

Healthcare Workforce and Organisational Transformation with AI – Enacting Change



Think Tank Round Table
Meeting Proceedings

EIT Health InnoStars
Think Tank Round
Table, CEZAMAT
(Poleczki 19),
Warsaw, Poland
15.09.20



THINK < TANK <

CONTENTS

CONTEXT FOR THE SELECTION OF THE 2020 ROUND TABLE SERIES TOPIC	3
AGENDA AND PARTICIPANTS: INNOSTARS ROUND TABLE	5
DISCUSSION TOPICS.....	5
SESSION I: VALIDATE THE RELEVANT BARRIERS AND ENABLERS AS INDICATED WITHIN THE REPORT FOR THE SUCCESSFUL ADOPTION OF AI AT THE MEMBER STATE LEVEL, WHILST ALSO IDENTIFYING SIMILARITIES AND DIFFERENCES BETWEEN REGIONS	6
SYNOPSIS OF PARTICIPANT SURVEY RESULTS	6
DISCUSSION OF OUTCOMES.....	7
SESSIONS II–V: HOW TO IMPROVE ‘ON THE GROUND’ IMPACT OF AI	9
CLINICAL LEADERSHIP	9
RETHINKING EDUCATION AND SKILLS AND INVESTMENT IN NEW ROLES AND TALENT.....	11
SESSION III: REGULATION, FUNDING AND REIMBURSEMENT	15
REGULATION AND POLICY MAKING	15
FUNDING AND REIMBURSEMENT	17
SESSION IV: STRENGTHENING DATA QUALITY, LIABILITY AND MANAGING RISK	20
STRENGTHENING DATA QUALITY, GOVERNANCE, SECURITY AND INTEROPERABILITY	20
LIABILITY AND MANAGING RISK	22
SESSION V: DRIVING ACCEPTANCE AND UTILITY OF AI IN HEALTHCARE	25
APPENDIX 1: ROUND TABLE MEETING PARTICIPANTS	26

Context for the selection of the 2020 Round Table

Series Topic

In March 2020, a joint report between EIT Health and McKinsey & Company 'Transforming healthcare with AI: the impact on the workforce and organisations' was launched which aims to contribute to the debate surrounding Artificial Intelligence (AI) in healthcare but going a step further in helping to define the impact of AI on healthcare practitioners, and the implications of introducing and scaling AI for healthcare organisations and healthcare systems across Europe.

With AI in healthcare being a fast-moving field, the report provides a unique vantage point from the frontline of healthcare delivery and innovation today, and the latest view from a wide array of stakeholders on AI's potential, the real state of play today, and what is holding us back from widespread uptake and adoption.

As the report takes a broad pan-European perspective, identifying levers for change at the personnel, infrastructural and environmental levels, further exploration of how these findings and recommendations could be translated at a national level is warranted.

Through this Round Table Series, national-level decision makers representing key stakeholders that play a role in developing and implementing AI approaches at scale within existing national healthcare systems will be identified to provide opinion and potential solutions that could be applied to support practitioners and providers to fully embrace the potential of AI.

Objectives of the National Round Table Meetings

In each of our seven locations, by reviewing the national infrastructural context, educational and health systemic structure, we aim to:

- > Validate the relevant barriers and enablers, as indicated within the report, for the successful adoption of AI at the Member State (MS) level, whilst also identifying similarities and differences between countries.
- > Identify how to improve 'on the ground' impact of AI by specifying obstacles to overcome and opportunities to maximise within the defined domains.
- > Outline a national (MS level) 'plan-of-action', indicating individuals, organisations, bodies or other relevant vehicles to accelerate and expedite integration of AI to drive workforce capability and organisational receptivity.

In addition, it will be useful to look at the role the EU could play in encouraging greater adoption of AI in healthcare.

Agenda and participants: EIT Health InnoStars Think Tank Round Table

Hosted by EIT Health InnoStars

Moderated by: Wojciech Kuta, Editor-in-Chief, Rynek Zdrowia

Other participants: A full list of meeting participants can be found in Appendix 1.

2020 Round Table Series Co-Chairs:

- > Charlotte Stix – former Coordinator for the European Commission’s High-Level Expert Group on Artificial Intelligence
- > Zineb Nouns – Physician, Medical Education Specialist and HR Manager
- > Farzana Rahman – CEO, London Imaging Network

Discussion topics

The agenda for the Round Tables was developed following a review of the EIT Health and McKinsey & Company report ‘Transforming healthcare with AI: the impact on the workforce and organisations’ and with the input and advice of the 2020 Think Tank Round Table Co-Chairs.

- > **Session I**

Validate the relevant barriers and enablers as indicated within the report for the successful adoption of AI at the Member State level, whilst also identifying similarities and differences between regions

- > **Session II–V:**

Identify how to improve ‘on the ground’ impact of AI by specifying obstacles to overcome and opportunities to maximise within these six domains:

1. **Clinical leadership**
2. **Rethinking education and skills and investment in new roles and talent**
3. **Regulation and policy making**
4. **Funding and reimbursement**
5. **Strengthening data quality, governance, security and interoperability**
6. **Liability and managing risk**

