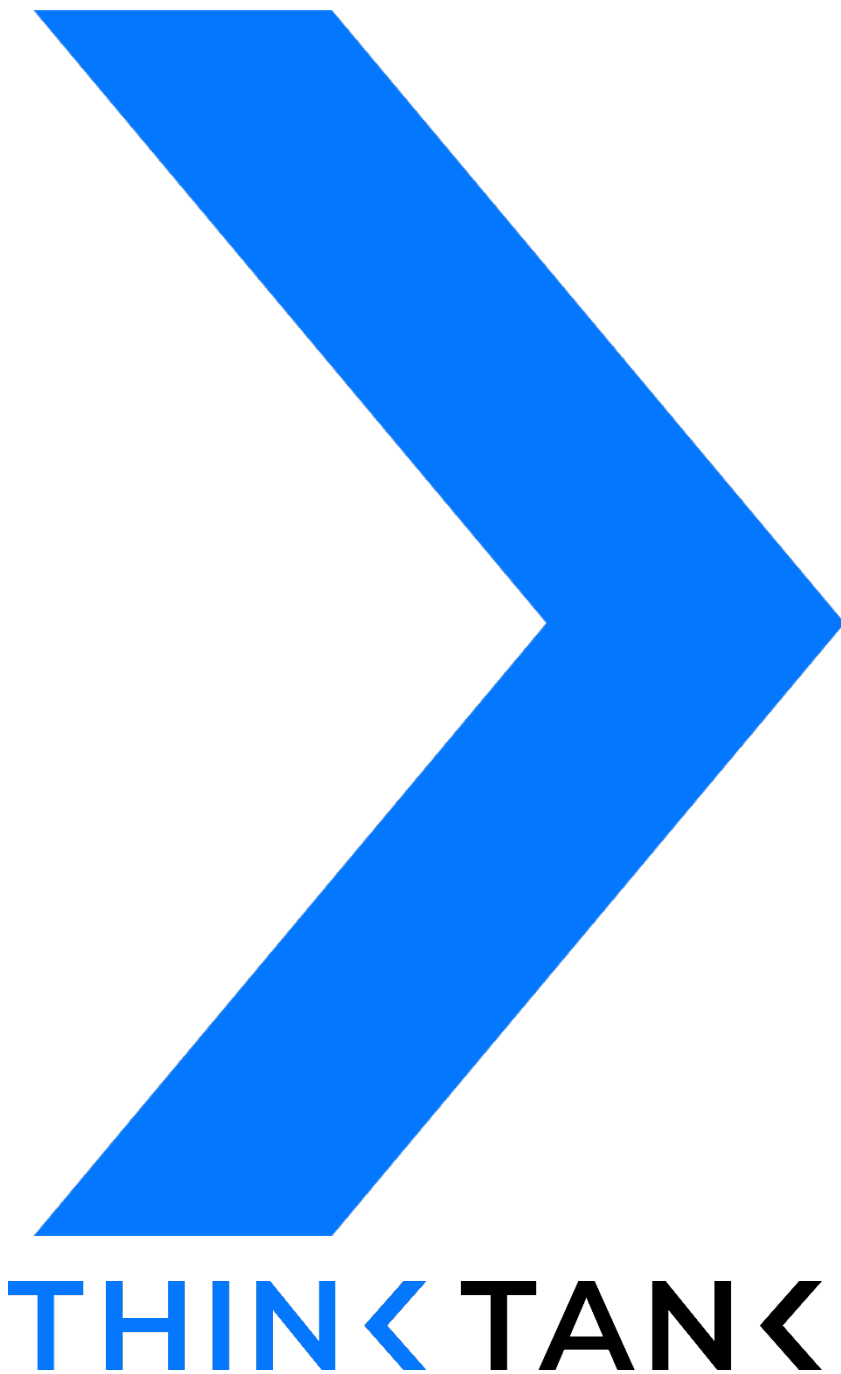


Healthcare Workforce and Organisational Transformation with AI – Enacting Change

Round Table Series
Meeting Proceedings

Poland
15.09.20



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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 were 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 for the successful adoption of AI at the Member State level

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 Poland regarding AI and healthcare in relation to the six domains identified in the joint EIT Health and McKinsey & Company report.

