Report of the Evaluation of Chronic Care Management in Counties Manukau: Phase One

Prepared by: Dr Tim Kenealy, Dr Peter Carswell, Dr Janet Clinton and Faith Mahony

Prepared for:
Counties Manukau District Health Board

Date: April 30th 2007

The views and opinions expressed in this report are those of the authors and do not necessarily represent the views of Counties Manukau District Health Board

Disclaimer

Reports from Auckland UniServices Limited should only be used for the purposes for which they were commissioned. If it is proposed to use a report prepared by Auckland UniServices Limited for a different purpose or in a different context from that intended at the time of commissioning the work, then UniServices should be consulted to verify whether the report is being correctly interpreted. In particular, it is requested that, where quoted, conclusions given in UniServices reports should be stated in full.

Table of Contents

List of Tables

List of Figures

Executive Summary

This external evaluation was commissioned to explore broad level outcome measures from the Chronic Care Management (CCM) programme. It was also designed to give an overview of factors that might enable or hinder programme implementation and growth.

Evaluation objectives

More specifically, the objectives of this evaluation included to:

- Use available CCM data to describe clinical outcomes and compare these with international benchmarks
- Explore outcomes across PHO's
- Describe variation in implementation processes across PHO's
- Describe practice characteristics that can be recognised or built on to support CCM
- Describe how decision support has been implemented
- Identify key stakeholder questions and concerns about implementation effectiveness, costs, health gains, monitoring, opportunities for improvement and opportunities to extend the model to other health problems.

Summary evaluation outcome

This evaluation was only ever preliminary and designed to raise further questions that needed to be explored.

Outcomes for patients who remain 'engaged' with the CCM programmes are broadly in the same range as published best practice. For the best-studied example, HbA1c control in diabetes, if studies are ranked in order of improvement in HbA1c between intervention group and control, CCM data fits at the mid point. However, there are important caveats around interpreting this data, see particularly pages 27-8. Overall we did not identify published results from programmes that were directly comparable. Difficulties of appropriate data comparison might lead Counties to focus principally on benchmarking against itself, rather than dubious international comparisons, in a process of continuous adaptation and improvement. Nevertheless, Counties will want to examine reports of programmes that appeared to achieve better results, though which programmes these are will vary by disease and by outcome measured. Nowhere in the world has learned how to deliver best practice to all patients all of the time, and groups like Counties that have taken leadership in this area are continually looking at each other to incrementally improve best practice.

We formed the opinion, from both quantitative and qualitative data, that the steady growth of the CCM programme over the last several years may be reaching unseen limits. We are also aware that there are a great many eligible patients who have never entered the programmes. If CCM is to both improve care for current patients and include other eligible patients, the CCM programme needs both extensive additional funds and to engage in a process of ongoing adaptation. If adaptation does not occur we are concerned

that practices and PHOs will progressively disengage from the programme. To direct adaptation, however, considerable additional work needs to be done to better understand factors that enhance or hinder the programmes. Workforce and related resource capacity issues within primary care (not under the control of the CCM team) will certainly feature amongst these factors.

Background

The CCM programme was initiated in 2001 with two pilot practices and a focus on Diabetes. It has since grown to involve all Primary Health Organisations (PHO's), and currently has 60 practices engaged, with a total of 10,875 patients enrolled as of the 5th March 2007. It has programmes for Diabetes, Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Cardiovascular Disease (CVD), a catch all category of "Other" which allows for tracking of FAMA and Care Plus patients and a recently added stream for Depression. This evaluation considers only the Diabetes, CHF, COPD and CVD programmes.

Evaluation Methods

The evaluation adopted a mixed methods approach using document analysis, qualitative interviews, and analysis of existing quantitative outcome data. Quantitative analysis was based on an extract of CMDHB CCM data on 28 February 2007.

The qualitative interviews were conducted with 28 PHO aligned providers in South Auckland during March and April 2007. All eight of the PHO Chief Executives or General Managers were interviewed along with 13 of their management staff and CCM dedicated personnel. There were also seven people from general practice interviewed including general practitioners, practice managers and practice nurses.

The interviews focused on discussing enablers and hindrances for each of the four areas that this evaluation focused on;

- Overall CCM concept
- Decision support
- Wellness plans
- Implementation

Evaluation objectives were refined by a collaborative process using a reference group assembled by ourselves and CMDHB. This group comprised key Counties staff, clinical leaders and PHO staff with knowledge of the CCM programme, and others with relevant expertise. The approach was collaborative and formative in that all information was shared with the reference group and it is expected that the reference group will engage in the dissemination of information.

Strengths of this report

- The report was independent while having the benefit of iterative consultation with experts both within Counties and beyond. This independence is confirmed by our ability to include both positive and negative feedback.
- We have identified some international benchmarks and papers that describe alternative or additional ways to provide disease management.
- We have offered an evaluation framework or template that may be useful for ongoing internal programme monitoring and future adaptation.
- We have offered an initial development of a series of diagrams representing putative sequences of cause and effect within the programme. With some development, we expect these to be of great value for further exploration and development of this programme. They may have international interest.

Limitations of this report

- The study was conducted to a tight timeframe and a limited budget and was always expected to identify and clarify important questions rather than provide all the answers.
- We have used only currently available data for the quantitative analysis.
- We interviewed only a limited selection of key informants for the qualitative data, mostly from PHOs.
- Due to a lapse of process between ourselves and Counties, we omitted to analyse some key performance indicators and have analysed some outcomes that were not key performance indicators.
- We were not able to offer the depth of analysis of variation between PHOs that we had originally anticipated.

Evaluation Results

1. Buy-in to CCM

The most important assets of the CCM programme are the passionate belief in the programme on the part of Counties staff, and the near universal acceptance of the CCM philosophy at PHO and practice level. This level of buy-in has been necessary to allow the programme to counter considerable challenges to reach the stage it has today. Ongoing buy-in will be equally necessary to adapt and expand the programme.

The general practitioner (GP) plays a key role in how engaged the practice is, principally because the GP is usually the business owner. While the practice nurse was often the person most involved in supporting and coaching the patient, their ability to do this was determined, in large part, by the support they received from the GP. Qualitative data suggests that a number of practices are losing energy and motivation in the CCM programme because of difficulties with prioritising time, accessing appropriate workforce, problems with IT issues, and not receiving payment in a timely manner. An additional factor is probably that the CCM programme is seen as a DHB initiative, so attitudes to CCM risk being tainted with any negative attitudes towards DHBs in unrelated domains. There may be a danger that CMDHB currently takes CCM buy-in for granted, whereas it must be actively fostered.

2. Programme coverage
There has been exponential growth in patient enrolment in the CHF, COPD and CVD programmes, although not the diabetes programme. The rate of increase for all programmes may be levelling off or decreasing.

There has also been growth in the number of practices 'signing up' to the CCM programme. This increase, too, may be reaching limits. Some of these limits, particularly workforce numbers of GPs and practice nurses, are outside the direct control of the Counties CCM team.

3. The relationship between programme enrolment and active participation
Full patient participation in CCM includes 4 general practice visits per year. On the advice of the reference group, we chose two measures of active participation, which we called 'engagement'; 3 visits in 12 months, and 2 visits in 6 months. We compared numbers of patients engaged in each programme with the numbers enrolled (i.e. having entered a programme and not exited from it on any given date). Engagement for the next 1 year ranged from 31% to 63%. Engagement for the next 6 month ranged from 73% to 81%. In the qualitative section we explored some potential reasons for 'dis-engagement'. It appears important to investigate this further, which would require formal research directly with patients themselves. 'Exit interviews' would be one useful method to further investigate and even monitor engagement long-term.

4. Clinical outcomes.
In most of the key clinical outcomes measured there were statistically and clinically significant improvements over time. For example, in the diabetes programme, for those patients followed for 5 years, their mean HbA1c improved from 9.0% on entry to 8.4% at their 5 year review. Where there is comparable international literature, the magnitude of this change is in the mid range. Taking the example of HbA1c again, two systematic reviews reported a mean or median drop in HbA1c of 0.5% over about 12 to 18 months with a disease management programme compared to usual care. It would be fair to note that, due to publication bias, the published results will typically be the best available.

Diabetes (change over 5 years)		**CHF (change over 2 years)**	
HbA1c	0.6% decrease*	Smoking	No change†
Smoking	Reduction of 4%†	ACE Inhibitors	decrease of 4%†
Systolic BP	Reduction of 4 mm Hg*	Beta Blockers	increase of 4%†
Total Cholesterol	Reduction of 1.2 mmol/L*		
LDL Cholesterol	Reduction of 1.1 mmol/L*		
COPD (change over 2 years)		**CVD (change over 1 year)**	
Systolic BP	Reduction of 1 mm Hg†	Total Cholesterol	Reduction of 0.4 mmol/L*
Smoking	Reduction of 7%†	LDL Cholesterol	Reduction of 0.4 mmol/L*
		Smoking	Reduction of 3%†
		Aspirin	Increase of 1%†
		Statin	Increase of 3%†
		ACE Inhibitors	Increase of 2%†

* statistically significant, $p < 0.05$)
† not statistically significant

While the measured smoking rates across the programmes all decreased over time, the changes were not statistically significant. The CCM programme will want to develop new strategies to address this important but difficult problem.

For most clinical measures there appeared to be little difference between PHOs, but differences were not formally statistically tested.

5. Wellness plans

Patient self management is considered a key aspect of CCM. The importance practitioners placed on the patient having an active role in their health improvement was a key factor of buy in to the philosophy of CCM. The only data collected that relates directly to self management is whether or not a 'wellness plan' has been completed. These plans were completed for 81 to 91% of patients across the four CCM programmes. While this indicates a high uptake, qualitative data shows that, overall, the plans are not generally well used or valued by either the patient or the practitioner. CMDHB will want to explore this further and will probably want to adapt both this part of the programme and the indicators used to measure it.

6. Systems for on-going adaptation and feedback

The programme has under-developed systems for effective learning and adaptation. There is no structured way in which the programme as a whole can look at what strategies are more effective than others. Qualitative data indicated that this is partly due the political and competitive nature of the relationships between PHOs, and a lack of trust to share analysis of good/poor practice either between themselves or with the DHB.

Lots of 'outcome' type data is collected and used for monitoring or auditing. However, this is in isolation from a larger improvement framework or formal continuous quality improvement process. Feedback is one necessary element in improvement programmes, but the mechanisms used to feedback data was seen as ineffective by at least some interviewees across each level of the programme - DHB, PHOs, the GPs and practice nurses. At worst, and at each level, these groups do not get the data they require, do not understand what they do receive, and do not make active use of it (beyond monitoring purposes).

Towards the end of the report (pages 75-8) we offer a series of tables laying out our summary of performance indicators, measures used and our evaluative judgement of programme performance against each indicator. Counties may find that this template is a useful tool to structure systematic programme monitoring and improvement.

7. Information technology

In this context, there are three aspects to 'information technology' – decision support, reporting requirements, and the invoicing system. All of the aspects fall down in practices where there is an inadequate level of IT infrastructure (hardware, broadband), and low level of IT capability amongst the users. IT issues remain an ongoing barrier, the extent varying between practices. We are aware that some PHOs provide more support to their practices than others, and the DHB provides direct support within some PHOs. The need

for support is ongoing and will only increase. However, IT issues are probably one of the rate-limiting steps in expanding the CCM programmes, and more support may be one of the more easily achieved remedies.

8. Restrictions of the CCM programme

The CMDHB CCM programme is seen by many practitioners as quite restrictive in terms of the process practices have to go though to enrol patients, and subsequent requirements of the type and nature of the data that is collected. The perception amongst many is that the DHB is putting in place unnecessary restrictions and compliance measures. Interviewees contrasted the 'difficult' CCM process with the 'easy' Care Plus process. CMDHB staff rightly point out the many, arguably appropriate and useful, differences between the two. But what matters here are practice perceptions. There is a real threat to CCM expansion plans as practices can limit their enrolments to CCM (as some already do), that they can use Care Plus as an alternative (as some already do), or they may opt out of both programmes.

9. Teamwork and workforce

One of the evaluation goals was to consider opportunities to spread the CCM model to other health problems. Those practices that have a greater buy in to the philosophy of CCM also talk more strongly about the importance of taking a team approach to patient care. Those who don't have such a buy-in to the philosophy will still share aspects of the care, but don't talk about the importance of an integrated team approach. It seems to us that integrated teamwork is fundamental to changing the current model of primary care from acute services to a chronic care model. Short supply of both GPs and practice impose a real and current restriction on CCM, and threaten both expansion of numbers in current CCM programmes and expansion to other areas. Both CMDHB and the training agencies could do more to train nurses in particular into new roles. But to address the workforce numbers issue may also need new employment models for chronic care management nurses, perhaps with employment from the PHO rather than the practice being the most easily achieved first step. In addition, however, we need a formal plan to develop more community health workers, and we may need to develop new roles such as physician assistants.

Access

Although it is outside our brief, this report would be unbalanced without noting that, as Counties is aware, there are a great many patients who are eligible for the CCM programmes but have never entered them. The current system is probably near capacity. There is clear need for additional resource at each level of CCM.

Recommendations

Specific recommendations from this evaluation are:

- The results of the evaluation be discussed with key stakeholders
- A process is put in place to guide an adaptation of the programme. Stages of this process are as follows.

    - Understanding barriers and facilitators of engagement and uptake at the General Practice level
    - Engage stakeholders to develop a 'whole systems' view of the CCM model. Look for levers to affect change
    - Initiate pilot trials that respond to barriers identified.
    - Engage in an action research program to support the change process

- A team is assigned to explore issues of data collection and analysis. Issues to consider include the following:
    - Clarifying the different data reports required by the different stakeholders.
    - Strategies to respond to differences in IT capabilities at the level of the General Practice.
    - A system for tracking the effect of programme adaptations over time.

Introduction

The School of Population Health at the University of Auckland was commissioned by Counties Manukau District Health Board (CMDHB) to conduct an external evaluation of the Chronic Care Management (CCM) Programme. The CCM programme was initiated in 2001 with two pilot practices and a focus on Diabetes. It has since grown to involve all Primary Health Organisations (PHO's), and currently has 60 practices engaged, with a total of 10,875 patients enrolled as of the 5th March 2007. It has programmes for Diabetes, Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Cardiovascular Disease (CVD), a catch all category of "Other" which allows for tracking of FAMA and C+ patients and a recently added stream for Depression. This evaluation does not however include the depression stream.

Goal of the evaluation

The goal of the evaluation is to provide an 'external' evaluation of the CCM programme in CMDHB that will address the key questions identified by stakeholders concerning implementation effectiveness, costs, health gains, monitoring, opportunities for improvement and opportunities to extend the model to other health problems.

Evaluation Objectives

The objectives of this evaluation include to;

- Describe practice characteristics that can be recognised or built on to support CCM
- Describe variation in implementation processes across PHO's
- Explore outcomes across PHO's
- Describe how decision support has been implemented

This evaluation uses a theoretical framework to structure the approach and methods used. The approach will be collaborative and formative such that all information will be shared with the reference group and it is expected that the reference group will engage in the dissemination of information. Evaluation objectives were refined by a collaborative process using the reference group.

Evaluation methodology

The evaluation adopted a mixed methods approach to address the evaluation objectives. The approach utilised document analysis, qualitative interviews, and analysis of existing quantitative outcome data.

Step 1 – *Document analysis*

- Collect existing documents that describe the plans for programme delivery. These were requested from CMDHB, and the eight PHOs. Where possible, these documents were analysed to determine how each of the PHOs designed the programme implementation and delivery.

Step 2 – *Outcome data*

- Collect and analyse relevant existing quantitative data from databases.

Step 3 - *Qualitative data collection*

- Semi-structured interviews with the eight PHOs.
  Interviews with the PHOs explored all four of the dimensions for the evaluation.
- Semi-structured interviews with the CMDHB CCM team
  - Interviews with the implementation team will focus on how the programme was rolled out, and perceptions of the impact of the programme.
- Semi-structured interviews with 6 General Practices (one GP and one nurse per practice)
  - The practices were selected via a success case methodology. In this approach the reference group was asked to determine criteria for 'success'. This criteria was used to select two high performing practices, two average performers, and two below average performers.
  - Interviews focused on understanding the factors that influence variance in performance. A primary purpose of these interviews was to determine the factors to focus on in phase two of the evaluation.

Effectiveness of the programme

There are a number of factors which could potentially be looked at when judging the effectiveness of the CCM programme. Based on discussions with the Counties Manukau CCM implementation team it was agreed that this evaluation would look at programme coverage, engagement, Wellness plan use, and clinical outcomes as measures of effectiveness. All analyses are based on data extracted from the Counties CCM database containing data to and including 27 Feb 2007, unless stated otherwise.

Coverage

Table 1 shows that 78/111 (70%) of the practices in the Counties Manukau had one or more patients ever entered in a CCM programme. The table also indicates a pattern in the variability in programme uptake across the PHOs. The larger PHOs have a lower proportion of active practices, compared to the smaller PHOs.

Table 2 shows the number of practices joining CCM (i.e. having their first patient enter any programme) by year and by PHO. There was steady uptake for the first 5 years, with fewer new practice starting up in 2006 and the first 2 months of 2007. (We are told that, since this extraction, there has been a recent increase in the number of practices involved.)

Table 1 Number of practices who have ever had a patient enter a CCM programme, by PHO at 28 Feb 07

PHO	*Number of practices*	*Number ever had patient enter CCM*	*Comment*
A	9	7	1 does not have practice nurse, 2 outside CMDHB area
B	3	3	
C	9	9	1 is not funded as outside CMDHB area
D	64	38	Few cannot join CCM as don't have a practice nurse and some don't have right PMS system* and other practices are situated in the Otahuhu area
E	3	3	
F	22	15	Balance do not have practice nurse
G	1	1	Only one practice in CMDHB
H	3	2	Only 2 practices in CMDHB
TOTAL	111	78	

* PHO perception that MedTech is the only supported PMS system

Table 2 Number of practices with first patient entering a CCM programme, by year, by PHO

PHO	2001	2002	2003	2004	2005	2006	2007	Total
A	3	4						7
B	3							3
C	6	3						9
D	3	10	17	4		4		38
E		2			1			3
F		1	3	2	9			15
G	1							1
H		1		1				2
Total	16	21	20	7	10	4		78

Table 3 shows that, as of the 5th of March 2007, 9,118 patients were enrolled in CCM diabetes, 416 in CHF, 506 in COPD, and 841 in CVD. This is a significant increase in numbers for all programmes compared to data collected at the end of 2004.

Table 3 Number of patients in each programme by PHO

PHO	*CHF*	*COPD*	*CVD*	*DIABETES*	*Total*
A	43	72	102	1,035	1,252
B	66	70	158	1,754	2,048
C	65	30	2	1,878	1,975
D	182	284	374	3,333	4,173
E	0	0	0	461	461
F	35	33	171	329	568
G	0	0	0	226	226
H	19	17	34	102	172
Total	419	506	841	9,118	10,875
% increase since 30/11/04[†]	423%	675%	904%	230%	257%

Patient engagement

The suggestion for the CCM programme is that patients make 4 annual visits to their General Practice at which the CCM template is used to guide consultations[‡]. Discussions with the CMDHB implementation team lead to an agreement that, for the purposes of the evaluation, three visits in any one 12 month period would define a satisfactory level of engagement.

The following sequence of graphs all show numbers of patients, who, on any one day, meet the following criteria:

1. Entered
    - entered the programme
2. Enrolled
    - entered
    - not dis-enrolled

[†] Counties Manukau DHB (2005). Chronic care management programme: Interim programme evaluation report.

[‡] The programme expects a number of additional GP consultations to take place in regards to acute illnesses as well as up to monthly contact with the nurse for ongoing education and support.

3. Engaged (6m)
    - entered
    - not dis-enrolled
    - seen in the next 6 months (183 days) if not dis-enrolled in that time
    - note that no data shown for the final 6 months (not time to revisit)
4. Engaged (3 in 1 year)
    - entered
    - not dis-enrolled
    - seen a further 2 times in the next year if not dis-enrolled in that time
    - note no data shown for final year (no time to accumulate 3 visits)

The sequence of lines in each of these graphs, reads, for any given date, from top to bottom:
1. number of patients ever enters the programme
2. number of patients currently enrolled
3. number of patients who will attend at least once in the next 6 months
4. number of patients who will attend at least 3 times in the next 12 months

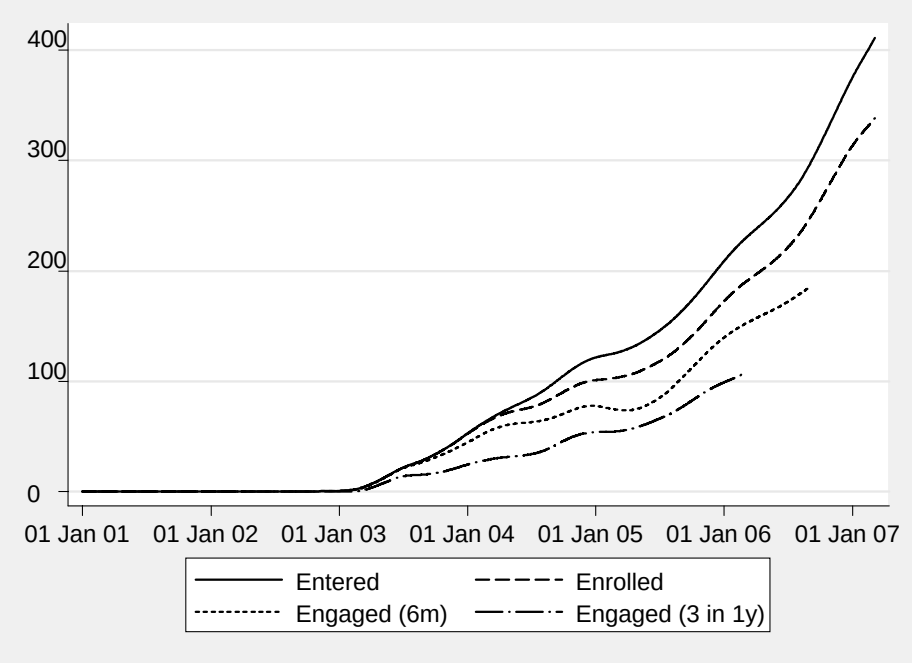


Figure 1 CHF numbers by date

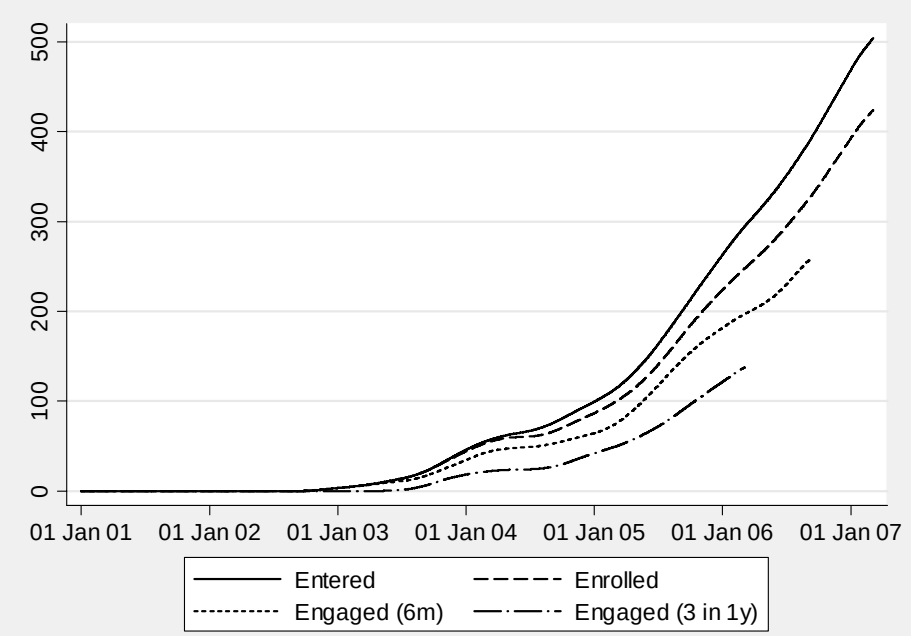


Figure 2 COPD Numbers by Date

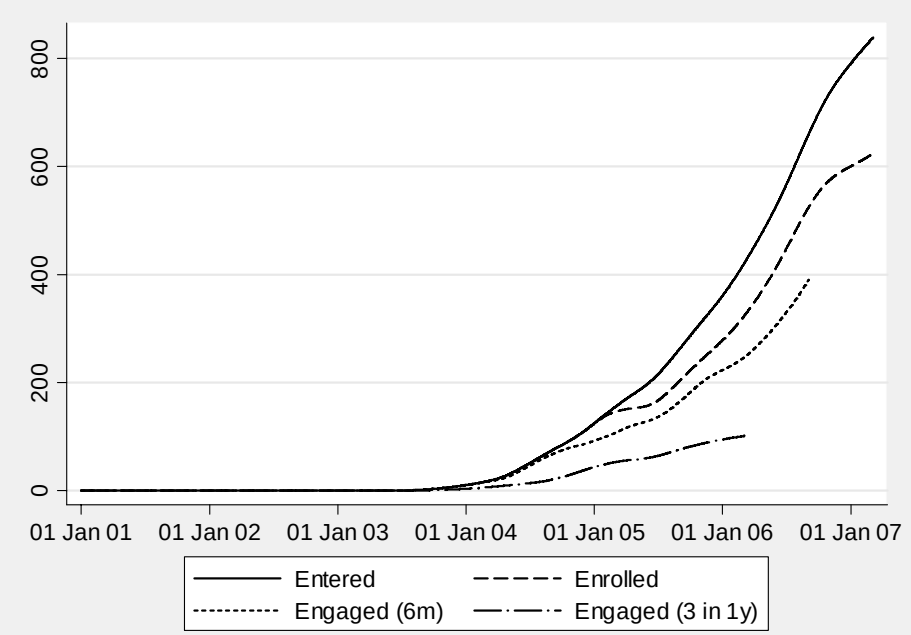


Figure 3 CVD Numbers by Date

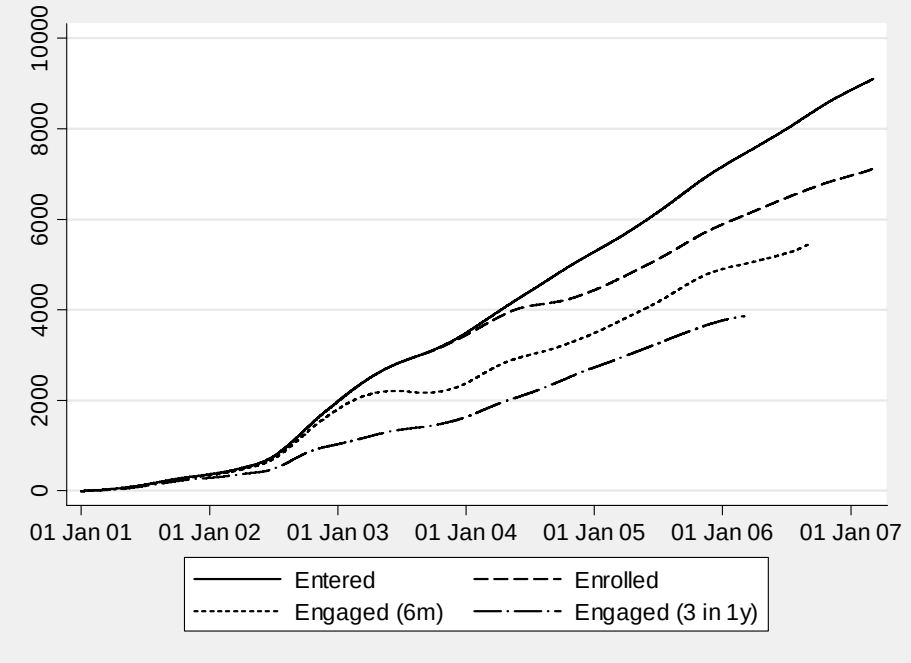


Figure 4 Diabetes Numbers by Date

Table 4 uses the numbers underlying these figures to calculate the percentage of patients in each programme who are Engaged compared with those Enrolled. Engagement for the next 1 year ranges from 31% to 63%. Engagement for the next 6 month ranges from 73% to 81%. Some possible reasons to explain both dis-enrollment (the gap between patients Entering the programme and those Enrolled) and dis-engagement (the gap between those Enrolled and those attending) are explored in the stakeholder interview section.

