

## Electronic Health Records

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I must declare a conflict of interest: I hold shares in what is probably the only organisation standing to benefit from the introduction of an Australian electronic health record - Telstra, but sadly, I am not the majority shareholder.

### Informing clinical judgements

I will open with a quote from George Halvorson, Chair and CEO of [Kaiser Permanente](#), a health maintenance organisation (HMO) in the United States. In May this year he said, “Doctors should have all of the information about all of their patients all the time”. Of course, that is arrant nonsense. We all live with uncertainty. We professionals sometimes make our judgments and form our opinions on very limited information; in Medicine, foot-of-the-bed diagnosis, or ‘spot’ diagnosis. Part of our professionalism is to make judgments and form opinions on the available evidence.

A change in this kind of attitude doesn't come easily or naturally. It certainly didn't in the era of the 6" x 4" cards commonly used by GPs when they first entered general practice, to record clinical information, and commonly, billing information.

### Medical records over the decades

The 6x4 card was followed, in the early 1980s, by the [Royal Australian College of General Practitioners A4 record](#), which was succeeded in turn, in the late 1980s, by the desktop computer, using early DOS-based clinical records. Nowadays, we face the prospect of the Electronic Health Record (EHR), sitting on a dispersed network and generating the bread-and butter income of people like Leanne O'Shannessy, our next speaker.

The 6x4 card had few special features. Initially it prompted the health record held by the practitioner, for the health record, in those days, was held in our heads; with the card itself but an *aide memoire*.

As the College record came along, it started to provide a progressive and longitudinal history because it tended to be used by more than one GP; we therefore had to write more than we did on our 6x4s and it also gave us some capacity to manage information. We started to file patients' family histories, to put pathology and radiology reports in order, and so on.

### The electronic record and its relation to quality

When clinical software eventuated, the patient history became much more complex than a mere *aide memoire*. In that era, it was more likely that another doctor would be using the record the next time the patient presented. In fact, it wasn't only doctors who had access to this information; other clinicians accessing this information included practice nurses and other allied health professionals. Perhaps the most frequent users of the clinical software record today are practice clerical staff.

Another function of the clinical record is, of course, clinical information management. I want to emphasise this because [McGregor found in 2006](#)<sup>i</sup> that, in rural and regional Australia, clinical information systems were used mostly for business purposes: making appointments, billing etc. The next most frequent focus for the record was prescribing, but the main use of clinical information systems, in general practice anyway, remained business focussed.

Other useful functions of clinical software programs include decision-support and recall and reminder systems.

[Linder et al](#)<sup>ii</sup>, just last year, found, however, that the use of desktop clinical software programs, which form the basis of most distributed EHRs, was unrelated to quality of patient care. In 14 out of their 17 quality indicators, there was no significant difference in patient outcomes between those doctors with access to clinical software packages and those without. Quality of patient care improved for two of the remaining three indicators; for the third it declined. As most EHRs are derived from information held in clinical desktop systems ('legacy systems'), there would appear to be a tenuous relationship between the EHR and improvement in patient outcomes.

### **Deriving the Electronic Health Record**

The EHR is very much about replicating patient history - about replicating information recorded elsewhere. That history might be presented in one of three different formats. The commonest is the event summary. Something happens to a patient and is recorded as a summary event. It might be a discharge from hospital; it might be a diagnosis; it might be a presentation to an emergency department or a visit to community health. So we are forming an aggregate of summaries about a patient. The total sum of these, of course, looks nothing like the patient. But at least there is some information.

Some EHRs actually pull text out of existing recording systems, in which case we have quite detailed information about patients. But it is not comprehensive. The comprehensive records are those where organisations are able to enter information *carte blanche* and where everybody is working off the single system. That doesn't exist in Australia at the moment beyond the private health insurance industry.

### **EHR in Australia**

As it is planned for Australia, (here it is called [Health Connect](#)) the EHR will provide an event summary system, bridging not only clinicians and administrators, but also organisations.

So if you are a clinician entering information into a record, your audience has metamorphosed from being yourself reading the 6x4 card in the 1960s, to a potential audience of thousands including clinicians, administrators and lawyers. Authoring for a potential audience of thousands, instead of authoring for an audience of one, might well alter what we decide to record in the way of clinical detail.

Other functions being asked of the EHR, but not yet determined, include data aggregation for research, for performing quality audits, or for determining where services should most appropriately be delivered to specific patient populations. They are all intelligent uses of data. But the EHR represents the lowest level of intelligent use of data. It is simply replicating it, taking data from one location and transmitting it somewhere else.

