FELLOWSHIP
IN CLINICAL AI
2022/23

Running order of the day:

Arrival & Registration		15:00 – 15:30
Roadmap of Programme	Haris Shuaib	15:30 – 15:45
NHS England address	James Freed	15:45 – 16:00
Cohort 1 Fellows Panel	Alexander Deng	16:00 – 16:30
Posters showcase		16:30 –18:00

Overview of Cohort 1

In this ground-breaking programme our fellows are embedded in a clinical artificial intelligence team of an NHS Trust - developing, deploying, and evaluating state-of-the-art software in live clinical workflows. The programme itself is integrated into their clinical training pathway so as not to interrupt specialty training progression.

Prior to the creation of the Fellowships in Clinical Artificial Intelligence we recognised a lack of educational opportunities for clinicians to equip themselves with the skills to adopt clinical AI. In response, we established a programme where our fellows could really engage in learning their craft from an expert in the field. We are immensely thankful to all our hands-on AI supervisors, who provide the fellows with close mentorship throughout the programme year.

Congratulations to our first cohort of clinical AI fellows for completing the programme! We are very proud to have our fellows showcase their innovative work from across a broad range of both clinical subjects and AI modalities. We cannot wait to see how the fellows will apply the knowledge and skills gained from this programme, and we look forward to continuing to support their career as alumni.

"The launch of the Fellowships in Clinical AI is an unprecedented step towards integrating experiential learning into postgraduate training pathways, and we hope to learn from, and scale opportunities like this to other regions and healthcare professional groups, to help prepare the future clinical AI specialist workforce.

Dr Hatim Abdulhussein,
Clinical Lead at HEE Digital, AI and Robotic Technologies in Education Programme (DART-Ed)

Looking back on our first year

The Roadmap for the Fellowships

Artificial intelligence (AI) in the clinical setting has huge potential to alleviate current and future challenges facing the healthcare sector. For the NHS to be able to deploy AI at scale, front-line staff and future clinical leaders must be supported to develop their experience and expertise in the safe and effective use of clinical AI. Investing in the workforce by providing development opportunities will ensure an accelerated and smooth transition to a clinical AI supported health system. The Fellowships in Clinical Artificial Intelligence successfully expanded from two training regions in Cohort 1 to five training regions in the upcoming Cohort 2 and grew to include dental specialty trainees, in addition to medical specialty trainees. In the coming years we hope to continue this expansion both geographically and professionally; training a multidisciplinary workforce which is skilled both in using AI in clinical workflows, and in identifying areas that may benefit from this technology. Our fellows will act as ambassadors for clinical AI, instilling confidence in the technology amongst their peers and patients.

We are passionate about providing our fellows with opportunities and are invested in their career progression post-graduation. We hope to build and sustain a network of clinicians who are dedicated to the integration of clinical artificial intelligence into day-to-day practice.

I'm so proud of what you're doing. I look forward to following your career paths because you're going to light it up. You're going to be the change agents for medicine, and we sure need it.

Professor Eric Topol,
Founder and Director of the Scripps Research Translational Institute, Leader of the Topol Review

Many Thanks:

We would like to give special thanks to our friends, funders and colleagues who have played an invaluable role in establishing the Fellowships in Clinical AI programme - your support and contribution have been instrumental in shaping its future.
To our friends, thank you for your ongoing encouragement and support, and for helping to create a supportive network that extends well beyond the threshold of the fellowships program.

To our funders at NHS England, your investment has allowed us to create this groundbreaking training programme, delivering on the promise to upskill the workforce and achieve a digitally enhanced NHS. The funding supplied has allowed us to provide outstanding mentorship and educational opportunities that have truly transformed the learning experience provided through these fellowships.

To our colleagues, we are grateful for your expertise, mentorship, and dedication to our growth. Your guidance has helped and will continue to help us train pioneers and leaders in the clinical artificial intelligence space.

We are thrilled to congratulate the first cohort of Clinical AI fellows on their graduation – and sincerely thank all those who have made this possible.

