

# The Evidence

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## cdmNet and the Chronic Care Model

According to the Royal Australian College General Practitioners: “The chronic care model provides a conceptual framework for understanding the elements considered essential for the management of chronic disease.”<sup>i</sup>

Evidence strongly suggests that the key elements of the Chronic Care Model (CCM) be provided to all patients with a chronic illness. cdmNet is based on this model. It aims to make it easy for General Practice, the care team and the patient to implement the key elements of the model.

## The Evidence for the Chronic Care Model

### RAND Evaluation of Chronic Care Collaboratives

- Two major evaluation questions:<sup>ii</sup>
  - Can busy practices implement the CCM?
  - If so, would their patients benefit?
- Studied 51 organizations in four different collaboratives, 2,132 BTS patients, 1,837 controls with asthma, CHF, diabetes.
- Controls generally from other practices in organization.
- Data included patient and staff surveys, medical record reviews.

### RAND Findings (1): Implementation of the CCM

- Organizations made average of 48 changes in 5.8/6 CCM areas.
- The emphases with greatest impact included organizing and engaging practice teams, collaborative decision making with patients, encouraging provider participation in QI efforts, and de-emphasis on traditional patient education.
- IT received most attention, community linkages the least.
- One year later, over 75% of sites had sustained changes, and a similar number had spread to new sites or new conditions.

#### STUDY SPECIFICS

- Of 23 change emphases, only 4 distinguished the best CCM implementers (i.e., the organization whose change activities were most likely to have impact, according to CCM principles). These key emphases included organizing and engaging practice teams, collaborative decision making with patients, encouraging provider participation in QI efforts, and de-emphasis on traditional patient education.<sup>iii</sup>
- Over four-fifths of the organizations implemented some interventions in all six CCM elements. However, there were differences: since many elements of the CCM depend on having a registry of patient, sites worked most intensely on improving information support (24% of all their efforts, on average) and least intensely on developing community linkages (8% of their efforts).<sup>iv</sup>

### RAND Findings (2): Patient Impacts of CCM

- Diabetes pilot patients had significantly reduced CVD risk (pilot > control), resulting in a reduced risk of one cardiovascular disease event for every 48 patients exposed.
- CHF pilot patients more knowledgeable and more often on recommended therapy, had 35% fewer hospital days and fewer ER visits.
- Asthma and diabetes pilot patients more likely to receive appropriate therapy.
- Asthma pilot patients had better QOL.

#### STUDY SPECIFICS

- The 10-year risk of cardiovascular disease was determined using a modification of the U.K. Prospective Diabetes Study risk engine. The baseline 10-year risk was 31% for both cases and controls. At the end of the period, the intervention group had a 2.1% greater reduction in predicted risk.<sup>v</sup>
- Participation in the collaborative for Heart Failure was associated with fewer emergency department visits.<sup>vi</sup>
- The RAND team also utilized medical record review to measure performance on 23 predefined quality indicators for sites participating in the heart failure collaborative. Patients from collaborative sites showed greater improvement than control sites for 11 of the 21 indicators, including use of lipid lowering and angiotensin converting enzyme inhibition therapy. When all indicators were combined into a single overall process score, participating sites improved more than controls (17% versus 1%, P = 0.0001). The improvement was greatest for measures of education and counseling (24% versus 1%, P = 0.0001).<sup>vii</sup>
- The overall process of pediatric asthma care improved significantly in the intervention group but remained unchanged in the control group (change in process score +13% vs 0%; P < .0001). Patients in the intervention group were more likely than patients in the control group to monitor their peak flows (70% vs 43%; P < .0001) and to have a written action plan (41% vs 22%; P = .001). Patients in the intervention group had better general health-related quality of life (scale score 80 vs 77; P = .05) and asthma-specific quality of life related to treatment problems (scale score 89 vs 85; P < .05).<sup>viii</sup>
- The RAND study of adult asthma care had a smaller study population and found process of asthma care improved significantly, as did patient satisfaction with communication, but outcomes were not significantly different from controls.<sup>ix</sup>

## Non-RAND Evaluations of CCM: Implementation

- In general, those studies with greater fidelity to the CCM showed greater improvements.
- All but one showed improvement on some process measures.
- Most showed improvement on outcomes and empowerment measures, as well.
- Sustainability and implementation of all CCM elements were challenges.
- Physician and staff must be motivated to change.

