AUSTRALIAN PRIMARY HEALTH CARE RESEARCH INSTITUTE

THE UNIVERSITY OF NEW SOUTH WALES SCHOOL OF PUBLIC HEALTH AND COMMUNITY MEDICINE

APHCRI STREAM FOUR: A SYSTEMATIC REVIEW OF CHRONIC DISEASE MANAGEMENT

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PREFACE

This is the final report of a systematic review conducted as part of the Australian Primary Health Care Research Institute (APHCRI) Stream Four funding. The aim of Stream Four was to systematically identify, review, and synthesise knowledge about primary health care organisation, funding, delivery and performance and then consider how this knowledge might be applied in the Australian context. This particular review focussed on the management of chronic diseases in the primary care setting.

THE RESEARCH TEAM

This review was undertaken by the Centre for Primary Health Care and Equity, School of Public Health and Community Medicine, University of New South Wales (UNSW) in association with University of Western Sydney and University of Manchester. The researchers involved included: Prof Nick Zwar (UNSW), Prof Mark Harris (UNSW), Prof Rhonda Griffiths (UWS), Prof Martin Roland (University of Manchester), Dr Sarah Dennis (UNSW), Mr Gawaine Powell Davies (UNSW) and Mr Iqbal Hasan (UNSW).

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LIST OF ABBREVIATIONS

ABCD – Audit and Best Practice for Chronic Disease

ABHI – Australian Better Health Initiative

ACIC – Assessing Chronic Illness Care

ACCHO – Aboriginal Community Controlled Health Organisation

AIHW – Australian Institute of Health and Welfare

ANU – Australian National University

APHCRI – Australian Primary Health Care Research Institute

BEACH -- Bettering the Evaluation and Care of Health

BOiMH – Better Outcomes in Mental Health

CBA – controlled before and after

CCM – Chronic Care Model

CCT – controlled clinical trial

CDM – chronic disease management

CHF – congestive heart failure

CINAHL -- Cumulative Index to Nursing and Allied Health Literature

CIS – clinical information systems

COPD – chronic obstructive pulmonary disease

CR – community resources

CRD – Centre for Reviews and Dissemination

CVD – cardio-vascular disease

DARE – Database of Abstracts of Reviews of Evidence

DS – decision support

DSD – delivery system design

EPC – enhanced primary care

EPOC -- Effective Practice and Organisation of Care

EPP – Expert Patient Program

ER – emergency room

FEV1 – forced expiratory volume in one second

HCO – health care organisation

ICCC – innovative care for chronic conditions

IHS – Indian Health System

ITS – interrupted time series

JBI – Joanna Briggs Institute

LAs – local authorities

MBS – Medicare benefit scheme

MCO – managed care organisation

MD – mean difference

NCDS – National Chronic Disease Strategy

NHPAC -- National Health Priority Action Council

NICE – National Institute for Health and Clinical Excellence

NPCCP – National Primary Care Collaborative Program

OA – osteoarthritis

PBS – Pharmaceutical benefit scheme

PCT – Primary Care Trust

PDSA -- plan/do/study/act

PEF – peak expiratory flow

PHC – primary health care

PHO – primary health organisation

PIP – practice incentive payment

PMOD – physiological measure of disease

QoL – quality of life

RA – rheumatoid arthritis

RACGP – Royal Australian College of General Practitioner

RCT – randomised controlled trial

SGRG – St George Respiratory Questionnaire

SIP – service incentive payment

SMS – self management support

SNAP – Smoking, Nutrition, Alcohol, and Physical Activity

SPSS – Statistical package for social sciences

UNSW – University of New South Wales

UWS – University of Western Sydney

VA – veteran affairs

WHO – World Health Organisation

WMD – Weighted Mean Difference

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1. BACKGROUND AND RATIONALE

The World Health Organisation (WHO) defines chronic diseases as having one or more of the following characteristics: they are permanent, leave residual disability, are caused by non-reversible pathological alteration, require special training of the patient for rehabilitation, or may be expected to require a long period of supervision, observation, or care. The Australian Institute of Health and Welfare (AIHW) listed the 12 chronic diseases that had the greatest impact on the Australian health care system. They were coronary heart disease, stroke, lung cancer, colorectal cancer, depression, diabetes, asthma, chronic obstructive pulmonary disease, chronic kidney disease, oral diseases, arthritis and osteoporosis (1). Increasingly people with chronic disease are being managed in primary care by general practitioners and other primary health care professionals often in collaborative arrangements with specialised services.

The Bettering the Evaluation and Care of Health (BEACH) report (2) identified those chronic diseases most commonly managed in primary care. They were hypertension, coronary heart disease, depression, diabetes, lipid disorders, asthma, chronic obstructive pulmonary disease, arthritis (including osteoarthritis and rheumatoid arthritis) and osteoporosis. Our intention in this review was to focus on those chronic diseases most commonly managed in primary care. Whilst lung cancer and colorectal cancer are important they are not frequently managed in primary care and therefore contribute less to the total burden of chronic disease seen in that context.

Weingarten's definition of chronic disease management is "an intervention designed to manage or prevent a chronic condition using a systematic approach to care and potentially employing multiple treatment modalities" (3). The WHO definition of chronic disease and Weingarten's definition of chronic disease management (CDM) have been used in developing our research questions. The review has been informed by the Chronic Care Model (CCM) proposed by Wagner and colleagues (4) which includes the six elements: health care organisation (HCO), delivery system design (DSD), decision support (DS), clinical information system (CIS), self management support (SMS) and community resources (CR).

OBJECTIVES

The aim of this review was to answer to following research questions:
1. What is meant by chronic disease management in the primary health care in Australia and in comparable countries such as USA, Canada, UK, Netherlands, New Zealand and Scandinavia?
2. How and in what context were the models of chronic disease management developed? Why were they developed?
3. What are the roles of those involved in the models identified?
4. What are they key outcomes and impacts of the models? How have they been measured?
5. How effective, efficient and innovative are the models and approaches identified?
6. What are the characteristics of successful (effective, efficient and / or innovative) models and approaches in terms of organisation, service delivery and funding? How applicable are these to the Australian context and health care system?
7. What are the facilitators and barriers to effective interventions for chronic disease in primary health care?

CHRONIC DISEASE MANAGEMENT MODELS

In Australia and comparable countries there has been a shift in health care from a reactive system with a focus on acute care to one that is proactive, which supports the management of chronic disease. There has been a range of policy and system wide changes to address the management of chronic disease. The aim of this section is to describe the development of models for the management of chronic disease, the context and roles of those involved. This will form the framework for the later review of evidence to support the components of the models. In particular the following questions will be addressed:

1. What is meant by chronic disease management in the primary health care in Australia and in comparable countries such as USA, Canada, UK, Netherlands, New Zealand and Scandinavia?
2. How and in what context were the models of chronic disease management developed? Why were they developed?
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INNOVATIVE CARE FOR CHRONIC CONDITIONS (ICCC)

In response to the global increase in the prevalence of a range of chronic diseases the World Health Organisation (WHO) recently published a report: Innovative care for chronic conditions: building blocks for action (ICCC) (5). The purpose of the ICCC report was to describe a comprehensive global framework for the prevention and management of chronic disease, which could be applied to both developed and developing countries. The ICCC report stated that healthcare systems around the world have developed to deal with acute episodic care, which is not appropriate for the management of chronic conditions in the long term.

The WHO identified eight elements essential for the successful management of chronic diseases in any healthcare system: (1) Support a paradigm shift from acute episodic care to a system of care that is more suitable for the needs of those with chronic conditions; (2) Manage the political environment to ensure commitment across all levels with information sharing; (3) Build integrated healthcare to ensure that information is shared across services, providers and time; (4) Align sectoral policies not only with health but also comprehensively across other areas such as education, workforce etc; (5) Effective use of health care personnel in order to maximise the roles of all those involved in care of patients and recognise the importance of their roles in the management of chronic disease; (6) Centre care on patient and their family with a shift from the patient as a passive recipient of care to a model where the patient takes some responsibility for their care. This is important when lifestyle factors play an important role in chronic disease particularly prevention; (7) Support patients in their communities with programs that span health care organisations and the wider community; (8) Emphasize prevention. The elements combine to form a triad of care between the health care organisation, the patient and their family and the community.

The organisation of health care systems is discussed in terms of macro, meso and micro levels and how they contribute to the management of chronic disease. At the macro level governments need policy for preventing and managing chronic disease that include both high and low technology approaches with the avoidance of fragmented financing and misaligned incentive schemes without regulation or monitoring of

standards. At the meso level there should be systems to manage care over time as opposed to acute episodic care. This will involve education of health care professionals, evidence-based guidelines, prevention strategies, information systems and linking with community resources. Finally at the micro level the development of skills for individuals to prevent and manage their own health.

In developing the ICCC the WHO drew from the Chronic Care Model (CCM) developed by Wagner and colleagues (4) and expanded this model for use particularly in developing countries.

Chronic Care Model

The Chronic Care Model (CCM) was developed in the USA after an extensive review of the literature and is the most widely known model of care for people with chronic conditions (4). The model describes the elements essential for improvements in the care of people with chronic conditions with a focus on primary care. The overall aim of the CCM is to develop well-informed patients and a healthcare system that is prepared for them. The six elements of the CCM are:

- **Delivery System Design (DSD)** The structure of the medical practice to create teams with a clear division of labour and separating the acute from the planned care. Planned visits and follow up are important features.
- **Self Management Support (SMS)** Collaboratively helping patients and their families to acquire the skills and confidence to manage their condition. Provide self management tools, referrals to community resources, routinely assessing progress.
- **Decision Support (DS)** Integration of evidence based clinical guidelines into practice and reminder systems. Guidelines reinforced by clinical "champions" providing education to other health professionals.
- **Clinical Information Systems (CIS)** Three important roles of computer information systems: Reminder system to improve compliance with guidelines, feedback on performance measures and registries for planning the care for CD.
- **Community Resources (CR)** Linkages with hospitals providing patient education classes or home care agencies to provide case managers. Linkages with community based resources – exercise programs, self help groups, and senior centres
- **Health Care Organisation (HCO)** The structure, goals and values of the provider organisation. Its relationship with purchaser, insurers and other providers underpins the model. (4, 6)

The six elements of the CCM operate within the context of the triangle of the community, the health care system and the provider organisation (6) (Figure 1). The model allows for division of labour and a switch from acute to long term care.
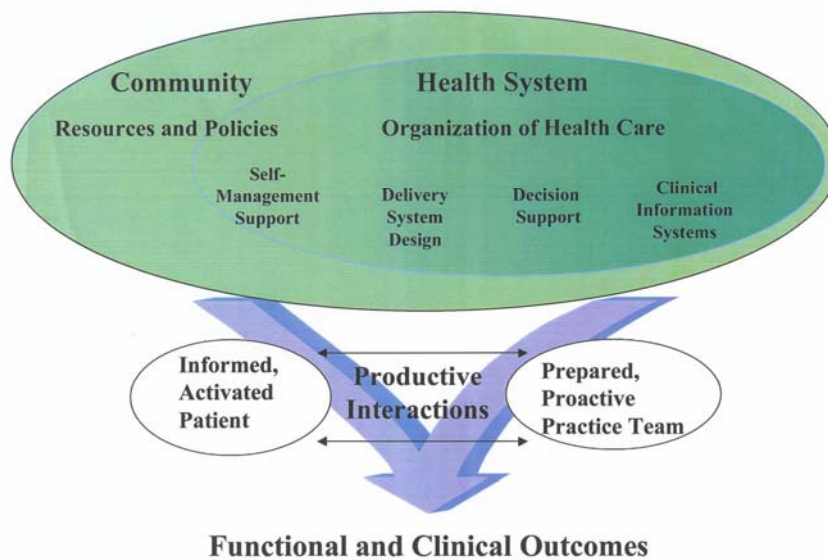
Fig 1: The elements of the Chronic Care Model

Figure from Wagner EH. Chronic Disease Management: What will it take to improve care for chronic illness. Effective Clinical Practice 1998;1:2-4. Reproduced with the permission from the American College of Physicians

There have been some attempts to assess the impact of the CCM on the outcomes for chronic disease and to try to determine the extent to which the elements of the CCM have contributed to care (7, 8). The results suggested that the inclusion of one or more element of the CCM resulted in improved patient or process outcomes for a variety of chronic diseases. The chronic care model has not been tested in its entirety but elements of the model have been incorporated into policy and programs for the management of chronic disease in several countries and these will be detailed below.

CONTEXT, ROLES AND IMPACTS

The Chronic Care Model has informed policy for the care of people with chronic disease in many countries. The model has been adapted for use in different healthcare systems either in its entirety or some of the elements. The aim of the following section is to provide some examples of how adaptations of the CCM have been evaluated or incorporated into policy in countries comparable to Australia. This will provide insights to answer the following questions:
-   How and in what context were the models of chronic disease management developed? Why were they developed?
-   What are the roles of those involved in the models identified?
-   What are they key outcomes and impacts of the models? How have they been measured?

USA
The CCM was developed within the context of the managed care organisations (MCOs) in the USA in an attempt to improve the management of chronic disease and to reduce costs to the organisation. The USA has no national system of health care; instead there are a series of healthcare providers operating in a market-based system. The US health care system is funded on three levels:
•   Government (Federal and State) funds, Medicare which covers much of the healthcare for those aged over 65, and Medicaid, which covers healthcare for those on low incomes.
•   Employers through corporate membership of health insurance.
•   Private individuals.

Access to healthcare in the USA is inequitable and approximately 18% of the population have no health insurance (9), many of these will be on low incomes with a higher prevalence of chronic disease. The structure of the US health care system means that there has been a focus on acute episodic care and the CCM was developed to address some of these issues and focus on the long-term planned care, which is necessary for the management of chronic disease. In addition, the USA has a poorly developed primary health care system (10).

Bodenheimer presented the results of several case studies of organisations that have implemented aspects of the CCM in the USA (6). The cases range from a network of private medical practices to a large community health centre providing care to the Hispanic population, many of who lived below the poverty line. The cases also highlighted the differences in the roles of those involved, with physicians in the private network and multidisciplinary teams in the community programs. Diabetes care improved for the patients of the private practice network when the physicians were provided with treatment guidelines, academic detailing and performance feedback. There were financial incentives for physicians in place to promote the process and plans to extend this to include other chronic diseases and programs that incorporated health professionals, other than physicians, to deliver the patient education sessions. The community program with Hispanic Americans addressed several aspects of the CCM; delivery system design, primary care teams, disease registers, physician reminders, decision support, group education sessions and self management including goal setting. The program was effective and the mean HbA1c level decreased from 10.5% to 8.6% in fewer than 18 months (6).

