ORIGINAL RESEARCH ARTICLE

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Room for improvement in diabetes care among First Nations in northern Quebec (Eeyou Istchee): reasonable management of glucose but poor management of complications

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Objectives. To evaluate the clinical management of type 2 diabetes in the Eeyou Istchee communities of northern Quebec.

Study design. Retrospective quality assurance audit.

Methods. Patients with diabetes were identified using the Cree Diabetes Information System. Charts of eligible patients were audited for healthcare visits, glycemic control, blood pressure, lipid profile, pharmacological treatment and complications for the 2006 calendar year. Analyses were performed to assess the association of disease duration, age, target glycemic and blood pressure control with diabetes complications.

Results. Half of the patients (49.7%) achieved target HbA1c, 53.6% had a blood pressure of $\leq$130/80 and 58.7% had an LDL of $\leq$2.5 mmol/L. The proportion of patients meeting all 3 targets was low at 17.1%. The mean number of diabetes-related clinic visits was high, with an average of 3.9 visits to a physician and an average of 8.7 visits to a registered nurse. Of patients with a documented diabetic complication, 39.4% of patients were not being managed with an ACE/ARB and 48.2% of patients were not prescribed a statin.

Conclusions. These findings suggest a possible treatment gap for risk factors and complications management. To circumvent further increases in diabetes-related complications, emphasis should be placed on improved healthcare worker training, greater use of clinical management and patient education tools and improved communication during the diabetes-related clinical visits. Development of a culturally appropriate multi-disciplinary approach towards improved understanding of diabetes and multifactorial risk management for diabetic patients is essential for the prevention of diabetic complications.

Keywords: *Aboriginal*; *Canada*; *diabetes*; *First Nations*; *clinical management*; *epidemiology*

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Type 2 diabetes (T2DM) is a significant health concern among Aboriginal peoples in Canada (1–3) with prevalence rates up to 5 times greater than in the general Canadian population (4). Among the Cree of Eeyou Istchee, diabetes is ranked as a top health priority with prevalence rates being well documented (5). In 2005, 18.3% of Cree ($\geq$20 years) had physician-diagnosed diabetes (6). When age-adjusted, this 2005 prevalence rate jumps to 24.9%, which is almost 4 times higher than that of Quebec (6.4%) (7). Additionally, prevalence of T2DM in First Nation populations has been increasing at a faster rate than in the general population (8). The crude prevalence of T2DM in adults ($\geq$20 years) among the Cree of Northern Quebec grew from 5.0% in 1989 to 21.4% in 2009, representing an increase of over 425% over a 21-year period (9).

Diabetes-related complications are also higher among Aboriginal peoples compared to the general Canadian

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population (10–12). By the end of 2005, 58.4% of Cree living with diagnosed diabetes had at least 1 documented diabetes-related complication and 23.3% had 2 diabetes-related complications (6). In particular, 53.3% had diabetic nephropathy, 12.5% had retinopathy, 9.5% had neuropathy and 12.6% had macrovascular disease. Diabetes-related complications are expected to rise dramatically with increasing diabetes prevalence rates among Aboriginal peoples in Canada, creating a potential healthcare crisis.

Previous studies have documented good adherence to diabetes screening and process recommendations in Eeyou Istchee. In 2005, 90.9% of patients with diabetes had documentation of hypertension screening and 80.8% had at least 1 HbA1c test in the previous year (6). Despite the commitment to screening guidelines, the percentage of Cree patients achieving the target HbA1c level was suboptimal with only 44.5% less than or equal to 7%[1]. Similarly, only 42.9% achieved the LDL-C target ($\leq$2.5 mmol/L), and 51.3% achieved the blood pressure (BP) target ($\leq$130/80 mmHg) (6).

Numerous studies have shown that achieving treatment goals and following preventive clinical practices in people with diabetes can reduce or slow the progression of diabetes-related complications (13–15). Treatment goals include ensuring optimal blood glucose control, reductions in weight and body mass index and normalizing lipid abnormalities and high BP. The Canadian Diabetes Association (CDA) clinical practice guidelines reflect such clinical targets (16).

