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Enabling research in general practice
Increasing functionality of electronic medical records

Background

With an estimated 80% of Australians visiting a general practitioner at least once a year, the data generated by GPs is a rich source of the overall health profile of patients. However, this data is rarely used to report on health outcomes.

Objective

This article reports on the use of remote access of electronic medical records (EMRs) for the purpose of collecting data during a collaborative research project involving the staff of three general practices and an external research team.

Discussion

Throughout the project numerous benefits to remotely accessing general practice EMRs were identified. However, there remain some difficulties which need to be addressed. An increased functionality of the software programs used in general practice is required, along with improvements in the utilisation of the software capabilities. Collaboration between clinicians, researchers and clinical software developers will be vital to advance this process.

Keywords: general practice; research; medical records systems; information storage and retrieval; medical informatics

A prospective randomised control trial to evaluate the effectiveness of a nurse led model of care in general practice[1] required researchers to remotely access 285 individual electronic medical records (EMRs) from three general practices. In this article the term 'EMR', is defined as an electronic record of patient information maintained in one practice.[2]

The challenge we faced entering the trial was to collect a wide range of financial and clinical data from a significant cohort of patients without disrupting the day-to-day operation of the practices or detracting from the provision of patient care. We anticipated that remote access to the EMRs would allow us to collect both financial and clinical data efficiently, accurately and with minimum impact on the practice. While the process was generally successful it did have some unanticipated complexities. The purpose of this article is to share the experiences of remotely accessing EMRs to facilitate general practice research and to highlight the need for increased collaboration between clinicians, researchers and medical software developers.

Background

The provision of general practice services has changed over the past decade[3] in line with the aging of the population,[4] increasing prevalence of chronic diseases,[5] changes in patient treatment expectations, changes in information technology and record keeping, and the acknowledgment by health practitioners of the need for evidence based practice.[6]

General practice data within Australia has been collected in a number of ways, including:

The Bettering the Evaluation and Care of Health (BEACH) program; the Australian Primary Care Collaboratives; the General Practice Research Network; and the Practice Health Atlas.[7] Nevertheless, in 2008 an Australian Institute of Health and Welfare report highlighted the current availability of information about primary healthcare practices and emphasised the need for more comprehensive data collection to assess the health outcomes of patients.[7] In essence, much of the data currently collected is about throughput and its associated costs,[7] with little focus on healthcare outcomes.

Internationally, initiatives to improve the collection and combining of primary healthcare data have included creating limitations on the number of clinical software programs available and mandating the use of a single clinical coding system.[8] Such limitations enhance data linkage and facilitate research.

Methods

Accessing and retrieving the clinical data

Each practice used a different clinical software program: Medical Director 2, Medical Director 3, and Best Practice. Medical Director and Best Practice use different clinical coding systems, Docle, and a hybrid of SNOMED CT® respectively. The Canning Data Extraction tool[9] can be used across both of these programs to extract data; however, it was established that the Canning tool would need further development to extend its use to this project. In order to collect the data we also investigated the possibility of using internal reporting functions within the programs, and the use of structured query language. However, due to the scope and complexity of the data required,

these options were not feasible. Therefore, the only viable option was the manual transcription of the data from the individual EMR to a purposively designed data entry package.

Ethical approval was obtained from the ethical review boards of the three universities conducting the research: The University of Queensland, Griffith University and Bond University. All patients participating in the project signed consent forms granting access to their EMRs.

The practices

Three general practices: one metropolitan and one regional located in Queensland, and one rural practice located in Victoria, were recruited to participate in this study. In order to collect patient clinical data, remote access was established with each practice. All practices consulted their information technology (IT) contractor to ensure the remote connection was secure and the appropriate settings applied for authorisation, authentication and encryption of data. One practice organised a virtual private network, thus providing secure access to their practice's internal network[10] via secure paths in the internet, and secured by cryptographic procedures.[11] The other two practices organised for the remote connection via the Remote Desktop Connection application: a function available within the Accessories section of Microsoft Windows®. This allows a user (identified by their computer internet protocol address, username and password) to log into a remote system and access the desktop, applications, and data on that system. Remote Desktop Connection encryption settings were checked by the IT contractor when setting up the initial connection.

Remote access

Throughout the data collection process, which involved the documentation of close to 6500 individual patient encounters, notes were kept on the strengths, weaknesses and barriers associated with the method. We found the strength of remote access to the practices' EMRs (*Table 1*) to be primarily the ability to access patient information at any time without disrupting the practice staff. This was dependent on several factors, including the capacity of the practice's network, the number of people needing to access

the network at any one time and the need for a reliable internet connection.

The capacity of the practice network and internet connection had a major impact on the speed of the data collection, with great variability in the time it took to load pages according to traffic loads on both the general practice network and the internet connection. This was problematic for large documents such as letters that had been scanned into the patient records. An occasional problem was if the patient record sought by the researcher was already in use by practice staff – this would block access to the researcher.

The data

The scope of the data collection was limited by the capacity of the software programs and the data entered by the clinicians. It seems that the EMRs require improved functionality to facilitate data entry by clinicians and, as reported elsewhere, clinician burden[12–14] and acceptance[14] appear to contribute to inaccurate data entry. An analysis of the data available in the EMRs is summarised in *Table 2*.

