POLICY LEADERS

QFI QUEENSLAND FUTURES INSTITUTE

SUMMARY REPORT

Queensland Policy Leaders Series
Artificial Intelligence in the Healthcare Sector:
The Good, the Bad and the Ugly

Wednesday 24 October 2018
07.30 am - 9.00 am

Moderator

Professor John Swinson, Professor of Law, The University of Queensland

Panellists

Professor Emma Duncan, Professor of Medicine, Queensland University of Technology

Dr Stefan Hajkowicz, Director Data61 Insight Team, CSIRO

Professor Carolyn Mountford, CEO and Director of Research, Translational Research Institute

Dr Clair Sullivan, Chief Digital Health Officer, Metro North Hospital

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Breakfast Summary

The predominant theme from the 2018 Queensland Futures Institute *Artificial Intelligence (AI) in the Healthcare Sector: The Good the Bad and the Ugly* focused on the role of AI in the healthcare sector. It delved into this ever-growing important topic that is equivalent to the fourth industrial revolution.

The discussion focussed on AI's potential in transforming healthcare to a cheaper, efficient and effective sector by freeing up human's cognitive brain capacity to focus on more important things than binary and repetitive tasks. However, the discussion also touched on some specific challenges, such as the ethical and legislative dilemmas as well as the shortage in data science and coding capabilities that constrain AI to work properly.

Lastly, the general discussion allowed the audience to explore further into the topic of how AI could be developed, implemented and facilitated in ethical and legislative terms without dampening innovation by starting the conversation on a national scale and constructing appropriate frameworks.

Key comments by panellists

Professor Emma Duncan, Professor of Medicine, Queensland University of Technology

- Research background: genetics.
- Interested in the interface between modern genetic technology and clinical delivery – space translation.
- The particular relevance of AI: the development and delivery of algorithms that deliver all that modern genetics can offer into clinical care at the point of care cheaply, efficiently and effectively.

The Good:

- Using existing technology of translating genetics easily into practice.
- With genotyping: on a chip about the size of microscope slide – 12 individuals, 600K different genetic variance for each of those individuals. You can get about four million piece of information on these individuals and much more. For about 35 USD per chip, you can get all the information that you might need. The good side is:
    - Pharmacogenomics: due to lack of pharmagenomics testing in Queensland, there is a high chance of inappropriate use of medications, excessive toxicity (e.g. adverse drug reaction, affecting state, mobility and mortality), and ineffectiveness (depending on level of metabolism, the responsiveness to drugs varies). With the chip mentioned above, appropriate algorithm could be set to provide us with comprehensive genetic information at the point of care.
    - Desaes prediction: using AI, we can reduce endoscopy by 40-70 %.
- Sequencing: sequencing individual tissues that can determine the cause of single-gene disorder. What about sequencing tumour? We can out what mutation is driving the cancer.

The Bad and the Ugly

- Barriers to implementation: current clinical care fall short, not from lack of knowledge or lack of technology, but from lack of implementation

Data availability in Australia:

- from the point of view of genetics, e.g. to differences across ethnic groups: we can tailor our prediction for disease according to ethnic background.
- In genetics, we don't just study Australia, we are blessed by having a large international community with extensive amount of information which is freely available.

Changes in the jobs of medical professions as a result of AI:

- Medicine does not begin and end with diagnostics or decision making. Medicine begins and ends with caring for people of which diagnostics is part of therapeutics – certainly not the whole.

Dr Stefan Hajkowicz, Director Data61 Insight Team, CSIRO

- The Insight Team at Data61, are doing the national roadmap for AI:
    - unlocks the productivity slump that OECD economies are in
    - allows us to do more with less and become more efficient

The Good

- There is an enormous number of applications of AI in health.
    - AI will start to be used to supplement our own creativity and insight.
    - data is a crucial part of it and it helps any industry to transform. On this note, coding and data science capabilities will be extremely crucial – we need the literacy and numeracy to leverage the potential of AI.

The Bad and the Ugly

- To make sure AI works, strong ethics are needed to not only enable positive outcomes, but also to foresee the potential of harmful use of AI – how algorithmic solutions in criminal justice, healthcare, education can cause bad outcomes if they are not managed properly.

General Discussion:

- There's a lot of evidence of AI that does nothing that a human being does, but still performs a very useful function. However, it needs a lot of oversight.
- The quality of AI depends on the data that it is drawing on, which needs to be trained and managed.
- The next 10 years of predictive analytics will create a whole new ethical dilemma: e.g. in the criminal justice systems, terrorism and crime using AI can help you identify criminals before committing the crime, however neither can you arrest them nor can you let the crime happen – dilemma.

