PHCM9129
Prevention and
Management of
Chronic Disease

Module 7

Information systems and decision support

Basic concepts

This section is about information and decision support systems in the prevention and management of chronic disease both globally and in Australia. We describe each of these elements, the evidence that they improve the quality of care and outcomes and their implementation in primary health care practice.

Learning objectives

By the end of this section you will be able to:

- Describe the desirable attributes of information systems that underpin chronic disease care and their impact on quality of care
- Describe the role and impact of decision support systems in chronic disease prevention and management
- Discuss current developments of integrated information systems for chronic disease in Australia

Health information technology can be defined as the application of information processing to retrieve, store, share and use health information, data, knowledge for communication and decision making [1]. It includes electronic records, web and mobile apps and telehealth.

Chronically ill patients need good care coordination as they 'journey' between care settings and a range of secondary and primary health-care professionals. Dis-continuities in information sharing often occur when patients move between organisations and settings of care. Effective, confidential and secure sharing of health information between primary health care professionals and organisations, and between primary health care and the wider health care system is important in order to achieve improved safety and quality of care.

Information technology can be used to support other elements of the chronic care model including clinical decisions and self-management. It can also be used to provide care in a more accessible way (especially in rural and remote areas and for patients with limited mobility) and to support practice or 'panel' management and outreach through telehealth.

7.1 Electronic health records

Electronic health records (EHR) provide a tool for ensuring continuity of information between episodes of care or encounters and between providers as part of team or coordinated care. They can also support establishment of chronic disease registers and 'panel management' of the population using the practice or service.

Connected or shared information systems and inter-operability standards can create opportunities for greater team communication and thus informational continuity. Well-designed clinical information systems (CIS) or EHR serve as the organising structure for integrated care delivery and to monitor the quality, impacts and outcomes of care can improve cost-efficiencies in information management. Conceptually, we use the term 'CIS' to mean an 'EHR with embedded clinical decision support applications' such as automated patient registries, reminder and/or recall functions, opportunistic prompts about preventive tasks due or potential drug interactions in specific patients. When information in the EHR is structured and coded, rather than free text, in line with semantic inter-operability standards, the information can be easily used by automated clinical decision support applications that work off the information in the EHR. Systematic reviews of CIS which allowed order entry by the care team, are specific to disease, and support longitudinal care planning; and population-based reporting and feedback (such as reporting unfinished care plan elements) have been shown to be effective in the provision of chronic disease care [2].

However, while almost 96% of Australian general practitioners are using computers for clinical activity, many primary health care practitioners and many consultant medical specialists lack suitable systems [3]. Most hospitals have bespoke legacy systems, which raises significant issues with information sharing across the patient's journey in the health system. A major issue is the quality of data held in these CIS and whether they are fit for primary clinical purposes or secondary research purposes [4].

The other significant issue is patient and consumer engagement in the development, implementation and use of CIS. This is particularly important as self-management is a vital and effective component of the chronic care model. The Australian National eHealth Strategy is currently focused on the My Health Record (Figure 1) [5]. The underlying concept is to place the individual at the centre of their own healthcare by empowering them to control access to important health information, when and where it is needed, by themselves and their healthcare providers.

