

**Diabetes Integrated Care Trial
Mid-North Coast, New South Wales**

Economic Evaluation

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I Introduction: The Diabetes Integrated Care Trial

In 1995 the Department of Health, NSW with the support of the Commonwealth Department of Health and Aged Care established a Trial of Integrated Care for persons with Diabetes. The Trial was to be implemented at three Pilot sites, Western Sydney (also encompassing the Daruk Aboriginal Health Service), Mid-north Coast New South Wales (also encompassing the Durri Aboriginal Medical Service) and Far West New South Wales. The Trials had two broad objectives; firstly to improve the quality of management of persons with diabetes and promote early diagnosis and timely management, thereby to enhance patient outcomes; and secondly to develop a data base on persons with diabetes and their costs of management.

At each site the Trial proceeded through four broad phases:

Phase 1 - Establish infrastructure support,

Phase 2 - Gain commitment from participants and service providers for involvement in the project and the evaluation;

Phase 3 - Conduct education sessions for GPs and collect base line data;

Phase 4 - Service delivery and conduct of evaluation and final reporting.

The intervention was tailored for each site but incorporated a number of common themes, notably:

- a clinical audit of GP management of their diabetic patients,
- support for GPs to participate in the recording of relevant clinical and other data on their diabetic patients on the 'Diabnet' data form,
- training for GPs in management of their diabetic patients,
- employment of a nurse educator to support the GP in the management of the person with diabetes and improved access to diabetes medical specialists.

A number of additional activities were undertaken for evaluation purposes, and to obtain additional information on persons with diabetes and their costs of management. Some of the activities identified above had a dual evaluation and clinical role, notably the collection of information through Diabnet. Other specific evaluation tasks included the collection of information on service use and cost and implementation of a health and satisfaction questionnaire. This incorporated a generic quality of life instrument, the SF-36.

As the intervention was implemented in the context of standard clinical care, with services offered to all those who would normally receive such care, the design of the Trial does not meet a preferred evaluation protocol. Participants, both patients and GPs, self selected for involvement in the pilot, and there is no control group with whom outcomes and costs can be compared.

Evaluation thus relies on a before/after methodology. This is problematic in that any changes identified (or lack of change) cannot readily be attributed to the intervention.

The Mid-North Coast Trial

The Mid-north coast trial commenced in November 1996 and continued for 2 years. A key intervention element was the establishment of mini-clinics at participating general practices and at the Durri Aboriginal Medical Service. The mini-clinics offered a complications assessment, clinical investigation and the negotiation of a care and treatment plan with the patient's general practitioner.

The mini-clinics were staffed by a visiting endocrinologist and diabetes nurse educator, dietitian and podiatrist. An outreach clinic was provided to Durri AMS for 42.5 hours/month, where 204 patients were screened. This and other information in this section is derived from the Macleay Hastings Diabetes Pilot – Project Evaluation Report, (March 1998).

Specific training was provided in diabetes education to enhance the quality of care of the diabetes educator/health worker. The role of the diabetes nurse educator was that of formal recruitment of patients into the Trial, collection of evaluation data, as well as the provision of a clinical service to referred clients. In the absence of a report of funds allocated to the Macleay Hastings Valley Diabetes Pilot, the resourcing defined in the original budget is used to define the additional staffing and costs of the pilot. While there were known to be some departures (over and under), a final statement of resourcing was not provided to the evaluation team and could not be used.

The original budget provided for 49 hours of diabetes educators (which was increased by 7 hours/week, on top of the previously existing diabetes education service), plus 38 hours per week for dietitian services, 7 hours per week for a podiatrist, 24 hours per week for an aboriginal health worker, plus funds for a project officer, GP administrator and other administrative, and other costs. The Pilot was also responsible for running mini-clinics with a visiting endocrinologist, whose travel to Port Macquarie was supported by the Pilot. At the same time a private physician established a special diabetes foot clinic (although not funded through the Trial).

Of GPs in the area, 76% participated in the Pilot, representing 83% of the members of the Port Macquarie Division of GP. These GPs identified 630 persons with diabetes who were registered with Diabnet plus 125 persons from the Durri Aboriginal Medical Service.

Guidelines for management of persons with diabetes were distributed to all participating GPs and other relevant service providers. Training for GPs in the management of diabetes was provided through two weekend seminars incorporating lectures and practical skills development, followed up by lectures and opportunities to observe clinical specialists. Almost all participating GPs (96%) attended training. People with diabetes were encouraged to attend formal education and training to enhance self management skills.

An active community awareness element highlighted the importance of diabetes. A parent support group for parents of children with diabetes was introduced and meetings facilitated by the Pilot.

An aim was to encourage a more collaborative approach to care. Results for the structural analysis questionnaire implemented in the Mid North Coast in 1997 (at baseline) and 1998, suggest a slightly more collaborative approach to the care of persons with diabetes in 1998. The Report of the Evaluation prepared about the Macleay Hastings Valley Diabetes Pilot states that a substantial improvement in collaboration of care between the GP and other health professionals

was achieved. There was also a view that the respective roles of the Division of General Practice, the Area Health Service and the AMS had become clearer with more cooperative relationships established¹.

The Economic Evaluation

Ideally an economic evaluation will establish whether a program/health service intervention has represented a worthwhile application of the community's scarce resources. This requires a comparison of program costs and program benefits. Generally the best way to determine program impacts, both costs and benefits is by a comparison of costs and outcomes between a control and intervention group. In the absence of a control group the capacity to determine the effect of a program and thus performance is seriously compromised.

What has been accomplished is an analysis of data to ascertain the cost of management of diabetes by disease stage. This is of interest firstly for descriptive purpose – do health service costs increase with disease progression. This information may also have potential policy relevance in the context of a debate about capitation based funding models. It may provide a possible basis for determining appropriate levels of funding for persons with diabetes, as a function of disease stage.

It might also enable the impact on downstream use of health services and their costs to be modelled in the context of a diabetes intervention designed to modify the rate of disease progression.

Two types of outcome measure have been analysed - quality of life as measured by the SF-36 and selected clinical parameters recorded on the Diabnet form. Quality of life, based on the eight dimensions of the SF-36, has been analysed by disease stage, and a comparison made between scores at base line and at 18-24 months. The measurement of HbA1c provides the most direct evidence concerning the effectiveness of the program in improving management of diabetes. Blood pressure readings are also reported but are considered less reliable, and also not an issue for all persons with diabetes.

While a before/after study design is used in program evaluation and can be quite powerful, especially in relation to a chronic disease for which standard rates of disease progression are well understood, there are known problems in the before/after study design. Firstly the normal rate of disease progression in relation to diabetes is not well documented. Even where there is reasonable information, as with diabetic retinopathy, averages derived from the international literature cannot be applied with any confidence to a specific community, as it is known rates of disease progression vary markedly between communities.

The second problem relates to the Trial population for which data is available, for which there are two main sources of bias. Firstly there is self-selection bias, in the GPs who have agreed to participate and patients who have been recruited and consented. It is not known whether they represent a representative sample of all GPs and of all persons with diabetes in the region. In relation to the patients for whom complete health service use and cost data and quality of life and clinical data was made available to the evaluators there are major problems. Because of concerns about the original consent process, a decision was made to seek the re-consent of all

¹ Diabetes Integrated Care Pilot Project in Mid North Coast, Far West, Western Sydney, Sept 1999, Draft Report p8 and p9.

participants for the evaluation in April/May 1998, towards the end of the Pilot project. Not surprisingly many did not take the step of re-consenting at this stage, so only 331 of the more than 600 who originally consented provided data for use in the evaluation. This of course excluded any who had died between Trial commencement and the re-consent date, and will probably have excluded many who were gravely ill. Persons with the aboriginal medical service did not participate in the re-consent process.

This loss represents a major flaw in the sample frame, both in terms of numbers and thus potential to detect change or describe cost by disease stage, and potential source of bias for a before/after study design.

The final difficulty with the evaluation relates to the conduct of an evaluation of an intervention introduced into the normal clinical practice setting, where participants do not necessarily understand or respect research principles. Combined with a situation where key evaluation instruments, such as the Diabnet form used to allocate patients to disease stage, were being developed/refined as the Trial went into the field, means that the collection of data, particularly around disease staging is not entirely reliable. The allocation of persons with diabetes to a meaningfully defined disease stage is not a simple task. The Diabnet form was developed largely as a clinical audit/management tool, it was not designed specifically for the purpose of establishing disease stage. There were difficulties in completion of the form and omissions and inconsistencies. There are a number of 'history of disease/event' questions that are somewhat confusing. Thus because of these limitations in terms of evaluation design and data, the results of this evaluation must be considered preliminary.

The economic analysis has focused on an assessment of the cost of management of diabetes in total, and by disease stage and by cost category, and how this has changed over the time frame of the trial. Any observed changes in health outcomes, as defined by the SF-36 and clinical parameters, need to be interpreted with caution.

II Data Sources

Costing Data

Health service use and cost data has been obtained for; hospital in-patient services, out-patient services, medical services and pharmaceuticals subsidised through the Pharmaceutical Benefits Schedule.

Hospital in-patient services cover all hospital admissions in NSW that could be identified from the NSW Health Department hospital in-patient data base, matched on patient name, Medicare number and date of birth. For each Trial participant information was gained for the four-year period from July 1 1994 to June 30 1998. This covers a 28 month period prior to Trial commencement (participant enrolment occurred between November 1996 and October 1997), and a 9 to 19 month post Trial period. In-patient costs were taken as the DRG cost adjusted for the patient length of stay.

Hospital outpatient services: cover all public hospitals and community health centres within the Mid-north Coast Health Service Region, for Pilot participants. Coverage is not complete but dependent on the quality of service records. These were obtained for the 4-year data period, although it is not clear whether the extent of coverage is consistent across the period.

Medical service: cost and service use data has been obtained from the Health Insurance Commission on all private medical services claimable through the HIC for the 4-year data period. The data has been separately analysed to identify GP services, specialists visits, pathology services, radiology services, and other tests.

