Integrating best practice and filling knowledge gaps in remote Aboriginal diabetes detection and care: Improving case detection and service delivery

2015 APHCRI Foundation Grant

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ACKNOWLEDGEMENTS

This research is a project of the Australian Primary Health Care Research Institute, which is supported by a grant from the Australian Government Department of Health. The information and opinions contained in it do not necessarily reflect the views or policy of the Australian Primary Health Care Research Institute or the Australian Government Department of Health.

CITATION

Marley JV, Singleton S, Griffiths E, Cutter M, Wright K, Falcocchio L, Scott L, Houston N, Martin J, and Atkinson D. Integrating best practice and filling knowledge gaps in remote Aboriginal diabetes detection and care: Improving case detection and service delivery. Final report to the Australian Primary Health Care Research Institute (2016)

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BACKGROUND

The long-term health impacts of type 2 diabetes mellitus (T2DM) are related to macrovascular (e.g. coronary artery disease, cerebrovascular disease, peripheral vascular disease) and microvascular (e.g. retinopathy, nephropathy, neuropathy) complications. T2DM and associated complications are a significant health problem facing Aboriginal and Torres Strait Islander people in Australia [1]. T2DM prevalence is estimated to be as high as 32% [2,3] and in the remote Kimberley region of Western Australia (WA), kidney disease has an average yearly incidence for Aboriginal people 30 times the national average [4].

The early identification of diabetes provides an opportunity to institute effective preventive approaches shown to reduce the subsequent development or progression of macrovascular and microvascular disease [5-9]. For example, Stratton et al. conducted a review of the long-term randomised controlled trials (RCTs) of people in the United Kingdom with diabetes aimed at reducing blood pressure and blood glucose levels (UKPDS). They concluded that for each 1% reduction in glycated haemoglobin A1 (HbA_{1c}), a measure of blood glucose over a three month period, there was a reduction in risk of 21% for any end point related to diabetes, 21% for deaths related to diabetes, 14% for myocardial infarction, and 37% for microvascular complications such as kidney disease [5]. A 10 mmHg decrease in systolic blood pressure reduced the risk of any diabetes related end point by 11% [9].

In contrast to the UKPDS, which enrolled patients newly diagnosed with diabetes, the Action in Diabetes and Vascular Disease: Preterax and Diamicron Modified Release Controlled Evaluation (ADVANCE) and Action to Control Cardiovascular Risk in Diabetes (ACCORD) trials enrolled patients who had been treated for 8 and 10 years, respectively [10-12]. These RCTs were not as effective as the UKPDS, suggesting that tight blood glucose control is more effective early in the course of T2DM. However, diabetes remains undiagnosed in up to 50% of people [7,8,13]. Delayed diagnosis is due in part to diabetes screening approaches which rely on glucose measurements [14].

When the Kimberley Chronic Disease Therapeutic Protocols and Australian guidelines for diagnosing T2DM were revised in 2007 and 2009, respectively, they used evidence from our "Kimberley POC Glucose Study" [15] to include the use of point-of-care (POC) glucose screening for diabetes in remote Aboriginal and Torres Strait Islander settings [16-18]. While we initially thought that this would improve case detection, the "DAHS Diabetes Study" [14] highlighted continuing issues with completing screening for diabetes related to the requirement for fasting and multistage testing in the existing glucose algorithm.

This led to our "Kimberley HbA_{1c} Study". This study demonstrated that screening for diabetes with glycated haemoglobin A1 (HbA_{1c}) in remote Kimberley towns and Aboriginal communities was more likely to: 1) be completed; and 2) detect diabetes than current screening using glucose measurements [19]. We also demonstrated that POC HbA_{1c} analysers can be used in real world remote Aboriginal health services for opportunistic screening to detect diabetes without extensive training and quality assurance processes [20].

Following this study Kimberley health services identified a gap in knowledge transfer: *how do we implement this evidence to make sustainable changes to screening for diabetes?*

Although RCTs are generally considered the gold standard in research, it has been argued that in complex public health interventions other methodologies should be pursued [21]. RCTs are not well placed to take into account the operational changes to service provision needed to deliver an intervention such as a diabetes screening program [21]. Contamination can also be an issue where individuals are randomised within the one health

care setting [22,23]. The usual solution to minimise contamination is to randomise on a cluster level. However this can introduce selection bias if randomisation occurs prior to participant recruitment. It may also slow down recruitment in the clusters that receive treatment such as "usual care" [24]. Other disadvantages compared with individually randomised trials include greater complexity in design and analysis, and the need for larger sample sizes to obtain the same statistical power [24,25].

Alternative methodologies include plausibility[1] and adequacy[2] evaluations [21]. Taking into account the risks, feasibility and cost-effectiveness of cluster randomised trials [21] an implementation science approach [26] is the only feasible method that will allow us to test the effectiveness of operational changes to clinical service provision on screening for diabetes. Researching in context and focusing on the end-user are key principles of implementation research [26,27].

This part of the pilot project was developed to provide preliminary data and establish systems to be used for an identified larger implementation research project required in the Kimberley to sustainably improve diabetes case detection.

Aims

The aims of this part of the pilot project were:

- to determine barriers and enablers to implementing the new Kimberley HbA_{1c} diabetes screening algorithm;
- to determine diabetes screening rates at baseline and 12 months after the Kimberley HbA_{1c} screening algorithm has been developed.

[1] Plausibility evaluations use an observational design with a comparison group.
[2] Adequacy evaluations use process indicators and outcome data to suggest if the intervention is having an important effect.

METHODS

This pilot project was conducted in the remote Kimberley region of far north WA. It focuses on the steps taken by Kimberley Aboriginal Medical Services' (KAMS) remote clinics to implement the new Kimberley diabetes screening algorithm.

Implementing the new model of POC HbA_{1c} screening

We talked with clinic/management staff across the Kimberley to discuss how the new Kimberley HbA_{1c} screening algorithm could be embedded into everyday primary health care (PHC) practice at each site. Some of the strategies that were trialled to achieve sustainability included:

- EDUCATION: intensive awareness and education of staff of the "Kimberley HbA_{1c} Study" results and changes to the Kimberley screening algorithm;
- PATIENT EDUCATION RESOURCE DEVELOPMENT: development of resources designed to assist health providers to explain HbA_{1c} measurements, in partnership with Kimberley Renal Services;
- TRAINING: adding POC HbA_{1c} analyser training to existing regional training programs;
- UPDATING PROTOCOLS: adding POC HbA_{1c} to routine tests for people due for screening;
- HARDWARE: ensuring clinics have POC HbA_{1c} analysers;
- MONITORING: developing a regional quality assurance program.

Six to 12 months after the visits we contacted clinic staff to see what changes they had made. Team members who visit the clinics during the study period also recorded their observations on changes that occurred.

Data from the discussions with clinic staff and team members' reflections were transcribed into Microsoft Word 2010 (Microsoft) documents. Individual documents were amalgamated into a textual database. The lead investigator reviewed and conducted thematic analyses of the data.

