Independent Reviewers: DeepMind Health Response

We have always believed that positive social impact requires innovative governance and oversight, as well as innovative technology. To help us do this for DeepMind Health, we set up a Panel of Independent Reviewers in February 2016 made up of respected individuals who are empowered to ask any questions, explore any areas, and reach their own conclusions about the degree to which we are living up to the highest possible standards.

This has not been an easy ride. Throughout the first year, the Independent Reviewers have asked us searching questions. But that process is a good one: it makes us think hard about what we are doing and how we are doing it.

The Panel has now produced its first Annual Report which can be seen here. This is our response to that report, which summarises the recommendations they have made and sets out the changes we are making in response. We welcome all comments on this at sayhi@deepmindhealth.com.

1. Law, Regulation and Data Governance

What the Reviewers found

The Independent Reviewers have expressed concerns about the lack of clarity in our original Information Sharing Agreement with the Royal Free, although they say this has since been corrected. They also believe that we should hold ourselves to a higher standard than other organisations.

What they have recommended

The panel writes:

- "DeepMind Health (DMH) should respond positively to any recommendations that result from the ICO investigation.
- "DMH set as a firm policy that all future contracts with the public sector should also be published openly, with minimal or no redactions.
- "That tech providers, the Department of Health and the Information Commissioner should discuss together a new system which protects patient data whilst allowing innovation and that collaborative discussions should take place in safe places, similar to Research Council 'sandpits', in order to create a new model for regulation."

What we will do

- We welcome the recent conclusion of the ICO's investigation, we're examining their report in detail and have acknowledged we should have done more to engage with patients much earlier. You can read about what we've learned here.
- We recognise that our initial legal agreement with the Royal Free in 2015 could have been much more detailed about the specific project underway, and about the data processing instructions the Royal Free had given us. We and the Royal Free replaced it in 2016 with a far more comprehensive contract (available on this page), and we've put in place similarly strong agreements with other NHS Trusts using Streams.

- We have already published our contracts with the Royal Free, Imperial and Taunton & Somerset NHS Trusts with minimal redactions. As part of our commitment to be the most transparent organisation working with the NHS, we will do the same with all of our NHS contracts in future.
- In order for the NHS to continue to improve patient care, we think it vital that new technological breakthroughs are able to be safety tested in the NHS, while rightly maintaining all necessary safeguards around patient confidentiality. There are many groups working on and interested in these challenges, including the Department of Health, regulators, clinicians and patient groups, and we will be happy to support them in any way we can.

2. Technology and Security

What the Reviewers found

On the basis of the expert audits that they commissioned, the Independent Reviewers were highly reassured about the approach that DeepMind Health has taken to technical and data security. For example, application security and overall data centre security were found to be "excellent", and the software development process was found to be "extremely rigorous". There were zero vulnerabilities found in our data storage and physical security practices. Across the other audits, there were some minor areas for improvement identified, though none of these at high or critical level.

There was a single medium level issue identified, "World-Writeable Files", whereby it is claimed that some files on some of the servers could be modified by "all users on the network". However, this can only happen where a user is logged into the server, and these logins are very tightly controlled, so no material risk exists in this area at present. It is however best practice to minimise the number of world writeable files, so we will do this.

What they have recommended

The panel writes:

- "DMH take appropriate steps to deal with all the vulnerabilities identified and mitigate any risk revealed."

What we will do

- We are pleased that independent audit of our approach to technology and security has been so positive about what we have done. We will systematically address all of the potential areas for improvement identified.

- We believe any issue raised is an issue that requires investigation and we will address the items listed in the report. However, maintaining world-class data security standards is both our expertise and our priority and we want to reassure patients and the public that data has not been put at risk.

- Later this year we will launch the first steps on the road to Verifiable Data Audit
    - Logging of all accesses to patient data we store, both by humans and by machines
    - First steps towards reducing need for manual code audit to ensure all accesses are logged
    - Supporting Trust IG processes with reports on all data access as specified by the Trusts.

3. Clinical Outcomes and Clinical Utility

What the Reviewers found

The Independent Reviewers were positive about the fundamental focus we have on clinical benefit. But their report suggests that we need to understand still further the scale and complexity of the healthcare systems we are seeking to work with; as well as the full spectrum of individuals and groups with whom we need to work in order to successfully introduce new technology.

What they have recommended

The panel writes:

- "Early engagement with the appropriate Royal Colleges and other clinical professional bodies for early identification of potential problems, as well as experts in implementation science and in quality improvement to maximise the potential for adoption and diffusion."

What we will do

- In response to earlier comments from the Reviewers, we have already now met with many of the major medical Royal Colleges to get their input into our work and to establish constructive relationships for the future.
- Additionally, we now have a Health Advisory Board, comprised of Professor the Lord Ara Darzi, Sir David Nicholson, Professor Don Berwick, and Professor Geraint Rees, who meet regularly to provide advice and to challenge us in these areas.
- We will ensure quality improvement (QI) methodologies are embedded in all our partnerships, and work with hospital QI teams to more fully involve them in deployments.

