Newsletter, 153 (June), 26-31. Copyright 2004: Australasian Association of Clinical Biochemists.
Published version of the paper reproduced here with permission from the publisher.

POCT in the Indigenous Rural Community

Mark Shephard
Director, Community Point-of-Care Services, Flinders University Rural Clinical School, Adelaide.

Introduction

This paper describes three health programs that I've been fortunate to be involved in as Program Manager over the past 7 years - the 'Umoona Kidney Project', the national 'QAAMS' Program for point-of-care HbA1c testing and the 'Point-of-Care in Aboriginal Hands' Program. The common feature these models share is the use of point-of-care technology for the early detection and/or management of chronic diseases (renal disease, diabetes and cardiovascular disease). The primary focus of each program has been the rural and remote Aboriginal Community Controlled Health Service (ACCHS) sector, because these three chronic diseases account for a huge burden of morbidity and mortality in Aboriginal Australians.

Above Left: Aboriginal health worker Richard Jones conducting a POC risk assessment on Elizabeth Taylor at the Port Lincoln Aboriginal Health Service, West Coast, SA. Above Right: Aboriginal health worker Sandy Wilson and Mark Shephard discussing POC results with a patient from Hack's Point, near Meningie in the Coorong region of South Australia.

Most laboratory people think of a point-of-care testing (POCT) model that is hospital-based, has direct connectivity with the laboratory and the laboratory being in full control of the service. The models described in this paper are different because they function outside the 'comfort zone' of the hospital base, with the Aboriginal community and their associated health service driving the model. The point-of-care challenge in this context is to develop quality-assured, sustainable and clinically effective models for the community setting.

POCT has several advantages specific to the Aboriginal health care setting.[1] Through appropriate training, Aboriginal Health Workers can perform POCT on-site, thereby empowering them to take greater responsibility for the health of their own community members. Immediate availability of result means that the Aboriginal patient doesn't have to come back for a followup visit, something that may often be very difficult to organise in the Aboriginal community setting due to other social and cultural priorities taking precedent over health matters. By conducting the tests on-site, ownership and control of health information remains with the community, a factor crucial to the acceptance and success of Indigenous health programs worldwide. Each of the working models described is based on the four fundamental elements: continuing education, training, quality management and ongoing support for point-of-care technology.

The Umoona Kidney Project

The Umoona Kidney Project was a partnership between the Umoona Aboriginal community at Coober Pedy in South Australia's far north (850 km from Adelaide) and the Renal Units at Flinders Medical Centre and Women's and Children's Hospital, Adelaide, South Australia.[2] The primary focus of the Umoona Kidney Project was a voluntary (or opportunistic) renal disease risk assessment and management program for the 400-plus adults and children in the community.

Table 1. Reduction in Renal and Cardiovascular Risk Two Years After Commencing Coversyl.

Marker	Measure/Matrix	Units	Pre-Coversyl Baseline Mean (+/-SEM)	Post-Coversyl 2 Years Mean (+/-SEM)	P-Value*
Blood Pressure					
Standing	Systolic	mmHg	151 (±3)	137 (±3)	<0.0001
	Diastolic	mmHg	92 (±2)	84 (±2)	<0.0001
Lying	Systolic	mmHg	147 (±3)	131 (±3)	<0.0001
	Diastolic	mmHg	94 (±2)	84 (±2)	<0.0001
Albumin: Creatinine Ratio (ACR)	Urine	mg/mmol	16.5 (±3.9)	12.0 (±2.8)	ns
Potassium	Plasma	mmol/L	4.0 ±0.1)	4.0 (±0.1)	ns
Urea	Plasma	mmol/L	4.9 (±0.3)	5.1 (±0.3)	ns
Creatinine	Plasma	mmol/L	0.081 (±0.003)	0.077 (±0.003)	ns
Glomerular Filtration Rate (GFR)**		mLs/min	110 (±5)	118 (±8)	0.019

* $p < 0.05$ is significant; ns = not significant.