Fellowship Faculty

Haris Shuaib
Fellowship Director

Dr Alexander T Deng
Fellowship Programme Lead

Lucy O'Neill
AI Centre Programme Manager

Beatrix Fletcher
Fellowship Programme Manager

Meet the class of 2023

- **Sarah Blake**
Artificial intelligence in chest X-ray interpretation
- **Salah Hammouche**
Deep learning cardiac motion analysis for automated outcome prediction in stable coronary artery disease: a prospective multi-cohort study
- **Adam Julius**
High-dimensional modelling of the focally injured human brain.
- **Mustafa Khanbhai**
Developing an AI based clinical decision support system for streamlining breast cancer multidisciplinary meetings through evidence integration
- **James Lai**
Novel predictive algorithm development for high-cost early mental health care

- **Akish Luintel**
Targeting penicillin allergy delabelling services using structured and unstructured data
- **Adam Mayers**
Automated extraction of dementia related volumetric assessments from radiology reports
- **Robert Miller**
Development & deployment of artificial intelligence radiology platforms
- **Jack Ross**
Radiomic evaluation of non-small cell lung cancer
- **Amit Samani**
Technical evaluation of an AI solution for prostate cancer detection
- **Kavitha Vimalesvaran**
Assess the clinical effectiveness in prioritising CT heads using AI

Sarah Blake

Bio: Dr Sarah Blake is a cardiology registrar at St Thomas' Hospital, specialising in congenital heart disease and cardiac imaging. She completed her medical training in Bristol in 2012 and obtained a PhD from the University of Liverpool in 2020. She is the Women in Cardiology Representative for the BJCA and is one of the first cohort of Clinical AI fellows, where she is deploying AI software to aid the interpretation of medical imaging.

Project: Artificial intelligence in chest X-ray interpretation

The goal of the project was to validate, deploy and monitor a deep learning algorithm deaof the CXR as well as categorise it into normal vs abnormal.

During the fellowship I gained knowledge about how to select, validate and evaluate AI algorithms for use in healthcare. I learned how to integrate a new software into existing trust IT. I developed a better understanding of trust infrastructure and how to implement change in the NHS. I learned how to work with a commercial partner.

Fellow's Reflection: The Fellowship has given me confidence to use and evaluate AI software used in healthcare. This is likely to be useful as a consultant where I will have more responsibility and be better able to improve systems in a hospital trust.

Salah Hammouche

Bio: Dr Hammouche is a triple qualified orthopaedic surgeon (FEBOT, SICOT Dip. Ortho, MRCS, Cert. BMS), and biomedical engineer. With dual orthopaedic board certifications and training on a prestigious T&O residency at the London Postgraduate School of Surgery, he has received training at world-renowned orthopaedic centres.

Project: Deep learning cardiac motion analysis for automated outcome prediction in stable coronary artery disease: a prospective multicohort study

This study aimed to develop an artificial intelligence approach for predicting clinical outcomes in patients with coronary artery disease (CAD) using three-dimensional motion tracking of the heart. This observational study involved patients from a CAD registry in London and performed external validation in patients from UK Biobank.
The results showed that the developed AI approach, called 4DSurvival, outperformed conventional models in predicting cardiovascular mortality, arrhythmia, and heart failure events. The approach utilized deep learning cardiac motion analysis, providing accurate risk stratification and clinical decision-making with reduced complexity and time in medical imaging.

Fellow's Reflection: As a Fellow in Clinical AI, I focused on large dataset analysis, coding, and AI System Deployment. **With this experience, I am dedicated to becoming a world-leading orthopaedic surgeon, leveraging AI and biomedical innovation to optimize patient outcomes and contribute to global healthcare advancements.**

NHS
Imperial College Healthcare
NHS Trust

NHS
Barts Health
NHS Trust

Adam Julius

Bio: Dr Adam Julius is an Anaesthetic Registrar with a strong foundation in clinical care, technical expertise, and leadership. He has implemented tablet-based learning for medical students, tackled VR-assisted regional anaesthesia projects and delivered digital professional development during COVID-19. During the Fellowship in Clinical AI, he has embraced the opportunity to make a meaningful impact on the future of digitised patient care.

Project: High-dimensional modelling of the focally injured human brain

Adam has been working on various projects in Professor Nachev's group, honing his AI and ML skills. His primary contribution this year has been to NeuroNLP, an AI system that classifies and labels neuroradiology reports. This generates operational data and provides ground truth data for advanced image classification and generation algorithms.

He has been involved in testing, training, and debugging NeuroNLP, creating 2D and 3D embeddings of training data, and co-authoring a paper set for submission soon. He's also been studying large language models and their potential applications in healthcare.

Fellow's Reflection: My goal is to apply the knowledge and skills I've gained to develop data-driven ML-based solutions to clinical and operational problems. My next step is a one-year research fellowship in liver transplant anaesthesia, where I will apply ML techniques to clinical risk estimation and devise innovative preoperative assessment approaches that enhance safety and efficiency through ML and automation.

