Healthcare Workforce and Organisational Transformation with AI – Enacting Change

Think Tank Round Table
Meeting Proceedings

The Netherlands
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THINK TANK

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CONTENTS

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: The Netherlands Round Table

Hosted by EIT Health Belgium/Netherlands.

Moderated by: Ronald Nanninga, CEO and Co-Founder, VirtualMedSchool, Rotterdam.

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

Domain coverage Survey respondents generally agreed that the six domains identified in the report were the ones likely to have the most importance regarding meaningful change or improvement in adoption of AI into the healthcare system in The Netherlands, however it was suggested that the aspect of patient preparation and education was missing. They were asked to rank the six domains in order of priority regarding the most urgent need for change within the national infrastructure to facilitate wider utility and adoption of AI in the Netherlands (1 = highest, 6 = lowest) – see Table.

Drivers of change Participants were also asked comment on what the likely drivers of meaningful change would be and whether change should be driven at a national Member State level or at an EU level – see Table.

Feedback from survey respondents

Priority ranking	Drivers of change
1	**Strengthening data quality, governance, security and interoperability** > Drivers of change: Hospitals in The Netherlands now have better IT systems and improved data processing methods which will help overcome personal data sharing concerns – a major barrier to progress. > Member State or EU level: EU standards are needed which can be used and shared at a Member State level.
2	**Regulation and policy making** > Drivers of change: Regulation needs to follow innovation and not limit it. In terms of AI adoption in healthcare, many of the relevant laws and regulations still need to be developed. > Member State or EU level: Primarily at an EU level; member states should follow the EU regulations so there should be no requirement for national adaptation.

3	Rethinking education and skills and investment in new roles and talent > **Drivers of change: New education programmes are in place in The Netherlands, or are being developed, and this will drive change from the bottom up.** > **Member State or EU level: International exposure and harmonised best practice and standards across the EU are important for education. These then need to be tailored at a Member State level.**
4	**Clinical leadership** > Drivers of change: Physicians tend to be very conservative towards changes in clinical practice, so efforts should be made to encourage those wanting to become early adopters. The culture of data sharing needs to be accelerated. > Member State or EU level: This will depend on the set-up of individual national healthcare systems. Discussion at and EU level might drive change within organisations at a national level.
5	**Liability and managing risk** > Drivers of change: Liability and risk are important topics to address but the scope is currently unclear. > Member State or EU level: Primarily at an EU level to ensure consistency across Member States.
6	**Funding and reimbursement** > Drivers of change: New business models specific for AI adoption in healthcare need to be developed. > Member State or EU level: Local health insurance schemes are important, but project funding should be at an EU level and not be limited by local constraints.

> **Stakeholder action** Stakeholder action to drive AI adoption is currently very fragmented and in its early stages. In most cases it still relies on individual efforts by those engaged and enthusiastic about its adoption.

> **National Healthcare System readiness** AI is currently used on a small scale within healthcare in The Netherlands however data access challenges limit its wider application. Incentives and payments need to move from treating diseases to a focus on keeping people healthy – where AI can have a big impact.

> **International Best Practice examples** The use of AI in clinical imaging is becoming mainstream internationally.

> **Post-pandemic adoption impact** As a result of the COVID-19 pandemic, there has been an acceleration in data sharing, as AI technology has become critical in the drive to continue to deliver effective healthcare.

> **Key challenges** Adoption of AI introduces a paradigm shift in healthcare. The key challenges are gaining access to hospital data for AI development as well as clear reimbursement frameworks.

Discussion of outcomes

The need for a holistic approach

AI is a complex sector ad while the six domains identified in the joint EIT Health and McKinsey & Company report were presented individually, in reality they are connected and interdependent and should be considered holistically. As a result, participants felt it was quite difficult to rank the domains in order of priority. The domains that were ranked by the survey respondents as the top two (Strengthening data quality, governance, security and interoperability; Regulation and policy making) were considered to be those that have most impact on the *speed of innovation* whereas the other domains have most impact on the *speed of adoption*.

For example, AI education is an important longer-term goal, but data access/quality and regulations are probably the most important aspects in the short term for innovation creation; funding and reimbursement may drive adoption at scale and improve access for all patients. However, it was highlighted progress is needed across all domains in parallel, and should not be focused on just one area.

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?