Table 4 Percentage engaged for next 6 months and 1 year on the last date shown for these lines in Figures 1 to 4. (Engagement for the next 6 months is the 3rd line down in Figures) and Engagement for the next 1 year is the 4th line down in the Figures)

		Number engaged on last date of figures	Number enrolled at that date	Engage as percent enrolled
Diabetes	6 month	5444	6681	81%
	3 in 1 year	3824	6070	63%
CVD	6 month	392	537	73%
	3 in 1 year	101	322	31%
COPD	6 month	252	322	78%
	3 in 1 year	134	248	54%
CHF	6 month	186	245	76%
	3 in 1 year	109	194	56%

The following series of graphs plots the numbers of new patients entering each programme as a count per month. This rate of new entry is variable month to month and may be recently increasing for CHF and COPD. We would expect a drop over the

Christmas / New Year period. (We are told by Counties staff that there has been a recent increase in numbers.)

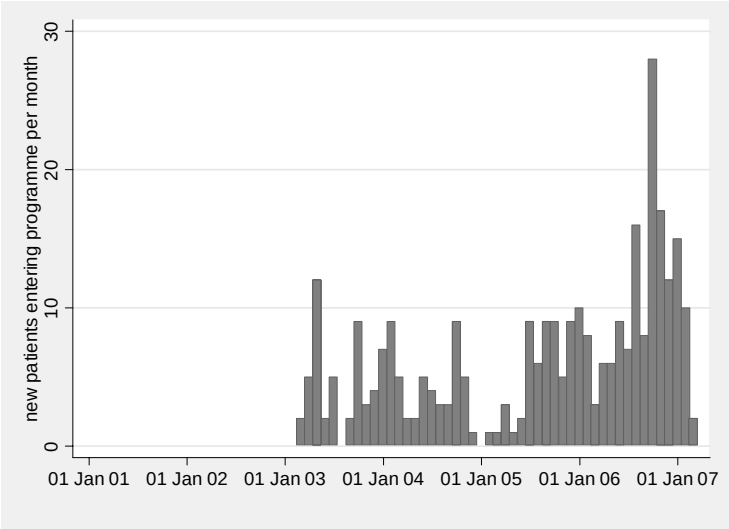


Figure 5 CHF: number of new patients entering per month. Each bar represents the number of new patients entering the programme in one month.

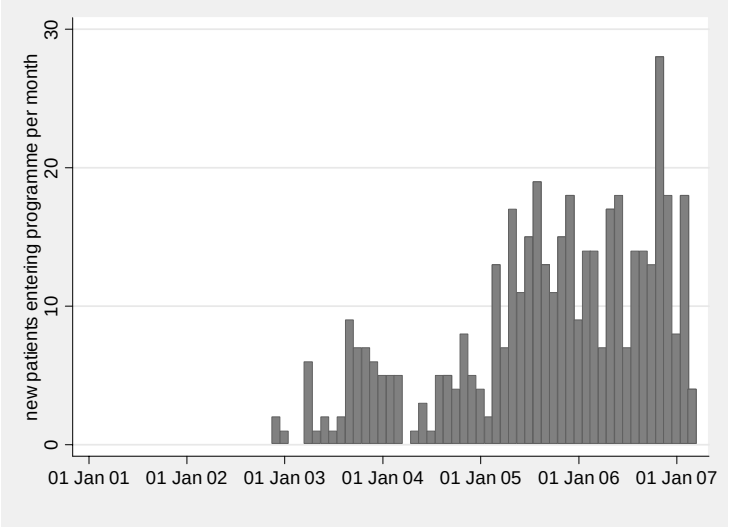


Figure 6 COPD: number of new patients entering per month. Each bar represents the number of new patients entering the programme in one month.

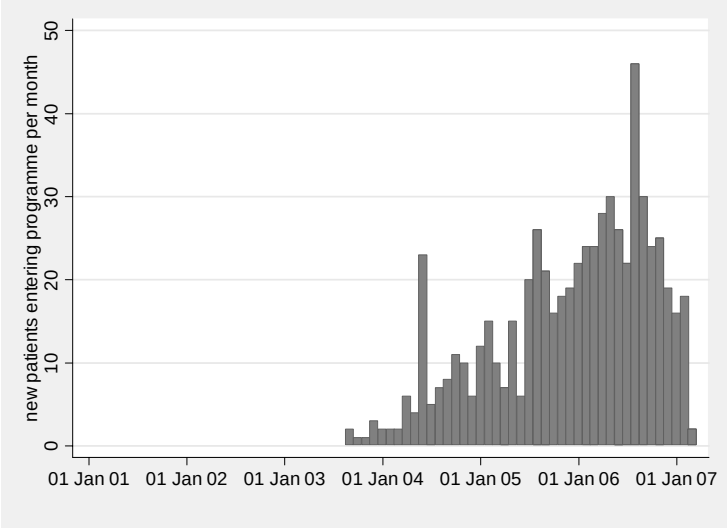


Figure 7 CVD: number new patients entering per month. Each bar represents the number of new patients entering the programme in one month.

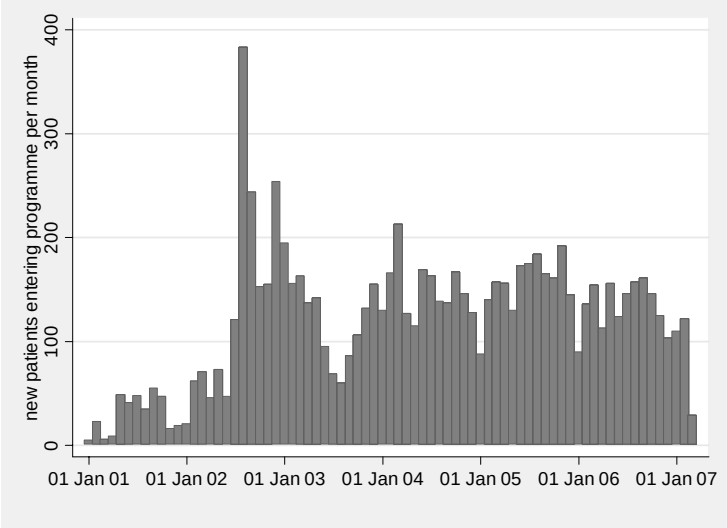


Figure 8 Diabetes - number of new patients entering per month. Each bar represents the number of new patients entering the programme in one month.

Wellness plans

The use of Wellness plans has been a key aspect of the CMDHB CCM programme, as it was considered one of several important tools to support patient empowerment Other mechanisms to support such empowerment may include one on one education, goal setting and structured self-management education; however, these mechanisms are not measured within the Counties dataset. Table 5 uses unpaired data to show in the first visit more than three quarters leave the session having discussed a Wellness plan. There is a slight increase in the percentage of patients having a Wellness plan after being enrolled in the programme for one year. It is important to note however that this is not necessarily an indication that Wellness plans are effectively used or not by patients and/or clinicians.

The section on Wellness plans in the stakeholder interviews section (page 37) explores this more fully.

Table 5 Percentage of patients with Wellness plans by ethnicity for CMDHB at first visit and at 1 year.

	Diabetes		*COPD*		*CHF*		*CVD*	
Ethnicity	First Visit	At 1 Year	First Visit	At 1 Year	First Visit	At 1 Year	First Visit	At 1 Year
Maori	77	81	76	77	80	86	78	87
Pacific	72	82	68	75	80	97	66	60
Asian	72	80	0	0	N/A	N/A	77	N/A
Other	78	77	0	0	N/A	N/A	75	N/A
All	75	82	78	87	79	91	80	81

Patient outcomes

Table 6 presents a summary of all the measured outcome data for each of the disease streams. It also shows the programme key performance indicators for which data was collected as part of this evaluation.

A note about all statistical testing in this report; no adjustment has been made for clustering of patient data by PHO or practice. Such adjustment would make some results less 'statistically significant' than they currently appear.

Table 6 Summary of clinical outcome data for the Counties Manukau Chronic Care Management Programme

Diabetes (change over 5 years)		**CHF (change over 2 years)**	
HbA1c	0.6% decrease*	Systolic BP (low bp indicates a poor prognosis)	Reduction of 1 mm Hg†
Smoking	Reduction of 4%†	Smoking	No change†
Systolic BP	Reduction of 4 mm Hg*	ACE Inhibitors	decrease of 4%†
Total Cholesterol	Reduction of 1.2 mmol/L*	Beta Blockers	increase of 4%†
LDL Cholesterol	Reduction of 1.1 mmol/L*		
Diabetes KPIs measured at 5 years		*CHF KPIs measured at year 2*	
% with HbA1c less than 7%	30%	% currently smoking	15%
% with total cholesterol less that 4 mmol/L	40%	% on ACE inbitor	80%
% with LDL cholesterol <= 2.5	69%	% on beta blocker	58%
% currently smoking	12%		
% patients SBP <130 and DBP <80	26%		

COPD (change over 2 years)		**CVD (change over 1 year)**	
Systolic BP	Reduction of 1 mm Hg†	Total Cholesterol	Reduction of 0.4 mmol/L*
Smoking	Reduction of 7%†	LDL Cholesterol	Reduction of 0.4 mmol/L*
		Smoking	Reduction of 3%†
		Aspirin	Increase of 1%†
		Statin	Increase of 3%†
		ACE Inhibitors	Increase of 2%†

COPD KPIs measured		*CVD KPIs measured at year 1*	
% currently smoking at year 2	31%	% with LDL > 2.5	37%
% receiving flue vaccine in 2006 (was 86% in 2004 and 82% in 2005)	79%	% prescribed a statin	85%
		% patients SBP <130 and DBP <80	27%
		% currently smoking	18%
		% prescribed aspirin	74%
		% prescribed ACE inhibitor	58%

* statistically significant, $p < 0.05$)
† not statistically significant

The following sections present outcome data for each of the disease streams in the CCM programme. The choice of each outcome measure was guided by the members of the initial stakeholder focus group. In most cases overall outcome data is presented, and then, where appropriate, broken down to compare by PHO, and ethnicity. Where available, comparison to international literature is provided at the end of each section on outcomes for each disease stream.

Diabetes

The stakeholder focus group agreed that key outcome measures for the diabetes stream were HbA_{1c}, smoking rates, blood pressure, and lipids.

HbA_{1c}

Table 7 shows that there is a significant decrease in HbA_{1c} for patients enrolled in the programme. The average decrease in the first year of enrolment is 0.5. This compares to an average decrease of 0.34 found in the 2005 internal evaluation of the CCM programme[§]. Target HbA1c is 6.5 to 7.0 mmol/L (New Zealand Guidelines Group 2003).

Table 7 CCM Diabetes: Mean HbA_{1c} overall (%).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	4403	8.7	8.2	.	.	.	.	0.0000
Entry to Year 2	2982	8.6	8.1	8.2	.	.	.	0.0000
Entry to Year 3	1996	8.7	8.2	8.2	8.3	.	.	0.0000
Entry to Year 4	1181	8.7	8.3	8.3	8.2	8.3	.	0.0000
Entry to Year 5	260	9.0	8.0	8.3	8.2	8.2	8.4	0.0000

The data in the above table should be compared with the natural history of HbA_{1c} in the United Kingdom Prospective Diabetes Study, in which HbA_{1c} rose by approximately 0.2% per year without treatment, and, after an initial dip, rose at the same rate in patients on treatment (UKPDS 1995). As such, it is not unexpected that the HbA_{1c} rate increases after an initial dip. However, for the patients in the CMDHB CCM programme, the annual increase in HbA_{1c} is 0.07%.

[§] Counties Manukau DHB (2005). Chronic care management programme: Interim programme evaluation report.

When looking at changes in HbA_{1c} by PHO the pattern is similar (appendix B1), with all except PHOs G and H demonstrating a significant decrease in HbA_{1c} in year 1. However, there is variation amongst PHOs in the rate at which HbA_{1c} increases subsequent to year 1.

Examining changes in HbA1c by ethnicity shows a similar pattern, with all having an initial decrease, and then slowly rising again subsequent to year 1 (appendix B1).

Smoking

Table 86 shows that there is a small (but not significant) decline over time in the proportion of people smoking. When looking at this data by PHO or ethnicity there is a similar pattern found (Appendix B2). In no case however is there a statistically significant change in the proportion of people smoking.

Table 8 CCM Diabetes: Proportion smoking overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	4410	0.20	0.18	.	.	.	.	0.9906
Entry to Year 2	2982	0.19	0.16	0.16	.	.	.	0.9990
Entry to Year 3	1997	0.20	0.17	0.16	0.17	.	.	0.9946
Entry to Year 4	1182	0.18	0.16	0.14	0.15	0.15	.	0.9816
Entry to Year 5	261	0.16	0.15	0.11	0.13	0.14	0.12	0.9339

Blood Pressure

Blood pressures have fallen. Table 7 shows that each year of enrolment in the programme leads to a further reduction in the systolic blood pressure. This decrease is statistically significant. When looking at this data by PHO or ethnicity there is a similar pattern found. Target blood pressure is less than 130/80 (New Zealand Guidelines Group 2003).

Table 9 CCM Diabetes: Mean systolic blood pressure overall (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall									
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p	% change
Entry to Year 1	4411	135	132	.	.	.	.	0.0000	2.2%
Entry to Year 2	2982	136	132	132	.	.	.	0.0000	2.9%
Entry to Year 3	1997	136	132	131	130	.	.	0.0000	4.4%
Entry to Year 4	1182	136	132	131	129	129	.	0.0000	5.1%
Entry to Year 5	261	134	131	130	133	128	130	0.0077	3.0%

Lipids

Total Cholesterol

Total cholesterol levels have dropped. Table 10 shows that each year of enrolment in the programme leads to a further reduction in cholesterol. This decrease is statistically

significant. When looking at this data by PHO or ethnicity (Appendix B4) there is a similar pattern found. Target total cholesterol is less than 4 mmol/L (New Zealand Guidelines Group 2003).

Table 10 CCM Diabetes: Mean total cholesterol overall (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

Overall Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	4402	5.2	4.7	.	.	.	.	0.0000
Entry to Year 2	2983	5.3	4.7	4.5	.	.	.	0.0000
Entry to Year 3	1998	5.4	4.8	4.6	4.5	.	.	0.0000
Entry to Year 4	1182	5.4	4.9	4.6	4.4	4.2	.	0.0000
Entry to Year 5	258	5.5	5.1	4.6	4.3	4.2	4.2	0.0000

LDL Cholesterol

LDL levels have dropped. Table 11 shows that each year of enrolment in the programme leads to a further reduction in LDL cholesterol. This decrease is statistically significant. When looking at this data by PHO or ethnicity (Appendix B5) there is a similar pattern found. Target LDL cholesterol is < 2.5 mmol/L (New Zealand Guidelines Group 2003).

Table 11 CCM Diabetes: Mean LDL ('bad') cholesterol (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	P
Entry to Year 1	4200	2.8	2.4	.	.	.	.	0.0000
Entry to Year 2	2875	2.9	2.5	2.3	.	.	.	0.0000
Entry to Year 3	1920	3.0	2.6	2.4	2.2	.	.	0.0000
Entry to Year 4	1131	3.0	2.7	2.4	2.2	2.0	.	0.0000
Entry to Year 5	239	3.0	2.8	2.4	2.2	2.0	1.9	0.0000

Comparison of outcome data to other literature

There are many studies which have examined the effectiveness and efficiency of an integrated approach to managing diabetes in a population (Norris et al., 2002). Many of these studies look at processes, rather than outcomes. Also, a large number focus on resource utilisation (hospital days, and costs). Consequently, relatively fewer published studies looked at the outcomes that this evaluation has measured.

To examine the literature a review was conducted on Medline for material published from 2004 onwards. Search terms were diabetes or diabetes management, and looking for changes in HbA_{1c}, blood pressure, and lipids reported in the abstracts.

From this search we found two systematic reviews, and a number of trial designs, or site specific studies. The two systematic reviews showed that, in the studies reporting a change in HbA1c, the average change was 0.5% (Norris et al., 2002; Knight et al, 2005).

It is likely that the effectiveness of any programme depends on details of context that are often not reported in primary reports of trials, let alone in syntheses in systematic reviews and meta-analyses.

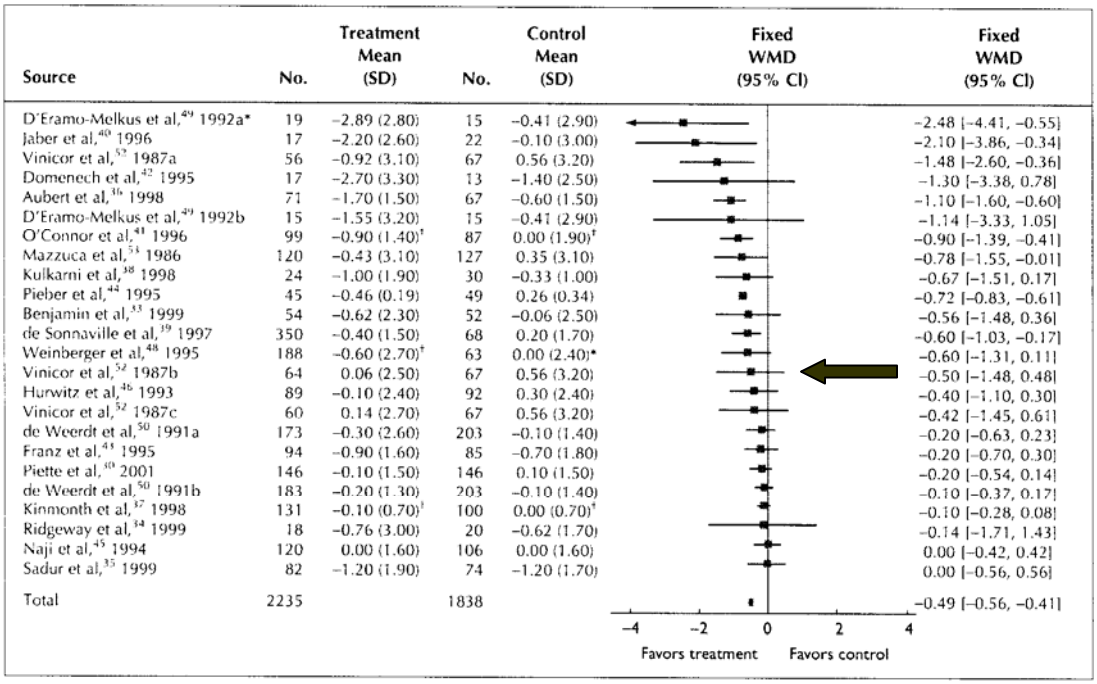
Norris et al 2002

This systematic review and meta-analysis studied the effects of disease management and case management on multiple measures of diabetes care process and outcomes. Their definition of disease management approximates to the CMDHB understanding of the Chronic Care Model. In their definition, case management is a much narrower concept than disease management, and case management can be conducted as a component of disease management or in isolation. For disease management, across 27 studies the median follow up was 18 months, and the median decrease in HbA1c (19 studies) was 0.5% (IQR decrease 1.35 to 0.1). For case management, the median follow up across 15 studies was 12.5 months. When combined with disease management (11 studies), the median decrease in HbA1c was 0.5% (IQR decrease 0.65 to 0.46). When case management was used alone (3 studies), the median decrease in HbA1c was 0.4% (IQR decrease 0.6 to 0.16). These results appear similar to CMDHB, in which the mean decrease in HbA1c was 0.5% for those followed for at least 1 year. However, the nature of such a review does not provide the details around each study needed to judge how similar to CMDHB were the populations within each of the included studies. A learning point for CMDHB, however, may be that this study gives no evidence of gain from adding case management to disease management, or vice versa.

Knight et al 2005

The paper reports a systematic review and meta-analysis of the effects of disease management programmes on processes and outcomes of diabetes care. The pooled estimate of effect on HbA1c (from 24 comparisons) was a decrease of 0.5% (95% CI 0.3 to 0.6). The duration of the disease management programmes ranged from several days to 30 months. Once more, these results appear similar to CMDHB, in which the mean decrease in HbA1c was 0.5% for those followed for at least 1 year. And once more, the nature of the review does not provide the details around each study needed to judge how similar to CMDHB were the populations within each of the included studies.

Figure. Forest Plot of the Estimated Program Effects on Glycemic Control



*a = comparison1; b = comparison 2; c = comparison 3.
‡Baseline values not reported, assumed to equal control group follow-up values.
SD indicates standard deviation; WMD, weighted mean difference; CI, confidence interval.

Figure 9 Forest plot from Knight et al 2005; decrease in HbA1c with disease management. The studies at the top of the list report larger drops in mean HbA1c than the studies lower on the list. The large arrow in the middle of the picture indicates 0.5% HbA1c drop. Counties mean difference was -0.47%, 95% CI -0.52 to -0.42.

Important notes on interpreting this data

At first look it seems that Counties ranks exactly in the middle of the field. However, there are complexities in this data that are worthwhile considering further, not least because this ranking issue has been contentious between the evaluation team and Counties staff. Firstly, in statistical terms, the only results that are different from each other are those that have non-overlapping confidence intervals. The Counties mean difference at 1 year was -0.47% with 95% confidence intervals -0.52 to -0.42%). There are 24 studies summaries in Figure 9. The only studies that report statistically better results, i.e. with non-overlapping confidence intervals, are studies 1,5 and 10 in the list above. The only statistically worse studies are 20, 21 and 23. Secondly, the comparison in each case is with 'usual care', which is likely to be different in each case. There are other potentially important issues to do with differences between studies, including difference lengths of intervention or observation; see the study descriptions below for some examples.

An analogy may help reinforce the importance of the point about 'usual care' being different in each study. Imagine you went into a school classroom and asked any two children to run around the school athletic track. You time their run and record just the difference between the two. Then you ask another pair to run, and record their time

difference, and do on. Now you rank the children in a list, with the children who won by the biggest margin at the top of the list. Now, do you know that the child at the top of the list is faster than every other child? Of course not – perhaps that child raced against the child who is actually the slowest in the class.

Olivarius et al., 2001

Controlled trial in Denmark with randomised allocation of patients (970 aged 40 years and older) with newly diagnosed type 2 diabetes into structured personal care, or routine care. Study was conducted over a 6 year period. The GP discussed with the patient the best possible goals for $HbA_{1c,}$ blood pressure, and lipids. Structured personal care was provided in 3 monthly visits to the general practitioner, where current status was compared to agreed goals, and annual screening for diabetic complications. The GPs were given clinical guidelines supported by an annual half day seminar. The explicit and repeated use of goal setting is a possible learning-point for CMDHB.

	Olivarius et al. (2001) comparing intervention group baseline and final data at 6 years	CMDHB change in those followed for 5 years
Change in proportion smoking	14% (control dropped 15%)	4%
Change in Systolic BP (mm Hg)	5 mm Hg	4 mm Hg
Change in HbA_{1c} (%)	1.7% (baseline 10.2%)	0.6% (baseline 9.0%)
Change in total cholesterol (mmol/L)	0.2 mmol/L	1.2 mmol/L

Tomlin et al., 2006

The authors analyzed information from 13,281 patients with any type of diabetes, collected by 242 general practices in the first visit of the Southlink Independent Practitioner Association's Get Checked program. The patients constituted approximately 60% of patients with diabetes in the South Island of New Zealand. Most were European, 5.8% were Maori or Pacific. The average duration of known type 2 diabetes was 7 years. This data has limited value as a comparison, however may reflect a cross-section of an unselected New Zealand diabetes population. CMDHB data clearly includes a group who were selected for raised risk and has a different ethnic makeup.

	Tomlin et al, type 2 diabetes data at programme entry		CMDHB CCM Data all diabetes types, baseline data on those followed for at least 1 year	
	European	Maori/Pacific	European	Maori
HbA_{1c} (%)	7.2%	8.1%	7.8%	8.6%
Systolic BP	141 mm Hg	139mm Hg	139 mm Hg	137 mm Hg
Smokers (%)	11%	28%	15%	34%
Cholesterol mmol/L	5.4 mmol/L	5.5 mmol/L	4.9 mmol/L	5.3 mmol/L

Bond et al., 2007

A randomized controlled trial (n=62) testing the effects of a 6-month web-based intervention plus usual care, compared with usual care alone, among adults 60 years of age and older with diabetes. The intervention was relatively intense with personalized goal setting and motivational strategies delivered by patient use of a web site plus frequent personalized contact from a study nurse via instant messaging, chat, email and bulletin board. There was no direct intervention with the usual health care providers. The populations are very different and this is a small study. However, there may be a learning point here for CMDHB in that useful improvements in patient care may be achieved by supported patient self-management that is complementary and additional to the current CCM programme.