Polish healthcare system According to the survey feedback, activity around AI adoption in healthcare in Poland can already be seen, but is mostly in the early stages of the innovation process at the research and start-up levels. However, when analysing the bigger picture, the Polish public healthcare system is not yet ready for full implementation of AI. The Polish healthcare system is primarily based around the public health system and public financing of healthcare is considerably below the European average – currently around 5% of the country's Gross Domestic Product (GDP). However, the Polish government has declared an increase in public funding of healthcare to 6% by 2024. Financing is based on obligatory contributions to health insurance managed by the National Health Fund (NFZ). An alternative to using the public system is that citizens can take out their own private healthcare insurance, but this still accounts for a minor part of the sector. According to data from the Polish Chamber of Insurance, at the end of 2018, 2.6 million Polish citizens used private health insurance (1), however, the demand is increasing.

The need for national and pan-European strategies The joint EIT Health and McKinsey report emphasised that when the possibilities and the potential for AI adoption in healthcare are discussed, it is important to think nationally as well as globally – recommendations at a national level are crucial and the key stakeholders, including various Polish ministries (the Ministry of Development, Labour and Technology, the Ministry of Health and the Ministry of Education and Science) should commence shaping the national strategy for AI. However, competition in AI sector is global. European countries need to act together to have a chance of being a major player in the AI race alongside the United States and China.

Discussion of outcomes

The implementation of cutting-edge technologies, including AI in healthcare, is an emerging concept in Poland. From the analysis of the opinions of key experts in this sector, the

implementation and adoption of AI in healthcare is in the process of growth in Poland and should be one of the government's priorities in the near future, particularly in the post-pandemic period.

- > **Impact of the COVID-19 pandemic on AI adoption** 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, this transformation accelerated on a massive global scale. The abruptness of the pandemic underlined the urgent need for open data, the concept of making data available to everyone, so that researchers and innovators may use, verify and analyse the data. In addition, during the pandemic, telemedicine solutions gained unprecedented popularity. According to the Biostat survey from April 2020 (2), 72% of Polish citizens consider telemedicine as the safest method of contacting a doctor and 43.8% used telemedicine (an increase from 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.
- > **Polish strategy for AI adoption** The Polish government is open to discussion about AI and the possible scenarios for AI implementation in Poland. A good example of this 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 the 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 organisations, including the Organisation for Economic Co-operation and Development (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, which manages healthcare financing and contracts with public and private healthcare providers. As a result, NFZ holds an immense amount of patient-generated health data that is not currently accessible to stakeholders or processed to a sufficient degree. NFZ currently has no advanced data analytics that could be used to create predictive models, analyse patient pathways, or share data for research purposes. With careful transformation, NFZ could play a significant role as a driver and implementer of the national AI strategy for healthcare.

Participants emphasised during the Round Table meeting that while challenges and barriers to AI adoption remain, a number of opportunities also exist, and with close public and private sector cooperation, Poland has a chance to become a significant player in the region.

- > **Domain priorities identified during the Round Table** Participants at the Polish Round Table meeting represented a range of stakeholders, including healthcare professionals, start-ups, academia, industry and public administration. The aim of their discussions was to

define the key domains of the six identified in the joint EIT Health and McKinsey & Company report that need most focus in order to drive the implementation of AI in Poland. After discussion of the pre-meeting survey results, participants agreed that the following three domains were key for the implementation and development of AI in the healthcare sector: (1) regulation and policy making, (2) strengthening data quality, governance, security and interoperability and (3) rethinking education and skills and investment in new roles and talent.