A medical group in Minneapolis underwent a reorganisation of its medical services using the CCM as its template. This provided an opportunity to evaluate the quality of care before and after the implementation using the Assessing Chronic Illness Care (ACIC) survey (11). In terms of quality improvement, most of the improvements demonstrated were associated with decision support, clinical information systems and community resources over the two-year period. A qualitative study was undertaken to identify what CCM elements were addressed, the strategies used in addition to facilitators and barriers encountered (12). Many of the challenges were associated with delivery system design. The development of the team varied and often the physician's role remained unchanged. Often the team or process did not engage the physicians so the team was built around the physician. The success of the team was more dependent on personalities than on the planned roles. The authors concluded that the CCM was useful as a conceptual framework but that to be effective in practice there needed to be more specific advice or examples to enable health professionals to determine precisely what changes to make in the organisation and delivery of care.

In the USA, there have been examples of discrete healthcare providers undergoing system wide changes that have provided some evidence for the effectiveness of the CCM in terms of the healthcare organisation (HCO). The Department of Veterans Affairs (VA) health care system underwent system-wide changes during the mid-1990s. The changes to the VA system included integrated medical records, performance data, performance contracts and overall management of quality. An evaluation was undertaken comparing the quality of care from 1994 to 2000 with the quality of care in a sample from Medicare. Improvements in quality outcomes were evident after two years of the changes and were significantly better than those in the Medicare system (13).

The Indian Health System (IHS) is a federally funded health system that provides health care to American Indians and Alaska Natives. This population has a very high prevalence of diabetes and diabetic complications and in order to address this, the IHS developed a Special Diabetes Program for Indians in 1997, which provided grants for diabetes programs aimed at both urban and tribal groups. An audit of diabetes outcomes was undertaken for the period 1995 to 2001 (14). There were significant improvements in HbA1c, total cholesterol, triglycerides and diastolic blood pressure between 1995 and 2001. Many of the programs that were funded during this period were aimed at prevention and management of diabetes in Indians. The money funded a variety of projects, which included healthcare teams, disease registers, case management and essential equipment. The results reflected achievements that may be possible within certain populations when policy, community and health programs focus on one issue.

The King's Fund recently undertook a qualitative review of the management of chronic diseases by MCOs (9) to determine how the CCM worked in these organisations. One of the key features of US managed care organisations is that they are decentralised and exposed to market forces. There is competition between the organisations to recruit insured companies or patients and this was one of the main driving forces behind the need for innovative chronic disease management programs. There were several organisational features identified by Dixon et al. (9) that may have considerable implications for the Australian healthcare system, in particular the way in which general practice could in the future work with local health services to provide care for people with chronic and complex conditions. These organisational features were:

- Local discretion to set organisational goals and priorities through negotiation between corporate and clinical managers.
- Long-term relationships between MCOs and providers (hospitals and physicians).
- Larger and more organised networks of physicians were more effective than looser networks of solo physicians.
- Where MCOs worked exclusively with medical groups then both the provider and purchaser had similar incentives to improve care.
- Effective financial incentives for quality to encourage better care (9).

All of the MCOs reviewed based their chronic disease management on the CCM and in addition to the six elements of care identified they also stratified their patients according to severity. A disease and case management approach was implemented according to disease severity and care was delivered by a multidisciplinary team (15).

In spite of the success of MCOs, the USA still lags behind Europe in the management of chronic disease with death rates in young people from diabetes five times higher in the USA compared to Europe (16). The structure of the health care system in the USA means that those people most likely to have one or more chronic disease are also most likely not to have health insurance and access to healthcare.

United Kingdom

The UK has looked to the CCM and the US managed care organisations such as Evercare and Kaiser Permanente to inform the management of chronic disease in primary care. The health system in the UK is different to the USA in that the National Health Service is funded by the tax system, access is free and there is a strong focus on primary care. The UK initiatives have incorporated most elements of the CCM with a

specific focus on delivery system design, decision support, clinical information systems and self management support.

In primary care, patients with chronic disease are often managed using guidelines, supported by clinical information systems and often in special "clinics" separate from regular urgent care. Practice nurses have a considerable role in this process. The Department of Health identified the management of chronic diseases as a key feature of the National Health Service Improvement Plan (17). The program was aimed at Primary Care Trusts (PCTs) and Local Authorities (LAs) to focus on health and well being in addition to ill health, devolving decision making to a local level and to making care more personalised.

One component of the program was the identification of high-risk elderly patients from hospital admission data, intensive case management by nurse practitioners and the organisation of care around the patient's need based on the Evercare MCOs program in USA. Community matrons had an important role in the identification and case management of patients. There have been interim analyses of the Evercare pilot projects in the UK and so far the results have suggested that high-risk patients could be identified this way and that once identified preventive health care was provided and there were responses to deterioration in the health of the patient (18). The results of the full evaluation will not be available until later in 2006 and therefore it is too early to say what impact this program has had on hospital admission rates.

The UK has developed National Service Improvement Frameworks for each of the major chronic diseases such as diabetes and cardiovascular disease. These provide a framework of standards for PCTs in delivery system design and decision support for chronic disease (19).

The Expert Patient Program (EPP) develops the role of the patient in their own care and is a chronic disease self management program which comprises of a six-week generic training course for adults with a chronic disease run in Primary Care Trust (PCT) sites although does not involve GPs (20). Pilot EPP courses began in May 2002 and have been deemed a success in terms of the number of PCTs taking part and the numbers of courses run (21-23). To date there has not been an evaluation of the impact of the EPP on patient outcomes or healthcare utilisation.

In addition to the Evercare pilot programs and the EPP there has been a move to reward good quality chronic disease management by GPs through the Quality and Outcomes Framework of the general practitioner contracts from 2004. The National Institute for Health and Clinical Excellence (NICE) have produced disease specific guidelines, which have been used as the national standards of care. Campbell et al (24) reported that in the period 1998 to 2003 there were substantial improvements in the quality of care for coronary heart disease, asthma and diabetes but there has not been an evaluation, published to date, of any effect on patient outcomes. The role of practice nurses has been important in helping GPs to reach their targets for care.

Netherlands

The healthcare system in the Netherlands is complex and characterised by three different levels of insurance (25). As a result of the organisation and funding for healthcare in the Netherlands there is fragmentation of services. Transmural care was developed in the 1990s to address the gap between hospital and primary care and the separate funding systems and targets delivery system design (26). The actual components of transmural care programs vary but a recent survey found that most

hospitals were involved in a program (26). Nurses play an important role in many of the programs in the Netherlands, which involve nurses with specialist training in the management of people with certain conditions, or liaison nurses. Other approaches involved education, guideline development and family support.

A disease management model was adopted by some regions in addition to the transmural model. Disease management for diabetes was developed in the Maastricht region (27). This delivery system design model was developed from the experience of a shared care for diabetes model where specialist nurses shared the care of diabetes patients with hospital specialists and has been extended to include a team of health care professionals (GP, practice nurse, specialist nurse, and endocrinologist). The balance of care in terms of the care providers was dependent on the severity of the patient's condition. For those patients with more severe disease the balance favoured hospital led care. The care was provided according to guidelines and patients were encouraged to take some responsibility for their own health care. The evaluation into the effectiveness of this model has not yet been completed.

The Dutch College of General Practitioners (NHG) has played an important role in the development of practice guidelines, which have played an important role in general practice and form the basis for interdisciplinary guidelines between GPs and hospital specialists in processes such as transmural care (http://nhg.artsennet.nl/content/resources).

Sweden
Primary care in Sweden typically involves a multidisciplinary team of health professionals and nurses have an important role with advance functions and some prescribing authority. Health care is provided at a local level and the development of "Chains of Care" to integrate the care of patients with chronic conditions between primary care and other care providers (28). More than half the councils had developed "Chains of Care" by 2002 (28) and many of these were concerned with improving care for specific conditions such as cancer or diabetes.   The aim of this model has been at the delivery system design level to improve the integration of services and there has been less focus on the empowerment of the patients at the centre of the care.

Canada
Canada lacks a capacity for national PHC reform system wide with most initiatives being pilots or implemented at province level. The Canadians have looked to the CCM to inform the management of chronic disease. The provinces have the responsibility for health service organisation and some attempts are underway to improve coordination and continuity of care. The CCM has been expanded for use in Canada (29) to incorporate population health promotion to prevent chronic disease. The community resources were expanded to include the five action areas from the Ottawa Charter for Health promotion which are to develop personal skills (self management support), re-orient health services (delivery system design), build healthy public policy, create supportive environments and strengthen community action (29). Many of the initiatives from the expanded CCM have been supported by the Primary Health Care Transition Fund, which aims to develop primary care reform strategies, improve coordination of care and improve health outcomes. In addition to this there are programs such as the Vancouver Island Chronic Illness Care Project (http://www.hc-sc.gc.ca/fnih-spni/services/acces/vancouver_isl-ile_e.html) which is a federal and First Nation Health collaborative project to improve care for First Nation people with chronic illnesses which addresses many of the components of the CCM such as self management, community resources, delivery system design. Diabetes is a major health

problem within indigenous Canadians and community based projects specific to local populations have been developed and funded.

New Zealand

In 2004, the New Zealand Ministry of Health launched Care Plus, a new service for people with chronic disease delivered through Primary Health Organisations (PHOs) (30). The key feature of the Care Plus program was the identification of people with chronic disease who required intensive case management. Once identified and enrolled on the program patients were entitled to reduced cost nurse or doctor visits, care planning with quarterly checks and self management support to enable them to achieve their care plan goals. The PHOs received additional capitation funding of around 10% to target 5% of the enrolled population. The Care Plus program was introduced to allay the fears of GPs who felt that some of their patients with chronic disease might have to pay more for their treatment if their GP was on an Interim Formula compared to those whose GP was on an Access Formula. GPs on an Access Formula were those who served a population with a higher proportion of Pacific Islander, Maori or low socio-economic status and they received additional capitation funding for care (31).

The aims of the Care Plus program were to improve the management of chronic disease and reduce health inequalities, improve teamwork within PHOs and reduce costs for high need patients. Early evaluations suggested that the program had been successful in terms of patient and practice satisfaction. As yet there has not been an evaluation published to include patient outcomes, health service utilisation or costs. Results from the pilot studies suggested that the barriers to implementation were apathy among some patients to taking a more active role in their care and staffing levels (31, 32). Improving the practice information system and disease registers were found to be important to prepare the practice to maximise the funding available for the Care Plus program (33).

The Chronic Care Management Model has been developed in the Counties Manukau region in South Auckland, New Zealand. The model was developed between the PHO and the local health authority and its aim was the "seamless" delivery of healthcare for people with chronic diseases (34). Since it was developed the program has been extended and in November 2004 there were 4,231 patients with diabetes, CHF, COPD or CVD enrolled and of these 23% were Maori and 51% Pacific Islanders (35). Interim results suggested that the program had been effective in improving patient outcomes and was addressing inequalities in health and patient follow up but it was too early to assess the impact on healthcare utilization costs.

Australia

The context of the Australian Health Care System is an important consideration in reviewing and synthesizing the literature on Chronic Disease Management (CDM) in primary care. This context includes the way primary care in Australia is organized and financed plus previous and current policy and programs relevant to CDM in primary care.

In the Australian health care system primary care services are a complex mixture of State and Commonwealth responsibilities with public and private providers. Primary care services in Australia include general practice, State funded generalist community health services, private allied health services, pharmacies and complimentary therapists (36). The largest group providing primary health care services are general practitioners. More than 90% of the population see a GP at least once a year and on

an average people attend 6.5 times per year (37). GPs and private allied health professionals, such as, physiotherapists and dieticians, largely work in a small business model while most primary health nurses work in the state funded community health services. The divide between State and Commonwealth in terms of responsibilities, funding structures, organisation and service delivery is an important feature of the Australian health system and has been cited as a barrier to reform (38). In the area of chronic disease the State and Commonwealth divide raises both financial and clinical barriers to providing care (39). In response to these barriers a number of policy and program responses have been initiated by the Governments at both State and Federal levels and many of the initiatives align to elements of the CCM. The initiatives of key relevance to chronic disease management in primary care are outlined below.

The coordinated care trials of the 1990s attempted to test better coordination of the management of people with chronic and complex needs. The interventions tested varied but typically involved a care coordinator to access services and so align to the CCM element of delivery system design. In some trials improved coordination was facilitated by funds pooling from different sources within current resource levels. Problems in the trials included inadequate periods to test the intervention, difficulties with recruitment and diverse patients groups entering the studies. Overall results in the first round of trials were that intervention groups did not have better outcomes in the quality of life measure used or in rates of hospitalisation, readmission or length of stay. Some of the design problems of the first round of trials are being addressed in round two.

The Enhanced Primary Care (EPC) package was introduced in 1999 with the aim of improving preventive healthcare and coordination of care. These initiatives again align to the CCM element of delivery system design and provide a mechanism for funding for a change in the role of the general practitioner towards greater involvement in structured and co-coordinated care. The package introduced Medicare Benefit Schedule (MBS) items for health assessments and care planning. Under the package GPs could receive a MBS rebate for initiating or participating in an EPC multidisciplinary care plan. The care plans provide a structure for a multidisciplinary approach but general practitioners experienced difficulty with using the items related to time, organisation, communication, education and resources (40). New Medicare items for CDM were introduced in July 2005 to streamline care planning for patients with chronic conditions and to facilitate multidisciplinary care planning (41). These items consist of a GP Management Plan and a Team Care Arrangement. The latter is very similar to the previous EPC Care Plan. Specific items for Aboriginal and Torres Strait Islander people have been established. An addition to the EPC package is access to allied health services. Patients with chronic conditions and complex needs being managed with a care plan can receive a rebate for up to five allied health services per year. Patients with dental problems that significantly exacerbate their chronic conditions may also access rebates for up to three dental services per year.