NHS
University College London Hospitals
NHS Foundation Trust

NHS
Royal Free London
NHS Foundation Trust

Mustafa Khanbhai

Bio: Dr Mustafa Khanbhai is currently an Onco-plastic Breast Surgery ST8 at Barts Health. As a Fellow in Clinical AI, he has been involved in developing clinical decision support systems to effectively triage breast cancer cases using various machine learning approaches. He completed a PhD at the Centre for Health Policy within the Institute of Global Health Innovation, Imperial College London, and is proud to be able to leverage his clinical, academic and policy experience by taking innovative approaches to transform healthcare.

Project: Developing an AI based clinical decision support system for streamlining breast cancer multidisciplinary meetings through evidence integration

The project's goals were to develop a process map for breast cancer care pathway at GSTT; integrate breast cancer MDT data into Deontics with local and national guidelines; carry out manual validation of outputs compared to historic MDT and develop decision trees; and apply machine learners to determine variables for triage.

Mustafa and the team achieved most of the goals as described above, with the added opportunity to network with key stakeholders and appreciate the power of integrating informatics and AI in everyday healthcare delivery through regular AI Centre driven cohort sessions.

Fellows reflection: I strongly believe that being part of the fellowship has elevated my experience and profile within the healthcare informatics ecosystem and provided me with the opportunity for further global work in clinical AI.

James Lai

Bio: James is an emergency physician and part of the first cohort of Clinical AI Fellows. He has an interest in leveraging data to aid clinical decision making and risk stratification in emergency care. .

Project: Novel predictive algorithm development for high-cost early mental health care

The goal of the project was to develop a predictive model for high intensity users in mental health care, based on the first three months of data extracted from an anonymised data pipeline.

Dr Lai developed an algorithm to predict high-intensity users of mental health care using data held in electronic health records (EHR) at the South London and Maudsley NHS Trust. The aim was to develop a working model to classify patients as predicted 'high-intensity users at 12 months' after initial assessment.

The project supervisor was Professor Stewart from the department of psychological medicine at Kings College London. Dr Lai also worked with the team from the Centre for Translational Informatics to extract anonymised data from the Clinical Record Interactive Search (CRIS) system within the NIHR Maudsley Biomedical Research Centre.

Fellows reflection: This fellowship has given me the breadth of knowledge to become a member of the Royal College of Emergency Medicine Best Practice Committee, where I hope to develop guidance on the adoption of AI and digital technologies in emergency care.

I will also be starting a PhD with the Major Trauma Service at Imperial College London and St Mary's Hospital.

Akish Luintel

Bio: Dr Akish Luintel is an infectious diseases registrar and PhD student at the Institute of Global Health Innovation. He has been interested in digital health since helping launch EPIC at UCLH in 2018/2019. This led to a national role where he served as clinical lead for Risk Stratification, COVID Oximetry@home, and Shielding at NHS Digital. Currently, he is working with Professor James Teo at King's College Hospital on using Cogstack and NLP in infectious diseases.

Project: Targeting penicillin allergy delabelling services using structured and unstructured data

6% of the UK population has a label of penicillin allergy, but fewer than 5% of patients with documented penicillin allergy have positive allergy tests. This impacts on antimicrobial resistance, length of stay, and costs. Akish believes that electronic health record systems and AI could improve this problem.

The project goals were to: engage stakeholders to create a penicillin delabelling service; identify inpatients with penicillin allergy; and use AI to help risk stratify patients into low or high risk of severe reaction, to target them for delabelling.

The project team engaged with the immunology/allergy, pharmacy, and microbiology teams to create an inpatient penicillin delabelling service and were successful in getting buy-in for the project.

Fellows reflection: Being part of the fellowship has allowed me to develop my understanding of the AI landscape, the upcoming challenges as clinicians and the regulatory challenges on the horizon.

Adam Mayers

Bio: Dr Adam Mayers is a Radiology Registrar at Guy's and St Thomas' Hospitals (2018 - present), with subspecialty interest in oncological imaging and previous experience in computer science.

NHS
South London and Maudsley
NHS Foundation Trust

NHS
Guy's and St Thomas'
NHS Foundation Trust

Project: Automated extraction of dementia related volumetric assessments from radiology reports

The aim for the project was to develop a natural language processing algorithm that could perform automated extraction of mentions of neurodegeneration-relevant volumetric assessments from plain text brain MRI reports, in a large cohort of patients referred for imaging from memory clinic in the South London and Maudsley NHS Foundation Trust.

Adam developed a machine learning algorithm to perform the above task. He also gained further skills around developing/maintaining datasets and experimental design and hyperparameter tuning.
The project was published as a poster at the Dementia Platforms UK Translation 2023 Conference and is currently in the process of being written up for publication.

Fellows reflection: During the fellowship I gained generalised AI skills and increased my experience in more widely applicable data science software development skills.

