Fiona Wood Public Lecture Series

Transcript for 'The digital revolution in health – what's in it for you?'

Presented by Professor Fiona Wood AM and Digital Innovation Lead Aaron Berghuber

Professor Fiona Wood AM

Thank you very much indeed and I'm here really just to intro and hand over to Aaron who's going to really take you through the exciting things we've been able to do and really what's there in the future. So, I'm going to take you back to thinking about my dream. I have this dream and I've had this dream for a very long time and I'd like when I see someone who has a burn injury I want them to go through a carwash right. In this carwash, in the first part of my carwash I want multiscale, multimodality assessment. I want to know what is wrong with that person at the sort of macro level, the whole of the person right the way down to the genetics in the cells. I want to move back from that and I go to the next part of the carwash and in that I want to remove everything that's causing a problem. I want to optimise that individual. I want to make them as good as they can possibly be and I want to make sure that all that nasty, burnt tissue is gone because that drives a terrible result. So I want to remove that and we could do that with enzymes and we can use a sharp knife, that's my sort of - what I've been doing for 30 odd years and I've learnt very skilled to cut until someone bleeds and then I know they're alive. That's really subtle isn't it you know. So and that as a surgeon is what I'm all about.

Then in the next part of my carwash I want self-assembly nanoparticles forming a framework so that when I spray the skin cells the skin cells express themselves to grow into new skin. So at the other end of this carwash what I've got is someone whole on the inside and out without the stress of that burn injury. Whose come out that carwash, oh what's happened? Oh I just look like I was before, without the pain, without the suffering. Then I wake up. Because along that journey there's a lot of pain, there's a lot of suffering and it's my dream yeah. What about the patients that go through this? How about listening to what they want and so many years ago we were challenged. We were challenged and I worked in the Multidisciplinary Team since I took over in 1991, the Burns Service. We were challenged. We said well, what actually are the outcomes from surviving a burn injury? Because we used to say, we've got to make sure that the quality of the outcome is worth the pain of survival. Because we know that. We see it, we witness it. Fortunately you don't have to feel it but I've seen more suffering than anyone should over the years.

So we started a programme with a lotteries grant in 2005/2006 where we started looking at understanding we needed the data. We need to back up our research with data of all what was happening to that person at the beginning, all what was happening across throughout that journey, throughout - one day the carwash -and then we come back and ask what - well how are you now? What can we do to make you feel better? What else do you need? So we did assessments, a long timeframe. At this point in time we have information, really rich data on over 10,000 patients in Western Australia. We have that because I met Aaron.

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His mum was, and still is, the ward clerk in Plastics at Royal Perth and he was kicking around. He'd just finished uni and he was kicking around and his mum said can't you give that boy something to do? As a mother I thought, yes I can. Yeah.

So we had the funding to build a data system which is the burns information management system, and then from then we started to realise the power of what we had. We started to understand the power of data. So when I now look in and see everything that's going on around me, I think well we've actually been in a bit of a – we've kind of had a bit you know. Because all this technology is supposed to make it easier for us, make the system streamlined. It's supposed to actually mean that we've got time. Time such that I can ask you actually, what brought you here today? How are you? Like when I did when I was a kid you know in medicine all those years ago, in the 1980s and before. God, that's a worry. So I need to give back the gift of time. We need to put the human back into this. Because you go around the wards and for no fault of their own, all the staff are in front of computers and they're not Aaron. Yeah.

So I've worked at this Multidisciplinary Team that has morphed into an Interdisciplinary Team, well over a decade ago and so I've seen the power of that and I've seen how it can change lives and how it can make our understanding of where we could go in the future so much better. So, wouldn't it be amazing - I won't answer my phone there, it's obviously ringing. If I actually came and I said right I was brought here today. Oh you've got - oh yeah I can see you've got that burn, yes. Did that happen a couple of days ago? I'll give you the answers because I don't - yeah. Do you mind if I actually record this? I barscan your medical record information/identification. It's populated. We've discussed your situation. I examine you and say, yeah it's red and as I touch that that's painful isn't it? Yeah. So really I could understand it's painful, it's red and it's not infected but I think that should heal without surgical intervention. So that's good, I'm redundant, I can go back to the beach, but it's all on this phone.