Given the concern about the rising rates of T2DM, the long-term implications of related complications and the feasibility of preventing complications, the requirement for standardized recurrent assessments of clinical management of Cree patients with diabetes has become integral to the diabetes management strategy. The current paper outlines the results of the third quality assurance audit carried out in the Eeyou Istchee communities to examine clinical management of diabetes.

Materials and methods

Eeyou Istchee

Eeyou Istchee, "the land of Eeyouch," encompasses 9 communities spread across 600,000 km^2 of boreal forest in Eastern James Bay and the southern part of Hudson Bay in Northern Quebec. By the year 2000, all communities but 1 were accessible by road. The communities vary in size from 600 to 4,000 residents, with 60% of the population of 16,000 younger than 30 years (6). Healthcare is provided in the local health and social service centres (1 per community) by nurses and visiting or permanent primary care physicians. The majority of care is provided by physicians as well as nurses whose involvement in patient management varies across communities. In general, when a medication adjustment is required, the nurse consults a primary care physician prior to making a change. This relies on the availability and the existence of a good working relationship with the primary care physicians.

Ethical approval

Ethical approval for the study was obtained from the Research Committee of the Cree Board of Health and Social Services and The University of Western Ontario. This chart audit was performed as a regional quality assurance program. Under Quebec law, chart reviews for the purposes of quality assurance or continuous public health surveillance do not require individual consent and patients were not contacted in any part of the study. All analysis for this report was performed on non-nominal data. However, formal permission to access medical charts was received from the Director of Medical Professional Services of the Cree Board of Health and Social Services of James Bay. Chart audits were performed by a nurse who signed an oath of confidentiality. Participating community clinics were informed that an audit was planned. All data and results remained the property of the Cree Board of Health and Social Services of James Bay (http://www.creehealth.org).

Procedures

The Cree Diabetes Information System (CDIS) was used to generate a list of patients diagnosed with type 2 diabetes. A census-sample approach was taken in order to ensure statistically significant intercommunity comparisons. In communities with greater than 100 patients with diabetes (a total of 5 communities), a random sample was selected using a random number table with samples varying in size from 66 to 114 patients. In communities with fewer than 100 patients with type 2 diabetes, all patient charts were reviewed with the number of patients ranging from 47 to 87 across the 4 communities with fewer than 100 diabetes patients.

Patient inclusion criteria for chart auditing included: (a) a physician diagnosis of type 2 diabetes prior to December 31, 2005, (b) inclusion in the CDIS, (c) on-reserve status as identified by Band lists for each of the Eeyou Istchee communities and (d) Aboriginal descent defined as an active Band number or self-identification as Cree to local community staff. Within the CDIS, James Bay Cree status is confirmed by a valid community Band number. Patients' charts were excluded from the audit if the charts could not be located, the patient was living outside the community, the patient was pregnant during the 2006 calendar year or the patient was diagnosed with type 1 diabetes.

[1]Targets as recommended by the Canadian Diabetes Association 2008 Clinical Practice Guidelines.

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The CDIS has 2 primary goals: (a) to improve the clinical management of diabetes through the use of standardized diabetes flow sheets in medical charts, which assist in identifying and managing patients at high risk of complications and (b) to be used as a management tool allowing local clinic managers to obtain statistics on their clientele. The secondary goal of the CDIS is to provide surveillance data (e.g. number of people diagnosed with diabetes, age and sex distribution etc.) to the communities and regional authorities in order to increase awareness of the magnitude of this health problem and to stimulate action. The clinical sections of the CDIS are not consistently or regularly utilized by healthcare professionals in the clinics and as such, may not be complete for assessing clinical parameters related to diabetes care or diabetes complications.

Given these limitations of the CDIS, a trained nurse performed a medical chart audit of all eligible patients using an encrypted and password protected Access database with direct entry into a password protected laptop. The database was developed by the research team of the Canadian First Nations Diabetes Clinical Management Epidemiologic (CIRCLE) study (17). Chart audits were carried out between June and October 2007 with medical chart information audited for the 2006 calendar year. No patient identifiers were collected and all data were entered into the database using study ID numbers.