The initial focus was to identify facilitators and barriers to implementing the new protocol. As review of the document continued important and recurring themes were identified by the team. Conclusions were developed and tested against data from the database and quantitative data.

Screening for diabetes in adults using HbA_{1c}

To determine HbA_{1c} diabetes screening rates for Aboriginal and Torres Strait Islander patients of KAMS clinics we conducted a retrospective audit of electronic records of patients who:

- had attended KAMS remote clinic(s) at least three times from 1 January 2014 to 31 December 2015;
- were recorded as Aboriginal and/or Torres Strait Islander;
- were 15 years and over at 1 January 2014;

- were not on a diabetes care plan[3] prior to 1 January 2014; and
- were not on renal replacement therapy prior to 1 January 2014.

Screening rates for this patient population were assessed over the following 12 month periods: 1 January to 31 December 2014; and 1 January to 31 December 2015. Patients who had a diagnostic HbA_{1c} measurement were assessed on whether or not a diabetes care plan was assigned (i.e., a diagnosis recorded by a clinician, usually a GP, within the medical record) during the audit period and the time taken to assign this care plan.

These audit periods were chosen as the "Kimberley HbA_{1c} study" stopped recruiting participants in October 2013, the last study follow-up blood test was October 2014, an MBS rebate for screening for diabetes using laboratory HbA_{1c} tests was introduced in November 2014, and in-services had been provided to several Kimberley health services on the new screening algorithm prior to January 2015.

In February 2016, data were extracted from MMEx and transferred into Excel 2010 (Microsoft). Outliers were identified and data entry errors were corrected and documented. The data were then imported into Stata, version 13 (StataCorp). Analyses were performed using Stata, version 13. We used the McNemar test for paired nominal data to compare differences between rates of screening for diabetes in 2014 and 2015. Point estimates were presented with 95% CIs; the exact *P*-value was used. $P < 0.05$ was defined as statistically significant.

[3] "Care plan" is the term used within MMEx to allocate a set of related "care plan activities" for a collection of chronic diseases. Allocating a care plan to a patient auto-generates a medical history item and helps to generate a list of activities due at set time points according to the Kimberley Regional Guidelines. For example, for diabetes this includes three monthly pathology, foot checks, retinal screening etc.

RESULTS

Implementing the new model of POC HbA_{1c} screening

Education

- EDUCATION: intensive awareness and education of clinic staff of the "Kimberley HbA_{1c} Study" results, and changes to the Kimberley T2DM screening algorithm
- PATIENT EDUCATION RESOURCE DEVELOPMENT: development of resources designed to assist health providers to explain HbA_{1c} measurements, in partnership with Kimberley Renal Services.

All health services were given a copy of the two peer reviewed papers from the original Kimberley HbA_{1c} study [19,20] and were given the opportunity to provide input and/or comment on the manuscripts prior to submission for publication. Plain language reports were developed for community members and health service providers. The papers and plain language reports were widely disseminated and added to the KAMS research website (available from: http://www.kamsc.org.au/research/Completed_Projects/HbA1c.html).

Face-to-face feedback was provided to staff at health services across the Kimberley:

- Management of Chronic Disease Workshop, Broome 25th August 2014
- WACHS Regional Drug and Therapeutic Committee 3rd September 2014
- Derby Aboriginal Health Service 9th September 2014
- KAMS Lead Clinicians' Forum 19th September 2014
- Broome Regional Aboriginal Medical Service 24th September 2014
- Kimberley Regional Lead Clinicians' Forum 7th November 2014
- GP registrar workshop, Broome 15th November 2014
- Bidyadanga Clinic 21st April 2015
- Kununurra Regional Hospital 8th May 2015
- Balgo Clinic 14-17th July 2015
- Billiluna Clinic 14-17th July 2015
- Mulan Clinic 14-17th July 2015
- KAMS Clinical Services Team Meeting 9th October 2015.

Face-to-face feedback was also provided to community members in Balgo, Bidyadanga, Billiluna, and Mulan. Discussions with community members about the HbA_{1c} tests highlighted the importance of having culturally appropriate resources.

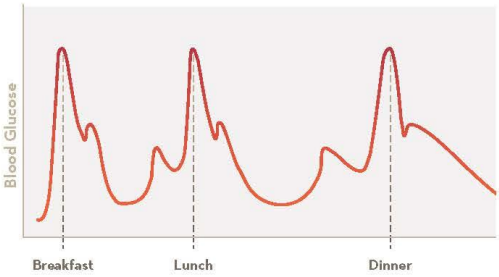
In response to this the Kimberley Renal Service developed a poster as a resource to explain the difference between glucose and HbA_{1c} tests: "Understanding your diabetes check". This resource (see Figure 1) was developed with extensive community consultation through iterative testing and redrafting using an evaluation sheet to record patient and provider feedback (see Figure 2). Over 30 community members from the Halls Creek and Kutjungka regions were asked if they understood the information in the resource and if changes needed to be made. Based on this feedback the resource was modified. The resource was redrafted two further times and each version tested. The final version was also tested at West Kimberley sites to ensure the message was effective across the Kimberley region.

Diabetes **Check**

What is Blood Sugar (Glucose) Level?

It's a measurement of the amount of sugar floating in the blood.

High blood sugars = MORE sugar floating in the blood.



Your value: .....

Your goal: .....

What is HbA1c?

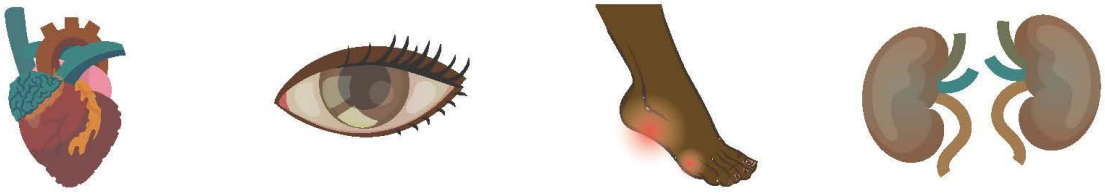
It's a measurement of the amount of blood sugar attached to the Haemoglobin part of your red blood cells.

High blood sugars for a long time = MORE sugar stuck to Haemoglobin.

Your value: .....

Your goal: .....

Untreated diabetes can seriously affect your heart, eyesight, feet and kidneys.



It's never too late to make positive changes to your lifestyle!

Eating well and keeping active can improve long term health and help to maintain good kidney function

Figure 1. Diabetes Check: Kimberley Renal Service resource for explaining the difference between blood sugar level and HbA_{1c}

Site: **Title of Poster evaluated:** **Role (e.g. Community member/client/nurse/health professional):** **Age:** **Please circle: M / F**				
Do you understand the poster?	Yes	not really	No	No comment
Do the words make sense?	Yes	not really	No	No comment
Do the pictures made sense?	Yes	not really	No	No comment
The number of words is okay?	Yes	not really	No	No comment
The number of pictures is okay?	Yes	not really	No	No comment
What else would you like the message to have?				
How would you explain about: ***Diabetes / High Blood Pressure / Stages of kidney disease / Roads to Kidney Disease?*** (circle as relevant)				
What I learned from the message on the poster?				