Natural language processing can actually give us the information that we just - because I've gathered and wouldn't it be amazing if one touch of a button we could edit that, together, because it's your information, and with one touch of a button I can send it to you. I can send it to the medical record. I can automate the waiting list. I can send it to a de-identified database such that we can then understand what it is that drives poor scar outcome. Or what it is that drives associated diabetes. Or what it is that drives anything. I'll take some images because I'm a very image area and they can be analysed, such that when other people send images in and they send those images into us with basic information, we can have an artificial intelligence platform that will give an indication of how to treat that patient.

Now I can, you know, dream but I understand people make dreams reality. I didn't expect it to be called Fiona Wood series actually, just for the record. But I really am passionate about letting people know what's going on here. Letting them know all the good stuff. You don't have to always read the newspapers, you know, you can find the good stuff, it's real you know, in here. So therefore it's all about the people and understanding in this way in the future we need another sort of string to our bow in the allied health space. We have physiotherapy, occupational therapy, dietitians, social work, psychology etc etc but we need digital innovators.

With that I'm going to hand you over to our digital innovator extraordinaire who my kids used to think needed danger money working for me because I was an IT crash dummy. But I actually know now where the on button is on my computer. So, there you go. Thank you Aaron.

Digital Innovation Lead Aaron Berghuber

Thanks Fiona. She never paid me that danger money. Alright. The clicker's not working. Alright. So I was sitting there, my heart is just beating really, really fast. Not because I'm nervous but I'm thinking how am I going to build that carwash. Gees there's so much stuff in there. Someone once asked me what it was like to work for you and it's like jumping off a cliff and trying to assemble a plane on the way down. It's absolutely crazy. I love it. Alright, digital revolution and health, what's in it for you? So, first of all thanks for coming out tonight and braving the storm. It's a real privilege to speak to you all. Thanks for everyone on the podcast in the future.

When I was putting this presentation together, I kind of wanted to go through a few of the digital tools that we have and also let you know about what's coming in the pipeline. I cast my mind back to when I actually started and this is what things look like in 2006. So, there's a desk and there's just tonnes of these paper medical records on there. If you've been in hospital for a while you have multiple volumes. There is only one of these in the hospital and I remember going into a clinic my first time and one of the doctors would take this big file with them and they'd be writing notes and then no-one else could read it. They have to wait until they came out and they'd write on these bits of paper and then you'd have to put them all in and it was just absolutely crazy. This is actually what researchers desks look like. They'll have to go in there, transcribe all of that, stuff from paper into a database so they can do their research.

That was all the way up until 2014 when we started to come over here. Look that's a bit of doctor's handwriting, that's exactly what it's like. Oh, I can't even look at it. So at Fiona Stanley Hospital we look very different now right? On the left we have a thing, it's a workstation on wheels. It's a computer it's hooked up to the WiFi. WiFi, brilliant thing. You can go around anywhere in the hospital, you can connect all your devices, connect to the network, even outside of the hospital. This goes around through wards and clinics, in every single room we have. We've got computers so we can connect to the network, we can get all that information. We've got mobile phones as well. You start to see staff members using those.

On the left we have a patient entertainment system. So, if you're in hospital you can order your food, go on the internet, video conferencing and staff members can use it as well, they can log into their systems. These things on the right, they're seriously cool. So people on the podcast, these are like little low-lying trolleys and you stack them up with medical supplies or foods. They're called automated guided vehicles. They sit downstairs on the lower ground. Connect to WiFi and you programme them and they're situationally aware. I've tried this out, you can go and stand in front of one of them and they've got little sensors on the front so they'll kind of come to a stop and they'll politely ask you to move out of the way then they'll go on their way. They can call a lift, go up a few levels and then they'll page the person to come and pick up the supplies. Absolutely brilliant.