Measurements

Data collected in each community included glycemic control and management, BP, lipid profile, screening and management for diabetes-related complications (cardiovascular disease, nephropathy, neuropathy and retinopathy), number of clinic visits to local healthcare workers and patient demographics. Cardiovascular disease included coronary artery disease, peripheral vascular disease and/or cerebrovascular disease. All complications were measured through chart documentation. Number of clinic visits was limited to diabetes-related visits (e.g. pharmacological visits for medication prescriptions, dosage changes, insulin adjustments, etc., smoking, counseling, nutrition, self-management, BP checks) and excluded other types of clinic visits. In 2006, the CDA CPGs were amended by reducing LDL-C targets from 2.5 to 2.0 mmol/L (18). Both lipid targets are presented in this paper.

Data analysis

All statistical analyses were performed using SAS, version 9.2 (SAS Institute, Inc., Cary, NC, USA). Univariate analysis for all study variables provided initial descriptive statistics. Additionally, descriptive statistics provided information concerning the distributions found in the sample data across all variables. Chi-square analyses were performed to test for the linearity in diabetes complications across diabetes duration, target HbA1c, age group and BP control. All statistical tests used a p-value of <0.05 to test for significance.

Results

A total of 685 medical charts were audited for diabetes clinical outcomes (see Table I). The majority of patients were female (60.6%) and had lived with diagnosed diabetes for less than 10 years (66.2%). The mean age at diabetes diagnosis was 42 years (SD = 13.8). Eighty-three percent of patients had a BMI of >30 kg/m^2 (obese) and 50.1% had a BMI of >35 kg/m^2 (morbidly obese). The mean number of diabetes-related clinic visits to a physician in the 2006 calendar year was 3.9 (median = 3.0, range = 0–30, SD = 3.6) and mean visits to a registered nurse was 8.7 (median = 6.0, range = 0–200, SD = 12.5).

At least 1 HbA1c test in 2006 was performed in 86.1% of patients (see Table II). BP was measured at least once in 87.3% of patients, 77.2% had their lipid profile measured at least once, and 65.4% had been screened for nephropathy at least once using random albumin/creatinine ratio or 24-hour urine collection. An ophthalmology examination was documented in 40.3% of patients while only 31.0% had a recorded foot examination. Documented pneumococcal immunization was present in 56.2% of patients while 32.8% had received an influenza vaccine in 2006.

The mean HbA1c of patients in 2006 was 7.8% (SD = 1.9) with almost half of patients (49.7%) meeting the recommended target of $\leq 7.0\%$. Only 22.6% of patients had an HbA1c $\geq 9.0\%$. BP targets ($\leq 130/80$) had been reached by 53.6% of patients. Furthermore, the LDL-C target (≤ 2.0 mmol/L) was achieved by 31.0%, and the LDL-C target (≤ 2.5 mmol/L) was achieved by 58.7%. The percentage of patients achieving all 3 targets was low at 7.8% (based on HbA1c $\leq 7.0\%$, BP $\leq 130/80$, LDL-C ≤ 2.0 mmol/L) and 17.1% (based on HbA1c $\leq 7.0\%$, BP $\leq 130/80$, LDL-C ≤ 2.5 mmol/L).

With regards to diabetes treatments, 64.2% were treated with oral hypoglycemic agents (OHA) alone, 21.2% were treated with both insulin and OHAs and 2.8% were treated with insulin alone. Pharmacological agents were not used in 11.8% of patients, who were being treated with lifestyle alone. Of patients with 1 or more diabetes-related complications, 51.8% were treated with a statin, 60.6% were treated with an ACE or ARB and 69.8% were treated with aspirin/ASA.

Nephropathy was the most prevalent diabetes complication, with 44.1% of patients having some stage of diabetic nephropathy, ranging from microalbuminuria to dialysis. Of these, 3.8% of patients had a medical diagnosis of renal failure and 0.6% received peritoneal or hemodialysis. Retinopathy was documented in 11.1% of patients, with 1.2% receiving retinal laser treatment and 0.3% having documented blindness. The percentage of