- > **Key challenges** Regulation and policy making was considered as the most challenging part of AI implementation and has to be thoroughly planned, not only at the national level but also more broadly at the regional and European level. Participants emphasised the importance of financing and reimbursement and the need to create new models of financing. Another key topic was the ethical dilemma related to the AI implementation in healthcare as well as the necessity for a broader discussion on this 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 Round Table participants, is a critical factor. Awareness of transparency, liability and explainability in the context of sensitive data-driven technology is crucial.
- > **The human factor** The role of the human factor was identified as a vital element in each of the six domains. When discussing the role of AI, healthcare as a ‘system’ needs to be separated from healthcare as a ‘clinical activity’ delivering care to patients. On one hand, there is the health system context and the potential of AI implementation, including systemic optimisation, fraud detection, analysis of electronic health record systems, and more effective clinical management. On the other hand, there is AI used in healthcare delivery, including decision support for doctors, improving the speed and accuracy in diagnostics and treatment, remote monitoring, and ‘omic-based’ care, including genomics and proteomics.

Sessions II–IV: 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.

1. Clinical leadership

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

Chief Innovation Officers in healthcare units

Within hospitals in Poland there is a considerable diversity in access to infrastructure, including to computer equipment and the use of electronic health documentation. However, some Polish healthcare units are relatively advanced technologically and ready to implement AI tools. The challenge is that there is currently insufficient knowledge amongst hospital managers and decision-makers regarding what AI solutions can be implemented, and whether these solutions are certified, tested and safe. The responsibility for implementing innovative solutions in hospitals is fragmented. Participants recommended creating a Chief Innovation Officer role in each healthcare unit with responsibility for all activities linked to the implementation of novel technologies, including AI.

Public sector Coordinator for AI in Healthcare

Responsibility and governance are also very fragmented. One of the recommendations from participants was to create a Coordinator for AI in Healthcare responsible for all public sector activities in this area. The Coordinator should have an independent position, act as an expert and adviser to the public sector, and as an interface between 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 the Polish representative at international conferences and high-level intergovernmental meetings on all issues related to AI implementation in healthcare.

Benefits for those involved in the AI implementation process

The understanding of AI and its benefits is still in its early phase within the healthcare sector. The goal of the AI adoption is to augment the role of doctors, not to replace them. According to research by Transactions of the American Clinical and Climatological Association, medical knowledge expands exponentially – the doubling time for medical knowledge was 3.5 years in 2010 and it is projected to be 73 days by the end of 2020 (3). The challenge for managers of healthcare units is to convince clinicians and middle-level staff to adopt AI tools. This process

need not be complex: education in parallel with a discussion with doctors and middle-level personnel on their needs in relation to AI implementation. It should be highlighted that AI is a tool that can help automate the administrative work for doctors, giving them more time for patients.

Cooperation between stakeholders

Participants considered that good clinical leadership requires close cooperation between stakeholders (policymakers, general managers of healthcare units, healthcare organisations and governmental bodies). EIT Health may play a key role in this process as a facilitator of cooperation at a national and pan-European level.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

AI is already being implemented successfully in some sectors of healthcare in Poland. AI applications are used in specialties such as radiology, pathology, oncology, pulmonology and psychiatry. Examples of AI research and implementation in Polish hospitals and medical centres include:

- > The 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 (4).
- > The 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 image analysis and discards non-suspicious images. The images that raise doubts or may indicate neoplastic lesions are further evaluated by radiologists.
- > 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, and operates 97 medical centres, as well as cooperating with more than 2,000 health centres in Poland (5). As an example, the Medical Centre PZU Zdrowie in Warsaw is using StethoMe, a stethoscope that helps doctors in the diagnosis 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 developed by [addictions.ai](#) to help people with alcohol addiction. AI tools make it possible to predict abstinence breaking with 80% accuracy (6).

Key Points

- > Responsibility and governance in the AI area is fragmented, hence it needs coordinators to act as representatives for stakeholders and those engaged in the AI implementation.

Proposed actions and recommendations

Clinical leadership	
Action	Target Stakeholder(s)
Create Chief Innovation Officers in healthcare units	Ministry of Health, healthcare units managing directors, National Health Fund
Create a new role: Public sector Coordinator for AI in Healthcare	Ministry of Development, Labour and Technology; Ministry of Education and Science; Ministry of Health
Strengthen the cooperation between stakeholders (policymakers, managers of healthcare units, healthcare organisations, governmental bodies) – EIT Health could facilitate	EIT Health

2. 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 should AI be defined?