	Bond et al., age 60+,	CMDHB all ages,

	change at 6 months	change from baseline in those followed for at least 1 year
Change in Systolic BP (mm Hg)	6 mm Hg	3.0 mm Hg
Change in HbA_{1c} (%)	0.6%	0.5% (baseline 8.7%)
Change in total cholesterol mmol/L	0.1 mmol/L	0.5 mmol/L

Heymann et al., 2006

This study describes the reorganization of diabetes care using disease management principles in a Preferred Provider Organization (PPO) operating across Israel. In this model each of 13 regional diabetes clinics was responsible for the overall care of all patients with diabetes. The model appears relatively 'top-down' and specialist-driven compared to the CCM programme in CMDHB, The main emphasis appears to be on centralized IT which was used to profile individual patient and individual physician data. This information was used to drive relatively intensive and multi-mode feedback and educational programmes for the primary care physicians. There were also teams trained to run patient support groups in each region.. The paper gives cross-sectional data for all patients in 1999 (16,440) and all patients in 2004 (19,159). The results are improvements in processes and outcomes. There may a learning point for CMDHB in that there may be some procedures that could be added to the current CMDHB programme.

	Heymann et al Change in whole group mean for all patients 1999 to all patients in 2004	CMDHB Change from baseline in those followed for 5 years
Change in HbA_{1c} (%)	0.3% (baseline 8.1%)	0.6% (baseline 9.0%)

Gilmer et al., 2005

This study was designed to examine the clinical effectiveness of a culturally appropriate diabetes disease management programme amongst 348 participants. The programme combined a stepped-care diabetes nurse case management program and culturally oriented peer-led self-empowerment training program. Change in outcomes was measured over a 1 year period

	Gilmer et al. (2005)	CMDHB*
Change in HbA_{1c} (%)	0.8%	0.5%
Change in Systolic BP (mm Hg)	5.4 mmHg	3.0 mmHg

* change over a one year period

Williams et al., 2005

This controlled trial of 232 people with type 2 diabetes, in the United States, examined the impact of an 'activation intervention' with patients, compared with a group who passively watched American Diabetes Association diabetes education video tapes. The trial was over a 1 year period. The activation intervention consisted of a research assistant conducting a 20 minute structured session with patients prior to three visits, one each to an endocrinologist, a diabetes nurse educator and a dietician. Patients in the intervention group, as such, did not change HbA1c. The setting was within specialty care, not primary care, and this may have contributed to a negative result in the primary trial analysis. However, regardless of group, patients who were more 'activated' (mainly judged by their asking more questions of their health professional patients) did significantly decrease HbA1c. The case is made that activated patients achieve improved HbA1c. Despite the authors' claims, it is least clear that the intervention improved activation. There is a possible learning point here for CMDHB that it is desirable to increase patient activation, but, from this study, it is not clear how to achieve that.

	Williams et al change in combined intervention and control groups over 1 year	CMDHB Change in patients followed for at least 1 year
Change in HbA_{1c} (%)	1.5% (baseline 9.1%)	0.5% (baseline 8.7%)

Zgibor et al., 2004

The purpose of this quality improvement project was to examine the effect of a Diabetes Disease Management Program (DDMP) on compliance with recommended process measures of care in primary care practice settings. Certified diabetes nurse educators visited five participating primary care practices biweekly for 1 year providing education to physicians and office staff on standards for diabetes management and to patients regarding self-management. The study involved 208 participants.

	Zgibor et al. 2004	CMDHB*
Change in HbA_{1c} (%)	1.3%	0.5%

* change over a one year period

Steines et al., 2004

This project evaluated the PROSIT® disease management programme for 55 high-risk diabetic patients in primary care. The main characteristics of this intervention were strict follow-ups of the patient's risk profile every three months and the use of quality management methods (definition of target values, structured documentation, central data feedback with diagnostic and therapeutic recommendations based on European guidelines). Change was measured over a 5 year period.

	Steines et al. (2004)	CMDHB†
Change in HbA_{1c} (%)	1.3%	0.6%

†Change over a 5 year period

Summary of diabetes outcomes

- **There is a reduction in all clinical outcomes explored for the diabetes stream of the CCM programme. There is no obvious variation between PHOs or ethnicities in the level of reduction. Reduction in HbA1c is the same as the mean or median reduction across studies included in two systematic reviews of disease management programmes for diabetes. We have not identified any reports that closely match the interventions and patient groups in CMDHB.**

Congestive Heart Failure

The stakeholder focus group agreed that key outcome measures for the congestive heart failure stream were blood pressure, smoking rates, proportion on ACE inhibitors, and proportion on Beta Blockers.

Blood pressure

Blood pressures have fallen. Table 10 shows that each year of enrolment in the programme leads to a further reduction in the systolic blood pressure. For those enrolled in the programme for three years there is an average decrease of 5mm Hg for systolic blood pressure. While this decrease is not statistically significant, this may well be due to

the relatively small number of people there is data for. When looking at this data by PHO or ethnicity there is a similar pattern found (Appendix C1).

Table 12 CCM CHF: Mean systolic blood pressure overall (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	118	126	123	.	.	0.1309
Entry to Year 2	51	124	120	123	.	0.5815
Entry to Year 3	23	126	124	127	121	0.3316

Smoking

The impact of the CHF CCM programme on smoking is mixed. While Table 13 shows that overall there is no real change in smoking, there is some evidence of changes in smoking in particular PHOs and ethnicities (Appendix C2). PHO B has had an 8% reduction of smokers in the first year of enrolment. Maori have increased in the proportion of smokers, whereas Pacific people have reduced smoking rates. In both cases however the numbers enrolled in the programme are small, so any change in the data should not be used as a basis for wider generalisations.

Table 13 CCM CHF: Proportion smoking overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	101	0.11	0.10	.		0.5912
Entry to Year 2	24	0.08	0.05	0.08		0.5000
Entry to Year 3	0	.	.	.		.

ACE inhibitors

Table 14 shows that, overall, just under 90% of patients enrolled in the CHF programme are prescribed ACE inhibitors. There is no statistical variation in this between PHOs, or ethnicities (Appendix C3).

Table 14 CCM CHF: Proportion on ACE inhibitors overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	109	0.86	0.86	.	.	0.5000
Entry to Year 2	44	0.84	0.82	0.80	.	0.7098
Entry to Year 3	19	0.89	0.88	0.94	0.89	0.5000

Beta Blockers

There is a relatively low level of prescribing Beta Blockers for those enrolled in the CHF programme (Table 13). A little over half are prescribed it in their first visit. This rises to two thirds by year three. This finding is similar to that found by Archard (2005) in which a number of studies were reviewed to show there was under prescribing of Beta Blockers amongst UK general practitioners. This is despite the guidelines from the National

Institute for Clinical Excellence who show the importance of Beta Blockers, even at low dosage.

There is some variation in prescribing behaviour between PHOs, with PHO B having a relatively low level of prescribing compared to PHO D (Appendix C4). There is also some variation between ethnicities with Europeans most likely to be prescribed the drug, and Pacific Peoples least likely to be prescribed it (Appendix C4).

Table 15 CCM CHF: Proportion on Beta Blockers overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	101	0.54	0.56	.	.	0.3885
Entry to Year 2	48	0.54	0.59	0.58	.	0.3404
Entry to Year 3	21	0.62	0.56	0.63	0.67	0.3737

Comparison of outcome data to other literature

To examine the literature a review was conducted on Medline for material published from 2004 onwards. Search terms were chronic heart failure or congestive heart failure, and looking for changes in, blood pressure, smoking, and use of Ace inhibitors and/or Beta Blockers. This search revealed no papers that were relevant for comparison to the outcomes measured in this evaluation.

This result is supported by McAlister et al. (2001) who conducted a systematic review of randomised trials of disease management programmes in Chronic Heart Failure. The authors found 11 studies, none of which looked at the impact on risk factors (BP, or smoking). They were all looking at the impact on re-admission rates, and deaths. A similar result was produced in Seow et al., (2006), a systematic review of papers examining multidisciplinary outpatient CHF management. The authors found 30 papers that matched their criteria. None reported changes in BP or smoking rates. Rather, they focused on costs, hospitalisation rates, and death rates.

Summary of CHF outcomes

- **There is no evidence of a reduction in smoking overall. However, there is some evidence of a reduction in smoking in some PHOs and some ethnicities.**
- **Most enrolled in the programme are prescribed ACE inhibitors.**
- **Much fewer are prescribed Beta Blockers than that recommended by international guidelines. NOTE MAY NEVERTHELESS BE GOOD BY INT COMPARISONS**

Chronic Obstructive Pulmonary Disease

The stakeholder focus group agreed that key outcome measures for the Chronic obstructive pulmonary disease stream were blood pressure, smoking rates, proportion receiving an annual flu vaccine.

Blood pressure

Blood pressures have fallen. Tables 14 shows that in the first year of enrolment there is a significant decrease in the systolic blood pressure. For the data provided, there is a slight (but not statistically significant) increase in the systolic blood pressure subsequent to the first year of enrolment. When looking at this data by PHO or ethnicity there is a similar pattern found - .i.e. a decrease in year one and then a slight increase in subsequent years (Appendix D1).

Table 16 CCM COPD: Mean systolic blood pressure overall (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	146	135	130	.	.	0.0152
Entry to Year 2	42	132	134	131	.	0.8540
Entry to Year 3	14	133	140	137	137	0.4521

Smoking

Those enrolled in the COPD programme show a reduction in smoking behaviour (Table 15). This reduction is not statistically significant, but this may be due to the relatively small number of people enrolled in the programme. This reduction continues for each year of enrolment in the programme. This reduction in smoking is seen across PHOs and ethnicities (Appendix D2)

Table 17 CCM COPD: Proportion smoking overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	145	0.43	0.35	.	.	0.9254
Entry to Year 2	42	0.38	0.43	0.31	.	0.7544
Entry to Year 3	14	0.57	0.73	0.42	0.43	0.7752

Flu vaccinations

Approximately 80% of those on the COPD programme are receiving an annual flu vaccine (Table 16). This pattern is reflected across PHOs and within ethnicities (Appendix D3)..

Table 18 CCM COPD: Proportion with flu vaccine overall.

	2002	*2003*	*2004*	*2005*	*2006*
Percent done	75%	93%	86%	82%	79%
(n flu / total CCM)	(3 /4)	(28/30)	(51/59)	(140/170)	(241/305)

Comparison of data with other programmes

To examine the literature a review was conducted on Medline for material published from 2004 onwards. Search terms were COPD or Chronic Obstructive Pulmonary Disease, and looking for changes in, blood pressure, smoking, and use of flu vaccines. This search revealed no papers that were relevant for comparison to the outcomes measured in this evaluation. Rather, similar to the literature for CHF, the studies focus on

outcome measures of hospitalisation rates, and economic factors related to the management of the disease. The lack of literature for comparison is supported by Taylor et al (2006) in their recent BMJ article. In conducting a systematic review of randomised controlled trials of nurse lead management programmes for COPD they identified several outcomes where little or no evidence was available; these included patients' satisfaction, self management skills, adherence with treatment recommendations, the likelihood of smoking cessation, and the effect of the interventions on carers.

Rea et al 2004

The paper reports a randomised controlled trial conducted in South Auckland. 135 patients with moderate to severe COPD were randomised to usual care or an intervention that included a COPD management guideline, a patient-specific care plan and collaboration between patients, general practitioners, practice nurses, hospital physicians and nurse specialists. The main reported analysis is before and after despite the concurrent study design, seemingly due to some unexpected differences between the intervention and control groups (probably due to chance). For respiratory conditions, mean hospital bed days per patient per year for the intervention group were reduced from 2.8 to 1.1, whereas those for the control group increased from 3.5 to 4.0 (group difference, P= 0.030) The intervention group also showed an improvement for two dimensions of the CRQ, fatigue (P= 0.010) and mastery (P = 0.007). The percentage of smokers in the intervention group fell from 30% to 25%, while the rate remained unchanged in the control group; however the difference was not statistically significant. Interestingly, an unpublished and more detailed internal report shows that blood pressure dropped in the intervention group, as in the CCM programme, even though neither programme targets blood pressure. The reason is not clear but may reflect a 'halo effect' - generalisation from one programme to other aspects of systematic health care and patient empowerment.

The COPD CCM programme is modelled on this intervention, although there are some important differences; the trial was conducted on paper, without IT support; access to spirometry was provided within the trial but remains a barrier to COPD CCM programme entry; and the principal author, Harry Rea reports informally that he believes the main reason for the trial success was the unstinting effort of a nurse case-manager and champion within the programme.

Adams et al 2007

Systematic review, included 32 studies. Symptoms, quality of life, lung function, and functional status were not significantly different between the intervention and control groups. However, pooled relative risks (95% confidence intervals) for emergency/unscheduled visits and hospitalizations for the group that received at least 2 CCM components were 0.58 (0.42-0.79) and 0.78 (0.66-0.94), respectively. The weighted mean difference (95% confidence interval) for hospital stay was −2.51 (−3.40 to −1.61) days shorter for the group that received 2 or more components. There were no significant differences for those receiving only 1 CCM component.

Summary of COPD outcomes

- **There is no evidence of a reduction in the proportion smoking.**
- **Approximately 80% of those enrolled receive an annual flu vaccination**.

Cardiovascular Disease

The stakeholder focus group agreed that key outcome measures for the Cardiovascular disease stream were Lipids, smoking rates, proportion on aspirin, statin, and ACE inhibitors.

Lipids

Total cholesterol

Total cholesterol levels have dropped.

Table 19 shows that each year of enrolment in the programme leads to a further reduction in cholesterol. This decrease is statistically significant in the first year. When looking at this data by PHO or ethnicity there is a similar pattern found (Appendix E1).

Table 19 CCM CVD: Mean total cholesterol overall (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

Overall				
Paired data	N	Entry	Year 1	p
Entry to Year 1	118	5.0	4.6	0.0000

LDL cholesterol

LDL levels have dropped.

Table 20 shows that each year of enrolment in the programme leads to a further reduction in LDL cholesterol. This decrease is statistically significant in the first year. When looking at this data by PHO or ethnicity there is a similar pattern found (Appendix E2).

Table 20 CCM CVD: Mean LDL cholesterol overall (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

Overall				
Paired data	N	Entry	Year 1	p
Entry to Year 1	118	2.8	2.4	0.0000

Smoking

Table 21 shows that there is a small (but not significant) decline over time in the proportion of people smoking. When looking at this data by PHO or ethnicity there is a similar pattern found (Appendix E3).

Table 21 CCM CVD: Proportion smoking overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall				
Paired data	N	Entry	Year 1	p
Entry to Year 1	118	0.21	0.18	0.7445

Aspirin

Table 22 shows that, overall, approximately three quarters of patients enrolled in the CVD programme are prescribed Aspirin. There is some variation in this between PHOs, with PHO 2 having a higher prescription rate than other PHOs (Appendix E4). When

looking at ethnicities, Maori are notably lower than the other groups in the proportion prescribed Aspirin (Appendix E4).

Table 22 CCM CVD: Proportion on Aspirin overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	p
Entry to Year 1	117	0.73	0.74	0.4414

Statin

Table 23 shows that, overall, just under 90% of patients enrolled in the CVD programme are prescribed ACE inhibitors. There is no statistical variation in this between PHOs, or ethnicities (Appendix E5).

Table 23 CCM CVD: Proportion on a Statin overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	p
Entry to Year 1	118	0.82	0.85	0.2995

ACE Inhibitor

Table 24 shows that, overall, just over half the patients enrolled in the CVD programme are prescribed ACE inhibitors. There is no variation in this between PHOs (Appendix E6). Examination of variation between ethnicities shows a higher proportion of Pacific Peoples are prescribed an ACE inhibitor as compared to other ethnicities (Appendix E6).

Table 24 CCM CVD: Proportion on an ACE inhibitor overall.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

Overall Paired data	N	Entry	Year 1	P
Entry to Year 1	118	0.56	0.58	0.3465

Summary of CVD outcomes at 1 year

- **There is a clinically and statistically significant reduction in total cholesterol and LDL cholesterol**
- **There is no evidence of a change in the proportion of people smoking.**
- **74% are prescribed Aspirin**
- **85% are on a Statin**
- **58% are prescribed an ACE inhibitor.**

Comparison of data with other programmes

To examine the literature a review was conducted on Medline for material published from 2004 onwards. Search terms were CVD or Cardiovascular Disease, and looking for changes in lipids, smoking, and prescription rates. This search revealed a small number of papers that were relevant for comparison to the outcomes measured in this evaluation.

The majority of the literature looking at outcomes for CVD disease management explored hospitalisation rates, and economic factors related to the management of the disease.

De Lusignan 2007

To examine the impact of eight years of regularly feeding back to general practices routinely collected cardiovascular data.

	De Lusignan 2007	CMDHB†
Change in proportion receiving a statin	From 46% to 68%	From 71% to 86%
Change in total cholesterol (mmol/L)	0.5	1.2

†Change over a 2 year period

Haskell et al., 2006

In this U.S. based study the authors examined the impact of a CVD disease management programme on those with no health insurance or on a low income. The programme involved a physician, nurse, and dietitian. The intervention was appropriate medications, and supporting the patient in a lifestyle change. Data was collected over a 12 month period

	Haskell et al., 2006	CMDHB*
Change in total cholesterol (mmol/L)	11.2 to 10.2 mmol/L	5.8 to 5.2 mmol/L
Change in proportion smoking	4%	11%

* change over a one year period

Majumdar et al., 2006

This study looked at the impact of opinion leaders of prescribing behaviour of physicians. In the trial physicians were asked to nominate who they saw as an opinion leader in treating CVD. The physician was then faxed a one page evidence summary and medication profile from the opinion leader

	Majumdar et al 2006	CMDHB*
Change in proportion receiving an ACE inhibitor	38%	11%
Change in proportion receiving Statin	17%	15%

* change over a two year period

Stakeholders Interviews

A key component of the evaluation were the interviews with key stakeholders. Interviews were undertaken with 28 PHO aligned providers in South Auckland during March and April 2007. All eight of the PHO Chief Executives or General Managers were interviewed along with 13 of their management staff and CCM dedicated personnel. There were also seven people from general practice interviewed including general practitioners, practice managers and practice nurses.

The interviews focused on discussing enablers and hindrances for each of the four areas that this evaluation focused on;

- Overall CCM concept
- Decision support
- Wellness plans
- Implementation

(See Appendix A for a copy of the interview schedule). Analysis of the data under these areas produced a number of themes. The following sections explore these themes.
We would like to remind the reader that the comments quoted verbatim are from interviewees, and, as such, cannot be changed by us. We are aware that Counties staff have been concerned about factual errors amongst these interviews. It is not our current role to investigate or correct them. Nevertheless we have included an occasional annotation about error or disputed fact, and have attempted to remain aware of these in drawing conclusions. Counties staff may wish to treat any such errors as an opportunity to discuss the issues with their PHOs.

Overall CCM concept

Ensuring that all stakeholders have a clear understanding of the nature of the programme and its underlying principles is critical to the success of any programme. The interviewees were asked to describe their concept or understanding of CCM.
The following section describes the many definitions given by providers when asked to describe what the concept of chronic care management meant for them. It is important to note that overwhelming all respondents supported the notion of CCM, while the understanding of the concept varied the respondents fervently believed in the concept. This is significant factor in terms of understanding success of any programme.

Overall the interviewees appeared to have a very global view of CCM which appeared to be based on their perceptions of need within the community. One respondent stated clearly

> *Any programme that focuses on people with chronic disease and aims to improve their ability to remain in the community is a good programme.* [PHO]

While the interviewees were not specifically questioned about the philosophy of CCM, it was of note that there was little spontaneous reflection underlying the philosophy of the

programme. The following list presents the multiple facets of CCM referred to by the interviewees.

- CCM Framework – overall concept
- Health team in the practice
- Patients' role
- Chronic condition
- Empower/ teach patient
- Tracking over time
- Programme to keep patients out of hospital
- Achieve clinical results
- Cost of the programme
- Reflective practice to work with chronic conditions
- Proactive concept
- Electronic interface system

Almost all providers described some facet of CCM when asked; interestingly only one mentioned the electronic decision support. Overall the interviewees see CCM as a framework or model that engages the practice team and the patients. The following two quotes provide unique descriptors of CCM as a model

> *It gives me a chance to look at the big picture to sort out loose ends not just the immediate issues of the day that the patient presents with…CCM gives the time and focus to look beyond today's issue.* [General Practice]

> *It's about being proactive rather than reactive.* [General Practice]

A number specifically focussed on the patient when asked to describe the CCM concept and said:

> *Teach patient to recognize, better manage, understand and take responsibility thus reducing hospital admissions.* [PHO]

> *For the patient it's an opportunity for them to get their condition under control through dedicated time to learn self management and increase their Wellness.* [PHO]

A number of practitioners talked about GP's and practice nurses working together. The system had forced them to be coordinated.

> *GP's are good about getting down to brass tacks with patients then …..… but me filtering out the little things and doing the education etc .. they can then focus on the heart etc….it frees them up to do their medical thing.* [General Practice]

The following quotes provide evidence of how they describe this model of care and what it aims to provide.

CCM is for people who have a chronic medical condition requiring prescriptions, education, and support. It is the interface between primary / secondary and allied care. It's medical and holistic, side by side and is linked to the nursing role.[CCM dedicated staff]

Structured programme for chronic care conditions that provides free visits (so cost is not a barrier to receiving care). Incorporating paid nursing time and is nurse led. It is an opportunity for health to take extra time to find out what's blocking the patients from achieving outcomes. It aims to reduce the progression of disease and prevent complications. [PHO]

It is for chronic patients and is a way to provide the care regime needed at a cost they can afford. The driver is patient benefit.[PHO]

The programme I think is to minimise the health problems and health risks of anybody with specific types of a chronic disease (the diabetics, the lung problems, the heart problems). The more we can keep them well and out of hospital the better they're going to be, and the better the whole system will be.[General Practice]

Overview of overall CCM concept

Following analysis of the interviewee comments about CCM the following statements are an amalgamation of their views.

Overall CCM is perceived as a structured framework/model of care/programme used by health professionals (general practitioners and nurses) in general practice to provide care for patients with chronic conditions (specifically Diabetes, CVD, CHF and COPD).

It aims to empower and teach the patients about their conditions and keep them out of hospital.

The programme is seen as a vehicle in which time is provided to undertake care which is provided without cost being a barrier and outcomes are able to be monitored.

The CCM programme is not necessarily seen as requiring decision support.

Implementation and engagement

Given the complex nature of the CCM programme it is important to understand how the programme is implemented as well as the extent and reach of the implementation of the programme. Therefore a number of questions about implementation were asked of the 28 interviewees from PHO management and general practice. Their responses indicate that there are concerns with the overall implementation process and the impact of these processes on the programme as a whole. A number of themes emerged that were seen to increase the successful implementation and reach. Conversely a number of obstacles to success were also identified by the providers. These themes could be categorised into three domains: First organizational processes, second communication and engagement and finally evaluation, monitoring and adaptation. The following table summarises the obstacles and success factors.

Table 25: Summary table of success factors and obstacles to implementation and engagement

Success Factors and Obstacles to Implementation and Engagement	
Organizational processes	
Enablers	***Hinderers***
• **Prioritization of Patient selection**	• **In comparison to other programmes CCM is difficult to implement**
• **Have effective recruitment processes**	• **Difficulty in getting patients to do the required blood tests**
• **Have a system for recalls and alerts**	• **Not enough workforce to meet the administrative requirements of the programme**
• **Prioritise time to engage effectively**	• **The frequency of scheduled visits seen as too high***
• **See nurse before Dr**	• **Restrictive entry criteria***
	• **MoH limit on enrolment numbers for CarePlus**
	• **CCM not set up to use with the range of PMSs***
Communication & Engagement	
Enablers	***Hinderers***
• **Have a programme champion**	• **Clinical disillusionment because of difficult implementation**
• **Patient receives a consistent message**	• **Lack of enough skilled workers**
• **Practices receive appropriate on-going training and support**	• **DHB underestimate the impact of the CCM programme on general practices.**
Evaluation and Programme Adaptation	
Enablers	***Hinderers***
• **Having a system for regular programme review**	**None identified**
• **Practices/PHOs taking initiative to adapt the programme to suit their needs**	

* considered incorrect by CMDHB staff

The following section describes the perceptions of success and obstacles that emerged in each of these areas.

Organizational processes

Enablers

General practices that appeared to be engaged with CCM were found to be undertaking a variety of processes that improved the effectiveness of the implementation of the programme. They used processes that facilitated the smooth running of the programme. Factors such as recruitment and clearly defined recall and alert systems were important. There were several factors related to nurse-led interactions that were vital enablers these include undertaking regular reviews with the patient to record progress and establish what problems were impacting on management goals; being confident users of the template and being able to resolve any validation issues; seeing the patient prior to their medical consultation and sharing relevant information with the doctor for follow-up, and having extra scheduled visits between quarterly screening visits to continue Wellness planning. The following enablers were identified as major themes.

Prioritization of patient selection: Selecting patients based on resources and compliance

In an effort to improve enrolment and increase recall rates a variety of strategies have been employed by PHO's ranging from using CCM dedicated nurses to dis-enrolling those who were considered to be non-compliant[**] or were about to start dialysis and limiting the number of modules that can be used initially. There is evidence of a PHO and practices prioritizing selection of patients enrolled into the programme in an effort to ensure that they have enough resources available.