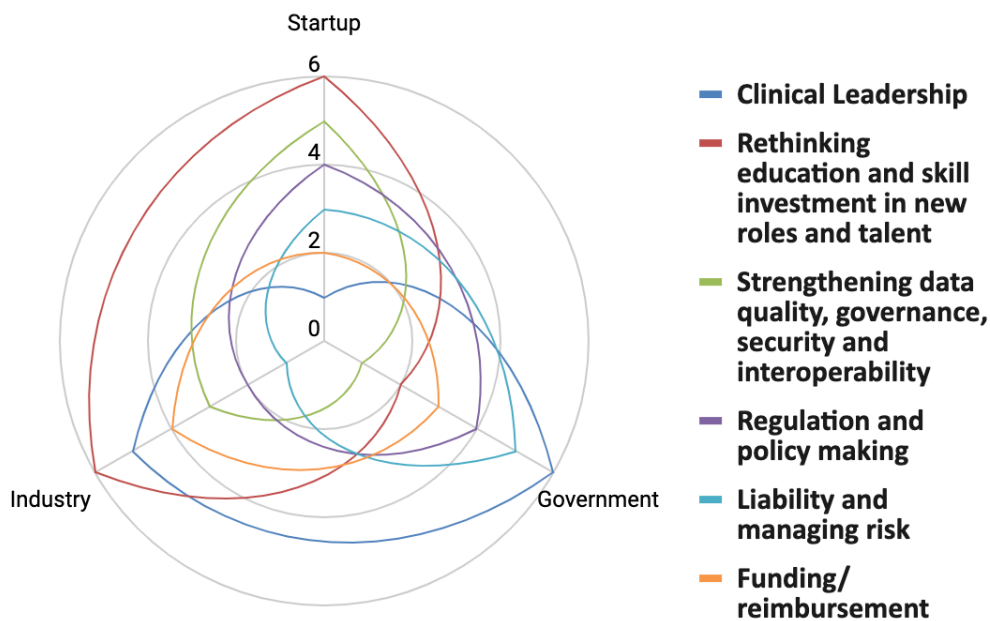
Outline a national (MS level) ‘plan of action’ to accelerate and expedite integration of AI to drive workforce capability and organisational receptivity

Session I: Validate the relevant barriers and enablers as indicated within the report for the successful adoption of AI at the Member State level, whilst also identifying similarities and differences between regions

Synopsis of participant survey results

A survey was sent to all participants prior to the Round Table meeting to gather feedback on the situation in their country regarding AI and healthcare in relation to the six domains identified in the joint EIT Health and McKinsey & Company report.

Summary of the survey results



1- Highest Priority (Centre) -> 6 – Lowest Priority (Periphery)

Based on the survey results, the key areas defined by the experts in regard to the AI implementation in Poland are funding/reimbursement, liability and managing risk and strengthening data quality, governance, security and interoperability (the average score was 3). The least priority was given to rethinking education and skill investment in new roles and talent (the average score was 4.7).

According to the survey results, one may observe the activity around AI adoption in healthcare, particularly in the early stages of the innovation process: research and start-up levels. However, when analysing the whole picture, the Polish public healthcare system is not yet ready for full implementation of AI. The Polish healthcare system is mainly based on the public health system. Public financing of healthcare in Poland is considerably below the European average – currently, it is around 5% of GDP. However, the Polish government declared an increase of public funding of healthcare to 6% by 2024. The Polish healthcare system is based on financing in the form of contributions to obligatory health insurance managed by the National Health Fund (NFZ). An alternative to using the public system is private healthcare, which still accounts for a minor part of the sector (according to the data from the Polish Chamber of Insurance, at the end of 2018, 2.6 mln of Polish citizens used private health insurance^j). However, the demand is increasing.

What is emphasized in the joint EIT Health and McKinsey report is that while we discuss the possibilities and the potential for AI adoption in healthcare, we should think locally and globally – recommendations on a national level are crucial – the key stakeholders, including Polish ministries: the Ministry of Development, Labour and Technology, the Ministry of Health and the Ministry of Education and Science should commence from shaping the local strategy for AI. However, the competition in AI is global. Europe needs to act together to have a chance to be a major player in the AI race – next to the United States and China.

Discussion of outcomes

The implementation of cutting-edge technologies, including AI in healthcare, is a relatively emergent domain in Poland. From the analysis based on the opinions of key experts in this sector, the implementation and adoption of AI in healthcare is in the process of growth and should be one of the government's priorities in the near future, especially in the post-pandemic time. Before the SARS-CoV-2 pandemic, AI already played a significant role in many aspects of healthcare, including diagnostics, drug discovery, health system optimisation and clinical management. During the pandemic, the transformation accelerated on a massive global scale. The abruptness of the pandemic underlined the even larger need for open data, the concept of making data available to everyone, so that researchers and founders may use, verify and analyse the data. What is more, during the pandemic, the telemedical solutions gained unprecedented popularity. According to the Biostat survey from April 2020ⁱⁱ, 72% of Poles consider telemedicine as the safest contact with the doctor and 43.8% used telemedicine (it was 6.8% in 2017). As an example of the Polish government's work on healthcare digitisation during the pandemic, the Ministry of Health together with the National Cloud and Centre for e-Health created a teleconsultation platform for those with suspected or confirmed COVID-19.

The Polish government is open to discussion about AI and the possible scenarios for the AI implementation in Poland. The finest example is the recent adoption of the "Policy for the development of artificial intelligence in Poland" by the Committee of the Council of Ministers for Digitisation. It is a document that supports and complements other strategic documents, including Responsible Development Strategy, Coordinated Plan of the European Commission for the

development of artificial intelligence in the European Union, as well as works of international organizations, including OECD. The document defines short-term (until 2023), medium-term (until 2027) and long-term (after 2027) goals for Poland.

Poland has a single-payer healthcare system – NFZ is managing healthcare financing and contracts with public and private healthcare providers. Hence, NFZ has an immense amount of patient-generated health data, still not being accessible for stakeholders and processed to a sufficient degree. There is currently no advanced NFZ data analytics, aiming at creating predictive models, analysing patient pathways, sharing data for research purposes. If transformed wisely, it may play a significant role as a driver and implementer of the national AI strategy for healthcare.

Challenges and barriers remain, however, as experts emphasized during the roundtable, a number of opportunities exist, and with close public and private sector cooperation, Poland has a chance to become a significant player in the region.

The aim of the introductory discussion among stakeholders, including healthcare professionals, start-ups, academia, industry representatives and public administration, was to define the key areas in regard to the implementation of AI in Poland. The results of the survey do not fully reflect the introductory discussion regarding key areas (barriers and enablers for the adoption of AI).

During the roundtable, the participants discussed six areas identified in the EIT Health and McKinsey report. Based on the discussion, they chose three key areas for the implementation and development of AI in healthcare: regulation and policy making, data (strengthening data quality, governance, security and interoperability) and education. Regulation and policy making is the most challenging part of the AI implementation and has to be thoroughly planned not only at the national level but more broadly – at the regional and European one as well. The participants emphasised the importance of financing/reimbursement in the context of creating new models of financing. What was brought into discussion during the roundtable was the ethical dilemma related to the AI implementation in healthcare as well as the necessity for a broader discussion on that topic – based on the European Commission “Ethics Guidelines for Trustworthy AI”, which EIT Health is piloting. The ethics of AI is closely linked to the safety process of the AI implementation, which, according to roundtable experts, is a key aspect. One needs to be aware of transparency, liability, explicability in the context of sensitive data-driven technology.