Mark on poster overleaf any part not understood.

Please return to: Fax: 91940342 Email: krsadmin@kamsc.org.au

Figure 2. Kimberley Renal Service evaluation sheet for resource development

Training and hardware

- TRAINING: adding POC HbA_{1c} analyser training to existing regional training programs;
- HARDWARE: ensuring clinics have POC HbA_{1c} analysers.

POC HbA_{1c} testing in Australia is currently used in the management of diabetes. Accreditation with a quality assurance program such as the Quality Assurance for Aboriginal and Torres Strait Islander Medical Services (QAAMS) program is required for clinics to claim MBS rebates for these tests [28]. The only clinic that was accredited during the "Kimberley HbA_{1c} study" subsequently lost its accreditation. Clinics can use POC analysers without accreditation, however they are less likely to do so as they are ineligible for the MBS rebate. There is currently no MBS rebate available for screening for diabetes with POC HbA_{1c}.

KAMS purchased four POC analysers and sent three staff from its remote clinics to Darwin to undertake QAAMS training in how to use POC HbA_{1c} analysers. A further seven KAMS staff received QAAMS training in Broome. There has been high staff turnover of both clinic managers and remote area nurses since the training happened. KAMS is looking at how to embed ongoing education and reaccreditation for staff already credentialed by QAAMS, and for more staff to undertake QAAMS training. The latter can be completed online under the supervision of other credentialed staff. The WA Country Health Service (WACHS) is also planning on purchase POC analysers so that POC HbA_{1c} testing can be done in their Kimberley clinics.

Updating regional guidelines

> UPDATING PROTOCOLS: adding POC HbA_{1c} to routine tests for people due for screening

The Chronic Diseases Subcommittee (CDS) of the Kimberley Aboriginal Health Planning Forum (KAHPF), has the core function of attempting to ensure consistent evidence based practice across the region. While the research team included members of CDS who drafted the revision of the Type 2 diabetes – Kimberley chronic disease protocol to include HbA_{1c} tests for screening for and diagnosing diabetes, there were staff shortages that impacted on the finalisation of the revised protocol. An additional Regional Physician was appointed in March 2015 and she participated in the working group to finalise the revision (in addition to changing the screening algorithm the therapeutic sections also needed to be updated).

Prior to endorsement the new Kimberley HbA_{1c} T2DM screening algorithm was field tested with KAMS GP registrars, nurses and Aboriginal health worker trainers to make sure that the end-users found it to be easy to understand and use. KAHPF endorsed the CDS revision on 28th August 2015 (four months before the end of the audit period), and the protocol was uploaded to the KAMS website [29]. The availability of the updated guideline was notified to regional health service practitioners (see the Education section for further details). The new protocol was promoted to primary care providers at the regional Chronic Disease Workshop in Kununurra in August 2015.

Monitoring screening rates

> MONITORING: developing a regional quality assurance program

KAMS has requested improvements to the reporting capabilities of the MMEx system. During this pilot project we had preliminary discussions with the developers of MMEx (ISA Innovation), who have been closely following our diabetes and dialysis research [4,14,15,30,31], about the analysis section they were planning on adding to MMEx and how they could be involved in KAMS research. The Tableau reporting suite was acquired with the contract renewal and currently KAMS is testing some of the reporting data fields that have been loaded onto the system. Tableau reporting capability will be completed and available for wide spread use before the 30th June 2016. This will greatly increase the capacity of KAMS and member services to report on quality of care provided such as auditing HbA_{1c} screening rates and determining concordance between POC and laboratory HbA_{1c} measurements [20]. The latter could then be used as part of a quality assurance program. The introduction of Tableau was too late for this pilot project to assess its implementation.

Barriers and enablers to implementing the Kimberley HbA_{1c} screening algorithm

During discussions with clinical staff we have identified the following barriers to implementing the Kimberley HbA_{1c} screening algorithm:

- needing extra POC HbA_{1c} analysers in one of the clinics where bloods are taken in the individual clinic rooms;
- not having established systems in clinics to reorder POC HbA_{1c} cartridges or systems to check the machines are working and calibrated;
- resistance to change / changing routine practice / clinic staff not feeling confident to do the POC HbA_{1c} test;
- POC HbA_{1c} testing is not yet incorporated into existing clinic flow;
- not having good, easy systems in the clinics for identifying who is due for screening;
- lack of understanding by all clinicians of the role of HbA_{1c}, what the results mean (i.e. abnormal measurements sometimes identified as normal), and the importance of using POC HbA_{1c} to screen for diabetes;
- pathology reports still only have criteria for management and do not include the diagnostic criteria for diabetes. Reports also do not specify if the test was done for management or screening, which is important as the results are interpreted differently;
- lack of an MBS rebate for POC HbA_{1c} testing for screening and diagnosing diabetes.

MMEx development requests were also required to add additional fields in order to distinguish between HbA_{1c} measurements that were obtained from laboratory and point of care analysers. KAMS requested that the following be added to MMEx:

- new observation for laboratory HbA_{1c} measurement with new international units (mmol/mol);
- two new observations for POC HbA_{1c} (current measurement unit (%) and new international unit (mmol/mol));
- the new observations are handled as usual through reporting and results filtering (for seamless collection of data);
- reports that reference HbA_{1c} (e.g. OCHREStreams [32]) can detect any of these four observations and the units match reference ranges; and
- when only one of the % or mmol/mol is known the unknown is auto populated.

The initial upgrade was released by ISA Innovation into the production environment in late June 2015. KAMS staff reported that some of the additions were not operating as requested and ISA innovation was advised about this. A fix was released into production by ISA Innovation to rectify the problem in early August 2015.

One remote clinic was used as a trial site for the audit of HbA_{1c} screening for T2DM. During this process we identified some unusual HbA_{1c} inputs. After one of the clinic GPs reviewed the relevant progress notes and formal pathology it appeared that when clinic staff were using the auto populate terms in progress notes[4] for POC haemoglobin (screening for

[4] Auto populate terms include use of “acronym:” to tell the electronic health record that anything entered in the progress notes for that occasion of service following the acronym can populate the relevant section in the observations section of the record. For example, “BP:120/70” would automatically add a blood pressure reading of 120/70 to the days’ observations. “Hb: 110” would auto populate a POC Haemoglobin of 110 etc.

anaemia, not diabetes), the number was auto populated into the incorrect field (laboratory HbA_{1c} not POC haemoglobin) in the observation section of MMEx. While it also appeared that a software patch had corrected this mistake (we were unable to replicate this in a test patient record), several records needed to be fixed and it was unclear what time period of data entry had been affected.

This issue was discussed with ISA Innovation, who developed and ran a script through the entire database to rectify any errors with the historical data at the beginning of September 2015.