## STUDY SPECIFICS

- Used disease registry, diabetes nurse case managers, and group visits to improve diabetes outcomes in rural, minority populations in Eastern North Carolina. Pre-post findings indicated an increase in patients with self-management goals who received lipid panel, used aspirin and received a foot exam.<sup>x</sup>
- Pre-post examination of Midwestern CHCs' participation in the Diabetes Health Disparities Collaborative showed increased process measures, like rates of HbA1c measurement, eye examination referral, foot examination and lipid assessment. Mean value of HbA1c also decreased. Survey respondents felt the effort was worth it and successful. Practices struggled in: needing more time, developing a patient registry, staff turnover, more support by senior management.<sup>xi</sup>
- Teams implementing CCM as part of the Diabetes BTS collaborative improved their self-management support capabilities, as measured both by self report and objective data. Among heart failure collaboratives, daily self-monitoring of weight by patients improved significantly (19% to 93%) and teams provided education significantly more often to patients.<sup>xii</sup>
- Harwell and colleagues supported primary care practices with performance feedback. Practices then did a variety of additional system changes. This cross-sectional study found improvements in some processes – foot examinations, microalbumin testing, dilated retinal examination – but not others like HbA1c testing

or LDL-C testing.<sup>xiii</sup>

- Multiple North Carolina residency practices participated in the BTS collaboratives and implemented strategies across all elements of the CCM. Practices evaluated themselves at base-line and after using the ACIC. Study found that key measures of diabetes care were improved in two-thirds of practices.<sup>xiv</sup>
- Practices in Wisconsin and Minnesota that implemented planned care and DEMS found that planned care plus use of a disease registry improved care across all 12 performance measures. Planned care alone or in conjunction with DEMS improved metabolic outcomes. DEMS alone improved process measures, but not metabolic outcomes.<sup>xv</sup>
- Implementation of the CCM in a rural Pennsylvania practice resulted in significant improvement in adherence to ADA guidelines including 2 HbA1c tests per year, lipid profile, urinalysis, eye exam, and foot exam performed. Mean HbA1c also declined significantly, as did mean HDLc levels. Improvement in three empowerment measures was seen, though it wasn't significant.<sup>xvi</sup>
- Among a highly transient, uninsured population, significant improvements in diabetes outcomes including decreased LDL, HbA1c, and Arterial Pressure were observed.<sup>xvii</sup>
- Case studies from North Carolina show that participation in the CCM collaborative resulted in improved HbA1c values for diabetics. Factors contributing to success included senior leadership support, physician champions, and multidisciplinary teams. Staff turnover was a barrier.<sup>xviii</sup>
- A Washington state initiative to conduct state-level collaboratives around diabetes care resulted in some improvement in process and outcome measures in most of the 47 participating teams. Absolute improvement was higher for process measures than for outcome measures.<sup>xix</sup>
- One study used the CCM framework to improve the delivery of diabetes self-management training. They found the framework useful in terms of improving the number of DSMT programs offered, enhancing reimbursement to cover costs, and lowering patients HbA1c –ostensibly by offering more patients self- management support.<sup>xx</sup>
- The implementation of the Chronic Care Model produced different results when used at two different primary care practices in London. One site showed significant improvements in identification and case management of depression; the other did not. Tangible barriers like a primitive information technology system, lack of experience with chronic disease management, and the inability to find common meeting time proved serious barriers to the implementation of the project in the second site. Other, intangible barriers which mediated the impact of the CCM at the second site included a lack of staff ownership, participation, and buy-in as well as lack of external support for the elements of the project.<sup>xxi</sup>
- Sites participating in the Breakthrough Series Collaborative for HIV/AIDS did not show improvement on process or outcome measures when compared to other clinics that did not participate in the BTS collaborative. The proportion of patients with a suppressed viral load decreased in the intervention group, compared to the control group, but the decrease was not significant.<sup>xxii</sup>