** Calculated GFR by Cockcroft DW and Gault MH.

The Bayer DCA 2000 was used for measurement of urine albumin: creatinine ratio, or ACR, as the cornerstone of both the risk assessment and clinical management arms. Prior to the commencement of the program, the Adelaide team spent six months of groundwork talking to the community, holding information forums, demonstrating all aspects of POCT and discussing the ACR test.

The overall risk factor profile of the 158 adults assessed (which represented approximately 65% of the adults in the community) showed 42% of the people had high blood pressure, 24% had diabetes, 19% had persistent microalbuminuria and 9% macroalbuminuria. Thirty-five people were identified as being at risk for renal disease and offered the ACE inhibitor Coversyl (Servier Laboratories, Australia) which resulted in a sustained and statistically significant drop in blood pressure to normal levels, as well as a stabilisation of renal function, with mean ACR of the group (monitored using the DCA 2000) falling from 17 to 12 mg/mmol (p=0.09, paired t-test). (Table 1).

Across two years of continuous field testing (n=46) the DCA 2000 exhibited a precision base (coefficient of variation, CV%) of 6.9 and 3.6% for urine albumin (for Bayer QCs with concentrations of 36 and 208 mg/L respectively), 3.2 and 4.1% for creatinine (9 and 36 mmol/L) and 6.7% and 5.3 % for urine ACR (ratios of 4.1 and 5.8 mg/mmol). These are well within precision goals of 10%, 6% and 12% for urine albumin, creatinine and ACR (which can be derived from biological variation and other international consensus data on performance criteria).

The Umoona Community evaluated the program through a survey conducted by community elders. By all criteria, the community expressed a high level of satisfaction with the program and the use of POCT (with a greater than 90% satisfaction rating being recorded for all questions). In December 2000, the program was handed over to the Umoona Community as a self-sustaining

Above: Mark Shephard conducting training for participants in the QAAMS ACR Program.

"One of the most pleasing aspects of the Umoona Kidney Project was that POCT became a focal point for raising community awareness about renal disease. We were able to build on the trust and respect gained from the renal program and conduct a number of other community activities around related health issues and health promotion."

activity fully integrated into the health service infrastructure. Both the South Australian Government's Department of Human Services Renal and Urology Services Implementation Plan 2000-2011 and the Statewide Iga Warta Aboriginal Renal Disease Summit, 1999 endorsed the Umoona model for expansion to other Aboriginal communities in rural and remote South Australia.

One of the most pleasing aspects of the Umoona Kidney Project was that POCT became a focal point for raising community awareness about renal disease. We were able to build on the trust and respect gained from the renal program and conduct a number of other community activities around related health issues and health promotion. These included developing a nutrition training program for Umoona's Aboriginal Health Workers, staging a poster competition for the children at the Coober Pedy Area School about healthy foods and holding education days at the school about kidney health and the importance of good food (sponsored by the Australian Kidney Foundation). A bush tucker trip was also conducted with the Umoona Community Elders for the school children, where the children were taught how to dig for witchetty grubs, collect other bush foods and cook kangaroo.

The National 'QAAMS' Program for Point-of-Care HbA1c testing

The 'QAAMS' Program, or Quality Assurance for Aboriginal Medical Services as it is known, arose from a recommendation of the National Diabetes Strategy in 1998, commenced as a pilot in June 1999 and, is now fully integrated into mainstream Aboriginal health care in Australia.[3] Since its inception, the program has been a collaborative partnership between a number of groups including the Office for Aboriginal and Torres Strait Islander Health (OATSIH), the Diagnostics and Technology Branch within the Australian Government's Department of Health and Ageing, the National Aboriginal Community Controlled Health Organisation (NACCHO), the RCPA Quality Assurance Programs Pty Ltd and the Community Point-of-Care Services Unit.