Robert Miller

Bio: Dr Rob Miller graduated from Bristol University with a medical and neuroscience degree. He completed his foundation training in Thames Valley and subsequently moved to London for surgical training. His dedication to this work will persist as a Topol fellow, allowing him to further advance the application of machine learning in hand surgery.

Project: Development & deployment of artificial intelligence radiology platforms

The project goals were to understand the theory, development, implementation, and evaluation of autonomous imaging AI in clinical radiology. This focused on the use of machine learning techniques through an active learning platform to train an intra-cranial haemorrhage segmentation model.

During the fellowship Rob contributed to the development of an intra-cranial haemorrhage segmentation model using the MONAI label platform. In doing so, a model was created to facilitate increased rate of intra-cranial haemorrhage CT head images, which can be used to enhance training of an intra-cranial haemorrhage phenotyping model. Performance of the segmentation model was evaluated against a novice clinician regarding accuracy and speed of segmentations and usability of the MONAI label system.

Fellows Reflection: With a subspecialist interest in hand surgery, I have been actively contributing to developing machine learning models in this field during my fellowship.
This fellowship allowed me to compile a successful application to the Topol digital transformation fellowship to develop a hand x-ray segmentation model and continue work on autonomous hand function analysis, which is aligned to my clinical sub-specialist area of interest.

NHS
King's College Hospital
NHS Foundation Trust

NHS
Chelsea and Westminster
Hospital
NHS Foundation Trust

Jack Ross

Bio: Dr Jack Ross is a registrar in clinical pharmacology with a keen interest in digital health and medicines safety. He had the opportunity to lead the AoMRC report into AI in healthcare. Jack firmly believes that AI has the potential to bring about significant benefits to patient care. However, he also recognizes the importance of ensuring its safety and effectiveness, as with any medical intervention.
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Project: Radiomic evaluation of non-small cell lung cancer

The main aim of the project is to train and test radiomic and machine learning models for analyzing CT-PET scans of patients with non-small cell lung cancer. The goal is to achieve more accurate risk stratification for these patients.

Throughout the year, the project has evolved, relying on the roll-out of FLIP and AIDE platforms. A more autonomous pipeline has been developed, starting from the automated segmentation of lung cancers to detailed radiomic analysis and summary statistics.

The team is analyzing local data and comparing the results to manual segmentations as well as published data from other sites. The ultimate objective is to replicate the findings on a federated platform in a multi-site trial once the platforms are fully operational.

Fellows Reflection: A brilliant part of this year has been the focus on self-development, working with the other Fellows in Clinical AI, improving my programming skills, and the lectures and seminars with experts from industry and regulators. **I want to use AI to improve patient outcomes throughout my career, and to build on this fellowship with the network of clinical AI fellow alumni.**

Amit Samani

Bio: Dr Amit Samani is nearing completion of training in medical oncology and aims to combine a clinical career with a role that recognizes the potential for data, AI, and/or technology to improve patient outcomes by generating new treatments and optimizing healthcare systems. He is currently working on several projects that involve real-world data and AI, and he is committed to continuously learning and broadening his horizons in his consultant career.

Project: Technical evaluation of an AI solution for prostate cancer detection

The goal of the project was to evaluate the real-world performance of a Siemens AI product designed to detect prostate cancer on bi- parametric MRI scans.

Through the project Amit had the opportunity to learn the fundamentals of study planning, design, execution and statistical analysis relevant to technical evaluation of a specific type of AI product.

Fellows Reflection: The fellowship has given me a broad understanding of the various facets of clinical AI including regulation, governance, clinical safety and challenges for clinical implementation. Beyond this, I have expanded my network, met some wonderful fellows and am seeking opportunities to take this forward.

Kavitha Vimalesvaran

Bio: Dr Kavitha Vimalesvaran is a Cardiology Registrar specialising in cardiac imaging and pursuing a PhD at Imperial College London. Her research focuses on developing AI-assisted clinical decision support systems to improve the efficiency of cardiac MRI. She works at the interface between data science and clinical medicine in the UKRI's first cohort of AI in Healthcare Doctoral Training Programme.

Guy's and St Thomas'
NHS Foundation Trust

Imperial College Healthcare
NHS Trust

Project: **Assess the clinical effectiveness in prioritising CT heads using AI (ACCEPT-AI)**

The primary goal of this national, multi-centre randomised clinical trial is to evaluate the impact of qER (an AI-based software for non-contrast head CTs) on the report turnaround time of abnormal scans in patients presenting to the emergency department.

Kavitha and her team recruited four sites across the UK, developed a detailed study protocol, determined the sample size, and established a robust data management plan. They are in the process of obtaining approvals and ethical clearances, as well as planning a health economic analysis.