### **Triggering the use of an EHR**

Why would somebody use an EHR on that meagre basis? I suggest that the trigger to use the EHR would be in response to the following statement, "I don't know something about this patient, but somebody else might have known, or thought that they did, at some other time in some other place, and it is worth my while to find out".

#### **"I don't know"**

So let's break this scenario down a little. Let's have a look at that first phrase "I don't know". It would be interesting for those clinicians amongst us to see how often that scenario actually occurs in your clinical practice – that you actually don't know and that you need further information to find out.

The suggestion that somebody else might have 'known' is an interesting one. Information exists as a spectrum. Quantitative data sit at one end, for example, a haemoglobin result – a result that sits around a tight mean with a tight confidence interval. At the other end of the spectrum are qualitative data, the clinical 'opinion', a picture formed by another clinician in another setting. The value that you place on the qualitative data is related to your professional knowledge of that clinician and his/her clinical acumen, the value you place on quantitative data is based on scientific standardised testing of large populations.

### **“Is it worth my while?”**

Back in 1994, [Slawson and Shaughnessy](#)<sup>iii</sup> tried to tease out what actually determines whether or not it is worthwhile gaining access to clinical information. They termed the phrase, ‘information mastery’. Information mastery, they argued, is your propensity to access information authored by somebody else and available elsewhere, and is the product of its relevance (R) and its validity (V) divided by the amount of work (W) required to obtain that information (ie R.V/W). The amount of work is crucial fourteen years later, because we now live in a much more time-pressured world; the EHR might live or die by its ability to provide information rapidly.

### **Does EHR work?**

So where does it, in fact, work? Let's go to the land of the free, the United States of America, and look at Kaiser Permanente. In May of this year, Kaiser released their EHR for 8.6 million customers, at a cost of \$4 billion capital investment – \$465.11 invested in each customer. Interestingly, and perhaps appropriately, this was not announced in a health informatics journal, but in the [Washington Business Journal](#).

The [Veterans Health Information System](#) (VISTA) has been working since 1999. Having been implemented for over nine years, it has undergone a much more rigorous embedding process. KP and Vista represent two instances of EHRs which have worked.

Why have they been successful? These are two autonomous organisations, particularly Kaiser Permanente. Against this background, the EHR is the clinical face of a multi-faceted system which might collect data for essential organisational purposes; for financial purposes to keep the organisation on budget; to audit the quality of service delivery; to audit customer service entitlements and to audit clinicians’ adherence to known protocols of care, including medication management. Many of these functions improve organisational profitability. Most importantly, autonomy allows for automatic patient enrolment. In other words, once a patient applies to Kaiser Permanente for membership, their details go straight onto the EHR. In most other systems, it is generally the clinician who has to enrol the patient and code their data.

### **Where does EHR not work?**

Where doesn't it work? [An article in the BMJ](#) recounts the sad story of the failed implementation of an EHR in 2005 for 250,000 Hawaiian residents. The subsequent evaluation demonstrated that the decision to go ahead with the EHR was not made in consultation with the local clinicians, nor were they involved in the design and, at the end of the day, clinical productivity actually declined<sup>iv</sup>.

In the early days of any EHR, clinical load increases as clinicians enter data, learn new technical skills and experience new work paradigms – an enormous hump to get over before there is a functional system. And then, the EHR itself might or might not work. The implementation phase is the crucial part of the EHR, not its maintenance phase.

The evaluators alleged poor leadership and suggested that there was a clinician culture which says, “This has to work for our purposes, not for your purposes”; they made the delightful observation, “culture eats strategy for breakfast”.

They proposed two solutions: the first was to have ‘clinician champions’ in order to achieve ‘ownership’ by the clinicians. Clinician ownership is obviously essential for the design and implementation of an EHR. [The literature suggests](#) that the clinician champions ought not also be health informaticians, because informaticians may be over-enthusiastic about the implementation of EHRs<sup>v</sup>.

Another place where it didn't work was the province of Limpopo in the north of South Africa, which, back in 1994 was not quite as xenophobic as it is today. At that time, 134 million rand was invested in a two-year EHR project – the biggest investment in electronic health funding in Africa. It consumed 2.5% of the South African health and welfare budget. A hospital-based intervention, [it was a total failure](#), with poor implementation and poor change management – “culture ate strategy” yet

again, and the clinician workload actually increased. At the end of the day, Limpopo was left with a non-functioning EHR. Again, there was no improvement in health outcomes<sup>v</sup>.