Moreover, what was highlighted in the course of the discussion was the role of the human factor – a crucial element in each of the six identified areas. When discussing the role of AI, one should separate healthcare as a clinical activity from healthcare as a system. On one hand, there is a health system and the potential of the AI implementation – including systemic optimisation, fraud detection, analysis of electronic health record system, more effective clinical management. On the other, there is AI used in health, including decision furtherance for doctors, the speed and accuracy in diagnostics and treatment, remote monitoring, “omic-based” care, including genomics and proteomics.

Sessions II–V: How to improve ‘on the ground’ impact of AI

For each of the six domains below, Round Table participants discussed and developed a list of actionable recommendations. They identified the people who need to be involved and proposed the actions that need to be taken, in order for these to be realised.

Clinical leadership

Challenges and barriers: What is not working/what needs to change in this domain?

Chief Innovation Officers in healthcare units

What is needed on a national level? As analysed in this report, regarding hospitals in Poland there is a diversity in the access to infrastructure, including access to computer equipment and lack of full electronic document circulation. However, some of the Polish healthcare units are advanced technologically and ready to implement AI tools. As highlighted during the roundtable, the still insufficient knowledge of those managing the hospitals and decision-makers on what solutions regarding AI may be implemented, whether the solutions are certified, tested and safe, is still a challenge. Moreover, the responsibility for implementing innovative solutions in hospitals is scattered. The experts recommend creating in each healthcare unit a Chief Innovation Officer role responsible for all activities linked to the implementation of novel technologies, including AI.

Benefits for those involved in the AI implementation process

AI is still in the early phase of understanding. As addressed in this report, the goal of the AI adoption is to augment the doctor, not to replace him. According to research by Transactions of the American Clinical and Climatological Association, medical knowledge expands exponentially – the time of doubling the medical knowledge was 3.5 years in 2010 and it is projected to be 73 days by the end of 2020ⁱⁱⁱ. The challenge for managing staff of healthcare units is to convince medical doctors and middle-level staff to adopt AI tools. This process should be complex: education in parallel with a discussion with doctors and middle-level personnel on their needs is in regard to the AI implementation. It should be highlighted that AI is a tool that may automate the administrative work for doctors, hence give them more time for patients.

Cooperation between stakeholders

As was recommended by the experts, clinical leadership requires close cooperation between stakeholders (policymakers, general managers of healthcare units, healthcare organisations and governmental bodies). EIT Health as a facilitator of cooperation on a national and pan-European level may play a key role in the process.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

The fact that AI is already implemented in Poland was highlighted during the roundtable. For instance, the applications of AI are already used in the specialties such as radiology, pathology, oncology, pulmonology or psychiatry. Examples of AI research and implementation in Polish hospitals and medical centres include:

- Maria Skłodowska-Curie Institute Oncology Centre in Gliwice is using Sens.AI, a deep-learning system for automatic analysis of MRI (magnetic resonance imaging) of the brain. Sens.AI determines easy-to-interpret visualisations of suspicious areas and calculates the volume of the largest, homogeneous lesion. The Sens.AI system was developed together with the specialists from the Department of Radiology and Imaging Diagnostics of the Oncology Centre^{iv}.
- Centre for Preventive Healthcare and Epidemiology of Cancers (OPEN) in Poznan performs screening for the early detection of breast cancer. OPEN cooperates with Merantix Labs from Germany, a technology lab and incubation platform for AI. AI helps in mammographic screening by images' analysis and discards non-suspicious images. The images that raise doubts or may indicate neoplastic lesions are further evaluated – by the radiologists, not by the AI model.
- PZU Group is one of the largest financial institutions in Central and Eastern Europe, led by the insurance company PZU. PZU Health is actively engaged in the healthcare sector, being an operator of 97 medical centres, additionally cooperating with more than 2 000 health centres in Poland^v. As an example, the Medical Centre PZU Zdrowie in Warsaw is using StethoMe, a stethoscope that helps doctors in the diagnostics of lung diseases. StethoMe is a combination of application, wireless stethoscope and AI medical algorithms. It can be used by patients remotely and is integrated with hospital information systems and electronic medical documentation.
- Tworki Psychiatric Hospital is using the Helping Hand application by addictions.ai for the alcohol addicted. AI tools make it possible to predict the abstinence breaking with 80% accuracy^{vi}.

Best practice examples

One of the recommendations from the experts includes the idea of creating a coordinator for AI in healthcare responsible for all public sector activities in this area. According to the roundtable participants, responsibility and governance are currently scattered. The coordinator should have an independent position, act as an expert and adviser to the public sector and as an interface between the stakeholders: the governmental bodies and the private sector (including large healthcare industry players, SMEs and start-ups) as well as academia. The coordinator should also act as a Polish representative at the international conferences and high-level intergovernmental meetings on all issues related to the AI implementation in healthcare.

Key Points

The key conclusion from the Clinical Leadership discussion is that the responsibility and governance in the AI area is fragmented, hence it needs coordinators to act as representatives for the stakeholders and those engaged in the AI implementation.

Proposed actions and recommendations

Clinical leadership	
Action	Target Stakeholder(s)
Chief Innovation Officer in healthcare units	Ministry of Health, healthcare units' managing directors, National Health Fund
Creating a new role: public sector coordinator for AI in healthcare	Ministry of Development, Labour and Technology, Ministry of Education and Science, Ministry of Health
Strengthening the cooperation between stakeholders (policymakers, GMs of healthcare units, healthcare organisations, governmental bodies) – EIT Health as the cooperation facilitator	EIT Health

Rethinking education and skills and investment in new roles and talent

Challenges and barriers: What is not working/what needs to change in this domain?

How to define AI?