Incentive programs for the management of diabetes, asthma and mental health were introduced as part of the 2001 Federal Budget aimed at supporting better care of these conditions in general practice. These initiatives involved both elements of delivery system design and decision support. The diabetes and asthma incentives involved a payment to the practice through the Practice Incentive Program (PIP) and a Service Incentive Payment (SIP) to the individual practitioner on completion of tasks related to that condition. In the case of diabetes it was an annual cycle of care and in the case of asthma a series of planned visits. The cycle of tasks was generated from clinical

practice guidelines on diabetes care while the asthma visits related to a process for implementing Australian asthma management guidelines. General practitioners have struggled with the complexity of having a range of different disease-specific incentives introduced at the same time and there have been considerable difficulties with uptake and use of the asthma incentive (42).

As well as incentives through the PIP and SIP process the mental health initiative also included education and training for GPs; focused psychological strategies; access to allied psychological services; and access to psychiatrist support (43). A study evaluating the Better Outcomes in Mental Health (BOiMH) programs in two general practice divisions in New South Wales showed satisfaction with the program and improved patient outcomes (44). However, there were issues with uptake of the training by GPs and difficulties with access in some Divisions with the result that some programs became oversubscribed.

Although the majority of initiatives to improve chronic disease management in primary care have focused on changing the role of general practitioners there have also been practice nurse initiatives. Practice nurses have become an integral part of health assessments and care plans. Support to assist GPs in rural areas and other areas of high workforce need to employ practice nurses was approved in the 2001 Federal Budget. Subsequently as part of the Strengthening Medicare announcement the PIP practice nurse payment was extended to urban areas of workforce shortage. Practice nurses have become increasingly involved in conducting health assessments, contributing to GP Management Plans and to Team Care Arrangements. This is a change in delivery system design towards an expanded role for nurses in primary care.

Another important innovation has been the National Primary Care Collaboratives Program (NPCCP). Introduced in 2004, the aim of the NPCCP was to improve service delivery, access and integration of care for patients with complex and chronic conditions. The first of the planned three waves focused on care of diabetes and secondary prevention of coronary heart disease. The approach relied on local activity in practices based on plan/do/study/act (PDSA) cycles. A total of 157 practices from 22 Divisions were involved in the first wave, which has shown some improvements in measures of quality of care for patients with coronary heart disease (45).

There has also been a focus on the CCM element of self management through a Commonwealth program focused on chronic disease self management. The Sharing Health Care Initiative 1999-2007 funded twelve demonstration projects of chronic disease self management. These programs addressed a range of chronic conditions and typically involved education and training for patients and health professionals. Self management education programs used have included the Stamford Model (46, 47) and the Flinders Model (39).

There have also been initiatives in chronic disease prevention. The Australian Government developed the Smoking, Nutrition, Alcohol and Physical Activity (SNAP) framework for general practice in response to evidence that lifestyle modification can be implemented in general practice but that relatively few encounters involve risk factor assessment (48). Following on from the SNAP initiative the Australian Government supported the development of a set of resources to assist GPs to incorporate behavioural risk factor management into their practice as part of the government's Focus on Prevention package announced in the 2003-4 Budget. The "Lifescripts" risk factor resource kit has been disseminated via Divisions of General

Practice and includes assessment tools and lifestyle prescription resources on each of the four SNAP risk factors.

More recently the Council of Australian Governments has announced the Australian Better Health Initiative (ABHI), a five-year package aimed at reducing the impact of chronic disease. This package includes a Medicare Benefits Schedule item for a focussed health check to be available via general practice for people around age 45 who have one or more identifiable risk factors that may lead to chronic disease. The ABHI also includes initiatives to support lifestyle change through individual and group lifestyle education to those with modifiable risk factors and a measure to encourage patient self management of chronic disease by providing training for health professionals, including GPs, in teaching self management skills. The Lifescripts resources and these measures that form part of the Better Health Initiative align to CCM elements of self management support and delivery system design.

As well as initiatives at national level there have been notable State level programs. For example in New South Wales the NSW Chronic Care Program has targeted the care of people with chronic and complex problems who are frequent users of the hospital system. The types of intervention used have typically been changes in delivery system design with care coordinator roles developed such as the role of specialist liaison nurse (49). There is some evidence that phase one of the chronic care program resulted in a reduction in hospitalisations. Phase two involved the development of clinical service frameworks for respiratory disease, heart failure and cancer, use of collaborative methodology and the development of service standards for Aboriginal chronic conditions (49). Other states have also developed chronic disease programs such as the Northern Territory preventable chronic disease strategy (50).

Australia has particular problems with chronic disease among indigenous people. In 1999-2001, over two-thirds of excess deaths for Aboriginal and Torres Strait Islander people were accounted for by diseases of the circulatory system, respiratory system, and endocrine, nutritional and metabolic diseases. The self reported rate of diabetes was almost four times as high as for other Australians (51). To a substantial extent the higher prevalence of chronic disease accounts for the shorter life expectancy of Aboriginal and Torres Strait Islander people, which is about 20 years less than non-Aboriginal Australians.

Primary health care services for Aboriginal and Torres Strait Islander people are provided in a number of ways including through Aboriginal Community Controlled Health Organisations (ACCHO), outreach services of various kinds and through mainstream services such as general practice. Efforts to improve chronic illness care in Aboriginal and Torres Strait Island people are made more challenging by geographical isolation in rural and remote communities and by workforce and capacity issues in primary care services generally. The Coordinated Care Trials included four trials in Aboriginal communities with a focus on improved care coordination, use of funds pooling and using additional funding calculated on the basis of relative under-use of Medicare and Pharmaceutical Benefit Schemes (MBS and PBS) rebates. These trials showed improvements in service access and service appropriateness but there were also lessons in the need for a comprehensive and sustained approach to building capacity in local services and communities (52).

In the Northern Territory the Assessment of Chronic Illness Care scale has been adapted and used in Aboriginal community health centres to examine the status of

systems for care of diabetes. Health centre systems were in the low to mid range of development and were comparable to results from the US except for lower scores on organisational influence and self management support (53).

A number of factors have been identified that are thought to contribute to the success of chronic disease programs in Aboriginal people (54). Key factors relevant to initiatives in Aboriginal Health in general are: Aboriginal community support and involvement; effective local area partnerships and working groups; participation and professionals development of Aboriginal Health Workers; adequate resources and coordination between existing human, financial and physical resources and initiatives; effective planning and evaluation with feedback to the community; and appropriate timeframes for the development and implementation of initiatives. Key factors specific to initiatives for early detection and management of chronic conditions among Aboriginal people are: accessible early detection and interventions program; local (including outreach) multidisciplinary teams or taskforces with clear roles and responsibilities; locally agreed evidence-based clinical protocols; and systems for follow up care including register and recall systems.

At the macro level a key issue with the approaches to date to improve chronic disease management in Australia for both the general population and the indigenous population has been the need for greater consistency and linkages between policy and program approaches at Commonwealth and State levels. There has been policy work to better define and coordinate Australia's chronic disease policy framework through the development of the National Chronic Disease Strategy (NCDS) (55) which seeks to provide an overarching policy framework for action on chronic disease. The NCDS does not contain implementation strategy; these are expected to be the responsibility of individual jurisdictions. The NCDS identifies the following action areas:

1. Prevention across the continuum.
2. Early detection and early treatment.
3. Integration and continuity of prevention and care
4. Self Management.

The NCDS has five Supporting Service Improvement Frameworks that cover the national health priority areas of asthma; cancer; diabetes; heart; stroke and vascular disease; osteoarthritis, rheumatoid arthritis and osteoporosis. The Australian Better Health Initiative, discussed above, forms part of the implementation of actions under the National Chronic Disease Strategy but coordinated action will be needed from a range of stakeholders at national, state and local level if comprehensive implementation is to occur.

SUMMARY

In summary the elements that make up the Chronic Care Model have been adapted for use in a variety of developed countries with a range of different health care systems. Emphasis has been placed on the elements of the model that address specific issues such as disease guidelines or self management within the context of the health care system. For example the delivery system design focus of the Transmural Care approach in the Netherlands to overcome a fragmented healthcare system (26). In other countries the CCM has been used to co-ordinate care in an affordable way for patients.

The role of practice nurses and primary care teams have become increasingly important to support the role of the GP in managing chronic disease. The role of the patient in their own care is being developed with programs such as the Expert Patient Program (EPP) and Stamford and Flinders Models.

The key outcomes and impacts on the examples described have focused on due uptake of the programs by healthcare providers and patients; health service utilisation and quality of care outcomes and the results have been mixed. Improvements in patient care have not always been associated with reduced health care costs for the healthcare system or the patient. As a framework the CCM provides policy makers and healthcare professionals with an overview of elements that are considered to be essential in the management of people with chronic conditions but it is not clear whether the elements are of equal importance in terms of their effect on process of care or patient outcomes.

The CCM sets out a framework for understanding the role of the different elements to provide health care for people with chronic disease. The descriptions of the adaptations of the model in different healthcare settings do not however provide information for the evidence of effectiveness for the elements. The next section will use a systematic review and review of reviews approach to establish the effectiveness of the elements of the CCM when tested experimentally.

2. METHODS FOR THE SYSTEMATIC REVIEW

The purpose of the systematic review and review of reviews was to identify the published experimental evidence to inform the elements of the chronic care model. In particular to answer the following questions:

1. How effective, efficient and innovative are the models and approaches identified?
2. What are the characteristics of successful (effective, efficient and / or innovative) models and approaches in terms of organisation, service delivery and funding? How applicable are these to the Australian context and health care system?
3. What are the facilitators and barriers to effective interventions for chronic disease in primary health care?

SEARCH CRITERIA

Primary research studies meeting the inclusion criteria for the review were identified by searching Medline, Embase, CINAHL and PsychLit from January 1990 to February 2006 and the Cochrane Effective Practice and Organisation of Care (EPOC) specialised register (Issue 4, 2005). Terms for the chronic diseases of interest and aspects of chronic disease management were combined with terms for primary and community care and the EPOC quality filter was applied to include randomised controlled trials (RCTs), controlled clinical trials (CCTs), controlled before and after (CBA) and interrupted time series (ITS) studies (Appendix 1) for the detailed search strategy. Systematic reviews meeting the inclusion criteria were identified by searching the Cochrane Library (Issue 4, 2005), the Database of Abstracts of Reviews of Evidence (DARE) and the Joanna Briggs Institute (JBI) Library from 1990 to February 2006. In addition to this there was a grey literature search of relevant government and health related websites (Appendix 2). The bibliographies of all primary research papers included in the review were searched to identify additional studies and systematic reviews for inclusion.

Studies and systematic reviews were included if they were published in the English language, published in 1990 or later and the research was undertaken in any of the following countries: Australia, Canada, Netherlands, New Zealand, Scandinavia (Sweden, Norway, Denmark, Finland, Iceland), United Kingdom (England, Scotland, Wales, Northern Ireland), or USA.

INCLUSION CRITERIA

Studies were included in the review if they contained male or female adults aged 18 years and over with one or more of the following conditions: asthma, heart disease, heart failure, hypertension, type 2 diabetes, lipid disorders, chronic obstructive pulmonary disease (COPD), arthritis (osteoarthritis or rheumatoid arthritis) and osteoporosis. Intervention strategies for patients with chronic diseases were included if they addressed organisational, professional or financial interventions as described in the EPOC taxonomy of interventions (see Table 1 and Appendix 3 for more detail). The EPOC taxonomy was used because the focus of the Cochrane EPOC group is on interventions designed to improve professional practice and delivery of health care, which fits with the scope of this review. The EPOC taxonomy does not include patient mediated interventions and these were expanded for the purpose of this review to include: distribution of educational materials, education sessions, motivational counselling, brief intervention, community programs, self management and call back reminder notice.

Table 1: EPOC Taxonomy of Interventions

Professional interventions	Financial interventions	Organisational interventions
Distribution of educational materials including clinical practice guidelines.	Provider level	Provider level
Educational meetings	Fee-for-service	Revision of professional roles
Local consensus processes	Prepaid	Clinical multidisciplinary teams
Educational outreach visits	Capitation	Formal integration of services
Local opinion leaders	Provider salaried service	Skill mix changes
Prospective payment	Prospective payment	Continuity of care
Reminders	Provider incentives	Interventions to 'boost morale'
Marketing (e.g. personal interviewing, focus groups, survey to identify barriers)	Institution incentives	Communication and case discussion between distant health professionals
Mass media	Provider grant/allowance	Patient level
	Institution grant/allowance	Mail order pharmacies
	Provider penalty	Presence and functioning of adequate mechanisms for dealing with patients' suggestions and complaints
	Institution penalty	Consumer participation in governance of health care organisation
	Formulary	Structural level
	Patient level	Changes to the setting/site of service delivery
	Premium	Changes in physical structure, facilities and equipment
	Co-payment	Changes in medical records systems
	User-fee	Changes in scope and nature of benefits and services
	Patient incentives	Presence and organisation of quality monitoring mechanisms
	Patient grant/allowance	Ownership, accreditation, and affiliation status of hospitals and other facilities
	Patient penalty	Staff organisation

Studies were included if they objectively measured health professional performance or patient outcomes in a clinical setting or self-report measures with known validity and reliability. Health professional performance included process outcomes such as adherence to disease specific guidelines, disease specific measurements such as blood pressure, blood glucose, spirometry, weight, referrals and follow up. Patient outcomes included disease control, self report measures with known validity and reliability such as well-being, quality of life and disability scores. Patient satisfaction, provider satisfaction and economic measures were included. Studies and systematic reviews that only evaluated the change in patient knowledge were excluded.

Studies were included in the review if they were randomised or quasi-randomised controlled trials (RCTs), controlled clinical trials (CCT), controlled before and after studies (CBAs), or interrupted time series (ITS) according to the EPOC criteria (EPOC Checklist 2002). If a study did not meet the above criteria it was included in a separate category if the research was undertaken in Australia and provided contextual information.

Systematic reviews were included in the review where more than 50% of the included studies met the above inclusions criteria. Primary research papers that were included in the systematic reviews selected for this review were excluded from data extraction so that they would not contribute to the results twice.

QUALITY ASSESSMENT FOR PRIMARY RESEARCH PAPERS

There were four processes undertaken to select the studies for inclusion in this review.