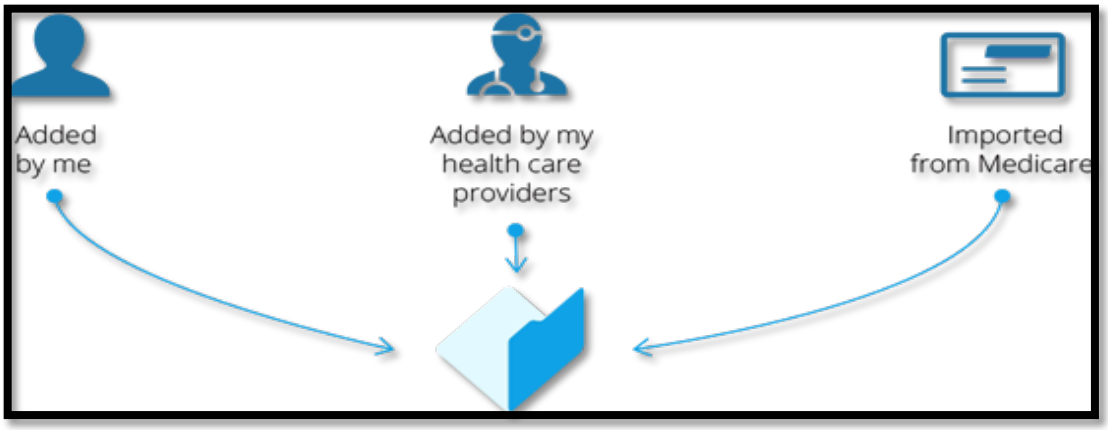

Figure 1: The concept of My Health Record

Information systems are also important in supporting sharing of information between specialist services and primary care in order to support models of shared care. This may take the form of a web-based care plan (Figure 2).

7.2 Guidelines and decision support

Evidence based guidelines developed specifically for use in primary health care can help ensure that care across providers is consistent and directed towards achieving health outcomes. They can provide an important basis for shared care planning by the primary health care team and for shared care with acute and specialist services. However, if no information systems, using consistent standards for technical and semantic interoperability, are in place to monitor quality and safety indicators, the potential for errors, both expected and unexpected, always exist.

Systematic reviews have reported on the effectiveness of computerised decision support systems for the management of diabetes and cardiovascular disease. One such tool is illustrated in Figure 3. These have demonstrated improvement in process outcomes such as adherence to disease specific guidelines for hypertension [6], diabetes and cardiovascular disease [7] However there is limited evidence for their impact on clinical or health outcomes [8, 9].