The observation fields that are available for clinicians for free-text entry were also reviewed. Laboratory results are automatically populated into patient records by the software used by Pathology laboratories, and thus should not be available for free-text entry. During this pilot study the laboratory HbA_{1c} field was available for free-text entry. This meant that we were unable to definitively distinguish between laboratory and POC HbA_{1c} tests. PathWest (the main pathology provide for the Kimberley) report mmol/mol results as whole numbers. The auto population of mmol/mol from POC results (measured as %) and vice versa, generates results to two decimal places. Therefore as a proxy for POC testing we assumed that any mmol/mol result to two decimal places was auto populated from a manually entered POC measurement.

As a result of this audit KAMS Health Informatics team is planning to:

- remove the laboratory HbA_{1c} field availability as free-text entry and
- Add POC HbA_{1c} % to the fields accessible as standard in KAMS and member service clinics (currently need to add manually from a dropdown menu). This can be configured locally and the team is waiting on confirmation on what to include in the KAMS observation template.

The Regional Physicians have begun to routinely request POC HbA_{1c} testing in their clinics. Nursing staff assisting at these clinics performed POC HbA_{1c} testing whilst the Physician was assessing the patients, so the result became available during the consultation. Before the introduction of POC testing venous blood samples had to be drawn and sent away for testing, often resulting in a delay of a week or more before the result became available. This meant the patient had to be recalled to clinic and a supplementary report issued by the Physician on each patient seen. Regional Physicians reported that using POC HbA_{1c} increased the productivity of their clinics, by enabling immediate feedback to patients and clinic staff, and avoiding loss to follow up and delaying appropriate medication regimen adjustment. While this was often used for the management of patients already known to have diabetes, it also provided an opportunity to emphasise the use and importance of POC HbA_{1c} testing for screening for diabetes.

For the general clinic a system is required to easily identify patients needing a POC HbA_{1c} test when they arrive at the clinic. That way AHWs/AHPs/nurses could do the test and have the result available when the GP sees the patient. The ‘lifetime surveillance’ care plan for Aboriginal and Torres Strait Islander patients still has blood glucose on it for annual diabetes screening. Changing this to POC HbA_{1c} for diabetes screening should enable overdue screening to be picked up by the new model of care that will include prospective identification of Medicare items that can be billed (see Chapter 3).

Screening for diabetes using HbA_{1c}

Data entry issues

There were 19 data entry errors identified, which included:

- Adding “%” to the end of the number (e.g. recording 5.8% when only 5.8 should have been entered)

- Adding "/-" to the end of the number
- Adding into the wrong field (e.g. 5.5 entered into the "mmol/mol" field instead of the % field giving an un-physiological result)
- Adding POC haemoglobin results into the wrong field (e.g. 122% entered into the POC HbA_{1c} field)

There were a further 19 results that were not auto populated from mmol/mol to % (14 cases) or vice versa (5 cases). Several results appear to be POC haemoglobin results entered into the laboratory mmol/mol observation field (e.g. a one off 53 mmol/mol; 7% HbA_{1c} result for a 12 month old infant). The script ISA Innovations ran to rectify haemoglobin measurements auto populating into the laboratory HbA_{1c} field in the observations section would not have rectified manual entry into the wrong field.

Screening rates

Screening practices were reviewed across KAMS clinics. Due to the current limitations of reporting capabilities within MMEx, data entry errors and delays in allocation of care plans, it was not possible to extract an automatic report from MMEx on HbA_{1c} tests used for screening for diabetes. The process used was laborious and involved cross-referencing several databases that were generated from data extracted from MMEx.

After identifying 2,149 regular patients aged 15 years and over, 675 were excluded for not meeting the selection criteria. Of this patient population 592 (40%) had HbA_{1c} measurements recorded on MMEx during 2014-2015 (see Table 1). There was a two fold increase in the number of the patient population who had HbA_{1c} measurements recorded in 2015 compared to 2014. The estimated use of POC machines for HbA_{1c} testing was low (18% of tests performed).

Table 1

Number of regular Aboriginal and Torres Strait Islander patients aged 15 years and over who were had HbA_{1c} measurements recorded in MMEx in 2014 and 2015	
Total no. of patients	**1474**
> 15-24 years old at 1st January 2014	575 (39%)
> 25-39 years old at 1st January 2014	535 (36%)
> ≥ 40 years old at 1st January 2014	364 (25%)
No. of patients who were screened using HbA_{1c} in 2014	**309**
> 15-24 years old at 1st January 2014	46 of 575 (8.3%)
> 25-39 years old at 1st January 2014	129 of 535 (24%)
> ≥ 40 years old at 1st January 2014	128 of 364 (35%)
No. of patients who were screened using HbA_{1c} in 2015	**455**
> 15-24 years old at 1st January 2014	98 of 575 (17%)
> 25-39 years old at 1st January 2014	184 of 535 (34%)
> ≥ 40 years old at 1st January 2014	162 of 364 (45%)
Odds Ratio 2015 v 2014	**2.0 (95% CI 1.6-2.4), p < 0.001**
> 15-24 years old at 1st January 2014	2.6 (95% CI 1.7-4.1), p < 0.001
> 25-39 years old at 1st January 2014	1.8 (95% CI 1.3-2.4), p < 0.001
> ≥ 40 years old at 1st January 2014	1.8 (95% CI 1.2-2.6), p = 0.002
No. HbA_{1c} tests recorded	1856
Estimated no. POC HbA_{1c} tests recorded	340 (18%)

HbA_{1c} = glycated haemoglobin. POC = point of care

Diagnosis of pre-diabetes and diabetes

Two hundred and ten of the 592 (35%) patients who were screened had prediabetes (5.7-6.4%; 39-46 mmol/mol) in 2014-2015 (see Tables 2-4). Thirteen (6.2%) of these patients developed diabetes within the audit period.

Ninety two of the 592 (16%) patients who were screened had at least one diagnostic HbA_{1c} measurement (≥ 6.5%; 48 mmol/mol) recorded during 2014-2015 (see Tables 2-4). It was of concern that the first recorded HbA_{1c} measurement for 56 of these patients was higher than that recommended for achieving good glucose control (≥ 7.0%; ≥ 54 mmol/mol), suggesting a high rate of undiagnosed pre-existing diabetes.