Screening
One reviewer (SD) screened the titles and abstracts of all the articles identified from the database and grey literature search strategies. Where there was any doubt as to the relevance of the study it remained in the list. Because of the broad nature of the research questions it was important that the search strategy was sensitive but not too specific. This meant that a large number of articles were identified in the initial search that were clearly irrelevant to this review and this initial screen simply removed these articles.

Two reviewers (IH and DT) screened the abstracts of the remaining articles independently. Abstracts remained in the list if they did not contain sufficient information for a decision to exclude to be made. The results of the screening were recorded in Excel spreadsheets for comparison and any disagreements were resolved by a third reviewer (SD).

Verification
Attempts were made to obtain full-texts of all the articles screened and included in the list for verification. The sources utilised included all online sources, library visits, inter-library loan requests, and purchasing on-line. Some of the Australian papers were collected directly from the author via email or fax.

A study verification form (Appendix 4) was developed (RG and SD) from those used by JBI and EPOC. Two reviewers (IH and DT) independently verified the papers. Again, the results of the verification process were recorded in Excel spreadsheets for comparison and any disagreements were resolved by a third reviewer (SD).

Quality Assessment

Quality assessment forms were developed from those used by the JBI and EPOC (RG and SD). Separate forms were developed for RCTs and CCTs, CBA and ITS study design (Appendices 5,6,7).

Two reviewers (IH and DT) assessed the quality of the articles. Because of time constraints the list of articles was split between the two reviewers with a 19% overlap so that an inter-rater reliability test could be performed. A one-way ANOVA was used to calculate mean squares of the scores and then a Spearman-Brown equation was used to estimate the inter-rater reliability. The agreement rate was 0.7.

In order to ensure the methodological rigor of included articles it was necessary to identify a mechanism to facilitate the identification and subsequent exclusion of studies of lesser quality. Sutton et al (56) advocate that the most appropriate method to facilitate such identification is to determine a threshold value by either using the mean score, median score or calculating the mean score plus one standard deviation. The mean of the scores of 212 studies included in this review that were subjected to quality assessment was 10.84 and the median was 11.0. The mean and/or median quality scores were adopted as the threshold for defining studies of adequate quality.

Data extraction

Data was extracted by two reviewers (DT and IH). A data extraction form (Appendix 8) was developed from those used by JBI and EPOC. An MS Access database was developed for data entry. Data were entered directly into the Access database while articles were being read.

QUALITY ASSESSMENT FOR SYSTEMATIC REVIEWS

There were three stages to the process of selecting the systematic reviews for inclusion in this review.

Screening

One reviewer (SD) screened the titles and abstracts of the systematic reviews identified by the database searches and excluded any reviews that did not meet the inclusion criteria. Where there was any doubt as to the review's relevance the review remained in the list.

Verification

Attempts were made to obtain full-texts of all the systematic reviews included in the list for verification. The sources utilised included all online sources, and purchasing on-line. A verification form for systematic reviews was developed by modifying the study verification form with information from published papers (Appendix 9) (57, 58). The systematic reviews were verified by one reviewer (SD) and any uncertainties were resolved following discussions with the other investigators (NZ, IH, RG).

Data extraction

All systematic reviews that met the inclusion criteria after verification underwent data extraction. Data were entered into an MS Access database. One reviewer (SD) extracted data from the included reviews.

SNOWBALLING

One reviewer (DT) screened the bibliographies of all the primary research papers and identified primary research articles and systematic reviews for inclusion. All additional articles and reviews identified through the snowballing process underwent the

screening, verification, quality assessment and data extraction process as detailed above.

CODING THE CHRONIC CARE MODEL

The interventions described in the primary research papers and the summary tables of included studies in the systematic reviews were described using the EPOC taxonomy and stored in the MS Access database. The EPOC taxonomy was mapped to the elements of the CCM using several published descriptions of the model (6, 8) to assist this process and a comparison table was developed (Table 2). This mapping process enabled the components of the CCM addressed by each paper to be listed. For the analysis it was important that each paper was categorised according to the element of the CCM that was considered to be the main focus, eg. self management support. Two reviewers (SD and IH) ranked the order of importance of the elements of the chronic care model to the review or paper using the results of the mapping from the EPOC taxonomy and the specific aims of the review or paper. Any disagreements were resolved by a third reviewer (NZ).

Table 2: Chronic Care Model mapping to EPOC taxonomy

Chronic Care Model Element	Description (6)	Classification of studies (8)	EPOC Taxonomy
Community Resources	Linkages with community based resources – exercise programs, self help groups, and senior centres. Linkages with hospitals providing patient education classes or home care agencies to provide case managers.	For patients. For community.	
Health Care Organisation	The structure, goals and values of provider organisation. Its relationship with purchaser, insurers and other providers underpins the model.	Leadership support. Provider participation. Coherent system improvement and spread.	Financial interventions Formal integration of services Ownership, accreditation and affiliation services Changes in scope and nature of benefits and services
Self Management Support	Collaboratively helping patients and their families to acquire the skills and confidence to manage their condition. Provide self management tools; referrals to community resources, routinely assessing progress.	Patient education. Patient activation / psychosocial support. Self management assessment. Self management resources and tools. Collaborative decision making with patients. Guidelines available to patients.	Self management Patient education Reminders Marketing Mass media
Delivery System Design	The structure of the medical practice to create teams with a clear division of labour and separating the acute from the planned care. Planned visits and follow up are important features.	Care management roles. Team practice. Care delivery / coordination. Proactive follow up. Planned visit. Visit system change.	Revision of professional roles Clinical multidisciplinary teams Skill mix changes Continuity of care – follow up Register recall Interventions to 'boost morale' Communication and case discussion Changes to the setting/site of service delivery Changes in physical structure, facilities and equipment

Chronic Care Model Element	Description (6)	Classification of studies (8)	EPOC Taxonomy
Decision Support	Integration of evidence based clinical guidelines into practice and reminder systems. Guidelines reinforced by clinical "champions" providing education to other health professionals.	Institutionalisation of guidelines or prompts. Provider education. Expert consultation support.	Distribution of educational materials for providers Educational meetings Local consensus processes Educational outreach visits Local opinion leaders Audit and feedback
Clinical Information Systems	Three important roles of computer information systems: Reminder system to improve compliance with guidelines Feedback on performance measures. Registries for planning the care for CD.	Patient registry system. Use of information for care management. Feedback of performance data.	Changes in medical records systems Presence and organisation of quality monitoring mechanisms

DATA SYNTHESIS

The data were synthesised using the approach described by Weingarten et al. (3), which was modified for the purposes of this study. We modified the methods of Weingarten et al. because we took a comprehensive approach when including studies and recording outcome measures. This resulted in heterogeneity in the recorded data and that prevented us from doing a meta-analysis to explore the effect-sizes.

The outcome measures that we recorded were:
1. Health care professional adherence to guidelines.
2. Patient outcomes:
   - physiological measures of disease,
   - adherence to treatment,
   - health service use,
   - quality of life,
   - risk behaviour,
   - satisfaction,
   - health status, and
   - functional status.

We entered all the key outcome measures recorded in the studies under each of the categories listed above. For each of the categories, if one of the recorded outcome measures showed a statistically significant improvement (p value <0.05) that outcome measure was coded as a statistically significant improvement. For example, if a randomised controlled trial focussing on diabetes reported HbA1c, blood lipids and blood glucose as physiological measures of disease (PMOD) and there was a statistically significant improvement (P<0.05) for HbA1c then we recorded the PMOD outcome for that study to have produced a positive outcome irrespective of the results for blood lipids and glucose. For the systematic reviews, the published results were used in this report.

Tables were produced that summarized the effective outcomes by CCM element. All analyses were performed using SPSS 14.0 for Windows, SPSS Inc.

3. RESULTS

RESULTS FROM THE PRIMARY RESEARCH PAPERS

Selection process

The initial database search identified 5032 relevant articles that were published between 1990 and February 2006. An initial screening by a single reviewer reduced this to 578. This number was reduced to 399 when screening was undertaken by two reviewers through abstract reading. Verification of the full-text resulted in 212 articles being selected for quality assessment. The cut-off score for quality was selected at 11.0. Ninety articles scoring less than 11.0 were discarded. The number of articles selected for data extraction was 132 including 10 Australian studies. Data was extracted from 126 articles including 10 Australian articles. Data could not be extracted from six papers because of inadequate and/or inappropriate reporting. Screening of the reference lists of those articles included in the review provided another 19 for data extraction. In total data was extracted from 145 articles (Figure 2). In cases where there were multiple papers based on the same study, data was extracted from one paper that best matched the purpose of the review. (Included and excluded papers are detailed in Appendices 10, 11 and 12).

Fourteen (10 during the initial search and 4 during snow-balling) relevant Australian studies identified during the verification stage were included for data extraction and were not subjected to quality assessment (Figure 2).
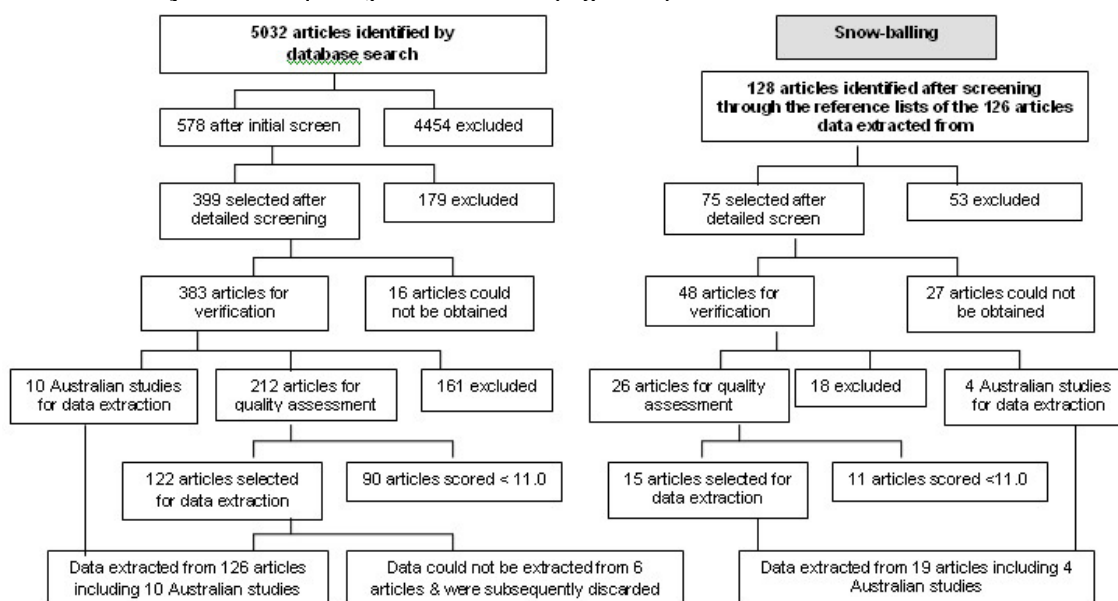
Fig 2. Selection process of the primary research papers

Characteristics of the programs

Of the 145 studies data extracted from the majority (80%) were randomised controlled trials (RCT). The next most common study design was controlled before and after (CBA) (15.2%). There were two controlled clinical trials (CCT) and one interrupted time series (ITS). Four descriptive Australian studies were also included to provide additional contextual information.

The majority (64.1%) of the studies were based at primary care settings, 33 in community based care and 12 in managed care organisation. Over half of the studies

were conducted in the USA followed by 21 in the UK, 15 in the Scandinavia, and 14 in Australia.

More than one-third (54) of the studies included in the review had diabetes as the key disease-focus. This was followed by hypertension (24), asthma (21), and heart disease (19).

Table 3: Study characteristics of the primary research papers

Study characteristics	Number	Percentage
Study design		
Randomised controlled trial	116	80.0
Controlled before & after	22	15.2
Descriptive (Australian)	4	2.8
Controlled clinical trial	2	1.4
Interrupted time series	1	0.7
Settings		
Primary Care	93	64.1
Community based care	33	22.8
Managed Care Organisation	12	8.3
Hospital	5	3.4
Mixed	1	0.7
Others	1	0.7
Country		
USA	74	51.0
UK	21	14.5
Australia	14	9.7
Netherlands	14	9.7
Finland	5	3.4
Canada	4	2.8
Sweden	4	2.8
Denmark	3	2.1
New Zealand	3	2.1
Norway	2	1.4
Iceland	1	0.7
Disease		
Diabetes	54	37.2
Hypertension	24	16.6
Asthma	21	14.5
Heart Disease	19	13.1
Lipid disorder	12	8.3
Osteoarthritis	8	5.5
COPD	5	3.4
Others	2	1.4

The number of interventions used in the 145 studies ranged from one to seven with nearly one-third of the studies using a single intervention, another third using two, and the remaining third using three or more interventions (Table 4).

Table 4. Number of interventions by disease

Disease	Number of Interventions in Programs					
	1	2	3	4	5	6
Asthma (21)	7	7	3	3	0	1
COPD (5)	1	1	0	0	1	2
Diabetes (54)	13	24	9	5	1	2
Heart Disease (19)	8	3	6	1	0	1
Hypertension (24)	7	6	4	7	0	0
Lipid disorder (12)	4	2	3	2	0	1
Osteoarthritis (8)	5	2	1	0	0	0
Others (2)	0	0	1	1	0	0
All conditions (145)	45	45	27	19	2	7

Note: One study had more than six interventions not reported above.

The interventions reported in the studies were categorised using the EPOC taxonomy (Appendix 3), which was then mapped to the elements of Chronic Care Model. Patient self-management support (SMS) (160) was the most frequently used intervention across all the disease groups followed by decision support (DS) (74) for health professionals and delivery system design (DSD) (69) (Table 5). The most frequently used SMS interventions included patient educational sessions and motivational counselling followed by distribution of educational materials among patients. Implementation of standard guidelines, educational meetings and distribution of educational materials among health professionals were most commonly used DS interventions. The most frequently used DSD intervention was multidisciplinary teamwork.

There were 30 interventions categorised as clinical information system (CIS) used by 145 programs. The most frequently used CIS intervention included audit and feedback to health professionals. There were only 10 studies that included health care organisation (HCO) as an intervention. Of the total of 343 interventions reported in the 145 studies none of them was categorised as community resource (CR) as per EPOC taxonomy. Table 5 shows interventions as per the elements of chronic care model by disease.