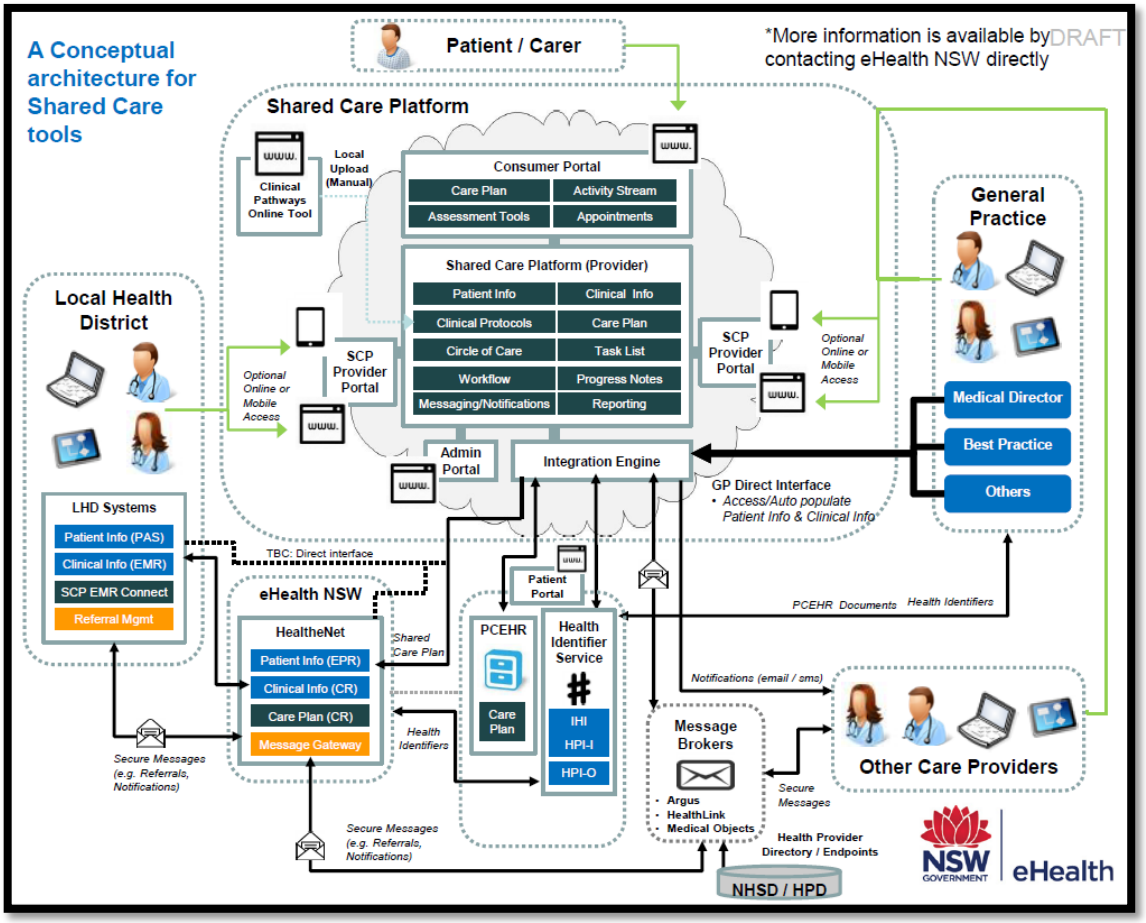

Figure 2: NSW Health conceptual IT architecture for shared care

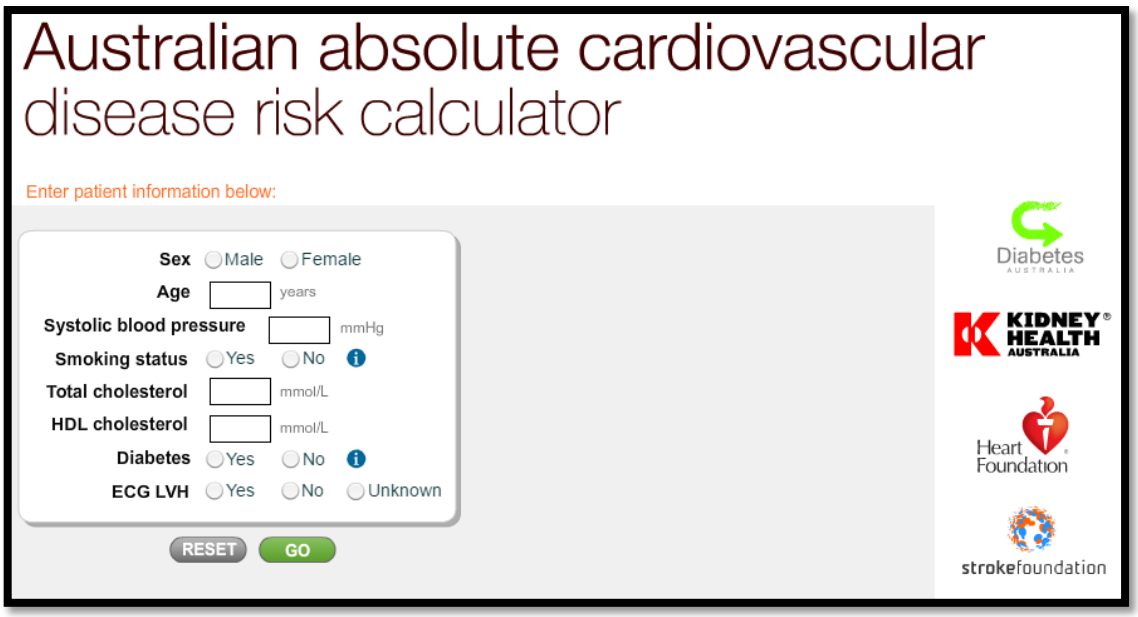

Figure 3: Australian Cardiovascular Risk Calculator

There were several characteristics of clinical information system interventions that seemed to increase the effectiveness on provider or patient outcomes. Many computer systems used disease specific guidelines to prompt care; automated prompts were found to be more effective than prompts that the required the health professional to activate manually. On the other hand, injudicious application of standardised guidelines across the range of patients can cause harm.

