Cancer Research UK workshop on AI and the diagnostic workforce, 4th June 2018

Meeting note

Cancer Research UK is the world’s largest independent cancer charity dedicated to saving lives through research. We support research into all aspects of cancer and this is achieved through the work of over 4,000 scientists, doctors and nurses. In 2017/18, we spent £423 million on research institutes, hospitals and universities across the UK.

Our ambition is to accelerate progress to see three in four patients survive cancer by 2034. To get there we need progress in research, as well as improvements in how UK health services prevent, diagnose and treat cancer.

The NHS is facing critical staff shortages, especially in diagnostic specialties such as radiology and pathology – which play a key role in the diagnosis of cancer. Health Education England (HEE) are currently developing a long-term plan for the cancer workforce. This plan will examine what staff might be needed to deliver cancer services by 2027.

It is important that this workforce plan takes into account the future impact of new technology such as AI, which has the potential to be used in clinical pathways—including those involved in cancer diagnosis. It is often assumed that AI could streamline or improve certain aspects of the diagnostic process, helping to alleviate pressures associated with staff shortages and freeing up valuable time for staff to focus on other activities, including patient care, service improvement and research. We wanted to explore whether this assertion was true, how far away from current practice it was, and what the implications were for workforce planning.

We therefore convened this workshop to build our understanding of how AI could impact cancer diagnostics in the future – and the implications for the cancer workforce. Attendees were from NHS Improvement, Royal Colleges, Academia and industry (a full list is available in Appendix 1). Discussions were held under Chatham House rules.

Introductions from CRUK

CRUK representatives introduced their work on AI and gave the context to the workshop (see slides in Appendix 2):

- CRUK sees significant potential in the use of AI in both medical research and healthcare – and especially in the diagnosis of cancer. However, there are several considerations if we are to realise the potential of technologies such as AI.
- One consideration is how workforce plans should factor in the future impact of AI. CRUK intends to use this workshop to reach consensus about the future impact of AI, to provide a clear steer to Health Education England about future workforce demand.
- CRUK will be using the definition of AI from the Government’s Industrial Strategy White Paper: “Technologies with the ability to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition and language translation”
- Relevant ongoing work was discussed; this includes the Topol review, HEE’s long-term cancer workforce plan and HEE’s wider workforce plan. Government have also launched the

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Industrial Strategy Challenge Fund and there is ongoing research within industry, in academia and being funded by organisations such as CRUK.

- There are five ways in which AI could be used in health, as recently outlined in Future Advocacy’s recent report\(^3\). Most technologies are being employed in “clinical pathways, such as diagnostics and prognostication” – and are mostly augmenting tasks, rather than replacing professionals. However, most technologies have not yet been tested in the “real world”.

CRUK representatives also introduced results from an initial survey of industry about AI:

- KPMG have estimated there could be financial savings of up to 10% thanks to digital technology\(^4\). However, survey responses regarding existing products showed a range of time saved. One example suggested 100% of time would be saved, whereas others suggested no time saved or that it would increase time required.
- We found a range of products in development across radiology and pathology. Some were focused on specific cancers (including breast, lung and prostate) and others were applicable across all cancer types. However, no-one responding to our survey had products already in routine use.
- The main workforce groups impacted by these products would be pathologists, radiologists, clinicians and surgeons.
- CE marking was the most discussed step to getting the product into routine use, with NICE approval also mentioned.
- Barriers to achieving routine use were needing to gain regulatory approval, lack of infrastructure and a slow procurement cycle.
- Attendees flagged that progress and perception of products would vary across industry – often dependent on how established they were. There were several suggestions about other ways to build on this understanding, such as with BIVDA.

**Future impact of AI on clinical pathways for pathology and radiology**

The group discussed the potential of AI in a range of areas, including:

- Assisting decision-making about which tests to order, and the relative value of different tests (i.e. clinical decision support tools using AI)
- Allowing more professionals to work at the top of their license, through automating more basic tasks. However, it was noted that there is currently significant scope for improving this through skills mix, before involving AI.
- Increasing the efficiency of resource allocation
- Smart scheduling and organising patient transport
- Stratifying a person’s risk of developing cancer, which could increase screening efficiency
- On cancer screening particularly, the group agreed that there are significant issues with capacity at present, however were not confident that AI could be applied in the near future.

The group also discussed the key enablers to putting AI into routine NHS practice. The most significant enablers were full digitisation of pathology and radiology, the headspace for health professionals to innovate, good pathways for diffusion of innovations and good-quality data (in


\(^4\) KPMG presentation ‘The Robots Are Coming’, Diagnostics Bootcamp, November 2017
terms of accuracy and completeness). High quality datasets would then need to be made available to the developers of AI to then ‘curate’ for their product or service. Other enablers discussed were:

- In primary care and beyond, use of AI within clinical decision support tools would need to ensure clinical buy-in and trust as well as being easy to use within current systems. Incentives could help this.
- Easy access to radiology training datasets that have images as well as clinical information, and large imaging datasets that can be curated for research.
- For digital pathology, ensuring new Centres of Excellence are liaising with other hospitals to diffuse practice, aiding others in adoption of new technologies. However, it was also noted that when technologies are seen to work well, they should be rolled out quickly rather than just focusing on early adopters.
- Updating clinical curricula, for example to include informatics training that would support an AI-supported pathology service, and also training regulators such as NICE. This was seen as in scope for the Topol review.