Table 5: Types of interventions by disease

Disease	CIS	DS	DSD	SMS	HCO	CR	TOTAL
Asthma (21)	5	10	11	21	1	0	48
COPD (5)	0	3	3	12	1	0	19
Diabetes (54)	16	33	29	42	5	0	125
Heart Disease (19)	2	4	11	25	0	0	42
Hypertension (24)	3	13	7	36	0	0	59
Lipid disorder (12)	4	8	7	10	2	0	31
Osteoarthritis (8)	0	0	0	11	1	0	12
Others (2)	0	3	1	3	0	0	7
All conditions (145)	30	74	69	160	10	0	343

Again, patient self-management support was the most commonly used intervention irrespective of the country where the study was conducted as shown in Table 6. There was no preponderance of any one type of intervention in any particular country.

Table 6: Types of interventions by country

Country	CIS	DS	DSD	SMS	HCO	CR	TOTAL
Australia (14)	2	5	8	20	1	0	36
Canada (4)	0	3	1	3	0	0	7
Denmark (3)	2	4	1	0	0	0	7
Finland (5)	1	2	1	11	0	0	15
Iceland (1)	0	3	1	0	0	0	4
Netherlands (14)	0	9	3	9	1	0	22
New Zealand (3)	0	2	4	8	1	0	15
Norway (2)	0	1	1	4	1	0	7
Sweden (4)	0	3	0	7	0	0	10
UK (21)	3	10	8	20	4	0	45
USA (74)	22	32	41	78	2	0	175
All country (145)	30	74	69	160	10	0	343

Characteristics of the effective interventions

Results showed that patient SMS was the most effective intervention and it was effective across the majority of outcomes measures recorded (Table 7). Within SMS the most effective intervention was educational sessions of patients and patient motivational counselling (Table 13). Distribution of educational materials among patients in association with patient education and motivation produced positive outcome for patients' service use and patient risk behaviour (Table 13).
DSD in the form of multidisciplinary teamwork produced positive outcome for patients' service use (Tables 7 and 13).

DS and CIS produced positive outcomes for professional adherence to standard disease management guidelines. DS interventions that were found to be effective included implementation of evidence based guidelines, educational meetings with health professionals and distribution of educational materials among health professionals (Table 13). Of the CIS interventions audit and feedback was found to be effective in assisting health care professionals adhere to guidelines (Table 13).

Table 7: Elements of chronic care model and outcomes measures

Elements of Chronic Care Model	Outcome Measures								
	Professional adherence to guideline	Patient adherence to treatment	Patient service use	Patient physio-logical measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
Delivery System Design (DSD)	4 (8)	4 (16)	12 (22)	18 (27)	2 (6)	6 (18)	3 (6)	3 (7)	0 (3)
Decision Support (DS)	18 (26)	3 (5)	1 (5)	9 (16)	0 (2)	4 (8)	2 (2)	1 (2)	
Clinical Information System (CIS)	4 (7)	1 (2)	1 (3)	1 (6)	1 (1)	0 (1)			
Self-management support (SMS)	2 (2)	3 (4)	9 (13)	13 (20)	12 (15)	12 (18)	7 (8)	6 (6)	6 (7)

Note1: None of the studies was categorised as having health care organisation and community resources as the key intervention.
Note2: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure.
Note3: Number in bracket is the number of studies reporting at least one outcome measure in that particular category.

In addition to patient SMS the other elements that produced positive outcome for patient physiological measure of disease included DS for health professionals and DSD. DS interventions that produced positive outcomes in this regard included implementation of evidence-based guidelines, distribution of educational materials among health professionals and educational meetings with health professionals (Table 13). DSD interventions that were effective in controlling disease measures included multidisciplinary teamwork.

Key Physiological Measure of Disease
Table 8 shows the interventions there were effective in controlling three key physiological measures of disease. For HbA1c the most effective intervention was DSD followed by SMS, whereas, for the other measures the most effective intervention was SMS followed by DSD.

Table 8: Elements of chronic care model and 3 key physiological measures of disease

Elements of Chronic Care Model	Outcome Measures			
	HbA1c	Systolic BP	Diastolic BP	Total Cholesterol
Delivery System Design	9 (17)	4 (10)	4 (10)	4 (11)
Decision Support	2 (8)	3 (9)	3 (9)	1 (5)
Clinical Information Systems	0 (4)	0 (1)	0 (1)	0 (2)
Self-management support	4 (10)	4 (6)	3 (6)	4 (7)

Note1: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure.
Note2: Number in bracket is the number of studies reporting at least one outcome measure in that particular category.

Number and type of elements
Adding multiple elements to the intervention programs did not seem to produce better outcomes as shown in Table 9. Again, adding multiple types of elements from the CCM did not make the intervention programs more effective (Table 10).

Table 9: Number of elements of CCM and positive outcomes measures

Total Number of Elements Used	Outcome Measures								
	Professional adherence to guideline	Patient adherence to treatment	Patient service use	Patient physio-logical measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
1 Intervention	9 (12)	3 (5)	5 (11)	9 (23)	3 (6)	5 (11)	4 (5)	2 (2)	2 (3)
2 Interventions	8 (14)	2 (6)	7 (11)	14 (19)	6 (7)	13 (19)	2 (2)	2 (5)	3 (3)
3+ Interventions	11 (17)	6 (16)	11 (20)	18 (27)	6 (11)	4 (15)	6 (9)	6 (8)	1 (4)

Note1: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure.
Note2: Number in bracket is the number of studies reporting at least one outcome measure in that particular category.

Table 10: Number of types of elements of CCM and positive outcomes measures

Number of Types of Elements Used	Outcome Measures								
	Professional adherence to guideline	Patient adherence to treatment	Patient service use	Patient physio-logical measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
1 Type	12 (17)	4 (7)	11 (19)	17 (36)	11 (15)	13 (22)	6 (7)	4 (6)	5 (6)
1+ Type	16 (26)	7 (20)	12 (23)	24 (33)	4 (9)	9 (23)	6 (9)	6 (9)	1 (4)

Note1: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure
Note2: Number in bracket is the number of studies reporting at least one outcome measure in that particular category

Combination of CCM elements
The combination of DSD and SMS was the most effective combination across the majority of the outcome measures (Table 11). The interventions that were most effective within this combination were patient educational sessions and multidisciplinary teamwork and patient motivational counselling and multidisciplinary teamwork.

Table 11. Combination of Elements of CCM and outcomes measures

Elements of Chronic Care Model	Outcome Measures								
	Professional adherence to guideline	Patient adherence to treatment	Patient service use	Patient physio-logical measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
CIS + DSD	2 (3)								
CIS + SMS	2 (2)								
DS + CIS	5 (8)			3 (4)					
DS + DSD	3 (4)			2 (4)					
DS + HCO	2 (2)								
DS + SMS				4 (6)					
DS Only	8 (13)			4 (5)		4 (6)			
DSD + SMS	3 (6)	4 (12)	11 (17)	15 (22)	4 (8)	7 (14)	3 (4)	5 (7)	
DSD Only			3 (5)	4 (8)					
SMS Only		2 (2)	5 (6)	5 (10)	9 (11)	9 (13)	4 (5)	2 (2)	5 (6)

Note1: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure.
Note2: Number in bracket is the number of studies reporting at least one outcome measure in that particular category.

DS in combination with CIS and DSD improved for health care professionals' adherence to guidelines. The most common interventions within these combinations were implementation of evidence-based guidelines and audit and feedback and multidisciplinary teamwork.

There was a relative lack of evidence of other combinations.

Effect by disease
Self-management support was the most effective intervention across the majority of the disease groups. For asthma, SMS improved patients' quality of life and functional status (Table 12). For diabetes, on top of patients' quality of life, SMS improved patients' physiological measure of disease and patients risk behaviours. SMS had a significant impact on service use of patients with heart failure (Table 12). Osteoarthritis patients' functional status was improved because of SMS. The effect of SMS on patients with COPD or lipid disorders was minimal.

Delivery system design predominantly had effects on diabetes, hypertension, and lipid disorders. It improved physiological disease measures in patients with diabetes, heart disease and lipid disorders. In addition, in diabetes and heart disease it also improved health services utilisation by patients (Table 12).

Results suggest that DS alone or in association with CIS mainly enhanced the management of diabetes (Table 12). DS and/or CIS significantly improved health care professionals' adherence to guidelines. DS also improved physiological control of diabetes.

Patients suffering from asthma also benefited from DS through better asthma control and thus enhanced quality of life.

Table 12: Elements of chronic care model and positive outcomes measures by disease

Elements of Chronic Care Model	Outcome Measures								
	Professional adherence to guideline	Patient adherence to treatment	Patient service use	Patient physio-logical measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
Delivery System Design									
Overall	4 (8)	4 (16)	12 (22)	18 (27)	2 (6)	6 (18)	3 (6)	3 (7)	0 (3)
Asthma	0 (1)	0 (2)	1 (4)	1 (2)		2 (6)	0 (2)	1 (3)	0 (1)
COPD	0 (1)	0 (3)	2 (3)	1 (1)		0 (3)	1 (1)		0 (2)
Diabetes	2 (3)	3 (8)	4 (7)	8 (14)	0 (3)	1 (2)	1 (1)	2 (3)	
Heart Disease	0 (1)	1 (2)	3 (6)			2 (5)	0 (1)	0 (1)	
Hypertension	1 (1)	0 (1)	1 (1)	3 (5)	2 (2)	1 (2)	1 (1)		
Lipid Disorders	1 (1)			5 (5)	0 (1)				
Osteoarthritis									
Others			1 (1)						
Decision Support									
Overall	18 (26)	3 (5)	1 (5)	9 (16)	0 (2)	4 (8)	2 (2)	1 (2)	
Asthma	2 (3)	1 (1)	0 (1)	2 (2)		2 (3)	1 (1)	0 (1)	
COPD									
Diabetes	11 (11)	2 (3)	1 (2)	7 (10)	0 (1)	1 (1)	1 (1)	1 (1)	
Heart Disease	2 (4)	0 (1)				1 (2)			
Hypertension	1 (4)		0 (2)	0 (3)		0 (2)			
Lipid Disorders	1 (3)			0 (1)	0 (1)				
Osteoarthritis									
Others	1 (1)								
Clinical Information System									
Overall	4 (7)	1 (2)	1 (3)	1 (6)	1 (1)	0 (1)			
Asthma	0 (1)								
COPD									
Diabetes	4 (5)	1 (2)	1 (2)	1 (5)	1 (1)	0 (1)			
Heart Disease	0 (1)		0 (1)	0 (1)					
Hypertension									
Lipid Disorders									
Osteoarthritis									
Others									
Self-management support									
Overall	2 (2)	3 (4)	9 (13)	13 (20)	12 (15)	12 (18)	7 (8)	6 (6)	6 (7)
Asthma		1 (1)	2 (2)			3 (4)	1 (2)	1 (1)	2 (2)
COPD			1 (2)			1 (1)	1 (1)		0 (1)
Diabetes	2 (2)	0 (1)	1 (2)	8 (11)	4 (5)	4 (5)		4 (4)	
Heart Disease		2 (2)	5 (5)		2 (2)	3 (4)	3 (3)	1 (1)	
Hypertension				4 (7)	5 (7)	0 (1)			
Lipid Disorders				1 (1)					
Osteoarthritis			0 (2)	0 (1)	1 (1)	1 (3)	2 (2)		4 (4)
Others									

Note1: Number in cells is the number of studies showing at least one positive outcome for that particular outcome measure
Note2: Number in bracket is the number of studies reporting at least one outcome measure in that particular category

Table 13: Effective interventions as per EPOC Taxonomy

EPOC Taxonomy	CCM Element	Outcome Measures								
		Prof. adherence to guideline	Patient adherence to treatment	Patient service use	Patient physiological measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient Satisfaction	Patient functional status
Audit and feedback (prof level)	CIS	✔			✔					
Brief intervention (pat level)	SMS									
Call back reminder notice (pat level)	CIS		✔							
Change to medical records system	CIS									
Change to physical structure	DSD									
Change to setting of service delivery	DSD									
Changes to scope and nature of benefits	HCO									
Communication & case discussion (org level)	DSD								✔	
Community programs (pat level)	CR									
Consumer partic in governance of org	HCO									
Continuity of care (org level)	DSD									
Distribution of educational material (pat level)	SMS			✔		✔				
Distribution of educational material (prof level)	DS	✔			✔					
Educational meetings (prof level)	DS	✔			✔				✔	
Educational outreach visits (prof level)	DS	✔					✔			
Educational sessions (pat level)	SMS	✔	✔	✔	✔	✔	✔	✔	✔	✔
Financial - patient	HCO									
Financial - provider	HCO									
Formal integration of services (org level)	HCO									
Implementation of evidence based guidelines (prof)	DS	✔			✔		✔	✔		
Interventions to boost morale (org level)	DSD									
Local consensus process (prof level)	DS									
Local opinion leaders (prof level)	DS									
Mail order pharmacy (org level)	DSD									
Marketing (prof level)	DS									
Mass media (prof level)	DS									
Complaints dealing mechanism (org level)	HCO									
Motivational counselling (pat level)	SMS	✔		✔	✔	✔			✔	
Multidisciplinary teams (org level)	DSD	✔		✔	✔			✔	✔	
Other org intervention	HCO									
Other patient interventions										
Other prof intervention (prof level)										
Other structural interventions										
Accreditation & affiliation of hospital	HCO									
Patient-mediated interventions (prof level)	SMS									
Presence of quality monitoring	CIS									
Reminders (prof level)	CIS									
Revision of professional roles (org level)	DSD									
Self management (pat level)	SMS	✔					✔			
Skill mix changes (org level)	DSD									
Staff organisation	HCO									

Economic outcomes

There were eight studies that reported the economic outcomes for their interventions. Out of those eight three had DSD as their key intervention and the other five had SMS. Of the three DSD studies two reported a statistically significant positive economic outcome. For the five SMS studies, none produced positive economic outcomes.

The DSD interventions that were effective in producing positive economic outcomes included multidisciplinary teams and continuity of care at the organisational level.