Pharmaceuticals: recorded by the HIC, which covers scripts that attract a government contribution. This includes scripts costing more than the patient co-payment of \$3.00 for Health Care Card Holders and \$20.00 for others, until the safety net is reached and individual patient identification is not recorded. Audit conducted as part of the National Coordinated Care Trials suggests that perhaps 60% of all scripts are captured.

As the safety net is reached as the year progresses there is an increasing loss of data in the last few months of the year. The effect is compounded as patients increase script purchases while on the safety net, reducing purchases in the first months of the year. For this reason pharmaceutical data is seasonally adjusted.

Patient Diary record of patient out-of-pocket costs: completed by a sample of 75 from the 331 participants who re-consented. Records were kept for up to 12 weeks and recorded as weekly amounts in the categories for drugs, other consumables (such as tests strips, special foods), services, travel (eg to/from medical appointments) and exceptional expenses, (for dental, glasses, glucometer etc.)

There has been no audit of this data and its validity is doubtful. For this reason it is simply reported, but not added to the cost of care used to establish changes in cost over time or cost by disease stage.

Disease Stage

A method of allocating persons with diabetes according to disease severity was required to establish the rate of disease progression, and cost by disease severity. A disease stage classification system was defined by an expert group, but the basis for allocation to disease stage was limited to reflect data being collected through Diabnet. Persons with diabetes were allocated a disease stage number covering both microvascular and macrovascular disease. Evidence of disease progression and comorbidity were specified and used to classify persons with diabetes into 1 of 4 broad disease stages for micro-vascular and macro-vascular disease as well as 44 detailed comorbidity codes. The four broad disease stages with examples of the sub-stages are summarised in Table 1.

Table 1 Summary of Disease Staging Classification System

Broad classification		Example of detailed classification
1. micro-vascular	no evidence of microvascular co-morbidity	distal foot pulse normal, albumin normal, no evidence of retinopathy, peripheral sensation normal.
2. micro-vascular	screen detected microvascular comorbidities	background retinopathy, albumin 30-300µg/min creatinine normal, peripheral sensation abnormal, etc.
3. micro-vascular	moderate microvascular comorbidities	preproliferative retinopathy, proteinuria > 150mg/24 hrs, etc.
4. micro-vascular	late stage micro	blindness due to diabetes, hospitalised for foot problems, amputation of lower limb, etc.
1. macro-vascular	no evidence of macrovascular risk factors	no claudication, no cardiac disease, cholesterol, HDL normal, not current smoker, not hypertensive.
2. macro-vascular	risk factors for macrovascular disease	Cholesterol>5.5mmol/L, HDL < 1.0 mmol/L, current smoker, hypertensive, etc.
3. macro-vascular	moderate macrovascular comorbidities	PVD, history of angina or MI, stroke without residual deficit
4. macro-vascular	late stage macro	recent MI, CABG, end stage renal failure, stroke with residual deficit etc.

III Results

Costs - Introduction

Results are reported for cost of management in total and by disease stage, prior to the intervention and once the intervention had commenced. Because there is no control group, any observed differences in cost and outcome before and after the pilot, cannot necessarily be attributed to the intervention. For instance, changes may reflect general changes in patient management that have occurred over that period. (For example in the management of heart disease, the use of procedures post heart attack has increased greatly, over the time frame of this trial, see Richardson et al 1999).

Average Total Cost

Average annual cost of care for a person with diabetes, for in-patient and outpatient services, medical services and pharmaceuticals covered under the PBS, was \$4,133 for trial participants, based on data covering the period July 1 1995 to June 30 1998.

For the period the 12 month period before the Pilot: determined separately for each participant based on the date of their first Diabnet snapshot, but excluding out-patient data for which consistency of cover across the entire period is uncertain, mean total cost of care was \$3,789 per person with diabetes. This included \$1,600 for in-patient costs, \$1,120 for pharmaceuticals and \$1,067 in medical services, made up of \$313 for general practitioner services, \$360 for specialists, \$163 for pathology and \$159 on imaging. Compared with the period 12 months after project commencement, total cost of management had increased by 19%, with a marked

difference in the distribution of costs. There had been a substantial increase in the cost of GP services, up by 30%, specialist services had increased by 69% and pathology by 24%, (all statistically significant). The number of pathology services had increased by 54%.

These increases are consistent with the change in clinical practice that the Trial had sought to achieve, notably more timely referral to specialists and more pro-active management by the GP. The increased use of specialist services was supported by the establishment of the mini-clinics staffed by the visiting endocrinologist, diabetes nurse educator, dietitian and podiatrist. Other changes in health service use were more modest, with use of in-patient services up by only 12%, and PBS up by 11%.

Lower cost increases are identified if a single cut-off date of January 1 1997 is selected to define the before and after trial period. This lends support to the conclusion that the observed changes are directly attributable to the Pilot. Using the fixed time definition, comparing costs incurred between July 1995 and end December 1996 with the period from January 1997 to end June 1998, in-patient costs had increased by 4%, MBS by 28% and PBS 27% increase.

The data suggests that integrated care was responsible for in a large increase in the use and cost of private medical and pharmaceuticals, with a more modest increase in in-patient services. This has resulted in the share of costs accounted for by in-patient services from 46% of total costs of diabetes care to 41% over the three years of the Pilot. These results are summarised in Table 2.

**Table 2 Annual Cost of Management of Patients with Diabetes
NSW Mid North Coast Diabetes Integrated Care Project**

	Pre trial July 1995 to Dec 31 1996	During trial Jan 1 1997 to June 30 1998	% change	
			18 months pre/post 1 Jan 1997	Pre/post date of enrolment in trial*
Total cost	\$3,818	\$4,448	+17% p=0.16	+ 19%
In-patient costs	\$1,774	\$1,840	+ 4% p= 0.84	+ 12%
Outpatients	\$ 159	\$ 248	+ 55% p=0.00	n.a.
PBS	\$ 953	\$1,207	+ 27% p=0.00	+ 11%
MBS	\$1,091	\$1,401	+ 28% p=0.01	+ 38%
- GP	\$ 323	\$ 397	+ 23% p= 0.05	+ 30%
- specialist	\$ 345	\$ 532	+ 54% p= 0.02	+ 69%
- optical [#]	\$ 62	\$ 67	+ 8% p=0.68	+ 17%
- imaging	\$ 180	\$ 169	- 6% p=0.57	+ 7%
- pathology	\$ 152	\$ 199	+ 30% p=0.00	+ 24%
- other tests	\$ 29	\$ 38	+ 30% p=0.12	+ 47%

Note: *determined by completion of first diabnet form.

[#]optical = ophthalmology and optician services

The growth in cost of in-patient services is similar to the trend growth in the cost of in-patient services across NSW. Between 1995-6 and 1996-7 total hospital expenditure in NSW increased

by 5.9% from \$5,305 million to \$5,617million (or just taking non-psychiatric public hospitals, an increase of 4.2%).

A small part of the change in cost of care is likely to reflect cost inflation, but in a way that is far from uniform across modalities of care. The health price index increased by only 1.6% between 1996-7 and 1997-8 (AIHW 1999). However, looking at change in use of services, the number of specialist services increased by 27% compared with a 54% increase in costs, while on the other hand, the number of pathology services increased by 54% with only a 30% increase in costs (before and after July 1 1997).

Total cost of care must also includes the direct costs of the integrated care pilot not captured in the HIC or hospital costs data sets. Additional costs were incurred to support the mini-clinics - for the diabetes nurse educator, podiatrist and dietitian. The endocrinologist is captured in the HIC medical costs), the costs of promoting best practice care in general practice through GP training and costs associated with the Diabnet form. Activities attributable solely to the evaluation have been excluded. An estimate of the costs of Program implementation are reported in Table 3.

**Table 3 Other Direct Costs of the Integrated Care Trial - as per Budget*.
Total over two year trial period \$`000**

Cost item	\$`000	Comment
1. Division related costs		
- GP administrator	79*	* partly allocated to diabetes education
- Project officer	36	
- GP training/meeting attendance/form completion	64	
2. Support to mini-clinics and etc.		
- diabetes nurse educator	110#	#partly for evaluation purposes
- podiatrist	16	
- dietitian	78	
- aboriginal health worker	39	
3. Consumables etc.		
- office costs	8	~ excluding software development
- travel, outreach	40	
- tests costs, HbA1c, BSL, glucometer	61	
- advertising, resource materials	20	
- Computing costs, including audit	9~	
TOTAL	560	

Notes: * as per Budget for Macleay Hastings Valley Diabetes Pilot allocated to the Health Service, the Durri AMS and the Division. Some departure from budget occurred, such that costs incurred were less than those identified, but exact figures have not been provided.# while partially for improved clinical management and partly for evaluation purposes, entire cost allocated to clinical management, but allocated over 4 years.

Costs are based on data provided by the Mid North Coast Area Health Service and the Port Macquarie Division of General Practice. Costs are thus more a reflection of the initial budget than monies actually spent. Program costs amounted to some \$560,000 over two years of the pilot, equivalent to approximately \$440/patient/annum, allocated across the 630 enrolled participants in the Pilot. The main costs were for diabetes nurse education, dietitian and podiatry at \$224,000, \$64,000 for GP training and form completion, and around \$100,000 for management. The estimated cost per participant should arguably be lower. If the costs of GP training and other GP related costs were allocated over other persons diagnosed (or yet to be diagnosed) with diabetes, cost per participant would be reduced. Secondly, some of the nurse education task was for the evaluation (not service delivery). Finally part of the Division Budget remained unspent. On the other hand none of the management costs incurred by the New South Wales Health Department have been attributed to the Pilot site. On balance, additional annual patient costs of \$400 may be a reasonable estimate of direct Trial costs.