In Poland, there is currently a discussion on how to define artificial intelligence. The joint EIT Health and McKinsey report defines AI as “the capability of a computer programme to perform tasks or reasoning processes that we usually associate with intelligence in a human being.” According to the roundtable participants, AI should be treated as a complementary technology to human intelligence, hence the term AI as augmented intelligence would apply better.

Data safety

One of the challenges related to data-driven technologies is the cooperation between research centres, universities and healthcare units having access to data in Poland. There is still a barrier to

sharing anonymised data for research purposes. Safety and control over data in the context of data sharing and analysis is the critical point for decision-makers. Hence, the guidelines prepared by the European Union regarding data safety, patient privacy and counteracting the cybersecurity attacks may be valuable in terms of the AI implementation. EIT Health may play the role of a facilitator in knowledge sharing and practical implementation of data safety strategies for policymakers.

AI education of medical doctors

Another challenge is related to the education of doctors and medical students. There is a gap in the AI education in medical schools compared to other universities. According to the "Policy for the development of artificial intelligence in Poland" document prepared under the guidance of the Polish Ministry of Development, compared to the rest of the world, the vast majority of talents professionally involved in AI in Poland are graduates of computer science, mathematics, information technologies, electrical and electronic engineering, physics, mechatronics and robotics.

Medical doctors should be properly trained in new technologies, including AI, both from the clinical aspect and its potential as well as from the regulatory aspects (including data transparency and liability). One of the recommendations from the experts is to add AI to the curriculum at medical universities from the beginning of training. It should be integrated into all elements of the studies' programme. The future medical doctors should develop knowledge in mathematical concepts, data science, AI/ML basics and regulatory and ethical aspects of the cutting-edge technologies' implementation in healthcare.

Moreover, there is currently a lack of postgraduate studies, extracurricular programmes and workshops for medical doctors in the area of digital innovations in healthcare. The demand for such knowledge and skills is increasing. The example of postgraduate education in the AI field is a one-year programme, "AI in diagnostics and medical practice", at the AGH University of Science and Technology in Krakow.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

During the roundtable, the representatives of the Polish Hospital Federation discussed the level of AI skills among Polish start-ups. The Federation together with the Association of Young Medical Managers and partners (including the Medical Research Agency in Poland, the National Centre for Research and Development, the Polish Ministry of Health and the Polish Development Fund) prepared a report "Top Disruptors in Healthcare"^{vii}. According to the report, the majority of innovative medical start-ups in Poland work in the telemedicine industry (45.9%). It is worth noting that the significant number of start-ups is engaged in artificial intelligence and machine learning (29.7%), which additionally explains the significant share of the medical data as a major area of activity (40.5%). The access to medical data is the crucial element of the AI implementation and is necessary at the stage of development and validation of algorithms as well as their usage in practice.

As the report underscores, there are a number of Polish start-ups engaged in AI and ML activity. One of them, BrainScan, is accelerated by EIT Health. BrainScan develops a system based on AI and ML technologies, which automatically detects and classifies pathological changes occurring in a CT scan of the brain. All scans are anonymised and sent to the BrainScan cloud, after which the analysis for radiologist begins. The BrainScan technology brings multiple benefits for patients (shorter time of CT scan analysis), healthcare system (higher efficiency of radiologist due to the increased number of CT scans) and radiologists (additional verification of the diagnosis)^{viii}. During the SARS-CoV-2 pandemic, BrainScan established cooperation with eight hospitals aiming at performing CT of the chest analysis. The characteristic changes in CT scans are associated with COVID-19. However, these changes are difficult to distinguish from other pathologies in a limited time. BrainScan developed a deep neural network model, which can precisely and quickly capture minimal differences in images, helping radiologists diagnose patients more effectively.

Molecule.one is a Polish start-up working on AI-powered software for synthesis design^{ix}. The aim is to reduce the time-consuming drug discovery process by molecular optimisation with an AI-based approach. Molecule.one created a platform able to perform synthesis planning for thousands of molecules per hour. During the pandemic, Molecule.one gave free access to its synthetic accessibility screening capabilities for research teams working on potential drugs for COVID-19. MIT and the University of Copenhagen are among those who have already benefited from using the platform.

One of the spin-off companies from the University of Warsaw is Smarter Diagnostics which develops Smarter Achilles MRI^x. Achilles tendon injuries are among the most common orthopaedic injuries (in Poland there are around 14 000 Achilles tendons scanned every year). A solution developed by the researchers allows users to automate and assess imaging diagnostics with the use of AI. The imaging time is shortened to a few minutes and the description is produced within a few seconds.

Best practice examples

When thinking about new skills and investing in education, one has to be aware of patient-oriented innovation. AI is a tool and the goal should be to improve patients' diagnostics, treatment quality and effectiveness.

Access to data and cooperation regarding data-driven technologies should be broad – Polish universities and healthcare agencies already cooperate internationally (on a European, American and Asian level), having access to external knowledge, research and data. Among the Polish Medical Research Agency partners, there are top-notch international organisations and research centres, including University of Texas – MD Anderson Cancer Centre.

AI technology is so complex that it requires an interdisciplinary approach. Thus, universities need to cooperate with each other as well as with the private sector. It is crucial to incentivise future medical doctors, biologists, informaticians, bioinformaticians, mathematicians, physicists to work on joint research projects. The example is EIT Health and its "knowledge triangle": research, education and business. EIT Health already cooperates with multiple Polish universities and

research centres, including the Medical University in Lodz as well as the largest research centres' network in Poland: Lukaszewicz Research Network.

Key Points

While thinking about education and investments in new talents, one cannot omit the role and significance of the technology "end users": patients. Education is key and it should concern all groups involved in the AI implementation – future software developers, doctors, bioinformaticians, data scientists, healthcare managers and middle-level staff, but also patients who need to be informed and prepared for the technological transformation in healthcare.

Proposed actions and recommendations

Education and skills	
Action	Target Stakeholder(s)
Education of all groups involved in the implementation and usage of AI in healthcare	Polish universities, Ministry of Health, Łukasiewicz Research Network
Cooperation between research centres, universities and healthcare units in Poland in terms of sharing anonymised data for research purposes	Medical Research Agency, research centres, universities, Centre for e-Health
Develop patient-oriented innovation at universities	Universities, research centres
Strengthening international cooperation between universities	Universities, Ministry of Education and Science, Medical Research Agency
Strengthening the interdisciplinary education	Universities, Ministry of Education and Science, Foundation for Polish Science
Include AI in the curriculum at medical universities	Ministry of Education and Science, Ministry of Health

Session III: Regulation, Funding and Reimbursement

Regulation and policy making

Challenges and barriers: What is not working/what needs to change in this domain?