The chronic disease focus of the QAAMS program is the management of established diabetes. Over 2300 Aboriginal patients with diabetes are involved in the program, which is being conducted at 50 Commonwealth and State/Territory funded Aboriginal Medical Services around Australia. These sites cover urban, rural and remote locations and encompass every state and Territory in Australia (Figure 1). At each site Aboriginal Health Workers measure HbA1c using the Bayer DCA 2000. A Quality Assurance Program (called QAAMS) to constantly monitor the analytical performance of all the DCA 2000 instruments in the field was developed collaboratively by the Community Point-of-Care Services unit at Flinders University and the RCPA Quality Assurance Programs Pty Ltd. This is the first program of this type to be developed for Indigenous people anywhere in the world.

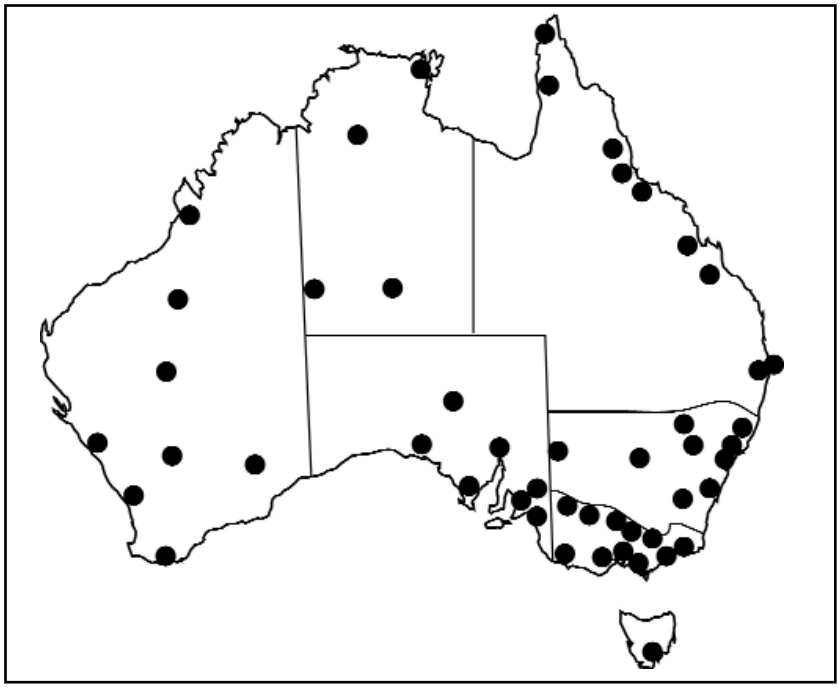

Figure 1. Map showing general location of QAAMS Participants in 2003.

Beryl Mazzachi, medical scientist from the Community Point-of-Care Services unit, training Aboriginal health workers Barbara White (left) and Erica Cox at the Broome Aboriginal Medical Service, Kimberley, WA.

Each QAAMS participant is provided with an annual kit of quality assurance samples for testing (with 2 samples to be tested per month), a single-page result sheet, and a monthly summary report with a graphical result format similar to, but more simplified than, that provided for laboratories. Each site has its own Community Number to ensure confidentiality of results. Eight six-monthly testing cycles have been completed over the four years from July 1999 to July 2003. Participation rate has averaged 87% (range 81-93%) across all eight testing cycles with over 3500 quality assurance results returned during this time. The percentage of results considered acceptable has averaged 83% (range 81 to 86%), using limits for acceptable performance that are the same as those for the laboratory-based Glycohaemoglobin Program run by the RCPA Quality Assurance Programs Pty Ltd (±5%). Across the past five testing cycles in particular, the median precision base (CV%) achieved by Aboriginal medical services in the QAAMS program has been equivalent to that achieved by 75 laboratory-based DCA 2000 users registered in the Glycohaemoglobin program (Table 2). As the table also shows, the precision achieved by Aboriginal medical services has been very consistent over time and approaches the 3% mark, which is the desired performance for monitoring of people with diabetes.

In March 2001, NACCHO conducted an independent evaluation of the first 18 months of the QAAMS program. The Executive Summary of this report stated that the use of the DCA point-of-care technology represented a major opportunity to better care for and manage Aboriginal clients with diabetes within the community setting, while the ability of POCT to generate rapid results served as a catalyst to enhance patient self-management. The summary concluded 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. Importantly, the sense of community control was enhanced as a result of diabetes management becoming more focused within Aboriginal medical services.