Perceived barriers to developing and implementing AI:

- Image acquisition has changed over time, which makes it more complicated (for example, higher resolution images).
- Time pressure can mean that there is a lack of headspace for innovation and system change.
- There is a gap in health informatics capacity.

Predictions for the future:

- There was broad consensus that AI within the diagnostic pathway would be most applicable to tasks which:
  1. Have a binary result (e.g. is this cell stained? Is this mammogram normal?) rather than a complex interpretation of an image (e.g. what does this CT scan show?).
  2. Are repetitive
  3. Had large datasets underpinning them (e.g. screening programmes)
- The group felt that AI could be used in breast screening mammography within 5 years and for determining the prognosis of pulmonary nodules within 10 years. Even then, there is still a debate about the role humans will play. Further work is still needed to gather evidence.
- Three underpinning things are needed for AI to be in use: digitisation, capacity and good quality data.
- AI would only happen with data input, quality assurance, interoperability and will need good adoption and diffusion pathways.
- We must also be cautious not to overestimate the impact of AI on radiology, as radiologists only spend a small amount of time doing the tasks which AI could replace.
- It was felt that the UK had the potential to realise the impact of new technologies, however data is stored in siloes and is often incomplete.
- Use of AI in histopathology would need significantly more digitisation and data curation before it would be possible to use routinely.

Updates on ongoing work

- The Topol review: following the publication of the initial report in June there will be engagement over the summer and then a final report published in December. The conclusion so far was that AI would give the ‘gift of time’ and would therefore enable more person-centred care, but would not replace people.
The Industrial Strategy Challenge Fund: the Prime Minister’s speech on data and diagnosis gave the Office for Life Sciences a mission; they are currently undertaking policy development work to make this vision a reality. There was recognition of the importance of digital pathology and radiology; they are working with NHS Improvement and the Centres of Excellence to take this forward.

Next steps

- CRUK will be publishing the note of this meeting and will consider further options to outline our position publicly. There will also be future work in this area; CRUK will consider how to involve patients in that process. The CRUK Policy and Information Patient Sounding Board was consulted in the run-up to the workshop and this insight is being incorporated into future plans.
- CRUK will also be engaging with the ongoing Topol review and HEE plans, as well as the broader NHS 10-year plan.

For more information, please contact Rose Gray, Policy Manager on rose.gray@cancer.org.uk or 020 3469 8046.
Appendix 1. Attendees

Sara Bainbridge  
Cancer Research UK

Samar Betmouni  
University of Bradford

Paul Devenish  
NHS Improvement

Tim Evans  
NHS Improvement

Fergus Gleeson  
Oxford University Hospitals/Optellum

Rose Gray  
Cancer Research UK

Emma Greenwood  
Cancer Research UK

Keith Grimes  
VR Doctors and Hastings and Rother CCGs

Annette Rusling  
Office for Life Sciences (BEIS)

Nicola Skinner  
Health Education England

David Snead  
Uni Hospitals Coventry & Warwick NHS Trust

Darren Treanor  
Leeds Teaching Hospitals NHS Trust

Kevin Tucker  
Society and College of Radiographers

Clare Verrill  
Oxford University Hospitals NHS Trust

David Wells  
NHS Improvement

Ken Young  
Optimam
Appendix 2: Slides used in the workshop

AIM FOR TODAY
REACH CONSSENSUS ON THE IMPACT OF A.I. ON RADIOLOGY AND PATHOLOGY ACTIVITY – TO INFORM FUTURE WORKFORCE PLANS

DEFINING ARTIFICIAL INTELLIGENCE:
“Technologies with the ability to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition and language translation”
- Industrial Strategy White Paper

WIDER CONTEXT
Topol Review
HEE’s wider workforce plan
Industrial Strategy ‘Challenge Fund’ (inc. Innovate UK £50m funding) and PM announcements
HEE’s long term cancer workforce plan
Ongoing research e.g. funded by CRUK
Industry developing products
A lot of hype and sweeping statements – still unanswered questions
WHAT WE KNOW SO FAR

FIVE WAYS IN WHICH AI COULD BE USED IN HEALTH:
1. Process optimisation, helping with things like procurement and logistics
2. Preclinical research, for example in drug discovery or genomic science
3. Clinical pathways, such as diagnostics and prognostication
4. Patient-facing applications, for example chatbots, personalised health advice or wearables
5. Population-level applications, including understanding risk-factors for NCDs

- Future Advocacy, Apr 2018

SURVEY FINDINGS

• Asked industry about their products – still in pipeline, not routine practice
• Variety of products – quite specific uses
  • E.g. Positively stained tumour cells, abnormalities in mammograms
• Time saved varies
• As does the other barriers to widespread, routine use (e.g. regulatory approval, procurement)