MINUTES

Chair:
Sir David Amess, MP

Co-Chair:
The Rt Hon. the Lord Warner

Vice Chairs:
The Rt Hon. the Lord Philip Hunt
Lord Narendra Patel
Chi Onwurah, MP

Treasurer:
Lord George Willis

Secretariat
PHG Foundation
2 Worts Causeway
Cambridge
CB1 8RN

All-Party Parliamentary Group on Personalised Medicine Annual General Meeting
How can Artificial Intelligence (AI) improve care for NHS cancer patients?

Venue and time

Location: Room N, Portcullis House
Date: Wednesday 17 October 2018
Time: 15:00 to 16:00

Attendees

Sir David Amess, MP
Helen Whately, MP
Alex Chalk, MP
Alex Cunningham, MP
Rachel Maclean, MP

MINUTES OF AGM

Helen Whately welcomed everyone to the meeting and thanked them for their attendance. She also explained that she would be stepping down as Chair due to the pressure of other commitments, but that Sir David Amess, MP would become the new Chair.

Sir David Amess thanked Helen and said he was pleased to take over as Chair; having been an MP for 35 years he noted that he had served on the Health Select Committee for 10 years, and has long standing interests in health including personalised medicine.

Election of officers and signature of income & expenditure statement

The APPG on Personalised Medicine elected Sir David Amess to serve as Chair. Other current Officers were confirmed as remaining in their roles as follows:

- **Co-chair:** The Rt. Hon the Lord Warner
- **Vice-chairs:** The Rt Hon. the Lord Philip Hunt, Chi Onwurah MP, Lord Patel
- **Treasurer:** Lord Willis

It was also confirmed that The PHG Foundation would continue as Group Secretariat.

ROUNDTABLE DISCUSSION ON AI AND CANCER

Guest speakers

Dr Alan Karthikesalingam - *Translational research lead, DeepMind Health*
Professor Carlos Caldas - *Professor of Cancer Medicine, University of Cambridge*

Carlos Caldas began by explaining that when people think about AI and machine learning, they are largely concerning with 'big data'. The question is how to use big data, AI and machine learning to improve cancer care in the era of personalised medicine. Two requisites are needed in this space, he suggested: one is to have open source, interoperable data repositories where the data can be held in an ethically sound, pseudo-anonymised state. The second is the development of new algorithms to examine these data. Of particular interest for cancer were images from pathology slides or images from radiology; transforming these

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images into digital format and linking them with other data such as genomics is really where the power of machine learning is, he suggested.

When asked how we bring this technology into NHS, and how this compares with other countries, Prof Caldas noted that the NHS was unique among health systems in following people 'from cradle to grave', giving it unparalleled opportunities to use machine learning and AI to interrogate health data. Others queried how much further the NHS has yet to go in collecting these data at the point of healthcare delivery.

Indra Joshi pointed to two programmes of work being led by NHS Digital. One is the Local Health and Care Record, which stretches across care, not just NHS, but social and community care also. There is also the E-Red Book initiative that will connect sets of data for children (including vaccines) and will effectively follow them to create a digital health journey for each child from the very beginning of life. The Digital Innovation Hubs, though noted to be still in development, were said to be expected to create and provide access to data sets.

Sir David Amess asked if there was anything Parliament could do to aid AI technology being brought into the NHS.

Suggestions included that it might help address barriers, for example unlocking effective interoperability in NHS systems to support effective data sharing and information flow. The NHS was also recognised as a trusted data holder, and it was suggested that aid in building and expanding public trust and generosity in participating in research would be vital.

Alan Karthikesalingam spoke next, explaining that the UK is brilliantly positioned to be a global leader in AI, and the NHS was one element in this pre-eminence. He noted that clinical benefit from AI was most promising in imaging and in applications relating to the use of Electronic Health Records, and of genomic data.

Dr Karthikesalingam outlined how DeepMind are working with Imperial College, Cancer Research UK and a Cancer Research UK (CRUK) funded group on anonymised breast cancer screening images. Currently, such images are reviewed by two human experts to spot potential cancers; in some other counties, only one expert looks at the images, with significantly worse outcomes. However, NHS provision of two experts is a real workforce challenge; the aim is to develop AI systems that can teach themselves to detect cancer with sufficient discrimination to play a valuable role in the screening process. Collaborative development between health professionals and experts from other sectors was noted to be of particular value, for example in training AI systems through supervised learning, a meticulous process that uses human experts to identify and mark cancer on images.

Turning to data considerations, Dr Karthikesalingam noted that much of the data routinely collected within the NHS is not ready for AI; curation of the data to make it suitable is an expensive and time-consuming exercise. With respect to data ownership, he noted that ownership of the original CRUK database of 8,000 cancer images used in the DeepMind collaboration remains with CRUK, despite DeepMind having funded the additional labelling processes; others wishing to use these images can apply to CRUK in the normal way for non-exclusive access. This was said to be very important because it will allow comparison of new AI algorithms by their relative performance on the same scans. The importance of ethnic, demographic, racial and gender differences were raised in the curation of data for AI. Breast density was said to differ around the world and in different ethnic

![Personalised Medicine All-Party Parliamentary Group]

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groups, and it was important that AI systems should be trained to be effective in different ethnic or age groups.

