

## Telehealth

Mohamed Khadra is a Professor of Surgery at Sydney University, Head of Urology at Nepean Hospital. He has post-graduate degrees in Surgery, Computing and Education. His books, [Making the Cut](#) (2007) and [The Patient](#) (2009) (Random House) were both bestsellers. His new book, [Terminal Decline](#), was released in October 2010 (Random House). He has recently co-authored a play, [At What Cost?](#), with David Williamson.

His roles have included being Inaugural Chair of Surgery at the Australian National University, Pro-Vice-Chancellor for Health, Design and Science at the University of Canberra, Professor and Head of School of Rural Health for the University of New South Wales and, most recently, founder of the Institute of Technology Australia, a higher education provider with a social justice mission to take quality education to students in developing countries.

He has won research prizes and accolades, such as the Alumni Medal University of Newcastle, the Noel Newton Medal for Surgical Research and the Alban Gee Prize for research in Urology.

### The impact of computers

'Telehealth' means a lot of things to a lot of people. It probably means something different to a doctor from its meaning to a patient or a lawyer. For us, the overwhelming principle – a bit of a cliché now – is the prediction in about 1965 by Gordon Moore, the CEO of Intel, that the power of computing will double every year. Initially, he said, "[The number of transistors that can be put on a computer chip will double every year](#)". That rule has not changed. In fact, there is recent evidence that it has actually accelerated. That has huge implications for us.

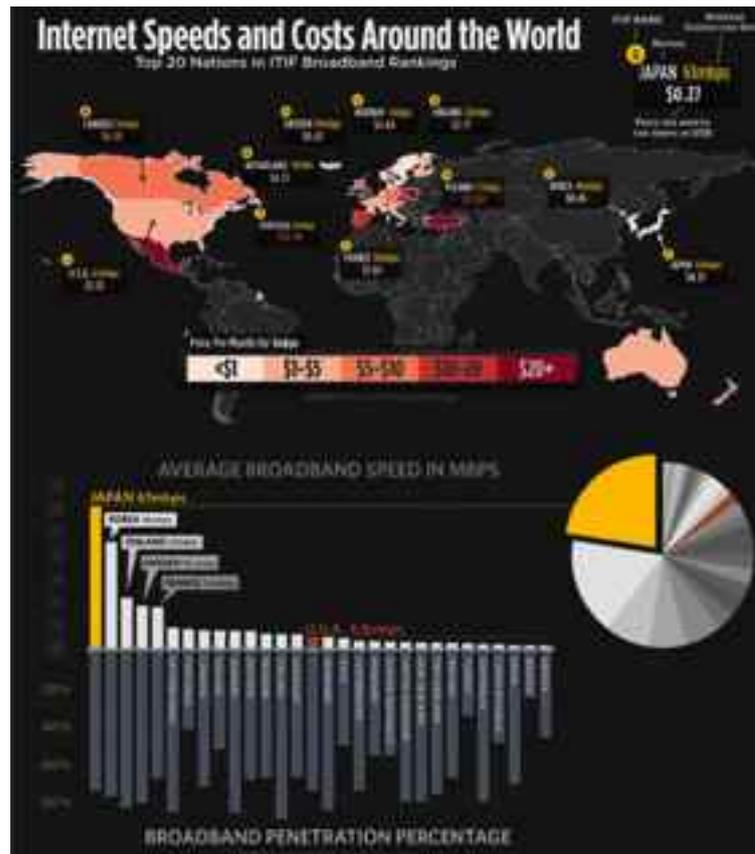
First and foremost, if you look at the speed of computing, at the amount of information available, at power, at storage, even at the pixels on a computer. My iPhone 4S, which I bought last week, has a pixel resolution higher than that of the human retina, and that is going to continue to improve.

### The Internet

Looking at world internet usage, Australia is a very small part. The biggest growth is in Asia and Africa.

WORLD INTERNET USAGE AND POPULATION STATISTICS						
World Regions	Population (2010 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% Population)	Growth 2000-2010	Users % of Table
<a href="#">Africa</a>	1,013,779,050	4,514,400	110,931,700	10.9 %	2,357.3 %	5.6 %
<a href="#">Asia</a>	3,834,792,852	114,304,000	825,094,396	21.5 %	621.8 %	42.0 %
<a href="#">Europe</a>	813,319,511	105,096,093	475,069,448	58.4 %	352.0 %	24.2 %
<a href="#">Middle East</a>	212,336,924	3,284,800	63,240,946	29.8 %	1,825.3 %	3.2 %
<a href="#">North America</a>	344,124,450	108,096,800	266,224,500	77.4 %	146.3 %	13.5 %
<a href="#">Latin America/Caribbean</a>	592,556,972	18,068,919	204,689,836	34.5 %	1,032.8 %	10.4 %
<a href="#">Oceania / Australia</a>	34,700,201	7,620,480	21,263,990	61.3 %	179.0 %	1.1 %
<b>WORLD TOTAL</b>	<b>6,845,609,960</b>	<b>360,985,492</b>	<b>1,966,514,816</b>	<b>28.7 %</b>	<b>444.8 %</b>	<b>100.0 %</b>