Adding together the health service costs through the HIC and the hospital sector with other direct costs of the Pilot, the total cost of management of the person with diabetes is estimated at approximately \$1,000 more during the Pilot than prior to commencement of the Pilot, an increase of 25%. Cost inflation probably accounts for a small component of the observed increase, with most of the increase reflecting a greater use of physician services and pathology plus the direct project costs. The latter accounts for approximately 10% of the costs of care.

The estimated cost increase does not take account the effect of an aging/sicker population group, which will explain a small part of the cost increase. This matter is considered again after the analysis of cost by disease stage. As noted earlier this analysis is confounded by the lack of a control group.

Out-of-pocket Costs

A diary was implemented for a sample of patients to establish additional out-of-pocket costs not captured in the standard data sets. As the reliability of this data is uncertain it has not been added to the total patient cost estimate. It is suggested that these values be treated as indicative.

Additional costs per patient were estimated at \$4.95/week per person on average for health related products such as test strips and special foods. If special foods are excluded the figure is just over \$1.00/week. Expenditure on health services excluding medical - for podiatry, chiropractic etc amounted to an estimated \$3.70/week. Respondents identified expenditure of \$135/person on occasional items, such as reading glasses, special shoes, extra-ordinary travel, glucometer. It is not certain how these expenses should be treated in the context of an annual costing. The data suggests that persons with diabetes spend on average some \$6.00/week on health related products (excluding medicines) and health services, plus at least \$135/year on occasional items. This is equivalent to an average of over \$400/year on management of their diabetes, additional to the costs identified through the HIC and hospital data bases. Patient contributions to medicines on the PBS are captured in the HIC data base for those medicines for which the price is above the co-payment level.

Cost by Disease Stage

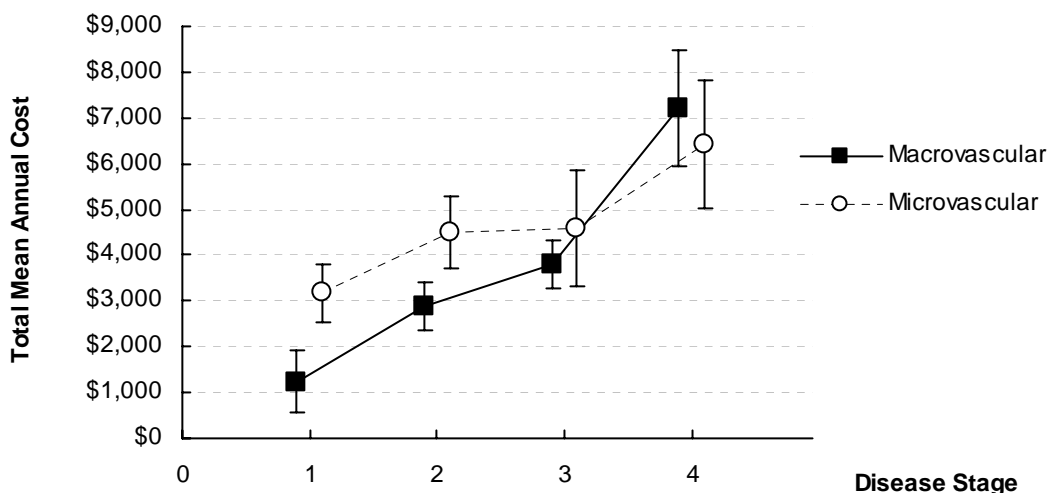
The cost of disease management, in total and for all major health service categories, is correlated with disease stage. This is demonstrated in Tables 4 to 8 and Figures 1 to 9. It is also apparent that cost is more influenced by macrovascular disease stage than micro-vascular disease. Mean cost per person with diabetes increases from approximately \$1,000/person per year for a person with no risk factors and comorbidities for micro or macro-vascular disease, up to a mean of \$9,000/year for persons with both advanced microvascular and macro-vascular disease.

In-patient costs did not change greatly for microvascular disease stages 1 to 3 but increase sharply to stage 4 micro, up from typically \$1,000 to \$1,500/patient year to \$3,500/patient year. In relation to macro-vascular disease in-patient costs show a more steady increase from close to zero up to \$3,600/patient per year at stage 4 macro. Expenditure on PBS displays a far flatter pattern, with drug costs consistently between \$1,000 and \$1200/patient year, except in persons without macro-vascular comorbidities who incur far lower drug costs. Costs of GP management is relatively flat in relation to micro-vascular disease, between stages 2 and 4, but increase consistently in relation to macrovascular disease from around \$200/patient/year to over \$500/patient per year. Specialist costs are relatively flat in relation to macrovascular diseases until stage 4 is reached, while in relation to micro-vascular disease costs increase steeply till stage 3 and then fall back.

Cost by Disease Stage: Comparison Before and During

The pattern of costs between disease stage is relatively similar before and during the intervention. The main differences relate to MBS costs, which show a substantial increase in the medical costs of managing micro-vascular disease stages 2 and 3 and macro-vascular disease stage 4. Use of pathology services has also increased especially for micro and macro disease stages 4. The increase in cost represents a substantial increase in service use as unit costs had fallen over the period of data collection.

Figure 1 Total Annualised Cost by Disease Stage: July 1 1995 to June 30 1998



In short there has been a substantial increase during the Pilot of medical services, especially in those with advanced diabetes. This is indicative of a move towards the adoption of best practice care, and reflects the greater access to specialists and the establishment of the diabetes mini-clinics. In contrast the cost of in-patient services increased only slightly and largely in the management of persons with early stage microvascular disease (such as foot ulcer).

Figure 2 Annualised Cost of In-patient Services by Disease Stage: July 1 1995 to June 30 1998

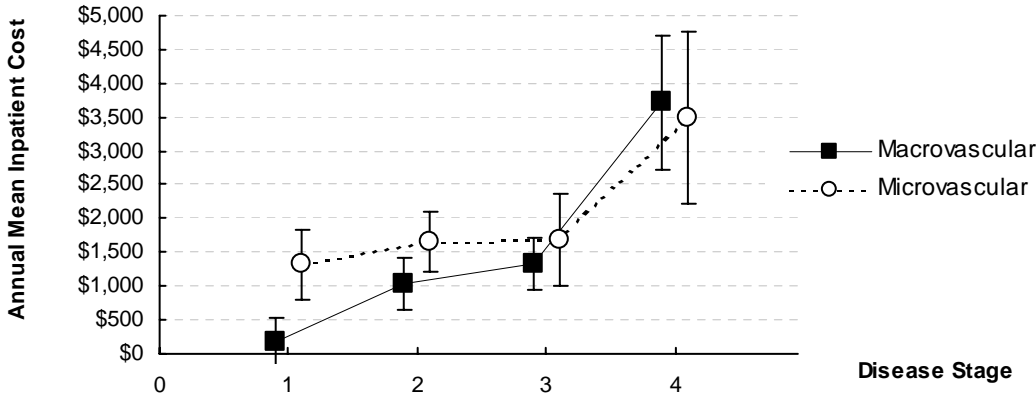


Figure 3 Annualised Cost of Out-patient Services by Disease Stage: July 1 1995 to June 30 1998

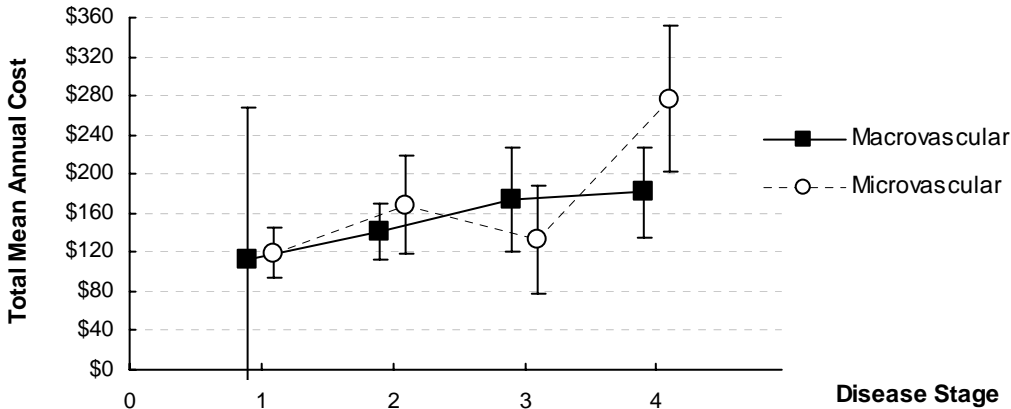


Figure 4 Annualised Cost of PBS Services by Disease Stage: July 1 1995 to June 30 1998

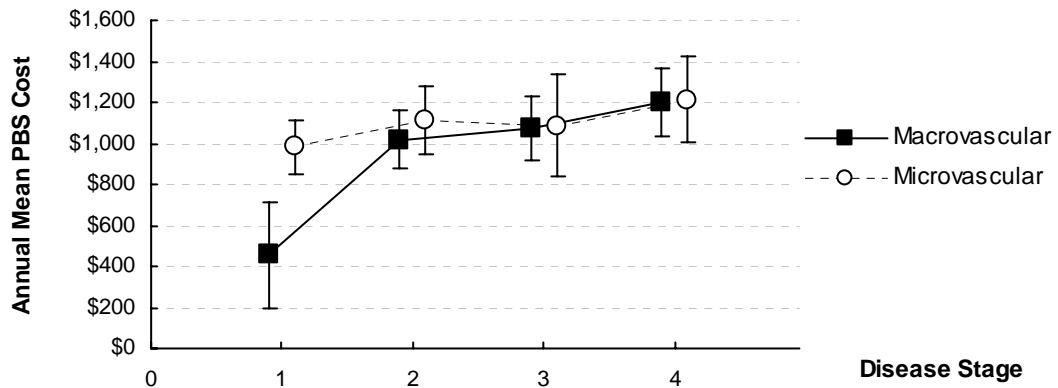


Figure 5 Annualised Cost of MBS Services by Disease Stage: July 1 1995 to June 30 1998