## Randomized Controlled Trials (RCT) of CCM-based Interventions

- 6 RCTs covering asthma, diabetes, bipolar disorder, comorbid depression and oncology, and multiple conditions.
- 5 in the US – disease specific, 1 in Australia – multiple diseases.

- Practice-level randomization.
- Varying levels of disease severity: mild to severely ill and highly comorbid.
- All but one study shows that implementation of the Chronic Care Model significantly improves process and outcome measures compared to controls and – when included in the trial – less intensive interventions (e.g. physician training alone).
- Often CCM implementation is linked with improved patient empowerment and education scores, as well.
- Active team motivation to change may be an important factor in predicting success.

## STUDY SPECIFICS

- Southern Australia “HealthPlus”: Four regions working on eight sub-trials found a generic model of coordinated care resulted in improved well-being for people with a wide range of chronic conditions in both rural and urban settings.<sup>xxiii</sup>
- Asthma: Compared planned care to physician education. Planned care was shown to be more effective than physician education alone in decreasing asthma symptom days for children with mild to moderate asthma.<sup>xxiv</sup>
- Diabetes: Implemented in underserved communities, this trial found that patients in the CCM group significantly lowered A1C levels, non-HDL cholesterol, and frequency of self-monitoring compared to controls. Results of diabetes knowledge and diabetes empowerment also improved, but not significantly more than other groups.<sup>xxv</sup>
- Applying CCM concepts like SMS, decision support, planned encounters, and care coordinators to treatment of bipolar disorder significantly reduced weeks in affective episodes, primarily mania in severely ill, highly comorbid individuals. Also, functional outcomes improved significantly.<sup>xxvi</sup>
- Among low-income Latinas with comorbid depression and cancer use of proactive care, case management, self-management support, and feedback to physicians resulted in significant improvement in depressive symptoms. Patients in the intervention group were also more likely to be alive at the end of the study and to have improved emotional well-being.<sup>xxvii</sup>
- Sites randomized to attend the Breakthrough Series Collaboratives to improve pediatric asthma care showed no differences in patient experience or outcomes. Lack of team motivation to change, as indicated by the fact that less than one-half the randomized teams attended all three learning sessions, may partially explain the results. Serious financial and other organizational factors also may have played a role.<sup>xxviii</sup>

## Other Evidence

- Limited published data exist evaluating the efficacy of CCM components in chronic obstructive pulmonary disease management. However, pooled data demonstrated that patients with chronic obstructive pulmonary disease who received interventions with 2 or more CCM components had lower rates of hospitalizations and emergency/unscheduled visits and a shorter length of stay compared with control groups.<sup>xxix</sup>
- The chronic care model (CCM) is a system-level framework used to guide quality improvement efforts in health care. However, little is known about its relationship to patient-level health measures. A practice's implementation of the CCM was significantly related to patient health status and HRQOL. Practices that used patient registries, health promotion champions, evidence-based guidelines, publicly reported performance measures, and support for behavior change were associated

with higher patient health levels (OR=1.28–1.98,  $p<0.05$ ). Adapting the CCM for prevention may serve to reorient care delivery toward more proactive behavior change and improvements in patient health outcomes.<sup>xxx</sup>