In Poland, there is currently an ongoing discussion regarding how to define AI. The joint EIT Health and McKinsey & Company 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 Round Table participants, AI should be treated as a complementary technology to human intelligence, hence the term ‘augmented intelligence’ may be better.

Data safety

One of the challenges related to data-driven technologies in Poland is the cooperation required between research centres, universities and healthcare units in order to allow access to data. 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 that have been developed by the European Union regarding data safety, patient privacy and counteracting cybersecurity attacks may be valuable in terms of the AI implementation in Poland. EIT Health may have a role in facilitating knowledge sharing and practical implementation of data safety strategies for policymakers.

Educating medical doctors in AI

Another challenge relates 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’ prepared under the guidance of the Polish Ministry for Development, compared to the rest of the world, the vast majority of talent involved professionally 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 perspective and its overall potential, as well as from a regulatory perspective, including data transparency and liability. One of the recommendations from participants is to add AI to the curriculum at medical universities from the start of training. It should be integrated into all elements of the study programme. Future medical doctors should develop knowledge in mathematical concepts, data science, the basics of AI and machine learning, and the regulatory and ethical aspects of the implementation of cutting-edge technologies in healthcare.

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.

AI skills amongst start-ups

During the Round Table meeting, 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’ (7). 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 a significant number of start-ups are engaged in AI and machine learning (29.7%), which explains why sharing of medical data is a major area of activity (40.5%). Access to medical

data is a 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.

Patient-focused innovations

When considering new skills and investing in education in the field of AI, it is important to be aware that these are ultimately patient-focused innovations. AI is a tool and the goal should be to improve patients' diagnosis, treatment quality and effectiveness. Citizens need to be included in innovation and development of AI solutions.

Building knowledge through national and international cooperation

Access to data and cooperation regarding data-driven technologies should be undertaken on a broad scale. Polish universities and healthcare agencies already cooperate internationally (on a European, American and Asian level), allowing them access to external knowledge, research and data. Polish Medical Research Agency partners include high-ranking international organisations and research centres, including University of Texas – MD Anderson Cancer Centre.

Multidisciplinary cooperation

AI technology is complex so it requires a multidisciplinary 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.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- > [BrainScan](#) is an innovative start-up that has received EIT Health Headstart support to help accelerate development of its AI application. BrainScan has developed 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) (8). During the SARS-CoV-2 pandemic, BrainScan established cooperation with eight hospitals to perform analyses of CT scans of the chest. 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 to diagnose patients more effectively.

- > [Molecule.one](#) is a Polish start-up working on AI-powered software for synthesis design (9). 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. The Massachusetts Institute of Technology in the USA and the University of Copenhagen in Denmark 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 (10). Achilles tendon injuries are among the most common orthopaedic injuries (in Poland around 14,000 Achilles tendons are 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

- > An example of successful 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.
- > The EIT Health 'knowledge triangle' brings together research, education and business. EIT Health currently cooperates with multiple Polish universities and research centres, including the Medical University in Lodz as well as the largest research centre network in Poland: Łukasiewicz Research Network.

Key Points

- > When considering education and investment in new talent, the role and significance of the technology 'end users' – citizens and patients – should not be forgotten any they should be provided with opportunities to learn about AI and to be involved in development of AI solutions.
- > Education is key and it should be accessible to all groups involved in AI implementation – future software developers, doctors, bioinformaticians, data scientists, healthcare managers and middle-level staff, but also citizens and 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)
Provide education for all groups involved in the implementation and usage of AI in healthcare	Polish universities; Ministry of Health; Łukasiewicz Research Network
Improve 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 and learning at universities	Universities; research centres
Strengthen international cooperation between universities	Universities, Ministry of Education and Science, Medical Research Agency
Strengthen 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

3. Regulation and policy making

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

Regulation is the greatest challenge

Regulation and policy making are currently the biggest challenges for the implementation of AI in healthcare. Of the six domains considered, regulation and policy making in the context of AI is the one where most action is deferred – the data are considered complex and sensitive, AI is constantly transforming and is not a standard domain. Thus, regulators may not have sufficient competency to enable implementation of AI tools in the healthcare system. In addition, regulation and policy making affects all other areas of healthcare. 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 solution to this challenge is to implement pilots which act as an enabler for the adoption of innovative solutions and regulations. The National Health Fund has launched its strategy for 2019–2023 (11). Among the main goals are innovation pilots targeting key health issues and service quality.

