

## Report

# Cultural and Clinical Effectiveness of the 'QAAMS' Point-of-Care Testing Model for Diabetes Management in Australian Aboriginal Medical Services.

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## **Abstract**

The national Quality Assurance for Aboriginal Medical Services (QAAMS) Program, in which point-of-care testing (POCT) for haemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) and urine albumin:creatinine ratio (ACR) is performed for diabetes management in 65 Australian Aboriginal medical services, is now embedded in the practice of diabetes care across Indigenous Australia. This paper documents the results of a detailed survey to assess levels of satisfaction with the QAAMS HbA<sub>1c</sub> Program among three key stakeholder groups – doctors, POCT operators and patients with diabetes. Both doctors and patients with diabetes agreed that the immediacy of POCT results contributed positively to patient care, improved the doctor-patient relationship, and made the patient more likely to be both compliant and self-motivated to improve their diabetes control. Both POCT operators and patients with diabetes reported improved satisfaction with their diabetes services after the introduction of POCT. The paper also provides evidence from two participating medical services that POCT has been an effective tool in improving the delivery of pathology services and clinical outcomes for both individuals and groups of patients with diabetes. A statistically significant reduction in HbA<sub>1c</sub> from 9.3% (± 2.0) to 8.6% (± 2.0) was observed in 74 diabetes patients 12 months after commencing POCT (p = 0.003, paired t-test). An improvement in the percentage of patients achieving glycaemic targets and a reduction in the percentage of patients with poor control was also observed in this group. These data provide evidence that the QAAMS POCT model delivers a culturally and clinically effective service for diabetes management in Aboriginal Australia.

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## **Introduction**

Type 2 diabetes mellitus and its principal complications, renal disease and retinopathy, are responsible for a significant burden of morbidity, mortality, social and cultural trauma in Australia's Aboriginal people.<sup>1-3</sup> In 1998, Australia's National Diabetes Strategy and Implementation Plan recommended that a trial of POCT for HbA<sub>1c</sub> on the DCA 2000 analyser (Bayer Diagnostics, Tarrytown, NY, USA) be conducted in Australian Aboriginal Medical Services to assist diabetes management for Indigenous people.<sup>4</sup> The resultant QAAMS Program for HbA<sub>1c</sub> POCT commenced as a pilot in 45 Aboriginal Medical Services in June 1999. Six years later, the national QAAMS Program has 65 participating medical services, 75% of which are located in rural and remote Australia. The program has now become firmly embedded in the practice of diabetes care for Aboriginal people.<sup>5-7</sup> In 2003, the program was

expanded to include urine ACR POCT on the DCA 2000 to monitor microalbuminuria in Aboriginal diabetes patients.<sup>8</sup> The QAAMS Program has been continuously funded by the Australian Government's Department of Health and Ageing since its inception.

The QAAMS model provides continuing education, training, competency assessment and support services for Aboriginal health workers and allied health professionals in their role as in-service POCT operators. The program also has a unique quality management framework involving both internal quality control and external quality assurance testing. These features set QAAMS apart from any other model of primary health care delivery for Indigenous communities worldwide. The ability of Aboriginal health workers to conduct POCT in the field to an analytical standard that meets current

laboratory-based goals has been verified for both HbA<sub>1c</sub> and, more recently, urine ACR testing.<sup>5-6,8</sup>

However, two key research questions for the QAAMS Program remained unanswered. Firstly, how well had the program been accepted by clinical staff (utilising POCT results for patient management), by Aboriginal health workers and allied health professional staff (as POCT field operators) and by patients with diabetes (the consumers of the POCT service)? Secondly, had POCT been an effective tool in improving clinical outcomes for both individuals and groups of patients with diabetes?

This paper provides the evidence base to answer these questions. It documents the results of a detailed questionnaire to assess levels of acceptance with the QAAMS HbA<sub>1c</sub> Program among its three key stakeholder groups – doctors, POCT operators and patients with diabetes. The paper also reports improvements in glycaemic control among diabetes patients at two rural and remote Aboriginal medical services in the QAAMS Program following the introduction of POCT.