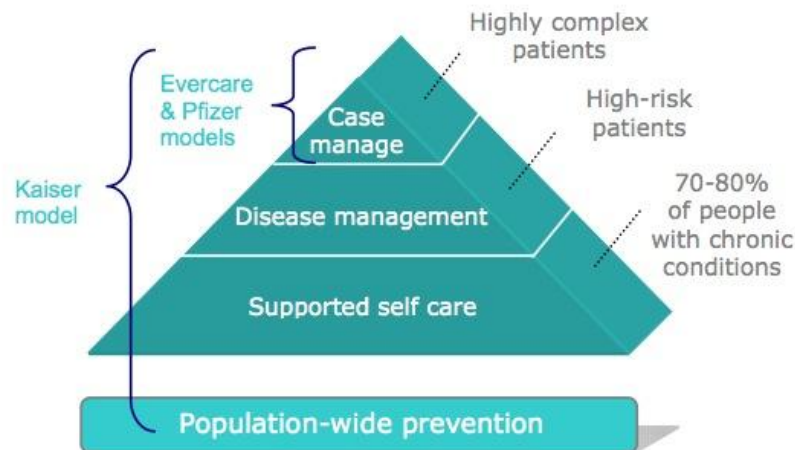
- The Chronic Care Model provides a useful framework for understanding the impact of chronic disease management interventions and highlights the gaps in evidence. The interventions most likely to be effective in the context of Australian primary care were engaging primary care in self-management support through education and training for general practitioners and practice nurses and including self-management support in care plans linked to multidisciplinary team support. The current Practice Incentives Payment and Service Incentives Payment programs could be improved and simplified to encourage guideline-based chronic disease management, integrating incentives so that individual patients are not managed as if they had a series of separate chronic diseases. The use of chronic disease registers should be extended across a range of chronic illnesses and used to facilitate audit for quality improvement. Training should focus on clear roles and responsibilities of the team members.<sup>xxxi</sup>

## Should all my Chronically Ill Patients use the CCM?

Evidence strongly favours managing all chronically ill people using the key elements identified in the Chronic Care Model.

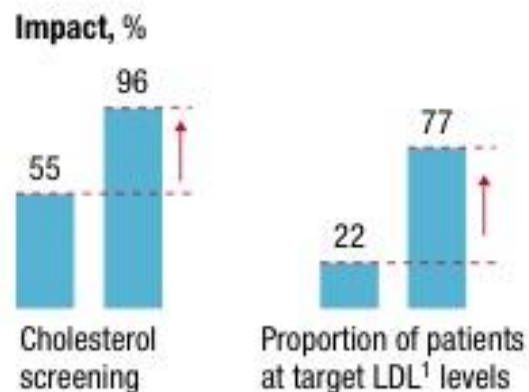
For example, Kaiser Permanente (Kaiser) in the US uses the elements of CCM for all their diabetes patients. Kaiser is one of the largest private healthcare organisations in the world with over eight million members. The Kaiser model focuses on integrating services and removing distinctions between primary and secondary care for people at all stages of the 'Kaiser pyramid'.

**The 'Kaiser Triangle' illustrating different levels of chronic care**



The approach taken by Kaiser is based on the Chronic Care Model. Kaiser focus on integrating organisations and disciplines. People with long- term conditions are stratified according to need, with intensive management targeted at those at highest risk.

**Exhibit:** The [Model] currently follows over 12,000 patients with CAD. The [Model] has demonstrated improvement in surrogate outcomes including: cholesterol screening (55% to 96.3%), the proportion of patients with a goal of low-density lipoprotein cholesterol (LDL-c) <100 mg/dL (22% to 76.9%), and has reduced the average LDL-c to 78.3 mg/dL for the CAD population it follows. The [Model] has shown a reduction in all-cause mortality associated with CAD by 76% in the patients followed by the service. Patient and physician satisfaction have been high with the [Model].<sup>xxxii</sup>



76% reduction in all-cause mortality  
73% reduction in cardiac mortality  
\$30 million in annualized cost savings

## Who Else is Using the Chronic Care Model

The CCM has been adopted worldwide by leading healthcare bodies, including:

- The American College of Physicians
- US Veteran's Affairs
- Kaiser Permanente (one of the world's largest private health organisations)
- The World Health Organisation
- State and Territory governments in Australia, Canada, and the UK
- Other countries worldwide

# The Evidence for cdmNet

## The Trials

### General metrics

The cdmNet trials<sup>xxxiii</sup> involved 97 GPs, 268 other healthcare providers (including practice nurses), and 733 patients with diabetes. From a baseline of zero, cdmNet broadband services generated 725 new care plans and 186 care plan reviews. cdmNet also collected over 30,000 health measurements, recorded over 2,000 appointments, and facilitated over 550 collaborative interactions between care providers. cdmNet sent 322 SMS reminders and 385 email reminders to patients. These services were provided to patients and healthcare providers covering 71 postcodes across regional, rural and remote areas of Victoria and Western Australia.

In the 16 months over which users progressively enrolled in CDM-Net there were over 90,000 page downloads from the cdmNet web site. This represents an average of about 200 care provider interactions with cdmNet per patient per year. Of these, 26,336 (or approximately 30%) involved care team members outside the GP practice, including allied health, specialists, and pharmacists.

### Estimates of care planning activity

The primary measure of the efficacy of CDM-Net is the degree to which the use of CDMS increased care planning activity. This was measured by the level of provision of Medical Benefits Scheme (MBS) Chronic Disease Management (CDM) items: GP Management Plans (GPMPs), Team Care Arrangements (TCAs), and the subsequent reviews of GPMPs and TCAs after a recommended period of six months.

Analysis of data pre and post the adoption of CDMS for a sample of eight GPs in the BSWR research evaluation showed increases of:

- 205% in GPMPs (compared with a regional change of 21% over the same period)
- 201% in TCAs (compared with 45% regionally)
- 595% in GPMP first (6 month) reviews (compared with 10% regionally)<sup>xxxiv</sup>
- 358% in TCA first (6 month) reviews (compared with 49% regionally)<sup>xxxv</sup>

For a sample of five GPs in the EGR for which pre and post data was available, the data showed increases of:

- 88% in GPMPs (compared with a regional decrease of 12% over the same period)
- 80% in TCAs (compared with a decrease of 10% regionally)
- 310% in GPMP first (6 month) reviews (compared with a decrease of 14% regionally)
- 220% in TCA first (6 month) reviews (compared with an increase of 32% regionally)

As the practices did not change their work processes to accommodate the use of CDMS, it can reasonably be assumed that these gains resulted in large part from improved productivity of the GP and/or the practice nurse through the use of CDMS.

Caution should be exercised in extrapolating the above results, given the relatively small sample sizes and the pre/post study design.

### Estimates of planned service use

Important measures of both the quality of care plans and whether or not these plans are acted upon is the degree to which patients are provided with the services recommended by best practice guidelines, such as HbA<sub>1c</sub> (blood glucose) tests and podiatrist services.

Analysis of Medicare claims data for the BSWR research cohort of 99 patients over a 10 month period shows that patients using CDMS receive a greater proportion of these services than patients on care plans prior to the use of CDMS. The proportion of patients on a care plan who received the recommended services increased by:

- 25% in HbA<sub>1c</sub> tests
- 5% in microalbumin tests
- 0% in HDL (high density lipoprotein) tests
- 707% in dietician services
- 68% in podiatry services, and
- 185% in Home Medicines Review (HMR) services.

These changes indicate that either many of the care plans created prior to CDMS did not include these recommended healthcare services or that patients were not followed up to ensure that they received these services.

The actual change in the number of patients provided the recommended services is further multiplied by the increase in the number of patients on care plans resulting from the use of CDMS. This results in the following overall increases in service use on a population basis:

- 82% in HbA<sub>1c</sub> tests (compared with 4% regionally)
- 75% in microalbumin tests (12%)
- 66% in HDL tests (-4%)
- 1645% in dietician services (26%)
- 151% in podiatry services (53%), and
- 498% in HMR services (23%).