> *One practice that has two doctors and are really getting up there, they were really slow with uptake, didn't want to know about it, but now with the CCM nurse going in they are really picking up.*[PHO]
>
> *I think the doctors there are prioritizing…the patients that are going to benefit most by being on CCM. They have to make some pretty tough choices. It's knowing the patient that they are going to be compliant. Compliance is a huge one.* [PHO]
>
> *I must admit that in our PHO, I told the GPs that they could only do diabetes because I wanted them to get that done and done well, sort out their IT, make sure they're using the programme properly and then this year we're going to move into CV.* [PHO]
>
> *We have to be careful who we pick because if we think they're going to go into renal failure next year, we shouldn't put them on, because they can't do the required tests and if you're at the hospital constantly having blood tests you won't go for this blood test.* [PHO]
>
> *We haven't started the other modules of CCM because we can't open the flood gates for the doctor's expectations.* [PHO]

[**] Non compliant in this context refers to patients who are perceived to be complying with the prescribed medical orders and turning up for appointments.

CCM nurse is focused on existing CCM practices to get them competent; she makes appointment with each small practice, talk, builds on that. [CCM dedicated staff]

Recruitment processes:

The recruitment process ensures an efficient system is in place to bring patients to the programme.

Have run recruitment drives – checked database. [PHO]

The CCM referral usually comes from the physician, I have to say ours are actually quite good about identifying CCM patients. ….I've got the CMDHB-CCM criteria flow chart in all the rooms, but occasionally they'll say I think he qualifies but will you check, because it's easier for me to go through an make sure they qualify. … They usually just zip me a task and then I go through and evaluate the patients as to whether they meet the criteria. [General Practice]

Recall systems and alerts:

Developing a system to ensure the programme is maintained including recall systems and alerts was also seen as an enabler.

3 months in advance – recall system and trained the administration/reception staff so that when a patient rang, asking for a prescription, they saw a message alerting them to say, I see you are due for a quarterly visit…how about I book you in to. [General Practice]

A lot of it I suppose is opportunistic, we don't get people in just for a diabetes check up, and we take them when they came and try and manage that. [General Practice]

We send a letter reminding them about the appointment and the bloods, they already know they have to have the bloods or the next visit will be a waste of time. [CCM dedicated staff]

We see them the next month and we usually try to book in their appointment while they're here, some of them it's better if they call us as it gets closer, we just send them a reminder letter. [General Practice]

Time to engage effectively:

Providing time for the health team to communicate effectively with their patients was considered an enabler.

Time wise, it's huge. Our doctors take full amount of consultation time and the nurses take the full time, too. You can't squeeze CCM on top of other consultation. You have to give them the resources and time to do it. [General Practice]

The doctor allows us to have that time as the owner of the practice – if he didn't allow us to have the CCM dedicated Nurse, or the time – it wouldn't work. [General Practice]

Seeing the nurse before the doctor:

Some interviewees reflected that one way they have found to improve the consultation process is to arrange for the patients to see the nurse before the consultation with the doctor as it is seen as a more efficient and effective system.

With our existing patients they're normally coming in to see the physician for the quarterly visits. [General Practice]

During that time they have the half an hour with me first and so we do the pre-screening getting blood pressure, weights, talking to them about how they've been doing with their diet, going over their goals, seeing if there's any new goals that they want to add. And so that probably leads us in to the next decision making for example if they're asking for more information. [General Practice]

So usually when they're seeing me we try to get all that pretty much sorted out so that by the time they see the physician it's more centred on getting their medicines right, going through any medical decisions, dose titration, different things of that type. [General Practice]

Hinderers

A number of common factors that were considered to be hindering the successful implementation of the programme emerged from the interviews. Below each of the factors that were identified by providers as hindering enrolment and recall rates are discussed.

In comparison to other programmes CCM is difficult to implement

Providers have found that other programmes are easier to use and do not have similar problems such as invoicing. Generally implementation of the programme was seen as being difficult:

Not a brilliant tool… (its) difficult to use. [PHO]

Familiarity with the TIM template is vital, they can't grasp it immediately. You maybe need to work through it with about 10 patients before confident. Lots of problems – need to get familiar. [PHO]

Some practices stopped using CCM in favour of CarePlus when they saw CarePlus especially with regard to CCMs complexity and invoicing restraints. [PHO] [††]

CarePlus has better implementation. All the template questions are used to review patient. It's simpler to use and the KPIs are similar. Practice uptake is better as are the quarterly visit rates and reporting. The IT, invoicing and payment cycles are easier too. [PHO]

With other programme easy to do training E.g. CarePlus easy – can get on job training. [General Practice]

Limited enrolments due to lack of capacity to meet the administrative requirements

The administrative requirements of CCM have meant that some practices have limited the numbers they can enrol because of the limited workforce available and capacity to complete the tasks.

They won't go any higher [enrolment numbers] because that's the best they can do given their levels of staffing. [PHO]

Really it's been manpower in the practices that's been the defining factor. [PHO]

[††] Counties staff acknowledge past difficulties with invoicing but dispute any claim of ongoing problems

But unfortunately with the extra administration that came with [CarePlus/CCM], we then said hey we need to be realistic, what's our capacity to deliver with that added administration? And so after discussing within the team and management we chose to drop our number down to 100. [PHO]

Arranging the required blood tests within valid time range is difficult

To arrange the required blood tests within the valid time range can be a lengthy and frustrating process and takes so long that it interferes with the overall management of the patient.

This process [getting the patient to have their required blood tests] can take seven to ten interventions. The HCA's will try three themselves then send to Community Health worker who will continue to chase the patients up. The blood is a big barrier at the moment. If I give them a blood test form now but they don't go for 2 months and one day- that template is invalid. Yet it has taken 6 to-10 interventions from us 'saying please go please go' for them to finally have their blood test done and the results have come back and the template is invalid. [PHO]

And our patients are slowly changing; we've been on it now for two and a half years. They are learning they have to do the blood test. [PHO]

Entry criteria for some modules is too restrictive

Eligibility to be enrolled is perceived by some interviewees as being very restrictive. To be eligible to be enrolled in the various modules the patients have to meet all the required criteria and in some instances the availability of getting the required screening tests can be difficult and prolonged. These restrictive requirements impact on the patient and the practice. The clinicians also noted that the entry criteria for some CCM modules are too restrictive. Interestingly sometimes the restriction can be that the patient needs to be so sick as to be almost palliative and in others that they can be too well.

I hear them saying is the criteria to get in to CCM for some of those modules is almost palliative. And then should there be more of an emphasis in to preventing people from getting to that stage, because at the moment it's like "Do they go in to CCM? Oh no they don't fit the criteria", so there's a sense that therefore the patient's getting slightly different care when in fact they would like to see a lot more emphasis going in to those early stages rather than the later stage. [PHO]

"If I work hard with my patient, and he improves, you're going to take him off because I've worked too hard and got him too better" you know that's a comment I've got. So you may have good blood tests, but you are a high needs patient that needs more chronic disease management advice, more input, and if you could have free visits you won't get to the renal stage. And so the criteria's are too narrowed. If a doctor feels, if I could spend 6 hours, if my nurses could spend 6 hours with this patient and I could keep him out of hospital, I think that would be a good enabler. Not to say his blood sugars got to be over 8 or 9, and the lipids have to be over this. [PHO]

And if they were diabetic then they had to have hypertension, be a smoker, have horrible cholesterol or horrible blood sugars; well if we'd at least worked with them a little bit before, we'd already fixed those things. And so then you'd go to put in their latest vitals or their latest bloods in to the screen and it would kick them out saying "now their blood pressures only 140, and now their cholesterol's less than six." Well it might have been horrible 3 months ago or 6 months ago before you saw them first, before the doctor put them on their tablets or something, but because they'll pull up the most current. So we've had trouble with that because you can't put anywhere on the screen bloods from six months ago when we first saw the patient were this and they were horrible, we've now worked with the patient off the CCM programme an we've improved them but by improving them we've knocked out their eligibility for the programme. So

it's kind of a catch 22, you might have fixed some things but you'd still like them on the programme for the education or for keeping them going, but the minute you put them on a cholesterol drug or get their blood pressure a little better because you've got them on a tablet then they don't meet the criteria anymore, so that's a little tougher. [General Practice]

The only thing is that in some cases, or in many cases, we are kind of dependent on secondary facilities to see if we can have our patient reach that screening criteria. Like for CHF they have to have an echocardiogram before they can go on. COPD, you have to have a spirometry done. Without that you can't put them on CCM. You know there is a huge waiting list for echo[‡‡]s. How are we going to try and get patients enrolled. [PHO]

Congestive hearts are hard to get on because you have to have a documented echo, it's a little easier now, Pro Extra will do the echoes, prior to that we have to wait for the hospital, and the waiting time was really long, or if we couldn't get their old records to verify an exact date they'd been told years ago that they had left ventricular failure.[General Practice]

With the COPD our biggest problem has been, when the hospital does their spirometry they don't do pre and post, so then it's useless to me, and the doctors get really frustrated at putting a patient through a second spirometry test, when they may have just done a few months ago. It doesn't fit the criteria. I'll ring [the hospital clinic] and say 'of all the people who should be doing pre and post it's you guys who are the ones sending me the note saying this guys got horrible COPD- put him on CCM but you did the spiro and there's no pre and post'. And the answer I've gotten back when I've talked the spirometry people is just 'well that's how our doctors do it'. [General Practice]

<u>The frequency of scheduled visits is too high</u>

The frequency of recalls required was seen as burdensome. Further, some clinicians commented on the frequency of the scheduled quarterly visits. Also, screening tests were too imposing for patients and impacted on the work of the practice.

Too often recall, 4 visits too many particularly with our population. Too many visits for the patient may have just completed all the previous visits/bloods it's too much for them and results in declines; less visits would be better. [PHO]

Too many visits, why so many visits all the time the patients hate the 3 monthly visits and blood tests. [CCM dedicated staff]

<u>MoH limit on numbers that can be enrolled in CarePlus and some PHOs have differing priorities for CarePlus usage</u>

A complicating factor for some PHOs is the MoH limit on numbers that can be enrolled in CarePlus. In South Auckland the numbers of patients per practice who are high needs are above the Ministry 5% limit. This is an issue for some PHOs have differing priorities for CarePlus usage from that of the DHB.

With Care Plus, which is an allied programme if you like, the Ministry's calculation is that around 5% of the practice will qualify for CarePlus, some of our practices are three times that percentage. If you have a practice with 90% Maori and high needs, which we do, you would expect that level. [PHO]

[‡‡] It is the perception of some in primary care that there is a huge waiting list for ECHOs to be done but this may be historical.

So there are significant numbers of people who qualify and trying to deal with them is a lot more complex than the designers of the scheme understand. [PHO]

We have a capacity issue, number wise, so we can't increase too many, we have to limit. It's a limiting process for us we can't cross that, so we have to weight that against other projects. It's a CarePlus issue more than a CCM issue. There are other projects that go on side by side and we have to take those in to account. In our PHO population, CCM is the minority, we need to take care of the majority of our population as well. Our clinicians have said high users will be used for our other than chronic disease people such as respiratory conditions like asthma and bronchitis, eczema and gout. [PHO]

Just because CCM is your priority doesn't mean it has to be a PHO priority, we have got a different break up of population we have to deal with. That's our ceiling, it's not the DHB saying you can't put any more on, it's just that we've got maximum CarePlus numbers and every CCM patient has to be put on CarePlus. And so he has to manage CarePlus very, very efficiently. [PHO]

Patient Management Systems (PMS) impacts on effectiveness

There is a common view that there no standard Patient Management System in use in general practice and the CCM programme was not set up to work with the range of PMS that are currently in use.

Latest criteria for entry have to have MedTech, not Next Gen, we have about half of the practices on MedTech, and the others can't upgrade, or are on another PMS system. [PHO]

Probably almost a third of our practices out there cannot do CCM even if they wanted to. And it's largely attached to people who have Profile or NextGen as opposed to MedTech. [PHO]

Because they were seen more by the teams there than by us, and so we weren't offering them anything really added here. So that's why I'm not sure what our spread is of our patients on CCM now, because we may have got rid of a lot of the really difficult ones. [General Practice]

Communication and Engagement

Enablers

Enabling factors to the communication and engagement of the programme in the practices included having programme champions, being consistent with messages to patients and having ongoing practice support. These enablers are discussed in more detail below.

Programme Champions

The providers frequently referred to people that were programme champions, these references varied from the original programme enthusiasts to the current CCM nurses. Key attitudes and skills that helped the programme champions were shared during the interviews. It also became apparent that successful CCM nurses didn't work in isolation and were supported by their PHO, or practice owners/ managers.

So I'm lucky here [GP & practice owner] especially is very pro-education, pro-preventative care in his own philosophy. [General Practice]

[Our doctor] had the insight to say "the doctors need to be doctoring, not trying to keep track of whether they're suppose to send a screen or fill out a screen or is it too early for the screen". As a result he established a dedicating CCM nurse role. [General Practice]

Because [the CCM nurse] is passionate about it, she could go in there and support the practice nurse and support the GPs, she's the driver. [PHO]

The nurses are doing a lot of CCM stuff – driving it more than GP. [PHO]

Then, we got [CCM nurse] on board – she loves CCM and she's dedicated. If I or anyone has a problem, she is the key person. [General Practice]

Getting champions to talk to other nurses can help with buy-in. [PHO]

Consistent message:

The fact that all staff was giving the same message to the patient was an enabler to communication and engagement.

With a lot of the patients we see it's about having the consistent message given to them and having those goals, realistic goals reinforced each time. [General Practice]

Talk about it each time eventually get the idea, it takes time then one day they decide. [CCM]

Practice support:

Providing ongoing support for practices in terms of training and necessary modifications was also seen as an enabler to the communication and engagement of the programme

You need ongoing support going into the practices. [PHO]

I go along and hear their issues about reports and the use of the template and the lack of time. Some GPs were behind in their claims and the problems sorting those put them off. I have tried to hurry along older claims (flexibility). [PHO]

[Practice manager] is strongly focused on team development and CCM. Within 5 minutes of a new staff member starting she will be telling them about CCM. [General Practice]

Help them be independent, constantly carry your phone so that they can ring and say I've a patient here I'm half way through the template and am a bit confused, can you me what to do next. [PHO]

As Practice Manager, I support the process – that's what is required in the programme
We weren't going to let it (CCM) beat us. [General Practice]

Hinderers

A number of factors hindered the communication and engagement of the programme in the practices. These included clinician disillusionment and the capacity of the workplace when there were competing priorities present in the practice. These are discussed in more detail below.

Clinician disillusionment / wariness

There have been many false dawns where promised solutions didn't materialise. It's been an administrative nightmare. [General Practice]

In the past because of invoicing – (has been) really bad. [General Practice]

When trying to get a new practice involved there was a very negative attitude about CCM being cumbersome and time consuming. Colleagues tell others. [General Practice]

Our GP's hear about problems from others moaning in cell group meeting. [PHO]

Very unhappy GPs, the main problem appeared to be this TIM template, and its introduction. We had a very complex template that was introduced in to a commercial environment. And I think a lot of the frustration was taken out on this TIM Template. So even today I have practices saying, "I want nothing to do with CCM" because this thing just became a bane of their lives. They just withdrew. [PHO]

The impression I had was that it was rolled out large, and then the problems started and it was virtually impossible to actually bring it back in. So we lost a lot of ground and are still losing ground around that. They've just never embraced it. You know "it's there but we don't use it because we can't bare it." for some it's a mental block. [PHO]

Workforce and workspace capacity and competing priorities

Hinderers to the successful engagement were considered to be the presence of competing priorities within the practice and limited workforce and workplace capacity.

We have a practice that is a solo doctor and he doesn't have a nurse so he has not been included. [PHO]

It's the system at the practice and the GP, because unless the GP allows the nurses to do it, then it won't happen. That's why we employed a nurse to implement it in the practices. The PHO employs a nurse who goes in, because it is a huge capacity issue. [PHO]

A limiting factor is GPs in small practices; GPs don't have the time and don't have the space or empty rooms for new programme. CCM requires space for the nurses to have a clinic. [PHO]

Nursing workforce is already at full capacity. There are not enough hours to cover CCM needs and practices are reluctant to bring on nurse until got enough numbers. [PHO]

Arrived at same time as the MMR campaign. [CCM dedicated staff]

Nurses are chock a block. [CCM dedicated staff]

DHB understanding of primary care reality

One hinderer to the implementation that PHOs shared frequently was about the DHB understanding of the reality of life in primary care specifically that the DHB had underestimated the impact on them.

DHB has mis-calculated impact on the practice. [General Practice]

No space, time, it's been driven by the DHB, not Primary Care. [PHO]

I think if there has been any conflict between the PHOs and the DHB it is that the DHB tends to underestimate the degree of difficulty in the implementation and I think that's particularly true with PHOs like ours who have a very high percentage of high needs patients and who are dealing with providers who have got in excess of 80% Maori and Pacific.[PHO]

I think there were some big assumptions made, that people had a level of understanding that they didn't actually have. [PHO

we had to recognise that the style of practice we, … and systems that they'd used to implement the programme didn't always fit with the way our team operates. [General Practice]

Felt it was being forced on us by DHB. [CCM dedicated staff]

Evaluation and Adaptation to context

Enablers

Enabling factors mentioned by respondents focussed on the regular review of the programme and adaptations to the programme being made.

Regular review of the programme:

It is important to have regular review of the programme to reflect and determine what is working.

Spending more time and checking compliance why they are having problems, identifying what the barrier is and why they aren't following advice. [CCM dedicated staff]

Programme Adaptations

Providers shared about strategies they used to address problems and improve the way CCM worked for them and their PHO/practice populations. These modifications varied from drawing their own bloods, to employing CCM focussed nurses and staff, to holding special CCM clinics, to providing needed screening services like spirometry that were delaying enrolment, to running centralised decision support systems, and developing a range of other strategies that increased enrolment.

- Strategies to improve blood collection rates

To ease the process for getting the [required] bloods our nurses draw the bloods they want. [PHO]

- CCM Boost ProCare initiative to address CCM issues

We've got a project called CCM boost that's about trying to resurrect CCM. We've got 3 large practices that are not doing well in CCM and we're putting in resources and IT support in to those practices and looking at all their quality systems around recall and everything else and working differently.[PHO]

- Employing CCM dedicated staff

We employ a nurse just to do CCM – on sessional basis she now moves around all the practices providing the practices nurses with collegial support. [PHO]

What we've done as a PHO, is employ people like [xx] as a specialist CCM nurse to do nothing else but implement CCM. ...To support the nursing staff in the practice, but also the doctors, to undertake the additional work, using someone who is totally familiar with the IT and who is an experienced nurse in primary care. [PHO]

And I could see from everything that I was hearing the practices were crying out for help and we had virtually no one on the ground helping them so I lobbied for funding to get [CCM Nurse] the skill level needed is someone who a) understands a commercial environment, which she does because she's been a business manager, she's been a nurse specialist, she's been a practice nurse and she's been a practice manager, so she actually understands the whole range of the systems. But they're a rare breed. [PHO]

Our CCM nurse is excellent, because she's very highly skilled. [PHO]

It's the system at the practice and the GP, because unless the GP allows the nurses to do it, then it won't happen. That's why we employed a nurse to implement it in the practices. The PHO employs a nurse who goes in, because it is a huge capacity issue. [PHO]

Actually we have two people there that are doing CCM work. They are employed for the nine surgeries to run the programme. They're health care assistants with training who run diabetic clinics. [PHO

We get task sent by the GP/Nurse advising us to check a patent for CCM eligibility, we check they have had a recent blood test seen. If eligible we enrol in CCM via TIM. The Dr tasks us about lifestyle changes, and we use the Recall system and make internal referral system to out. [CCM dedicated staff]

- Creating centralised decision support within the PHO

We've centralised our claiming procedures, so the decision support comes centrally and gets dissipated to all the other centres because we've got nine practices. We've got one server, and the nine medical practices, we do the management for them. There's two people employed for the nine surgeries to run the programme. [PHO]

We use a centralised model [server] that allows us park templates as a result our error rates are lower. [PHO]

Because the clinician is very busy we don't him to waste time clicking on TIM and waiting for things to happen. We'd rather have him or her focus on clinical issues rather than IT issues. [PHO]

- Hold special clinics

Pre check clinic – just for blood test, highest rates, best results, it occurs before the quarterly check. [PHO]

No, we actually at this time have [Spirometry technician] come in every 3 months. So we usually have a waiting list and we book in with her. If someone needs it urgently then we can usually do that ProExtra referral otherwise if I need one kind of in a hurry I can ring and we usually track down where she's at and have her do one for the patient at that point. We are looking at probably trying to get a machine in for the number we do it probably is easier just to get one in and not have to wait. [General Practice]

Overview of implementation and engagement

A number of themes emerged that indicate some fundamental flaws in the implementation and engagement of providers in CCM.

- The programme appears to be successful, where there is a champion and where they really *understand* it's a system based on feedback of solid evidence.

Successful implementation appears to occur in areas were patients are compliant and involved.

- Resources are portioned out to those where it is felt that there is a high chance of success.

Workforce capacity is also a problem when there is not enough staff to undertake the CCM role.

- Some of the practices of subjective selection and retention of patients undertaken by the general practices could actually be increasing inequalities.
- There is good impact on practice nurses, GP's and patients where the implementation and engagement is working.

The relationship between PHO's and DHB is difficult

- The programme appears to be too restrictive for practices, adapting it to their context is important, some practices have been successful and some haven't.

Wellness plan & Goal setting

Fundamental to the CCM programme are Wellness plans and associated goal setting. These components facilitate patient empowerment. There are three components to examine in this process, first the worth of idea as vehicle for engaging patients in taking responsibility for their health, second, the collaboration between the health team and the patient, and finally the functionality of the Wellness plans i.e. how it fits in with the whole model of CMM. Overall the concept of the Wellness plan and the goal setting could not be faulted. It was viewed as a worthwhile and ethical approach, however the practicalities of the system where questioned. The following section presents the findings from the providers' perspectives of Wellness Plans and Goal Setting. The section is divided into two areas of Enablers and Hinderers

Table 26: Summary table of enablers and hinderers

Success Factors and Obstacles to Wellness Plans and Goal Setting	
Enablers	***Hinderers***
• **Practitioners having a 'buy in' to the philosophy of patient engagement and valuing the use of Wellness plans**	• **A belief that the plans were difficult to develop and use**
• **Practitioners seeing patients value the plans.**	• **A belief that the plans didn't affect patient outcomes**

Enablers

The enablers can be categorised into two themes, engagement i.e. the level and depth of participation of patients in the process and valuing this describes the merit and or worth of the concept as seen by the patients and health team.

Engagement

While there were not many providers who spoke positively of the wellness plans the enablers for patient engagement in the management of their chronic disease include having health professionals use the Wellness plan; buy in to the concept of empowerment; a team approach to patient care; a consistent message and using strategies to encourage usage.

> *One man uses it and takes it to clinic visits, the doctors don't write in it, as there is not enough space to write in it but they do review it.* [CCM dedicated staff]

> *The little red book, the patients have them and I write in them if I'm tweaking their drugs.* [General Practice]

> *I let [the nurse] focus on what she can do and I focus on what she can't. She will send a memo about what she's been covering e.g. diet, support or exercise when I see them so I can support what she has been doing.* [General Practice]

> *So if something in the goals is really not being met …and the GP needs to intercede on that I just put a note for the GP. And it would be the same thing with the medicines. If it was something more, "doesn't like this pill", or "isn't taking this med", or "can't afford this drug". On the goals*

we might put get a drug appropriate or get one that you can take and we want to watch the blood pressure but then we would put the note for the GP so he knows there's a snag.[General Practice]

I guess the advantage is that it's documented, for all the people that come in contact with the patient to see. Because, from my perspective with a lot of the patients we see it's about having the consistent message given to them and having those goals, realistic goals reinforced each time. [General Practice]

I think it's more the fact that they get the same message each time they come, and that it's reinforced each time. Because it's much worse if they get conflicting information, that's when you really loose them. But if they hear the same thing, and I think that's the thing to, if you talk to people they often can retell the message very well. [General Practice]

We set goals together with them that are realistic, weight, diet. [General Practice]

One doctor explained how he observed three groups of patients when discussing levels of engagement in their health care.

The first group are those who are regular visitors, happy customers and regular users of health care. They see the Wellness plan as an outing, an event or 'their hobby' they are often older retired people who have time to spare. The second group are those that are not easy recipients of health care, may even be considered non compliant but overtime and they have become more willing and involved. For example I have a Maori lady in her 50's with diabetes and hypertension who works full time and cares for her mokopunas, through constant friendly encouragement is now involved. She is not a natural up-taker at health care. She couldn't see why she needed to come in. Now she's attends her regular CCM appointments. Five years ago it was always a battle I'd say "you can't keep getting repeat prescription" the issue for her was paying for visits. Now her care is free and accessible she comes in for other stuff as well. She's now more willing to come in and her diabetes is better controlled. It isn't perfect but has improved. Her HbA1c was 11.3 its now down to 9.6. For years she was out of control and she was non compliant. She would wait till all her medication ran out before coming. She's a good example of person brought into regular care by CCM. Now she's focused on her diet and brings in her machine. Now that the price is better she is now starting to buy into her disease management and believes in her own health care. The third group of patients have an attitude of I'm not interested let me back to my work/life, just give me my drugs. They don't show up and they don't get involved in CCM. We cannot make them. [General Practice]

Not all patients want the formal red wellness plan folder as they already have an effective system for recording their care

I have had a few patients who said they didn't want a book, that they remembered things well enough or they would write their own little notes and they didn't want copies of their bloods, ….they would bring in their little note book and they didn't want the formality of an actual book and I'm fine with that and the GPs are fine with that, as long as they can show us that they really do track and that they really do understand their medicines if they're not having us print the lists out and different things.[General Practice]

The attitudes that aided buy in to the concept of empowerment and Wellness plan involvement were strengthened by prior experience and PHO leadership.

I was already geared towards empowering the patients and giving them control and trying to keep everybody well rather than reacting when they're ill. ….I was already coming from the mindset that that's a good thing, so I didn't have to be convinced. [General Practice]

I've told our nurses that it's the heart of CCM and if you're not doing it then you're not doing CCM properly. That's our philosophy within our PHO. [PHO]

The Wellness programme is our way of helping them have control, make decisions, understand the pills that they're popping, so that they can stay well. [General Practice]

Strategies used to increase usage include having multiple ways to remind patients of the plans and the need to have them when they are with health professionals.