## Methods

*Questionnaire for Key Stakeholders in the QAAMS Program*  
During mid-2004 the QAAMS Program Manager, in collaboration with the Flinders University Centre for Biostatistics and Epidemiology, prepared three questionnaires for dissemination to all Aboriginal medical services participating in the QAAMS Program. A small group of Aboriginal health workers from selected medical services assessed the questionnaires for their cultural appropriateness in their development phase.

The questionnaires were specifically designed to determine satisfaction levels with the QAAMS HbA<sub>1c</sub> Program among three key stakeholder groups; namely doctors, Aboriginal health workers and allied health professionals, and patients with established diabetes.

Each questionnaire contained a series of short statements or questions, with respondents rating their level of agreement or disagreement with the statement or question posed according to a five-point Likert scale.<sup>9</sup> Participants were given equal opportunity to agree or disagree with each statement or question. The questionnaire also listed other open questions where a more detailed written response was requested or selections could be made from a series of options provided. In relation to the patient questionnaire, Aboriginal health workers were invited to work with and assist as many diabetes patients as possible to complete this questionnaire. All respondents completed the questionnaires anonymously.

Distribution of the questionnaires commenced in mid-July 2004. The Chief Executive Officer of each Aboriginal medical service was also sent an accompanying letter, explaining the purpose of the questionnaires. Services were asked to return their completed questionnaires by fax or post by mid-October 2004.

The results of the questionnaires were analysed by the QAAMS Program Manager, in collaboration with an epidemiologist (Dr Kristin McLaughlin) from the Flinders Centre for Biostatistics and Epidemiology using the Epidata software program ([www.epidata.dk](http://www.epidata.dk)).

## *Impact of POCT on Delivery of Pathology Services and Clinical Outcomes*

For the past two years, the QAAMS Program Manager and his supporting scientific team have worked closely with two Aboriginal health services in rural and remote Australia to collect information concerning the impact of POCT on the delivery of pathology services and on clinical outcomes among individuals and groups of patients with diabetes. These studies have been conducted at the request of the health services concerned and have been undertaken since full DCA 2000 POCT services for diabetes management were introduced at each site.

Information was initially obtained on the number of HbA<sub>1c</sub> test requests from patients with diabetes who attended their clinics for set periods immediately preceding and following the introduction of POCT; these periods were one year for service 1 and two years for service 2, respectively.

POCT HbA<sub>1c</sub> results on patients with diabetes who attended the clinics at both services were monitored across a 12-month period to assess the change in glycaemic control following the introduction of POCT. All POCT HbA<sub>1c</sub> tests were performed on-site by the principal Aboriginal POCT operator at each site.

## Results

### *Questionnaire for Key Stakeholders in the QAAMS Program (i) Questionnaire for Doctors*

41 doctors completed the clinician questionnaire. A summary of their responses is shown in Table 1. Greater than 95% of doctors agreed that POCT provided a convenient service for them. Approximately 90% felt confident with the accuracy and reliability of the POCT result and that POCT was an acceptable alternative to the laboratory. More than 90% of doctors stated that the immediacy of the POCT result contributed positively to patient care, they were comfortable in continuing to use POCT for patient management, and they would like to see POCT available to all patients with diabetes

**Table 1.** Results of satisfaction questionnaire for doctors (n=41)

Synopsis of Statement	DISAGREE		UNSURE		AGREE	
	Strongly Disagree or Disagree				Agree or Strongly Agree	
	n	%	n	%	n	%
<b>Section 1. Specific Questions</b>						
<i>Convenience</i>						
Satisfied with POCT results immediately available	1	2%	1	2%	39	96%
Advantage discussing results immediately with patient	1	2%	0	0%	40	98%
<i>Analytical Quality</i>						
Confident in accuracy and reliability of POCT result	1	2%	4	10%	36	88%
POCT acceptable alternative to laboratory	2	5%	2	5%	37	90%
<i>Patient Care Issues</i>						
Immediate result contributes positively to patient care	1	2%	1	2%	39	96%
Immediate result contributes positively to patient compliance	2	5%	17	41%	22	54%
Immediate result contributes positively to relationship with patient	2	5%	5	12%	34	83%
Patient more likely to return if POCT available	2	5%	14	34%	25	61%
POC HbA <sub>1c</sub> testing made positive contribution to patient management	1	2%	1	2%	39	96%
Like POCT for HbA <sub>1c</sub> to continue for diabetes management	1	2%	0	0%	40	98%
<i>General Issues</i>						
Like to see POCT for HbA <sub>1c</sub> available for all diabetics in the community	1	2%	3	7%	37	91%
POCT for HbA <sub>1c</sub> more clinically and culturally effective than laboratory	2	5%	4	10%	34	85%