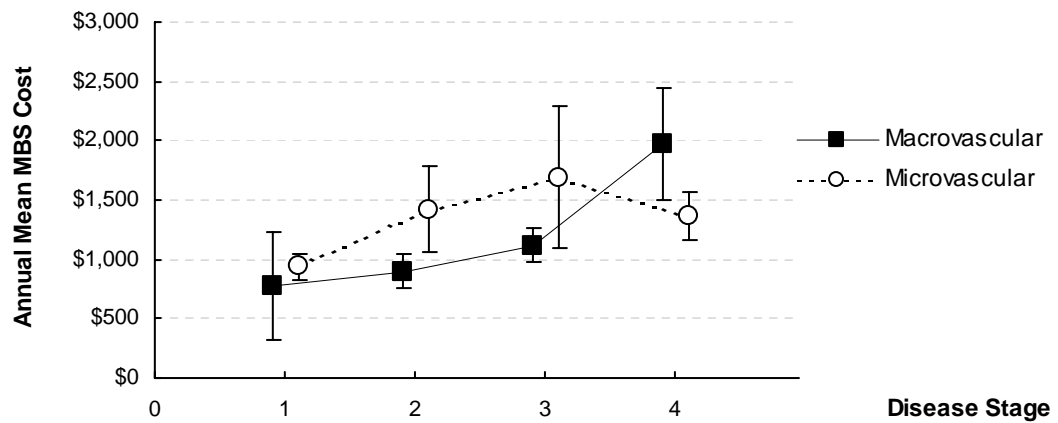


Figure 6 Annualised Cost of MBS Imaging Services by Disease Stage: July 1 1995 to June 30 1998

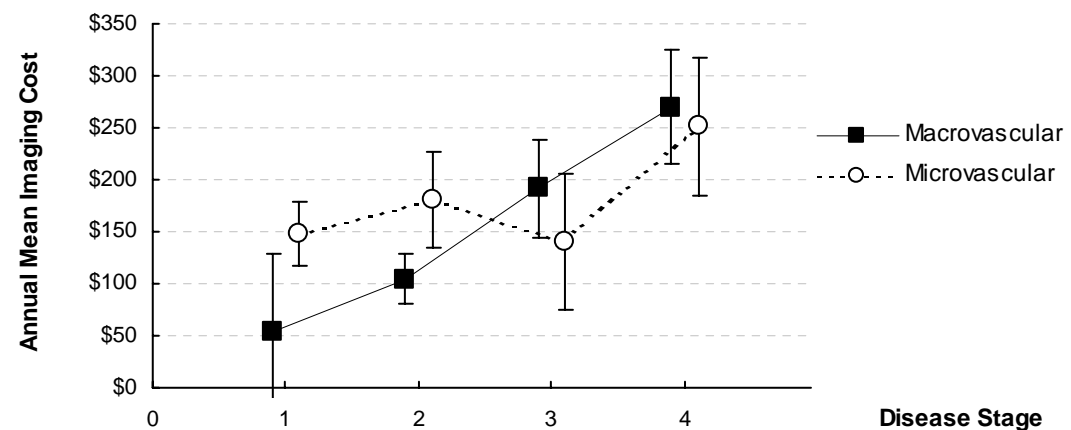


Figure 7A

July 1 1995 to Dec 31 1996

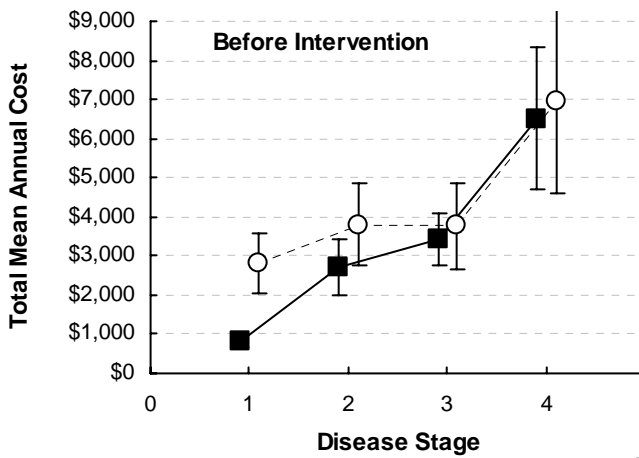


Figure 7B

Jan 1 1997 to June 30 1998

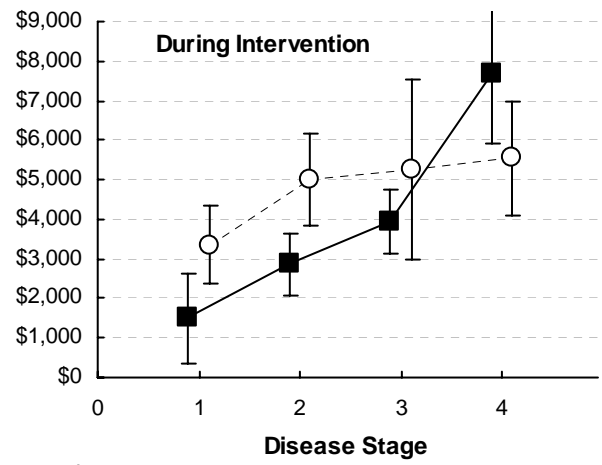


Figure 8A

July 1 1995 to Dec 31 1996

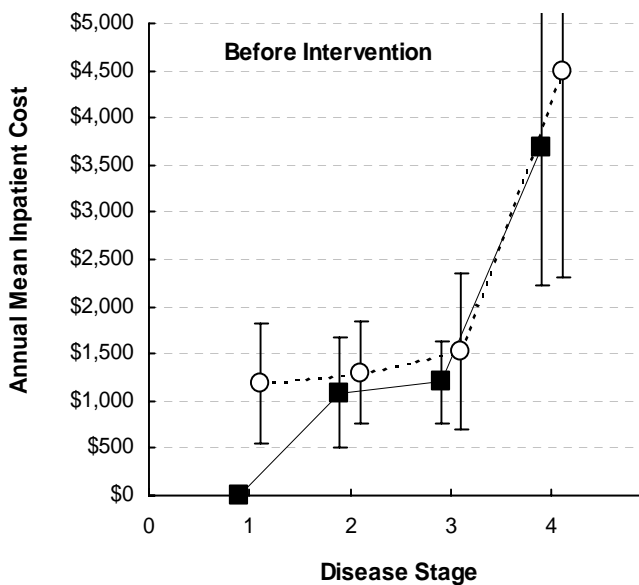


Figure 8B

Jan 1 1997 to June 30 1998

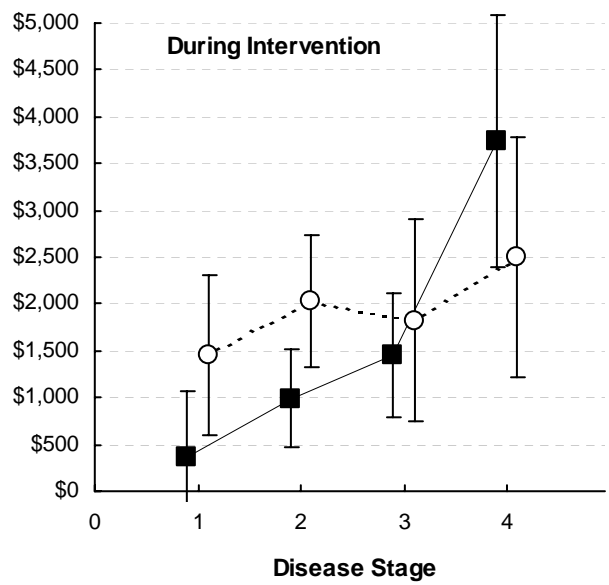


Figure 9A

Annualised Cost of PBS Services by Disease Stage
July 1 1995 to Dec 31 1996

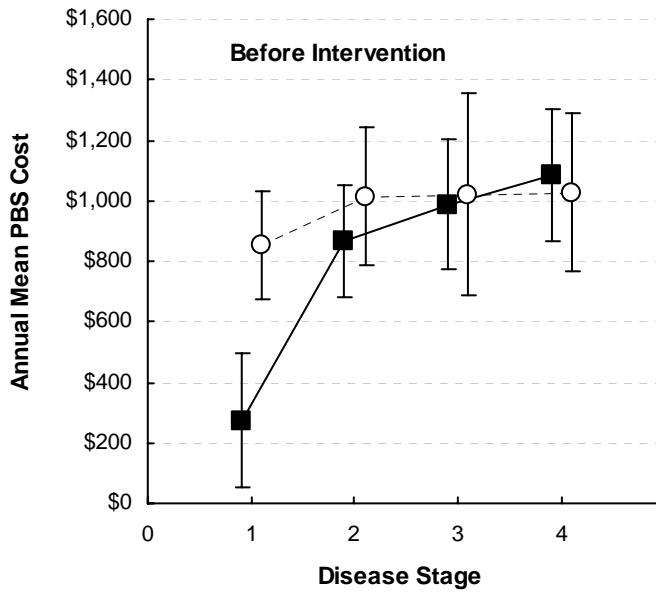
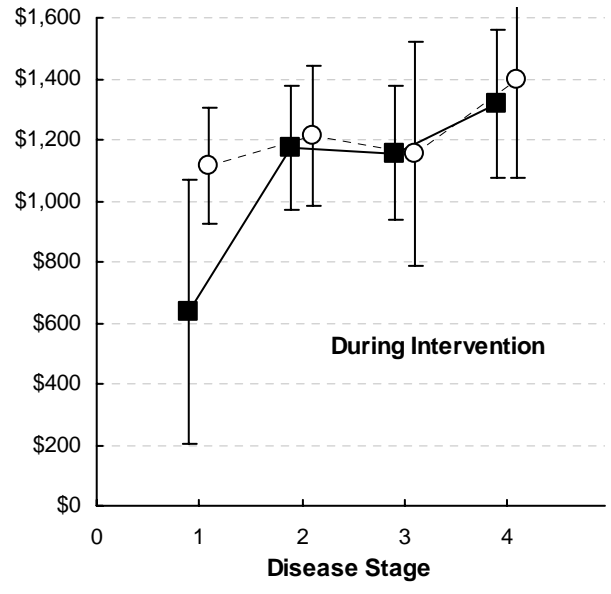