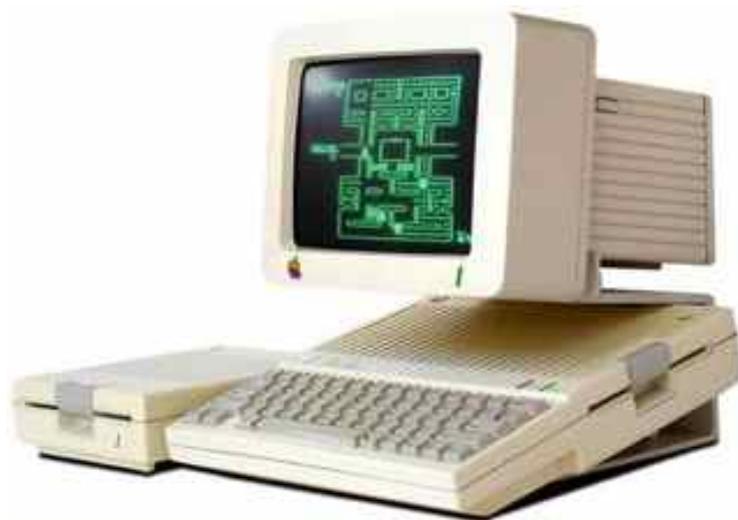
We still are very expensive in terms of procuring broadband.



Will \$43 billion or \$60 billion, or whatever the National Broadband Network costs – will that cure the problem? I don't know. I am not sure that it is the right technology. What I do know is that, for a place like Australia, internet band-width is essential to cure the problems of distance. We cannot continue to charge essentially on distance-based pricing as Telstra does. We are one of the slowest countries if you look at our average Internet bandwidth. Obviously the NBN is attempting to change that.

**Progress in computers**

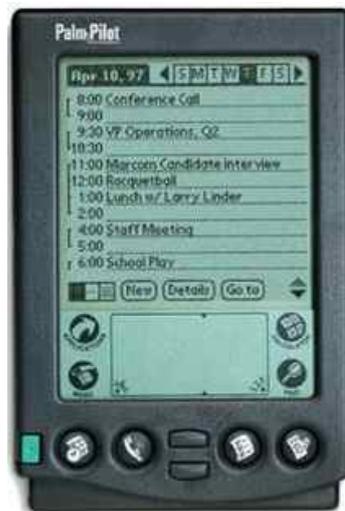
This is my first computer, bought in 1987, an *Apple IIC*. I used to love that computer.



I recently purchased a *MacBook Air*.



I love the new Apples. As soon as they come out, I purchase them. It is the only indulgence I allow myself, but it absolutely powers ahead of anything I have ever bought. This was my first personal assistant, and it was amazing.



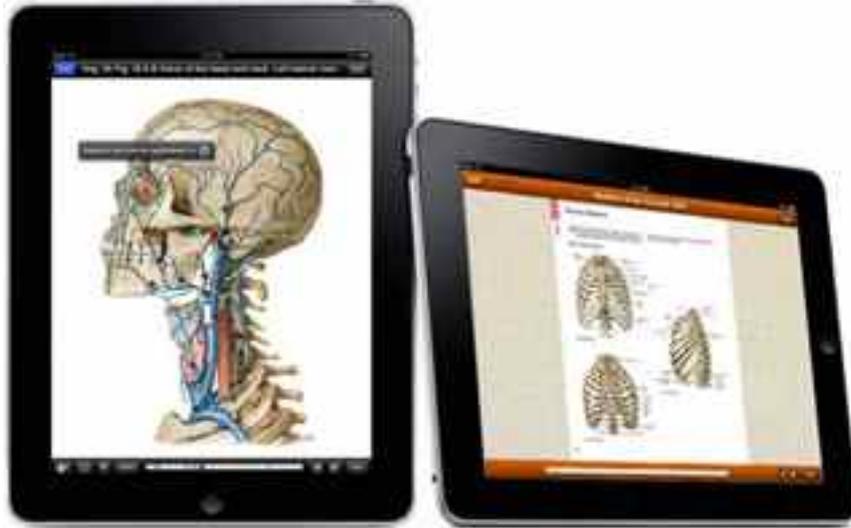
I don't know how many in the audience had one of these, the *Palm Pilot*. Before that, we had the *Apple Newton*, and we all learnt a new language called *Graffiti*, which was completely non-English, but it was an attempt to try to make the computer understand what we were writing. Of course, now on my *iPhone* and your *iPhone* we have the greatest library that has ever been known by man on this earth.