in their community. More than 80% of doctors agreed that POCT provided a more culturally and clinically effective service for the patient than their laboratory service and that POCT contributed positively to their rapport and relationship with their patients. Over 60% of the doctors felt that patients were more likely to return for a follow-up visit, with more than half believing the immediate availability of results contributed positively to patient compliance with medication.

One doctor responded negatively to all questions asked. This doctor preferred to use the local laboratory service, ordering a complete profile of tests for diabetes management on every patient. The Aboriginal health workers at this site remained keen to use the DCA 2000 but had been progressively discouraged to do so by the doctor.

Selected written comments received from doctors are listed below in response to the question: How did you view the clinical effectiveness of the DCA 2000 point-of-care testing program overall and (could you comment on) whether it had contributed to improved diabetes management in your service? These comments are reflective of the overall views of the 23 doctors who responded to this question.

‘This has made a well run Diabetic Clinic to be more effective and impressive to the patient; most of the aboriginal patients are reluctant to come back in a few days for their results. Thus, a well-run point of care test facility gives me a chance to have a bird’s eye view of where a patient stands and helps me to readjust their regime.’

‘The DCA 2000 POC test adds greatly to the assessment and management of diabetics in our practice by giving a ‘real time’ picture of the progress, especially after changes have been made to their management. It enhances doctor/diabetic team AND patient satisfaction and most certainly imparts positively on patient outcomes.’

‘Many clients of this service do not come for follow-up appointments and so it is very beneficial to have the POC HbA<sub>1c</sub> result available at the time of that visit rather than hoping they will return. Treatment decisions about need for medication change or need for further diabetic education, weight loss, or diet, etc., can all be made at the one visit. This greatly improves patient care and

the likelihood of reducing long-term diabetic complications.’

‘The advantages of having this POC testing are incalculable. There are many patients we would otherwise not be able to follow-up or treat appropriately. This is because they are often travelling, they have some reluctance to go to pathology dep[artmen]t. within the hospital, or they do not understand the risks associated with their illness.’

‘HbA<sub>1c</sub> testing was poorly taken up prior to the POC program. Seeking out people for urine testing was even harder. Now that we can give immediate results and discuss them straight away, clients are happy. They are even happier that the AHWs [Aboriginal health workers] are doing all this. We now are collecting consistent longitudinal data.’

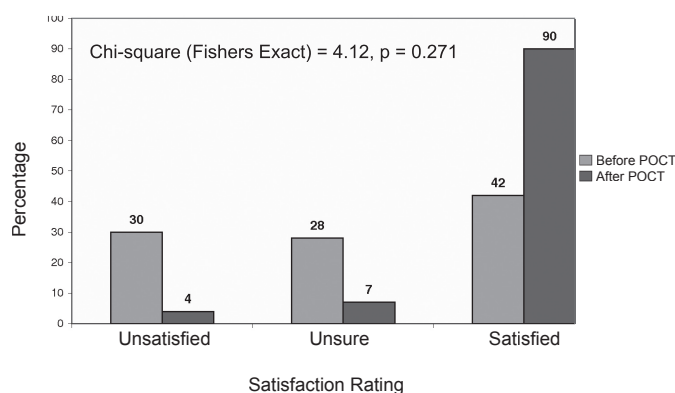
*(ii) Questionnaire for POCT Operators (Aboriginal health workers and allied health professionals)*

65 respondents completed this questionnaire. Of the 61 who specified their health profession, 51% were Aboriginal health workers and 41% were nurses; the remaining respondents were diabetes educators (2), a community health worker (1) and a primary health care network co-ordinator (1). A summary of their responses is shown in Table 2.