Figure 9B

Annualised Cost of PBS Services by Disease Stage
Jan 1 1997 to June 30 1998



—■— Macrovascular
--○-- Microvascular

Figure 10A

Annualised Cost of MBS Services by Disease Stage
July 1 1995 to Dec 31 1996

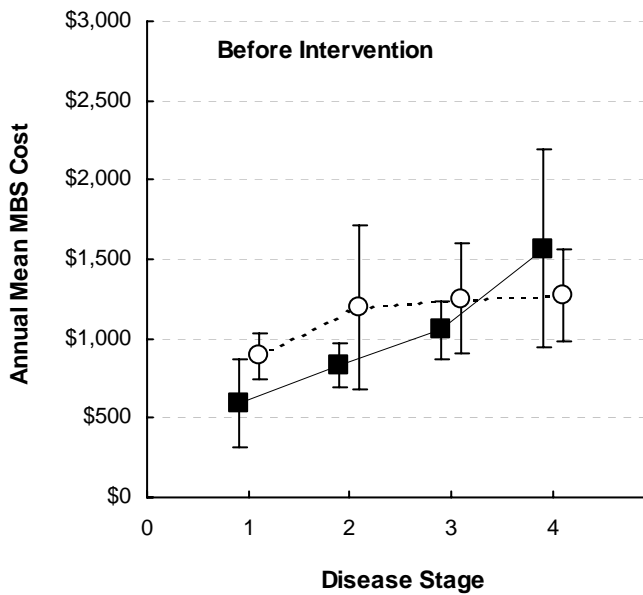
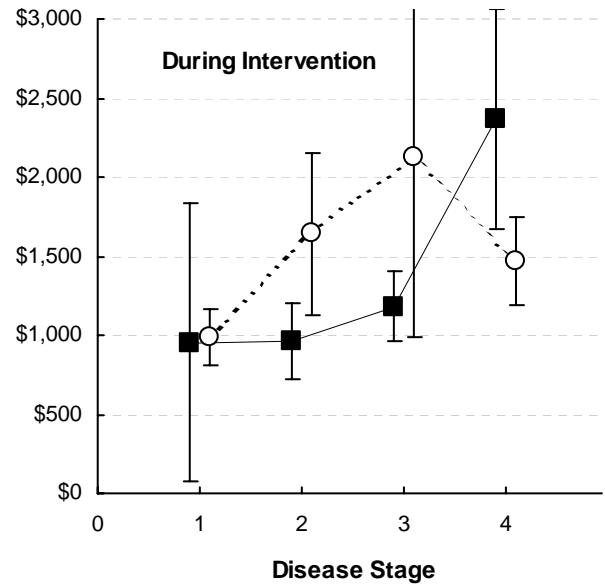


Figure 10B

Annualised Cost of MBS Services by Disease Stage
Jan 1 1997 to June 30 1998



■ Macrovascular
 ---○--- Microvascular

Figure 11A

Annualised Cost of GP MBS Services by Disease Stage
July 1 1995 to Dec 31 1996

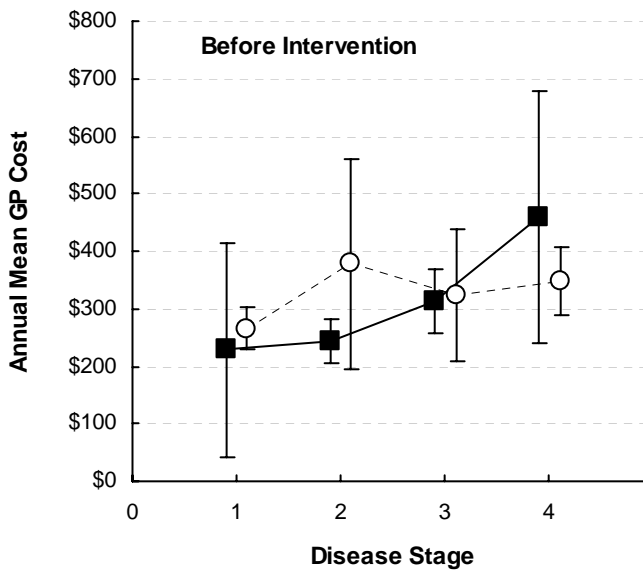
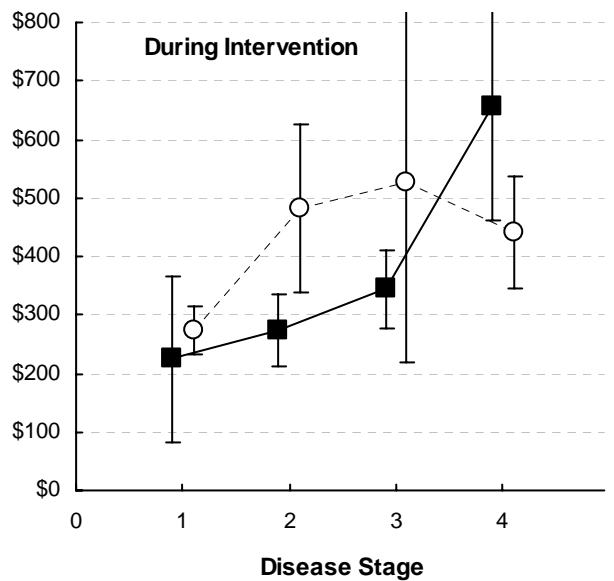


Figure 11B

Annualised Cost of GP MBS Services by Disease Stage
Jan 1 1997 to June 30 1998



■ Macrovascular
 ---○--- Microvascular

Figure 12A

Annualised Cost of Specialist MBS Services by Disease Stage
July 1 1995 to Dec 31 1996

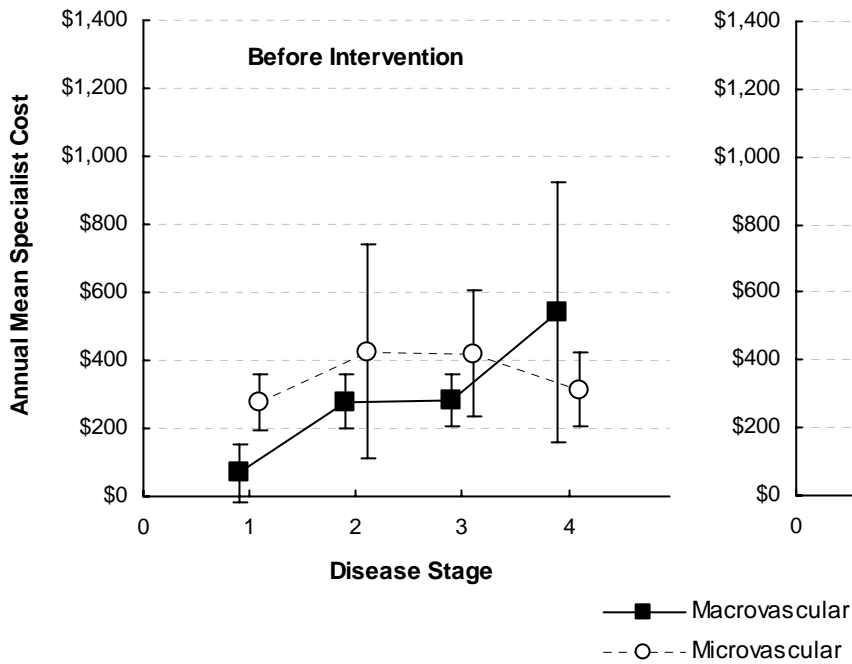


Figure 12B

Annualised Cost of Specialist MBS Services by Disease Stage
Jan 1 1997 to June 30 1998

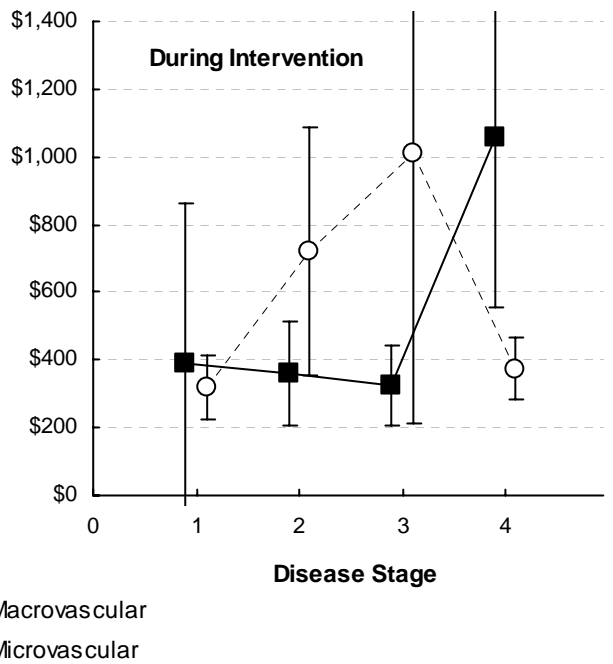


Figure 13A

Annualised Cost of Pathology MBS Services by Disease Stage
July 1 1995 to Dec 31 1996