So I'll go through a few of the services that we have available and digital tools. A huge one is Telehealth. So we've been doing this for well over a decade. Traditionally this was - and especially at Fiona Stanley, we have quite a lot of statewide services. If you think of WA it's 2.6 million people spread across about 2.6 million square kilometres. So we're very lucky to have facilities like this to grant access to more specialists. Traditionally it's been you will go to a certain area, nursing station or a GP wherever it may be, and you'll consult with the specialist. But now we're starting to offer appointments in your home or work where it's clinically appropriate. If you're a frequent flyer you have a chronic illness you need to manage, Telehealth is available. If you think about all those people in rural and remote areas, it's fantastic for them so they don't have to fly down or drive multiple days to their nearest hospital.

Of course mobile technology. So this is my team and a few of the CSIRO guys there. So, if you do come to any of the SMHS sites you will see clinicians on their mobile phones. We had a problem and it was around consent.

So, whenever you have a treatment or for various things, you'll go through a consent process with one of the clinicians. You'll sign a paper form and then it will be put into some kind of tray, someone will take it to get scanned and it will eventually make it to the medical record. It took a long time, it was slow, it's expensive and forms did get lost and that causes a lot of delays, especially in theatres. So, we thought alright, we've got new technology let's try and solve this problem that's been around for a while. So we developed the eConsent application. This is what it looks like. Everything in the process is exactly the same and at the end you either sign with your finger or a stylus and it goes straight through to the medical record. Just like you sign for a package at your house. This is an opt-in thing as well, so paper will always be around. It goes straight through to the medical record, there it is. So you know where it is and it never gets lost.

Even though it seems like a simple kind of thing, it's quite significant for South Metro. So, we're the first ones to do this in all of health and there were so many challenges. At the start we thought great, we'll get these hospital phones, we'll connect them to WiFi, it'll be fantastic. Quite a lot of problems there. No-one wanted to carry around two phones so we had to get really innovative to overcome this problem. Also if you're outside of the site you don't have WiFi and it won't work. So we have a scenario where doctors are in their private rooms but they'll be operating here and we wanted them to be able to use it as well. So to overcome those challenges we got really, really smart and we made it so that nothing is ever stored on the phone. So there's no patient data, nothing. You don't have to worry. Doctors can use their own phones because it is that secure. Instead of just being on a WiFi network we're using the internet so you can use it anywhere, anytime and it always makes it to the medical record. Since we've done all this integration, we've got two-way patient information flow. So there's endless possibilities with this platform that we've built. We can really solve real problems right now.

Then the next app that we're building is called MICE, Medical Image Communication Exchange. So an extension of that is images. Because we do those statewide kind of services, especially in burns, we're very image intensive. To send images from a country to us or even in-between hospitals or to someone else, it's very clunky and it's very difficult to be compliant. So we made a very simple application where nothing is stored on the phone. Everything makes it into the appropriate medical record or storage system. This really helps. When you're making expensive treatment decisions, if there's been an incident in a rural or remote area, you need to decide do I fly this person to Perth? Do I contact the Royal Flying Doctor Service to get them down? These kind of photos can really aid those decisions.

Of course on the right we've got our little man. So, if you think about where this is heading, there's going to be millions and millions of photos that are taken over time and as you're taking these photos, you can tag them with the location of where the injury is so in the future you're essentially labelling all of this data. For your research you can go back and you can say, I want to see a forearm laceration and you'll get all of the images for that, which will be really useful for when we start doing artificial intelligence.

I want to talk about design. So, this is a typical Apple product. Very simple, one button. Love it, I know what to do. Google product, little search bar and you press find, I know how to use it. Your company's app, 10 billion fields. It just doesn't work, it's clunky and it really sucks. We've taken a really - a design intensive approach and co-creation with clinicians. We follow them around, we see exactly what they want, we streamline their work flows and we make it very, very simple with our applications. There was a staggering statistic where for every hour a clinician spends with a patient they will spend one hour in documentation because of systems like this. We need to cut that right down so they can spend more time with the patients.