Engaging clinical leadership – hub-and-spoke model

Clinical leadership in many hospitals is fragmented and they often lack an understanding of the concept of AI and its benefits, as well as being conservative about new ideas. Outside of academic centres it can be difficult to get internal support from all clinicians for AI applications that will benefit the hospital as a whole, rather than their own particular speciality. They tend to work as individuals, rather than as a group, so it can be difficult to progress AI innovations through to adoption. Participants agreed that it might be of value to build case examples of successful adoption of AI by focusing on centres where there is a positive perception of AI and enthusiasm for its use, rather than investing in centres that are reluctant to change – thereby creating momentum through people who are motivated to make the change. It was suggested that investment in developing a hub-and-spoke model centred on academic medical centres and spreading out through local systems to non-academic hospitals would be beneficial to help communicate the benefits of AI and drive adoption, as well as being a useful network for innovation development, validation and to determine scalability.

Translating ideas into practical solutions

It is important that the results of research efforts are translated into meaningful outcomes for patients. Currently, there is gap between research communities and the realisation of tangible ideas and innovations in hospitals so they can benefit patients. This will require sustained communication and collaboration with key stakeholders to determine how the gap between research and deployment (and scaling) of AI solutions can be bridged so that valuable end-to-end solutions can be created.

All stakeholders – medical professionals, health insurance companies, policy makers, payers, patients and citizens – need to be aware of new developments in AI technology and the benefits it can bring by supporting (but not replacing) clinicians and healthcare teams.

Ideally, all new technological innovations should be based on a user-centric design – often, innovations fail as, ultimately, they do not fulfil the role they were intended for. End users need to be involved in collaboration with innovators in the design and conceptual phase of development, in particular to help define the problem for which innovators can develop the solution. Participants agreed that a multidisciplinary approach was key and that embedding AI experts from start-ups, academia, and private research and development organisations into clinical

environments would be a more sustainable way of co-creating effective solutions. There may be a role for EIT Health in facilitating stakeholder collaboration and allowing scale-up.

It was suggested that leveraging small datasets might facilitate the small-scale demonstration of AI useable applications which might encourage wider buy-in and encourage investment for scale-up.

Validation of clinical impact

The gap between the potential of AI and its impact and value in the clinical setting also needs to be addressed. The medical imaging field was one of the first to embrace AI technology however there has sometimes been a mismatch between what is developed and what is needed, so it is important that actual clinical impact and safe implementation of AI applications can be validated.

A useful example is the Data Science Institute of the American College of Radiology which has published scenarios of use cases where AI may be able to improve imaging care in daily practice. Stakeholders are invited to collaborate to develop solutions. End users have access to data and it therefore provides a validation framework.

New business models will also be needed that can demonstrate the clinical efficacy and value of AI implementation, and this should continue to be tracked after deployment. In the field of medicines, pharmaceutical companies are struggling to demonstrate safety and efficacy in therapeutic areas where there are only small patient populations as it an expensive undertaking for a potentially small market. Similarly, AI applications often target small problems, so being able to prove efficacy and impact can be difficult.

Participants recommended that a network of multiple healthcare centres – at an EU as well as a national level – should be established that will allow data sharing for testing AI applications in a realistic clinical setting. It was suggested that federated learning, whereby an AI algorithm is tested across multiple decentralised local databases, would be a valuable approach and help overcome the reluctance of individual organisations to exchange or share data.

Cure versus care

Participants noted that hospitals should not always be the epicentre of AI innovations. While their focus is on treating and curing illness, it is also important to remember care of the healthy individual and the uses of AI in disease prevention.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

> The American College of Radiology issues challenges relating to use case scenarios where AI may be able to help in daily practice. Stakeholders can collaborate to develop solutions and validate their impact.

Best practice examples

> Radiology departments in secondary and particularly tertiary care hospitals in The Netherlands are at the forefront of implementation of AI solutions in imaging technologies.

Key Points

- Adoption of AI should be driven, at least initially, by focusing on centres where there is a positive perception of AI and enthusiasm to use it – this will provide successful use cases to encourage further adoption and investment.
- Ecosystems need to be developed that will allow effective co-creation with multiple stakeholders in AI ensuring the gap between research and adoption of effective AI solutions is bridged. Hospitals are the likely, but not exclusive, epicentres of these ecosystems.
- New business models are needed to demonstrate the clinical efficacy and value of AI implementation.
- To facilitate testing of AI applications for both efficacy and value, a network of multiple healthcare centres should be established that will allow data sharing. Alternatively, federated learning would be a valuable approach to overcome data sharing barriers.