Table I. Patient demographics and characteristics

	n (%)[a]
Male gender	270/685 (39.4)
Age at audit [mean (SD)], years	50.8 (15.1)
10–19	5/685 (0.7)
20–39	179/685 (26.1)
40–59	304/685 (44.4)
60–75	156/685 (22.8)
>75	41/685 (6.0)
Age at diagnosis [mean (SD)], years	42.0 (13.8)
<40	320/684 (46.8)
40–49	169/684 (24.7)
50–59	118/684 (17.3)
60 +	77/684 (11.3)
Duration of diabetes [mean (SD)], years	9.1 (6.2)
<5	199/684 (29.1)
5–10	254/684 (37.1)
>10	231/684 (33.8)
BMI[b] [mean (SD)]	35.7 (7.4)
Normal (<25)	16/419 (3.8)
Overweight (25–29.9)	55/419 (13.1)
Obese (30–34.9)	138/419 (32.9)
Morbidly obese (>35)	210/419 (50.1)
Ever smoke	162/546 (29.7)
Clinic visits with MD [mean (SD)], [median (range)]	3.99 (3.60), 3.0(0–30)
5 or more visits	206/671 (30.7)
Clinic visits RN [mean (SD)], [median (range)]	8.70 (12.50), 6.0(0–200)
5 or more visits	414/668 (62.0)

[a]Data are present as number (percentage) unless otherwise indicated.
[b]266 patients did not have either a height or weight in the chart to calculate BMI.
SD, standard deviation.

Table II. Number (%) of patients meeting CDA guidelines for diabetes management

CDA guideline recommendations	n[a] (%)
Screening	
A1c measured at least once in 2006	584/678 (86.1)
Blood pressure checked at least once in 2006	592/678 (87.3)
Lipid profile done at least once in 2006	517/670 (77.2)
Nephropathy assessment	448/685 (65.4)
Ophthalmology examination	272/675 (40.3)
Foot examination	210/678 (31.0)
Pneumococcal vaccine (ever)[b]	358/637 (56.2)
Influenza vaccine (2006)[b]	211/644 (32.8)
Clinical targets	
Hba1c (≤7.0)	289/581 (49.7)
Blood pressure (≤130/80)	318/593 (53.6)
LDL-C ≤ 2.0	160/516 (29.1)
LDL-C ≤ 2.5	303/516 (58.7)

[a]Excludes patients without documented screening test or documented clinical target, therefore the denominator may be less than the total sample size (685).
[b]Individuals with diabetes have higher risk of pneumonia and death associated with influenza, thus the CDA recommends that people with diabetes should receive an annual influenza vaccine and a 1-time pneumococcal vaccine to reduce this risk.

patients having any stage of neuropathy documented in their chart was 6.0%. Finally, 13.0% of patients had cardiovascular disease (CVD), including coronary artery disease, peripheral vascular disease and/or cerebrovascular disease.

The percentage of patients achieving target HbA1c levels decreased as the duration of living with diabetes increased. Significantly fewer patients with disease duration of 10 or more years met the HbA1c target of ≤7.0% (33.0%) compared to patients with a duration of less than 5 years (70.8%) ($\chi^2 = 52.7$, $p < 0.0001$). Increased duration of diabetes was associated with increased rates of all complications, including nephropathy ($\chi^2 = 138.3$, $p < 0.001$) (see Table III). Poor glycemic control was also associated with increased rates of nephropathy ($\chi^2 = 31.8$, $p < 0.001$) when controlled for diabetes duration (see Table IV). While most complications, including cardiovascular disease increased with age ($\chi^2 = 57.1$, $p < 0.001$), complications were also documented in the youngest age group (4.9% CVD in age <30 years) (see Table V). Lastly, improved BP control was significantly associated with decreased rates of diabetic nephropathy ($\chi^2 = 13.5$, $p < 0.001$), although this was not significant for other diabetic complications.

Discussion

The prevalence of T2DM and related complications in the Eeyou Istchee communities has been increasing, with 1 in 5 adults living with diabetes in 2009 (5). Although previous studies have documented good adherence to screening guidelines in Eeyou Istchee, lack of success at reaching target goals of management has demonstrated a gap (6). Using a retrospective chart audit methodology with direct entry into a database, the current study explored rates of visits to the healthcare facility for diabetes-related problems, prescription rates, proportion meeting clinical targets and co-morbidity burden.