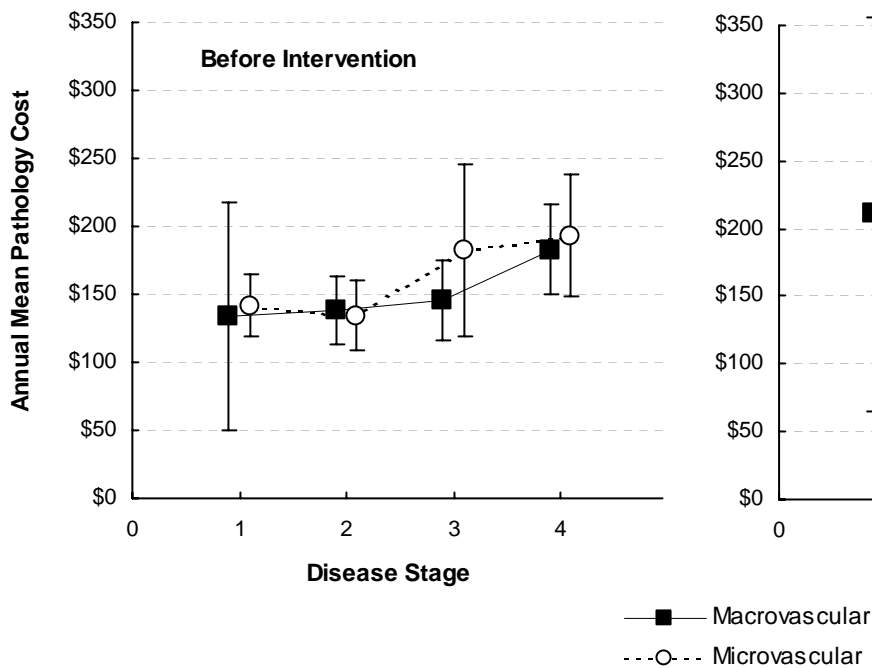


Figure 13B

Annualised Cost of Pathology MBS Services by Disease Stage
Jan 1 1997 to June 30 1998

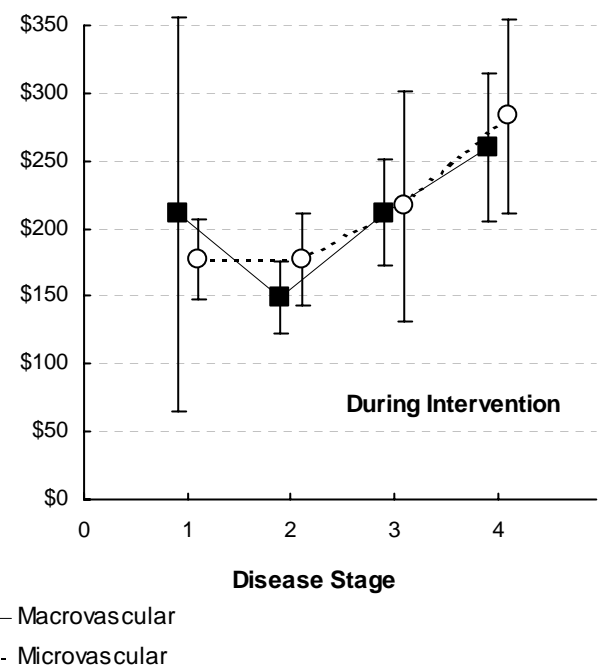


Table 4 Mean Total Cost by Disease Stage (dollars)

Microvascular disease	Macrovascular disease				
	Stage 1	Stage 2	Stage 3	Stage 4	All macro
stage 1	n<3	n<3	n<3	n<3	1 239
stage 2	2 746	2 920	3 562	2 820	2 884
stage 3	2 489	4 338	3 616	5 794	3 802
stage 4	5 198	7 393	8 414	9 068	7 224
all micro	3 168	4 514	4 599	6 429	

Note: Excludes cells with n<3

Table 5 Mean Total Cost by Disease Stage : Before and During (dollars)

Disease Stage	Microvascular		Macrovascular	
	Before	During	Before	during
stage 1	828*	1 500	2 819	3 357
stage 2	2 713	2 867	3 808	4 995
stage 3	3 441	3 931	3 782	5 238
stage 4	6 510	7 694	6 953	5 537

Note: * small n

Table 6 Rank cost order by disease stage

Disease stage	Mean cost
micro 1, macro 1 or 2	971
micro 1, macro 3	2 310
macro 1, micro 2 or 3	2 635
micro 2, macro 2	2 920
micro 2, macro 3 or 4	3 190
micro 3, macro 2 or 3	4 086
micro 4, macro 1	5 198
micro 4, macro 2	7 393
micro 4, macro 3	8 414
micro 4, macro 4	9 068

Quality of Life

Quality of life of persons with diabetes who participated in the Trial has been measured at commencement of the pilot, and towards the end of the Pilot using the SF-36 quality of life instrument. This provides a score across eight sub-scales and two summary scales. An assessment has been made of patient quality of life by disease stage, at the commencement and after approximately one year into the Pilot.

Overall, quality of life of persons with diabetes is observed to be less than that for persons without diabetes, or compared with those with no serious conditions. This is based on results from the 1995 Australian Health Survey (ABS 1999). In reporting quality of life score by disease stage, results for participants in the pilot have been compared with Australian norms, (identified as Aus: no serious conditions and Aus: diabetes). See Figures 11 to 18.

Quality of life is found to change with disease stage but not consistently across all dimensions. Mean physical functioning is found to fall off with disease progression, to start at about the Australian population norm and finish below the norm for all persons with diabetes. Role physical on the other hand is more constant across the disease range suggestive of substantial adaptation to disease progression. (Included in this score are responses to questions to do with the effect of physical health on normal activities). Loss in quality of life associated with bodily pain is found to increase with disease progression, to fall from close to the norm for persons with no serious conditions to the mean for persons with diabetes. The general health score also falls with disease stage, and is low relative to the Australian norms. Mean vitality score is also low and tends to fall with disease stage. Social function also falls with disease stage, with values more consistent with the Australian norms. Role emotional which reflects the effect of emotional health on participation in normal activities, is low across all disease stages, but tends to improve with disease progression. The mental health score is low compared with the Australian norms but relatively constant with disease progression.