EVIDENCE FROM SYSTEMATIC REVIEWS

A total of 23 systematic reviews met the inclusion criteria and were included in this review of reviews. Figure 3 details the stages involved in the identification of the reviews and the number excluded at each stage. For a detailed summary of the included systematic reviews see Appendix 13. References for the included and excluded reviews are listed in Appendices 14 and 15.
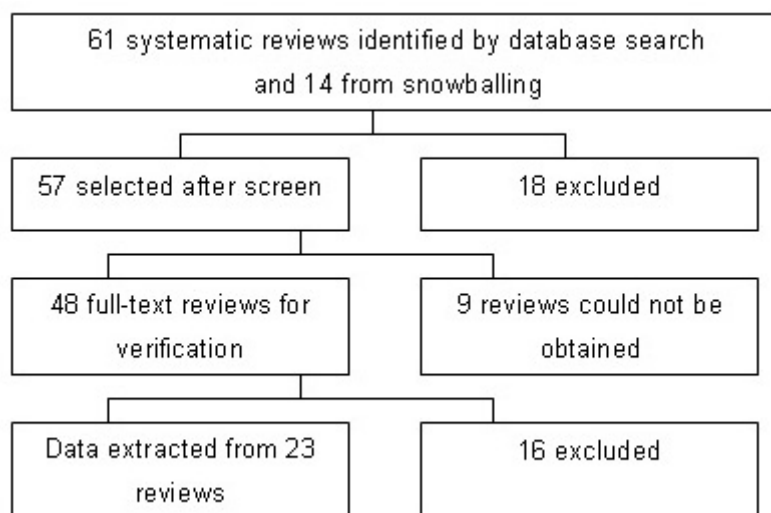
Figure 3: Selection process of the systematic reviews

The 23 systematic reviews identified addressed four of the elements of the Chronic Care Model as their primary focus:

- **Self-management support** – eleven reviews, six reviews in diabetes, two in asthma, COPD, hypertension and arthritis.
- **Delivery system design** – eight reviews, four reviews in diabetes although 2 reviews are duplicates (59, 60) and the results will be considered together, heart disease, hypertension, COPD and asthma.
- **Decision support** – two reviews, diabetes and asthma.
- **Clinical information systems** – two reviews, diabetes and cardiovascular disease and hypertension.

A summary of the results is presented in Table 14.

Table 14: Summary of results for the systematic reviews by CCM element

Elements of Chronic Care Model	Outcome measure								
	Health professional adherence to guidelines	Patient adherence to treatment	Patient service use	Patient physiological measure of disease	Patient risk behaviour	Patient quality of life	Patient health status	Patient medication	Patient knowledge
Self Management Support	1 (1)†		0 (3)	9.5* (11) †		2 (3) †		2 (3) †	5 (5) †
Delivery System Design	4 (4) †		1 (5)	5 (7) †	1 (1) †	2 (5)			1 (1) †
Decision Support	0.5* (2)		1 (1) †			0 (1)			
Clinical Information System	2 (2) †			1 (2) †					

*0.5 used as the results suggest improvement but it is not conclusive

† More than 50 per cent of the reviews reporting this result report a positive outcome

Note: The table reports the number of reviews that report a significant positive result for each outcome measure, the number in brackets is the total number of reviews that include the outcome measure of interest.

Self-management support (SMS)

There were eleven systematic reviews that primarily addressed SMS, six reviews in diabetes (61-66), two in asthma (67, 68), COPD (69), hypertension (70) and arthritis (71).

A total of five reviews reported an increase in patient knowledge with self-management support for diabetes (61-63, 65) and COPD (69). Only two of these reviews also demonstrated an improvement in patient outcomes associated with the improvement in knowledge for diabetes group training (61) and for self-management education in community gathering places (63). The results for patient outcomes were unclear for a further two reviews of diabetes self-management education (62, 65). HbA1c was improved in 14/54 studies but there was also an improvement in both active and control groups in a further 15 studies (62). Turnock et al reported an improvement in COPD knowledge; whilst this was not associated with an improvement in patient outcomes it was associated with better use of antibiotics (69). Patient outcomes were improved in a review of behavioural interventions for hypertension; counselling or counselling with training was more effective than usual care (70). There was a small improvement in pain and disability scores for patients with OA or RA attending arthritis self management programs (71). Blood glucose monitoring alone was not associated with improvements in patient outcomes (64).

Characteristics of effective SMS interventions

Group based self-management support was associated with improved patient outcomes for diabetes (61, 63, 65) (Table 15). Loveman et al. reported that group based education was particularly effective for interventions that targeted lifestyle change and increasing knowledge (65) and that it did not matter which health care professional delivered the education as long as they were well trained. Class size was not an important factor but annual top up sessions maintained the effect (61). Successful interventions were based on therapeutic patient interventions and empowerment (62, 63, 70). To be effective interventions had to address motivation to change and this seemed to be more effective in a group setting. Patient self management was particularly effective in community gathering places such as

community groups or church groups because it could be culturally specific and the evidence seemed to be applicable to a range of ethnic groups (63). Short term and repetitive focused interventions were found to be effective for diet and lifestyle (62, 65). Simply providing a verbal or written self management plan for asthma was not associated with improvements in patient outcomes however regular review improved morbidity and lung function, patients in both groups frequently improved (67, 68).

Barriers to effective SMS interventions

In general, many authors of the reviews reported that the quality of included studies was variable (61-63, 68, 69, 71). A feature of these studies was significant losses to follow up so that a selected group of patients remained in the study and patients tended to have poor control at baseline (63). Most of the authors reported that many of the studies included did not provide sufficient details of the self-management interventions used.

Table 15: Summary of the results for reviews addressing self-management support

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
SMS, DS, DSD, HCO	COPD		**Hospital admission**, (n=2) WMD 0.16 (95 per cent CI –0.09, –0.42) **Healthcare utilisation**, (n=1) WMD -0.01 (95 per cent CI –0.12, – 0.1)	**FEV1 per cent pred (6 months)**, (n=2) WMD 1.83 per cent (95 per cent CI -1.05, 4.71) **FEV1 per cent pred (12 months)**, (n=1) MD 2.00 (95 per cent CI -1.89, 5.89) **Mortality Peto OR at 12 months** 1.01 (95 per cent CI 0.32, 3.24)	**SGRQ 6 months**, (n=2) WMD-1.91 (95 per cent CI -5.46, -1.63) **SGRQ 12 months**, (n=2) WMD-0.32 (95 per cent CI -3.34, -2.70)	**Antibiotics 6 months**, (n=1) MD 6.00 days 95 per centCI 1.4 to 10.6	**Recognition of stable health**, (n=1) MD 1.10 (95 per cent CI 0.46, 1.74) **Recognition of early exac**, (n=1) MD 1.80 (95 per cent CI 0.75, 2.85) **Recognition of severe exac**, (n=1) MD 2.50 (95 per cent CI 1.04, 3.96) **How to act stable health**, (n=1) MD 0.5 (95 per cent CI 0.21, 0.79) **How to act early exac**, (n=1) MD 2.3 (95 per cent CI 0.96, 3.64) **How to act severe exac**, (n=1) MD 1.50 (95 per cent CI 0.62, 2.38)
SMS, CR, DSD	OA RA OA+RA Other			**SMS effect on pain**, (n=12) Effect size 0.12 (95 per cent CI 0.00, 0.24) **SMS effect on disability**, (n=12) 0.07 (95 per cent CI 0.00, 0.15)			
SMS, CR, DSD	Diabetes			**HbA1c (12-14 months)**, (n=7) WMD -0.82 (95 per cent CI -0.99, -0.65) **HbA1c (2 yrs)**, (n=22) WMD -0.97 (95 per cent CI -1.40, -0.54) **Weight (12-14 months)**, (n=5) WMD -1.61 (95 per cent CI -2.97, -0.25) **Sys (4-6 months) BP**, (n=2) WMD -5.37 (95 per cent CI -9.53, -1.21)		**Reduction diabetes medication**, (n=5) OR 11.79 (95 per cent CI5.17, 26.90)	**Diabetes knowledge**, (n=3) Std MD 0.95 (95 per cent CI 0.72, 1.18)
SMS, CIS, DSD	Asthma		**PEF vs symptom SMS, hospital admissions**, (n=4) R Risk 1.17 (95 per cent CI 0.44, 3.12) **PEF vs symptom SMS, ER visits**, (n=5)	**PEF vs Dr review, mean FEV1**, (n=3) SMD 0.10 [-0.05, 0.25 **PEF vs Dr review, mean PEF**, (n=3) SMD 0.16 (95 per cent CI 0.01, 0.31)		**PEF vs symptom SMS, oral steroids**, (n=2) R Risk 1.53 (95 per cent CI 0.82, 2.87)	
SMS	Asthma		**PEF based Written plans vs Symptom based Written Plans, Dr visits**, (n=2)	**PEF written plans vs no written plan, FEV1**, (n=1) WMD 2.00 (95 per cent CI -6.41, 10.41) **PEF written plans vs no written plan, PEF**, (n=1) WMD 2.10 (95 per cent CI -5.84,		**PEF based written plans vs symptom based written plans, oral steroid courses**, (n=2) R Risk 2.28 (95 per cent CI 1.25, 4.17)	

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
				10.04)			
SMS	Diabetes			**HbA1c**, (n=6) 5 no difference **HbA1c (mean change)**, –0.4 per cent in SMBG and +0.5 per cent in control (p<0.05)			
SMS	Hypertension			**Counselling vs Usual care - dias BP**, (n=2) 3.2 mmHg improvement in DBP (95 per cent CI 1.2, 5.3) **Counselling vs Usual care - sys BP**, (n=2) 10 mm Hg improvement in SBP (95 per cent CI 4.8, 15.6) **SM vs UC, BP**, No difference **C + training, BP**, 4.7mm Hg (95 per cent CI 87, 99)			
SMS, CR, DSD	Diabetes			**Community gathering places, HbA1c per cent**, (n=4) Pooled estimate –1.9 (95 per cent CI –2.4, –1.4) **SMS in the home, HbA1c per cent**, (n=2) Pooled estimate –0.5 (95 per cent CI –1.1, 0.1) **Community gathering places, weight (lbs)**, (n=6) -5.2 (95 per cent CI –9.0, 1.6) **SMS in the home, weight (lbs)**, (n=3) -2.3 (95 per cent CI –4.5, 0)			**Community gathering places, knowledge**, (n=1) Improved **SME in the home, knowledge**, (n=5) Improved
SMS, DS, CIS, DSD	Diabetes	**Provider intervention on provider outcome**, (n=4), 3 improved		**Patient behaviour intervention, effect on patient**, (n=4) Improved in 4 **Provider behaviour intervention, effect on patient**, (n=4) 1 improved	**Provider behaviour intervention, pyschosocial effect on patient**, (n=4) 3 unclear **Patient behaviour intervention, pyschosocial effect on patient**, (n=4) 3 improved, 1 unclear		
SMS, DSD, CR	Diabetes			**HbA1c**, 3/8 studies signif improvement in HBA1c **BP**, Signif improvement in BP with	**QoL**, (n=1) Signif improvement		**Diabetes knowledge**, (n=2) Signif improvement

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
				intensive behavioural intervention (1/8) **Weight**, 4/8 report small but significant reduction in weight or BMI. Control group also lost weight **HbA1c**, Signif reduction with diet and education (1/8) **BP**, NS diff (1/8)Signif reduction in diast BP (1/8) **Weight**, 5/8 NS diff			
SMS	Diabetes			**SMS vs control, HbA1c**, (n=54) Improved in 14 **SMS vs control, HbA1c**, (n=54) Both groups improved in 15 **HbA1c (6 months)**, (n=54) Greater improvement at 6 months, 8 studies			**Diabetes knowledge**, (n=17) Signif improvement in 11

Delivery system design (DSD)

There were eight systematic reviews that primarily addressed DSD for diabetes (59, 60, 72, 73), heart disease (74), hypertension (75), COPD (76) and asthma (77). Two of the diabetes reviews were different reports of the same review and the results were considered together (59, 60).

Overall there were improvements in process outcomes such as adherence to guidelines and increased follow up in four of the reviews targeting patients with heart disease (74), diabetes (59, 60, 73) and asthma (77). Patient outcomes were less clear, four reviews reported improvements in patient outcomes such as blood pressure (74), mortality (59, 60), HbA1c (73) and night waking in asthma (77) (Table 16). Two reviews explored the role of nurses as case managers in diabetes (72, 73) and the key finding was that case management alone had a limited effect on patient outcomes and the effects were not sustained at 12 months (72). Case management for diabetes was more effective when combined with intensive disease management (73).

Characteristics of effective DSD interventions

When DSD was combined with SMS there were improvements in the patient outcomes particularly when case management was combined with disease management (73). Much of this evidence came from studies that were conducted in managed care type organisations in urban USA and Europe. The key features of many of the DSD interventions were the combination of service reorganisation, division of labour with professional support and information systems for patient review and recall (73). Follow up in primary care was increased compared to secondary care (59, 60) for diabetes and with nurses compared to GPs for heart disease (74).

Most of the reviews highlighted the improvements in process of care outcomes such as smoking cessation (74), improved follow up (59, 60), improvements in diabetes checks such as foot and eye checks (59, 73) that were associated with DSD interventions but this was not always accompanied by improvements in patient outcomes.

Barriers to effective DSD interventions

The barriers to effective DSD interventions tended to occur at the organisational level. In order to be effective there had to be a change from a reactive system of health care to a system that was proactive (73). The roles of the members of multi-disciplinary team needed to be clearly defined and where there was no reimbursement for delivering patient reminders for follow up the process was less effective (73).

