical companies – and individual technologies are reviewed only at the request of the Ministry of Health or affiliated scientific institutions[11]. This case-by-case approach does not enable comprehensive or continuous monitoring of innovation. Moreover, the current HTA horizon is typically limited to 2–3 years and focused on specific diseases, which restricts strategic foresight and limits the healthcare system's preparedness for transformative advances.

In recent years, several initiatives have been launched to support the identification and evaluation of innovative technologies. Two centers dedicated to medical technology transfer and coordination of biomedical research were established in 2022 under a federal program aimed at advancing medical science. Additionally, a national information system was introduced to collect and store data on publicly funded R&D projects conducted by institutions subordinate to the Ministry of Health [*7*].

However, these efforts do not constitute a systemic HS process. First, they are narrowly focused on the internal needs of public institutions and are not designed to provide early intelligence across the full spectrum of emerging health technologies. Second, these mechanisms operate in isolation and are not embedded within a continuous, transparent, and coordinated national foresight framework. There is no structured methodology for technology prioritisation, no regular scanning cycles, and no active engagement of key stakeholders such as industry, academic researchers, patients, or payers. In addition, these initiatives do not leverage modern analytical platforms such as AI, big data analytics, or predictive modelling. To be effective, HS must rely on these technological tools and be integrated into a national-level framework that ensures collaboration across all sectors of the healthcare and innovation ecosystem.

[11] Government Decree No. 871 of August 28, 2014. On the procedure for the development of lists of medicinal products for medical use and the minimum assortment of medicines needed for medical care provision. Accessed 05.02.2025. http://government.ru/docs/14540/

At the same time, other sectors in Russia are already successfully using sophisticated forecasting systems. One notable example is iFORA (Intelligent Foresight Analytics), an intelligent foresight analytics platform developed by the Institute for Statistical Studies and Economics of Knowledge at the National Research University Higher School of Economics. This system uses big data analytics, machine learning, and semantic technologies to identify major technological and economic trends and forecast the development trajectories of various sectors[12]. Applying such advanced analytical tools in healthcare – adapted to sector-specific needs—could significantly enhance governance and strategic planning. It would also support the establishment of a unified, sustainable, and forward-looking HS process.

HS in healthcare is a strategic instrument for identifying and evaluating future trends and potential shifts that may affect the health system. Its implementation could bring substantial benefits for Russia:

- Strategic planning: enables early identification of long-term trends and potential challenges, allowing for the development of proactive policies, innovation strategies, and better resource allocation. This improves system readiness and strengthens the competitiveness of sectors such as healthcare, pharmaceuticals, and biotechnology.
- R&D: supports the identification of priority areas for investment, encourages collaboration between academic institutions and industry, and contributes to the planning of joint scientific initiatives.
- Export potential: enhances the global competitiveness of Russian health technologies by continuously monitoring healthcare systems abroad, including regulatory requirements, reimbursement frameworks, clinical practice trends, and unmet medical needs.
- Policy development: facilitates timely adjustments to health and pharmaceutical policy through evidence-informed regulation and supports faster, safer integration of innovations into clinical practice.
- Informed funding decisions: provides a robust evidence base to guide public and private investment in high-impact technologies, improving the alignment of financial decisions with system and patient needs.
- Early access to innovation: improves system preparedness for the introduction of emerging health technologies, reducing time to implementation and increasing adoption efficiency.
- Healthcare cost management: identifies technologies that enhance diagnostic and therapeutic efficiency, reduce long-term system costs, and inform future planning for medical infrastructure and supply needs.
- Support for HTA: provides early-stage data and insights on new and emerging health technologies, enabling HTA bodies to conduct more comprehensive, timely, and informed evaluations of clinical effectiveness, safety, and economic impact.
- Patient benefit: enables quicker access to innovative treatments, supports improved health outcomes, and contributes to the advancement of personalized medicine approaches.
- Risk management: anticipates systemic and technological risks and supports the development of early mitigation strategies, contributing to greater resilience and sustainability of the healthcare system.