As you can see I usually paperclip stuff to the front which are their reminders for their next appointment and on those appointment reminders we put "bring your book". [General Practice]

So maybe little things like that are helping and we're not even aware just 'cause for us it works. When we call them to do their follow up we'll say "now when you come next month to see your doctor, don't forget to bring your book". And our letter, our reminder letter for the appointment and the receptionist also reminds them to bring their book. [General Practice]

<u>Valuing</u>

Analysis revealed common factors that resulted in the Wellness plans being valued including patients' seeing positive outcomes in their health and seeing health professionals use them. For the health professionals it is suggested that their value is improved when success is celebrated.

Patients love them. Gives them something to go back to, to hold onto, and their family can go back to stuff or check, too. Recently, I said a lady I saw in the clinic, I've not seen you much lately and the lady pointed at it (the red book), I think I'm better this year because of this.[General Practice]

Some patients of them really value them and I know from talking to nurses at Middlemore that more and more are turning up there with their Wellness Plans, that' fantastic. It absolutely can work. [PHO]

And the fact that people keep asking for it because I do know that one lady came to us from somewhere else and she'd been on the CCM somewhere else and she said "No one even ever asked me for it". And I said well, you know maybe they were doing it a little different but we'll fix it, we'll get out the old stuff, we'll put in the new stuff when you come for your GP visit so it's tidied up. And then I'd tidy it up the next month to make sure any medicine changes and things that he's done. So maybe that might have a bearing in the fact that if you're using it and making it worthwhile for them, then maybe they'll value it more. [General Practice]

…and the fact that we work with it, the patients view it as valuable, they know that we're taking out the expired pages and putting in new and make notes for them and notes for the family and you know food notes and different things and copies of their tasks. So that maybe if they're not bringing it back, they maybe don't value that that's going to be done. [General Practice]

To pay attention to this document is a way to change the critics by celebrating when doing well. [PHO]

Hinderers

The hinderers are divided into poor engagement and a perception of lack of value in the exercise.

Poor engagement

Providers gave many examples of how difficult the Wellness plans were to use. Factors that hindered engagement in Wellness plans and goal setting included a belief that it's a huge task; the difficulty some health professionals experience in sharing decision making with patients. Despite the support for the idea practices felt that it took so much time and it required a different communication skill than the traditional approach.

> *Good in principle, but will take a generational change to achieve.* [PHO]
>
> *So having something to take away on a bit of paper probably isn't that useful to them …. And I don't think having a bit of paper with it on makes much difference to our crowd.*[General Practice]
>
> *But I think it has another unexpected flipside in that some health practitioners suddenly have to look at co-making decisions with their patients, which is a bit difficult for some of them. It's much easier to say "do this". Empowerment, empowerment!* [PHO]
>
> *Patients who don't want to be told they have a scheduled visit.*[CCM dedicated staff]

In some cases it was evident that goal setting is still being done to and not with patients.

> *Nurses still telling patients what goals are to be.* [CCM dedicated staff]
>
> *Diabetes nurse sets the goals.* [CCM dedicated staff]

Interviewees spoke of very poor return rates with regard to the plans and how they had to keep providing replacements. In fact one group reported a 7% return rate.

> *Out of the 300 Wellness plans we have had 15-20 bring them back. They forget them and their recording books.*[CCM dedicated staff]
>
> *I print off hundreds and hundreds of them, mainly because they don't bring them back to their next visit.*[PHO]
>
> *I think the difference between practices lies with the nurses and the age of patients their occupation e.g. busy executives. At first all nurses thought it was fantastic but over time have realised that there's a group don't want to use it.*[CCM]

Lack of Valuing

When providers spoke about the Wellness plans they frequently spoke about how the tools didn't work, weren't appropriate, were difficult to use

> *One nurse moved from Mangere to Clevedon, it worked well in Mangere but she is embarrassed to use now and thinks the plan is degrading. She has a different relationship with these patients.*[CCM]
>
> *Some of them will take it quite seriously, and others don't to be honest. Not many of them actually bring their plans when they come to the visit. They say they don't want them. Don't see them as important. Won't bring in even though encouraged.* [General Practice]
>
> *Difficulties implementing, printing and compiling the folders they aren't funded, we don't have the printing capability.* [PHO]

Pacific need (would prefer) one page visual colourful. [PHO]

Steps to do verbal not written, might be in consultation notes. [CCM dedicated staff]

The providers also mentioned that the Wellness plans need to be replaced so often it is an expense for the PHO.

$5 per plan and our PHO have spent approximately $30,000 which includes Care Plus plans in 2.5 years. [PHO]

27000k on Wellness plans, and CarePlus, generic and insets. [PHO]

There also appears to be confusion around use of the plans when the patients are registered in more than one chronic care module and how confident the nurse is with goal setting in the light of patient's goal setting naivety and working with them to as they learn the skill.

If you have three conditions, so is that three plans not one? [PHO]

Overview of Wellness plan and goal setting

Again all the providers take the view that it is important to do something. Their support for CCM appears based on a general view of need as opposed to a true understanding of the philosophical nature of this integrated disease management system. The idea that it is to be patient centred has not been grasped by some providers and many patients. Where the concept of collaboration and empowerment is clearly understood and articulated the providers appear to work hard to make the process function effectively. There is a sense from providers that the facilitating Wellness plans and goal setting is hard work and the cost and practically is not always feasible. There are still many barriers for patients such as literacy levels and understanding the nature of the programme. The fundamental factor for success of the Wellness plan appears to be embracing and even celebrating the concept of patient empowerment. The collaboration between GP, CCM nurse and the patient is critical to CCM success. It is important to note that the Wellness plans factor in the IT system and the point of decision making. If the wellness plan is used effectively then it is used in conjunction with the point of decision making and it is supported by the IT system.

Information Management

A significant part of CCM is the information management process. Fundamental to CCM is its ability to produce real time information that is accessed by GP's and the health team. Interviewees were asked a number of questions that related to this information management. There are four components to this section; each component was categorized into the main topics and sub-themes as described in Table 2726. The information was also analyzed in each component to present a collective view of enablers and hinderers as determined by the interviews.

Table 27 Description of Components that relate to Information management

Success Factors and Obstacles to Information Management Components*	
Decision Support (DS)	
Enablers	***Hinderers***
• **DS messages are seen to have improved** • **Regular use of TIM Template increases confidence in its use.**	• **Inappropriate DS messages received** • **TIM Template interferes with the normal flow of patient consultation** • **Poor compatibility with use of PMS systems**
Reporting	
• **Receiving regular and appropriate feedback on progress.** • **Effective use of reports provides support for the clinical review process** • **An ability to re-present the data in way more easily understood** • **Provides details of overdue/ out of criteria patients that need addressing**	• **CCM report results vary from that in other systems** • **Not having systems for getting the information to the appropriate people** • **Raw CCM reports not always easily understood/ adds value** • **Takes to long to receive the reports.** • **No clear system for sorting out the problems in the reported data**
Invoicing	
Enablers	***Hinderers***
• **Auto-invoicing**	• **Not have the necessary time to sort out invoicing problems** • **Delays in receiving payment**
IT capability	
Enablers	***Hinderers***
• **Having good hardware and broadband access** • **Having individuals with good IT literacy** • **Having good communication channels with IT people at DHB level**	• **Not having powerful enough hardware** • **Having to regularly upgrade hardware** • **Poor levels of IT literacy amongst practitioners** • **Practice management system (PMS) not interfacing well with the CCM system.**

*** Counties staff dispute some of the hinderers as factually incorrect**

The following illustrates a number of views from respondents. The quotes from interviews are divided into a number of areas to provide a general overview of the perceptions of information management

Decision support

Decision support is the essential to CCM. It is the point when patient and GP arrive at a management plan for their management of their chronic disease based on real time information. It is designed to empower the patient to engage in decision making. There were a number of factors that facilitated this process:

Enablers

It was clear that having decision support information was useful to clinicians. It was important to feel prepared for patients and thus be able to be informed so it was easy to make decisions.

Decision support (DS) messages

There were a number of factors that emerged from the interview that suggested that decision support messages were useful.

> *Decision Support has got better and clinicians are taking more notice.* [CCM dedicated staff]
>
> *I don't do much with decision support. I delegate it [completing the template] to my nurse. .. I do get the messages, once she has sorted the template. I look at them, I get them in my down time, (e.g. lunch, breakfast). I can deliberate (…) carefully then it doesn't mean I contact the patient then but that I can create a task or diary, a flag for me to discuss with the patient.* [General Practice]
>
> *There are 4 key elements of point of care decision support. The absence of any one of the key points will halve the effect. If don't have the patient there in front of you at the time you receive the message you lack the trigger and have to reinvent. What you need is patient. It's a balancing act between what's simple to use and what's detailed enough to influence how you to make decision. The ability to create change is on the too complex side at moment.* [PHO]
>
> *The messages come into the inbox, and as a result a referral is sent or a task is sent to the nurse.*[CCM dedicated staff]
>
> *The GP's get the messages back …e.g. says BP optimisation, the GPs will put either an alert or they'll put a patient task on the next visit 'lets re-look at blood pressure' or they may note that they have already discussed it with that particular visit then they're going to say "already discussed, monitor next visit" or something of that type.*[General Practice]
>
> *The feedback comes directly to Dr's in box and.. The Dr tasks us to sort out things like lifestyle changes, or make internal referrals to our CCM clinics. We have a recall system that we log it in.*[CCM dedicated staff]
>
> *TIM wasn't available to us previously, so we weren't getting immediate decision support until this year. It used to take a few days before we got it. This is before the new TIM, now it's instant.* [PHO]
>
> *I don't deal with computer whilst the patient is in front of me. I focus on the patient and then input the data as soon as they leave. That way the information is ready when the patient is seen by the doctor.* [General Practice]

I have the decisions/ messages but they haven't been useful up until now as the patient is not in front of me, if instantaneous that would be valuable. [General Practice]

TIM Template

There was a common belief that the use of the TIM template increases confidence in the ability to produce information. However there were a number of issues with the TIMs that made the process difficult. The interviewees described a number of ways they attempted to reduce TIM errors.

At [PHO] we've outsourced the internal management of CCM and have two people there that are doing CCM work with regard to the templates.[PHO]

It really does take one dedicated person, doesn't mean they're the only ones, like I say if the other nurse see's the patient just like I do but she follows the same system that we've laid out and if ever in doubt she leaves them 'parked' for me and just send a task that says I'm not sure if this was right, I'll check it, and then send it. And the same with the GPs, if they have to see someone on a Saturday, we've trained them that do the screen but 'park it' or leave it I can fix it if it's parked. [General Practice]

I don't find the TIM template difficult; it's a matter of getting to know the questions.[CCM dedicated staff]

I use the tool all the time and know it back to front, the screen is good and the information coming in is very handy. [CCM dedicated staff]

And the GPs seem really happier with having patients on CCM now because they're not getting disillusioned by sending a screen that didn't work or was sent wrong. And what they're now getting back in their tasks, are medical things not "wouldn't send" or "they're not enrolled". …..… 'you've done it wrong'. Whereas now all they're getting is the feedback from the medical part that their blood pressure needs to be better managed… or what ever. [General Practice]

It is important to note that at least one CCM nurse was attempting to have the TIM template completed before the patient saw the doctor so that any resulting decision support messages were available for the GP's during their next visit with the doctor, immediately after, so that any changes could be made at the appropriate time.

Purpose

The participants were asked to describe the purpose of the product. It was important to understand what the awareness was of the rationale of the IT system. The following quotes reflect those positive views and negative views

Provides time for clinical over view and feedback. [CCM dedicated staff]

Aims to influence how the clinicians make their decisions. [PHO]

Hinderers

There were a number of hinderers to the decision support.

DS Messages

There appear to be two main categories of messages received; they are clinical prompts and administrative prompts related to eligibility. Both messages can be frustrating for the receiver especially if they do not understand why the prompt was generated or they believe they have already dealt with the issue.

> *Some question why they get the clerical prompts and recommendations.*[PHO]

> *We hear when DS messages come back if the practices can't understand the language. When people are first using it they get error messages and the language [of the messages] can be confusing.* [CCM dedicated staff]

> *The decision support feedback, the GPs don't find it useful. Some prompts to think about e.g. statin maybe helpful but what if I don't want X don't use it.* [CCM dedicated staff]

> *Doctors don't deal with error messages well, they ignore it, I tell them don't ignore it, task it to the nurse as it needs to dealt with or the claim will be declined, and subsequent visits wont be paid.* [CCM dedicated staff]

TIM Template

Respondents also commented on issues with the TIM template.

> *I can't be bothered with the template filling. I hate the messages that relate to validation checks. E.g. you haven't done (…). I often got rejected [when filling in the template]. You can get to the end of the form and it 'spits the dummy'.* [General Practice]

> *And that is about what I'm hearing, they're used to sitting and talking to patients and picking up those clues, but when they're got a computer screen there it adds another dimension to the whole discussion so therefore they miss the cue's from the patient and they're concentrating on the screen.* [PHO]

During the interviews examples were given of problems with some template options. The following table illustrates just some of the DS categories that are not effectively resolved because of missing 'drop down' selections. Consequently inappropriate clinical messages will be sent to the clinicians.

Table 28 Missing drop down options on TIM Template

Item	Missing option
Pnuemo vax	allergies
COPD - consider outpatient referral	decline, already been
DM diuretics	contra indicated
DM diet advice	already done, or not needed, or not indicated
DM - statins	contra indicated
Smoking cessation -If yes current smoker	attempting to quit or have been given advice
Goals	unable to evaluate

The TIM template section that refers to goal setting combines the outcomes of all goals into one option that does not adequately capture results. Comments relating to this can be seen in the table below.

Table 29 Goal outcomes

Comment
Missing text box to explain 'secondary failure'
No electronic record of multiple goals
All goals assessed as if one in DS system

Compatibility with variety of PMS systems

Of great concern for many practices was the compatibility of the information management system with the PMS system. It was felt that there were so many problems with interface that the information loop was just not efficient

> *The PMS systems we have in use are Next Gen. My Practice and MedTech. There are glitches in their use for example in MedTech, one can't put more than one recall, one has to go in manually up to 3 times and invoicing not as clever.* [PHO]

> *We have two IT systems in our PHO, we have Med Tech and Next Gen, that makes a difference. Med Tech matches up well. I understand that we're into some new problems because Next Gen has just shifted across to My Practice and I understand that TIM doesn't work very well with it in one practice. We're keeping our fingers crossed to see what happens.* [PHO]

While there were a number of factors that appeared to support the idea behind the system, there was little evidence that the decision support process is used as a point of care decision support as was envisioned by the creators of this system and is considered as a significant part of the CCM program

Reporting

A number of questions were asked relating to reporting. Regular reporting is the crux of the CCM programme. Again the information was variable, what was seen as effective for some practices was seen as a problem for others. There were a number of successful components and negative factors that influenced the reporting system. Presenting the data in a regular, user friendly yet robust way was seen as very positive.

Enablers

There were four factors that were seen as very positive; frequency of reporting; data presentation; detail of the information provided; and transformation of patient information into a very user friendly form

Frequency

Having regular feedback was seen as very important.

> *As a clinical team we welcome the regular reporting on our CCM patients.* [General Practice]

Clinical detail

Clinical detail was seen as enabling clinical review.

> *The other thing in terms of clinical benefit for our patients is, the reports have given us good things to focus on… For example your prescribing and your blood pressure controls and HbA1cs and things are quite good to see where you're heading with things.* [General Practice]

> *But when we get monthly reports you see things like low use of statins and Hb1Ac that are high and nothings happening with them and when you try and drill into that with them.* [PHO]

> *For example 43 in DM 1 year HbA1c not falling, I take it to the clinical governance group to discuss, and identify what to do differently.* [PHO]

> *When we've had the feedbacks come back, we'll see the range of like diabetic sugars and HbA1c's; so that's helpful in the fact that we have been seeing a lot of our patients getting better blood sugars, better HbA1c's.* [General Practice]

> *We tend to, in the past try to sit down and go through our reports as a team, and look at the results and then discuss where we could improve.* [General Practice]

Data transformation

Being able to transform the patient's data into a more user friendly form was seen as an enabler to successful reporting.

> *Internally I've developed systems, where on a monthly basis I will provide the healthcare assistance, feedback on how many checks we've done, how many patients are not up to date with their checks, how many haven't been seen in 6 months.* [PHO]

> *Now [CCM nurse] takes the reports out and reviews them with the nurse, practice manager and GP.* [PHO]

> *All that data has had to be totally re-manipulated and put it in to a practice acceptable, easily recognisable whether we're getting better or worse.* [PHO]

Provides details of overdue /out of criteria patients that need addressing

It was also found that an enabler was that it provided details of both overdue patients and patients not fitting the criteria that needed to be addressed.

> *I send the 'out of date - not meet funding' criteria to nurse to sort monthly.* [PHO]

> *Overdue CCM – Nurses review and recall.* [CCM dedicated staff]

Hinderers

A number of the negative factors also emerged. Of major concern was the quality of the reporting provided. It was felt that there were other systems that provided checks that did not match with data being provided.

Variation in results reported with other audits or internal systems

A hinderer to successful reporting was the variation between the CCM reports and the results reported by other systems.

> *We were also doing [being audited by] DPT so we were able to show care not reflected in CCM. PHO has different interpretations [to the DHB].* [General Practice]

Although there are some issues there as well in terms of the accuracy of the data that comes back. [General Practice]

From a clinical point of view, he's saying he knows he's doing some things which aren't coming through on Chronic Care, but when you look at the [reports] it's got these really low percentages and he just knows that it doesn't connect, that something's wrong somewhere. [PHO]

Our practice reputation was being compromised because CCM data was not accurate, it affected how our data was compared with other practices. [General Practice]

Not having systems for getting the information to the appropriate people

It was thought that there needed to be clear systems in place[§§] to ensure that the information went to the appropriate people.

An admin person was actually just putting it in an envelope and sending it out to practices

Raw CCM reports not always easily understood

The reports generated were sometimes not clearly understood or it was felt that they did not add value.

Some reports are too detailed I don't want clinicians doing all the sorting. [PHO]

"We do CCM really well" so I said "Do you?" they said "Oh yes" so I said lets see what CCM you're doing. Out they came with a box, and when they showed me what they had been sent in the way of reported for CCM, no wonder they were confused! They had this wad that they'd got in a month, of data, we have bars and whiskers and goodness knows what else, which they had no understanding of. They showed me and said "see look what we do". So I looked at it, and of course I had already seen it, and I said but this shows me that you've put four people on the diabetes module last month, and they said "Oh no that can't be right" so they had a look and they said it must be the wrong… out came the next wad from the last month, and they said "Oh there's only six there!". [PHO]

The readability for practices needs sorting, needs someone to explain. So it's required a lot of re-manipulation of the reporting that comes out of TIM. [CCM dedicated staff]

Well understandable to me equals you've got to be able to quick flick, and can everyone in the practice from the receptionist [understand]. But they can all recognise a graph that goes down or goes up, and put it on the wall in the tea room. [PHO]

It's pretty consistent with what I'd expect with our demographics. There's page after page which doesn't add anything to my knowledge. [PHO]

Timeliness of reports

The length of time it takes to get the reports was of concern to some respondents.

It still worries me that they're still not getting acceptable reporting. And it's not real time, it's like two months out. [PHO]

Currently it takes too long to get reports. [PHO]

[§§] The PHO administration systems needed to be revised

Sorting out the problems

The lack of clear systems for addressing problems was also raised as a hinderer.

> *If [CCM nurse] can't answer our query, we can get support from CCM. Before [CCM nurse] we got told [the DHB support person] will get back to you, but, they were always too busy.* [General Practice]

> *I'm trying to ask them how are you getting this? And no one's coming back to me. Everyone's saying "it's this person's problem, this person's problem". They're telling us that "we're just working out from the data that you're giving us". So I'm trying to look at my data, and I've re-checked and re-checked and I can't see anywhere that I'm going wrong.* [PHO]

Invoicing

Enablers

Auto-invoicing

Auto-invoicing was seen as a success factor to the invoicing system.

> *It's fantastic now with auto invoicing.* [General Practice]

Hinderers

Respondents mentioned that obstacles to successful invoicing included not getting paid and not being able to easily address and solve invoicing problems.

Sorting invoicing problems

When practices did not have the necessary means to address and solve problems with invoicing it was seen as an obstacle to the successful invoicing of subsequent payment.

> *I am not unique. I was on Practice Managers Committee, at a networking meeting. I checked with all the others, how do you go with the 'payments / up-to-date' problem. I was wondering was this just me and found that 100% were like me; I did not come across anyone who was not struggling.* [General Practice]

> *Those sorts of things are really time-consuming when you go have to back through it.* [General Practice]

> *I've have to sit and sort all the invoicing issues. I could train administration staff, but too many rules e.g., one part could be on several templates – had to get all info. I found it easiest to only charge once, and then once payment came through, had to do a manual check and re-submit.* [General Practice]

> *Dealing with error rates – reconcile claims off server – all errors – lot of admin work. My group – needs clinical knowledge to drive admin task.* [General Practice]

> *There were times when I'd go to [GP Practice owner] and say it's all too hard – then, I'd go home and have a think about it and give it another try.* [General Practice]

Not getting paid

Delays in being paid was raised by respondents as a significant hinderer in regard to invoicing.

So when you're two months out, people then come back and say "my god, we haven't been paid, why should we do any more" they can't reconcile something that's two months ago when they do their accounts on a monthly basis, so you've got to take your head back two months to what you did and practices pulled out because they claimed they weren't being paid for it. [PHO]

Back funding not paid the process for sorting it is not satisfactorily, The systematic response is debt. There is a lot done for no payment. [General Practice]

Most people just give up, they gave up and therefore they didn't get paid. It's actually quite a complex system. [PHO]

So that what I'm trying to say is that a lot of clinical work that is taken place when patients who haven't met their blood tests, who haven't done their blood tests, they're not even reflected, that work is not reflected. [PHO]

Information Technology Capability

Enablers

Having the necessary information technology capabilities required for the programme was seen as an enabler to its success including having the necessary hardware and internet connections, having a high level of IT literacy and having communication systems established.

Hardware and Internet

Having good hardware and broadband was seen as an enabler.

Our new servers drive everything for our PHO, there has been lots of learning. TIM now easier. [PHO]

One can do now so long as the practice uses broadband. [PHO]

IT literacy - IT savvy

Having individuals with high levels of IT literacy in the practice was seen as an enabler to the programmes success.

Absolutely, it's all tied in with the IT skills. … When I started in this role I noticed we had one practice were doing really well going by their monthly reports. I wanted to know what was going on, so when I went into the practice and asked them. I discovered there was only one GP in that practice who was doing it, and he was a very IT savvy. [PHO]

For those who are IT savvy they enjoy it and its easy. [PHO]

Communication

Having active communication systems between the different people involved in the IT side of the programme was considered to be a success factor.

I think to me it was like get the IT people talking to the Counties IT people for a start, they weren't actually even having regular meetings so we got that going. [PHO]

Hinderers

Not having the necessary information technology capabilities required for the programme was seen as a hinderer to its success including not having the necessary hardware and internet connections. Further when practices did not have access to the upgrades needed or did not have a high level of IT literacy there were problems with communication. This in turn affected the practices management structure.

Hardware and Internet

A hinder to the programme was the hardware available in the practice and internet access.

> *Slow computers are a limitation. Practitioners don't realise because they are used to it, some are x5 slower than other practices. I notice because I go around the different practices.* [CCM dedicated staff]

> *They have to get the IT system sorted out. Our little one off practice didn't have broadband; IT was a stand alone computer. I don't think that was what the system was designed for our little practices it was a major [problem]. Down time was quite high, to get things sorted out when you're really busy and you have no alternative.* [PHO]

Upgrades

Having to continually upgrade the system was seen as a hinderer to the programme success.

> *If they hadn't forecast that [upgrades]in their business plan, it would be a no go territory really.* [PHO]

> *That's a cost to the practice and I think it's a cost that was just underestimated.* [PHO]

> *It's like comparing a 2002 model car with a 2007 model car. IT moves so quickly there are now programmes that have the technical capability to suck in all the info and self populate, they have all gizmos and are totally interactive. The CCM model isn't fancy enough.* [PHO]

> *The new upgrades take up a lot of time, each day the person comes round to load the upgrade template [the CCM nurses] have to go with them for the day, meaning they have a day lost to all the other things / support they have to do. The upgrades and debugging happens quite frequently, have already had it occur twice recently. They [CCM nurse] have to be present as the person goes round the practices; we need to ease the way as the practices don't like people touching their systems.* [CCM dedicated staff]

> *Well my understanding is, if it's the latest version of NextGen it will work, the TIM template is the latest version now so you've always got to be upgrading your system.* [PHO]

IT literacy - IT challenged

Not having a high degree of IT literacy raised a number of obstacles for the practice.

> *Its becoming more IT stuff than actual patient/client focused. At least I feel that.* [General Practice]

> *One practice has ongoing IT capability problems like issues with internet they don't understand IT enough its a worry.* [CCM dedicated staff]

> *One practitioner is totally IT illiterate, others need someone to come in and sort it out for them. It was very clear when we started out that this was not going to be easy for them. Very quickly we*

knew that they were not going to cope with it very well. If the IT system falls down they have to come back at night or try and sort it out at the end of the day, it's just an extra thing to do. [PHO]

Hinderers include the IT glitches and how onerous it all is especially if not IT savvy, it's a nightmare. [PHO]

Practice management system (PMS) limitations

A major hinderer for practices enrolling in the CCM programme is not having the appropriate PMS system.

Probably almost a third of our practices out there cannot do CCM even if they wanted to. And it's largely attached to people who have Profile or NextGen as opposed to MedTech. [PHO]

I was happy with the Next Gen PMS template, for some things there is more flexibility on MedTech but not in all areas e.g. feet care scale is better on Next Gen. [CCM dedicated staff]

This is a group of people who want to do CCM and they've upgraded to My Practice which is the latest version of NextGen and nearly nine months later the problems with My Practice have still not been ironed out, so they're limping along. [PHO]

Overview

Those interviewed discussed the IT system as being collectively a decision support tool, and vehicle for monitoring, and a system for payment. In many respects, the IT system is the 'face' of the DHB when it comes to the CCM programme. While the information management system is designed, in part, to support point of care decision making, there was little evidence provided for this occurring. Reports sent to practices are seen as valuable where they are read. However, a number of practices either have difficulty interpreting them accurately, or don't look at them at all. The invoicing system was seen as problematic, and leading to delays in payment. This was seen as a major concern.