Greater than 90% of POCT operators agreed that the QAAMS educational resources were culturally appropriate, and they understood why the HbA<sub>1c</sub> test needed to be performed on patients with diabetes and what the result meant in terms of diabetes control. Greater than 90% of respondents were confident in using the DCA 2000, in the accuracy and reliability of the POCT result, and in discussing the result with their patients. POC HbA<sub>1c</sub> testing on a finger-prick sample was considered an acceptable alternative to laboratory testing on a venous sample. Greater than 90% of respondents understood the need to perform quality assurance testing and felt the frequency of this testing (two samples per month) was appropriate. They also felt the level of support and the training methods of the QAAMS management team were culturally appropriate.

POCT operators agreed that patients were comfortable in having POC HbA<sub>1c</sub> testing performed as part of their diabetes management. Overall community acceptance of POCT was high, with approximately 80% of POCT operators agreeing that POCT on the DCA 2000 had provided a focus for raising community awareness about diabetes and had enhanced community ownership.

POCT operators were also asked to rate how satisfied they were with the diabetes services for their patients before and after the introduction of POC HbA<sub>1c</sub> testing on the DCA 2000. Figure 1 shows the satisfaction rating of the 57 POCT operators who responded to this question. The percentage of POCT operators who were unsatisfied with, or unsure about, their diabetes service fell from 30% to 4% and 28% to 7% after the introduction of POCT respectively, while the percentage who were satisfied with their diabetes service increased from 42% to 90% after POCT was introduced (Fishers Exact chi-square = 4.12, p = 0.271). While this result is not statistically significant due to the small sample size, the improvement in satisfaction rating with diabetes services since the QAAMS Program commenced is clearly evident.



**Figure 1.** POCT operator satisfaction with services for managing patients with diabetes before and after the introduction of POCT (n=57).

When asked in a series of open questions what the QAAMS Program had meant to them personally, over 90% of POCT operators stated that it had enabled them to know their community members with diabetes better and had given them a greater role in their management, while over 70% indicated it had provided them with a sense of empowerment and had made them better known in their community.

When asked to specify in what ways their diabetes services had improved following the introduction of POCT, over 95% of POCT operators stated that POCT was more convenient than the laboratory service, with patients having their POC test and seeing the doctor during the one visit. 85% of respondents felt POCT had improved patient self-motivation.

POCT operators were also asked to comment on what were the main issues in maintaining the QAAMS Program in the long-term. Over two-thirds felt that neither their current workload nor the number of programs they were responsible for would preclude them from maintaining participation in QAAMS. Nearly three-quarters of respondents felt their

**Table 2.** Results of satisfaction questionnaire for POCT operators (Aboriginal health workers and allied health professionals) (n=65)

Synopsis of Statement	DISAGREE		UNSURE		AGREE	
	Strongly Disagree or Disagree				Agree or Strongly Agree	
	n	%	n	%	n	%
<b>Educational Resources</b>						
Useful and culturally appropriate	0	0%	4	6%	60	94%
Clearly show why POC HbA <sub>1c</sub> test is needed	0	0%	3	5%	61	95%
Clearly show what POCT result for HbA <sub>1c</sub> means	2	3%	3	5%	59	92%
<b>DCA 2000 and Testing Procedure</b>						
Confident and comfortable using DCA 2000	2	3%	1	2%	62	95%
Fingerprick blood as reliable as venepuncture for HbA <sub>1c</sub>	0	0%	4	6%	60	94%
<b>Point-of-Care Results</b>						
Confidence in accuracy and reliability	1	2%	0	0%	62	98%
POCT for HbA <sub>1c</sub> on DCA 2000 acceptable alternative to lab	0	0%	2	3%	61	97%
Confident to discuss results with client	3	5%	2	3%	58	92%
<b>Quality Management</b>						
Understand need for quality assurance testing	0	0%	1	2%	63	98%
Level of quality assurance testing required is appropriate	1	2%	3	5%	60	94%
<b>QAAMS Team and On-going Support</b>						
QAAMS Team provides appropriate support	0	0%	3	5%	60	95%
Training methods instructive and appropriate	0	0%	6	10%	55	90%
<b>Overall Community Acceptance</b>						
Clients happy with POCT for HbA <sub>1c</sub> testing	0	0%	1	2%	62	98%
POCT for HbA <sub>1c</sub> raised awareness about diabetes	1	0%	11	17%	52	83%
DCA 2000 has enhanced community ownership and control	1	2%	12	19%	50	79%

current fridge space was adequate to store program reagents and consumables. Respondents were unanimous in rating the mechanical reliability of the DCA 2000 as good or very good.