To further enhance the sustainability of the QAAMS HbA1c program, a Medicare rebate is now available for participating sites and an annual workshop has been held since 2001. These workshops have now become a key feature of the QAAMS calendar. The meetings are very interactive, with significant opportunities for retraining and networking. All participants now undergo competency assessment and certification (in both practical and theoretical elements of the program) at the Workshop. A new QAAMS program for ACR testing on the DCA 2000 commenced in 2003 and involves 30 ACCHS.

"Over 2300 Aboriginal patients with diabetes are involved in the HbA1c program, which is being conducted at 50 Commonwealth and State/Territory funded Aboriginal Medical Services around Australia."

Table 2. Comparative Precision Base Over Last Five Testing Cycles: Aboriginal Community Controlled Health Services (ACCHS) versus Laboratories using the Bayer DCA 2000.

Program	Type of Service	Cycle Period Jan to June 2001	July to Dec 2001	Jan to June 2002	July to Dec 2002	Jan to July 2003
QAAMS	ACCHS	3.7	4.1	3.9	3.4	3.8
Glycohaemoglobin	Laboratories	3.4	4.1	3.7	3.5	3.6

* Coefficient of variation (CV%) is calculated by dividing the standard deviation by the mid-point of the service's range of concentrations, expressed as a percentage. The standard deviation is the error of the estimate Sy.x and represents the average standard deviation across the range of concentrations analysed.

Left : Conducting POC chronic disease risk assessments in a tin shed at the Port Lincoln Aboriginal Women's Centre.

The Point-of-Care in Aboriginal Hands Program

The Point-of-Care in Aboriginal Hands program, which commenced in mid 2001, is a partnership between the Community Point-of-Care Services unit and four rural and remote Aboriginal health services at Port Lincoln, the Riverland and Meningie in South Australia and at Kalgoorlie in Western Australia.[4] Education, training and quality management of POCT again underpin the program and the local Aboriginal Health Worker(s) is responsible for the day-to-day operation of the point-of-care technology.

However the Point-of-Care in Aboriginal Hands program differs from the other models described in several fundamental ways. Firstly it has a greater local community focus with local medical officers and/or Medical Directors undertaking all clinical management at each health service. Secondly, the program has a broader chronic disease focus that looks at the early detection, risk assessment and management of diabetes, renal disease and cardiovascular disease collectively rather than having a single disease focus for example renal for the Umoona project or diabetes for the QAAMS HbA1c program. Finally, there is wider use of POCT with Aboriginal Health Workers trained to use the Bayer DCA 2000 for both HbA1c and urine ACR testing and the Cholestech LDX lipid analyser.

While most of the point-of-care risk assessments are conducted in the clinic setting, the opportunity is taken whenever possible to conduct field-testing outside the clinic. For example, testing has been carried out at such diverse locations as a local eco-tourism centre, a TAFE (adult education) College, and in a tin shed at the Pt Lincoln Aboriginal Women's Centre (an event which was also linked with a nutrition health promotion activity). In the Riverland, a bus has been purchased and renovated to provide a mobile POCT service throughout the Riverland region (with risk assessment also linked to an eye check for people with diabetes through a separate program). These examples really show the flexibility and versatility of POCT in the community setting.

Across all four participating sites over 600 chronic disease risk assessments have been performed by POCT. Diabetes is extremely prevalent, there is a large incipient pool of renal disease, with rates of microalbuminuria ranging from 19 to 26% in the general community and elevated lipids are very common. An example of the risk assessment profile found at one community is shown in Figure 2. For clinical management flow charts for POCT have been developed in collaboration with each community, based on best practice evidence and input of the local clinicians. The frequency of follow-up testing is determined by diabetes, blood pressure, microalbumin and lipid status. At Port Lincoln a subset of 29 patients with diabetes have shown a mean decrease in HbA1c of 0.4% after a year on POCT and managed care planning.