## Users' perspectives

Interviews with professionals and patients reflected a positive view of their involvement in the CDM-Net project and their experience with cdmNet. All indicated they had experienced both positive and challenging aspects of cdmNet.

Approximately two thirds of the patients reported having Internet connected, of which 70% were using email and 70% were conducting Internet searches. Approximately 75% of the patient participants owned mobile phones and, of these, about 40% were using SMS. Hence cdmNet interactions with patients, especially reminders for tests and appointments via email or SMS, could be sent to around half of this population.

Questions were also asked about beliefs and attitudes to, and satisfaction with, cdmNet. Sixty one percent of patients agreed that they believed the care plan developed through cdmNet improved their control of diabetes and helped them comply with their care plans, with 29% unsure. Of the 50% of respondents that used email or received SMS, approximately 80% found cdmNet reminders and alerts helpful. Of importance to this study, two thirds of respondents agreed they would recommend that cdmNet be made available to others with diabetes, with 9% unsure.

## Extrapolation to the Australian Population

The tables below show the current Australian data on MBS CDM Item use per FTE GP.<sup>xxxvi</sup> Based on the Barwon South Western Victoria trials, adjusted for all chronic diseases from diabetes alone and assuming no practice nurse, the expected increase in MBS CDM Items (not including Annual Cycle of Care Items) from 145 Items to 590 Items per annum. In revenue terms, this represents moving from a revenue base for MBS CDM Items of \$14,964 to \$52,591 per annum (approximately 250% increase). Assuming GPs spent the same amount of time on MBS CDM items prior to using cdmNet, this represents a productivity improvement of about the same (250% increase or 3.5 times multiplier).

Including Service Incentive Payments (SIPs) and taking account of costs or loss of income in delivering these services, the net change in revenues from CDM Items is estimated to increase from \$5,505 to \$39,079 per annum (approximately 600% increase).

If the practice were to employ a practice nurse, and providing the same number of MBS CDM Items, net revenues per GP per annum are estimated to increase from \$10,159 to \$50,545 (approximately 400% increase).

**Warning: The increases estimated above can only be expected of regular users of cdmNet.**

<b>MBS CDM Services</b>	<b>Current</b>	<b>With cdmNet</b>
<b>GP Management Plan (721)</b>	54	134
<b>Team Care Arrangement (723)</b>	42	108
<b>GPMP Review (725)</b>	33	238
<b>TCA Review (727)</b>	16	110
<b>SIP (Diabetes)</b>	9	63
<b>SIP (Asthma)</b>	1	10
<b>Total</b>	155	662

<b>Revenues (\$s)</b>	<b>Current</b>	<b>With cdmNet</b>
<b>MBS CDM Items</b>	14,964	52,591
<b>Practice Nurse Support (10997)</b>	4,590	11,402
<b>SIP (Diabetes/Asthma)</b>	474	3,463
<b>PIP (Diabetes)</b>	171	1,251
<b>Practice Nurse Costs</b>	(2,716)	(2,716)
<b>Lost Consulting Time (Fees)</b>	(7,326)	(7,326)
<b>cdmNet Service Fee</b>	0	(8,122)
<b>Total</b>	10,159	50,545

### **Current User Experience**

Current user experience (as of end of July 2010) shows the top user of cdmNet generating annualised MBS CDM revenues (including HMRs but not including SIPs) of approximately \$75,000 per annum and the average of the top four users generating approximately \$50,000 per annum.