Regulation as the utmost challenge

When thinking about the implementation of AI in healthcare, regulation and policy making is currently the biggest challenge. Why? Among six analysed key areas, regulation and policy making in the context of AI is the most deferred field – the data we analyse is complex and sensitive, AI is constantly transforming and is not a standard domain. Thus, the regulator may not have sufficient competencies to implement AI tools in the healthcare system. Moreover, regulation and policy making affects all other areas. As an example, a large innovative hospital in Poland cannot fully go through the digitisation process yet, mainly due to the legal restrictions and lack of proper regulations. One of the solutions is to implement pilots which act as an enabler for the adoption of innovative solutions and regulations. The National Health Fund launched the Strategy for 2019–2023^{xi}. Among the main goals, there are innovation pilots targeting key health issues and service quality.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

During the roundtable, there were proposals regarding holistic thinking about the development and implementation of data-driven technologies. However, they also focused on the elements that are easier and faster to implement as well as improving those already functioning ones by implementing AI tools. E-prescription and e-admission are examples of such digital elements that already function in Poland. E-prescription has been in operation since the beginning of 2020 and the process of its implementation lasted 2 years (e-prescription pilot was launched in 2018). The next step would be to internationalise and to prepare consistent regulations on a European level regarding e-prescription.

E-prescription is a central IT system. The main goals of the e-prescription system are to facilitate the process of filling prescriptions, reduce errors, optimise time for doctors, pharmacists and patients, eliminate the problem of illegible and false prescriptions and epidemiological analysis based on drug sale. The subsequent stage of the process should be implementing the advanced data analytics, including providing additional information for patients, doctors and pharmacists regarding drug use and cross-border digital patient data.

E-admission is a central IT system. The main purpose of the e-admission is to facilitate the process of carrying out admissions, as well as reducing errors and eliminating the problem of illegible admissions.

Best practice examples

Regulation should be as transparent as possible to avoid misunderstanding of the law. Based on the international examples, Polish healthcare units should have access to regulatory guidelines and explanations on how to act in accordance with the law. The major agencies responsible for safety monitoring of medicines, medical devices, food as well as for scientific evaluation – EMA (European Medical Agency) and FDA (U.S. Food and Drug Administration) – already provide clear guidelines for all involved in the process.

As mentioned earlier, another example demonstrating the government's willingness to implement AI is the adoption of the "Policy for the development of artificial intelligence in Poland" report by the Committee of the Council of Ministers for Digitisation^{xii}. The main conclusions from the document include:

- support for enterprises in the processes of creating and commercializing innovations in the AI area, through procurements, research programmes, acceleration programmes, and also through technological diplomacy; so that over 700 AI-based companies could be established in Poland by 2025;
- creating infrastructure or regulatory space to test AI models (so-called regulatory sandboxes). This is also a recommendation from the roundtable experts;
- support for the creation of trusted spaces for data and algorithm exchange, including cross-border.

The Polish government appointed GovTech Poland, an inter-ministerial team operating in cooperation with the Prime Minister. GovTech operates across the entire public sector to coordinate strategic digital projects, involving the public and private sector and all those supporting and impacting the digital transformation of the Polish public sector. Additionally, GovTech Poland aims at simplifying the implemented regulations in the area of digitisation process in Poland.

Key Points

It is worth noting that Poland has already implemented data-driven tools in healthcare. One of the examples is e-prescription. When thinking about AI adoption in healthcare, one should have a holistic approach (short-term and long-term) but also focus on the elements that are easier and faster to implement. The long-term approach is the adoption of strategy/policy for the development of AI in Poland, the short-term approach consists in creating an infrastructure to test AI models in the healthcare area (AI sandboxes). What was highlighted during the roundtable is that while creating regulations for data-driven technologies, one should draw from the already existing regulations in other European countries.

Proposed actions and recommendations

Regulation and policy-making	
Action	Target Stakeholder(s)
Creating guidelines/standards for all involved in the AI implementation process	Polish Medical Research Agency, Ministry of Health, Ministry of Development, Labour and Technology, GovTech Poland, Centre for e-Health
Preparing consistent regulations on a European level regarding e-prescription	European Commission, Ministry of Health
Introducing regulations and developing policies regarding the wide sharing of anonymised data	Ministry of Health, National Health Fund
Implementing the advanced data analytics related to e-prescription	Ministry of Health, Centre for e-Health

Funding and reimbursement

Challenges and barriers: What is not working/what needs to change in this domain?

New models of financing

Artificial intelligence and its implementation in healthcare is a relatively new domain, hence there is a need to rethink and create new models of financing in the area of data-driven technologies in healthcare. Value-based medicine (VBM) is becoming a significant concept in regard to the healthcare sector in Poland. As was addressed in the article by Federico Espoti and Giuseppe Banfi, VBM is “a redefinition of patient-centred targets for healthcare strategic interventions and optimization policies, reducing the risk of false economies linked with cost-reductions designed on poorly defined objectives”^{xiii}. The successful implementation of VBM requires complex patients’ data, hence the necessity of implementing AI and ML tools and establishing pricing policies.

Financing and reimbursement policy should be considered and planned also on an EU level. Recent European Commission’s initiative EU4Health is a good example of how cooperation between the Member States may bring benefits to all interested parties.

According to the experts, one also has to consider cost-effectiveness: whether the costs for research and development of data-driven technologies, including AI in healthcare, are adequate to the results and positive outcomes technology may bring. In 2018, the 3-year project IMPACT HTA

was launched^{xiv}. It is a joint initiative of 10 universities, health technology agencies, institutes for health, including The London School of Economics, the Agency for Health Technology Assessment in Poland (AOTMiT, Agencja Oceny Technologii Medycznych i Taryfikacji), the National Institute for Health and Care Excellence, Istituto Superiore di Sanità in Italy. The aim of the pan-European project is to integrate clinical and economic data to improve HTA economic evaluation and health system performance measurement. The research areas of the IMPACT HTA include hospital-based assessments, combining randomised clinical trial results with real world data, measuring fiscal impact, HTA implementation and methods for non-randomised data.