Table 2

Number of regular Aboriginal and Torres Strait Islander patients aged 15 years and over who had HbA_{1c} measurements consistent with prediabetes and diabetes in 2014-2015	
Total no. of patients with prediabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**210** 23 (11%) 85 (40%) 102 (49%)
Total no. of patients with diabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**92** 7 (7.6%) 48 (52.2%) 37 (40.2%)

HbA_{1c} = glycated haemoglobin

Table 3

Incidence of prediabetes and diabetes in the patient population who were screened with HbA_{1c} in 2014-2015 by age category	
Total no. of patients with prediabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**210** 23 of 132 screened (8.4%) 85 of 264 screened (32%) 102 of 247 screened (41%)
Total no. of patients with diabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**92** 7 of 132 screened (5.3%) 48 of 264 screened (18%) 37 of 247 screened (15%)

HbA_{1c} = glycated haemoglobin

Table 4

Incidence of prediabetes and diabetes in the patient population in 2014-2015 by age category	
Total no. of patients with prediabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**210** 23 of 575 patient population (4.0%) 85 of 535 patient population (16%) 102 of 364 patient population (28%)
Total no. of patients with diabetes > 15-24 years old at 1st January 2014 > 25-39 years old at 1st January 2014 > ≥ 40 years old at 1st January 2014	**92** 7 of 575 patient population (1.2%) 48 of 535 patient population (9%) 37 of 364 patient population (10%)

There were delays to T2DM care plans being assigned. Only 64 (70%) of the 92 patients who had diagnostic measurements were assigned a diabetes care plan during 2014-2015. The median time for assignment was 47 (IQR 7-218) days. Possible reasons for delay in adding a care plan include:

- Waiting for the patient to return to the clinic to discuss the diagnosis with the patient[5]. This is to avoid the assumption that patient has been told of the diagnosis. The patient also needs to provide consent to having a care plan assigned;
- The criteria for assigning a diabetes care plan has not been updated in MMEx to include HbA_{1c} (currently only displays the glucose criteria for diagnosing diabetes);
- The staff performing POC testing are generally not the staff which are able to assign care plans.

A further 13 patients had a diabetes care plan assigned who did not have any recorded diagnostic HbA_{1c} measurements. The audit did not ascertain glucose measurements or the reason the care plan was assigned and these patients were not included in the total number diagnosed with diabetes using HbA_{1c} tests.

There has been discussions between KAMS and WACHS staff about changing the "impaired glucose" care plan to a "pre-diabetes" care plan and moving patients over to this new care plan.

Summary

While the rate of screening for diabetes using HbA_{1c} tests doubled in 2015 compared to 2014, there are still several issues that need to be addressed including increasing the usage of POC HbA_{1c} analysers; making MMEx easier to input and extract data; and timely assignment of care plans.

[5] In many cases this is not just a case of recalling the patient the next week. The wait can be considerable, with loss to follow up or delays of months to years not being unusual.

DISCUSSION

We found significant increases (1.8 to 2.6 fold) in screening for T2DM using HbA_{1c} tests in all age groups from the year before the relevant MBS rebate was introduced (2014) to the year after this change (2015). The strategy used to implement the new Kimberley HbA_{1c} T2DM screening algorithm was and will continue to be multidimensional and multidisciplinary. Champions have included GPs, regional physicians, managers and researchers.

Due to unavoidable delays the screening algorithm was officially in place in the Kimberley for only the last four months of 2015. However, from August 2014 to July 2015 there was extensive communication and consultation with clinic staff about the findings of the "Kimberley HbA_{1c} study" [19,20] and the proposed new screening algorithm. Clinicians were encouraged to use HbA_{1c} testing for screening for T2DM as soon as the original study was completed. Talking about the changes to as many people as possible before the new screening algorithm was officially introduced is likely to have contributed to the doubling of the number of HbA_{1c} tests used to screen for T2DM in 2015 compared to 2014.

An effective screening program requires that implementation addresses both health service provider and patient related factors. A lack of understanding of the difference between glucose and HbA_{1c} measurements was demonstrated when talking to community members about the results of the original "Kimberley HbA_{1c} study" and the new way their clinic will be testing for diabetes. Confusion over this would have undermined the success of any implementation activities and the Kimberley Renal Service developed and field tested resources to address this. Again extensive consultation with patients and providers was an important part of this process.

Implementing the new screening algorithm also requires several system level changes, some of which have been addressed during this pilot project. These included developing a new screening algorithm that is easy for clinicians to follow; adding the ability to record POC and laboratory HbA_{1c} measurements in the old and new international units as separate fields in MMEx; and purchasing new equipment and training clinicians into how to use them.

There still needs to be more system level changes before we can improve data entry. This includes making it clearer which field the data should be entered into in MMEx. It is also important that CQI is embedded into this process, and that inaccurately recorded measurements are corrected. CQI processes that are applied as extra tasks which are carried out intermittently tend to be considered a low priority and are often ignored. Greater implementation of CQI are associated with health care cultures that emphasise flexibility, coordination, teamwork and group affiliation [33]. Embedding CQI into everyday health service practice can be done by formalising, integrating and enhancing existing systems for evaluation and quality improvement with electronic patient information and recall systems [31]. Addition of the Tableau reporting capability in MMEx should facilitate this, but there will also need to be further training of clinicians to ensure that data is entered in a way that allows for accurate reporting.

The new Kimberley algorithm recommends screening with POC HbA_{1c} first and to follow-up with a laboratory HbA_{1c} test on the same day if the POC measurement is abnormal (≥ 5.7%, 39 mmol/mol) [29]. However, despite each clinic audited having at least one staff member trained and accredited to use POC analysers, estimated use (18% of HbA_{1c} tests recorded during the audit) was lower than expected. Effective implementation of a point of care testing program requires a significant change to clinic work flows (i.e., allowing for the 6 minutes it takes to complete the test; establishing new habits).

Any such implementation is dependent on strong clinic leadership and regional governance. Key factors that appear to impede change include inadequate or inappropriate leadership, perceived lack of ownership, complexity, and subcultural diversity within a health care organisation [34]. Workforce instability with high staff turnover affects teamwork and

negatively affects both access to care, and the level and quality of healthcare being provided [35]. Team building has been shown to improve morale and job satisfaction whilst mitigating the effects of burnout in health care workers [35].

Implementation is most likely to be effective where a benefit is visible to clinic staff. The ways that KAMS will attempt to increase the use of POC HbA_{1c} tests will include: ongoing education and reaccreditation for staff credentialed by QAAMS, and for these staff to provide QAAMS training to co-workers. Another possibility is the development of clinic protocols around "routine observations" including POC HbA_{1c} which would guide not only when to do this but also what action to take based on the result (e.g. if normal reassure that the patient does not have diabetes, if abnormal organise for the patient to see a GP as soon as possible). This would give AHWs/AHPs doing observations greater empowerment and may lead to less diagnostic tests going without appropriate follow up.

KAMS is also developing specific chronic disease portfolio holders in each clinic along with a new model of care (staff permitting) that will shift focus to chronic disease prevention and management strategies (see Chapter 3 for more detail).

Another barrier to POC HbA_{1c} screening for T2DM is lack of an MBS rebate. We are currently looking to obtain funding to do a cost-effectiveness study into the using POC HbA_{1c} tests as the first step of the diabetes screening process to support a submission to Medicare for an MBS rebate.

The data presented in this report gives an indication on the incidence of prediabetes and diabetes in five remote Kimberley communities. However due to the limitations identified during this pilot project (e.g., some measurements recorded in the wrong MMEx field; low level of screening of patients 15-25 years of age; delays in assigning diabetes care plans) caution needs to be used when assessing these results.

