The electronic health record and the management of cardiovascular disease

This article describes the development of a computerised clinical information system in Tayside which can automatically collect electronic patient data across organisational boundaries – in this case on patients with, or at high risk of developing, cardiovascular disease.

Abstract

Advanced web-based clinical care applications as part of an electronic health record can assist clinicians to meet Government targets for the management of cardiovascular disease. A clinical module of the Tayside electronic health record collects electronic data automatically from a variety of sources and holds this data in a central regional repository. It identifies those patients with existing cardiovascular disease and also those high priority patients at risk of developing clinical atherosclerosis. It allows the clinician to effectively manage these patients in line with national evidence-based guidelines. Real time audit of patient management is instantly available at the point of direct patient contact, as well as benchmarking to agreed performance criteria. Demonstrating improvement in clinical outcomes remains the eventual goal.

Key words: electronic health record, central data repository, automatic data collection, coronary heart disease, cardiovascular disease management, collect data once, CARDIA.

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Introduction

The proportion of deaths in Scotland from coronary heart disease (CHD) has fallen in recent years but this death rate still remains the second highest in Western Europe.[1] A factor in both this declining mortality and hospital admissions from acute myocardial infarction may be the increased use of vascular protection and disease-modifying therapeutic agents in clinical practice.[2] The impact of atheromatous vascular disease will continue to increase, however, as the number of elderly people in the population increases, particularly if lifestyles fail to change.[3]

Background

In line with the national priorities of CHD and stroke,[4] both Angus Local Care Co-operatives (LHCCs) have adopted an extensive joint programme of vascular disease prevention. A national target has been set of reducing the age-standardised morbidity for CHD in those less than 75 years by 50% between 1995 and 2010.[5] To help meet these targets and because of the overlapping nature of vascular diseases and diabetes,[6] primary care physicians need to consider a move away from managing specific disease entities and adopt a more patient-centred management approach.

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Informatics in practice

Assembling patient data involves a great deal of time and often duplication of effort.[7] This is in contrast to the concept of – collect data once and use it often.[8,9] An effective and integrated system across organisational boundaries is required where data collection is part of routine clinical activity, embedded within existing systems and with clinical information immediately available at the point of patient contact.[1,10,11] Although computers extend the length of the consultation, but perhaps not the time spent interacting with patients, reminder systems can improve process rates.[12,13] Computers may also help manage complex and chronic cases as well as improving outcomes in disease management.[13-15]

CARDIA development

The limited application of a stand alone Microsoft Access audit database set up by Tayside Audit and Research in Primary Care in 1997 for all Angus patients after acute myocardial infarction to assist a community programme of cardiac rehabilitation soon became apparent.[16] A partnership was formed between Angus LHCC, Finix and Saragon Ltd to develop CARDIA (Computerised Automated Risk Detection Intervention and Advice), the first clinical application module of the Tayside electronic health record as part of the regional information management and technology strategy. This clinical information system automatically collects data from a range of existing electronic sources and makes that data available to health care professionals at the point of patient contact to help assist in the appropriate evidence-based management of that patient.

Data collection

Hospital discharge data is collected

from both the Scottish Morbidity Recording and Core Patients Profile Information in Scottish Hospitals data and also, in due course, from the Electronic Immediate Discharge letter. Diagnoses are mapped from International Classification of Diseases (ISD 9 & 10) codes to READ codes in line with the Scottish Clinical Information Management in Primary Care[17] initiative and suggested national minimum data set.[1] Data is extracted automatically from the various existing practice-based systems, such as General Practice Administration System Scotland; laboratory data is fed directly from the existing Fountain Results system. A priority of the Tayside electronic clinical communications initiative[18] is to embed the existing Diabetes Audit Research Tayside Scotland (DARTS) system[19] into the regional system and the level of data available will also be enhanced from the Heart Disease Evidence-based Audit and Research in Tayside Scotland (HEARTS) initiative – in the next two years this will identify all patients who have had a myocardial infarction or coronary intervention.[20] There is also provision for direct data input.