Within the 9 communities of Eeyou Istchee, the number of diabetes-related clinic visits within a single calendar year was high. On average, patients visited a physician 3.9 times (SD = 3.6), with a maximum number of 30 physician visits for a single patient. The percentage of patients with 5 or more visits was 30.7%, whereas the percentage of patients reporting zero visits was 9.4%. Mean number of visits to a registered nurse were much

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Table III. Relationship between diabetes complications and diabetes duration

Complication	<5 Years (n = 199)	5–10 years (n = 254)	>10 Years (n = 231)	Chi square (df = 2)	p value*
Nephropathy	29 (14.6%)	109 (42.9%)	164 (71.0%)	138.3	<0.001
Eye complications	4 (2.0%)	11 (4.3%)	61 (26.4%)	83.2	<0.001
Neuropathy	3 (1.5%)	8 (3.2%)	30 (13.0%)	30.8	<0.001
Cardiovascular disease	8 (4.0%)	32 (12.6%)	49 (21.2%)	28.0	<0.001

*p value <0.05 used for determining statistical significance.

higher at 8.7 (SD = 12.5), with a reported maximum of 200 visits related to wound care management. The number of patients who visited a nurse 5 or more times in the 2006 calendar year was 62.0%, with 7.2% of patients having zero visits to a nurse. Combining physician and nurse visits, patients averaged 12.63 visits (SD = 14.5) and the percentage of patients visiting 5 or more times was 81.3%. As nurses provide part of the front-line services in Eeyou Istchee, both nurse and physician visits are opportunities for improved management that need to be taken into account in order to compare service use with that from other locations.

A study conducted with primary care physicians in Canada found that patients visited their family physician a mean of 4.3 times for diabetes-related issues in a 1-year period (19). The total number of clinic visits with a physician or nurse in Eeyou Istchee for diabetes-related issues is greater. The high frequency of visits suggests ample opportunity for optimal screening and care. Screening rates showed that 86.1% of patients received at least 1 HbA1c test during the year, 87.3% of patients had at least 1 BP measurement taken and 77.2% of patients had at least 1 lipid profile measurement completed.

Despite the high number of diabetes-related visits and reasonable adherence to screening guidelines for blood glucose, BP and lipids, diabetes management in Eeyou Istchee remains insufficient. Only half of the patients (49.7%) achieved target HbA1c (≤7.0%), 53.6% met the BP target (≤130/80) and 58.7% met the LDL target (≤2.5 mmol/L). The proportion of patients meeting all 3 targets was 17.1%. Although these percentages are suboptimal, diabetes care among the Eeyou Istchee are better than those reported for other First Nation communities. A 2007 national study examining diabetes care in Canadian First Nations communities, the CIRCLE study, showed that only 38.9% of patients achieved target HbA1c, 34.7% reached target BP and 35.2% met the LDL target. Similarly, only 6.7% of patients met all 3 clinical targets (17).

Examination of treatment modalities showed that 88.2% of patients were being managed with either insulin alone, an OHA or both while only 11.8% of patients were not prescribed any medication. In contrast to the high rates of glucose-lowering medications, 39.4% of patients diagnosed with 1 or more complications (cardiovascular disease, nephropathy, neuropathy and/or retinopathy) were not being managed with an ACE/ARB and 48.2% were not prescribed a statin. Although it was not verified if the patients not receiving an ACE/ARB had persistent microalbuminuria or high BP or if the patients not receiving a statin had elevated LDL cholesterol levels, these data suggest a more intensive pharmacologic therapy may have been warranted. Treatments with an ACE/ARB or a statin may serve multiple purposes (e.g. kidney, heart) and may be cardioprotective (16). According to CDA guidelines, drug therapy including ACE/ARBs and statins should be initiated in all patients with elevated BP, high cardiovascular risk or high LDL levels (16). Similarly, the CIRCLE study found that 27.9% of First Nations with diabetes were not on an ACE or ARB and that 44.9% were not prescribed a statin (17). Interestingly, a recent study examining diabetes care among Australian Aboriginals reported higher prescription rates of ACE inhibitors and statins in patients with renal disease and hyperlipidemia, 79 and 76%, respectively (20). In that study, participating health centres were part of a quality improvement project with continuous audit and feedback to communities to direct efforts at identified clinical care gaps. However, the study noted

Table IV. Relationship between diabetic complications and target HbA1c

Complication	HbA1c ≤ 7.0	HbA1c > 7.0	Chi square (df = 1)	p value*
Kidney complications	96/289 (33.2%)	165/292 (56.5%)	31.8	<0.001
Eye complications	11/289 (3.8%)	55/292 (18.8%)	32.6	<0.001
Neuropathy	9/289 (3.1%)	28/292 (9.6%)	10.2	0.001
Cardiovascular disease	37/289 (12.8%)	39/292 (13.4%)	0.0	0.843

*p value <0.05 used for determining statistical significance.