An analysis of 70 randomised controlled trials identified four features strongly associated with a decision support system's ability to improve clinical practice: (*a*) decision support provided automatically as part of clinician workflow, (*b*) decision support delivered at the time and location of decision making, (*c*) actionable recommendations provided, and (*d*) computer based [7].

7.3 mHealth, eHealth & digital health

eHealth is defined as healthcare information, communication or services provided electronically via the Internet [10]. It has the potential to provide more accessible health information and healthcare online and improve communication among providers.

mHealth is a subset of eHealth and is defined by the WHO Global Observatory for eHealth (GOE) as:

> "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices." (p.6) [11]

Recently, the term **digital health** was introduced as "a broad umbrella term encompassing eHealth (which includes mHealth), as well as emerging areas, such as the use of advanced computing sciences in 'big data', genomics and artificial intelligence". [12]

Arguably, a key benefit of many digital health solutions is their ease of engagement and convenience to seek and find medical help and advice. These can be linked to wearable devices such as fitness trackers and other measurement tools. They can thus be a valuable tool to support chronic disease prevention and self-management and there is some modest evidence for the impact on quality of care and health outcomes [13]. However, there are concerns about the capability of some to take up these interventions especially those who are older, have low literacy or who cannot afford smart phones or internet access costs. Furthermore, although many Apps have been developed for depression and diabetes, they have not been developed for some other important conditions [14].

The WHO has cautioned against the proliferation of digital health innovations in the absence of careful evaluation. It recommends the use of client-to-provider telemedicine to "complement, rather than replace, delivery of health services where safety, privacy, traceability, accountability and security can be monitored" [12].

7.4 The implementation of information systems and decision support in primary health care

Current methods of development and implementation of clinical decision support systems (CDSS) have consistently failed to engage primary health care providers or consumers.

Some evidence for the impact of decision support and clinical information systems is provided by a Sydney study where patients of GPs using a ‘diabetes shared care register’ received care more in accordance with clinical practice guidelines compared to patients of GPs not using a register in Sydney [15].

Organisations such as the Royal Australian College of General Practitioners, National Asthma Council, National Heart Foundation and Diabetes Australia have produced and maintained clinical practice guidelines for preventive care and chronic disease management. Some have developed decision support tools around these guidelines for clinicians and patients.

The key implementation objectives are to promote quality use and prevent user errors. Risk management in implementation includes transparent assessment of system errors and fair principles of engagement between the vendors and healthcare organisations and users. Basic implementation questions to ask include: Are the systems usable? Are they sufficiently fast? How well integrated are the systems into the workflow and clinical care? Is the data in the EHR and CIS usable and able to be integrated with the decision support system? Does it improve productivity and clinical performance? Are impacts on patients and patient outcomes a core part of the software design? Are professional values embedded in the systems? Are these systems error free?

Figure 4 illustrates the interlinked ways that digital interventions can address health system needs.