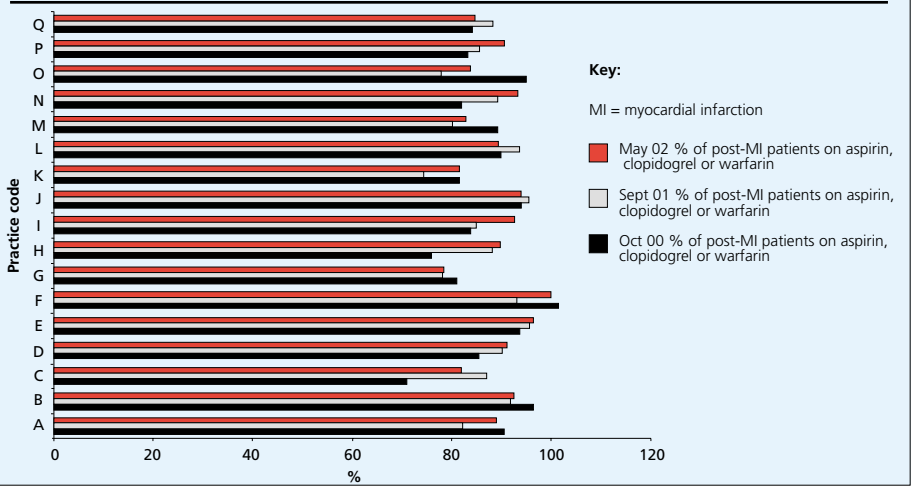
Regional data repository

Building on information from existing computer systems, data are stored in a central regional repository accessed through a closed intranet. This allows clinicians with appropriate authority to share clinical information across organisational boundaries.[21] Using modern secure internet technology, including Oracle and Extensible Mark up Language, storage is on a Sun Solaris server with Apache and Cold Fusion. Secure access is controlled through a Lightweight Directory Access Protocol service.[22]

Evidence-based clinical management

CARDIA will identify patients with existing cardiovascular disease and assist the clinician in ensuring ongoing maximum vascular protection as well as meeting the requirements and recommendations for a comprehensive practice-based CHD register.[1,23] Assessment of the absolute risk of patients without cardiovascular disease is available automatically with unique automatic input of laboratory values.[24,25] Action can then be instituted to prevent disease and help effect lifestyle change. Instant real time audit is available on a range of performance criteria which have been agreed by all clinicians involved facilitating benchmarking and for use in Clinical Governance purposes.

Figure 1. Post-MI patients on aspirin, warfarin or clopidogrel



> ***'Data are stored in a central regional repository accessed through a closed intranet allowing clinicians to share clinical information'***

Discussions and conclusions

In order to reduce the risk of heart disease in the population, the National Service Framework for CHD[23] has set specific dates for milestones to be reached in order that clear progress in implementing particular areas can be specifically monitored. In Scotland the approach has been different. Initially the Clinical Standards Board for Scotland (CSBS) is focusing specifically on the care provided in an acute hospital setting for secondary prevention following a diagnosis of acute myocardial infarction.[26] The standards that have been set are felt to be achievable yet 'stretching' in order to avoid the demotivating effect of trying to reach unattainable levels within a rigid timescale. This is reflected in the criteria with some being essential when a service is provided with others being aspirational/desirable to promote continuous quality improvement. The CSBS standard for primary care is the Royal College of General Practitioners (Scotland) Practice Accreditation Scheme.

The barriers to the implementation of CHD prevention and the difficulties of meeting NSF targets have previously been highlighted.[27,28] There is a need for integrated information management and technology systems, as well as resources for them, along with efficient data collection as part of every day patient management avoiding double data entry.[29] A clinical information system (CARDIA) as an integral part of an electronic health record has been developed to assist in the direct management of patients with or at risk of developing cardiovascular disease using web-based technology and automatic data capture. It has been developed in line with regional and national strategies and provides appropriate data