4. Patient and Public Involvement and Engagement (PPIE)

What the Reviewers found

The Reviewers were impressed with our commitment to PPIE and with the work that Rosamund Snow, the late Patient Editor of the BMJ, did to recommend how patient and public involvement and engagement could be made central to our work. However, they have found that we should have done more to address public concerns about the relationship between DeepMind and Google, including tackling the public perception that health data processed by DeepMind Health could be shared with Google - even though they recognise this has not happened and that we have committed never to link patient data to Google products or services.

What they have recommended

The panel writes:

- "That DMH develop the principles for effective involvement laid out by Rosamund Snow, in co-production with citizens, into a set of values for how they work with patients and the public.
- "DMH talk to Wellcome Trust about their work with patient engagement.
- "That DMH urgently develop a strategy for public engagement, in partnership with others, as part of a wider conversation about health data and trust.
- "That DMH consider developing education programmes about AI and its uses in healthcare."

What we will do

- We are now working with Paul Buchanan as our Patient and Public Lead. Paul is a well known patient advocate and has recently served as the BMJ Patient Editor.

- We are holding two patient consultation events in July 2017 - one in London and one in Manchester. We are expecting up to 30 participants at each event and are using these events to listen to feedback and to invite participants to help shape our PPIE strategy and programme of future events going forward.
- We have been in close contact with organisations involved in the debate around patient data including the Wellcome Trust, and have contributed our experience to their Understanding Patient Data programme.
- We agree that wider public engagement must be a priority. We have begun to improve our website to include clearer information about our work, and about AI and its potential uses in healthcare. We will continue to create written and video materials to better explain our work, and find new ways to invite public feedback. We will also actively explore ways to help spark and participate in the wider public debate around AI and the use of data in healthcare, wherever possible partnering with other organisations active in this area.

5. Broader Consequences and Human Factors/Ergonomics

What the Reviewers found

The Reviewers recognise that the use of the secure clinical app Streams, and the introduction of algorithms into health, could have wide consequences for health service delivery. Alongside encouraging us to bring these considerations more systematically into our work, they highlighted two specific concerns. First, that there may be problems with rolling out Streams to other hospitals where it may be seen as being 'parachuted in'. And second that the broader implications of the use of Streams in relation to performance management, workforce and potential litigation have not yet been explored. In addition, the use of devices in hospitals always requires hospitals to have an appropriate approach to infection control.

What they have recommended

The panel writes:
- "DMH considers any infection risks and how they might be addressed.
- "DMH consider with clinical and non-clinical professionals the implications of their work for performance management, for litigation and for assessment of future workforce requirements."

What we will do

- We agree that the use of technology on wards, from pagers to mobile phones, means every healthcare provider and partner organisation needs to take infection risk seriously. This is already built into our work with the Royal Free - for example guidance relating to the safe use of mobile phones in ward settings is included in the Instructions For Use provided to nurses and doctors at the trust. We will ensure this focus is repeated in all of our work with Trusts on clinical deployment.
- The implications of health technology for workforce management is an important issue. But Streams is no different in this regard from existing health technologies that already 'time stamp' various activities in the hospital. We have explored these issues extensively, both with staff as part of our user research and with professional bodies and unions. We will continue to observe industry guidelines and work with other bodies on this topic.

6. Governance

What the Reviewers found

The Reviewers were positive about the decision to create a Panel of Independent Reviewers, and the way in which DeepMind Health has opened itself up to external scrutiny. However, they have found a one year appointment term for each Independent Reviewer is not long enough to fully get on top of the complexities of healthcare, and would like the appointment of Reviewers to be more formally defined. Further, the unpaid nature of the Reviewers, although admirable in principle, has meant that not all Reviewers have been able to contribute as much time to this work as they would have liked.

What they have recommended

The panel writes:

- "Give thought to how new IRs will be chosen in future.
- "Three year appointment terms for IRs, staggered so that current members serve a further 1, 2 or 3 years.
- "Annual election of the Chair of the IRs, with no person allowed to serve as Chair for more than two consecutive years.
- "IRs should receive a modest honorarium from DMH, with the option to receive it personally or have it paid to a charity or organisation of their choice."

What we will do

- We agree with these recommendations.We think it is the right time to draw up and agree a written Terms of Reference for the Panel, including clear approaches to the recruitment of Reviewers, their terms of office, ensuring the relevance and diversity of their skills sets, and to how the Panel will be chaired.
- We will work with the Independent Reviewers to agree the Terms of Reference by October 2017.
- We agree that the Reviewers should receive a modest honorarium. We have agreed with the Reviewers that this should be pegged at the standard level of an NHS Non-Executive Director, currently £6,157 per year. Reviewers will be able to choose whether to take this personally, or whether to have it paid to a charity or other suitable organisation.