POCT operators were invited to provide written comment on: 'What are the 'Positives' and 'Negatives' about the QAAMS Program, and how could the program be improved and made more effective?' A list of selected comments, reflective of the overall views of this group, is listed below.

'It is very useful to use opportunistically with clients who are difficult with attending follow-ups on their health care.'

'Clients are very happy with it saving them a trip to local hospital for blood testing. Clients like to know the result, and what it means. Gives me a chance to continue diabetic education.'

'Well accepted by our health workers and clients and CEO. Visiting specialists, podiatrist know about the DCA machine. Great asset.'

'The POC testing has greatly improved service delivery particularly with patients who are mobile and are not continuously contactable.'

'Effective POC, mildly invasive, results in 6-7 minutes instead of 48 hours to 1 week.'

'The DCA 2000 has given me a time saver in showing community how their diabetes is really going as they can see the results in 6 min and this helps us both to work to a health plan to improve the next reading.'

### *(iii) Questionnaire for Aboriginal Patients with Diabetes*

161 clients with diabetes completed this questionnaire, with the support and assistance of their local Aboriginal health workers. Of the 148 who specified their gender, 58% were females and 42% males. Of the 159 who reported their age,

6% were 25-34 years old, 15% 35-44 years, 24% 45-54 years, 28% 55-64 years and 27% were older than 65.

A summary of their responses is shown in Table 3. Greater than 90% of respondents understood the role of the DCA 2000 machine in managing their diabetes and were comfortable in having their glycaemic control monitored. Patients were very satisfied (97% or greater) with the convenience of POCT and believed a finger-prick collection was less stressful than venipuncture. More than 90% of patients reported regular POCT resulted in improved self-motivation to control their diabetes and they were comfortable in returning for further testing. Over 90% of patients felt the visit to the doctor was more useful and the doctor was able to better manage their diabetes by having the POCT result available at the time of consultation.

In separate questions, greater than 95% of respondents wanted POCT to continue as part of the management of their diabetes and stated they would like POCT to be available to all patients with diabetes in their community.

Patients were also asked to rate how satisfied they were with the diabetes services offered to them before and after the introduction of POC HbA<sub>1c</sub> testing on the DCA 2000. Figure 2 shows the satisfaction rating of the 159 patients with diabetes who answered this question. The percentage of patients who

were unsatisfied with, or unsure about, their diabetes service fell from 11% to 3% and 28% to 6% after the introduction of POCT, respectively, while the percentage who were satisfied with their diabetes service increased from 61% to 91% after POCT was introduced (Fishers Exact chi-square = 12.09, p = 0.007, significant).



**Figure 2.** Patient satisfaction with services for managing their diabetes before and after the introduction of POCT (n=159).

Selected written comments by patients with diabetes are listed in response to the question: ‘Do you have any other comments on whether POCT has helped you look after your diabetes?’

**Table 3.** Results of satisfaction questionnaire for patients with diabetes (n=161)

Synopsis of Statement	DISAGREE		UNSURE		AGREE	
	Strongly Disagree or Disagree				Agree or Strongly Agree	
	n	%	n	%	n	%
<b>Understanding of POCT</b>						
Understand what POCT machines are used for	0	0%	10	6%	150	94%
Happy to have diabetes checked by POCT rather than lab	0	0%	3	2%	156	98%
<b>Convenience</b>						
Happy with immediate POCT result	1	1%	1	1%	158	98%
Immediate result better than having to come back for lab result	0	0%	1	1%	159	99%
Fingerprick less stressful than venepuncture	1	1%	3	2%	156	97%
<b>Personal Issues</b>						
Regular POCT encourages me to look after my health better	1	1%	10	6%	150	93%
Happy for further POCT to be used for my management	2	1%	2	1%	157	98%
<b>Doctor Patient Issues</b>						
Visit to doctor more useful because POCT results available	2	1%	9	6%	149	93%
Doctor better able to manage my health by having POCT results when seeing the doctor	3	2%	5	3%	152	95%

‘This my first time, I’m new about it and I like it. Yes!! I really want to put my head down now, take good care of myself and manage my health.’