Data quality was enhanced with the use of general practice management plans where a comprehensive clinical profile was available in a single location. Major deficiencies identified were the scattering of clinical information and, as identified elsewhere, the amount of information entered into freetext areas instead of EMR structured tables.[15] Scanned documents required a considerable amount of time to be deciphered due to resolution issues and readability. Further to this, widespread variability[16] in the terms used to record reason for visit was also found (eg. blood pressure [BP] measured, BP measurement, BP review). Similar findings were associated with diagnosis documentation, with inconsistencies

seen within and between patient records. These inconsistencies required significant recoding by the researchers.

Discussion

There are several weaknesses to remotely collecting patient clinical data from EMRs in general practice. Some of these weaknesses are associated with the remote internet connection, but many are associated with the EMRs themselves. Many clinicians would be able to identify with the weaknesses of EMRs and have already identified the need for increased functionality to support administrative and clinical work.[17]

However, given that real life research is often complex, unpredictable and time consuming, remote access by researchers to EMRs does have obvious advantages in assisting practice staff to become involved in research. The major advantage of collecting the clinical data remotely was the limited impact on the practice staff. Unless a researcher was accessing a patient file required by a practice staff member, the practice staff were unaware that the researchers were online and collecting data – therefore requiring the researchers to notify the practice manager via email when about to access the EMRs. Logging of authentication and accounting information can also be monitored to ensure appropriate access to patient data.

While collecting the data for this project it became apparent that EMRs have some design deficiencies. If we are to evaluate the utilisation of evidence at point-of-care, it is essential that researchers are able to collect clinical data efficiently. Our study has indicated that there is still some way to go in developing EMRs which are both clinician and researcher friendly. Improving the capabilities of these systems would

Table 1. Analysis of remote access to EMRs	
Strengths	**Weaknesses**
• Ease of access to patient records (able to access patient data at any time) • No disruption to clinical staff*	• Reliant on internet connection • Connection instability • Reliant on capacity of practice network • Network running slow and information slow to appear on screen • Limited number of people able to access network at any one time and therefore dropoffs
* Unless researcher collecting data from patient record which practice staff need to access	

assist with the collaborative research effort and increase the speed with which evidence could be translated into practice.

Implications for general practice

It has been well established that for many patients the general practitioner is the first contact with the healthcare system.[18] Therefore it is essential that the care given in general practice is based on evidence, including that from clinical research,[19] and that research needs to be sympathetic to general practice working conditions if GPs and other practice staff are to increase their involvement in such projects.[20]

In this report we have discussed the methods used to involve general practice staff in clinical research while minimising the impact on their day-to-day work. Based on our experiences we would endorse and encourage the use of remote access to electronic practice records as a data collection strategy. However, researchers and practices alike need to be aware of the potential limitations, difficulties and costs of this method.

It is evident that there are numerous potential benefits of collecting individual patient clinical data, including the ability to assess equity of care; to identify the use of guidelines; to evaluate clinical care; to link financial and clinical data to enable cost analysis of care; and to determine population health needs.[21] Although there is continuing discussion on the secondary use of clinical data,[22,23] development of the functionality of EMR software systems associated with the ability to remotely access patient records, would enhance future research. Given that the first meeting of the General Practice Data Governance Council was held in August 2009, our findings are particularly pertinent and highlight the need for increased collaboration between clinicians, researchers and software developers in order to develop primary healthcare research.

Table 2. Analysis of data available within EMR system	
Strengths	**Weaknesses**
Scope of data	

• Access to individual patient information
• Abundance of information:
  – demographic data
  – pathology results
  – prescriptions
  – lifestyle risk factors
  – vital signs
  – referrals
  – care plan information
  – discharge letters
• Data able to be collected in real time or retrospectively
	• Inability to systematically download all required data
	• Variability in documentation between practitioners
	• Information missing
	• Comorbidities difficult to decipher

Data formats	
• Availability of data in structured tables • Access to pathology results in time series • Availability of lifestyle risk factors such as blood pressure, weight, body mass index, waist circumference • Access to scanned letters and documents	• Inefficient use of software capabilities • Availability of information only in freetext sections of the records • No set templates for care plan information • Variability in diagnosis formats • Use of abbreviations • Resolution of scanned documents
Data quality	

• Availability of general practice management plans allowing tracking of patient care	• Difficulties in verifying current prescriptions
	• Current diagnoses difficult to decipher
	• Variability in terminology used
	• Information scattered
	• Unable to detect reason for referral
	• Inaccuracies in data recorded:
	  – no diagnoses entered
	  – reason for encounter not entered
	  – smoking status not entered or not updated
	  – cardiovascular risk not recorded
	  – clinical data entries inaccurate (mistakes in typing in information)

Impact on practice staff	
• Practice staff not required to collect data • No interruption to clinical care	• Dropoffs if network capacity overloaded • Inability to access individual patient record if researcher collecting data from same patient
Ethics and privacy	
• Ethics approval and signed consent allowed for individual patient data to be collected	• Need for individual signed consent is time consuming

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