Infrastructure

One of the challenges in the Polish healthcare sector is the diversity in infrastructure. There are healthcare units highly advanced technologically and, on the other hand, there are a number of units unprepared for the technological transformation. What still is a challenge for healthcare units in Poland is: the access to computer equipment for medical and non-medical staff, lack of full electronic paper circulation, access to the IT infrastructure to store electronic medical documentation, Internet access, lack of sufficient funds for hospitals for digitisation transformation as well as lack of access to ERP systems.

Smart money

What needs to be improved regarding financing and investments is the amount of “smart money” and funds specialized in the area of new technologies in healthcare, including AI. Moreover, currently in Poland, there is an investment gap between early series funding (EUR 2–5 mln) and funding at later stages (EUR 10 mln plus).

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

If there is good science the funding is not a challenge. In Poland, there are a number of grants, programmes dedicated to the AI implementation, which include, for instance, the Foundation for Polish Science, the Medical Research Agency or the Polish National Centre for Research and Development programmes.

One of the most recent projects of the Polish Medical Research Agency is the network of Clinical Research Support Centres (CWBK)^{xv}. The EUR 25 mln project aims at coordinating medical trials, setting standards for trial procedures and increasing the number of commercial and non-commercial clinical trials in Poland. The project gathered 10 top-notch Polish universities and medical institutes, including the Medical University of Lodz (which is an EIT Health Partner) and the Medical University of Gdansk, Bialystok Medical University and the Institute of Cardiology in Warsaw.

Selvita, the largest biotechnology company in Poland and Ardigen, the bioinformatics company developing AI technology for precision medicine, are partnering in a project funded by the National Centre for Research and Development (NCBR). NCBR provides EUR 1.05 mln grant for both companies. The aim of the project is to develop the HiScAI (High Content Screening Artificial

Intelligence) Technology Platform for studying phenotypic changes in cells treated with a drug candidate, using AI and ML technologies to analyse data from high-content screening method^{xvi}. The platform will address multiple therapeutic areas, including neuroinflammatory and fibrotic diseases.

The Foundation for Polish Science (FNP) is the largest extra-budgetary source of funding for science in Poland. One of the projects granted by the FNP as part of TEAM-NET competition is the research aiming at the development of innovative artificial neural networks supervised by Prof. Jacek Tabor from the Jagiellonian University in Krakow. The scientists received EUR 5 mln for their research^{xvii}.

Best practice examples

The Medical Research Agency is active in the AI field as an organizer of a sector competition dedicated to AI as well as a competition for non-commercial clinical research in the area of artificial intelligence in oncology (with a budget of at least EUR 12 mln). These programmes act as a catalyser for strengthening public-private partnerships.

Key Points

The key conclusion from the Funding and reimbursement discussion is that the infrastructure in Polish healthcare system is diverse. There are healthcare units highly advanced technologically and there are units unprepared for the technological transformation. The experts highlighted that one has to consider cost-effectiveness: whether the costs for research and development of data-driven technologies are adequate to the results and positive outcomes technology may bring. In Poland, there are a number of programmes dedicated to the AI implementation.

Proposed actions and recommendations

Funding and reimbursement	
Action	Target Stakeholder(s)
Creating a new model of financing	European Commission, Polish Ministry of Health, National Health Fund
Investing in infrastructure (allocating more resources for hospital digital transformation)	Ministry of Health, Ministry of Development, Labour and Technology

Developing “smart money” investment model	Ministry of Education and Science, Ministry of Development, Labour and Technology, Medical Research Agency, Polish Development Fund
Engaging and supporting EU initiatives for health	Health organisations, Patients’ organisations, EIT Health

Session IV: Strengthening Data Quality, Liability and Managing Risk

Strengthening data quality, governance, security and interoperability

Challenges and barriers: What is not working/what needs to change in this domain?

Fragmentation and diversity of healthcare units in Poland

One of the challenges related to data quality is the fragmentation and diversity of healthcare units in Poland in regard to technological advancement and access to digital tools; hence, there is a risk of poor quality and falsified data.

Data standards and updates

Another challenge is a data update and creating a data input standard. Based on the example, Polish medical registers including pharmacies, medicinal products, healthcare units in Poland have standardised data. However, the challenge is to regularly update the existing data.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

As mentioned earlier, e-prescription is a big step forward in the digitisation process in Poland. This is a crucial element of broader digitisation programmes: P1 (Electronic Platform for Collection, Analysis and Sharing of digital resources on Medical Occurrences) and P2 (a platform for providing online services and resources of digital medical registers). Both programmes are flag projects of the Ministry of Health and Centre for eHealth. As part of the Project P1, subsystems and applications are being launched. They allow for the improvement of processes related to the planning and implementation of health services, monitoring and reporting on their implementation, and publishing information in the area of health. Apart from e-prescription, one of the applications implemented in P1 is Patient’s Online Account (Internetowe Konto Pacjenta, IKP). The account is a voluntary application for patients and is still in the development phase regarding gathering and

analytics of the patient data. The account makes it possible to receive an e-prescription via SMS or e-mail, buy prescription medications, provide a family or a doctor with information about the health condition and history of prescribed medications, apply for the European Health Insurance Card, collect e-prescriptions without visiting the doctor (in the case of chronic disease and after teleconsultation)^{xviii}.

Best practice examples

One of the recommendations from the experts includes the idea of creating so-called AI catalysts: a coalition of stakeholders involved in the implementation of AI in healthcare, including academia, the private sector (both large Polish and international companies as well as start-ups), public administration (ministries and institutional bodies working under ministries), healthcare organisations and European bodies (such as EIT Health). According to the roundtable participants, there is currently no sufficient communication between those involved in the AI implementation process.