Proposed actions and recommendations

Clinical leadership	
Action	**Target Stakeholder(s)**
In order to bridge the gap between research and deployment, provide support for stakeholders who want to collaborate to develop, validate, deploy and scale AI solutions in health and healthcare.	Technology providers; health insurance companies; hospital staff and leadership; teaching faculty
Create specific ecosystems for co-creation of AI applications within clinical environments.	EIT Health could facilitate
Develop a networks of healthcare centres (national and EU-wide) that provide access to data for validation of algorithms.	Healthcare providers (ongoing effort)

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?

Changing the educational mindset

Participants agreed that it was important to focus on future needs and the new skills required for adopting AI into the healthcare system in The Netherlands. In the case of universities, often when it is suggested that they need to change or adapt their educational curriculum to include more information about AI and data science, the response is that it is not possible due to an already full

programme of courses and lack of capacity. Within academia there is a need to change this mindset and lead by example.

As with clinical leadership, it might be beneficial to focus on academic institutions where inclusion of AI and data science educational content is already in progress or working successfully. One initial step to facilitate institutions making these changes might be to introduce data science and AI topics within existing courses first, rather than trying to develop and assimilate completely new courses.

Change in the educational mindset does not always have to come from the top down. As an example, at some centres groups of medical students are organising their own educational initiatives and approaching data science centres within their institutions to learn about AI and new innovations, as well as pushing for inclusion in medical school programmes. Within The Netherlands there are ongoing developments in medical school curricula with modules on medical informatics soon to be added.

The International Network for Health Workforce Education (INHWE) is an organisation that brings together healthcare educators and researchers from all disciplines with the aim of improving the education and training provided to health workforce professionals across the globe. INHWE has a series of Working Groups that provide opportunities for educators, practitioners, researchers and policy makers to connect and advance their focused area of practice and research. As part of the Working Group on Digital Skills and Technology in Healthcare and Education, Erasmus Medical College in Rotterdam has organised a Thematic Network on digital skills for future-proof doctors which will develop recommended learning outcomes for European medical schools. Thematic Networks fall within the framework of the EU Health Policy Platform and are intended to facilitate discussion of key health EU issues in order to provide input for EU policy making.

Multidisciplinary experts

Future development in AI in healthcare will require a range of different and new skill sets. It will be essential to bring all these specialities together to share knowledge and ideas. While there is a need to educate hospital clinicians about AI and data science, this needs to be extended to other healthcare professionals, for example general practitioners and nurses. Some centres are introducing new types of experts – technical physicians – to bridge the gap between clinical and data science/technology. Importantly, the existing – as well as the future – workforce needs to be educated. One suggestion to share expertise was 6-month internships for AI/data science specialists in hospitals across the EU.

Consultancy network

Engaging specialists as consultants was suggested as an alternative to employing them. This is already happening in some hospitals where clinical physicists, for example, may work part time across several hospitals on a consultancy basis but not employed. New roles in AI and data science may take time to be accepted by Clinical Leaders so a consultancy approach may be an initial step in getting them established.

Patient and citizen education

Round Table participants agreed that patients and citizens are important targets for education and information about AI. In particular, they need to understand how their data are being used, that the technology can be trusted, and how the doctor is using an AI application to make

treatment decisions. It was therefore important that the datasets used for training AI algorithms are representative of patients' gender and culture. If patients have a clear idea of the benefits of AI in improving diagnosis and treatment., they may in fact create a demand for adoption of AI applications.

EU standards

Most education is regulated at national level as it needs to be tailored to the local cultural context, however it is important that these regulations are aligned with global or EU standards.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

> The Erasmus Medical College Thematic Network on digital skills for future-proof doctors which aims to develop recommended learning outcomes for European medical schools.

Best practice examples

> Exchange of knowledge and people through existing networks (e.g. The Netherlands Federation of University Medical Centres)

Key Points

> Education in AI (both in terms of technical knowledge and also awareness-raising) should be targeted to all key stakeholders in health and healthcare, including public health officials, general practitioners and nurses.

> Greater AI and data science content needs to be included in medical school curricula and in educational courses for other health professionals.