The need for regulation transparency

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. In the fields of medicine, medical devices, food and scientific evaluation, clear guidelines are already in place for all involved in the process by the relevant regulatory bodies.

Focus on easy and fast implementation

While holistic thinking about the development and implementation of data-driven technologies is needed, there should also be a focus on elements that are easy and fast to implement as well as improving those already functioning by implementing AI tools. E-prescription and e-admission are examples of such digital elements that already function in Poland.

Polish government policy

The Polish government has already demonstrated its willingness to implement AI as demonstrated by the adoption of the 'Policy for the development of artificial intelligence in Poland' report by the Committee of the Council of Ministers for Digitisation (12). The main conclusions of the report are to:

- > Provide support for enterprises in the processes of creating and commercialising 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
- > Create infrastructure or regulatory space to test AI models (so-called regulatory sandboxes). This is also a recommendation from the roundtable experts
- > Provide support for the creation of trusted spaces for data and algorithm exchange, including cross-border

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- > E-prescription and e-admission are examples of digital applications that already function in Poland. E-prescription and e-admission are both central IT systems. E-prescription has been in operation since the beginning of 2020 and the implementation process lasted two years (the 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. 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. 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

- > The major agencies responsible for monitoring the safety of medicines, medical devices, food as well as those for scientific evaluation – the EMA (European Medical Agency) and the FDA (United States Food and Drug Administration) – provide clear guidelines on regulation for all involved in the process.
- > The Polish government has 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. Notably, GovTech Poland aims to simplify the existing regulations in the area of digitisation in Poland.

Key Points

- > Poland has already implemented data-driven tools in healthcare, one example being e-prescription.
- > When considering AI adoption in healthcare, a holistic approach (short-term and long-term) is needed but also focusing on the elements that are easier and faster to implement.
- > The long-term approach in Poland is the adoption of a strategy/policy for the development of AI; the short-term approach consists of creating an infrastructure to test AI models in the healthcare sector (AI sandboxes).
- > While creating regulations for data-driven technologies in Poland, experience should be drawn from existing regulations in other European countries.

Proposed actions and recommendations

Regulation and policy-making	
Action	Target Stakeholder(s)
Create 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
Prepare consistent regulations at a European level regarding e-prescriptions	European Commission; Ministry of Health
Introduce regulations and develop policies regarding the wide sharing of anonymised data	Ministry of Health; National Health Fund
Implement the advanced data analytics related to e-prescription	Ministry of Health; Centre for e-Health

4. Funding and reimbursement

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

New models of financing

As AI and its implementation in healthcare is a relatively new domain, there is a need to rethink and create new models of financing in the area of data-driven technologies. Value-based medicine (VBM) is becoming a significant concept within the healthcare sector in Poland. As stated in the 2020 article by Espoti and Banfi, VBM is “a redefinition of patient-centred targets for healthcare strategic interventions and optimisation policies, reducing the risk of false economies linked with cost-reductions designed on poorly defined objectives” (13). The successful implementation of VBM requires complex patient data, hence the necessity of implementing AI and machine learning tools, and establishing pricing policies.

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

Evaluation of cost effectiveness

According to the participants, evaluation of cost-effectiveness is an important consideration: determining how the costs for research and development of data-driven technologies, including AI in healthcare, are balanced against the results and positive outcomes technology may bring. In

2018, the 3-year project IMPACT HTA was launched (14). This is a joint initiative between 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 in the UK, and Istituto Superiore di Sanità in Italy. The aim of this pan-European project is to integrate clinical and economic data in order to improve Health Technology Assessment (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. While there are many healthcare units that are highly advanced technologically, on the other hand there are others unprepared for technological transformation. Ongoing challenges for healthcare units in Poland are: access to computer equipment for medical and non-medical staff, lack of full electronic documentation, 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 enterprise resource planning systems.