We have apps for patients as well. So this is one that we've just begun, it's called Manage My Care. The use case here was, if you're getting an appointment at a hospital you'll get a letter in the mail, which I can't even say it I haven't said that for a very long time - a letter in the mail, you'll get one or two. You'll have to manage them yourself and then to change your appointments you have to call up, you'll be on hold. You may or might not get through to the right person. You can't call after hours. It's a really bad experience. So, why not do it on your phone? So you can see your appointments 24/7. You can reschedule at your leisure via the application and you'll get reminders as well. So that's something we're trialling at the moment and we'll roll that out further as well as the features.

Now My Health Record. So, I revisited this recently because it had a very clunky start right. It was very - there was a lot of press about it. It was overtime, it was over budget and people had gone a bit cold on it. So, a few stats, 90% of people have a My Health Record and integration is improving. What I mean by that is yeah you've got a My Health Record but how do all the clinicians access that? Now we've built out features where you can click one kind of button and it goes straight there and I can read the information, it's really quick. It does give you quite a lot of control. I think a very low percent, less than 9% have actually logged in and looked at those controls, so do that. Utility is increasing. They're uploading more and more documents. This was staggering - 1.7 billion documents have been uploaded to My Health Record, 100 million of those were in December and it's just exponential. There's a quick breakdown of the documents.

This is what really got me interested. This was the recent bushfires in Australia over east and this is from a clinician. The main hurdle I faced in the bushfires was assisting patients who had chosen to opt out of the My Health Record system. This took me back to, oh early in my career. It was a Friday night, it was about 6 pm at Royal Perth Hospital. I was the last one in the office and walking to the lifts and Fiona's office was there and her light was on so went in you know, I'll say good night to her. She had this kind of frustrated look on her face and I asked her what was happening. It turned out that a doctor had asked her for some information on one of our patients and this patient was injured offshore, came to us with quite a severe burn injury, stayed with us for a series of months and then went back home over east. She couldn't get any information because of course it was in a paper file. If you've ever been to the hospital it goes and gets archived.

I actually remember this patient and she was in one of our databases. I pulled up the information, gave it to Fiona and she was able to send it to that doctor. She looked at me and said, you may have just saved her life. That was really a career defining moment for me. That particular patient recovered from the incident and she was a double amputee - both legs - and she ended up walking down the aisle and getting married. She ended up having a child, she had a baby. Did her PhD and is now a marathon kayaker, which is just absolutely phenomenal when you think about that how those little pieces of information can really transform people's lives.

Alright. Artificial intelligence. So two things you need to know about this, automation of steroids and all it is, is fancy, fancy maths okay? So you hear a lot about it. Really today AI is really overhyped. The stuff that you kind of hear in the news, mm yeah not really there. It's very hard to do well. You only hear about the one or two things that actually succeed in a very narrow field, most of these fail. It is - the latest techniques we're using are still in its infancy and a lot of it is in the research phase but it has and will continue to change the world. You guys use it every day and we'll go through some examples. To put this in perspective McKinsey are saying that there will be 13 trillion dollars of GDP by 2030 for artificial intelligence. So if you take all of Australia's economic output, it's 10 times that. They reckon it will transform every industry.

So there's two types of AI, the first one is artificial general intelligence. This is the intelligence of a machine that has the capacity to understand or learn any intellectual task that a human being can. So, if we think about what that actually is, let's look at a movie, Terminator, how does that end up? We have Skynet and they get all shooty shooty and it doesn't end very well alright?

Next one, Ex Machina. So this is a brilliant movie. Ava becomes self-aware, stabs the guy that made her and runs off into the general public. The Matrix right. Everyone's seen this, they turn us into batteries. None of this really ends well with artificial general intelligence, but it's fine because it does not exist okay. We would need several technological breakthroughs to get to that point and the world will just be crazy different to where it is now.