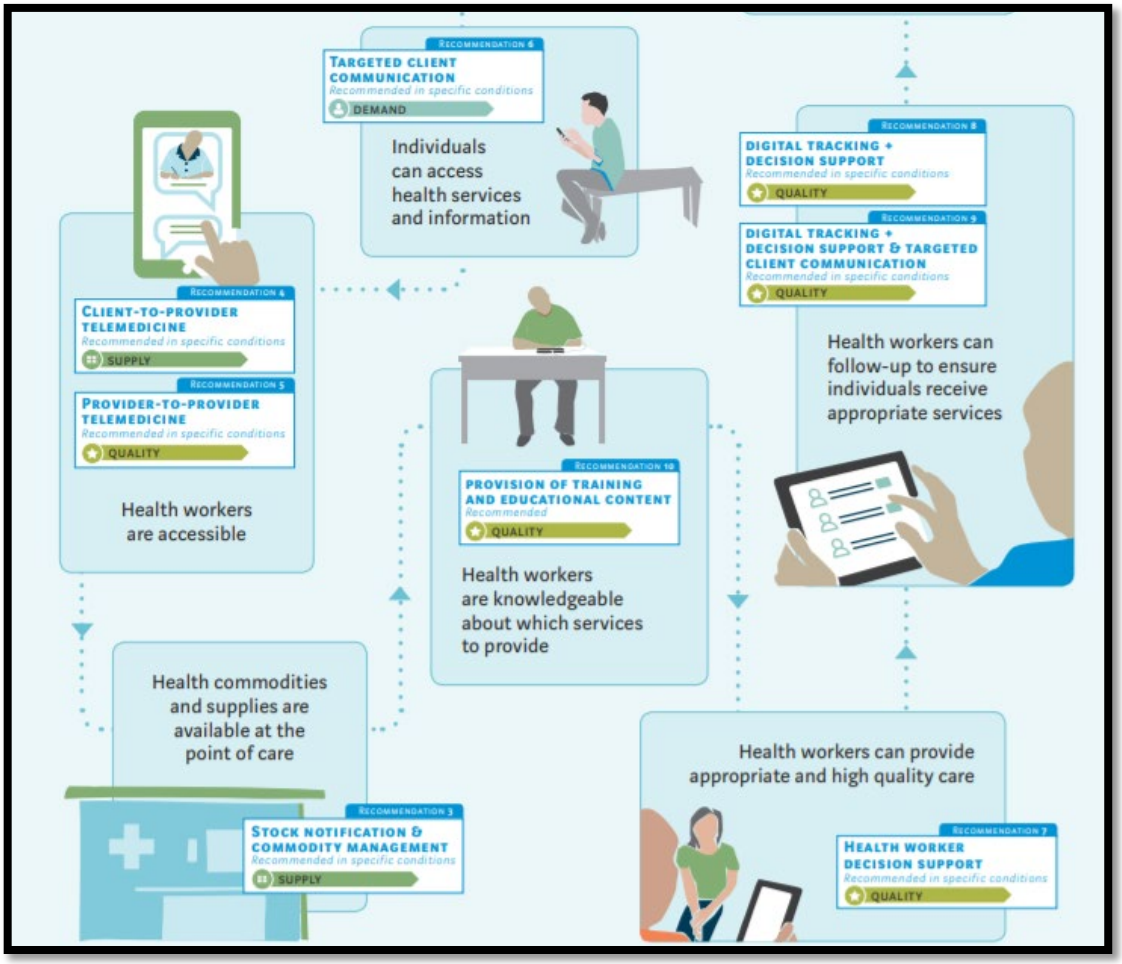

Figure 4 Digital health applications [12]

Learning Activity 1

Look at Australian Department of Health page on the Personally Controlled Electronic Health Record system (PCEHR).
https://myhealthrecord.gov.au/internet/mhr/publishing.nsf/content/home

How could My Health Record facilitate:

- Patient-centred care and the prevention and management of chronic illness in the community?
- Use of electronic decision support to improve outcomes in clinical and population health practice?
- Use of electronic personal decision aids for self-management and guidance for journeys across care pathways in the health system?

Or could it undermine:

- The relationship between providers and patients
- the privacy and confidentiality of health professionals, carers and patients?
- the legal and ethical responsibilities of health professionals in preventing and managing chronic illness?

Suggested further reading

Liaw ST & Pradhan M. Computerised Decision Support Systems – Implementations. Chapter 23 in: *Hovenga E, Kidd M, Garde S, Cossio CHL (Eds)*. Health Informatics: An Overview. Volume 151 Studies in Health Technology and Informatics. ISBN 978-1-60750-092-6. IOSPress; Feb 2010.

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Chiang et al. *Electronic clinical decision support tool for the evaluation of cardiovascular risk in general practice: A pilot study.* Australian Family Physician. 46(10), October 2017. https://www.racgp.org.au/afp/2017/october/electronic-clinical-decision-support-tool-for-the-evaluation-of-cardiovascular-risk-in-general-practice/

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15. Harris, M.F., et al., *Quality of care provided by general practitioners using or not using division-based diabetes registers.* Medical Journal of Australia, 2002. **177**(5): p. 250-252.