Figure 14 SF-36 Mean Physical Functioning Score

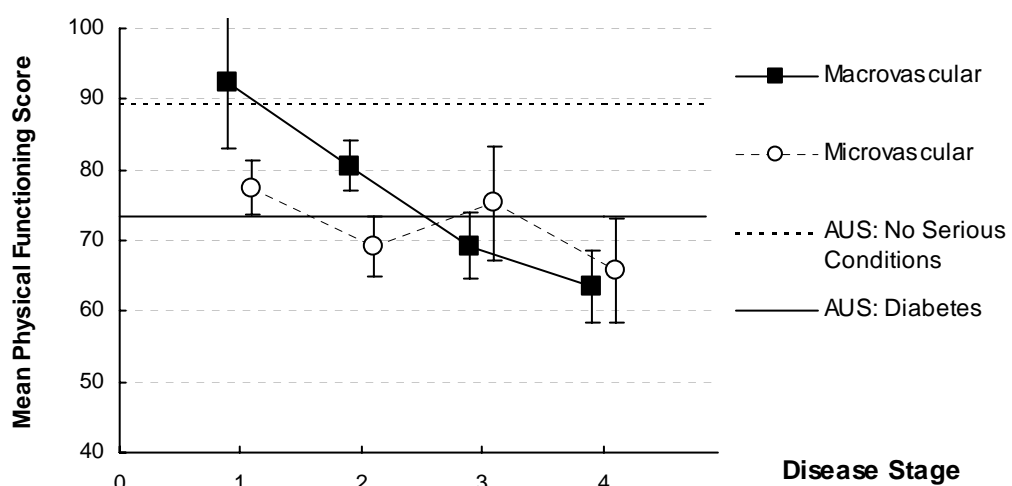


Figure 15 SF-36 Mean Role Physical Score

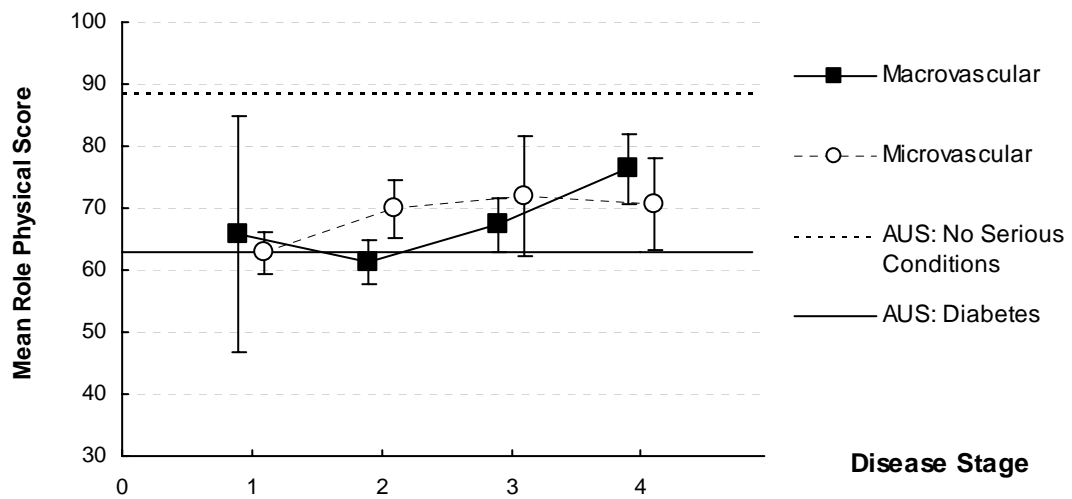


Figure 16 SF-36 Mean Bodily Pain Score

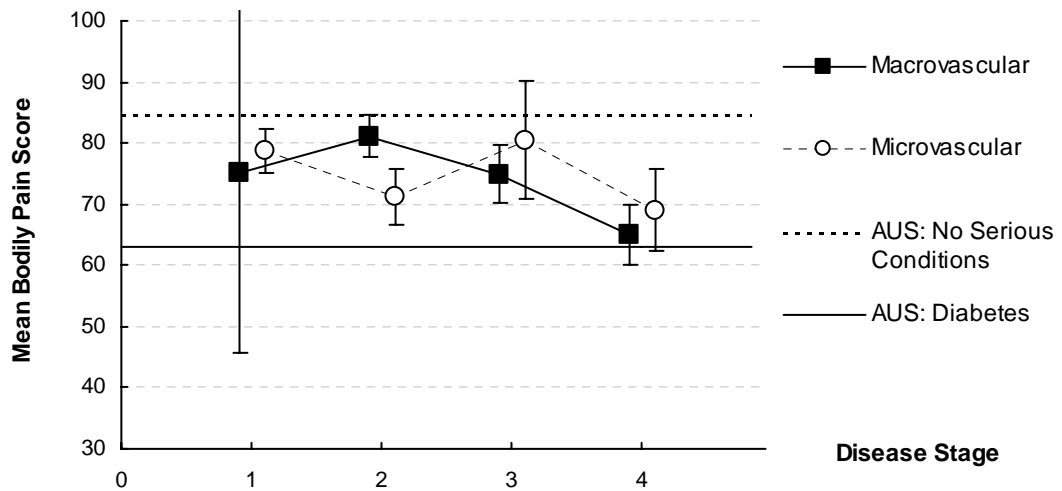


Figure 17 SF-36 Mean General Health Score

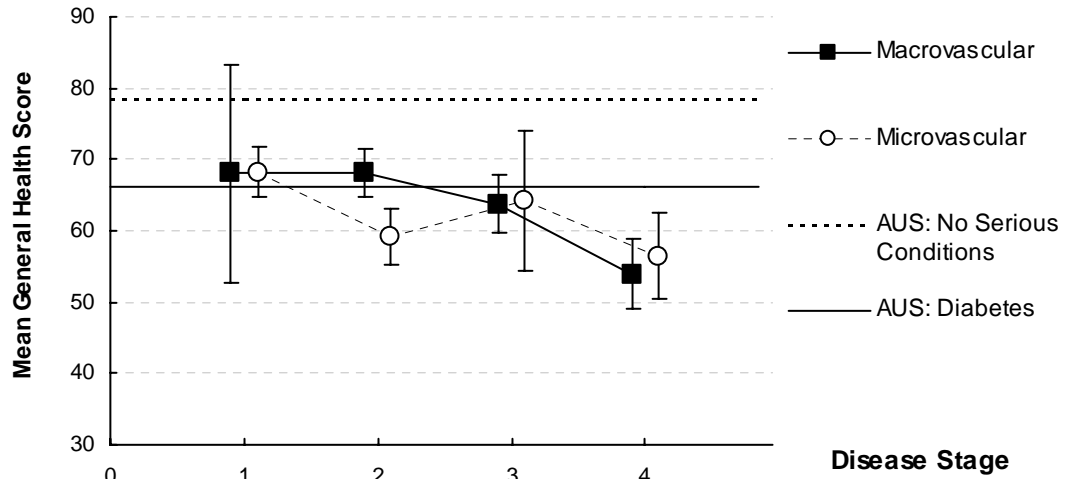


Figure 18 SF-36 Mean Vitality Score

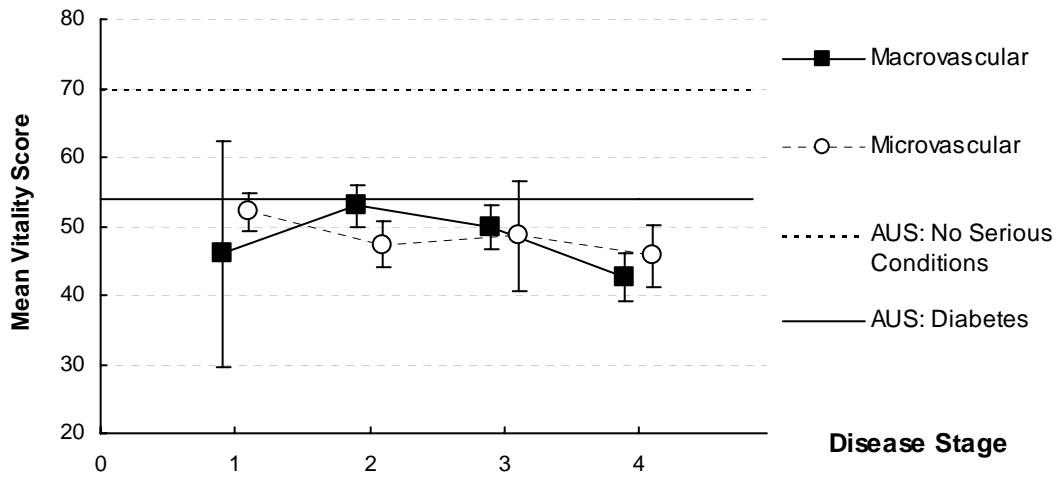


Figure 19 SF-36 Mean Social Functioning Score

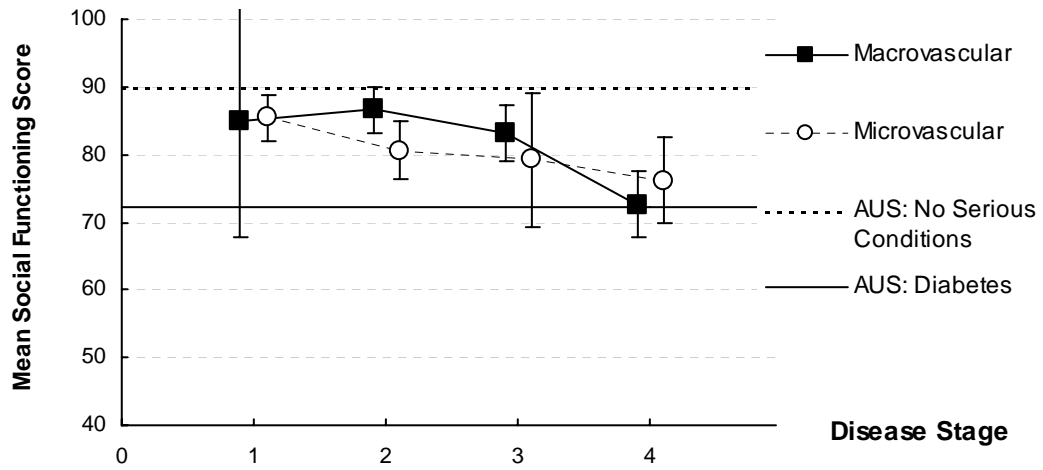


Figure 20 SF-36 Mean Role Emotional Score

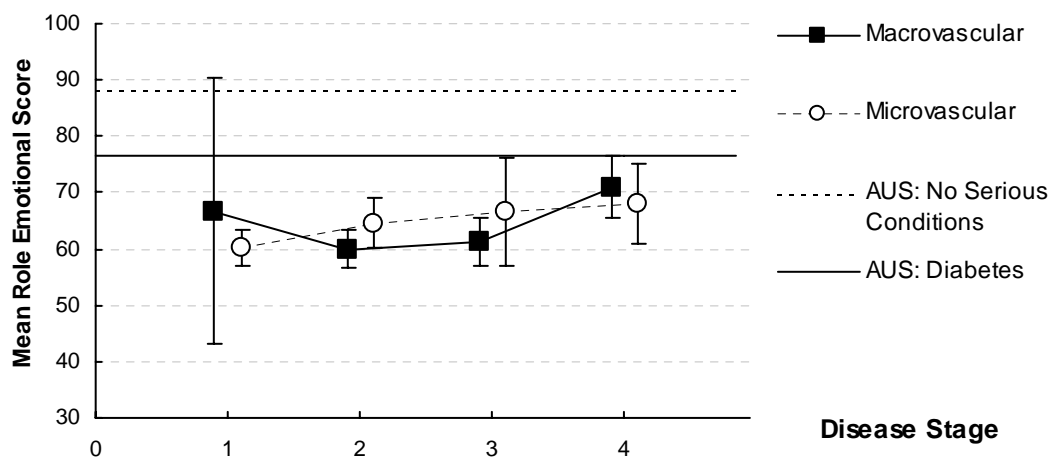
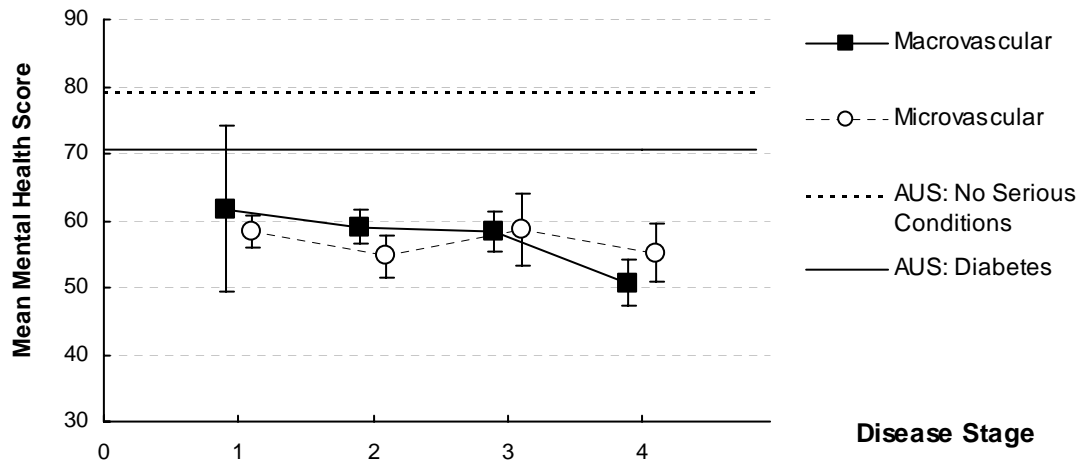


Figure 21 SF-36 Mean Mental Health Score



Change in Quality of Life

Between commencement of the pilot, and some twelve months later, a small improvement is observed in the role physical score and role emotional score. The improvements are greatest in those with more advanced disease. On the other hand a fall in social functioning score is observed, also more apparent in those with more advanced disease. However, without a control group, it is difficult to know if these changes should be attributed to the diabetes integrated care pilot. See Figure 22.