Now the one I'm really interested in, artificial narrow intelligence. So this is a computer's ability to perform one single task extremely well. It's a one-trick pony. Classic example, smart speakers so Siri, Alexa, Google. The way these work is you'll say a trigger word so you'll say, okay Google and it'll turn on. It'll listen to what you say. Hey Google tell me the weather. It'll use natural language processing over tell me the weather and work out, oh Aaron wants the weather. Calls a weather programme, comes back, Aaron it will be 36 degrees tomorrow.

Now in medicine, so our CSIRO partners what they've developed here is diabetic retinopathy grading and they developed this to stop unnecessary blindness. This is - there's so much fancy stuff behind it but it's so simple. You sit in front of a camera, takes a photo of your retina, shoots it up to the cloud, does fancy maths and comes back. What that does is people that wouldn't normally be screened can be screened and we're going to start using this in our clinics while you're waiting. Here's what it looks like. On the top left its detected it, its graded it and it will create a report and it will send it on to the appropriate clinician.

Now, we made a decision at SMHS, would our business be more efficient and effective if we were good at AI? The answer is absolutely yes. So we need to build some AI capability. We've done quite a few projects that we've completed. This is one that we're actually starting. So this is a simple classification problem of a radiology fracture. If you think about that artificial narrow intelligence, this will work on wrist fractures. If you gave this a photo of a brain it would just go what is this? I don't understand. We're going to continually build out this kind of capability and this was amazing, this blew my mind. So, this was from a researcher recently and what they were trying to do is reduce the radiation from CT and those kind of things. On the right you have a normal dose and then you also have a low dose. What he's done is used artificial intelligence and postprocessing to change those low dose images to make them as good as normal dose images, which is phenomenal.

Look, the focus areas for us for artificial narrow intelligence are treatment plans. So if you have some kind of intelligence looking over all the data that you have, the clinical data and everything and looking at patients that were like you previously, you'd want it to create similar treatment plans the most efficient kind of path and then you would look over that as well, and like Fiona said, discharge summaries. So, at the end of a hospital stay a doctor will have to go through, they have to read all of those notes and then they'll have to write a discharge summary. That should be automated, you should check it and then you should edit it. Streamline our check-in process and personalise health advice as well. Even with genomic medicine, mapping our geno.

A lot of people say AI will take a lot of jobs. It won't necessarily take jobs, it'll take tasks. So if you look at a radiologist. Yeah they look at x-rays, they look at CTs but they also talk to patients, they talk to other doctors, they do really novel things. So it's not going to take jobs, it will take away some repeatable tasks and they'll still be watching over it anyway. It will create amazing jobs like drug creator, people that will create drugs specific for you.

Alright now this was awesome, virtual and augmented reality. We've done a few projects on this with Murdoch Computer Science and Gaming Division and this first project was a data visualise. So we've got all of this data and we need really smart people to wrangle that data, put it in front of people like Fiona so she can interrogate it and look at it. How do we get that middle man out?

So we set these kids a task and a guy called Matt Schneider from Optika – I will never forget this – he came into the room and he told this group of kids and myself, he was like we want to build a data visualiser. What does data look like? What is the texture? What shape is it? How do you interact with it? How do you traverse that world? How do multiple people traverse that world and have a shared experience? Then he walked out of the room. It was unbelievable right. It was so, so crazy. I just looked at these kids and I'm like, well good luck.

What they built us was phenomenal. It was a virtual world and they took our data and they made these, it almost looked like brilliant buildings like huge skyscrapers. What it was, was a timeline of when a patient came in with an injury and as they were recovering and had different interventions it would go higher and higher and you could compare people together – I haven't put a photo up because it looks so rubbish in 2D – and compare them and what were patients like these? How are they tracking? Absolutely brilliant thing and then you could take pieces of that data and you could put it on separate boards so other people could look at it. It was just phenomenal. Then Fiona tried it on and two minutes later she felt sick. So, it kind of gives you an idea of where virtual and augmented reality are and realistically in two to three years you will start seeing these kind of things in the hospital. I think we're already using it for medical education.