> Focus initially on academic institutions where inclusion of AI and data science educational content is already in progress or working successfully to create examples of best practice.

> Patients and citizens are important targets for education as they need to understand how their data are being used and that the technology can be trusted to help inform their care.

Proposed actions and recommendations

Education and skills	
Action	**Target Stakeholder(s)**
Develop educational initiatives in AI aimed at all key stakeholders in health and health care.	Knowledge institutes to work with EIT Health

3. Regulation and policy making

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

Existing regulation

Regulation and policy was rated as the second priority domain according to the pre-meeting survey responses. It was noted that a White Paper had been published by the European Commission in February2020: 'On Artificial Intelligence - A European approach to excellence and trust'. This recognises that there is fierce global competition in the AI field and that a consolidated EU approach is needed to address the opportunities and challenges of AI and promote its development and deployment. A response to this White Paper was issued by COCIR, the European Trade Association representing the medical imaging, radiotherapy, health ICT and electromedical industries along with a Position Paper in September 2020 'Artificial Intelligence in EU Medical Device Regulation'. While they welcomed the actions identified by the Commission to create an ecosystem of excellence, they called for additional efforts to ensure access to data, technology and infrastructure through strategic investments and actions. Importantly, COCIR considered there was no need for novel regulatory frameworks for AI-based devices in healthcare, because the requirements of EU Medical Device Regulation (MDR) and EU IVDR (In-vitro Diagnostic Medical Devices Regulation) in combination with GDPR (General Data Protection Regulation) are adequate to ensure that same quality and trust. It was noted that the use of data was subject to separate regulation (GDPR) from AI tools themselves (MDR) .

Most participants agreed that locked AI applications were no different to any other digital health application and so should be subject to the requirements of the existing MDR. Therefore, this was not a barrier to AI adoption, although the situation may be different for unlocked AI. Others raised the point that AI algorithms are subject to a process of continuous learning and get better over time which makes them different to standard biomedical devices and they therefore require different regulation.

Overall, it was agreed that a more enabling regulatory environment was needed for AI applications but this was difficult when avoidance of risk was the main driver. It was understood that for low risk applications, the EU Commission was considering some form of self-certification. Clear guidelines on the regulation of all forms of AI applications were needed from the EU.

Participants also considered that it was important within regulation and policy-making to distinguish AI applications for 'care' with those for 'cure'. Although most of the discussion was centred around AI applications in hospitals to support 'cure', AI also has societal benefits in terms of 'care' (i.e. rehabilitation) and also for disease prevention. Different, and possible less strict, regulatory processes for AI implementation may apply to applications intended for care or prevention.

Standardisation of datasets and AI learning

Problems may occur with standardisation and harmonisation across healthcare organisations that use different datasets and systems for AI algorithm learning. It was suggested that one option was to use federated tools and a multi-step process demonstrating an AI application's efficacy and safety. Validation of AI applications should be the responsibility of the manufacturer who would need to provide evidence and to specify the datasets on which the validation has been done. Participants considered that validation should be linked to clinical outcomes supported by

use case examples in order to demonstrate to regulatory agencies the ability of AI tools to solve clinical problems.

For self-learning, AI needs supervision to ensure it stays within its intended use. China is currently focusing on quality of data, interoperability and standardisation of data sets. Similar standardisation will be needed across the EU. Within The Netherlands, Health-RI, a non-profit foundation supporting a public–private partnership of more than 70 organisations, is currently aiming to build an integrated health data research infrastructure accessible for researchers, citizens and care providers.

The need for data spaces for validation

Data spaces are needed across the EU to allow companies gain access to data in order for AI algorithms to be tested and validated. The 'FAIR Guiding Principles for scientific data management and stewardship' were published in 2016 (Wilkinson et al, 2016) and are intended to provide guidelines to improve the **F**indability, **A**ccessibility, **I**nteroperability and **R**euse of digital assets. Participants were in favour of a European strategy to make FAIR-databases accessible to innovators using agreed ontologies but it was suggested that those requesting access should by default be required to be GDPR compliant to ensure data protection.

The European Open Science Cloud (EOSC) sector for Life Sciences (EOSC-Life) has brought together a range of research infrastructures to create an open, digital and collaborative space for biological and medical research using FAIR data principles.