**Warning: The revenues indicated above can only be expected of regular users of cdmNet.**

## The Numbers

### Number of people with chronic disease

According to AIHW based on the ABS National Health Survey, some 77% of Australians in 2004-05 had at least one long-term condition defined as one which has lasted or is expected to last for at least six months. Vision and hearing problems and allergic conditions were common as were chronic conditions such as asthma (10.0% of the total population), osteoarthritis (7.9%), depression (5.3%) and diabetes (3.5%). Approximately 34.5% of the population (about 7 million people) had at least one of the ten major chronic diseases, excluding cancer and depression.<sup>xxxvii</sup> However, because the data should be treated with caution as people may have multiple conditions and reporting can under- or over-estimate actual numbers.

In their analysis of chronic disease and participation in work, AIHW estimates that there were 3,431,100 people aged 25 to 64 in 2004-05 that had one or more of the following chronic diseases: arthritis, asthma, chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD), depression, diabetes, osteoporosis and stroke.<sup>xxxviii</sup> This represents about 31.7% of the population in this age group. The numbers of people aged 25 to 64 with the most common chronic diseases in 2004-05 are listed below in Table 1. Adding together the numbers in the table overstates the number of people aged 25 to 64 with chronic disease as people can have more than one disease, especially in older age groups.

Table 1: Number of people with chronic disease aged 25 to 64, Australia, 2004-05

Arthritis	1,773,300
Asthma	990,100
CHD	87,300
COPD	298,500
Depression	761,400
Diabetes	287,700
Osteoporosis	238,400
Stroke	67,900

Source: AIHW (2008)

### Number of GPs

It is estimated there were 22,965 GPs in Australia in 2008,<sup>xxxix</sup> equivalent to 19,230 FWE GPs and 16,045 FTE GPs.<sup>xl</sup>

Based on a total chronic disease population of 7 million, the number of chronically ill people per FTE GP is 436 and per FWE GP is 364.

## Number of Claims

Table 2: Medicare CDM Items Claims (Medicare Data)<sup>xli</sup>

	State								Total
	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	
	Services	Services	Services	Services	Services	Services	Services	Services	Services
721	442,249	264,938	166,711	69,820	69,969	18,721	6,089	5,643	1,044,140
723	354,209	213,499	125,186	54,982	46,697	12,629	4,533	3,954	815,689
732	405,311	223,706	143,364	75,189	68,243	14,702	2,721	3,388	936,624
900	16,703	12,348	10,659	3,903	3,139	1,214	364	171	48,501
<b>Total</b>	<b>1,218,472</b>	<b>714,491</b>	<b>445,920</b>	<b>203,894</b>	<b>188,048</b>	<b>47,266</b>	<b>13,707</b>	<b>13,156</b>	<b>2,844,954</b>

	State								Total
	NSW	VIC	QLD	SA	WA	TAS	ACT	NT	
	Services	Services	Services	Services	Services	Services	Services	Services	Services
2517	30,917	24,712	15,599	10,993	8,609	2,260	1,014	394	94,498
2518	264	307	62	55	16	8	6	4	722
2521	21,142	16,312	9,709	5,469	5,840	2,130	487	243	61,332
2522	98	99	58	40	7	8	0	4	314
2525	3,187	1,389	1,445	626	368	403	176	572	8,166
2526	24	19	4	3	1	0	2	0	53
<b>Total</b>	<b>55,632</b>	<b>42,838</b>	<b>26,877</b>	<b>17,186</b>	<b>14,841</b>	<b>4,809</b>	<b>1,685</b>	<b>1,217</b>	<b>165,085</b>

Table 3: Medicare MBS Item Claims, 2009 (GP Division Data)<sup>xlii</sup>

MBS Item	Current Services	Current Benefits (\$m)
721	1,040,992	136
723	813,671	85
725 (732)	627,023	41
727 (732)	308,167	20
Total CDM Items	2,789,853	282
900	48,437	7
ACoC (diabetes)	165,085	7
Health check (CD)	324,918	65
Consult A	2,741,963	42
Consult A	81,864,328	2,778
Consult A	9,125,711	587
Consult A	743,642	71
Total Consults	94,475,644	3,478
All prof services	111,357,458	4,563

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i

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