Figure 2. Post-MI patients aged < 75 years with cholesterol < 5.0 mmol/L

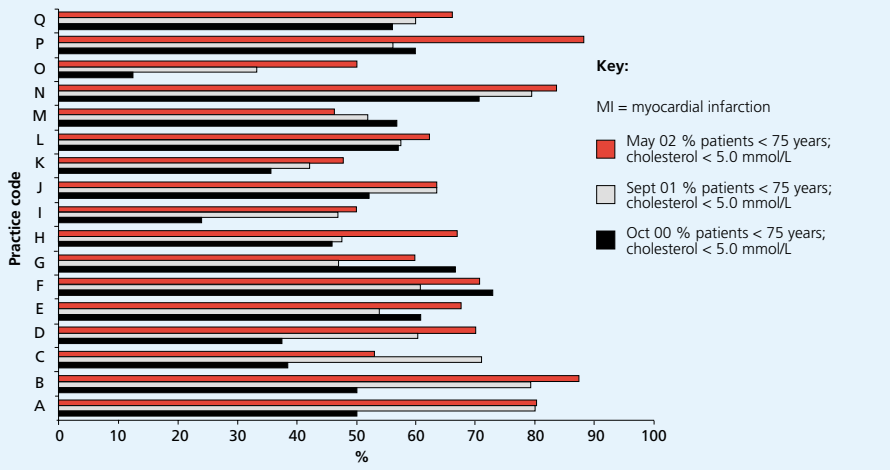


Figure 3. Post-MI patients aged < 75 years on a beta blocker

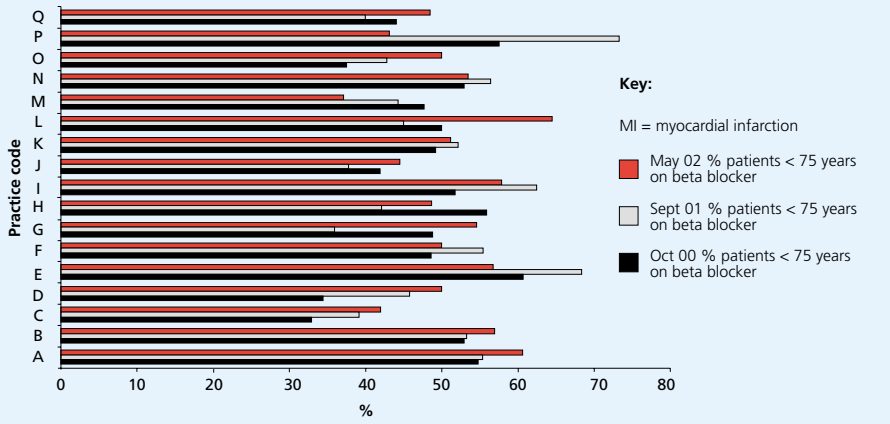
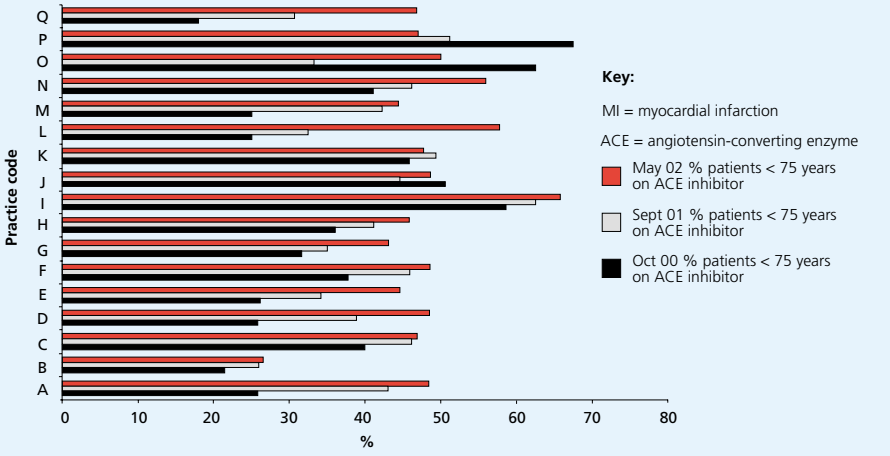


Figure 4. Post-MI patients aged < 75 years on an ACE inhibitor



management, avoiding unnecessary duplication yet ensuring evidence-based clinical practice. A comprehensive educational programme of appropriate training including the use of a manual and multimedia will accompany practice rollout.[30] As well as an exhaustive technical appraisal and internal Health Board auditing, a full evaluation programme is in place. Expert review has resulted in system improvements, and an assessment of the barriers to change in the process, as well as the approach to clinical care, is underway.

At present, data collection at practice level is possible but tends to use a variety of existing paper and electronic methods – these can be laborious and time consuming. These data can then be correlated within an operating unit of the National Health Service (NHS), such as a LHCC or Primary Care Trust, to allow appropriate benchmarking (figures 1–4). The use of the electronic health record will streamline this process requiring minimal but no additional effort for all professionals involved.

Although there is a template for further developments, demonstrating clear improvements in clinical outcomes is the challenge ahead.

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Declared interest

Any potential commercial development of CARDIA is governed by NHS Tayside intellectual property regulations.

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Awards

CARDIA was the winner of the 2000 Vision Award for IT, the 2001 Bob Scott

Key messages

- Data can be collected once and available to be used often
- Modern secure internet technology can be utilised to centrally store and control access to patient data
- The electronic health record can help clinicians meet national targets in the management of cardiovascular disease
- Improved evidence-based clinical activity should lead to improved patient outcomes

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