Changes in the jobs of medical professions as a result of AI:

- Referring to Moravec's paradox, AI will be there to build systems that will fly a plane better than you or will beat you at world class chess, but we are decades away of making a machine that will tie your shoe laces up.
- Human judgment, creativity, emotional, and social intelligence, will not get automated anytime soon.
- AI will free up cognitive brain capacity to focus on things that matter and eliminate repetitive tasks.
- A large number of jobs will require data science and coding capability, but it will certainly not replace jobs.

- There are two types of people: those who see a threat to their jobs and those who see an opportunity using AI.

Professor Carolyn Mountford, CEO and Director of Research, Translational Research Institute

- AI includes capability from automation of routine operations, data mining, all the way to big data.
- The evaluation in the area of healthcare is commonly referred to as 'clinician assisted diagnostics'

The Bad and the Ugly

- The aerospace industry was one of the first to use AI and automation a flight from Singapore to Perth in 2008 experienced a sudden and commanded pitch down manoeuvres, which caused minor and major injuries among the crew members and passengers.
- AI influences nearly every aspect of the human condition. However, rolling out AI requires a level of quality control and evaluation that Boeing did not have in 2008.

The Good

- Data mining can assist the clinicians using a clinical MRI scanner.
  - we have developed the first objective test for conditions that had previously relied on a subjective diagnosis.
  - classifiers in the technology provide a personalized medicine approach
- Worldwide interest in AI applications is high, it's growing rapidly and it's fuelled by available large data sets and significant advances in computing power and deep learning algorithms.
- There are many opportunities and challenges for the imaging community in this space:
  - the development of a common nomenclature and standards for validating across different platforms and different patient populations
  - we in healthcare cannot make such areas as we build clinician assisted diagnostics. We need to teach the clinicians about AI and the hardcore data on which it's based.

General Discussion:

Challenges of data collection and data analysis:

- The usefulness of clinician assisted diagnostics is based on correctness of the developed algorithms.
- Despite significant advantages, not all types data can be used and analysed, as there is a huge ethical and legal catch up is needed.

Data availability in Australia:

- This depends on the scale of difference between patients: for small difference across patients, we need a large cohort, for large differences we can work with smaller cohorts, too.

Dr Clair Sullivan, Chief Digital Health Officer, Metro North Hospital

- In computer science, Artificial Intelligence is defined as the study of intelligent agents – any device that perceives its environment takes action and maximizes its chances of achieving its goals. The term AI is applied when a machine mimics the cognitive function of a human brain. These functions include learning and problem solving. They don't include love, respect, compassion, and social justice.
- While the study of machine learning or AI began with philosophers as far back as ancient Greece, in 1943 AI was defined as 'artificial neurons', which I will be referring to.

The Good

- AI is accurate, it's not unionized; doesn't take leave; doesn't get pregnant; works 24/7; and doesn't complain
- The accuracy and that reliability frees up people to put their cognitive effort into nuanced emotional intelligence, rather than making binary decisions, shuffling zeros and ones.

The Bad

- Poor-quality AI is dangerous.
- AI is an immature industry.
- We need to make AI systematised, put it in a framework, have some clear societal expectations and explore the ethical implications.

The Ugly

- AI – where computers rule the world. It doesn't differentiate between the binary decision making and emotional intelligence, which is what really drives the world.
- We need to be systematising it and have an enterprise wide approach.
- Use it as a tool to deliver the easy reliable aspects of healthcare and free up our work to actually care for our patients.
- Some people might think humans will fail because they have compassion. I'd argue that compassion in a sense of social justice are the reasons that humans will survive, and that is a strength and AI becomes our tool.

General Discussion:

Using AI in the hospital system:

- When you think about the decision support that you're providing, within an AI framework, there is a level of sophistication ranging from
    1. descriptive (this patient is deteriorating),
    2. to a little bit more sophisticated, predictive (I think this patient is going to deteriorate),
    3. to then prescriptive (this patient is deteriorating, and this is what you need to do).
- In Queensland, we are somewhere at the start of descriptive decision support.
- Algorithms are living and breathing, and need to be constantly retrained. So an algorithm that we train at Rockhampton hospital may not be fit for purpose in Mackay hospital
- The question is: how to retain the data, the benefit of shadow implementations and to understand that AI is not a product.
- AI is a care delivery method. It is shifting the industry from I've got a product to you to this is actually a care delivery method that becomes business as usual, needs constant clinical governance and iteration rather than buying an algorithm.