A common factor in perceived and actual IT problems was a limited level of IT capability and capacity amongst the practitioners. This is both in having appropriate hardware, and IT skills.

Programme & patient outcomes

Programme Outcomes

Overall there were a number of comments that indicated that CCM was having a significant impact on the practices as a whole. For nurses in particular, who are involved in the CCM programme there were significant positive spin offs including increased autonomy, professionalism and the development of a career path.

> *CCM has been positive for nurses they are more engaged and have a better relationship with the GP. They are able to autonomously achieve good outcomes. CCM shows the worth of a nurse to GP and to themselves.* [CCM dedicated staff]

> *They get to know their CCM patients well, some practices set up with key nurse.* [CCM dedicated staff]

> *CCM is a step-up for nurses.* [CCM dedicated staff]

> *The practice nurse is realising more and learning more, and as a result some proactive ones are unfortunately leaving our PHO and become specialist CCM nurses.* [CCM dedicated staff]

Some of the positive impacts of CCM for the general practice include having the ability to meet the needs of the high needs patient's by employing CCM dedicated nurses, and having the practice run more efficiently and smoothly.

> *Before capitation the viability of having a nurse to do all the 'real' stuff was not viable as no one to pay for it. With CCM I can justly having an extra nurse focussed on CCM.* [General Practice]

> *People now come every 3 months. The practice runs more smoothly they are not just arriving any time; they save up the minor stuff till the scheduled CCM appointment. Some practices have not yet [understood] that is what will happen and that they don't need to be afraid, CCM will result in an empty waiting room.* [CCM dedicated staff]

> *Because we used to get the monthly reject letters, huge page loads of reject letters, that noted where we were done wrong, for example they weren't the right dates or they weren't filled in correctly. And now we're down to one or two duplication's or some such thing.* [General Practice]

Patient Outcomes

Overall, the providers felt that there were observable outcomes for patients. Whilst not all outcomes are easily quantifiable, anecdotal examples were provided of positive changes in the differing chronic disease groups. There were many comments detailing clinical outcomes.

> *The one measurable impact that I've seen is …. a lot of our patients getting better blood sugars, better HbA1c's.* [General Practice]

> *We get that monthly report from the DHB that shows us the drop in HbA1C...Marginally yes, but a drop.* [PHO]

> *We've had less problems [compared to] the last year I could anecdotally say, we've had less foot problems this last year, and I've noticed less abnormal diabetic eye screening ...* [General Practice]

Significantly, the providers felt that was increasing and more efficient monitoring of patients, they commented that the patients were increasingly coming back for monitoring

> *The COPDer's we're seeing that we're getting some of them a little better, we're getting them on their long term inhalers a little better, 'cause we're monitoring them every three months.* [General Practice]

> *The Diabetics they're coming in every three months we're making sure they're getting their medicines, they're not running out and calling panicked on a Friday night, we just seem to really find that most of them we're not having as many panicked calls or as many spot fire to put out. When I started here in 2005, every day was "I'm out of pills" "I'm out of insulin" "I don't have any needles" "I don't have any test strips" and it would be 4 o'clock in the afternoon and they were out. It's probably now one a month at the most where it used to be four or five a day.* [General Practice]

Keeping patients out of hospital was raised as a theme that was seen as valuable for the system and the patients generally.

> *The congestive heart folks, I couldn't say I'm seeing really big changes in them, other than we're keeping them out of the hospital.* [General Practice]

Finally the was a view that patients were becoming more engaged the programme and in taking responsibility for their disease

> *The COPDer's and some of the CVDs, we've had a couple that did quit through the programme, really stuck with it, their blood pressures better, they're feeling better…*[General Practice]

A systems view of the CCM programme

The figure below integrates the complexity of views and ideas presented through the stakeholder interviews. The data is presented as a system, which looks at the CCM from the level of the General Practice. It should be noted that there are other variables that affect this system. Most notable amongst these other variables is the role that the DHB and respective PHOs play. However, it was decided to focus on the level of the General Practice. This is for two reasons. Firstly, and most importantly, the practice is the unit of delivery for the programme, and the 'face' of the programme from the patients' perspective. Secondly, focusing on the practice reduces the complexity and therefore aids in conversations aimed at understanding how to improve the system.

The reinforcing and balancing casual loops can be understood as follows:

R1: The more the practitioner (general practitioner, practice nurse, practice manager) has 'buy-in' to the overall philosophy of CCM (particularly aspects of patient empowerment and self-management), the more the patient is likely to be engaged and motivated. This motivation means they are more likely to come regularly, take their medications, and adapt their lifestyle. These factors are more likely to contribute to an improvement in the appropriate clinical outcomes. Such improvement in clinical outcomes will reinforce the practitioners commitment to the overall CCM philosophy.

R2: The more that a practice can successfully generate income from the CCM programme the more the practice will be engaged. This practice engagement (as a result of income generation) will facilitate the allocation into resources to support the CCM programme (ie workforce, building improvements, IT upgrades). This increase in resources for CCM enables the practice to enrol more patients, which, in turn, generates more income. A point to note in this reinforcing cycle is that income into the practice relies on the patient going to the lab for their blood test. If this does not occur, the practice will not receive income for the patient that they have seen.

R3: The more the practice is engaged, the greater the effort they will make to understand and use the IT system. This leads to an improvement in clinical outcomes captured in the database. This improvement in the data reinforces the practitioners 'buy-in' to the CCM philosophy. This individual practitioner 'buy-in' reinforces the engagement of the practice in the CCM programme.

B1: The more a patient is engaged the more their clinical outcomes will improve. The less they see a change however, the less engaged they become in the programme.

B2: The more a practitioner has brought in to the philosophy of the CCM programme, the more they can influence the wider practice to become engaged

in the programme. This is balanced though by factors limiting practice engagement which, in turn, reduce the 'buy-in' of the practitioners.

B3: A practice that is engaged puts effort into understanding and using the IT system. The more difficult they find this system, the more they disengage from the programme.

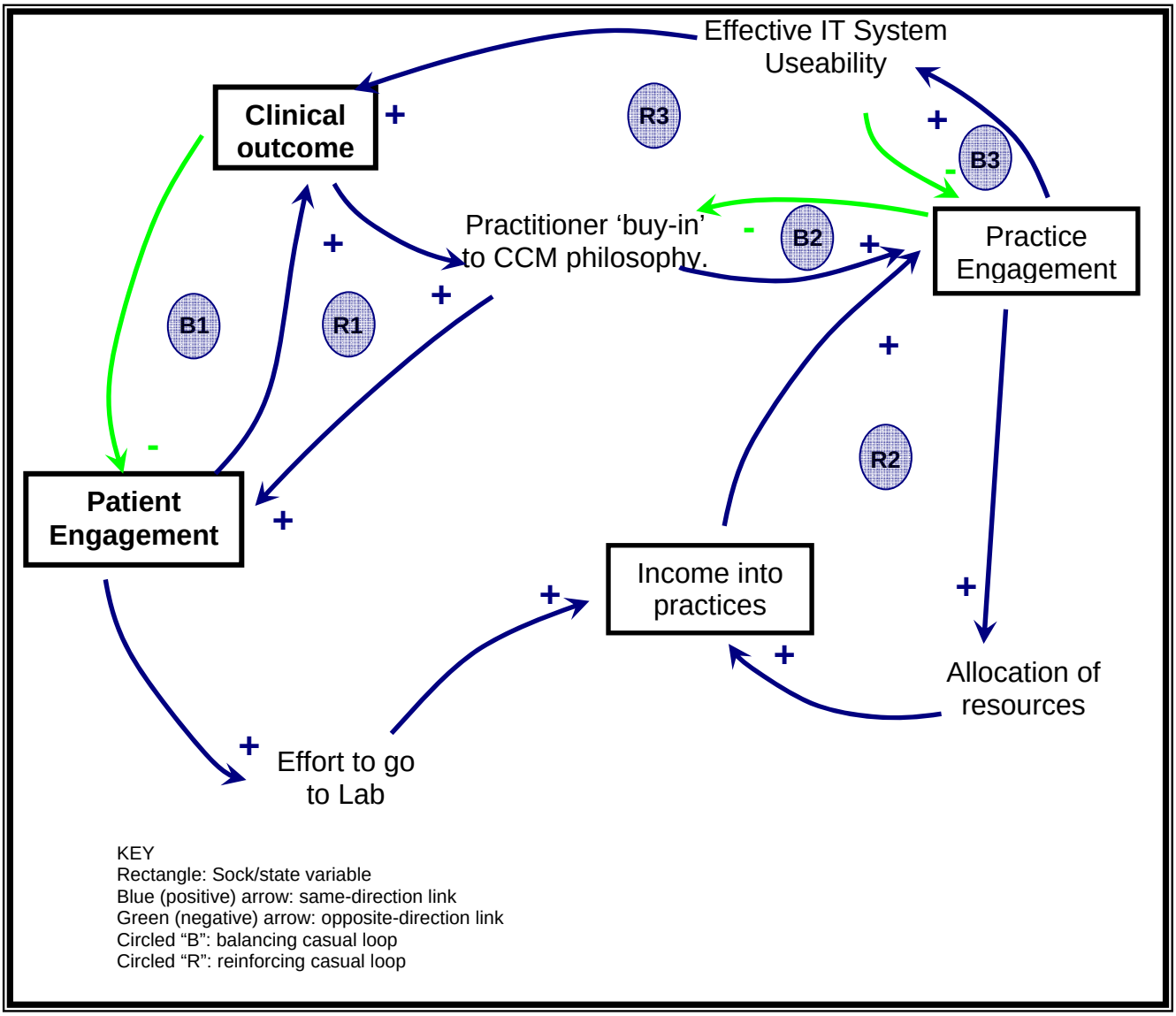


Figure 10 Dynamic hypothesis for the CCM system at the level of the General Practice

Summary, Discussion and Recommendations

This section brings together a number of data sources to describe the progress of the CCM programme and signals areas for future direction. Data from the existing data and the interviews was drawn together to make an evaluative judgment in each area. This data was then used collectively to determine the developmental status of the programme on a programme life curve.

Evaluation judgement

There are a number of variables that are important to any programme, and are critical to development and on going sustainability of CCM. Information from each variable was summarized and a score given by the evaluation team. The scoring rubric for the programme was base standard theory of programme planning and progress.

Tables 29-32 below groups the evaluation variables under the four broad areas this evaluation was commissioned to explore, namely impact, implementation, information technology, and processes.

Table 30 Analysis and summary of data collected for process factors

Performance Indicator	Measurement	Evaluative Comment	Qualitative Evidence	Quantitative Evidence
Stages of program development; Level of program development against a bench march	Compilation of process factors	Still in growth phase	Discuss of implementation engagement and capacity to deliver by providers such high levels of variability across the sector	
Programme Evaluation ; Extent to which overall programme evaluation is conducted and finding acting upon and feedback	• Monitoring • Process • outcomes • Utilization	Poor use of integrated programme evaluation data.	No qualitative information about process collected Poor use of IT systems. Action learning sessions have occurred No overall evaluation framework Difficulties accessing data	A large amount of data collected e.g. clinical outcomes data collected. Apparent lack of data flowing thru the system
Evaluation readiness: Organisations willingness and capacity to engage in evaluation	• Evaluation delivery Experience and culture of programme evaluation in organization	High level of willingness to engage and capacity.	Strong culture of monitoring as opposed to overall evaluation	
Knowledge management :Flow of information around organizations	Systematic and integrated procedures are not in place to promote transfer and use of knowledge for all stakeholders.	Poor	Reports received by General Practices are not understood, or not used	
Programme Adaptation: programme change over time	Reported programme change	Little evidence of change	No discussion of change	Relatively small increase in proportion of patients receiving a wellness plan
Collaborative Action Activities that occur as a consequence of collaboration between partnerships	• Perception of programme change as a consequence of discussions • Reactions to feedback	Poor	DHB and PHO are as seen as unresponsive partners Feedback not responded too by DHB	
Internal Support Ongoing buy in from lead organization	Perception of support from DHB-resources and perception	High	Absolute buy in from head organizations	
External Support for programme out lead organization	Perception of support from other stakeholders-resources and perception	High	All stakeholders describe support	

Table 31 Analysis and summary of data collected for Implementation factors

Performance Indicator	Measurement	Evaluative Comment	Qualitative Evidence	Quantitative Evidence
Degree of implementation The overall dosage of an intervention e.g. Coverage and reach Meeting the target	• Number of individuals • No practices • No PHO	Poor degree of implementation. Unclear target being meeting	Selection process not standard; Patients not returning; Engagement in project variable across providers. Programme not implemented as planned	257% increase in patient numbers since 30/11/04 60/111 General Practices currently[9] enrolled All PHOs currently enrolled
Initiative management Level and quality of management structures in place: leadership implementation plans monitoring	• Practice • PHO • CMDHB	High level of variability.	Many comments about lack of consistency around the plans. Implementation plans and framework for PHOs and CM not accessed	
Policy incentive : Need political socially economically	Perception of need	Very high and accept the need	Absolute buy to the need and idea	
Program Sustainability Ability of programme to become mainstream and maintain structures	Resources Guidelines leadership policy & systems	Poor	Not all stakeholders believe programme is sustainable	
Programme concept	Belief in programme	Very High	Absolute buy in	
Programme Champion:	No of leaders and supporters in PHO DHB & practices	Medium	Not enough in practices and PHO to make the difference	

Table 32 Analysis and summary of data collected for Information Technology factors

Performance Indicator	Measurement	Evaluative Comment	Qualitative Evidence	Quantitative Evidence
Information management: it system	Quality of IT system.	Poor	Difficult to use , does provide real-time information. Need to be very IT literate	Data problems; for example duplication of patient data to deal with system

[9] At the time of the evaluation 60/111 general practices were reported to be involved that has subsequently grown to 83/111 general practices.

Table 33 Analysis and summary of data collected for Impact factors

Performance Indicator	Measurement	Evaluative Comment	Qualitative Evidence	Quantitative Evidence
Level of engagement:	• Individuals >2 visits • Practice increase in individual over time • Perception of engagement	Variable	Providers suggest that it extremely hard work to keep patients coming back	Approximately 50% of patients have 3 or more visits per 12 month period.
Resources-financial	Resources X need to run course	Costly	Perceived as costly	
Resource-workforce	DHB PHO Practice	DHB perceived as being experienced. Practices and PHO perceived as under staff and unqualified		
Clinical Out comes results of program	Clinical indicator	Medium		<u>Diabetes</u> • HbA1c 0.6% decrease • Reduction of 4% in smokers • Reduction of 4mm Hg in systolic BP • Reduction of 1.2 mmol/L total cholesterol • Reduction of 1.1 mmol/L LDL cholesterol <u>CHF</u> • Reduction of 3mm Hg in systolic BP • No change in smoking • 80% prescribed ACE inhibitors • 58% prescribed Beta Blockers <u>COPD</u> • Reduction of 1mm Hg in systolic BP • Reduction of 7% in smokers • 86% of patients receiving flu vaccination <u>CVD</u> • Reduction of 0.8 mmol/L total cholesterol • Reduction of 1.0 mmol/L LDL cholesterol • Reduction of 11% in smokers • 88% prescribed Aspirin

Performance Indicator	Measurement	Evaluative Comment	Qualitative Evidence	Quantitative Evidence
				• 58% prescribed a Statin • 67% prescribed ACE inhibitors
Sustainability of effects. Measure of how long effect lasts for of program	Outcomes sustained over 3 year period for individuals & practices	Medium		<u>Diabetes</u> • Sustained reduction in all clinical outcome measures for the diabetes stream. <u>CHF</u> • Gradual sustained reduction of systolic BP • Gradual sustained increase in proportion of patients on ACE inhibitors and Beta Blockers <u>COPD</u> • Reduction in systolic BP ***not*** sustained • Sustained reduction in proportion smoking • Sustained proportion of patients receiving flu vaccination <u>CVD</u> • Sustained reduction in cholesterol • Sustained gradual reduction in proportion smoking • Gradual sustained increase in proportion of patients on Aspirin, Statin, and ACE inhibitors.

Programme life cycle

A programme life-cycle is used as a bench mark on which to compare the development of the CCM programme. A life-cycle curve follows a sigmoid 'S' pattern. Growth is slow initially, and then rises exponentially until it hits maturity. Maturity is the level that the programme is perfectly designed to reach. For example, the CCM data on patient engagement (attending 3 or more times in a one year period) is constant at 50%. This indicates that the system has reached a level of maturity for patient engagement. This level will not increase unless there is programme adaptation. In fact, following the logic of life-cycle theory, this level will decline.

If the programme does not change in some way maturity will eventually move to decline. What programme life-cycle theory suggests is that adaptation needs to occur before maturity has set in for too long. Based on the information available it was determined that the current system for CCM delivery has reached maturity and needs to adapt if growth is to be seen. The major areas for growth are in patient engagement, practitioner engagement, general practice engagement, and clinical outcomes. These aspects are illustrated in Figure 11.

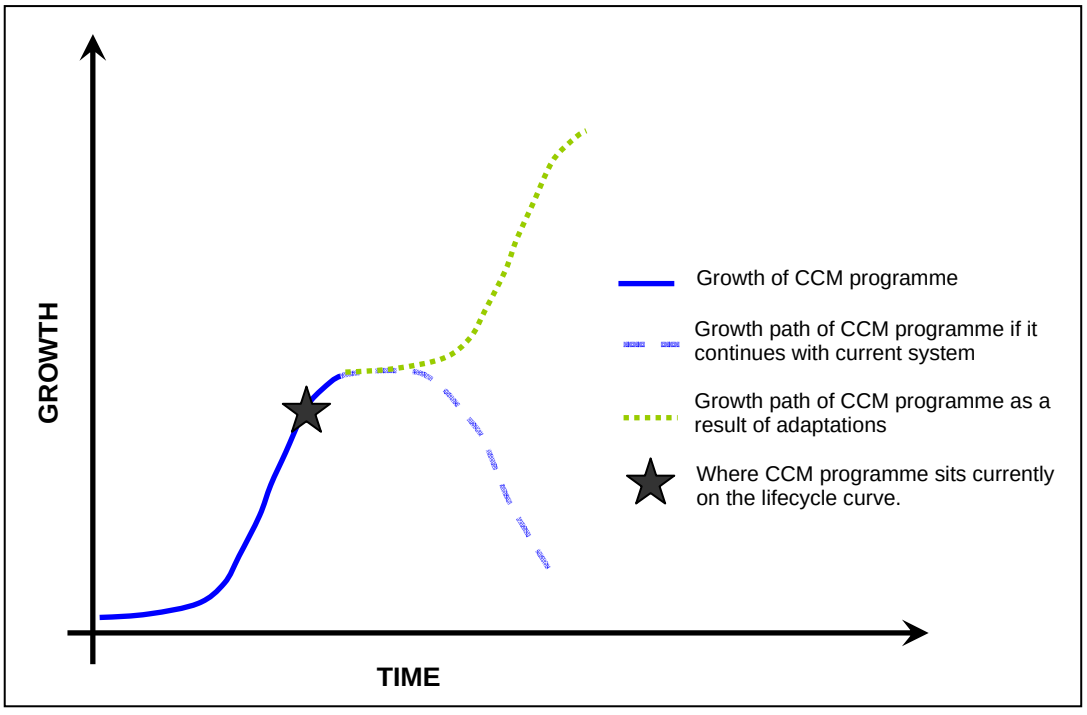


Figure 11 Life cycle curve for the Counties Manukau CCM programme.

In deciding on how to map the life-cycle of the CCM programme the evaluation team considered a series of behaviour over time graphs. These graphs are a pictorial representation of a combination of both the quantitative and qualitative data. They represent the four key aspects of the CCM system as presented in Figure 10 (page 84). These are patient engagement, practice engagement, practitioner engagement, and clinical outcomes.

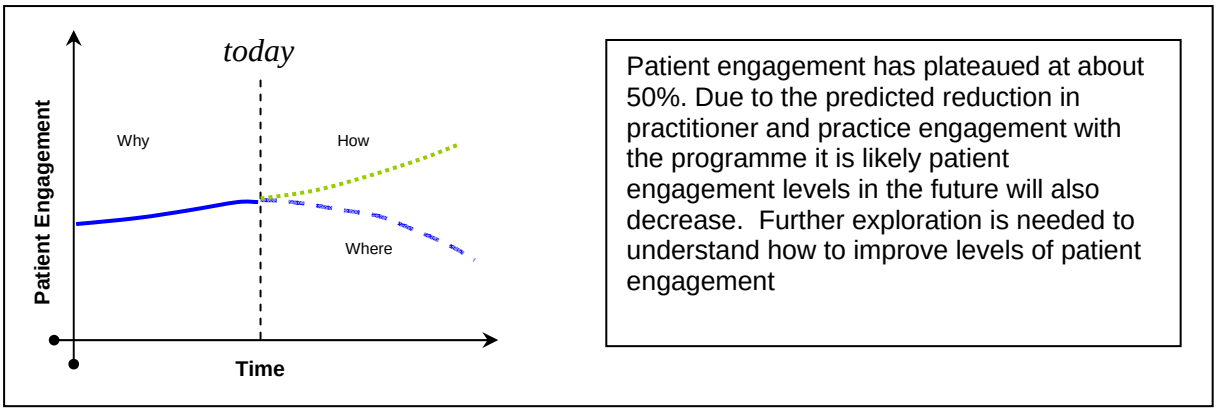


Figure 12 Patient engagement behaviour over time graph

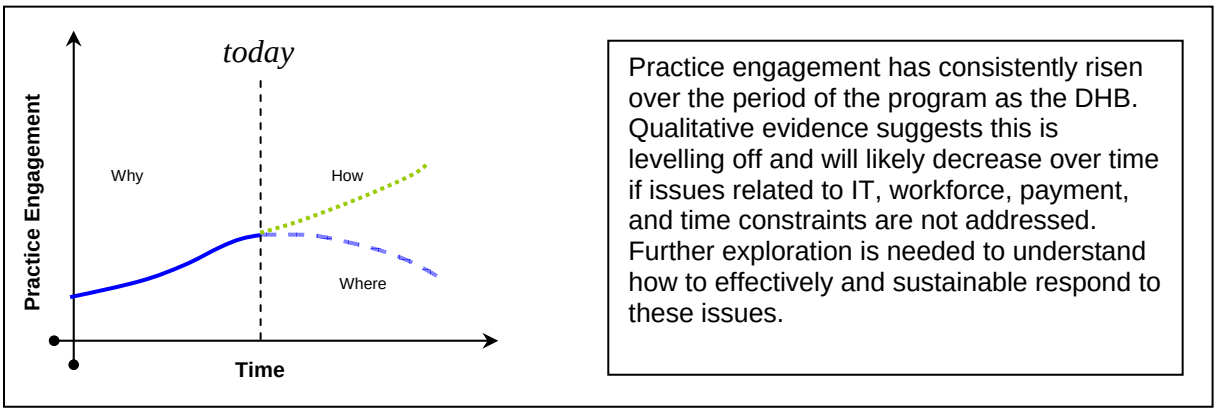


Figure 13 Practice engagement behaviour over time graph

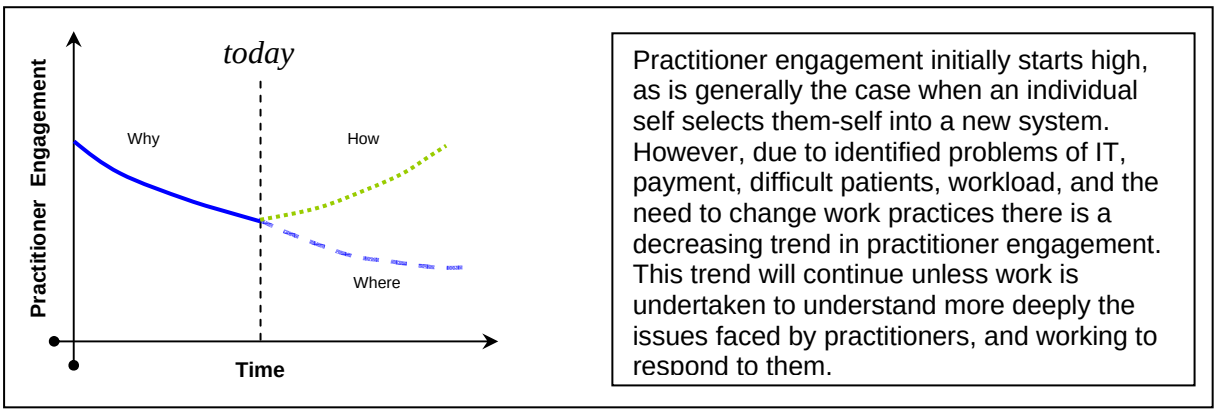


Figure 14 Practitioner engagement behaviour over time graph

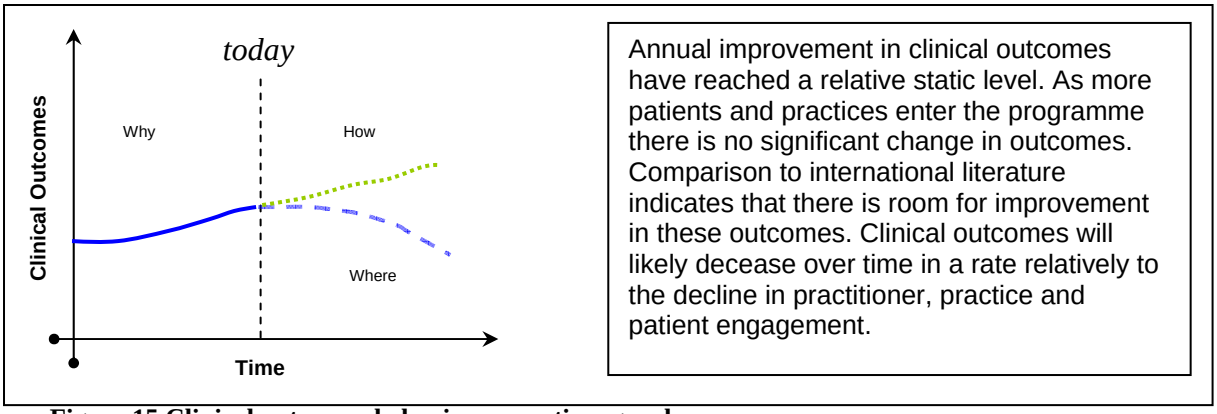


Figure 15 Clinical outcomes behaviour over time graph

Conclusion

Like many innovations there are pockets of absolute success within the CCM programme. Which illustrate strong clinical out comes and efficient practice, albeit it being extremely hard work for the practitioners. Overall, the clinical outcomes are in the same range as other international evaluations of chronic care management programmes. A major concern is the level of engagement from both patients and practitioners. While the number of enrolments is increasing exponentially, the subsequent level of engagement from patients is significantly less. Qualitative data suggests that a number of practices are loosing energy and motivation in the CCM programme because of difficulties with prioritising time, accessing appropriate workforce, problems with IT issues, and not receiving payment in a timely manner. Those who are actively engage with the programme are doing so because of a real belief in the whole philosophy of the programme. This belief means that the practitioners are putting in considerable extra effort to overcome problems in programme implementation. It is in these practices that there is evidence of change in practice to respond to the demands of the programme, and the needs of their patients.