International experience shows that the results of HS have a wide range of potential users [1, 5, 8], making it particularly important to ensure broad dissemination of HS outputs and access to information for all interested stakeholders. In the context of the Russian Federation, potential users of HS results in healthcare may include:

[12] Institute for Statistical Studies and Economics of Knowledge. iFORA: Intelligent Foresight Analytics System. Moscow: HSE University. Accessed 01.02.2025. https://issek.hse.ru/en/ifora/u

- Research institutions and academic centers: can use HS to identify emerging research priorities and align scientific agendas with the future needs of the healthcare system. This helps direct efforts toward high-potential areas for the development of new health technologies.
- Pharmaceutical companies and manufacturers of health technologies: may rely on HS to better understand long-term national priorities, assess the market potential of their innovations, and optimise development strategies. Early access to strategic intelligence supports more efficient product planning and commercialization.
- Healthcare providers (e.g. hospitals and clinics): use HS to identify, evaluate, and adopt innovative diagnostic and therapeutic solutions. This enables timely integration of new technologies into clinical practice and contributes to improving the quality and efficiency of care delivery.
- Patient organizations: benefit from early awareness of upcoming treatment options and technological innovations. HS also enables stronger engagement in policy development and participation in clinical research and advocacy.
- Health insurers and payers, including the Mandatory Health Insurance Fund: use HS to evaluate the potential impact of new technologies on clinical outcomes and healthcare budgets. This supports evidence-informed reimbursement decisions and long-term financial planning.
- Venture capital firms and institutional investors: use HS to identify promising areas for investment in biomedical and health technology innovation. Access to early signals reduces investment risks and helps prioritize resources for high-impact technologies.
- Regulatory authorities: draw on HS findings to anticipate future regulatory needs, adapt evaluation frameworks, and accelerate the review and approval of transformative health technologies.
- HTA agencies: use HS to prepare for upcoming submissions, collect early data on safety, clinical effectiveness, and cost-effectiveness, and enhance the quality and relevance of assessments.
- Government ministries and policy-makers: the Ministry of Health can use HS to anticipate public health needs, plan national program, and allocate resources more effectively. Early awareness of pipeline innovations is crucial for timely decision-making on access and financing. The Ministry of Industry and Trade can use HS to guide industrial strategy by aligning domestic production with projected healthcare demands and global technology trends.

Importantly, the development of an effective HS framework should also include mechanisms for international cooperation – particularly within strategic alliances such as BRICS. Collaboration with BRICS partners can facilitate joint foresight studies, the exchange of early intelligence on emerging health technologies, coordination of research priorities, and cross-border innovation planning. Such efforts can strengthen the collective preparedness of BRICS health systems, enhance industrial integration, and create a shared vision for navigating global health technology transitions.

To unlock these benefits, Russia must move beyond isolated initiatives and establish a unified, institutionalized HS framework for healthcare. This should be forward-looking, technologically advanced, inclusive of all system stakeholders, internationally coordinated, and aligned with broader socioeconomic and industrial strategies.

Conclusion

In an era of rapid advances in medical science and technology—paired with the financial constraints faced by healthcare systems – HS has be-

come a critical tool for identifying and evaluating developments that may shape the future of health systems. By applying modern analytical methods and digital technologies, HS enables not only reactive adaptation to emerging trends but also proactive shaping of healthcare futures.

The results of HS can have far-reaching policy implications. They support the formulation of national health priorities, guide strategic investment in research and development, inform the design of legal and regulatory frameworks, and define focal points for international cooperation. For example, HS findings can recommend closer collaboration with specific international partners around shared research agendas or priority technologies. Importantly, all stakeholders within the healthcare system are potential users of HS outputs and should be actively engaged in their dissemination and application.

In the context of international integration, collaboration within BRICS countries is especially important. Joint efforts in HS could strengthen the collective ability to monitor health technologies and enhance the quality of strategic forecasting. For Russia, systematic work in HS is particularly relevant to ensure early identification of technology trends, develop a consistent regulatory framework with aligned innovation policy. Coordinated initiatives would not only improve the identification of global technology trends, but also support the alignment of innovation policy, regulatory strategy, and implementation across diverse health systems.

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