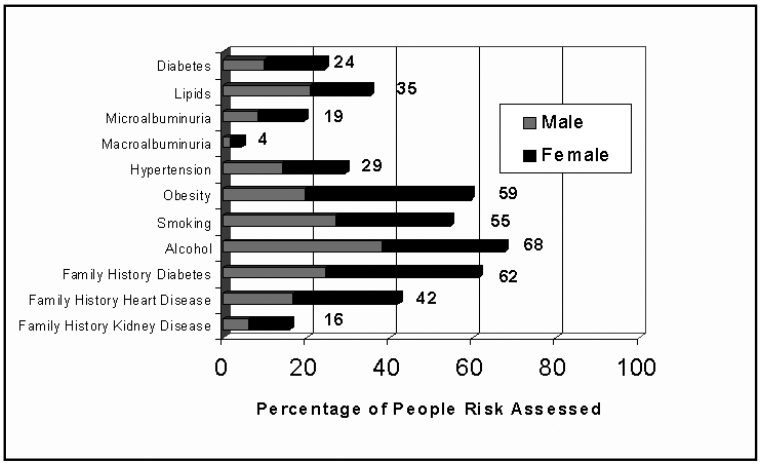

Figure 2. Chronic Disease Risk Assessment Profile at one community.

All sites are now enrolled in both national QAAMS programs - for HbA1c and urine ACR - and they conduct on-site internal quality control testing, the results of which are immediately faxed to and managed by the Flinders' Community Point-of-Care Services unit. There is also monthly communication between the unit and each participating site around a quality management checklist. Quarterly on-site field visits are also conducted by the Flinders' team. Table 3 details the analytical performance achieved by each site for QAAMS testing in the most recent cycle. These results again clearly demonstrate that point-of-care testing can be carried out to a high level of analytical competency by Aboriginal Health Workers, provided they are supported by a quality management framework comprising on-going education, training and participation in structured quality management programs.

Mark Shephard training Maxine Gosam (Innisfail, North Queensland) and Jacqueline Freeburn (Grafton, NSW) in how to conduct quality assurance testing on the Bayer DC 2000 point-of-care analyser.

Table 3. Median Precision Achieved for QAAMS HbA1c and Urine ACR Testing by the Four Sites Participating in the Point-of-Care in Aboriginal Hands Program

	HbA1c		Urine ACR	
Site	**Median Precision (CV%)**	**Precision Goal (CV%)**	**Median Precision (CV%)**	**Precision Goal (CV%)**
1	3.2%	3%	4.3%	12%
2	3.1%		5.1%	
3	3.1%		N/A*	
4	2.9%		5.0%	

* Data is not available for the Urine ACR Program for Site 3.

References

1. Shephard M. Point-of-care testing in the Aboriginal community. Australian Journal of Medical Science 2003; 24: 10-16.

2. Shephard MDS, Allen GG, Barratt LJ, Paizis K, Brown M, Barbara JAJ, McLeod G, Vanajek A. Albuminuria in a remote South Australian Aboriginal community: results of a community-based screening program for renal disease. Rural and Remote Health 2003; 3 (online) 8 February 2003. Available from http://rrh.deakin.edu.au.

3. Shephard MDS and Gill JP. Results of an innovative education, training and quality assurance program for point-of-care HbA1c testing using the Bayer DCA 2000 in Australian Aboriginal Community Controlled Health Services. The Clinical Biochemist Reviews 2003; 24(4): 124-31.

4. Jones R, Mazzachi B and Shephard M. Point-of-Care in Aboriginal Hands. Aboriginal and Islander Health Worker Journal 2002; 26 (6): 13-16.

Acknowledgement: The author wishes to acknowledge the continued sponsorship of the work of the Community Point-of-Care Services unit by Servier Laboratories (Australia) Pty Ltd and the ongoing support of Bayer Australia and Point of Care Diagnostics Australia. The QAAMS programs are funded by the Australian Government's Department of Health and Ageing (Diagnostics and Technology Branch). The Pfizer Foundation and Pfizer Australia sponsored the POC in Aboriginal Hands Program in 2002.