The conclusion of this evaluation is that the CCM programme, in its present form, needs to go through a process of adaptation. If this does not occur it is likely that further practices and PHOs will disengage from the programme.

Recommendations

- The results of the evaluation be discussed with key stakeholders

- A process is put in place to guide an adaptation of the programme. Stages of this process are as follows.
    - Understanding barriers and facilitators of engagement and uptake at the General Practice level
    - Engage stakeholders to develop a ‘whole systems’ view of the CCM model. Look for levers to affect change
    - Develop a programme logic to inform the theory of change
    - Initiative pilot trials that respond to barriers identified.
    - Engage in an action research program to support the change process

- A team is assigned to explore issues of data collection and analysis. Issues to consider include the following:
    - Clarifying the different data reports required by the different stakeholders.
    - Strategies to respond to differences in IT capabilities at the level of the General Practice.
    - A system for tracking the effect of programme adaptations over time.

Appendix A

Evaluation of CMDHB CCM
Phase 1
Interview Themes
Research Team: Janet Clinton, Peter Carswell, Faith Mahony, Tim Kenealy University of Auckland

Centre for Health Services Research & Policy
School of Population Health
Tamaki Campus
University of Auckland
Private Bag 92019
Auckland

Detailed interviews protocols will be developed in collaboration with a stakeholder reference group following analysis of the secondary data and talks with stakeholders.

Decision support

1. Talk me through CCM decision support
2. What are the enablers?
3. What are the hinderers?

The following variables will be used as prompts, if necessary.

- Who make the decisions?
- Who has access to the decisions?
- Who controls the decisions?
- What is the quality of the decisions, including completeness and usability?
- What systems are in place for practice?
- What is the degree and depth of use?

Process

1. Talk me through the implementation of CCM
2. What are the process enablers?
3. What are the process hinderers?

The following variables will be used as prompts, if necessary.

- What processes are in place to decide the implementation process?
- How is the process monitored?
- What is the role and importance of CCM strategically to the PHO?
- What is the uptake of the processes?
- What is the degree of implementation?
- Does it meet the needs of sub groups eg reducing inequalities?

Delivery

1. Talk me through how the CCM Wellness plans are delivered
2. What are delivery enablers?
3. What are delivery hinderers?

The following variables will be used as prompts, if necessary.

- What variance in usage of Wellness plans occurs between practices?
- What is the variance between DHB v PHO v GP/PN delivery expectations?

Impact

1. Talk me through the impact of CCM
2. What are impact enablers?
3. What are impact hinderers?

The following variables will be used as prompts, if necessary.

- What are the clinical outcomes eg individual changes and individual access?
- What changes have occurred in PHO systems?
- What changes have occurred in PHO culture?
- What is the resource/ cost effectiveness?
- What is the sustainability of CCM?

Appendix B1 – CCM Diabetes: HbA1c by PHO and ethnicity

Table 34 CCM Diabetes: Mean HbA1c by PHO (%).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	502	8.2	7.9	.	.	.	.	0.0004
Entry to Year 2	318	8.1	7.9	7.9	.	.	.	0.0120
Entry to Year 3	160	8.2	8.2	8.0	8.0	.	.	0.1947
Entry to Year 4	47	8.6	8.0	8.3	7.7	8.3	.	0.4084
Entry to Year 5	4	10.4	8.2	10.0	.	9.4	8.4	0.0938
PHO B								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	975	8.9	8.2	.	.	.	.	0.0000
Entry to Year 2	813	8.8	8.1	8.2	.	.	.	0.0000
Entry to Year 3	664	8.9	8.1	8.2	8.3	.	.	0.0000
Entry to Year 4	477	8.8	8.2	8.2	8.3	8.3	.	0.0000
Entry to Year 5	243	9.0	8.0	8.2	8.2	8.2	8.4	0.0000
PHO C								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	810	9.5	9.0	.	.	.	.	0.0000
Entry to Year 2	405	9.0	8.6	8.6	.	.	.	0.0001
Entry to Year 3	430	8.9	8.5	8.5	8.6	.	.	0.0025
Entry to Year 4	372	8.7	8.5	8.4	8.4	8.7	.	0.6965
Entry to Year 5	10	9.8	9.4	9.4	7.9	9.0	9.6	0.8017
PHO D								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	1581	8.4	7.9	.	.	.	.	0.0000
Entry to Year 2	1116	8.5	7.9	8.0	.	.	.	0.0000
Entry to Year 3	666	8.5	8.1	8.1	8.1	.	.	0.0000
Entry to Year 4	247	8.3	8.1	8.1	7.9	7.9	.	0.0010
Entry to Year 5	1	11.8	7.5	10.0	.	.	13.0	.
PHO E								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	300	8.9	8.7	.	.	.	.	0.0181
Entry to Year 2	209	8.8	8.6	8.5	.	.	.	0.0177
Entry to Year 3	12	7.6	7.4	7.5	8.0	.	.	0.1966
Entry to Year 4	4	7.7	.	.	8.8	9.7	.	0.0029
Entry to Year 5	0	.	.	.	.	.	.	.
PHO F								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	89	7.9	7.5	.	.	.	.	0.0077
Entry to Year 2	4	6.8	6.5	7.5	.	.	.	0.1845
Entry to Year 3	3	7.8	5.5	7.4	8.4	.	.	0.4941
Entry to Year 4	0	.	.	.	.	.	.	.
Entry to Year 5	0	.	.	.	.	.	.	.
PHO G								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	105	8.5	8.6	.	.	.	.	0.7094
Entry to Year 2	114	8.4	8.4	8.5	.	.	.	0.9010
Entry to Year 3	61	8.4	8.2	8.3	8.6	.	.	0.3250
Entry to Year 4	33	8.2	8.2	8.4	8.2	8.3	.	0.6547
Entry to Year 5	1	9.5	10.3	8.2	13.8	.	7.4	.
PHO H								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	41	8.5	8.6	.	.	.	.	0.7826
Entry to Year 2	3	10.5	.	10.1	.	.	.	0.7088
Entry to Year 3	0	.	.	.	.	.	.	.
Entry to Year 4	1	8.2	7.0	.	.	8.1	.	.
Entry to Year 5	1	8.2	7.0	.	.	8.1	8.2	.

Table 35 CCM Diabetes: Mean HbA1c by ethnicity (%).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	896	7.8	7.4	.	.	.	.	0.0000
Entry to Year 2	565	7.9	7.4	7.5	.	.	.	0.0000
Entry to Year 3	331	7.8	7.5	7.5	7.6	.	.	0.0174
Entry to Year 4	156	7.6	7.5	7.6	7.5	7.7	.	0.4464
Entry to Year 5	22	7.8	7.0	7.4	7.2	7.3	7.2	0.1655
Maori								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	948	8.6	8.3	.	.	.	.	0.0000
Entry to Year 2	635	8.6	8.2	8.3	.	.	.	0.0000
Entry to Year 3	384	8.6	8.3	8.2	8.3	.	.	0.0007
Entry to Year 4	176	8.5	8.4	8.4	8.1	8.4	.	0.2919
Entry to Year 5	32	8.9	7.7	8.5	8.4	8.3	8.7	0.4708
Pacific								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	2137	9.2	8.6	.	.	.	.	0.0000
Table 7 continued								
Entry to Year 2	1544	8.9	8.4	8.5	.	.	.	0.0000
Entry to Year 3	1135	9.0	8.4	8.4	8.6	.	.	0.0000
Entry to Year 4	755	8.9	8.4	8.4	8.4	8.5	.	0.0000
Entry to Year 5	189	9.2	8.2	8.4	8.3	8.4	8.5	0.0000
Asian								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	354	8.4	7.9	.	.	.	.	0.0000
Entry to Year 2	204	8.2	7.8	7.7	.	.	.	0.0000
Entry to Year 3	127	8.3	7.9	7.7	7.8	.	.	0.0003
Entry to Year 4	82	8.4	8.1	7.8	7.8	8.0	.	0.0384
Entry to Year 5	14	8.1	8.0	7.9	8.0	8.1	8.1	0.9417
Other								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	67	8.1	7.7	.	.	.	.	0.0705
Entry to Year 2	34	7.7	7.7	7.6	.	.	.	0.9529
Entry to Year 3	19	8.1	8.0	7.9	7.5	.	.	0.0433
Entry to Year 4	12	8.5	7.8	8.2	7.6	7.4	.	0.0350
Entry to Year 5	3	8.5	7.0	7.3	6.8	6.9	7.2	0.4845

Appendix B2 – CCM Diabetes: Smoking rates by PHO and ethnicity

Table 36 CCM Diabetes: Proportion smoking by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	502	0.27	0.24	.	.	.	.	0.8270
Entry to Year 2	319	0.22	0.21	0.19	.	.	.	0.7842
Entry to Year 3	161	0.27	0.24	0.14	0.23	.	.	0.7805
Entry to Year 4	47	0.15	0.12	0.00	0.11	0.11	.	0.7318
Entry to Year 5	4	0.25	0.33	0.00	.	0.25	0.00	0.8575
PHO B								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	980	0.17	0.15	.	.	.	.	0.9225
Entry to Year 2	812	0.19	0.15	0.16	.	.	.	0.9557
Entry to Year 3	664	0.19	0.15	0.14	0.15	.	.	0.9834
Entry to Year 4	478	0.18	0.16	0.14	0.14	0.14	.	0.9424
Entry to Year 5	244	0.16	0.14	0.11	0.13	0.13	0.11	0.9260
PHO C								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	813	0.22	0.20	.	.	.	.	0.7858
Entry to Year 2	405	0.20	0.16	0.18	.	.	.	0.7654
Entry to Year 3	430	0.20	0.17	0.17	0.20	.	.	0.6011
Entry to Year 4	372	0.21	0.17	0.17	0.20	0.19	.	0.7952
Entry to Year 5	10	0.10	0.17	0.17	0.25	0.17	0.10	0.5000
PHO D								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	1580	0.19	0.18	.	.	.	.	0.7660
Entry to Year 2	1116	0.20	0.18	0.17	.	.	.	0.9424
Entry to Year 3	666	0.21	0.18	0.17	0.18	.	.	0.9282
Entry to Year 4	247	0.15	0.13	0.13	0.13	0.14	.	0.6950
Entry to Year 5	1	1.00	1.00	1.00	.	.	1.00	.
PHO E								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	300	0.14	0.08	.	.	.	.	0.9898
Entry to Year 2	209	0.13	0.07	0.06	.	.	.	0.9932
Entry to Year 3	12	0.17	0.00	0.00	0.08	.	.	0.7315
Entry to Year 4	4	0.50	.	.	0.25	0.00	.	0.9488
Entry to Year 5	0	.	.	.	.	.	.	.
PHO F								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	89	0.11	0.10	.	.	.	.	0.5959
Entry to Year 2	4	0.25	0.00	0.25	.	.	.	0.5000
Entry to Year 3	3	0.33	0.00	0.50	0.33	.	.	0.5000
Entry to Year 4	0	.	.	.	.	.	.	.
Entry to Year 5	0	.	.	.	.	.	.	.
PHO G								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	105	0.14	0.14	.	.	.	.	0.5000
Entry to Year 2	114	0.19	0.17	0.15	.	.	.	0.8104
Entry to Year 3	61	0.16	0.09	0.12	0.11	.	.	0.7836
Entry to Year 4	33	0.12	0.11	0.04	0.00	0.03	.	0.9186
Entry to Year 5	1	0.00	0.00	0.00	0.00	.	0.00	.
PHO H								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	41	0.34	0.29	.	.	.	.	0.6825
Entry to Year 2	3	0.33	.	0.33	.	.	.	0.5000
Entry to Year 3	0	.	.	.	.	.	.	.
Entry to Year 4	1	1.00	0.00	.	.	1.00	.	.
Entry to Year 5	1	1.00	0.00	.	.	1.00	1.00	.

Table 37 CCM Diabetes: Proportion smoking by ethnicity
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	896	0.15	0.14	.	.	.	.	0.5801
Entry to Year 2	566	0.14	0.12	0.12	.	.	.	0.8375
Entry to Year 3	332	0.14	0.12	0.12	0.14	.	.	0.5441
Entry to Year 4	157	0.13	0.13	0.12	0.15	0.15	.	0.3725
Entry to Year 5	22	0.14	0.21	0.24	0.19	0.27	0.23	0.2172
Maori								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	949	0.34	0.32	.	.	.	.	0.8469
Entry to Year 2	636	0.31	0.29	0.28	.	.	.	0.9014
Entry to Year 3	384	0.34	0.29	0.27	0.30	.	.	0.8778
Entry to Year 4	176	0.31	0.28	0.20	0.26	0.27	.	0.7596
Entry to Year 5	33	0.36	0.38	0.20	0.33	0.31	0.24	0.8580
Pacific								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	2141	0.18	0.15	.	.	.	.	0.9883
Entry to Year 2	1542	0.19	0.15	0.15	.	.	.	0.9969
Entry to Year 3	1135	0.19	0.16	0.15	0.16	.	.	0.9883
Entry to Year 4	755	0.18	0.15	0.14	0.15	0.14	.	0.9874
Entry to Year 5	189	0.15	0.12	0.10	0.11	0.10	0.10	0.9422
Asian								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	355	0.07	0.06	.	.	.	.	0.7748
Entry to Year 2	204	0.05	0.04	0.04	.	.	.	0.6852
Entry to Year 3	127	0.06	0.03	0.04	0.03	.	.	0.8816
Entry to Year 4	82	0.06	0.02	0.05	0.03	0.04	.	0.7658
Entry to Year 5	14	0.00	0.00	0.00	0.00	0.00	0.00	.
Other								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	68	0.09	0.06	.	.	.	.	0.7444
Entry to Year 2	34	0.06	0.03	0.06	.	.	.	0.5000
Entry to Year 3	19	0.16	0.07	0.07	0.05	.	.	0.8548
Entry to Year 4	12	0.00	0.00	0.00	0.00	0.00	.	.
Entry to Year 5	3	0.00	0.00	0.00	0.00	0.00	0.00	.

Appendix B3 – CCM Diabetes: Blood pressure by PHO and ethnicity

Table 38 CCM Diabetes: Mean systolic blood pressure by PHO (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	502	135	130	.	.	.	.	0.0000
Entry to Year 2	319	135	130	130	.	.	.	0.0001
Entry to Year 3	161	134	131	131	128	.	.	0.0010
Entry to Year 4	47	132	130	129	125	132	.	0.8422
Entry to Year 5	4	138	125	120	.	133	128	0.7239
PHO B								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	980	134	131	.	.	.	.	0.0001
Entry to Year 2	812	134	132	130	.	.	.	0.0000
Entry to Year 3	664	134	132	130	130	.	.	0.0000
Entry to Year 4	478	135	132	131	131	128	.	0.0000
Entry to Year 5	244	134	132	130	133	128	129	0.0048
PHO C								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	813	133	129	.	.	.	.	0.0000
Entry to Year 2	405	136	131	129	.	.	.	0.0000
Entry to Year 3	430	137	132	129	125	.	.	0.0000
Entry to Year 4	372	137	131	130	125	128	.	0.0000
Entry to Year 5	10	133	110	132	135	127	136	0.6282
PHO D								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	1581	138	135	.	.	.	.	0.0000
Entry to Year 2	1116	139	135	135	.	.	.	0.0000
Entry to Year 3	666	139	133	134	133	.	.	0.0000
Entry to Year 4	247	139	134	135	133	134	.	0.0023
Entry to Year 5	1	120	84	100	.	.	154	.
PHO E								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	300	132	134	.	.	.	.	0.0915
Entry to Year 2	209	132	132	141	.	.	.	0.0000
Entry to Year 3	12	130	131	138	137	.	.	0.1831
Entry to Year 4	4	140	.	.	134	143	.	0.8307
Entry to Year 5	0	.	.	.	.	.	.	.
PHO F								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	89	142	135	.	.	.	.	0.0195
Entry to Year 2	4	145	134	124	.	.	.	0.2133
Entry to Year 3	3	152	145	118	133	.	.	0.3438
Entry to Year 4	0	.	.	.	.	.	.	.
Entry to Year 5	0	.	.	.	.	.	.	.
PHO G								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	105	133	131	.	.	.	.	0.1181
Entry to Year 2	114	132	131	126	.	.	.	0.0013
Entry to Year 3	61	133	133	126	128	.	.	0.0648
Entry to Year 4	33	133	135	120	125	126	.	0.0060
Entry to Year 5	1	150	142	160	140	.	180	.
PHO H								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	41	133	136	.	.	.	.	0.4374
Entry to Year 2	3	136	.	137	.	.	.	0.8534
Entry to Year 3	0	.	.	.	.	.	.	.
Entry to Year 4	1	138	120	.	.	136	.	.
Entry to Year 5	1	138	120	.	.	136	110	.

Table 39 CCM Diabetes: Mean systolic blood pressure by ethnicity (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	896	139	135	.	.	.	.	0.0000
Entry to Year 2	566	140	136	137	.	.	.	0.0074
Entry to Year 3	332	139	136	136	135	.	.	0.0010
Entry to Year 4	157	140	136	137	136	136	.	0.0607
Entry to Year 5	22	139	142	128	142	135	135	0.3226
Maori								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	949	137	133	.	.	.	.	0.0000
Entry to Year 2	636	138	133	132	.	.	.	0.0000
Entry to Year 3	384	137	132	131	130	.	.	0.0000
Entry to Year 4	176	136	132	130	127	129	.	0.0001
Entry to Year 5	33	136	129	125	139	129	134	0.5317
Pacific								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	2142	134	131	.	.	.	.	0.0000
Entry to Year 2	1542	135	131	131	.	.	.	0.0000
Entry to Year 3	1135	135	132	130	129	.	.	0.0000
Entry to Year 4	755	136	132	131	129	128	.	0.0000
Entry to Year 5	189	134	130	132	131	126	129	0.0147
Asian								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	355	132	130	.	.	.	.	0.1569
Entry to Year 2	204	131	129	127	.	.	.	0.0012
Entry to Year 3	127	133	131	125	125	.	.	0.0007
Entry to Year 4	82	132	130	123	123	130	.	0.4541
Entry to Year 5	14	127	129	121	127	131	127	0.9582
Other								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	68	134	132	.	.	.	.	0.5901
Entry to Year 2	34	135	133	129	.	.	.	0.1267
Entry to Year 3	19	139	137	132	133	.	.	0.3751
Entry to Year 4	12	141	142	129	132	132	.	0.1529
Entry to Year 5	3	132	145	112	144	124	129	0.8306

Appendix B4 – CCM Diabetes: Total cholesterol by PHO and ethnicity

Table 40 CCM Diabetes: Mean total cholesterol overall (mmol/L) by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	502	5.1	4.7	.	.	.	.	0.0000
Entry to Year 2	319	5.1	4.7	4.6	.	.	.	0.0000
Entry to Year 3	161	5.1	4.7	4.4	4.5	.	.	0.0000
Entry to Year 4	47	5.4	4.9	4.7	4.4	4.2	.	0.0000
Entry to Year 5	4	5.5	5.8	8.4	.	4.9	4.8	0.2607
PHO B								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	977	5.4	4.8	.	.	.	.	0.0000
Entry to Year 2	813	5.5	4.7	4.5	.	.	.	0.0000
Entry to Year 3	665	5.5	4.8	4.5	4.4	.	.	0.0000
Entry to Year 4	479	5.5	4.9	4.6	4.4	4.2	.	0.0000
Entry to Year 5	241	5.5	5.0	4.5	4.3	4.2	4.2	0.0000
PHO C								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	807	5.3	4.7	.	.	.	.	0.0000
Entry to Year 2	405	5.4	4.8	4.6	.	.	.	0.0000
Entry to Year 3	430	5.4	4.8	4.6	4.4	.	.	0.0000
Entry to Year 4	371	5.3	4.8	4.5	4.3	4.2	.	0.0000
Entry to Year 5	10	5.8	5.4	5.8	4.5	4.3	5.1	0.0164
PHO D								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	1581	5.1	4.7	.	.	.	.	0.0000
Entry to Year 2	1116	5.2	4.7	4.6	.	.	.	0.0000
Entry to Year 3	666	5.3	4.8	4.7	4.5	.	.	0.0000
Entry to Year 4	247	5.2	4.8	4.7	4.6	4.4	.	0.0000
Entry to Year 5	1	7.4	4.9	4.8	.	.	6.2	.
PHO E								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	300	5.0	4.7	.	.	.	.	0.0000
Entry to Year 2	209	4.9	4.7	4.4	.	.	.	0.0000
Entry to Year 3	12	5.2	4.5	4.4	4.4	.	.	0.0257
Entry to Year 4	4	5.4	.	.	4.9	5.1	.	0.5809
Entry to Year 5	0	.	.	.	.	.	.	.
PHO F								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	89	4.7	4.9	.	.	.	.	0.6542
Entry to Year 2	4	5.1	4.2	4.5	.	.	.	0.4280
Entry to Year 3	3	5.1	4.2	4.0	3.9	.	.	0.0868
Entry to Year 4	0	.	.	.	.	.	.	.
Entry to Year 5	0	.	.	.	.	.	.	.
PHO G								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	105	5.2	4.8	.	.	.	.	0.0004
Entry to Year 2	114	5.2	4.9	4.5	.	.	.	0.0000
Entry to Year 3	61	5.2	4.9	4.4	5.7	.	.	0.7450
Entry to Year 4	33	5.2	4.7	4.1	3.9	3.8	.	0.0000
Entry to Year 5	1	6.7	6.3	7.3	5.2	.	5.5	.
PHO H								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	41	4.7	4.2	.	.	.	.	0.0046
Entry to Year 2	3	5.4	.	5.3	.	.	.	0.6784
Entry to Year 3	0	.	.	.	.	.	.	.
Entry to Year 4	1	6.1	7.0	.	.	6.0	.	.
Entry to Year 5	1	6.1	7.0	.	.	6.0	5.8	.

Table 41 CCM Diabetes: Mean total cholesterol overall (mmol/L) by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	896	4.9	4.5	.	.	.	.	0.0000
Entry to Year 2	566	5.0	4.5	4.4	.	.	.	0.0000
Entry to Year 3	332	5.1	4.7	4.5	4.5	.	.	0.0000
Entry to Year 4	157	5.1	4.6	4.5	4.4	4.3	.	0.0000
Entry to Year 5	22	5.4	4.8	4.3	4.2	4.4	4.3	0.0007
Maori								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	947	5.3	4.8	.	.	.	.	0.0000
Entry to Year 2	636	5.3	4.8	4.7	.	.	.	0.0000
Entry to Year 3	385	5.4	4.9	4.7	4.6	.	.	0.0000
Entry to Year 4	176	5.5	5.0	4.9	4.6	4.5	.	0.0000
Entry to Year 5	32	5.8	5.1	5.2	4.8	4.8	4.7	0.0000
Pacific								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	2138	5.3	4.7	.	.	.	.	0.0000
Entry to Year 2	1543	5.4	4.8	4.5	.	.	.	0.0000
Entry to Year 3	1135	5.4	4.8	4.6	4.4	.	.	0.0000
Entry to Year 4	756	5.4	4.9	4.5	4.3	4.2	.	0.0000
Entry to Year 5	187	5.5	5.1	4.6	4.2	4.0	4.1	0.0000
Asian								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	353	5.0	4.6	.	.	.	.	0.0037
Entry to Year 2	204	5.1	4.6	4.4	.	.	.	0.0000
Entry to Year 3	127	5.2	4.8	4.6	5.0	.	.	0.8190
Entry to Year 4	81	5.2	4.9	4.5	4.3	4.1	.	0.0000
Entry to Year 5	14	5.5	5.2	4.6	4.3	4.2	4.3	0.0053
Other								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	67	4.6	4.3	.	.	.	.	0.0114
Entry to Year 2	34	5.0	4.6	4.1	.	.	.	0.0000
Entry to Year 3	19	5.0	4.4	4.0	3.8	.	.	0.0001
Entry to Year 4	12	5.1	4.5	4.0	3.8	4.4	.	0.0267
Entry to Year 5	3	5.4	4.8	3.6	4.4	5.1	4.9	0.4103

Appendix B5 – CCM Diabetes: LDL cholesterol by PHO and ethnicity

Table 42 CCM Diabetes: Mean LDL ('bad') cholesterol by PHO (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	P
Entry to Year 1	449	2.7	2.4	.	.	.	.	0.0000
Entry to Year 2	284	2.8	2.3	2.3	.	.	.	0.0000
Entry to Year 3	146	2.8	2.4	2.2	2.2	.	.	0.0000
Entry to Year 4	42	3.0	2.5	2.2	2.2	1.9	.	0.0000
Entry to Year 5	2	3.2	3.5	.	.	2.5	2.0	0.2048
PHO B								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	P
Entry to Year 1	936	3.0	2.6	.	.	.	.	0.0000
Entry to Year 2	794	3.1	2.6	2.4	.	.	.	0.0000
Entry to Year 3	642	3.1	2.6	2.4	2.3	.	.	0.0000
Entry to Year 4	463	3.1	2.8	2.4	2.3	2.0	.	0.0000
Entry to Year 5	225	3.0	2.8	2.4	2.2	2.0	1.9	0.0000
PHO C								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	P
Entry to Year 1	759	2.8	2.4	.	.	.	.	0.0000
Entry to Year 2	389	3.1	2.5	2.4	.	.	.	0.0000
Entry to Year 3	409	3.1	2.5	2.4	2.1	.	.	0.0000
Entry to Year 4	347	3.1	2.6	2.4	2.1	1.9	.	0.0000
Entry to Year 5	10	2.8	2.4	3.0	1.5	2.3	2.6	0.7515
PHO D								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	P
Entry to Year 1	1539	2.7	2.4	.	.	.	.	0.0000
Entry to Year 2	1086	2.8	2.4	2.3	.	.	.	0.0000
Entry to Year 3	648	2.8	2.6	2.4	2.2	.	.	0.0000
Entry to Year 4	241	2.8	2.6	2.5	2.3	2.2	.	0.0000
Entry to Year 5	0	.	.	.	.	.	.	.
PHO E								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	287	2.6	2.5	.	.	.	.	0.0122
Entry to Year 2	201	2.7	2.5	2.3	.	.	.	0.0000
Entry to Year 3	11	3.0	2.4	2.3	2.1	.	.	0.0450
Entry to Year 4	4	3.5	.	.	2.5	2.7	.	0.0995
Entry to Year 5	0	.	.	.	.	.	.	.
PHO F								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	84	2.4	2.1	.	.	.	.	0.0043
Entry to Year 2	4	2.9	2.0	2.1	.	.	.	0.2077
Entry to Year 3	3	2.8	2.0	1.8	1.7	.	.	0.1558
Entry to Year 4	0	.	.	.	.	.	.	.
Entry to Year 5	0	.	.	.	.	.	.	.
PHO G								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	105	2.9	2.5	.	.	.	.	0.0029
Entry to Year 2	114	2.9	2.5	2.3	.	.	.	0.0000
Entry to Year 3	61	3.0	2.2	2.2	2.0	.	.	0.0000
Entry to Year 4	33	2.9	1.9	2.1	2.0	1.8	.	0.0001
Entry to Year 5	1	4.3	4.0	4.3	3.0	.	3.1	.
PHO H								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	41	2.2	1.8	.	.	.	.	0.0199
Entry to Year 2	3	3.2	.	2.6	.	.	.	0.2971
Entry to Year 3	0	.	.	.	.	.	.	.
Entry to Year 4	1	3.9	2.0	.	.	0.0	.	.
Entry to Year 5	1	3.9	2.0	.	.	0.0	3.8	.