Table 16. Summary of the results for reviews addressing delivery system design

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
DSD, SMS, CIS	Asthma	Have PEF meter, (n=1). R Risk 1.30 (95 per cent CI1.05, 1.61)	Hospital admission, (n=1) R Risk 0.39 (95 per cent CI 0.08, 1.95) GP home visits, (n=1) R Risk 0.97 (95 per cent CI 0.06, 15.27)	Night waking, (n=1) R Risk 0.36 (95 per cent CI 0.16, 0.81) Morning waking - asthma, (n=1) R Risk 0.66 (95 per cent CI 0.41, 1.06)		Rescue b2, (n=1) R Risk 0.98 (95 per cent CI 0.92, 1.04) Preventer use, (n=1) R Risk 1.03 (95 per cent CI 0.91, 1.17)	
DSD, DS, CIS	Diabetes	All GP/shared care versus hospital care, No follow. (n=4), OR 3.05 (95 per cent CI 2.15, 4.33) Prompted GP/shared care vs hospital care, no follow up. (n=3) OR 0.37 (95 per cent CI 0.22, 0.61) Routine unprompted GP/shared care vs hospital care, no follow up. (n=2) OR 11.99 (95 per cent CI 7.82, 18.38)	All GP/shared care versus hospital care, hops admission. (n=2) OR 0.83 (95 per cent CI 0.53, 1.30)	All GP/shared care versus hospital care, HbA1c. (n=4) WMD 0.00 (95 per cent CI -0.28, 0.25) Prompted GP/shared care versus hospital care, HbA1c. (n=3) WMD -0.28 (95 per cent CI -0.59, 0.03) Routine unprompted GP/shared care versus hospital care, HbA1c. (n=2) WMD 0.19 (95 per cent CI -0.17, 0.56) Mortality, all GP shared care v hospital care OR 1.75 (95 per cent CI 1.11, 2.74) Mortality, prompted GP shared care vs hospital care OR 1.06 (95 per cent CI 0.53, 2.11) Mortality, routine unpromted GP shared care v hospital OR 2.55 (95 per cent CI 1.40,			

Table 16. Summary of the results for reviews addressing delivery system design (cont ...)

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
				4.62)			
DSD, DS, SMS	Diabetes		ER visits, 1 study – no diff1 study – more with intervention Hospital admissions, No diff	HbA1c 12 months. (n=3) No signi diff HbA1c 6 months, (n=1) Signifi improvement	QoL. No differen ce		
DSD, DS, SMS	Hypertension			Dias BP. (n=10) 1 improved with nurse. 9.1 (p<0.001)		Antihypertensives . (n=3) No difference	
DSD, DS, SMS	Heart disease	Nurse led care vs usual care, smoking cessation., 25 per cent vs. 2 per cent p = 0.001 Cardiac nurse vs GP, smoking cessation. 13.1 per cent vs. 11.2 per cent p=0.05 Cardiac nurse vs GP, follow up. Cardiac nurse > GP p<0.001		Nurse led care vs usual care, dias BP. -8mmHg vs. +3mmHg p0.048 Nurse led care vs usual care, sys BP. -9mmHg vs. 0mmHg p=0.000 Cardiac care vs GP, angina pain on exercise. cardiac nurse >GP p=0.05 At 4 monthsNot clear at 12 months	Nurse led care vs usual care, SF-36. All domains significa ntly improve d with nurse led care	Cardiac nurse vs GP, medications, No diff	
DSD, DS, SMS	COPD		Respiratory readmission (short term). No effect Respiratory readmission (long term), Days in hospital (long term), GP visits. Equivocal evidence of effect	Lung function (long term). No effect Symptoms (long term). No effect Mortality No effect	QoL. (brief or long term). No effect		

*(n=) refers to the number of studies in the systematic review contributing to the outcome of interest

† the rank order of the elements of the Chronic Care Model address by the review

Decision support (DS)

There were two systematic reviews that primarily addressed DS in the management of diabetes and asthma (Table 17). Renders et al (78) explored the effectiveness of professional and organisational interventions on the management of diabetes and Barton et al explored the impact of education for doctors on the management of asthma (79). Both reviews concluded that health professional education alone did not improve patient outcomes but may have some effect on provider outcomes such as adherence to guidelines in diabetes.

One of the reviews included under CIS also addressed the impact of health professional education on the management of hypertension (80). Again, health professional education alone did not improve blood pressure control compared to health professional education in combination with intensive protocol driven care.

Characteristics of effective DS interventions

Renders et al explored the combinations of interventions likely to be effective in the management of diabetes (78). When health professional interventions were combined with delivery systems design including patient reminders and recall there was an improvement in patient outcomes although this occurred more often where baseline care was poor and many of the studies were undertaken in USA.

Adding register recall to the interventions reduced the number of people lost to follow up. Combinations of health professional education with revision of professional roles or patient education were also more likely to improve patient outcomes.

Barriers to effective interventions

There were none identified for these reviews.

Clinical information systems (CIS)

There were two systematic reviews that primarily addressed CIS (80, 81) (Table 18)

Table 17. Summary of the results for reviews addressing decision support

CCM Elements †	Chronic disease	Process outcomes	Health service utilisation	Patient outcomes	QoL	Medication Use	Knowledge
DS, DSD, HCO, CIS, SMS	Diabetes	Prof intervention vs usual care, HbA1c, (n=7), 3 improved Organisation intervention vs usual care, HbA1c, (n=14) 2 improved, 1 unclear Prof and org intervention vs usual care, HbA1c, (n=20) 4 imporved, 1 unclear		Prof intervention vs usual care, HbA1c, (n=7) 1 improved, 2 unclear Organisation intervention vs usual care, HbA1c, (n=14) 2 improved, 1 unclear Prof & org interventions vs usual care, (n=20) 9 improved			
DS	Asthma	No smokers, (n=1), No diff	Hosp admissions, (n=1) $p = 0.03$	Symptoms, (n=3) No signif diff	QoL, (n=1) No diff		

*(n=) refers to the number of studies in the systematic review contributing to the outcome of interest

† the rank order of the elements of the Chronic Care Model address by the review

Garg et al. (81) reported on the effectiveness of computerised decision support systems for the management of diabetes and cardiovascular disease. Fahey et al (80) explored the effectiveness of clinical guidelines with a system of reminders to increase follow up on the control of hypertension.

Both reviews reported that CIS was associated with an improvement in process outcomes such adherence to disease specific guidelines for hypertension (80), diabetes and cardiovascular disease (81). Computerized clinical decision systems in isolation were not associated with improvements in patient outcomes such as HbA1c (81) but when combined with health professional led care or intensive protocol driven care there were significant improvements in blood pressure control in hypertensive patients (80). Appointment reminders increased the likelihood of patients attending for follow up (Table 18).

Characteristics of effective CIS interventions

Both reviews combined the CCM elements of CIS and DS. 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, the guidelines based prompts that automatically prompted care were found to be more effective than prompts that the health professional had to manually activate (81). Systems where the target end-user health professionals were also involved in the development tended to be preferred.

The features of successful hypertension management were that the care was free, register recall of patients and vigorous "stepped care" when the patients attended for review. The patient reminders were essential to increase patient attendance for follow up. The authors suggested that health care should be organised in such a way with systems that remind patients to attend for regular review. If these systems were in place then health professionals could deliver intensive guideline driven care when the patients attended for review (80). Both elements were believed to be essential and two year follow up of the patients once the intensive stepped care aspect of the study had ceased showed that there was a decline in blood pressure control (82).

Barriers to effective CIS interventions

The effectiveness of any computerised decision support system depended on the quality of the guideline prompts and patient data included. Garg et al noted that many of the studies included in their review had employed research staff to enter data or deliver prompted care (81) which has implications when applying the results to the clinical setting where entered data may be inadequate and dedicated data entry staff are not available.

Table 18. Summary of the results for reviews that primarily address clinical information systems

Chronic Care Model Elements †	Chronic disease	Patient outcomes	Process outcomes	QoL	Health service utilisation	Medication Use	Knowledge
CIS, DS, DSD, SMS, HCO,	Hypertension	**Self monitoring, BP control,** (n=4)* OR 0.88 (95 per cent CI 0.67, 1.15) **Physician eductaion, BP control,** (n=6) OR 0.85 (95 per cent CI 0.80, 0.91) **Protocol driven care, BP control,** (n=7) OR 0.43 (95 per cent CI 0.40, 0.46)	**Appointment reminder,** (n=6), OR 0.41 (95 per cent CI 0.32, 0.51)				
CIS, DS, . . .	Diabetes CVD	**HbA1c,** (n=3) No improvement **Patient outcomes, hypertension and CVD,** (n=5) No improvement	**Practitioner performance (diabates),** (n=3), 2 improved **Practitioner performance, hypertension and CVD,** (n=5) 1 improved				

*(n=) refers to the number of studies in the systematic review contributing to the outcome of interest

† the rank order of the elements of the Chronic Care Model address by the review

Health care organisation

There were no published systematic reviews that primarily addressed the role of health care organisation in chronic disease management.

Community resources

There were no published systematic reviews that primarily addressed the role of community resources in chronic disease management.

KEY FINDINGS

Table 19. Summary of the key findings from the review

Element of CCM	Effective Interventions	Effective on (outcome measures)
Patient self-management support (SMS)	• Patient educational sessions • Patient motivational counselling • Distribution of educational materials	• Physiological measures of disease • Patient quality of life • Patient health status • Patient functional status • Patient satisfaction with service • Patient risk behaviour • Patient knowledge • Patient service use • Patient adherence to treatment
Delivery system design (DSD)	• Multidisciplinary teams	• Physiological measures of disease • Professionals adherence to guidelines • Patient service use
SMS + DSD	• Multidisciplinary teams+ Patient educational session • Multidisciplinary teams+ Patient motivational counselling	• Physiological measures of disease • Patient quality of life • Patient health status • Patient satisfaction with service • Patient risk behaviour • Patient service use • Professionals adherence to guidelines
Decision support (DS)	• Implementation of evidence-based guidelines • Educational meetings with professionals • Distributional of educational materials among professionals	• Professionals adherence to guidelines • Physiological measures of disease
Clinical information system (CIS)	• Audit and feedback	• Professionals adherence to guidelines
Health care organisation (HCO)	• Little published experimental evidence	
Community resources (CR)	• Little published experimental evidence	

4. DISCUSSION AND CONCLUSIONS

The Chronic Care Model (CCM) provides a useful conceptual framework for understanding the elements considered essential for the management of chronic disease and the interplay between the elements. However, not all of the elements of the CCM can be assessed experimentally for their effectiveness or efficiency and this was illustrated by the lack of research evidence to support the role of Health Care Organisation and Community Resources in this review.

The evidence to support the elements of the CCM in primary care presented in this review was focused at the meso and micro levels of care. At the level of the element there was evidence that interventions that addressed delivery system design improved adherence to guidelines, patient service use and physiological measures of disease. Self-management support was effective at the patient level outcomes such as physiological measures of disease, quality of life, health status and satisfaction. Clinical information systems and decision support were effective at improving adherence to guidelines with some evidence for patient outcomes for decision support. These results support a previous analysis of the elements of the CCM by Tsai et al (8) and further analysis of patient and provider interventions by Weingarten et al (3). Much of the evidence presented in this review referred to the management of adults with type 2 diabetes and may not be applicable to all chronic diseases.

It would have been useful to have identified some HCO and CR approaches that had been shown to be effective in supporting the effective meso and micro level interventions. The only evidence for these elements has been obtained from examples of health system change in comparable countries that may be useful to the Australian context and was from program evaluation as opposed to experimental evidence. The focus of this review was to explore the use of the model in primary health care context and its application to the Australian healthcare system.

The number of elements of the CCM addressed by the intervention was not associated with improved patient or process outcomes and this supported previous reports of the CCM (8).

SELF-MANAGEMENT SUPPORT

The aim of self-management support is to develop skills and confidence within patients and their families so that they can take responsibility for their own care (4, 5). The self-management support strategies that were found to be most effective were those that developed self-efficacy in relation to specific behaviours such as diet and diabetes rather than those that were more general. Self efficacy theory underpins this process and this can only be interpreted and measured in regard to specific behaviours, such as diabetes self management or diet and exercise behaviours and not broadly in relation to a range of behaviours such as chronic disease self management in general (83, 84). Self-management support in group settings was more effective than that offered on a one to one basis and was specific to behaviours. Self-management support in community gathering places was also found to be effective and useful for targeting specific ethnic groups. Simply providing written information such as asthma action plans was not associated with improvements in lung function for asthma and there was less effect in those conditions such as arthritis and COPD where the disease progression was more difficult to modify although there were often improvements in health status, quality of life or disease knowledge.

Interventions that addressed self-management support reported improvements in patient use of services and intermediate health outcomes such as physiological measures of disease, health and functional status, quality of life, health service use and knowledge for diabetes. There was also improvement in physiological measures of disease for hypertension and small improvements for arthritis. The evidence was less clear for asthma and COPD.

Much of the evidence presented in this review focused on self-management support for diabetes. Patient education, self management and empowerment of people with diabetes and their carers, has been a focus for diabetes management for many years. Diabetes is a complex disorder and the majority of sufferers will develop complications that result in significant morbidity and high rates of mortality. Achieving optimal control of blood glucose levels has been demonstrated to delay the onset of the complications and engaging patients in their care has been demonstrated to promote adherence to treatment and hence improve quality of life.

The Flinders Model of chronic care management is one model that has been developed in Australia and is a clinician led model, which emphasises the education of the primary health care team and has been tested in some states (39). The Flinders Model is a generic model of chronic disease self management based on cognitive behavioural therapy and involves goal setting, care planning and review.

Other models such as the Stamford Model (46, 47) and Expert Patient Program (EPP) (20) are also effective. The review found that using motivational approaches and targeting specific behaviours were the characteristics of effective interventions rather than the self management model used. Health care professionals, especially practice nurses, can play an important role in facilitating chronic disease self management. However, to do this they need adequate training to effectively support the development and maintenance of self-efficacy and skills in chronic disease self management. This is even more challenging because self-efficacy is specific to a particular behaviour and not general. Thus a set of skills required to manage the SNAP risk factors for example, may not be applicable for monitoring glucose or adherence to medication plans. Self-efficacy and behavioural skills can be supported in group sessions with peers, and by vicarious experience.

Current lifestyle education for GPs and practice staff has been based on stages of change theory rather than self-management support, which is based on self-efficacy theory. While this has been demonstrated to be useful for supporting behaviour change in relation to smoking and alcohol, it is less well suited to other aspects of self management, which require development of skills. There is a need to incorporate self-management education into existing programs such as lifestyle scripts as well as into annual cycles of care for chronic disease.

The National Chronic Disease Strategy (55) highlights some of the difficulties that currently exist with the integration of self-management support into the Australian health care setting. Several recommendations have been made that SMS should be encouraged and supported at all entry points to the health care system. In Australia, self management strategies and programs have been developed with relatively little engagement of general practitioners and have not been established as integral components of the primary health care system. Training of primary health care providers should be provided to encourage use of self-management support strategies in routine practice. The new Australian Better Health Initiative will address some of the

self management training needs in primary care at both a Commonwealth and State or Territory level. In addition to a range of self-management support activities such as face-to-face and group training.