Motivation of people to see AI as an opportunity – the role of AI in digitalisation of a hospital

- Transformational change is happening in healthcare, and many other industries.
- For a strategic change, and transformational change, you have to stop reacting – rethink, retrain, realign, and deliver.
- Transformational change, similar to the Industrial Revolution: stopping to react, thinking strategically, having a plan for transformational change, investing in our people and in technology, and then start-

ing again from the bottom of that learning curve. Don't be frightened, learn, iterate, get better go through your productivity paradox

- The AI revolution and something that we really need to invest in as a jurisdiction and get it right.

General discussion with the audience

Question: *How would you like to see in fully digitalized hospital the ability to have information stored safely and securely, which can be used and incorporated? What about the ethics of holding information and not necessarily acting on it early on?*

Dr Sullivan:

- My role as a chief digital officer is to enable clinician.
- The clinical governance of technology becomes a critical enabler for healthcare delivery.
- My job is to understand the informatics, understand the information governance and work out the best way to deliver that information to the clinician.
    1. availability of the genetic information of individual patients for individual consultation to enable the prescription of the right drug.
    2. care of groups of patients: the clinician might like to see all of the patients who have that mutation on a dashboard, e.g. for routine screening every few years, and observe unexpected development of cancer, etc.
    3. new and innovative models of care: where we actually start to look at those individual episodes of care and think about new and innovative ways to perhaps intervene. could we look at a population level about environmental factors, could we look at new interventions
- Underpinning those horizons is clinical governance, quality and safety, cyber security, and privacy and ethics.

Question: *a) how much collaboration, conversations and cooperation are we having with your interstate colleagues or interstate hospitals interstate governments? b) how do we compare to what might be happening in in Asia (advanced South East-Asia)?*

Dr Hajkowicz:

- Asia is moving really fast – China is investing big time: much focus is put crowd monitoring social credit score. At the same time, really rapid development of AI capability.
- Singapore: much focus is put into the finance sector.
- The MIT recently announced the $1.4 billion Australian Research Initiative on AI. In comparison, not much has happened in Australia.

Professor Mountford:

- Some of the major the major industries have been investing significantly in AI, in the United States, Siemens' healthcare has Princeton's whole Institute just committed to AI related to health care.
- The Canadian government has been working in this space for 35 years now.
- Part of the problem in Australia is that even those of us that have been doing it for decades, nobody ever quite believed it was ever going to work. And so that's a common tale for Australia, it clearly is working – we have a lot of catching up to do, which needs to start in the schools and in the universities.

Question: *Referring to My Health Record, how do you think that we're going to navigate this so that these particular AI opportunities are going to get the data they need, yet people feel confident that they're not going to be discriminated against by private health insurance and other people?*

Dr Hajkowicz:

- There are real risks, you can destroy someone's life by revealing personal data. And we got to protect that as much as we do their physical safety.

- In other aspects, it can be used very well and appropriately within safe standards.

- The most aggressive data standard framework is a European data governance framework that has been announced not yet implemented – you own the delete key. However, this can be challenging. I'd wonder will evolve.

Dr Sullivan:

- It is the dichotomous binary view that you're presenting. It is the social contract we make with someone when we care for them. So that is independent of legislation that is independent of what the politicians say, it is a social contract, that when I care for you, you are giving me your data, and I'm using it to care for you. That contract can be extended to use of that data within the appropriate ethical and legislative bounds that still cares for that patient – which doesn't include insurers accessing that data.

Professor Duncan:

- That social contract extends one step further: there is an altruism element to this, too.

- You give me your data, and I will use that to care as best as possible. But I'd also like to care for anybody else who has conditioned in the future better than I can today, can I use your data to help others?

- The virtuous relationship between research and clinical care: the information that we can get from big data, I think that's part of the social contract, there's altruism beyond your own benefit for your health – the health of our community.

Dr Hajkowicz:

- It is hugely valuable for you to share your private data so that we can do analysis at higher level.

- We are operating in a grey space, a lot of innovation in data is not happening because people don't know what is okay, or what isn't.

- In the banks and finance sector, we actually can do a lot of good and do things a whole lot better and use massively powerful datasets which will actually cross over into more efficient healthcare delivery.

- We don't have a framework or a basis – it needs to be a national conversation which gets translated into usable frameworks, without dampening innovation in the AI space. Because if we put in heavy bureaucratic restrictions on what can and cannot happen will kill a lot of innovation.

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