Smart money

What needs to be improved regarding financing and investments is the number of 'smart money' funds and investment models that specialise in the area of new technologies in healthcare, including AI. Currently in Poland there is an investment gap between early series funding (EUR 2–5 million) and funding at later stages (EUR 10 million plus).

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- > In Poland, there are a number of grants and programmes dedicated to AI implementation, including the Foundation for Polish Science, the Medical Research Agency, and the Polish National Centre for Research and Development.
- > The network of Clinical Research Support Centres (CWBK) (15) is one of the most recent projects of the Polish Medical Research Agency. This EUR 25 million project aims to coordinate clinical trials, setting standards for trial procedures and increasing the number of commercial and non-commercial clinical trials in Poland. The project gathered 10 top-tier 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 has provided

a EUR 1.05 million grant to 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 machine learning technologies to analyse data from high-content screening methods (16). 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 for research aimed at the development of innovative artificial neural networks supervised by Prof. Jacek Tabor from the Jagiellonian University in Krakow. The scientists received EUR 5 million for their research (17).

Best practice examples

- > Poland's Medical Research Agency is active in the AI field as an organiser of a sector competition dedicated to AI as well as a competition for non-commercial clinical research in the area of AI in oncology (with a budget of at least EUR 12 million). These programmes act as a catalyst to strengthen public-private partnerships.
- > [IMPACT HTA](#), an EU Horizon 2020-funded research project looking at new and improved methods for understanding variations in costs and health outcomes within and across countries. The project will integrate clinical and economic data from different sources to improve methods for economic evaluation in the context of HTA and health system performance measurement.

Key Points

- > The infrastructure in the Polish healthcare system is diverse. There are healthcare units highly advanced technologically and there are units unprepared for the technological transformation.
- > Cost-effectiveness of AI applications is an important consideration and improved methods are needed for its assessment in order to determine whether the positive outcomes that data-driven technologies may bring can be balanced against the costs invested for their research and development.
- > In Poland, there are a number of programmes dedicated to AI implementation.

Proposed actions and recommendations

Funding and reimbursement	
Action	Target Stakeholder(s)
Create new models of financing	European Commission; Polish Ministry of Health; National Health Fund
Invest in infrastructure, including allocating more resources for hospital digital transformation	Ministry of Health; Ministry of Development, Labour and Technology
Develop 'smart money' investment models	Ministry of Education and Science; Ministry of Development, Labour and Technology; Medical Research Agency; Polish Development Fund
Engage with and support EU initiatives for health	Health organisations; patient organisations; EIT Health

5. 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 regarding their technological advancement and access to digital tools. As a result, there is a risk of poor quality and falsified data.

Data standards and updates

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

AI catalysts

According to Round Table participants, there is currently insufficient communication between stakeholders involved in the AI implementation process. 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. They suggested 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).

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- > E-prescription is a big step forward in the digitisation process in Poland and is a crucial element of other 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 flagship 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 collection and analysis 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 diseases and after teleconsultation) (18).

Best practice examples

- > The Centre for e-Health is an institutional body under the Ministry of Health in Poland. One of the topics addressed in their Strategy for e-Health is the AI implementation in the Polish and, more broadly, European context.

Key Points

- > The public sector is the largest administrator of data (NFZ, the Ministry of Health, and the Centre for e-Health in particular) and could have a role in identifying specific problems that occur during the patient pathway. If NFZ identifies a problem completing the patient pathway for a particular medical condition but has insufficient data regarding, for example, diagnosis, it is an opportunity for researchers and start-ups to work on this issue and find solutions.

- > A challenge-based approach could be developed by creating an innovation system that supports the public sector in handling the issues related to AI development and also researchers and start-ups in working on innovative solutions to these unmet needs.

Proposed actions and recommendations

Strengthening data quality, governance, security and interoperability	
Action	Target Stakeholder(s)
Create AI catalysts, a coalition of stakeholders involved in the implementation of AI in healthcare, including academia, the private sector, public administration, healthcare organisations and European bodies (such as EIT Health).	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, SMEs & start-ups); Centre for e-Health; Coalition for AI in Health
Implement a strategy for e-Health	Centre for e-Health
Implement a challenge-based approach to developing AI applications to meet unmet medical/clinical needs that supports the public sector as well as researchers and start-ups	GovTech Poland; Medical Research Agency

6. Liability and managing risk

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

Eliminating 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. It is important to thoroughly plan each step of the operation and create a strategy to protect the data at each stage that eliminates all 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 (19).