It appears that many patients audited had HbA_{1c} measurements suggestive of uncontrolled diabetes as the first HbA_{1c} measurement recorded in the audit period. This indicates high rates of undiagnosed pre-existing diabetes. A further limitation is that the audit did not assess whether or not these patients were managed as if they had diabetes (e.g., prescribed metformin, which is used to manage glycaemia), but had not had a diagnosis recorded and been assigned a care plan. Within MMEx, addition of a care plan is important because it facilitates a number of things to happen within the patient's record. In the first instance, it adds the chronic disease item (T2DM) to the list of current issues for the patient. Subsequently, it auto-generates related tasks that are due over a designated cycle of time, including chronic disease reviews, pathology due and screening for complications relating to the condition. These "care plan activities" reflect the agreed cycle of care as per the regional protocols [29]. They can be used to prompt opportunistic activities when a patient presents for unrelated reasons, and to generate recall lists for chronic disease review clinics. It is important that patients are placed on diabetes care plans as soon as possible after a diagnosis is made to give patients the best opportunity for all care relating to diabetes to be delivered in a timely manner.

Our data also suggests that there are high rates of young onset diabetes in remote Aboriginal communities: 14% of patients aged 15-39 years who were screened during 2014-2015 but not on a care plan had diagnostic HbA_{1c} measurement(s). While taking into account the limitations of the audit, the risk of developing prediabetes and diabetes appears to increase dramatically in the 25-39 year old group compared to the 15-24 year old group (32% v 8%, and 18% v 5%, respectively). These data highlight the importance of screening for diabetes in all Aboriginal and Torres Strait Islander people over the age of 15 in remote communities. Identifying those at high risk and implementing culturally appropriate interventions has the potential to reduce morbidity and mortality associated with T2DM in this population.

Another limitation is that the study design focused on regular patients (seen at least 3 times over 24 months). Screening for diabetes using POC HbA_{1c} tests should have greater value

for patients who are infrequently seen. This group may contain patients with more advanced diabetes. A single POC HbA_{1c} measurement that is abnormal could be used to inform the patient that they are likely to have diabetes (this still needs to be confirmed with a laboratory HbA_{1c} test) [19], and engage them in care. POC HbA_{1c} testing in this group may also allow the re-diagnosis of diabetes of patients who were diagnosed elsewhere, but may have not understand or acknowledge their diagnosis.

With the new Kimberley HbA_{1c} screening algorithm we expect that the use of HbA_{1c} tests to screen for diabetes will continue to increase over time. By following-up patients in the Kimberley over the next 5 years we should be able to determine the true burden of disease and how long it takes for progression from normal to prediabetes to diabetes and at what age this happens.

Chapter 2: Regional systems approach to diabetes management and continuous quality improvement

BACKGROUND

There is little long-term evidence of the effectiveness of diabetes care in real world PHC settings [14]. Many international and national health service approaches have focused on CQI as a mechanism to improve quality of care. Despite a decade of activity and financial investment in CQI in Aboriginal Community Controlled Health Services (ACCHSs) across Australia, anticipated improvements in quality of care and patient outcomes have not been achieved, CQI is still not embedded in routine practice and the agenda has stalled [36].

We have demonstrated that Kimberley ACCHSs can successfully provide high quality diabetes care using local CQI processes over 10 years [14], with the potential to expand this experience across multiple sites ("Kimberley Diabetes Study") [37]. The latter study provided important information on the elements required to run a high quality diabetes program and develop a sustainable and practical approach to CQI in ACCHSs. The core features are:

- allocated roles for chronic disease management;
- a well-functioning recall system;
- the involvement and support of local AHWs/AHPs in diabetes care delivery;
- well-coordinated integration with allied health professionals;
- seamless and timely data collection;
- local ownership and participation in the CQI process; and
- openness to admitting deficiencies and willingness to embrace change.

We found that facilitating change required more than an external report on processes and indicators (as with ABCD/one21seventy [38,39]) and is best provided by local on the ground support for health services to implement and improve their own CQI. Rather than using the time laborious Systems Assessment Tool processes of ABCD/one21seventy [40] we explored the local knowledge about what was and was not working at the health service level, and what was required to improve it.

Although we have started to scale up this CQI approach, gaps in knowledge include: *1) will further rounds of this regional systems approach to diabetes management and CQI lead to improved care and outcomes? 2) how can we sustainably integrate this approach in the services this has been trialled in? and 3) how do we scale it up so that all services in the Kimberley are using it?* A longer term interventional study, that uses implementation specific research methods is required in order to continue refining the CQI approach taken in our earlier studies, and to evaluate changes in service delivery rates and clinical outcome measures.

The steps involved in the CQI model we developed during the DAHS [14] and Kimberley [37] diabetes studies were:

- support an individual service to make progress with their own CQI;
- share the experience with a small number of other health services with connections or similarities; and
- continue to review the CQI process and share these experiences to help develop regional strategies for CQI that are flexible and adaptable.

The next step in helping to improve the quality of diabetes care is to implement the recommendations from these studies. These include:

- system changes to MMEx to increase the rates of data capture, increase tracking of patients as they move between communities in the region, and improve ease-of-use as well as use of the software; and
- development of a role for regional ‘CQI facilitators’ to assist services with their CQI efforts.

This part of the pilot project was developed to provide preliminary data and establish systems to be used for an identified larger implementation research project required in the Kimberley to sustainably improve provision of high quality care to people with diabetes.

Aims

The aim of this part of the pilot project was:

- to conduct a clinical systems and software/data quality needs assessment at participating sites on how diabetes programs can be improved

METHODS

As with the first part of this pilot project (Chapter 1) we used an implementation science approach [26] to assess the operational changes to clinical service provision required to improve diabetes care at KAMS' five remote clinics.

As a first step we talked with clinic/management staff across the Kimberley about the findings of the "Kimberley Diabetes Study". Discussion included changes that happened since this study took place; and how the recommendations from this study could be implemented. A clinical systems and software/data quality needs assessment was also conducted.

Some of the strategies used by KAMS managers to identify system issues included:

- STAFFING: evaluating current allocation of staffing resources and determining changes that should be made;
- ROLES AND RESPONSIBILITIES: developing clearer description of roles and responsibilities with particular regard to recall systems and chronic disease management programs;
- IMPROVEMENTS TO MMEx: establishing systems to facilitate opportunistic screening.

Six to 12 months after the visits we assessed what relevant changes had been made by KAMS. Team members who visit the clinics during the study period also recorded their observations on changes that occurred.

Data from the discussions with clinic staff and team members' reflections were transcribed into Microsoft Word 2010 (Microsoft) documents. KAMS policy documents relating to clinical care were also reviewed. Individual documents were amalgamated into a textual database. The lead investigator reviewed and conducted thematic analyses of the data.

The initial focus of the thematic analysis was to identify systems issues relating to delivery of good quality chronic disease care. As review of the document continued important and recurring themes were identified by the team. Conclusions were developed and tested against data from the database.