In the USA, the National Cancer Institute (NCI) has launched the NCI Cancer Research Data Commons model, a cloud-based data science infrastructure that connects data sets with analytics tools to allow users to share, integrate, analyse, and visualise cancer research data.

Use of patient and citizen data

Patients need to be aware of how their data are being used, and while regulations need to be in place to protect the public's privacy and data security, there is also a need to stimulate innovation rather than hinder it. GDPR was considered a good example of a well thought out data policy which give data ownership to the individual.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

> Health-RI, a non-profit foundation in The Netherlands, is currently aiming to build an integrated health data research infrastructure accessible for researchers, citizens and care providers.

Best practice examples

> EOSC-Life a group of 13 life science research infrastructures that enable collaboration and sharing of data.

> The NCI Cancer Research Data Commons cloud-based data science infrastructure connects datasets with analytics tools to allow sharing, integration and analysis of cancer research data.

Key Points

- There is currently no need for novel regulatory frameworks for AI-based devices in healthcare as the requirements of EU MDR in combination with GDPR are adequate.
- The use of federated tools may help demonstrate an AI application's efficacy and safety to regulatory agencies without the need for data sharing or exchange.
- Validation should be linked to clinical outcomes and illustrated by use cases in order to demonstrate to regulatory agencies the ability of AI tools to solve clinical problems.
- Data spaces based on FAIR principles and requiring GDPR compliance are needed to allow companies gain access to data in order for AI algorithms to be validated.

Proposed actions and recommendations

Regulation and policy making	
Action	**Target Stakeholder(s)**
Create data spaces based on FAIR principle that enable researchers and academic institutions to request data with the requirement that they must be GDPR compliant.	Large-scale initiatives such as Health-RI

4. Funding and reimbursement

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

The value of data collection

The central issue is that testing of AI applications requires access to data however from the clinical perspective, collecting useable data is time- and cost-intensive. It was suggested that financial incentives should be given to clinicians not only for treating patients, but also for making data reusable for research and innovation, including AI – the value in prospectively collecting data for research and investing in developing a suitable infrastructure for data management needs to be promoted.

Funding models

Experience of some of the participants with grant applications is that funding often goes to leading departments in large institutions. Access to funding for complex and specific projects in AI is challenging. More agile financial processes are needed otherwise it can take several years to get a project off the ground.

Reimbursement models

Models for reimbursement in healthcare now have a greater focus on outcome-based incentives and value-based healthcare (VBHC). However, participants highlighted that some AI applications were not replacements for existing processes or systems but additions to it, so financial models

need to take this into account, In addition, while new innovations may not necessarily generate immediate costs savings, they may provide longer-term system benefits.

Within organisations it can be difficult to get AI applications adopted and used in clinical practice, particularly if adoption means that work tasks switch between departments and funds need to be redistributed. Linked to this, in the USA innovation companies not only have to prove the clinical claims for their application but also the workforce impact. A change in working practices within an organisation often means that a new application will initially incur higher costs before they reduce, and that initial cost investment can be a barrier, particularly if there is a need to continue with the usual process while an new AI tool is being piloted. Some hospitals in The Netherlands have transformation budgets to cover such costs; primary care has similar innovation budgets.

The very traditional budgeting systems often used in hospitals where departments effectively compete against each other can be another factor that limits investment in and adoption of innovations. Often, the innovation itself is not the issue but rather the impact that using an AI application will have on the various levels of an organisation which puts up a barrier to use. In order to adopt as scale the impact on the on total finance of hospital needs to be addressed. Hospitals need to critically assess their financial structures as some are currently hindering innovation and adoption of AI applications.

Overall, participants considered that the current reimbursement policies in The Netherlands are compatible with implementation of AI, based on current use cases, however it is important that they are able to demonstrate value to payers. VBHC-like models (with long term-multi stakeholder contracts) should be considered when validating and deploying AI driven innovations.

The role of AI in value-based healthcare

Eindhoven University of Technology have developed a vision statement on the role of AI in VBHC which notes that the improvement in care quality with the aid of AI will mean that reimbursement can be based on outcomes: "*Decision support systems and robots will carry out tasks where humans do not add value (e.g. e-triage, autonomous delivery of goods, lifting heavy weights). Nurses and informal caregivers will also be aided in their decision making by suggesting actions that have proven most effective. Nurse capacity will then be available more for emotional support. Specialist care will also be augmented with AI and robotics: AI will aid in better considering patient profiles across disciplines while robotics will aid in precision surgery. Due to an increase in quality, care can ultimately be reimbursed on outcomes rather than on the resources spent.*"

Health insurance

From the patient's perspective, new AI technologies are currently not integrated into health insurance schemes or linked with VBHC agreements.