‘I live 30 kms from the service so it’s much better for me.’

‘Instant results make management more convenient and efficient.’

‘Yes it has helped me to stay positive and not to get too stressed out as I know help is at the door.’

‘The health workers explain everything to me and are very helpful. I’m very pleased with this set up.’

#### *Impact of POCT on Delivery of Pathology Services and Clinical Outcomes*

At service 1, in the year following the introduction of POCT, there was a 76% increase in both the number of HbA<sub>1c</sub> tests performed and the number of diabetes patients being monitored for their glycaemic control. Following the introduction of POCT at service 2, there was a 91% increase in the number of HbA<sub>1c</sub> tests performed (with an average of 3.7 HbA<sub>1c</sub> tests per patient performed in the two years after POCT compared with 2.0 HbA<sub>1c</sub> tests per patient performed in the two years before POCT). Across the same period, there was a 3.5-fold increase in the number of urine ACR tests performed (with an average of 1.8 urine ACR tests per patient performed in the two years after POCT compared with 1.1 urine ACR tests per patient performed in the two years before POCT). There was also a doubling of the number of patients tested for urine ACR. Thus, patients with diabetes at this service received closer clinical monitoring of their HbA<sub>1c</sub> and urine ACR levels (and hence diabetes management) after the introduction of POCT.

Did this increased level of POCT testing at these two services translate into improved glycaemic control for Aboriginal patients with diabetes? A total of 74 patients with diabetes were monitored for their HbA<sub>1c</sub> levels across both services. There was a statistically significant reduction of 0.7% HbA<sub>1c</sub> in this group of 74 patients monitored at baseline (when POCT commenced) and at 12 months after the introduction of POCT respectively ( $p = 0.003$ , 2-tailed paired t-test) (Table 4). This fall in HbA<sub>1c</sub> indicated that glycaemic control within the group had improved post POCT.

Patients were further categorised into those who achieved optimal glycaemic control (HbA<sub>1c</sub> <7%), controlled glycaemia (HbA<sub>1c</sub> <8%) and exhibited poor glycaemic control (HbA<sub>1c</sub> >10%) before and after the introduction of POCT. Current

best practice guidelines for Aboriginal people recommend that the optimal glycaemic goal is an HbA<sub>1c</sub> of <7%; however, in acknowledging that this will be extremely difficult to achieve in many Indigenous people with diabetes, they also state that an HbA<sub>1c</sub> of 8% represents a more realistic target for this population.<sup>1,10</sup> HbA<sub>1c</sub> concentrations of 7% and 8% have been previously recommended by the American Diabetes Association (ADA) as the goal for optimal glycaemic control and a value at which a change of therapy is indicated respectively.<sup>11</sup> More recent recommendations by the ADA suggest that even more stringent goals (for example, an HbA<sub>1c</sub> as close as possible to 6%) should be considered for individual diabetes patients to further reduce risk of complications at the possible increased risk of hypoglycaemia.<sup>12</sup> The HbA<sub>1c</sub> value of 10% was selected to represent poor control on both empirical and practical grounds. As can be seen in Table 4, the percentage of diabetes patients who achieved optimal glycaemic control increased by 12%, the percentage who achieved controlled glycaemia increased by 19%, and the percentage exhibiting poor diabetes control fell by 12%. These findings also support the trend towards improved glycaemic control after the introduction of POCT.