Virtual reality – this was another project we did. We found that our patients spend a considerable amount of time in bed and our physios wanted to get them up and moving. They had their gym sessions but you're in predominantly a single room doing not much. So how do we engage them? This is brilliant. They created an entire game arcade. You could select the game you wanted. As an administrator you had a physiotherapist and they would choose the different range of motion kind of things that was appropriate for the patient. This is this Japanese game where a wall comes towards you and you have to make the shape right. There's one of our physios, Ingrid using it. This was absolutely brilliant. We did an augmented reality one as well. So a few more washes of this and you will start seeing it in our hospital.

Of course wearables. We've been working on this for a very long time and now we have a masters student working very hard on it, a data scientist. If you think about what these wearable devices are, they've got little sensors in them and they do heart rate, temperature, galvanic skin response, steps, sleep, all these kind of things. The application for us is we really want that data on people and if you're staying in a hospital you get your obs done every two hours, four hours whatever it may be. That's just a snapshot, it's a point in time. What if that was streaming and continuous. Even with these watches, you get little apps that will tell you up to three hours ahead of time, hey you're going to have a heart attack you should go to ED. That's the kind of information that we want.

Now artificial clinical intelligence, so this is Fiona's the walls are listening right. She's right. Clinicians are the highest paid data entry people on the planet and a recent report I read said that the number one thing patients complained about was that the doctor had one eye on them and one on the keyboard. The number one thing doctors complain about was that they had one eye on the patient and one eye on the keyboard. It was exactly the same thing. We have to make these systems better. We have to use these new technologies and turn data into information quickly. What we want to do is we don't want to replace clinical decision making we just want to augment it, make it faster. Give these people back the time so they can spend it with patients.

Alright, now this is a thing that's been bugging me for ages. So when a doctor retires they've got 50 years of knowledge. Where does it go? It leaves the business. How do we capture that knowledge? I've thought quite a lot about this and if you think - if you're in a treatment room and you have a junior doctor, the level of knowledge that's in that room. Now if you call in someone like a consultant like Fiona, the level of knowledge has just gone up and you'll lead to better decisions. But that's a very analogue kind of paper solution where there's one of her. You're very good at being in multiple places at the same time.

How do we make a digital representation of that? Well, you can do that with artificial intelligence. So, part of what Fiona is, is everything she's ever written in all the medical records, things she's entered, photos that are attributed to her, her patients, her research, her publications. How do we get all of that and create a knowledge corpus? Well we can do that but how do we interact with it? Why not have a hologram?

So, what if you were that junior doctor and you could have a hologram of a person that was an expert in their field and you could ask it questions and it would answer based on the best evidence available? But then let's kick it up another level. What if Fiona could interact with digital Fiona? So imagine this, if you had yourself and you had all of that knowledge and you could ask yourself questions, something with a perfect memory of the things that you've done in your working life and you're both learning at the same time. She's freaking out. Right? These are things we can do. It's difficult but you can do it and you're both learning. But why would you stop at Fiona? Why wouldn't you get the top 50 people that are like her and have those instances, ask the person that is the expert in that field just with your voice. Why not ask them a really difficult question and get them to go off, have a discussion about it and come back. Really what that is, is reducing all of that evidence, using fancy maths and coming back with a few options. That is where we need to head.

A final thought, so in my own personal health journey I've been quite unwell for the last four years, awesome now. But this really, really stuck with me. So a healthy person has a thousand wishes and a sick person has only one. Man when I was really crook I would give anything just to be well. Honestly it's - I feel it is my mission to absolutely push that needle forward for patients on that path to recovery every single day with techniques like this. Thanks so much.

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