The library of Alexandria, the Bosnian library, all of that is about three or four key strokes away from me every time I stand here – huge changes.

### **The iPad**

The iPad has brought complete changes to how we do medicine, how we treat patients. If I had to give this talk 20 years ago I would be in the stacks of the Fisher Library, looking up various journals.



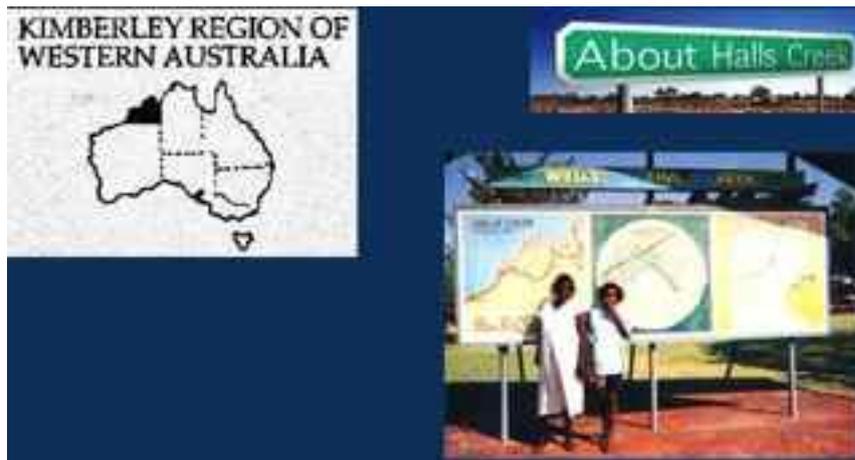
Now, when the patient sits in front of me and says they are on *Plavix*, and I think, "What is *Plavix* and how does it work." My fingers go straight to Google while the patient is sitting in front of me. What is also the case is that they are looking me up as well. Almost 70 per cent of my patients have Googled me when they have seen me. I am sure the same applies to a lawyer. I wouldn't go to a lawyer I hadn't Googled.



Fundamentally, this must lead to new models of care. The old model of "I go to my GP, the GP sends me to a specialist, I go to the hospital" just has to change because of these technological changes.

## Early telehealth

It is fair to say that the first instance of telehealth that is known around the world occurred right here in a place called Halls Creek.



A lady was giving birth and having quite profound difficulties. Using the bush telegraph, they Morse-coded a message back to Darwin, where an obstetrician gave instructions on how to get her out of trouble. This is the first reported instance of telehealth. Of course, that has changed considerably.

## A telehealth cubicle

This is the virtual intensive care unit which we use at Nepean Hospital and it is the first instance of its kind in the world.



What happens at Nepean Hospital is we have a telehealth cubicle – a room with eight channels broadcast to us from Lithgow Hospital and from the Blue Mountains Hospital. If somebody is brought in quite unwell after a road crash or other trauma, eight channels of information are fed back from Lithgow directly to a specialist at Nepean Hospital. The specialist at Lithgow now has another pair of hands, eyes and ears looking over their shoulder and giving advice. In fact the x-rays, everything, can be broadcast back to Nepean support. This type of model of course is starting to be found everywhere.

## Telehealth in the home

When people ask what we consider telehealth is, we think of a patient somewhere, a video screen with the patient half-seen, half-heard and somebody else somewhere else, but really the enormous breadth of what we mean by that word is only now starting to be known.

This is a lady sitting at home, she has been discharged from hospital. You can go to Intel and buy one of these devices. We are using them now at Penrith and they are being used in Melbourne and throughout Victoria. This device costs less than a couple of thousand dollars and it can be re-used. It is often connected to wi-fi. The lady can take her blood pressure and pulse rate. She can press a button and speak to somebody, and actually look at them. They can look at her. They can assess her

temperature. They can see whether she is walking all right and make a decision. If she doesn't report in on a daily basis, a decision is made to send out an ambulance and get her to hospital, depending on the parameters coming in. She is at home, the doctors and nurses looking after her are somewhere else and they are monitoring her from a distance.

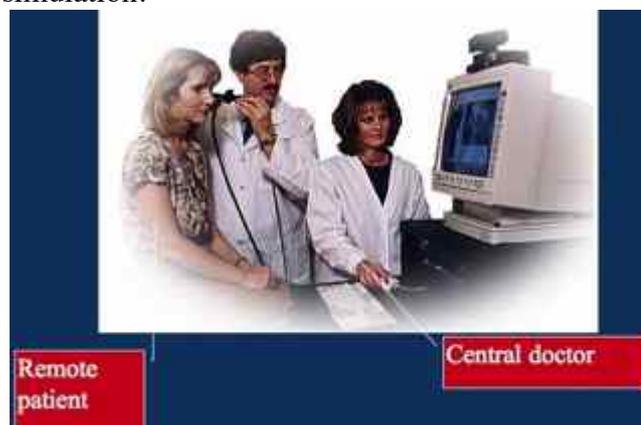


### Telesurgery

Pat Cregan, a surgeon, is very interested in this type of thing. Pat did the first telesurgery case in Australia, from a conference (I think at Darling Harbour) across to Penrith. Of course, the American military use this type of device constantly.