Table 43 CCM Diabetes: Mean LDL ('bad') cholesterol by ethnicity (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European							
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	872	2.6	2.3	.	.	.	.	0.0000
Entry to Year 2	563	2.7	2.3	2.2	.	.	.	0.0000
Entry to Year 3	320	2.8	2.5	2.3	2.2	.	.	0.0000
Entry to Year 4	152	2.9	2.5	2.3	2.2	2.0	.	0.0000
Entry to Year 5	17	3.2	2.4	2.3	2.0	1.7	1.7	0.0000
Maori								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	864	2.8	2.4	.	.	.	.	0.0000
Entry to Year 2	587	2.8	2.5	2.4	.	.	.	0.0000
Entry to Year 3	354	2.9	2.5	2.3	2.1	.	.	0.0000
Entry to Year 4	155	3.0	2.6	2.4	2.2	2.0	.	0.0000
Entry to Year 5	27	3.3	2.8	2.4	2.4	2.1	2.2	0.0000
Pacific								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	2063	2.9	2.5	.	.	.	.	0.0000
Entry to Year 2	1491	3.0	2.6	2.4	.	.	.	0.0000
Entry to Year 3	1106	3.1	2.7	2.4	2.2	.	.	0.0000
Entry to Year 4	735	3.1	2.7	2.4	2.2	2.0	.	0.0000
Entry to Year 5	182	3.0	2.8	2.5	2.2	2.0	2.0	0.0000
Asian								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	336	2.6	2.3	.	.	.	.	0.0000
Entry to Year 2	201	2.8	2.3	2.2	.	.	.	0.0000
Entry to Year 3	122	2.8	2.4	2.3	2.1	.	.	0.0000
Entry to Year 4	78	2.9	2.5	2.3	2.1	1.9	.	0.0000
Entry to Year 5	11	3.0	2.6	2.0	2.1	1.6	1.7	0.0004
Other								
Paired data	N	Entry	Year 1	Year 2	Year 3	Year 4	Year 5	p
Entry to Year 1	64	2.5	2.2	.	.	.	.	0.0603
Entry to Year 2	33	3.0	2.5	2.0	.	.	.	0.0000
Entry to Year 3	18	3.1	2.3	2.1	1.9	.	.	0.0000
Entry to Year 4	11	3.1	2.5	2.2	2.0	2.1	.	0.0022
Entry to Year 5	2	2.5	2.8	2.3	2.6	2.2	1.7	0.1112

Appendix C1 – CCM CHF: Systolic BP by PHO and ethnicity

Table 44 CCM CHF: Mean systolic blood pressure by PHO (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	5	117	108	.	.	0.2662
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	39	128	125	.	.	0.5143
Entry to Year 2	25	127	123	124	.	0.3952
Entry to Year 3	11	126	126	130	127	0.8413
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	
Entry to Year 2	1	160	.	120	.	
Entry to Year 3	0	.	.	.	.	
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	59	128	125	.	.	0.3071
Entry to Year 2	25	119	118	122	.	0.5361
Entry to Year 3	12	126	121	124	115	0.2174
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	14	119	114	.	.	0.4896
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	100	100	.	.	
Entry to Year 2	0	.	.	.	.	
Entry to Year 3	0	.	.	.	.	

Table 45 CCM CHF: Mean systolic blood pressure by ethnicity (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	59	126	124	.	.	0.4899
Entry to Year 2	25	123	122	124	.	0.8387
Entry to Year 3	11	118	122	123	117	0.7067
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	25	130	127	.	.	0.4556
Entry to Year 2	9	137	128	133	.	0.6128
Entry to Year 3	5	156	137	162	125	0.1025
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	31	124	120	.	.	0.3357
Entry to Year 2	14	121	117	116	.	0.3249
Entry to Year 3	6	118	120	112	126	0.3821
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	3	105	93	.	.	0.1917
Entry to Year 2	3	108	90	111	.	0.7896
Entry to Year 3	1	110	.	120	118	.

Appendix C2 – CCM CHF Smoking rates by PHO and ethnicity

Table 46 CCM CHF: Proportion smoking by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	5	0.00	0.40	.		0.0569
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	38	0.24	0.16	.		0.8064
Entry to Year 2	15	0.13	0.07	0.13		0.5000
Entry to Year 3	0	.	.	.		.
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.		.
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	43	0.05	0.02	.		0.7216
Entry to Year 2	9	0.00	0.00	0.00		.
Entry to Year 3	0	.	.	.		.
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	14	0.00	0.07	.		0.1543
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	0.00	0.00	.		.
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.

Table 47 CCM CHF: Proportion smoking by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	48	0.00	0.00	.		.
Entry to Year 2	9	0.00	0.00	0.00		.
Entry to Year 3	0	.	.	.		.
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	21	0.10	0.19	.		0.1889
Entry to Year 2	6	0.00	0.00	0.17		0.1481
Entry to Year 3	0	.	.	.		.
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	29	0.28	0.17	.		0.8276
Entry to Year 2	9	0.22	0.13	0.11		0.7365
Entry to Year 3	0	.	.	.		.
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	3	0.33	0.33	.		0.5000
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.
Other						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.		.
Entry to Year 2	0	.	.	.		.
Entry to Year 3	0	.	.	.		.

Appendix C3 – CCM CHF: ACE inhibitor prescription by PHO and ethnicity

Table 48 CCM CHF: Proportion on ACE inhibitors by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	5	0.60	1.00	.	.	0.0569
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	36	0.83	0.81	.	.	0.6203
Entry to Year 2	21	0.76	0.72	0.71	.	0.6372
Entry to Year 3	11	0.82	0.80	0.91	0.82	0.5000
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	1	1.00	.	1.00	.	.
Entry to Year 3	0	.	.	.	.	.
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	54	0.87	0.85	.	.	0.6096
Entry to Year 2	22	0.91	0.90	0.86	.	0.6826
Entry to Year 3	8	1.00	1.00	1.00	1.00	.
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	13	1.00	1.00	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	1.00	1.00	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Table 49 CCM CHF: Proportion on ACE inhibitors by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	52	0.87	0.85	.	.	0.6099
Entry to Year 2	20	0.85	0.84	0.80	.	0.6613
Entry to Year 3	7	0.86	0.86	0.83	0.86	0.5000
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	25	0.76	0.80	.	.	0.3664
Entry to Year 2	9	0.78	0.50	0.78	.	0.5000
Entry to Year 3	5	1.00	0.67	1.00	0.80	0.8541
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	29	0.93	0.93	.	.	0.5000
Entry to Year 2	12	0.92	0.91	0.75	.	0.8633
Entry to Year 3	6	1.00	1.00	1.00	1.00	.
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	3	1.00	1.00	.	.	.
Entry to Year 2	3	0.67	1.00	1.00	.	0.1367
Entry to Year 3	1	0.00	.	1.00	1.00	.
Other						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Appendix C4 – CCM CHF: Beta Blocker prescription by PHO and ethnicity

Table 50 CCM CHF: Proportion on Beta Blockers by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	5	0.20	0.40	.	.	0.2451
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	35	0.46	0.49	.	.	0.4054
Entry to Year 2	23	0.57	0.47	0.57	.	0.5000
Entry to Year 3	11	0.45	0.30	0.45	0.45	0.5000
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	1	1.00	.	0.00	.	.
Entry to Year 3	0	.	.	.	.	.
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	48	0.60	0.63	.	.	0.4169
Entry to Year 2	24	0.50	0.70	0.63	.	0.1914
Entry to Year 3	10	0.80	0.88	0.88	0.90	0.2656
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	12	0.75	0.67	.	.	0.6733
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	0.00	0.00	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Table 51 CCM CHF: Proportion on Beta Blockers by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	48	0.65	0.69	.	.	0.3325
Entry to Year 2	24	0.54	0.70	0.63	.	0.2791
Entry to Year 3	9	0.78	0.78	0.75	0.78	0.5000
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	23	0.48	0.39	.	.	0.7240
Entry to Year 2	8	0.63	0.50	0.63	.	0.5000
Entry to Year 3	5	0.60	0.33	0.75	0.80	0.2451
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	27	0.44	0.52	.	.	0.2930
Entry to Year 2	13	0.46	0.45	0.46	.	0.5000
Entry to Year 3	6	0.33	0.33	0.33	0.33	0.5000
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	3	0.33	0.33	.	.	0.5000
Entry to Year 2	3	0.67	0.50	0.67	.	0.5000
Entry to Year 3	1	1.00	.	1.00	1.00	.
Other						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Appendix D1 – CCM COPD: Systolic BP by PHO and ethnicity

Table 52 CCM COPD: Mean systolic blood pressure by PHO (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	14	135	123	.	.	0.0267
Entry to Year 2	1	120	.	120	.	.
Entry to Year 3	0	.	.	.	.	
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	37	133	131	.	.	0.6445
Entry to Year 2	21	135	135	133	.	0.6573
Entry to Year 3	11	132	138	137	135	0.6081
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	
Entry to Year 2	0	.	.	.	.	
Entry to Year 3	0	.	.	.	.	
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	84	135	131	.	.	0.0806
Entry to Year 2	20	128	132	130	.	0.7330
Entry to Year 3	3	138	148	135	145	0.6349
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	11	135	131	.	.	0.4899
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	
Entry to Year 2	0	.	.	.	.	
Entry to Year 3	0	.	.	.	.	

Table 53 CCM COPD: Mean systolic blood pressure by ethnicity (mm Hg).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	84	135	132	.	.	0.1473
Entry to Year 2	25	133	134	131	.	0.6839
Entry to Year 3	7	138	141	142	140	0.8262
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	44	136	130	.	.	0.0867
Entry to Year 2	9	125	134	128	.	0.6047
Entry to Year 3	3	130	149	125	132	0.7745
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	17	131	125	.	.	0.1700
Entry to Year 2	8	135	134	133	.	0.7969
Entry to Year 3	4	126	129	139	134	0.4318
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	
Entry to Year 2	0	.	.	.	.	
Entry to Year 3	0	.	.	.	.	
Other						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	115	125	.	.	
Entry to Year 2	0	.	.	.	.	
Entry to Year 3	0	.	.	.	.	

Appendix D2 – CM COPD: Smoking rates by PHO and ethnicity

Table 54 CCM COPD: Proportion smoking by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	14	0.71	0.71	.	.	0.5000
Entry to Year 2	1	0.00	.	0.00	.	.
Entry to Year 3	0	.	.	.	.	.
PHO B						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	37	0.59	0.49	.	.	0.8246
Entry to Year 2	21	0.62	0.56	0.38	.	0.9386
Entry to Year 3	11	0.64	0.78	0.40	0.45	0.8041
PHO C						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO D						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	83	0.33	0.24	.	.	0.8861
Entry to Year 2	20	0.15	0.25	0.25	.	0.2146
Entry to Year 3	3	0.33	0.50	0.50	0.33	0.5000
PHO F						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	11	0.36	0.27	.	.	0.6764
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
PHO H						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Table 55 CCM COPD: Proportion smoking by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European					
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	84	0.36	0.32	.	.	0.6875
Entry to Year 2	25	0.36	0.56	0.40	.	0.3854
Entry to Year 3	7	0.71	1.00	0.60	0.57	0.7115
Maori						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	43	0.53	0.42	.	.	0.8598
Entry to Year 2	9	0.33	0.17	0.22	.	0.7006
Entry to Year 3	3	0.33	0.33	0.33	0.33	0.5000
Pacific						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	17	0.59	0.35	.	.	0.9153
Entry to Year 2	8	0.50	0.33	0.13	.	0.9472
Entry to Year 3	4	0.50	0.67	0.25	0.25	0.7674
Asian						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	0	.	.	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.
Other						
Paired data	N	Entry	Year 1	Year 2	Year 3	p
Entry to Year 1	1	0.00	0.00	.	.	.
Entry to Year 2	0	.	.	.	.	.
Entry to Year 3	0	.	.	.	.	.

Appendix D3 – CCM COPD: Flu vaccination by PHO and ethnicity

Table 56 CCM COPD: Proportion with flu vaccine by PHO

PHO	2002	2003	2004	2005	2006
A			100% (1 /1)	93% (13/14)	84% (37/44)
B	66% (2 /3)	86% (6/7)	86% (19/22)	39% (9/23)	57% (17/30)
C			100% (1 /1)	0% (0 /1)	94% (17/18)
D	100% (1 / 1)	96% (22/23)	86% (30/35)	89% (107/121)	78% (135/174)
F				100% (10/10)	83% (19/23)
H				100% (1 /1)	100% (16/16)

Table 57 CCM COPD: Proportion with flu vaccine by ethnicity

Ethnicity	2002	2003	2004	2005	2006
European	66% (2 /3)	90% (19/21)	88% (28/32)	86% (91/106)	77% (126/163)
Maori		100% (6/6)	82% (14/17)	81% (38/47)	81% (87/108)
Pacific		100% (2/2)	100% (9/9)	63% (10/16)	79% (22/28)
Asian				100% (1 /1)	100% (3/3)
Other		100% (1 /1)	100% (1 /1)	100% (1 /1)	100% (2/2)

Appendix E1 – CCM CVD: Total cholesterol by PHO and ethnicity

Table 58 CCM CVD: Mean total cholesterol by PHO (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	5.1	4.8	0.2933
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	29	4.8	4.5	0.0752
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	5.3	4.7	0.0012
PHO F				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	4.6	4.1	0.0036
PHO H				
Paired data	N	Entry	Year 1	p
Entry to Year 1	1	4.6	4.9	

Table 59 CCM CVD: Mean total cholesterol by ethnicity (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	5.2	4.6	0.0002
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	5.2	4.8	0.1933
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	23	4.6	4.3	0.0548
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	4.5	4.1	0.4512
Other				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	5.3	4.8	0.6560

Appendix E2 – CCM CVD: LDL cholesterol by PHO and ethnicity

Table 60 CCM CVD: Mean total cholesterol by PHO (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	2.6	2.4	0.3809
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	29	2.8	2.3	0.0161
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	3.0	2.5	0.0016
PHO F				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	2.4	2.0	0.0054
PHO H				
Paired data	N	Entry	Year 1	p
Entry to Year 1	1	3.1	3.3	

Table 61 CCM CVD: Mean total cholesterol by ethnicity (mmol/L).
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	2.9	2.4	0.0003
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	2.7	2.4	0.1437
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	23	2.6	2.3	0.0296
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	2.5	2.0	0.3632
Other				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	3.5	3.1	0.7338

Appendix E3 – CCM CVD: Smoking rates by PHO and ethnicity

Table 62 CCM CVD: Proportion smoking by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.29	0.43	0.1670
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	29	0.24	0.14	0.8425
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	.
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	0.13	0.13	0.5000
PHO F				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.29	0.10	0.9420
PHO H				

Paired data	N	Entry	Year 1	p
Entry to Year 1	1	0.00	0.00	.

Table 63 CCM CVD: Proportion smoking by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	0.18	0.12	0.8339
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	0.30	0.30	0.5000
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	23	0.22	0.22	0.5000
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	0.17	0.17	0.5000
Eth5 5				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	0.50	0.50	0.5000

Appendix E4 – CCM CVD: Aspirin prescription by PHO and ethnicity

Table 64 CCM CVD: Proportion on Aspirin by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.57	0.62	0.3766
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	28	0.82	0.93	0.1127
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	.
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	0.76	0.67	0.8228
PHO F				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.71	0.76	0.3628
PHO H				
Paired data	N	Entry	Year 1	p
Entry to Year 1	1	0.00	0.00	.

Table 65 CCM CVD: Proportion on Aspirin by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	0.79	0.75	0.7306
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	0.50	0.55	0.3758
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	22	0.73	0.82	0.2359
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	0.67	0.83	0.2525
Other				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	1.00	1.00	.

Appendix E5 – CCM CVD: Statin prescription rates by PHO and ethnicity

Table 66 CCM CVD: Proportion on a Statin by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.76	0.71	0.6372
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	29	0.79	0.83	0.3688
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	.
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	0.83	0.87	0.2808
PHO F				

Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.90	0.95	0.2745
PHO H				
Paired data	N	Entry	Year 1	p
Entry to Year 1	1	1.00	1.00	.

Table 67 CCM CVD: Proportion on a Statin by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	0.81	0.87	0.1755
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	0.70	0.65	0.6322
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	23	0.91	0.91	0.5000
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	1.00	1.00	.
Other				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	1.00	1.00	.

Appendix E6 – CCM CVD: ACE inhibitor prescription rates by PHO and ethnicity

Table 68 CCM CVD: Proportion on an ACE inhibitor by PHO.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

PHO A				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.62	0.71	0.2563
PHO B				
Paired data	N	Entry	Year 1	p
Entry to Year 1	29	0.52	0.48	0.6036
PHO C				
Paired data	N	Entry	Year 1	p
Entry to Year 1	0	.	.	.
PHO D				
Paired data	N	Entry	Year 1	p
Entry to Year 1	46	0.57	0.59	0.4165
PHO F				
Paired data	N	Entry	Year 1	p
Entry to Year 1	21	0.52	0.57	0.3783
PHO H				
Paired data	N	Entry	Year 1	p
Entry to Year 1	1	1.00	1.00	.

Table 69 CCM CVD: Proportion on an ACE inhibitor by ethnicity.
(Row data is paired for entry and last year reported; p values are from paired t-tests on the same.)

European				
Paired data	N	Entry	Year 1	p
Entry to Year 1	67	0.51	0.51	0.5000
Maori				
Paired data	N	Entry	Year 1	p
Entry to Year 1	20	0.65	0.65	0.5000
Pacific				
Paired data	N	Entry	Year 1	p
Entry to Year 1	23	0.70	0.83	0.1499
Asian				
Paired data	N	Entry	Year 1	p
Entry to Year 1	6	0.33	0.33	0.5000
Other				
Paired data	N	Entry	Year 1	p
Entry to Year 1	2	0.50	0.50	0.5000

References

Ackermann, E. and G. Mitchell (2006). "An audit of structured diabetes care in a rural general practice." The Medical Journal of Australia **185**(2): 69-72.

Adams SG, Smith PK, Allan PF, Anzueto A, Pugh JA, Cornell JE. (2007) Systematic review of the Chronic Care Model in Chronic Obstructive Pulmonary Disease prevention and management. Archives of Internal Medicine **167**:551-61.

Archard, G. (2005). Additional benefits versus practicalities of Beta-Blocker use in CHF patients: the 'some is better than none' rule. *British Journal of Cardiology, 12*(4), 313-317.

Aubert, R., W. Herman, et al. (1998). "Nurse care management to improve glycemic control in diabetic patients in a health maintenance organisation: a randomised, controlled trial." Annals of Internal Medicine **129**(8): 605-612.

Bond, G. E., Burr, R., Wolf, F. M., Price, M., McCurry, S. M., Teri, L. (2007). The effects of a web-based intervention on the physical outcomes associated with diabetes among adults age 60 and older: a randomised trial. *Diabetes Technology & Therapeutics, 9*(1), 52-59.

de Lusignan, S. (2007). An educational intervention, involving feedback of routinely collected computer data, to improve cardiovascular disease management in UK primary care. *Methods of Information in Medicine, 46*(1), 57-62.

Gilmer, T. P., Philis-Tsimikas, A., & Walker, C. (2005). "Outcomes of project Dulce: a culturally specific diabetes management program." The Annuals of Pharmacotherapy, **39**(5), 817-822.

Griffiths, T., M. Burr, et al. (2000). "Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial." The Lancet **355**: 362-368.

Haskell, W. L., Berra, K., Arias, E., Christopherson, D., Clark, A., George, J., Hyde, S., Klieman, L., & Myll, J. (2006). Multifactor cardiovascular disease risk reduction in medically underserved, high-risk patients. *American Journal of Cardiology, 98*(11), 1472-1479.

Knight K, Badamgarav E, Henning J, Hasselblad V, Gano AJ, Ofman J, et al. (2005) A systematic review of diabetes disease management programs. American Journal of Managed Care **11**(4):242-50.

Lacasse, Y., R. Goldstein, et al. (2006). "Pulmonary rehabilitation for chronic obstructive pulmonary disease (review)." Cochrane Database of Systematic Reviews(4).

Majumdar, S., J. Johnson, et al. (2005). "A Canadian consensus for the standardised evaluation of quality improvement interventions in type 2 diabetes." Canadian Journal of Diabetes **29**(3): 220-229.

Majumdar, S. R., Tsuyuki, R. T., McAlister, F. A. (2007). Impact of opinion leader-endorsed evidence summaries on the quality of prescribing for patients with cardiovascular disease: a randomised controlled trial. *American Heart Journal, 153*(1), 22, e1-8.

McAlister, F. A., Lawson, F. M. E., Teo, K. K., & Armstrong, P. W. (2001). "A systematic review of randomised trials of disease management programs in heart failure". American Journal of Medicine **110**: 378-384

New Zealand Guidelines Group. (2003) Management of type 2 diabetes. Wellington: New Zealand Guidelines Group.

Nine, S., C. Lakies, et al. (2003). "Community-based chronic disease management program for African Americans." Outcomes Management **7**(3): 106-112.

Norris, S., P. Nichols, et al. (2002). "The effectiveness of disease and case management for people with diabetes: a systematic review." American Journal of Preventive Medicine **22**(4S): 15-38.

Olvarius, N., Beck-Nielsen, H., Andreasen, A., Horder, M., & Pedersen, P. (2001). "Randomised controlled trial of structured personal care of type 2 diabetes mellitus." British Medical Journal **323**(970)

Pablo de Torres, J., V. Pinto-Plata, et al. (2002). "Power of outcome measurements to detect clinically significant changes in pulmonary rehabilitation of patients with COPD." Chest **121**(4): 1092-1098.

Rea H, McAuley S, Stewart A, Lamont C, Roseman P, Didsbury P. (2004) A chronic disease management programme can reduce days in hospital for patients with chronic obstructive pulmonary disease. Internal Medicine Journal **34**(11):608-14.

Renders, C., G. Valk, et al. (2006). "Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings." Cochrane Database of Systematic Reviews **2**.

Rich, M., V. Beckham, et al. (1995). "A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure." The New England Journal of Medicine **333**(18): 1190-1195.

Seow, H, B. S., Phillips, C. O., Rich, M. W., Spertus, J. A., Krumholz, H. M., & Lynn, J. (2006). Isolation of health services research from practice and policy: The example of chronic heart failure management. *Journal of the American Geriatrics Society, 54*(3), 535-540.

Steines, W., Piehlmeier, W., Schenkirsch, G., Renner, R., Landgraf, R. (2004). Effectiveness of a disease management programme for patients with type 2 diabetes mellitus and albuminuria in primary care - the PROSIT project. Experimental & Clinical Endocrinology & Diabetes, **112**(2), 88-94.

Taylor, S., B. Candy, et al. (2005). "Effectiveness of innovations in nurse led chronic disease management for patients with chronic obstructive pulmonary disease: a systematic review of evidence." British Medical Journal., 331(7515), 485-490

Tomlin, A., Tilyard, M. Dawson, A., Dovey, S. (2006). Health status of New Zealand European, Maori, and Pacific patients with diabetes in 242 New Zealand general practices. The New Zealand Medical Journal **119**(1235):

UK Prospective Diabetes Study Group. U.K. Prospective Diabetes Study 16. (1995) Overview of 6 years' therapy of type II diabetes: a progressive disease. Diabetes **44**:1249-58.

Vermeire, E., J. Wens, et al. (2006). "Interventions for improving adherence to treatment recommendations in people with type 2 diabetes mellitus." Cochrane Database of Systematic Reviews **1**.

Williams, G. C., McGregor, H. Zeldman, A., Freedman, Z. R. , Deci. E. L., Elder, D. (2005). Promoting glycemic control through diabetes self-management: Evaluating a patient activation intervention. *Patient Education & Counseling, 56*(1), 28-34.

Zgibor, J. C., Rao, H., Wesche-Thobaben, J., Gallagher, N., McWilliams, J., Korytkowski, M. T., (2004). Improving the quality of diabetes care in primary care practice. *Journal for Healthcare Quality, 26*(4), 14-21.