RESULTS

During 2014-2015 there was a high turnover of senior management at all of services involved in our previous studies. We needed to wait for the new clinic managers/CEOs to settle into their new roles before going back to the clinics to present the results of our diabetes research and discuss how the findings can be implemented. Face-to-face feedback on the overall findings of "Kimberley Diabetes Study" was provided to staff at health services across the Kimberley:

- Derby Aboriginal Health Service 9th September 2014
- KAMS Lead Clinicians' Forum 19th September 2014
- Kimberley Regional Lead Clinicians' Forum 7th November 2014
- Bidyadanga Clinic 21st April 2015
- Balgo Clinic 14-17th July 2015
- Billiluna Clinic 14-17th July 2015
- Mulan Clinic 14-17th July 2015

All participating health services were given a copy of the peer reviewed paper [31] and plain language reports from this study (available from http://www.kamsc.org.au/research/Completed_Projects/CQI_Diabetes.html), and given an opportunity to provide input and/or comment on the manuscript as it was being drafted. We also provided feedback to community members at Bidyadanga. The student involved in the project provided face-to-face feedback on each clinic's individual audit results during her honours project in 2012.

Openness to admitting deficiencies and willingness to embrace change

In order to sustainably improve chronic disease care KAMS has identified several areas for improvement. These included supporting local AHWs/AHPs and improvements to CQI processes.

Involvement and support of local AHWs/AHPs in diabetes care delivery

An important issue KAMS identified that it needed to address was determining how to change the culture at KAMS' clinics to ensure that AHWs/AHPs are valued for the important role they can have in the clinic. AHWs/AHPs can assess and treat patients, deliver specific health care programs, maintain health care systems and provide culturally safe and appropriate advice and support in order to contribute to better health outcomes for Aboriginal and Torres Strait Islander people. Additional barriers to AHWs/AHPs being involved in diabetes care include lack of numbers, poor engagement by the health service, wide variation in roles between clinics, and underutilisation of their skills. The strategies used by KAMS to address these issues include:

- improving the pay and conditions for AHWs/AHPs by providing isolation leave and a retention payment;
- developing a scope of practice so that all clinicians are aware of what AHWs/AHPs have been trained to do, that they respect what AHWs/AHPs can do and assist them to do these tasks;
- returning to KAMS' policy of "AHW first", whereby patients are first seen by an AHW/AHP whenever possible before seeing a nurse or GP (if required);
- empowering AHWs/AHPs by listening to and acting on their suggestions for improving services.

Most of these changes to policy have only recently been introduced (between July 2015 and January 2016) and work is in progress with implementing the AHW/AHP first model. There has been an increase in the number of AHWs/AHPs employed by KAMS at its remote clinics (from three to six over the past 6 months).

Seamless and timely data collection

As with the first part of this pilot project, the introduction of the improvements to the reporting capabilities of the MMEx system was too late for this project to assess the Tableau reporting suite's ability to support seamless and timely data collection.

Local ownership and participation in the CQI process

KAMS has also recently introduced changes to address acknowledged deficiencies in CQI processes. These include:

- creation of a position for a remote area nurse to act as a remote clinic support officer (commenced February 2016), to support clinics to audit service provision and patient outcomes and to act on the audit results;
- weekly / monthly team meetings at each clinic that will include discussion of CQI;
- developing key performance indicators (KPIs) to add to job description documents (JDFs), which when combined with CQI will be used to hold clinical staff accountable for their performance; and
- developing a model of care that maximises the use of MBS rebates to drive best quality care

The regional lead clinician's forum decided in November 2015 to have CQI as a permanent agenda item for its meetings to discuss what activities KAMS and each member service is engaged in and how learnings can be propagated through the service network.

Allocated roles for chronic disease management

A major theme of the original "Kimberley Diabetes Study" was the need for a clearer description of roles and responsibilities and to have dedicated funding for chronic disease roles. KAMS is developing several portfolios, including chronic disease management. The aim of these portfolios is to outline what is expected on a daily, weekly, monthly and annual basis (see Table 5 for the draft Chronic Disease Management Portfolio). As ACCHSs in the Kimberley predominately operate on a "walk-in" system it can be difficult for GPs to take the time to address identified chronic care needs and assessments when they are aware that the next person to be seen has been waiting an hour and might be quite unwell. The possibility of an additional GP visit to focus on chronic disease working with the nurse/AHW portfolio holder is under discussion and funding options are being explored by KAMS.

Table 5

KAMS Clinical Services Portfolio Guide (draft): Chronic Disease Management	
Daily	Liaise with clinic liaison officer/driver regarding recall priorities for the day
	Act as a resource for all department staff in relation to management of chronic diseases e.g. know where all the relevant guidelines and protocols are and direct staff to them
Weekly	Generate list of tasks due relevant to chronic disease care plans, including: > bloods due (e.g. HbA_{1c}, eGFR) > LAB injections > renal bloods pre renal visits > GP Management Plans and Team Care Arrangements
	Create list of recalls for the next week, including identifying patients due for bloods that they could have prior to specialty/GP review
Monthly	Run report on chronic disease care plan activities due in the coming month and prioritise patients for review
	Check educational information available in waiting room: posters/pamphlets
Annually	Audit of appropriate assignation of care plans to patients
	Attend Regional Chronic Disease Workshop
	Run at least one local health promotion activity relating to Chronic disease
Other	Self-directed learning on chronic disease management issues

KAMS will also be introducing prospective identification of Medicare items that could be billed. A bank of computer monitors have been installed in KAMS Health Informatics office that will be used to proactively monitor patient flow. When patients attend the clinic a member of the Health Informatics team will determine what tests and/or procedures are overdue and prompt clinicians though patient tracking to follow-up on these if appropriate (as determined by the clinician). KAMS is planning to use the extra revenue that should be raised from this new model of care to employ allied health workers.

A well-functioning recall system

It was identified that a clear recall process is needed within clinical sites to support the chronic disease portfolio. A recall system facilitates follow up of any abnormal results identified with opportunistic screening to diagnose chronic disease in the first place, and to follow up on abnormalities detected at ongoing review. It also enables the clinic to embed chronic disease review recalls in regular clinic recall processes to streamline resources required. A consistent method of documentation in the electronic health record makes it is easier for health care providers to identify what efforts have been made at recall, and to communicate with other clinics if the patient requires follow up in another site. Embedding this process within the health record also facilitates opportunistic completion of outstanding tasks at any time the patient is seen.

There are currently a number of different models used across the KAMS clinics for recall systems. These are being reviewed with a view to maximising the tools available within MMEx and drawing on the local strengths and resources, including staff skill mixes.

Barriers to recalls include similar issues to those already highlighted, namely staffing resources, including numbers and rate of turnover, and patient mobility. Additional barriers to mainstream clinical recall systems include lack of usual postal services, variable literacy levels and variable access to phone networks. Placing value on the role of recalls within a busy clinical workload can be difficult in the context of high numbers of acute presentations. It has been difficult to establish a system that is independent of any individual staff member, and sustainable over time, including more “busy” clinical days.

DISCUSSION

During this part of the pilot study we planned to develop, test and document strategies for the seamless and timely collection of data for CQI purposes. However the clinical systems and software/data quality needs assessment identified several areas that needed to be addressed first. These include supporting local AHWs/AHPs, developing a new model of care, and improvements to CQI processes. Difficulties in these and other areas, such as high staff turnover, have been described previously in the Aboriginal health care setting [14,31,38,41-51].