What is working well and best practices identified in this domain

Best practice examples

- In the USA, the National Institutes for Health (NIH) provide grants not only for research itself but also for compilation and curation of datasets, such as MIMIC (Medical Information Mart for Intensive Care. MIMIC is a large, single-centre database comprising information relating to patients admitted to critical care units at a large tertiary care hospital in Boston (Johnson et al, 2016). The database is accessible for a range of

applications including academic and industrial research, quality improvement initiatives, and higher education coursework.

Key Points

- The value in prospectively collecting data for research and investing in developing a suitable infrastructure needs to be promoted.
- The existing reimbursement policies in The Netherlands are currently compatible with implementation of AI.
- Hospitals need to critically assess their traditional financial structures and processes to ensure that they are not a barrier to adoption of AI innovations.
- VBHC-like reimbursement models should be considered when validating and deploying AI driven innovations.

Proposed actions and recommendations

Funding and reimbursement	
Action	**Target Stakeholder(s)**
Develop VBHC-like models (with long term-multi stakeholder contracts) for validating and deploying AI driven innovations.	Patient organisations; health care insurance; health care providers; health economists
Hospitals in The Netherlands should critically assess their financial structures and processes to confirm they do not hinder innovation and adoption of AI applications.	Hospitals

5. Strengthening data quality, governance, security and interoperability

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

Improving access to and sharing of data

Currently, getting access to good quality datasets for testing AI applications is a significant challenge. Even within an individual hospital it is often difficult to combine or share data. Participants considered that data access was a fundamental requirement and a key priority for AI adoption which will require considerable investment in order to progress.

The COVID-19 pandemic has resulted in an acceleration in data sharing due to the urgency for research.

- Within The Netherlands, Health-RI and the GO FAIR Foundation have been commissioned to develop a national observational COVID-19 data portal that will help researchers to find and reuse COVID-19 related observational data from Dutch health care providers. This has included a governance policy for data sharing: researchers can gain access to FAIR

research data while adhering to legal conditions and the privacy of patient's data. The initiative has not yet been implemented but is an example of what can be achieved when there is an urgent need.

- In the Intensive Care (IC) sector, CovidPredict is a central national patient database. In collaboration with the Dutch Association for Intensive Care and the National Intensive Care Evaluation Foundation, doctors and researchers from Amsterdam UMC and Maastricht UMC established a consortium to centralise the collection of data on COVID-19 patients. It took a considerable time to get all the data from the participating centres standardised.

Data storage

It was recommended that federated ecosystems should be used to store data, rather than moving them from their original data spaces. It was critical to ensure the full confidence of citizens in data storage and management policies, and to make sure that citizens retained full ownership of their own data. It was suggested that verification of system security could be undertaken by working with white hat hackers.

Standardisation of datasets

Common standards are important in terms of how you collect and pool health data. Importantly, the data needs to be uniformly processed in order to be aggregated and this will require standardisation of data exchange methods and ontologies. Good data management is essential from the start as it is not possible to know what questions will be asked in the future. Data management standards are needed at an EU level and investment is needed in programmes to standardise clinical data and make it re-usable for AI application testing and validation.

It was queried whether public funding could be used to support the structuring and cleaning of existing datasets. Even for large companies the costs to undertake this would be considerable so it was unlikely that a single entity would achieve this. It was suggested that it might be sustainable if public funds were used initially to set-up and run the project with companies then paying for access and use of the data.

A national initiative ongoing in The Netherlands for sharing data is 'Registration at the Source' (Registratie aan de bron) which aims to improve healthcare provision by clear and standardised recording of citizens' care information and facilitating its reuse. It was started in 2014 as an initiative of the University Medical Centres and Nictiz, the national competence centre for electronic exchange of health and care information.

What is working well and best practices identified in this domain

Existing successful projects and positive experiences

- 'Registration at the Source' (Registratie aan de bron) the national initiative which aims to improve healthcare provision by clear and standardised recording of citizens' care information and facilitating its reuse.
- The national observational COVID-19 data portal being developed by Health-RI and the GO FAIR Foundation which has a governance policy for data sharing.