Setting 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 AI implementation need to be standardised for the whole life science sector.

Data anonymisation

When discussing data anonymisation, it is necessary to rethink data governance: who should be responsible for anonymising the data? The data administrator (for instance in hospitals) or the data recipient (for instance the private sector)? There are currently insufficient regulations in this area – there is a need to change the law in order to give the healthcare units the possibility of sharing data with the private sector for research and development purposes.

Data storage

One possibility for data storage 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 EU (20). In recent years, digitisation of the Polish healthcare system has transformed dramatically. Storing data in the cloud is another level of transformation – it is linked to the entrustment of personal data and it is necessary to ensure that the cloud provider meets the safety requirements set out in the provisions regarding the protection of personal data, and recommendations from the public sector (such as The Personal Data Protection Office) regarding the conditions for processing sensitive data in the public cloud.

Patient prerogative

One of the solutions suggested in the Clinical Leadership section was to appoint 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. This data would be managed by an independent third party.

AI sandboxes

Another recommendation from participants was to create AI sandbox opportunities – 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.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- > European countries already have a well-developed central data management system. As an example, Estonia has e-Health Records, a national system integrating different healthcare providers. The 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 (21). 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

- > Provisions for the protection of personal data in the EU following implementation of the General Data Protection Regulation (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 (22). 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).

Key Points

- > Data safety is key in terms of liability and managing risk of AI applications.
- > Setting policies for accessing 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 anonymisation. One suggestion is to give patients the prerogative to make their data public.

Proposed actions and recommendations

Liability and managing risk	
Action	Target Stakeholder(s)
Give patients the prerogative to make their own data public	Polish citizens; GovTech Poland
Develop policies regarding healthcare organisations sharing patients' data with the private sector for research and development purposes	Ministry of Health
Develop AI sandbox opportunities	Private sector (large companies, SMEs & start-ups); GovTech Poland; Universities
Set standards for life science sector regarding liability for AI applications	Data Protection Authority

Session V: Driving acceptance and utility of AI in healthcare

The Round Table participants identified three key areas for the implementation and development of AI in healthcare in Poland: (1) regulation and policy making, (2) strengthening data quality, governance, security and interoperability and (3) rethinking education and skills and investments in new roles. The crucial element in all domains is the human factor; the human component cannot be excluded when considering AI implementation. In addition, AI adoption requires education of the whole of society: highlighting the benefits of AI for all citizens and ensuring safe implementation.

Participants agreed that there is a long way to go in order to achieve these goals and fully implement AI nationally. However, Poland has a chance to become a significant player in the region. Participants put forward a range of recommendations across the six domains to help drive acceptance and utility of AI. These include strengthening the cooperation between stakeholders (policymakers, managers of healthcare units, healthcare organisations, governmental bodies) with EIT Health as a facilitator, 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 models, creating 'AI catalysts', and developing AI sandboxes to allow testing of applications.

Holistic thinking about the development of data-driven technologies was considered important, but there is also a need to focus on elements that are easier and faster to implement as well as improving those already functioning (a good example being e-prescriptions).

Bearing in mind data safety concerns, alongside other doubts and ethical dilemmas relating to AI, it should be viewed as a complementary technology rather than something that supersedes human intelligence. In this regard, 'augmented intelligence' is probably a better descriptor than 'artificial intelligence'.

Afterword

What should be the key education elements in the context of AI implementation from the patient's perspective?

From the patient's perspective, the AI (*Artificial Intelligence*) implementation requires the adoption of cooperation assumptions by all participants in the healthcare sector during the provision of health services. The patient should have minimum technical skills in using advanced technologies along with knowledge on the availability of health-related AI technologies.