Currently, if you wanted a robotic prostatectomy you go to St Vincents. It is actually madness, I always think, to have it in a hospital in the city, because the real use of robotics or telesurgery is in trying to take high-end surgery to people far away. So we should have robots in Dubbo and Broken Hill and Orange and patients could be operated on there through specialists at central hubs. That is the dream. The NBN might make that available, and of course even the opportunity for virtual surgery and for these things being used in simulation.



All these slides I am showing you aren't science fiction. This is what is happening now. We haven't actually got to the future.

### **The iPhone**

The iPhone has really revolutionised Medicine. To those of you who have androids etc, my condolences, but the iPhone has made huge differences to how we practise Medicine. This is one of my favourite apps.



No matter where you are in the world, you point it at the picture in front of you and it tells you how good the bars are in the area. It actually tells you how cheap the drinks are as well. Use that technology in medicine and we will continue to change.

### **The costs**

The problem is that all of this costs money and no matter how many arguments we try to have with the NSW Health system about the fact that these costs, these investments, actually eventually save money, it is very difficult to make that statement. Not only are the costs going up substantially, but we are, by the way, just about to hit what is called a 'tsunami' of medical students.

In 2000, we had something like 1,500 medical students graduating. We now have double that number. In about two years time, next year, we will be graduating double the number of medical students who are then going to feed into how many doctors need training, and of course simulation is going to be another use of telehealth to try and train some of these people.

### **Simulation**

Increasingly, patients are saying, "You know what, I don't want to be your guinea pig. You go and learn somewhere else and then come and see me." I think simulation is going to be one of those things.

Kahlil Gibran says:

*Your children are not your children. They are the sons and daughters of life's longing for itself. .... You may house their bodies but not their souls, for their souls dwell in the kingdom of tomorrow, which you cannot visit, not even in your dreams.*

This is how as a teacher like myself and some of the doctors here feel.

## Communication

These technological changes are happening and my medical students look like this.



They are adopting Facebook and Twitter and twitting each other all the time. Not only they, but also the patients. are adopting this social medium. There is this concept of smart patients, e-patients, patients who hold me to account, who have actually looked up all of the treatments that are available for any condition. For example, consider prostate cancer: most of my patients with prostate cancer actually know what the right thing is to do. They have looked it up. Not only that, but they have formed social networking communities where they compare and contrast the results of surgeons, of various treatments, of new modalities of treatments. So this idea of smart patients is something we aren't at all equipped to handle.

### Medical risk

Health care remains a risky undertaking. I can't give a patient a Panadol without some risk. No matter what the regulatory, statutory and bureaucratic regulations, ultimate control is at the end of my scalpel. While there can be consequences later, there is still that ultimate devolved control right at the heart of it. Again, spending in health tends to be emotionally based. So perhaps one needs to ask: "Are we addressing the right types of questions?"

In my play, *At Any Cost* with David Williamson, we asked that question – is it right that we have a health system that spends about 75 per cent of its budget on the last six months of life, about 42 per cent of its budget on the last month of life, when there are so many other things that increase quality of life?

### The role of bureaucracy

In closing, I want to have my usual dig at bureaucracy. I have an antipathy towards bureaucracy. With any technology, we have research, development and commercialisation. In the past what has perhaps happened is that community ethics tend to be assessed at a time when research is being assessed. By the time we get to development, we are really talking about community impact – and by the time we get to commercialisation we are talking about how acceptable the technology is, about community acceptance and uptake.

The problem with Moore's law is that it has propelled the technology development cycle faster than the cycle of ethics, community acceptance and community sensibility. As we expand and accelerate those technological changes, we start to get to a circumstance talked about by [Ray Kurzweil](#), who runs something called the [Singularity University](#). What Ray says, and what a lot of people now believe, is that within the next 30-40 years we are going to slowly meld human beings and computers together. That is, computers will actually be physical parts of human beings.

### **Conclusion**

We are about 10 to 20 years away from a computer capable of actually changing its own code, of saying, "My code is no longer good enough. I need to rewrite my code", and then doing it. These are huge changes. The problem is that in most of our hospitals we are still running with outdated computers and systems and many of the things I have talked to you about are being done by enthusiasts and others like myself.