Dr Karthikesalingam also discussed other DeepMind AI health projects such as precision radiotherapy planning, which could save expert clinicians lots of time, and on developing stem cell therapies for eye diseases. He noted that data needed to be curated in ways that puts the control solidly in the hands of the NHS and academic clinicians, who are ultimately treating patients.

The essential importance of NHS digital maturity ads a prerequisite for using AI effectively was discussed, and said to rest on effective digitisation of hospitals and GP surgeries using interoperable systems so that information about patients can be shared appropriately across the system – not only to improve immediate care, but also to support AI. From a global perspective, it was suggested to be helpful to look at the 2009 US *Health Information Technology for Economic and Clinical Health* (HITECH) act, which was said to have resulted in considerable acceleration of hospitals' digital maturity – and concomitant benefits in terms of AI applications.

Alex Chalk asked asked if it should be a condition of procurement for hospital software systems to consider interoperability with software in other hospitals and NHS trusts in the country? He also asked what exactly needed to happen to enriched data sources after they have been created, and whether it was something Parliament need to be involved in. Dr Karthikesalingam explained that he couldn't advise specifically on the procurement of NHs data systems, but emphasised that did feel that interoperability was absolutely crucial.

It was suggested that of government investment in AI for health needed to recognise that data volumes matter, but that quality of data enrichment and curation is also important; and that steps should be taken to ensure the curated data sits wholly within the NHS. Control of the databases used in the DeepMind collaborations with CRUK and Moorfields remained with them rather than DeepMind, and this was suggested to be the right approach to creating innovation ecosystems, because others will be able to access the data.

Rose Gray gave a CRUK perspective on what Government can do to help AI benefit NHS cancer patients, explaining that whilst AI cannot replace NHS staff, it can give them the gift of time by taking on less complicated, more repetitive tasks and freeing the health professionals up to undertake specialised tasks. This could reduce current pressures on the NHS workforce. On the other hand, for AI to flourish within the NHS, staff needed 'headspace' to innovate effectively; for this reason, CRUK was said to consider it essential to reduce workforce pressures and train more staff in the short term, so that they are able to utilise digital advancements and ultimately AI to best effect.

She said that NHS patients in technology hot spots and areas with active research benefited, but that it was vital once this type of technology is established to ensure it was rolled out across the country so that everyone can benefit. She further observed that Public Health England, NHS England and NHS Digital need to be properly resourced to keep pace with growing demand as healthcare moves towards using AI in routine settings.

Alex Chalk, MP said that he understood the importance of effective data curation and of interoperable NHS digital systems, but further asked what one single thing roundtable attendees would like to see?

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Carlos Caldas asked that Government should help the NHS to create a single data repository that can be used, under stringent constraints, for research and innovation.

Lester Russell added that doing so would add value to the NHS and that commercialisation could also be used to help fund further innovation.

Clare Delmore explained that help could also be given on the demand side in preparing hospitals, health professionals and patients to accept AI, and to ensure cancer patients across the country could benefit – in Peterborough as well as London, for example.

Alan Karthikesalingam said that his key point would be need digital maturity in the NHS with interoperable systems.

Antoni Criminisi expressed the view that patients could benefit in the longer term from AI by reduced waiting times and more effective treatments at lower cost. He cautioned that in order to get to this point, patients need to be on board with AI development and application – and crucially, with consent for data use. Unfortunately, he noted, the term AI is not very constructive for public discourse as it often gets associated with images such as *Terminator* style robots who want to take over the world! He called for an educational campaign that, instead of bombarding people with AI scare stories, should feature machine learning and algorithms and their uses. This, he suggested, would be more likely to encourage participation in research and ultimately, better patient outcomes.

Sir David Amess queried why UK cancer outcomes were not as good as other countries, if the NHS cancer screening processes were superior, as earlier outlined (using two rather than one expert to check images for cancer)?

Rose Gray explained that UK has worse stage specific survival across many cancer types in comparison with countries with comparable health systems, and it was thought to be primarily the result of later stage cancer diagnoses within the NHS .

Maria Cerrone added that the UK has centres of excellence where if you are a patient you receive amazingly good treatment, but that there are many other hospitals with considerably less resources where patients don't get the same quality of treatment. She explained that the 'postcode lottery' of inequitable care is not as evident in London, because there are so many good centres, but hospitals outside of the big cities and centres of research like Oxford, Cambridge, Manchester, simply cannot offer the same excellence of care. She concluded that the healthcare inequalities are another important reason why UK cancer outcomes are so much poorer than in other countries.

Indra Joshi concluded that NHS Digital have taken on board the necessity for digital maturity and interoperability for data systems, and were working hard to address the issue - but warned roundtable attendees that implementation of solutions will take some time.

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