The first problem lies directly in the patient's confidence to use advanced technologies in relation to their lifestyle. One should keep in mind that the lack of skills or willingness to use the offered solutions may lead to the objection to the cooperation which relates to the implementation or use of these solutions. In this area, the development of technology as a tool may turn out to be faster than gaining approval for its use in society. Some technologies may also raise ideological objections. Movements negating achievements of medicine are becoming more and more popular. Therefore, the state needs to maintain a high level of education of the society.

In terms of using AI technology in medicine, it is important to equip patients with knowledge and skills that focus on exercising the patients' rights. Patients' co-responsibility for their health results from the exercise of patients' rights to information and consent. The idea of informed consent adopted according to the law (e.g. Polish law) assumes that by giving a statement the patient repeals the unlawfulness of an act involving interference with his or her personal rights such as health, privacy or even life. Giving informed consent is possible only after the patient has received appropriate and understandable information. This is where the issue of using the achievements of AI in the provision of health services arises. In principle, the patient must be informed to a minimum extent about the method of the used diagnosis or treatment, especially about the complications, which are unintended but possible consequences. Therefore, as part of exercising the patient's right to information in individual cases and in order to give legally valid consent to the provision of a health service, it might be necessary to clarify certain technical information to the patient, including the likelihood of a technical error resulting from the usage of a given technology. We can already notice increased awareness of patients of the importance of using specific medical devices or equipment during the provision of health services. Patients ask about used material or technical parameters of a medical device more and more often. Similar trends might be expected when AI technology is used in health services.

The staff providing the services must be prepared to cooperate with an active, aware of his or her rights patient, also in terms of difficult technical questions. By significantly boosting the development of e-health tools, the time of the epidemic has shown the general acceptance and understanding of the tools used to help patients, but it has also revealed first problems resulting from a lack of understanding of the technique. By observing this process, we should argue that the medical staff needs to be open to new technologies if AI is to be developed. This staff should be previously trained in presenting the uses of AI to the patient. Not only will the efficient

exchange of information between all participants of the system influence the increase of the therapeutic and cost effectiveness, but it will also allow patients to manage their health consciously.

It is also necessary for the patients to maintain a certain level of health competence, understood as active care of their health. Therefore, the Ombudsman proposed introducing health knowledge as a separate subject in public schools. Apart from the skills focused on health-related competence, general knowledge of the healthcare system and ICT tools (e.g. Online Patient Account) provided for patients by the state should be introduced. This subject could also include discussions on the possibility of using AI in medicine. The acquired knowledge could include examples of the use of AI, and the knowledge in upper grades could also include the ability to discuss the use of AI as part of practical ability to execute patient's right to information and consent. The Ombudsman believes that due to the level of complexity of the topic pupils generally do not need skills regarding the use of AI but only knowledge about its use in medicine. Without a doubt, it will increase confidence in the use of modern technologies.

The AI development in Poland required legal framework and a system aimed at preventing the exclusion of patients who cannot use the latest technical solutions (for various reasons, including dementia, age, mental illness). However, we should remember that if we want tools to work properly and lead to the desired effects, we need years of experience and readiness to introduce constant changes and innovation.

Bartłomiej Chmielowiec, Patients' Rights Ombudsman

Appendix 1: Round Table Meeting participants

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

Name	Organisation
Advisers	
Wojciech Kuta (moderator)	Editor-in-Chief, Rynek Zdrowia
Ligia Kornowska	Managing Director, Polish Hospital Federation
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, Łukasiewicz Research Network
Szymon Korzekwa	R&D Director, BrainScan
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, Łukasiewicz - PORT
Paweł Ptaszyński	Vice-Director, Central Clinical Hospital of the Medical University in Lodz
Piotr Najbuk	Public and Government Affairs Director, AstraZeneca
Organisers and other attendees	
Mikołaj Gurdała	Innovation Manager, EIT Health InnoStars
Marta Kaczmarek	Communications and Marketing Manager, EIT Health InnoStars
Zofia Meissner	Think Tank Roundtable Warsaw Coordinator

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?'. Link to the debate:

<https://www.youtube.com/watch?v=g-JROC4zpwY>

EIT Health also officially announced a new partner – Łukasiewicz Research Network, the third biggest R&D network in the European Union. Łukasiewicz 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/>

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