Significant problems associated with high staff turnover at KAMS included institutional amnesia (learnings known become unknown) and the large cost (time and money) of clinical staff orientation. This process can be overwhelming for both those giving and receiving the orientation, particularly for some nurses who may just be relieving for a month or two. There is often difficulty knowing what to focus on with clinical staff coming from other geographic areas, and much is forgotten or assumed will be learned on the job. Just reading all the Kimberley Protocols is a major undertaking, on top of all the other orientation requirements (e.g., training in how to use MMEx and quality assurance software, WA specific legislation). Improvements in new staff orientation could lead to improved adherence to local guidelines and in turn improved care. This has wider implications to other remote locations where high staff turnover occur.

Attempting to change the culture at KAMS is a demonstration of KAMS' openness to admitting deficiencies and willingness to embrace change. However, these changes to policy and then to practice all take time to implement. While it is too early to determine if patient outcomes have improved as a result of the changes already instigated by KAMS, there has been an increase in the number of AHWs/AHPs employed by KAMS during this pilot project.

These changes also required KAMS to find more funding for existing staff and employ new AHWs/AHPs to provide backfill for isolation leave. If patients have a GP Management Plan completed (GPMP) highlighting their individualised treatment goals for diabetes, then up to 10 visits a year with the AHW/AHP are funded by Medicare[52]. The Medicare driven model of care should improve patient care due to improved continuity of care. It is based on the Practice Incentives Program (PIP) Indigenous Health Incentive. This program aims to support health services to provide better health care for Aboriginal and Torres Strait Islander patients, including best practice management of chronic disease. This incentive is a key part of the Council of Australian Governments (COAG) National Partnership Agreement on Closing the Gap: Tackling Indigenous Chronic Disease [53]. This approach should also provide an additional revenue stream that can be used to employ allied health professionals. This in turn should help with the integration and coordination of allied health services at KAMS' clinics, which has previously been identified as an issue [31].

While there currently is insufficient funding to support dedicated chronic disease clinics as recommended in our previous study [31], the creation of job portfolios should provide a clearer description of the roles and responsibilities of clinical staff. Sufficient, well-motivated, and appropriately skilled workers operating within service delivery models that optimise their performance are required for health care systems to provide safe, high-quality, effective and patient centred services [54]. The use of KPIs in Nursing and AHW/AHP JDFs will be used by KAMS in the future as part of the staff performance appraisal process. This will enable management at both a local clinic and organisational level to assess individual and team outputs and measure outcomes in relation to chronic disease management. It may also assist in reorientating the focus of the service to chronic disease prevention, identification and management.

Integrated services provided by ACCHS (which provide a culturally safe environment) have been shown to be successful [4,14,55], and interventions can reduce risk [14,22,31,56].

However, establishing new programs in ACCHSs is extremely complex with no 'one size fits all' solutions as demonstrated by this pilot project. KAMS has taken several steps to address systems issues that impact on provision of high quality care. We plan on incorporating CQI processes that will continue to assess how well these policy changes are implemented and what impact they have on delivery of care and patient outcomes. However the resources required to monitor implementation and evaluate programs are not currently funded. This is despite funders such as the Commonwealth Department of Health requiring reporting on national KPIs and for health services to conduct CQI activities and report on their achievements. As demonstrated in this pilot project this results in fragmentation, with no one individual having oversight of the process. To adequately address the issues highlighted in this pilot project funders need to take responsibility for systems to address chronic disease.

Chapter 3: Conclusion, policy recommendations and future directions

We have demonstrated some successes with implementing the new Kimberley HbA_{1c} diabetes screening algorithm. KAMS has also started building the foundation on which the development of sustainable chronic disease programs will be based. This in turn should lead to improvements in health outcomes for Aboriginal and Torres Strait Islander people attending KAMS clinics.

This pilot project demonstrates that implementation is a complex, at times fragmented, ongoing process that requires detailed planning. High staff turnover and the institutional amnesia and delays that will occur as a consequence of this, need to be factored into the planning process. Implementation takes time and effort, and requires a multidimensional and multidisciplinary approach that involves extensive consultation with heath care providers and patients. This pilot project has also highlighted the importance of monitoring each part of the implementation process and that CQI processes need to be built into the implementation of new programs. Together with the evaluation of existing programs, the evaluation of the implementation of new programs needs to be adequately resourced. A fully funded chronic disease coordinator position would be a good starting point for KAMS and other ACCHSs to be able demonstrate that systems can deliver high quality care.

Through this implementation process we have identified several issues that still need to be addressed such as:

- understanding what the HbA_{1c} measurements mean when diagnosing T2DM (both patients and providers), and acting on these results appropriately and in a timely manner;
- accurate data entry;
- encouraging POC analyser use;
- simplified POC HbA_{1c} training and quality assurance systems, and ensuring that this occurs;
- MBS rebate for POC HbA_{1c} tests for screening for diabetes.

Any new program will need to address issues such as high staff turnover; recurrent training of new and existing staff; ensuring that staff are supporting a high quality program; integrating the program into health services and evaluating the program [22,23]. Recruiting, supporting, training and employing local Aboriginal people is the central requirement for sustainable programs in Aboriginal health, especially in remote areas.

Further research includes:

- Continuing to document the implementation of both the new screening algorithm and the recommendations from the “Kimberley Diabetes Study”.
- Conducting a cost-effectiveness study into using POC HbA_{1c} tests as the first step of the screening process to support a submission to Medicare for an MBS rebate.
- Determining the diabetes screening rate after the issues raised during this pilot study have been addressed.
- Determining the true burden of T2DM and how long it takes for progression from normal to prediabetes to diabetes and at what age this happens.
- Conducting further rounds of the regional systems approach to diabetes management and CQI used in the “Kimberley Diabetes Study” and determining if this leads to improved care and outcomes.

FUTURE DIRECTIONS

Although not directly related to this APHCRI-funded grant on diabetes, the learning's from implementing diabetes screening will be included in an NHMRC Partnership grant application that will be submitted for the 30th June 2015 round. This application has been shortlisted by the WA Department of Health for potential partnership support ($250,000 cash contribution) under the FutureHealth WA Major Research Grant Support 2015 scheme for the NHMRC Partnership application. The proposal aims to improve detection and management of perinatal women's mental health in Aboriginal communities (WA and FNQ) in real world settings.

The research team is also intending to apply for a Diabetes Australia research grant looking at simplifying the screening process for gestational diabetes using glycated products such as HbA_{1c}. Again, learning's from this APHCRI-funded project on implementation of HbA_{1c} for screening for diabetes in the general Kimberley population will be included in this grant application.

Requiring extensive community and health service consultation, the research team is considering submitting a NHMRC project grant application in 2017 relating to diabetes, but the specifics of the topic will be informed by community consultations. As mentioned earlier in this report, the project team is also broadly planning on applying for WA Department of Health funding (Category 2) looking at the cost-effectiveness of the Kimberley screening algorithm.

PUBLICATIONS

Future publications relating to pilot project as well as related projects will be made available on the KAMS website: http://www.kamsc.org.au/research

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