Strategy for e-Health – the Centre for e-Health as a creator. The Centre for e-Health is an institutional body under the Ministry of Health in Poland. One of the topics addressed in the strategy is the AI implementation in the Polish and, more broadly, European context. There is a need for a clear plan and strategy which would involve short-term and long-term goals and draw a roadmap for the digital health sector in Poland.

Key Points

While discussing the access to data and the role of the public sector as the largest administrator of data (NFZ, the Ministry of Health, the Centre for e-Health in particular), we should think about addressing specific problems which occur during the process. If NFZ, as an administrator of data, sees the problem with completing the patient pathway and, for instance, it has no sufficient data regarding the patient’s diagnosis, it is an opportunity for researchers and start-ups to work on this issue and find solutions. Hence, one should implement a challenge-based approach by creating an innovation system that supports the public sector in handling the issues related to the AI development and the researchers and start-ups in working on innovative solutions.

Proposed actions and recommendations

Strengthening data quality, governance, security and interoperability	
Action	Target Stakeholder(s)

AI catalysts	Medical Research Agency, Polish Hospital Federation, Łukasiewicz Research Network, EIT Health, Ministry of Health, Ministry of Development, Labour and Technology, Ministry of Education and Science, private sector (large companies, start-ups, SMEs), Centre for e-Health, Coalition for AI in Health
AI sandbox	Private sector (large companies, start-ups, SMEs), GovTech Poland, universities
Strategy for e-Health	Centre for e-Health
Implementing a challenge-based approach (creating an innovation system that supports the public sector in handling the issues related to the AI development and the researchers and start-ups in working on innovative solutions)	GovTech Poland, Medical Research Agency

Liability and managing risk

Challenges and barriers: What is not working/what needs to change in this domain?

Eliminating the risks

From the point of view of the Data Protection Authority, setting policies and formalising the process of accessing the data is just one element. One has to thoroughly plan all the operations and create a strategy to protect the data to eliminate all the risks related to sensitive-data access. According to the report prepared by the Ponemon Institute, healthcare organisations globally are unprepared to protect sensitive patient data against security threats^{xix}.

Setting the industry standards regarding liability

When discussing the safety aspect of implementing AI, the unresolved question is related to liability: who is responsible if the algorithm prediction is wrong? Should it be the hospital, the doctor, the researcher, the company which developed the AI tool? The liability issues linked to the AI implementation needs to be standardised for the whole life science sector.

Data anonymisation

When discussing data anonymisation, one has to rethink data governance: who should be responsible for anonymising the data? The data administrator (for instance in hospitals) or the data recipients (for instance the private sector)? There are no sufficient regulations in that area – there is a need to change the law in order to give the healthcare units the possibility to share the data for the private sector (for research and development purposes).

Another possibility to store the data is the cloud. This method is being increasingly developed in Poland mostly by the private sector. At the EU level, the legal act specifying the principles of cloud data processing is Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union^{xx}. In recent years, digitisation of the Polish healthcare system has transformed dynamically. Storing data in the cloud is another level of transformation – it is linked to the entrustment of personal data and one should be sure that the cloud provider meets the safety requirements set out in the provisions on the protection of personal data, recommendations from the public sector (such as The Personal Data Protection Office) regarding the conditions for processing sensitive data in the public cloud.

One of the solutions addressed in the Clinical Leadership Session was to hire a Chief Innovation Officer in healthcare units, responsible for data processing, including anonymisation. Additionally, another idea linked to data governance and liability is to create a whole new system and give patients the prerogative to make their data public for a higher purpose. These patients' data would be managed by an independent third party.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

The experts highlighted that European countries already have a well-developed data central management system. As an example, Estonia has e-Health Record, a national system integrating different healthcare providers. E-Health record uses KSI (Keyless Signature Infrastructure) blockchain technology to ensure integrity and security of data. According to the Estonian data, 99% of patients in Estonia have a digital record^{xxi}. Apart from being a tool for patients and for doctors to access patient's data, the system is used by the public sector to track epidemics, control government expenditures and measure healthcare trends.

Best practice examples

The provisions on the protection of personal data in the EU after the implementation of the GDPR ensure a high standard of data protection. According to the recent study prepared for the European Parliament "The impact of the General Data Protection Regulation (GDPR) on artificial intelligence", although the term "artificial intelligence" is not explicitly mentioned in the GDPR, there are provisions relevant to AI^{xxii}. The study analyses two legal perspectives for data protection: right-based approach and risk-based approach. The right-based approach focuses on individual rights (data protection rights and fundamental rights), whereas risk-based approach focuses on data

protection by implementing the appropriate organisational and technological measures. According to the latter approach not only individuals are affected, but the larger groups as well (as an example: patients).

Another recommendation from the experts is to create an AI sandbox – an environment to test AI tools and evaluate algorithms to ensure that the technology is safe and effective for patients and that the algorithms meet the required standards.

Key Points

Data safety was the key discussion point for the liability and managing risk session. According to the experts, setting policies for accessing the data is just a part of a more complex process which requires eliminating all risks related to sensitive-data access. Another challenge is data governance and the responsibility for data anonymization. Among the recommendations, there is an idea to give patients the prerogative to make their data public.

Proposed actions and recommendations

Liability and managing risk	
Action	Target Stakeholder(s)
Giving prerogatives to patients and make data public	Polish citizens, GovTech Poland
Developing the policies regarding healthcare units and sharing patients' data for the private sector (for research and development purposes)	Ministry of Health
AI sandbox	Private sector (large companies, start-ups, SMEs), GovTech Poland, universities, hospitals
Setting the standards for life science sector regarding liability	Data Protection Authority

Session V: Driving acceptance and utility of AI in healthcare

The experts chose three key areas for the implementation and development of AI in healthcare in Poland: regulation and policy making, strengthening data quality, governance, security and interoperability and rethinking education and skills and investments in new roles. As was discussed during the roundtable, the crucial element in all six areas is the human factor. One cannot omit the human component in the AI implementation. Moreover, AI adoption requires education of the whole society: highlighting the benefits of AI for society and ensuring implementation safety.