### **Why hasn't EHR worked in these instances?**

Common themes include poor design, poor implementation and data which might not be relevant to clinicians. The data might not be valid for the clinicians or might increase their workload. It certainly doesn't, at least initially, reduce their workload. [It has been reported](#) that a critical mass of information and a critical number of patients are required before a clinician will actually use an EHR<sup>vi</sup>. And, of course, patient enrolment stands as an enormous barrier to participation<sup>vii</sup>.

### **Australian experience of EHR**

Have we done any better in Australia than in Hawaii or Limpopo? Health Connect is our national strategy. In Australia, as we all know, we do pilot studies. We have piloted EHRs in the Northern Territory, Queensland, Tasmania, Victoria, South Australia and New South Wales. The Northern Territory trial looks good; and there are substantial reasons why it should. Many patients do not have a culture centred around health. When they do visit a doctor, which is uncommon in itself, they do not traditionally take their medical record with them in their heads. They also tend to travel vast distances. It is a long way from Daly Waters up to Darwin. Widespread access to clinical data therefore makes sense. It also tends to work well because it is managed and funded centrally by the NT Government.

North Queensland is an interesting case because it was functioning quite well until Queensland Health decided that they weren't comfortable sharing all of hospital data with clinicians outside their system and stopped most of the electronic transfer of data<sup>viii</sup>.

Ballarat and Hobart stand out as interesting sites because the doctors eventually gave up enrolling patients; enrolment was cast onto the project staff who actually had to door-knock to get patients into the system<sup>ix</sup>.

South Australia had an EHR centred around care planning; the care plans, done by GPs, actually declined in number while the GPs reported that their workload had actually increased<sup>x</sup>.

It works in the Northern Rivers. If you live in Nimbin, and if your mind is clouded or confused by whatever you do in Nimbin, and you want to see a GP in Lismore, yes, you can have your electronic record picked up in Lismore from your GP in Nimbin.

### **EHR in NSW**

The NSW version of Health Connect, [Health e-Connect](#), works effectively at two sites, Maitland and Westmead. The Maitland model is pilot-focussed and expanding slowly. They spent three years and most of their \$9.4 million recruiting 9,000 patients<sup>xi</sup>. That was fairly expensive, but almost fortnightly, practices are coming on line, new community health centres are coming on line, and with each practice come several thousand patients. It is an interesting model to watch grow out from there. It makes one wonder when the Maitland model expands north to meet the Northern Rivers model coming south, what will happen at that watershed? That, of course, is the problem with regionalised medical records.

In summary, why has the international community done so badly? Primarily because we have never specified what we want EHR to do. It is almost certainly not related to quality, but we so often mention quality. We know it is not working too efficiently, but often we see that qualifying word 'efficiently' used with respect to EHR.

We don't yet understand what information we need to make our work better, easier or whatever. We have relied, particularly in New South Wales, on an EHR to bridge the 'silos' of information which exist within the health sector, including community health, hospitals and GPs. However, only infrastructure reform can overcome silos. A communication system cannot and does not do that. And there has been a failure, almost universally, to respect clinicians' input into the design and implementation phases.

May I suggest that, in view of the fact that it is likely that we will spend more than Kaiser spent (\$450 per patient) on their EHR, there is a better bet for Australia?

### The real issue of quality of care

A study from the New England Journal of Medicine<sup>xiii</sup> looked at the 98,649 times that indicator eligibilities were met for patient 'best care'. On about 55% of occasions, patients were likely to receive recommended care, or in other words, on 45% of occasions you are not likely to get recommended care. There is little more chance than the flip of a coin as to whether or not you will get correct care. Two-thirds of patients will get the right medication for their illness, and two thirds will get immunisations appropriately – over here we're about 91 percent.

**Table 3. Adherence to Quality Indicators, Overall and According to Type of Care and Function.**

Variable	No. of Indicators	No. of Participants Eligible	Total No. of Times Indicator Eligibility Was Met	Percentage of Recommended Care Received (95% CI) <sup>a</sup>
Overall care	439	6712	98,649	54.9 (54.3–55.5)
Type of care				
Preventive	38	6711	55,268	54.9 (54.2–55.6)
Acute	153	2318	19,815	53.5 (52.0–55.0)
Chronic	248	3387	23,566	56.1 (55.0–57.3)
Function				
Screening	41	6711	39,486	52.2 (51.3–53.2)
Diagnosis	178	6217	29,679	55.7 (54.5–56.8)
Treatment	173	6707	23,019	57.5 (56.5–58.4)
Follow-up	47	2413	6,465	58.5 (56.6–60.4)

\* CI denotes confidence interval.

