Decision Support – a little history

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In the beginning, way back when the Health Informatics Society of Australia (HISA) was in its formation, one of the early luminaries in clinical informatics was consultant physician Dr Terry Hannan (Immediate Past President, Australian College of Health informatics). As an early evangelist in Clinical Decision Support Systems (CDSS) concepts he regularly delivered his sermon that articulated the huge challenge of information recall faced by doctors in a patient consult and particularly about the limits of the human brain, even bright doctor ones. At the time, Terry was focussed on the unacceptable prevalence of medication accidents in hospitals, and clinical practice generally around our world.

A few years later, in 1997, Gary Kasparov, unbeaten world chess master, took on IBM's supercomputer, Deep Blue, in a chess tournament and lost. Deep Blue, IBM's second generation of chess maestros came to the contest with a computer that not only had great computational power but it came equipped with "knowledge of the game" said the IBM gurus behind this success. Clinical informatics probably did not need this example to convince humans that computers had a role to play in decision support in health, but the potential for computer-based knowledge management in healthcare was a sleeping giant starting to stir.

I am sure that Terry would acknowledge that, with the Australian prevalence of clinical desktop computers in general practice and in pharmacy now in use, that the potential for medication errors causing medical misadventure (iatrogenic disease) has been reduced, but by no means eliminated.

By 2002, the Department of Health and Ageing had begun more serious investment in CDSS and had established the National Electronic Decision Support Taskforce[1]. They began funding projects to understand how computer-based decision support could be useful. A centrepiece of that work, which traversed several years, was the Integrated Care Program which, using Asthma management as an example, sought to find out what components of computer-based information would be useful to general practice. Easy access to educational material for patients and providers, and simple reminders, came up trumps. That taskforce also utilised a general classification system for the levels of clinical decision support that had been devised by the NHIMAC and the National Institute of Clinical Studies[2].

In 2004, The National Institute of Clinical Studies published an exhaustive report on the barriers to the use of decision support but it was in the following year that Kensaku Kawamoto[3] and colleagues provided the first real guidance to creators of CDSS on approaches that could make a difference. They screened the world literature on the topic and admitted 88 papers covering 71 randomised control trials into their investigation. They reported that in 68% of trials of CDSS there was significant improvement in clinical practice, but, more importantly, they identified a series of attributes that defined the efficacy of a CDSS. The outstanding attributes were systems that:

- provided decision support automatically as part of clinician workflow;
- provided decision support at the time and location of decision-making;
- provided actionable recommendations; and
- were computer-based.

Of particular interest to providers of CDSS is that across all 71 trials, 75% reported successful use by clinicians if the CDSS was provided automatically as part of clinician workflow. This means we must have

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John has had a career interest in electronic clinical decision support systems with a particular focus around systems that assist the prevention and management of chronic disease. Over the last decade his company, Pen Computer Systems Pty Ltd has been extensively engaged in projects that test the concepts of CDSS and the implementation of these using systems underpinned by emerging NEHTA standards and terminology choices.

close consultation with clinical providers to make serious headway as we build the systems.

To go back to another recollection from the Terry Hannan ministry, there was another critical success factor. "If the information presented to the clinician was not available within 1 second (or 2) in a clinical consult, it would not be used".

In 2010, we have reached a stage in the evolution of CDSS where there is now a plethora of systems delivering Type 1 and Type 2 decision support with a sprinkling of systems that consider the patient record status and approach Type 3 (RACGP eRedbook).

Types of Clinical Decision Support Systems[1]

Type 1: Provides categorised information that requires further processing and analysis by users before a decision can be made, e.g. accessing an information sheet from a clinical desktop icon.

Type 2: Presents the clinician with trends of patients' changing clinical status and alerts clinicians to out-of-range assessment results and intervention strategies. Clinicians are prompted to review information related to the alerts before arriving at a clinical decision, e.g. notification that the patient is overdue for an immunisation.

Type 3: Uses deductive inference engines to operate on a specific knowledge base and automatically generates diagnostic or intervention recommendations based on changing patient clinical condition, with the knowledge and inference engines stored in the knowledge base, e.g. delivery of guideline information from the web into a clinical consult informed by the patient record.

Type 4: Uses more complex knowledge management and inference models such as case management reasoning, neural networks, or statistical discrimination analysis to perform outcome or prognostic predictions. Such systems possess self-learning capabilities and use fuzzy set formalism and similarity measures or confidence level computation as mechanisms to deal intelligently and accurately with uncertainty, e.g. an artificial intelligence system that progressively learns about a clinical concept and becomes more accurate as it assimilates the knowledge.

Some of our universities are now investing in artificial intelligence solutions that are at Type 4. One of those institutions is the Centre for Health Informatics at University of NSW but its leader, Professor Enrico Coiera[4], says there is no reason to wait for these new systems. "There is plenty of evidence," he says "that shows that simple reminders, drug alerts, and simple lookups all help to improve clinical practice".

From an implementation perspective, there are challenges that remain for those that create knowledge resources. In the years immediately before his untimely passing, Professor Branko Cesnik of Monash University spent much of his time trying to convince the clinical guideline creators that they must now think of the way in which their knowledge will be delivered into clinical practice and, if it is to be part of a clinician workflow, its technical construct must be in a computable form. It is only now that we are starting to see that vision acquiring the consideration that it so richly deserves.

As we aspire to implement more sophisticated CDSS that recognise changing patient health status, this author's belief is that the emphasis will shift to activities associated with a focus on the improvement of the quality and completeness of clinical data in all patient information systems. This, and the requirement for secure, patient-consented, sharing of clinical information, will deliver the environment that will support the more widespread implementation of effective CDSS that will make a difference in the patient consultation of the future.

References

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