Figure 22 Changes in SF-36 Scores between Trial Entry and One Year Later

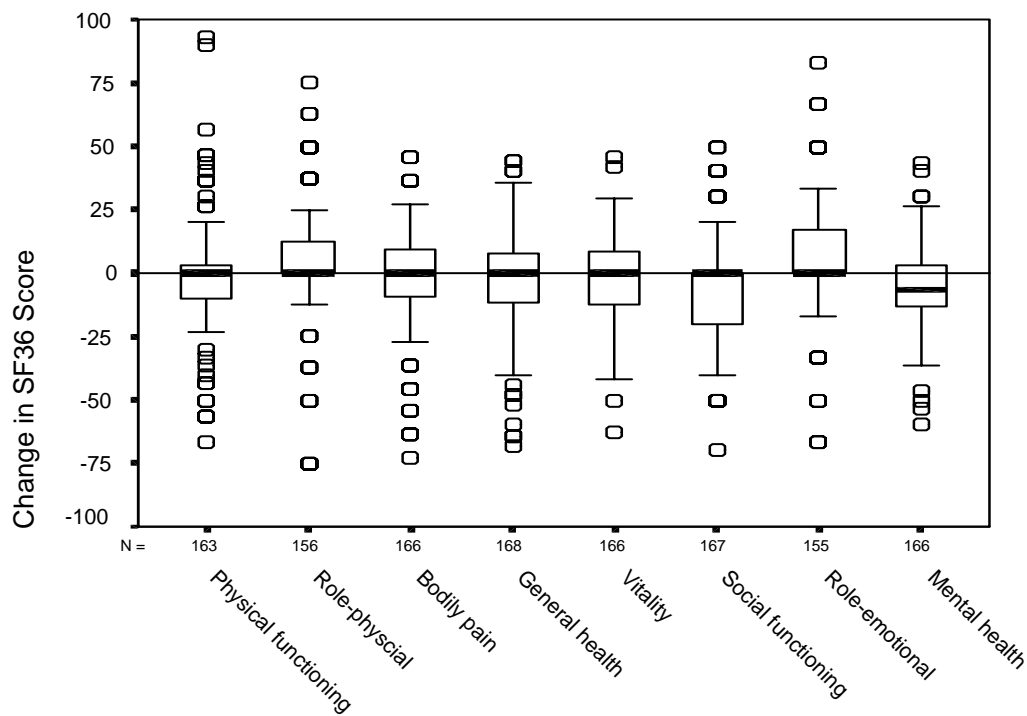


Table 7 SF-36 Scores at Trial Entry and One Year Later, Difference and Significance

SF 36 Domain *	Trial Entry		One Year		Difference			Wilcoxon p =
	N	Mean	N	Mean	N	Mean	S.D.	
Physical functioning	163	73.1	168	72.1	163	-1.2	21.1	0.022
Role – physical	164	64.7	158	69.0	156	4.3	25.5	0.019
Bodily pain	168	76.5	166	73.2	166	-3.2	21.1	0.157
General health	168	64.9	168	61.3	168	-3.6	19.4	0.037
Vitality	168	50.1	166	48.3	166	-1.6	16.0	0.246
Social functioning	168	84.6	167	79.3	167	-5.3	21.9	0.003
Role – emotional	162	60.6	159	65.8	155	4.8	23.6	0.017
Mental Health	168	58.9	166	54.5	166	-4.6	16.0	0.000

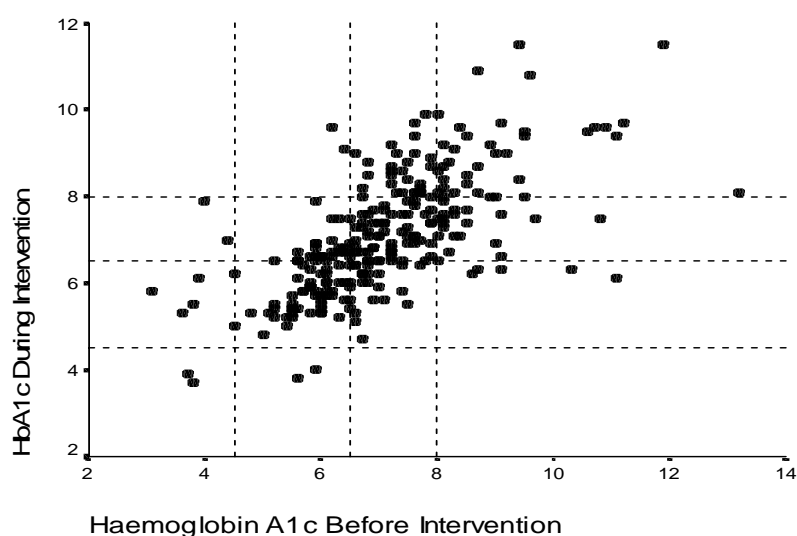
Note: * Maximum score for each domain is 100, with 100 being the best health state and 0 being the worst.

Clinical Outcomes

Blood Glucose

Information has been collected on blood glucose, measured through HbA1c. This shows no significant change in HbA1c values for the 319 subjects for whom health service use and costing data has been collected. Mean HbA1c levels at the first snapshot were 7.13% and 7.09% at the last snapshot between 12 and 18 months later, reflecting the impact of integrated care. There is a slight improvement in the distribution of HbA1c values. For persons recording HbA1c values of less than 4.5% (indicative of too tight control), a small but significant increase in mean value is observed. There is no significant change recorded in those with a HbA1c of between 4.5 and 8.0%, and a small but significant fall in those recording values above 8.0% at the first snapshot. The results are reported in Table 8, and illustrated in Figures 23 and 24.

Figure 23 HaemoglobinA1c Values at Commencement of the Pilot and 12 to 18 Months Later



Without a control group it is not possible to determine how much of the improvement might reflect the observed 'regression to the mean' phenomena* and how much the result of improved management. It can also be noted that while mean HbA1c has not improved significantly, it also has not got worse, which with time might be expected. Again a control group for comparison would have been helpful.

Figure 24 Change in Haemoglobin A1c Values between Commencement of the Pilot and 12 to 18 Months Later, by Initial Reading

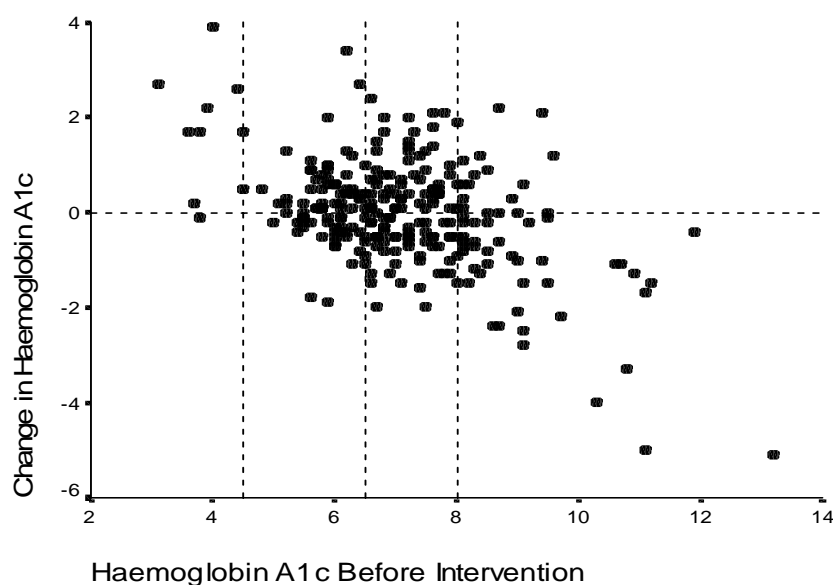


Table 8 HbA1c Mean Value and Change

HbA1c	Mean	S.D.	Minimum	Maximum
Before	7.13	1.56	3.1	17
During	7.09	1.35	3.7	11.5

Change in Haemoglobin A1c in Different Initial Level Bands ¹		
	Mean Change	Paired t-test p =
ALL	-0.03	0.672
<4.5	1.86	0.000
4.5 - 6.0	0.26	0.124
6.0 - 7.0	0.12	0.514
7.0 - 8.0	0.11	0.486
8.0 - 9.0	-0.24	0.042
9.0 +	-1.67	0.000

Note:¹ Change in Mean HbA1c level in the Subjects whose HbA1c level before the intervention fell into the different HbA1c ranges indicated in 266 subjects where HbA1c was measured both before and during the intervention.

Blood Pressure and Weight

Blood pressure measure is somewhat unreliable and therefore a less satisfactory basis for establishing an improvement in clinical outcomes. We can report that between commencement of the pilot and 12 to 18 months later, mean systolic blood pressure improved by 2.64 %, and mean diastolic blood pressure remained virtually constant, changing by – 0.32%.

Mean weight did not alter over the course of the pilot.

IV Discussion

The NSW Diabetes Integrated Care Pilot as implemented in the NSW Mid-North Coast was highly successful in engaging the general practitioners and persons with diabetes. Changes in patterns of care, consistent with recommendations under best practice guidelines were observed. This has also increased the cost of care. Whether there will be offsetting savings in hospital costs or improved clinical outcomes and health status is yet to be realised. The only positive sign in terms of outcome is a small but significant reduction in HbA1c in those with readings above 8%. The effect on quality of life is difficult to establish from the SF 36 although some improvement in role function seems to have occurred.

Cost of management is seen to be highly associated with disease stage, rising from around \$1,000 for those with no risk factors or comorbidities to \$9,000 per patient per year with advanced disease. This suggests that over time if the rate of disease progression is slowed there might be cost savings, although it must be expected that additional medical and diabetes education costs will need to be incurred to achieve that result. It is not established that any additional costs would be more than offset by downstream cost savings.

References

ABS 1997, National Health Survey: SF 36, ABS Catalogue no 4399.0

AIHW 1999, *Health Expenditure Bulletin no 15*, AIHW, Canberra.

Robertson I., Richardson J., Hobbs M., *The impact of new technology on the treatment and cost of acute AMI in Australia*, CHPE Research Report no 10, Health Economics Unit, Monash University, Melbourne