When discussing the role of the AI implementation, one should separate healthcare as a clinical activity from healthcare as a health system. The experts agreed that there is a long way ahead to achieve the goals and fully implement AI. However, Poland has a chance to become a significant player in the region. The key recommendations include, among others: strengthening the cooperation between stakeholders (policymakers, GMs of healthcare units, healthcare organisations, governmental bodies) with EIT Health as a facilitator of cooperation, creating a new role: a public sector coordinator for AI in healthcare, including AI in the curriculum at medical universities, implementing the advanced data analytics related to e-prescription, developing "smart money" investment model, creating AI catalysts and developing AI sandboxes.

During the roundtable, there were recommendations regarding holistic thinking about the development of data-driven technologies, which also focused on the elements that are easier and faster to implement as well as improving those already functioning (e.g. e-prescription).

The conclusion is that having in mind safety issues, doubts and ethical dilemmas, one should treat AI as a complementary technology rather than supersedence of human intelligence by AI. Hence, the term augmented intelligence should be used instead of artificial intelligence.

Appendix 1: Round Table Meeting participants

EIT Health would like to thank the following participants for their input into the Round Table Meeting:

Organisers and other attendees	
Name	Organisation
Wojciech Kuta (moderator)	Editor-in-Chief, Rynek Zdrowia
Mikołaj Gurdała	Innovation Manager, EIT Health InnoStars
Ligia Kornowska	Managing Director, Polish Hospital Federation
Prof. Jarosław Fedorowski	President, Polish Hospital Federation
Radosław Sierpiński	Acting President, Medical Research Agency
Roman Topór-Mądry	President, Agency for Health Technology Assessment in Poland
Wiktor Rynowiecki	Deputy Director for Key Health Systems, Centre for e-Health
Robert Król	Vice-Director, GovTech Poland
Piotr Dardziński	President, Lukaszewicz Research Network
Szymon Korzekwa	R&D Director, BrainScan
Prof. Lucyna Woźniak	Vice-Rector, Medical University in Lodz
Michał Kępowicz	Strategic Relations, Governmental Affairs and Market Access Director, Philips Healthcare

Piotr Drobek	Legal expert, Data Protection Authority
Piotr Zień	Life Science and Biotechnology Center Director, Lukaszewicz - PORT
Prof. Paweł Ptaszyński	Vice-Director, Central Clinical Hospital of the medical University in Lodz
Piotr Najbuk	Public and Government Affairs Director, AstraZeneca
Marta Kaczmarek	EIT Health Innostars Communications and Marketing Manager
Zofia Meissner	Think Tank Roundtable Warsaw Coordinator
Sameena Conning	Director of External Affairs, EIT Health e.V.
Mayra Marin	Think Tank Manager, EIT Health e.V.

Appendix 2: Video summary of EIT Health Think Tank Warsaw Roundtable and satellite events

The video summarising EIT Health Think Tank Roundtable Warsaw: <https://www.youtube.com/watch?v=kUey9xX9MU8>

Think Tank Roundtable in Warsaw was preceded by the EIT Health and Forbes debate “Future of Medicine. Is the Polish healthcare system ready for AI?”. The link to the debate: <https://www.youtube.com/watch?v=g-JROC4zpwY>

EIT Health also officially announced a new partner – Lukasiewicz Research Network, the third biggest R&D network in the European Union. Lukasiewicz will collaborate closely with EIT Health core partner, the Medical University of Lodz. Link to the announcement: <https://eithealth.eu/news-article/lukasiewicz-joins-forces-with-eit-health-and-the-medical-university-of-lodz/>

Bibliography

-
- ⁱ Website. <https://www.rp.pl/Ubezpieczenia/190409435-Rekordowe-26-mln-Polakow-z-prywatnym-ubezpieczeniem-zdrowotnym.html>
- ⁱⁱ Website. <https://www.politykazdrowotna.com/57910,telemedycyna-wychodzi-na-prowadzenie>
- ⁱⁱⁱ Website. <https://www.elsevier.com/connect/medical-knowledge-doubles-every-few-months-how-can-clinicians-keep-up>
- ^{iv} Sens.Ai. <https://sensai.eu>
- ^v PZU Health. <https://www.fcmzdrowie.pl/o-nas/aktualnosci/pzu-zdrowie-przejmuje-centra-medyczne-falck>
- ^{vi} AI in psychiatry. <https://www.isbzdrowie.pl/2019/11/sztuczna-inteligencja-w-szpitalu-w-tworkach/>
- ^{vii} Report. Top Disruptors in Healthcare. PFSZ. 2020
- ^{viii} BrainScan. <https://brainscan.ai/en>
- ^{ix} Molecule.one. <https://techcrunch.com/2019/10/02/molecule-one-uses-machine-learning-to-make-synthesizing-new-drugs-a-snap/>
- ^x Smarter Diagnostics. <https://www.smarterdiagnostics.com>
- ^{xi} Strategy for National Health Fund. 2019-2023
- ^{xii} Policy for the AI development in Poland. <https://www.gov.pl/web/cyfryzacja/rozwoj-sztucznej-inteligencji-w-polsce--wazna-decyzja>
- ^{xiii} Fighting healthcare rocketing costs with value-based medicine: the case of stroke management. <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-4925-0>
- ^{xiv} IMPACT HTA. <https://www.impact-hta.eu>
- ^{xv} Clinical test network in Poland. <https://eithealth.eu/news-article/new-clinical-test-network-created-in-poland/>
- ^{xvi} Cooperation between Selvita and Ardigen. <https://selvita.com/news/selvita-and-ardigen-will-receive-funding-for-the-development-of-an-ai-based-high-content-screening-platform/>
- ^{xvii} Website. <https://www.fnp.org.pl/en/sztuczna-inteligencja-coraz-inteligentniejsza-dzieki-polskim-naukowcom/>
- ^{xviii} Patient's Online Account. <https://pacjent.gov.pl/internetowe-konto-pacjenta>
- ^{xix} Ponemon Institute. <https://www.ponemon.org>
- ^{xx} Medical data in the cloud. <http://www.kancelariajbw.com.pl/dane-medyczne>
- ^{xxi} E-Health Record. <https://e-estonia.com/solutions/healthcare/e-health-record/>
- ^{xxii} "The impact of the General Data Protection Regulation (GDPR) on artificial intelligence". European University Institute of Florence. June 2020.