- The CovidPredict central national patient database developed in collaboration with the Dutch Association for Intensive Care and the National Intensive Care Evaluation Foundation.

Best practice examples

- The GO FAIR Foundation was established in February 2018 as a separate legal entity under Dutch law in order to support the FAIR principles and metrics: **F**indability, **A**ccessibility, **I**nteroperability and **R**euse of data.

Key Points

- Data access is a fundamental requirement for development and implementation of AI applications but is an ongoing challenge.
- Urgency around the COVID-19 pandemic has accelerated data sharing and generated some good examples of successful data sharing platforms and governance policies.
- Investment is needed in programmes to standardise clinical data and make it suitable for AI use; it might require public funding to undertake this, then organisations could be charged for access.

Proposed actions and recommendations

Strengthening data quality, governance, security and interoperability	
Action	**Target Stakeholder(s)**
Develop further national data platforms with robust governance policies for data sharing.	Tech providers; health insurance companies; healthcare providers; patient organisations

Note: The domain 'Liability and managing risk' was not discussed at the meeting due to time constraints

Session V: Driving acceptance and utility of AI in healthcare

Discussions at the Round Table meeting confirmed that of the six domains identified in the joint EIT Health and McKinsey & Company report, the most crucial to driving greater acceptance and utility of AI in The Netherlands is 'strengthening data quality, governance, security and interoperability'. Funding and reimbursement was considered as having the lowest priority. However, participants agreed that it is difficult to rank the domains in a hierarchy as they are all interconnected and interdependent.

Various opportunities exist to develop agreements on data standards at pan-European level: (1) calls for data, (2) data collection, (3) data structure and maintenance, (4) data storage, (5) data governance, (6) access to data, (7) data security and (8) acceptable business models for financial sustainability of data repositories.

AI in healthcare is currently established in The Netherlands on a small scale but the ongoing data access challenges need to be overcome in order to facilitate its wider application. Initiatives are underway to facilitate access to and sharing of data, for example Health-RI which is building an integrated health data research infrastructure accessible for researchers, citizens and care providers. However, efforts need to develop infrastructures at an EU level to facilitate wider development and testing of AI applications. EU-wide sandboxes are also needed to allow testing and to stimulate deployment of AI powered innovations.

Although there is funding available for development of AI solutions in the Netherlands and more widely, participants highlighted the need for financial investment in developing the infrastructure for data collection, standardisation, and ongoing management – this is currently underfunded across the EU.

Changes in the approach to data management are needed in order to complete on the global stage. In the USA, for example, in all large grant awards for project that generate large datasets, the NIH now includes a 'data stewardship' position. Upload of this data to an NIH database is mandated and this is then maintained by a separately funded contractor even when the original grant comes to an end.

The COVID-19 pandemic has highlighted the importance of collaboration and data sharing in order to undertake research and provide appropriate patient care, and as part of this AI has become an important tool in healthcare delivery. Thinking beyond the COVID-19 era, continued efforts are needed to encourage data donation by citizens for research, including testing of AI applications, maybe considering an opt-out strategy along the lines of organ donation.

Importantly, the voice of the citizen should not be overlooked. Citizens are key stakeholders in the transition process towards implementation of new AI methodologies in healthcare.

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	
Ronald Nanninga (Moderator)	CEO of VirtualMedSchool
Marc van Buchem	Leiden University Medical Centre
Wiro Niessen	Erasmus University Medical Centre and Quantib BV
Peter van Ooijen	UMC Groningen
Arianne van Lavieren	Zilveren Kruis Achmea
Sybo Dijkstra	Philips Healthcare
Hans-Aloys Wischmann	Philips Healthcare
Shai Shen-Orr	Technion and Cytoreason
Susanne Baars	Social Genomics Foundation
Tom Dutilh	Compleye BV
Pieter van Gorp	TU Eindhoven
Judith van de Meerakker	Patients Association, Congenital Heart Disease
Organisers and other attendees	
Jan-Philipp Beck	CEO of EIT Health eV
Sari Makkonen	Communications Manager, EIT Health BeNe
Menno Kok	CLC Manager, EIT Health BeNe
Sameena Conning	Director of External Affairs, EIT Health e.V.
Mayra Marin	Think Tank Manager, EIT Health e.V.