Fellows Reflection: The fellowship provided me with the opportunity to lead a multi-centre randomized controlled trial, enhance my knowledge in clinical AI implementation under the guidance of world experts, and develop a versatile professional skill set to tackle complex healthcare challenges. This has improved my ability to contribute to the future of healthcare delivery using the skills acquired during this fellowship.

I gained valuable insight into the technical challenges in implementing AI in healthcare and managing expectations from different stakeholders.

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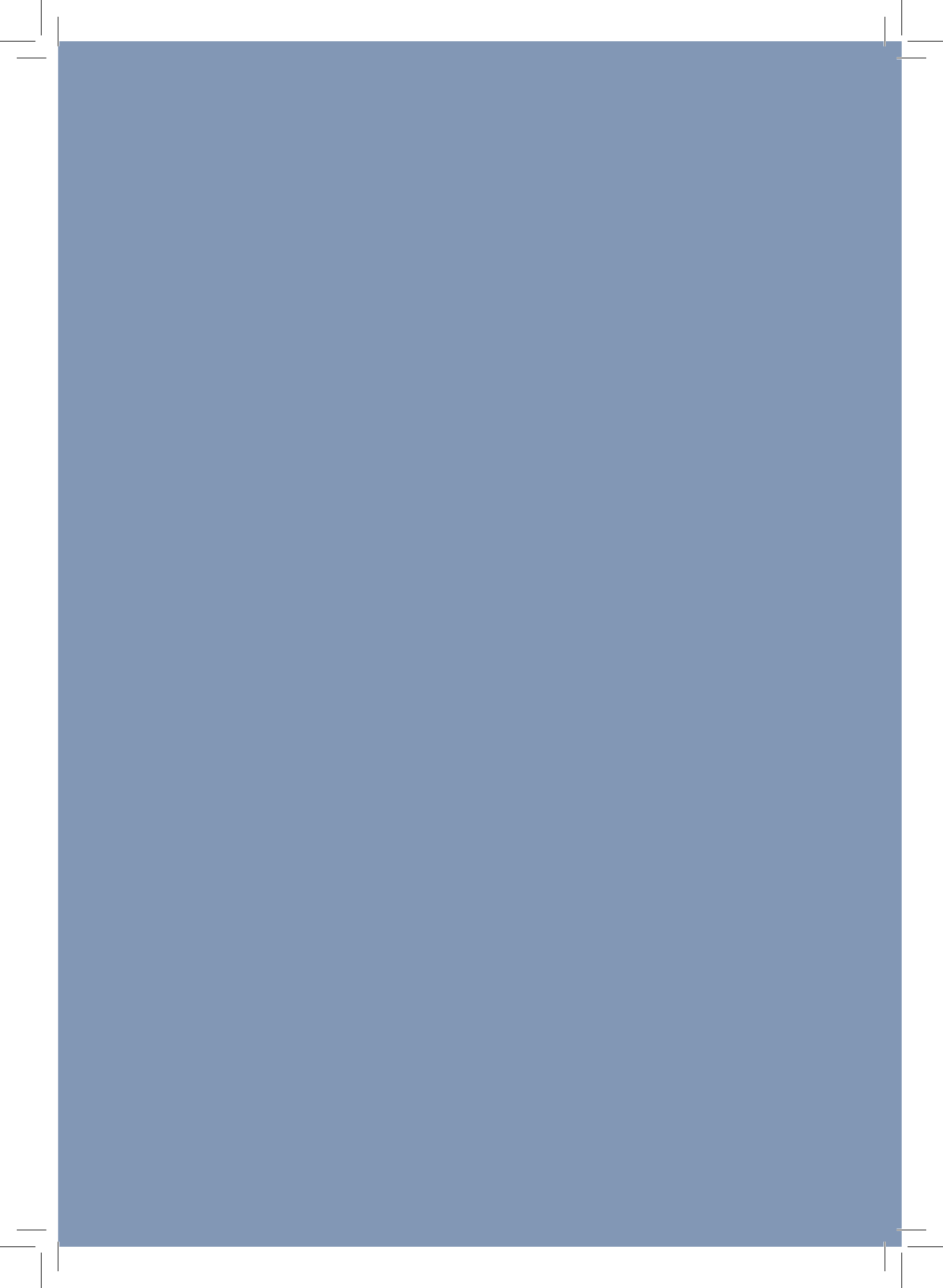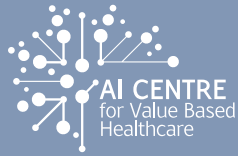
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