**Table 4. Adherence to Quality Indicators, According to Mode.**

Mode	No. of Indicators	No. of Participants Eligible	Total No. of Times Indicator Eligibility Was Met	Percentage of Recommended Care Received (95% CI) <sup>a</sup>
Encounter or other intervention	30	2843	4,329	73.4 (71.5–75.3)
Medication	95	2964	8,389	68.6 (67.0–70.3)
Immunization	8	6700	9,748	65.7 (64.3–67.0)
Physical examination	67	6217	19,428	62.9 (61.8–64.0)
Laboratory testing or radiography	131	5352	18,605	61.7 (60.4–63.0)
Surgery	21	244	312	56.9 (51.3–62.5)
History	64	6711	36,032	43.4 (42.4–44.3)
Counseling or education	23	2838	3,806	18.3 (16.7–20.0)

\* CI denotes confidence interval. All pairwise differences were statistically significant at  $P < 0.001$  except those between medication and encounter or other intervention ( $P = 0.02$ ), physical examination and immunization ( $P = 0.001$ ), surgery and immunization ( $P = 0.004$ ), and surgery and physical examination ( $P = 0.05$ ). The difference between surgery and laboratory testing or radiography was not significant ( $P = 0.39$ ).

We see somewhere between 45% and 33% of patients not receiving quality of care; yet we are investing billions of dollars in developing an EHR with no evidence that it will improve the quality of care.

What matters are not the technical issues about EHR, but the ethical debate: is this the appropriate way for us, as a community, to expend the dollars that we intend to expend on replicating information at many points where it might, or might not, be needed?

### **Concluding remarks**

Forty-five years ago, Karl Popper said, “What we should do, I suggest, is to give up the idea of ultimate sources of knowledge, and admit that all knowledge is human but it is mixed with our errors, our prejudices, our dreams and our hopes.”<sup>xiii</sup>. In closing, let me suggest that our view of the EHR should most appropriately be filtered through the warning inherent in Popper’s insight.

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<sup>i</sup> McGregor R, Hyland P, Harvie C, Lee,B, Dalley A, Ramu S. 2006. Benefits of ICT adoption and use in regional general medical practices: a pilot study, *Health Information Management*, Vol 35, No 3: 23-35

<sup>ii</sup> Linder JA, Bates DW, Middleton B, Stafford RS. 2007. Electronic health record use and the quality of ambulatory care in the United States, *Arch Intern Med*, 167, No 13: 1400-5

<sup>iii</sup> Slawson DC and Shaughnessy AF. 1994. Becoming an information master: a guidebook to the medical information jungle, *J Fam Pract*, 39: 489-99.

<sup>iv</sup> Teasdale S. 2005. Commentary: Trouble in paradise – learning from Hawaii, *BMJ*, 331: 3 December 2005:1316

<sup>v</sup> Littlejohns P, Wyatt J, Garvican L. 2003. Evaluating computerised health information systems: hard lessons still to be learnt, *BMJ*, Vol 326; 19 April 2003: 860-863

<sup>v</sup> Littlejohns P, Wyatt J, Garvican L. *ibidem*

<sup>vi</sup> HealthConnect Project Overview, p115

<sup>vii</sup> Commonwealth of Australia. 2005. [Lessons learned from the Mediconnect field test and health connect trials](#): 8

<sup>viii</sup> *ibidem* 24,25

<sup>ix</sup> *ibidem* 26

<sup>x</sup> Gadzhanova S, Kalucy E, Reed R. 2007, [Final Evaluation Report Health Connect SA Trial of Care](#), Flinders University:3

<sup>xi</sup> Gedda R. 2004. [NSW electronic health records system goes live](#), *Computerworld.com.au*, accessed 28.05.2008

<sup>xii</sup> McGlynn E et al. [The Quality of Health Care Delivered to Adults in the United States](#), *N Engl J Med* 2003;348:2635-2645

<sup>xiii</sup> Popper K. [Conjectures and Refutations: The Growth of Scientific Knowledge](#), 1962, re-published 2002, Routledge:39