Examples of some of the improvements in glycaemic control observed within individual patients are provided in the following brief case histories:

The first case describes a 57-year-old man who was diagnosed with diabetes in 1989. He had not been compliant in taking his diabetes medication and had a past history of heavy alcohol intake. There was a strong family history of diabetes. He visited the health service on average once per year but generally declined blood testing and follow-up. His last laboratory HbA<sub>1c</sub> was 13.0%. He attended the clinic following the introduction of POCT in the service and his initial POCT results were HbA<sub>1c</sub> 12.1% and urine ACR 64 mg/mmol (normal ACR <2.5 mg/mmol). His blood pressure was 158/98 mmHg (target for Aboriginal person with diabetes 130/80 mmHg) and weight was 124 kg. His cholesterol was 6.9 mmol/L (target for Aboriginal person with diabetes <4.0 mmol/L), triglyceride 4.2 mmol/L (target <2.0 mmol/L), HDL cholesterol 0.7 mmol/L (target >1.0 mmol/L) and LDL cholesterol 5.1 mmol/L (target <2.5 mmol/L).<sup>10</sup> As a result of his poor glycaemic control, he was placed on selected diabetes medications and referred for dietician, diabetes educator and podiatry review. His HbA<sub>1c</sub> by POCT was 10.8% at three months and 7.6% at 12 months. His lipids had also improved at 12 months (cholesterol 5.9 mmol/L, triglyceride 2.6 mmol/L, HDL 1.0 mmol/L and LDL 3.8 mmol/L). His weight fell to 110 kg and his blood pressure to 140/90 mmHg. This man’s confidence with a local diabetes system was improved considerably by having access to immediate results through

**Table 4.** Improvement in glycaemic control in Aboriginal patients with diabetes 12 months after the introduction of POCT at two rural and remote Aboriginal medical services (n=74)

Parameter	Baseline POCT	12 Months After POCT
<b>Reduction in HbA<sub>1c</sub></b>	<b>Mean ± SD</b>	<b>Mean ± SD</b>
HbA <sub>1c</sub>	9.3 ± 2.0	8.6 ± 2.0*
<b>% Patients</b>		
Achieving optimal glycaemic control (HbA <sub>1c</sub> <7%)	15%	27%
Achieving controlled glycaemia (HbA <sub>1c</sub> <8%)	28%	47%
Exhibiting poor glycaemic control (HbA <sub>1c</sub> >10%)	35%	23%

\*The observed reduction in HbA<sub>1c</sub> of 0.7 was statistically significant (p = 0.003, paired t-test)

POCT. The significant improvement in his HbA<sub>1c</sub> reflected attention to multiple aspects of his diabetes care.

The second case describes a 53-year-old man who was diagnosed with Type 2 diabetes in 1980. In 2001, he was found to have peripheral neuropathy and vascular disease. His initial POCT investigations revealed an HbA<sub>1c</sub> of 10.9% and a urine ACR of 66 mg/mmol (normal ACR <2.5 mg/mmol). His weight was 126 kg. His poor glycaemic control and macroalbuminuria (ACR >30 mg/mmol) identified by POCT were initially managed with oral hypoglycaemic and ACE inhibitor medications. With aggressive management and regular POCT over the ensuing 18 months, this patient's HbA<sub>1c</sub> fell from 10.9% to 7.6%, then to 6.7%. His urine ACR levels measured by POCT decreased from 66 mg/mmol to 56 mg/mmol, then to 44 mg/mmol, while his weight was now 106 kg. This case describes substantial improvements in glycaemic control and reductions in albuminuria and weight in a patient with diabetes following intensive management that included regular POCT.

### Discussion

The QAAMS Program for diabetes management has recently completed its sixth year of operation. In March 2001, the National Aboriginal Community Controlled Health Organisation (NACCHO), the peak body representing Aboriginal Community Controlled Health Services in Australia, released an independent evaluation on the first 18 months of the QAAMS Program.<sup>13</sup> The Executive Summary of this report viewed the use of the DCA 2000 POC technology as a major opportunity to better care for and manage Aboriginal clients with diabetes within the community setting, while the ability of the POC device to generate rapid results served as a catalyst to enhance patient self-management. The summary also concluded that the DCA 2000's simplicity of use led

to high levels of acceptance by Aboriginal health workers nationally, with nearly two-thirds of services expressing the view that it had raised the self-esteem of their health workers. It also concluded that the sense of community control was enhanced as a result of management of diabetes becoming more focused within Aboriginal medical services.