While the literature did not identify any experimental evidence assessing the impact of self-management support in Indigenous communities, an evaluation report from the Eyre Peninsula suggests that chronic disease self management can be effectively delivered to Aboriginal populations by Aboriginal health workers (85). There have been secondary prevention examples in Aboriginal communities that have involved the whole community in making dietary changes. The key features of these programmes have been the role of the community in the intervention (86-88).

Self management policy options
- Engage primary care through the development of more programs to support the training of GPs and practice nurses in chronic disease self management in general practice.
- Develop programs to support community health, multicultural and Aboriginal health workers in chronic disease self management.
- Encourage or mandate the inclusion of self-management education into care plans and structured care for chronic disease such as the annual cycle of care for diabetes.
- Link the referral to allied health providers under the current Medicare arrangements to self-management support in general practice. For example, the referral of a patient with diabetes to a dietician for dietary advice supported by self-management education by the practice nurse.
- Explore the role of Divisions of General Practice in providing self-management support for their general practices.
- Support self management by linking general practice with community health, multicultural health and Aboriginal health services to provide group self-management support targeted for specific ethnic groups.
- Explore how the home medicines review could be utilised to enable pharmacists to support self management.

DELIVERY SYSTEM DESIGN

Delivery system design was effective in improving patient use of services, patient outcomes and health professional adherence to guidelines particularly for heart disease, diabetes and asthma. In combination with self-management support it was effective in improving physiological measures of disease, health and functional status and quality of life particularly for hypertension and diabetes. Nurses acting as case managers were effective in diabetes when combined with self-management support. Innovations in delivery system design were often designed to promote self-management support.

The delivery system design interventions found to be effective included the development of multidisciplinary team care especially the role of practice nurses, use of patient reminders and proactive follow up which are central to the switch from acute to chronic care. There were also examples of primary care teams sharing care for patients with specialist teams in diabetes. Many of these features were key components of the system wide changes in USA and in the Evercare trials in the UK.

Unlike the UK with the PCTs and the USA with Managed Care Organisations, Australian primary health care is still characterised by a preponderance of small or solo practices which are only loosely linked into primary care organisations such as Divisions. However, this is changing, between 1990 and 2003 the proportion of practices in Australia with 4 or more GPs increased from 34.3 per cent (29.7–39.0) to 59.8 per cent (56.7–62.9) (89). The role of the practice nurse in Australia is less well developed than in countries such as the UK, Netherlands or Scandinavia where practice nurses are highly trained, particularly in the management of chronic diseases such as asthma and diabetes. Many of the initiatives to improve chronic disease management in the UK such as the Evercare trials have been dependent on practice nurses for their implementation and success. Expanding the role of the practice nurse to include responsibility for the management of people with chronic disorders is a logical progression of the GPs role as case manager and coordinator of care, however there could be significant workforce issues in Australia if practice nurses are going to take on more responsibility for the management of people with chronic disease. A survey by the RACGP found that of the 222 practice nurses surveyed, over 75 per cent were involved in care plans and chronic disease management but very few of these nurses had received formal training (90).

The Better Outcomes in Mental Health (BOiMH) initiative is an Australian example of a health care delivery model that has proved effective in terms of uptake and positive results for patients. The initiative combines decision support (training of GPs), delivery system design (the 3-step process - assessment, care plan and review and access to psychologist and/or psychiatrist) and patient self-management support (education for patients by psychologist). All of these elements are supported by a financial support system. The results have been positive and there has been good uptake of the initiative but it has been difficult for Divisions of General Practice to manage the demand within the recommended budget (44).

The National Chronic Disease Strategy (NCDS) lists several recommendations that target delivery system design in primary care under the proposals for integration and continuity of care. These include risk stratification and case management where routine care planning and self management are insufficient. There is a need to develop the funding structures to support multidisciplinary care and care planning more effectively to overcome the fragmented nature of the Australian healthcare system. There is also a need for greater coordination between the services especially to improve the referral pathways between services. Delivery system design is of particular importance in Aboriginal health to overcome the problems of healthcare delivery in remote areas and barriers to access even in urban areas.

Delivery system design policy options

- Extend the financial support for practice nurses to become more involved in self management, especially group programs for patients in general practice, including self-management education. This involves the removal of the geographical restrictions of access to PIP incentives for practice nurses. It also involves establishing new MBS item numbers for chronic disease management by practice nurse.
- Extend the financial support for practice nurses to provide group clinics and outreach visits for patients with chronic disease, including self-management support.
- Support training of primary care staff in a multidisciplinary team approach to management of chronic disease. Training should focus on clear roles and responsibilities of the team members.

- Link the referral to allied health providers under the current Medicare arrangements to self-management support in general practice. For example, referral to dietician linked to self-management education by practice nurse.

DECISION SUPPORT AND CLINICAL INFORMATION SYSTEMS

Decision support and clinical information systems will be considered together as there was considerable overlap in the interventions used. Overall both decision support and clinical information systems improved health professional adherence to guidelines for a range of chronic disease in primary care, particularly diabetes. Many of the interventions involved the use of disease specific guidelines and the incorporation of these guidelines into computer systems to provide prompts and feedback on performance. Health professional education alone did not improve patient outcomes.

Disease specific guidelines are already in use in Australia, encouraged by financial systems such as the SIP and PIP payments to general practitioners on completion of condition related tasks. However, uptake of these incentives has not been universal amongst practitioners, partly because the system is complex (42) and further complicated by the fact that they are disease specific rather than providing an holistic approach which may make it difficult to manage patients with several chronic diseases.

General practices in Australia use a variety of computer software and the quality of the information entered varies. In order to manage chronic disease effectively and act on performance feedback, there is a need for complete and accurate patient data. This may be difficult for small practices or solo practitioners who may not have the support to update this information.

Decision support policy options
- Further develop practice incentive payment (PIP) and service incentive payment (SIP) programs to encourage guideline-based chronic disease management.
- Integrate chronic disease SIP and PIP incentives so that patients are not considered as a series of separate chronic diseases.
- Encourage greater use of streamlined SIP and PIP incentives to improve quality of care.
- Encourage the use of chronic disease registers; only diabetes is supported by PIP at present. Encourage the use of registers in the provision of audit data for practices to use in quality improvement process.
- Support the use of data extraction tools and Collaboratives methodology including Plan/Do/Study/Act (PDSA) cycles to improve the quality and use of practice data.
- Continue to support the development and revision of disease specific guidelines.
- Develop programs to support the training of GPs and practice nurses in guideline-based chronic disease management in general practice.
- Provide support to GPs and practice staff so that they can make more effective use of clinical information systems for patients with chronic illness.

HEALTH CARE ORGANISATION AND COMMUNITY RESOURCES

There was no experimental evidence for the effect of health care organisation or community resources on the management of chronic disease. Interventions that address these elements such as incentives and support for widespread change are

often facilitators or barriers to the success of interventions such as self-management support or delivery system design. Health care organisation and community resources are also specific to the healthcare system that the CCM is operating in but it would be useful to have some evidence for effective health care organisation or community mechanisms to support effective meso or micro level interventions.

At the macro level there needs to be a reorganisation of the burden of chronic disease. The descriptions from comparable countries provided some examples of the responses of different healthcare systems to the challenge of chronic disease. However, it is not clear from these examples the extent of the role of the organisational level changes in the success of the programs and how this might be transferable to other healthcare systems.

ADVANTAGES AND DISADVANTAGES OF THIS REVIEW PROCESS

The aim of this review was to use a systematic approach to identifying the best available evidence for chronic disease management from counties comparable to Australia. By using methodology developed by the Cochrane Collaboration, JBI and Centre for Reviews and Dissemination (CRD) the search has been extensive, transparent and comprehensive. Previous reviews of chronic disease management have included primary and secondary care and the advantage of this review was that it focused on issues specific to primary care and primary health care professionals. The combination of the results from published systematic reviews and primary research papers added to the strength of this review and the results extend those of Tsai (8) and Weingarten (3).

The topic of the review generated a significant number of potential studies however those studies that did not demonstrate high levels of scientific rigour were excluded based on a mean score of 11 on the quality assessment scale. There was little homogeneity among the outcomes and interventions therefore a formal statistical analysis such as meta analysis was not possible and a narrative analysis was undertaken. The short time frame also precluded the team undertaking an additional review to determine the cost effectives of the elements of the model.

ABORIGINAL AND TORRES STRAIT ISLAND COMMUNITIES

The prevalence of chronic disease in the Aboriginal and Torres Strait is high particularly for diabetes, heart disease, hypertension and renal disease. The age standardised prevalence for diabetes in Aboriginal and Torres Strait Islanders is 11 per cent compared to 3 per cent for non-indigenous Australians and in 2002 36 per cent of indigenous adults aged fifteen years and over had a disability or long term condition (51).

The search strategy for the review identified only one randomised controlled trial of an intervention to improve diabetes care in a remote Indigenous community (91). The intervention was primarily delivery system design; a diabetes recall system and training of the local healthcare workforce in diabetes management. The intervention resulted in greater adherence to diabetes guidelines by health professionals and a reduction in health service use such as hospital admission for diabetes complications. The remaining papers identified were reports of projects or programs in Aboriginal communities, which did not meet the inclusion criteria for the main part of the review.

Within in the context of the Audit and Best practice for Chronic Disease (ABCD) project, which was undertaken in the Northern Territory, there was an assessment of health systems using the Assessment of Chronic Illness Care (ACIC) which is a tool based on the Chronic Care Model (53). Overall the scores indicated that for the participating health centres most of the elements of the CCM were present in the health centres but at a basic level. A regression analysis was used to determine the level of association between ACIC score and quality of diabetes care and patient outcomes. The elements that they identified to be the most important were HCO and CIS with CR important for process of care and DSD for patient outcomes. There was limited uptake and evidence for self-management support in these health centres.

The results from the ABCD project reflect the types of interventions and programs that have been tested in Aboriginal and Torres Strait Island populations. Many of the problems faced by these populations relate to access to health care services. A quarter of the Australian Aboriginal and Torres Strait Island population live in remote areas and between 16.7 per cent to 54.1 per cent of the communities live more than 10 km from the local health centre and in the Northern Territory only 37 per cent have access to a working telephone (51). Many of the projects in remote areas have targeted delivery system design and how sustainable health services and programs can be delivered. For the 30 per cent of Aboriginal and Torres Strait Islanders that live in major cities there are still problems with access to health services. Urban dwelling Aboriginal people did not feel confident with mainstream GPs who may not be sensitive to or aware of Aboriginal health issues (92) or where the GP does not know the Aboriginal Health Worker (93).. In addition to this they experience considerable social disadvantage with poor access to transport and local services.

The results of main review identified DSD and SMS as having an impact on patient and process outcomes, especially in diabetes. The elements of DS and CIS improved health professional adherence to guidelines. There was no experimental evidence for the role of HCO and CR which seem to be important to the success of interventions or programs to improve chronic disease management in Aboriginal populations (94). Audits and evaluations of programs have tended to target delivery system design in terms of the development of disease registers, multidisciplinary team care, recall system and care planning (95-98) (91). The Co-ordinated Care trials in Aboriginal populations demonstrated that the pooling of funding supported improvements to healthcare access and investment in infrastructure, care planning and the role of community empowerment (99). Many of the programs have demonstrated improvements in patient and process outcomes but have been difficult to sustain in the long term (95). Features of successful interventions in terms of those that improve patient or process outcomes require community involvement and commitment.

There have been few interventions that have targeted self management in these populations. The Indigenous demonstration projects of the Sharing Health Care Initiative suggested that there had been improvements in the health of the participants and that community engagement was a key feature of the Indigenous demonstration projects and that a "bottom-up" approach to self management with community led initiatives was likely to be the sustainable model. The Eyre Peninsula chronic disease self management project demonstrated that self-management support by Aboriginal health Workers was successful in improving patient outcomes and highlighted the complex and often dysfunctional social situation of those involved (85). Self-management support in the CCM involves the patient and their family but in some of the indigenous communities this family support may not be available. With

involvement of the whole community there have been improvements in patient outcomes associated with secondary prevention interventions such as dietary interventions in remote communities (86-88).

Much of the indigenous literature has been focused on interventions in remote communities and more research is required to support urban populations who also experience considerable morbidity and mortality. If the delivery system design issues can be addressed then the evidence presented in this review would support self-management support for chronic disease and possible approaches would include group sessions and in community gathering places. In order for this to happen there would need to be training and support for the Aboriginal Health workers in self management.

Indigenous health policy options
- Support SMS education and support for Aboriginal Health workers
- Support SMS and community involvement

Capacity and sustainability are the key issues for the success of programs in Indigenous communities.

SUMMARY

The Chronic Care Model provides a useful conceptual framework for understanding some of the elements considered essential for the management of chronic disease and the interplay between the elements. The elements that most frequently impacted on physiological measures of disease, health and function status, and quality of life were self-management support and delivery system design particularly when in combination. Decision support and clinical information systems played an important role in health professional adherence to guidelines. There was little evidence for changes in health care organisation and community resources because they are difficult to assess experimentally.

A number of issues with using the Chronic Care Model to guide evidence based care of chronic disease have been identified in the course of this review. The first of these is the lack of literature for the impact of interventions focussed on two elements of the model – Health Care Organisation and Community Resources. These elements are relatively difficult to assess experimentally but in the real world may be of considerable importance to the overall success of chronic disease management programs.

The next issue is the lack of research evidence for the impact of the chronic care model as a whole. This is understandable as it is usually not feasible to test entire health system changes, which require substantial organisational reform, in an experimental design. This inevitably leaves doubt as to the effectiveness of applying the Chronic Care Model although the work that has been done in comprehensive health systems change for example in the Veterans Administration in the US has been noted and provides some insight.

The final issue is that the Chronic Care Model, while a very helpful conceptual framework, may not provide sufficient practical guidance at the level of the health service to assist policy and decision makers to plan and guide organisation and delivery of services. This implies a need for the development of capacity in health services to translate the Chronic Care Model into fully developed proposals and programs for health service reform.

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