Three years since this initial evaluation and with the approval of the Australian Government's Department of Health and Ageing, a detailed survey of satisfaction levels was undertaken among the three key stakeholder groups involved in the QAAMS HbA<sub>1c</sub> Program – doctors, POCT operators and patients with diabetes. The results of this survey showed conclusively that the aim of the QAAMS Program to provide a more timely, efficient, and practical diabetes monitoring service using a quality assured framework has been achieved.

From the clinical viewpoint, doctors were comfortable that the POCT result was accurate and reliable. As POCT operators, both Aboriginal health workers and nurses felt the education, training and quality management framework that underpinned the QAAMS Program was culturally appropriate and that the DCA 2000 had proven mechanically sound and reliable in Aboriginal hands. Aboriginal health workers again reported that POCT had provided them with a sense of self-empowerment, an important cultural benefit of the program.<sup>13</sup> Both POCT operators and patients with diabetes reported improved satisfaction with their diabetes services after the introduction of POCT, also reflecting positive acceptance of the QAAMS model. Importantly both doctors and patients felt the immediacy of the POCT result contributed positively to patient care, improved the doctor-patient relationship, and made patients more likely to be both compliant and self-motivated to improve their health.

From a clinical outcome perspective, an improvement in glycaemic control was observed in a group of 74 diabetes patients from two Aboriginal medical services with whom the QAAMS management team worked closely. The UKPDS study has shown that every 1% decline in HbA<sub>1c</sub> substantially reduced the risk of the microvascular complications of diabetes, particularly retinopathy and nephropathy.<sup>14</sup> Thus the statistically significant fall of 0.7% HbA<sub>1c</sub> observed in diabetes patients at these two services, together with the improvement in the percentage of patients achieving glycaemic targets and the reduction in the percentage of patients with poor control, augur well for the longer-term outcomes of the patients. The collection of further longitudinal data on these patient groups will continue to be important.

Convenience, acceptability, immediacy of result and improved patient outcomes are often quoted with limited supporting data as 'potential' advantages of POCT. The results documented in this paper confirm, for the first time, the widespread acceptance of the QAAMS POCT model as a culturally and clinically effective service for diabetes management in Aboriginal Australia. This study also verifies that the role of POCT in achieving better clinical outcomes stems mainly from its convenience, the immediacy of result, and an enhanced doctor-patient relationship collectively leading to greater patient self-motivation.

In previously published material, the QAAMS Program has been shown to be analytically sound in Aboriginal hands, with the quality of POCT for both HbA<sub>1c</sub> (and urine ACR) continuing to improve across time, meeting analytical performance goals and matching equivalent laboratory performance.

Reimbursement of POC HbA<sub>1c</sub> and urine ACR tests conducted for diabetes management can be obtained through the Australian Government's Medicare rebate system. This rebate system ensures that the QAAMS Program remains cost neutral for participants and is financially sustainable in the long term.

The QAAMS model has also shown its versatility in being adaptable to other health sectors in Australia. For the past three years, the Community Point-of-Care Services unit at Flinders University (from which QAAMS is now managed) have provided specialist POCT services for a novel program called Diabetes Management Along the Mallee Track, which is based at the remote town of Ouyen in north-west Victoria.<sup>15</sup> In this program, POCT is provided through the local hospital and general practice as part of an integrated, multidisciplinary 'one-stop', management service for diabetes patients across the region. POC HbA<sub>1c</sub>, urine ACR (and lipid) measurements are conducted by nursing staff who participate in on-going

education and training sessions and conduct regular quality testing. This model has gained widespread acceptance by the Mallee Track community and also resulted in improved clinical outcomes for diabetes patients from the region.

In summary, there is now a considerable evidence base to show the QAAMS POCT model for diabetes management in Aboriginal Australia is analytically sound, culturally and clinically effective (providing a convenient and accessible service for both doctors and patients with diabetes), results in improved clinical outcomes, is sustainable, and is adaptable and transferable to other POC tests and other non-Indigenous health settings in rural and remote Australia.

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