Table V. Relationship between diabetic complications and age group

Complication	<30 years old	30–50 years old	>50 years old	Chi square (df = 2)	p value*
Nephropathy	10/41 (24.4%)	117/307 (38.1%)	175/337 (51.9%)	19.3	<0.001
Retinopathy	1/41 (2.4%)	30/307 (9.8%)	45/337 (49.2%)	5.4	0.067
Neuropathy	1/41 (2.4%)	8/307 (2.6%)	32/337 (9.5%)	14.52	<0.001
Cardiovascular disease	2/41 (4.9%)	10/307 (3.3%)	77/337 (22.9%)	57.1	<0.001

*p value <0.05 used for determining statistical significance.

poor medication adjustment after elevated HbA1c and BP were detected, at 26.0% and 13.0%, respectively (20). Targeted strategies need to be developed to address this treatment gap otherwise resources and efforts put into screening and clinical visits will only bring limited benefits to patients with diabetes.

In comparison to other First Nations communities, patients with diabetes in Eeyou Istchee have better glycemic control (mean HbA1c 7.8% vs. 8.2% in the CIRCLE study) (17). As over 80% of patients are receiving some form of glucose-lowering treatment, these findings suggest satisfactory management of glycemia. However, there remains room for improvement. The mean HbA1c found in Eeyou Istchee remains higher than that recommended by national guidelines and is greater than that reported in the general population with diabetes (mean HbA1c 7.3%) (19). In addition, given the high complication rates (44.1% nephropathy, 13.0% CVD and 11.1% retinopathy) and low prescription rates for ACE/ARBs and statins, the management of risk factors and complications is suboptimal. This treatment gap is contributing to patients not meeting national diabetes targets. From the current study, it is not clear if low prescription rates are related to physicians not recommending sufficient pharmacological agents, to resistance from patients towards biomedical or "Western" medical management of diabetes or to adherence to prescribed treatments. Different understandings of the etiology of health and illness may influence patient compliance and willingness to comply with prescribed medical regimes. Typical "Western" biomedical models explain disease as centered within the individual (21), while many Aboriginal peoples believe disease is a collective social experience shared by the individual, the family and the past and future community (10). As such, the concept of chronic disease and the prevention of complications within an individual may be difficult to reconcile in the continuing context of post-colonialism.

There are likely several reasons for this treatment gap in adequately addressing risk factors and complications, despite the need to prevent and manage diabetes complications within the Eeyou Istchee communities. One contributing factor may be the high turnover of physicians and nurses in Aboriginal settings (22,23) and their lack of sufficient knowledge or experience to adequately educate patients about diabetes management in a First Nations context. As such, continuity of care may be more difficult to achieve (24,25), and initiation or adjustments of medications may be overlooked (26). Resource limitations, issues of access and poor organization of care (27,28) are other barriers healthcare providers face when serving these communities. From the patient perspective, factors such as language barriers, poor health literacy and cultural differences can make it difficult for patients to understand the disease and/or the importance of pharmacological management, and this may contribute to resistance in following physician prescribed treatment regimes (27,29–31). All these challenges highlight the importance of developing and implementing community diabetes programs in the context of local traditions, language and culture. The need exists in Eeyou Istchee for the development of more intensive education programs for people with diabetes to help patients better understand the potential complications that may result from poor management of their diabetes, increase awareness of unhealthy habits and behaviours and highlight methods and avenues for potential behavioural change leading to healthier lifestyles. In addition, the communities may benefit from the development of protocols for the management of patients with diabetes as a large portion of care is provided by nurses.

Studies using existing community resources to increase community awareness and focusing on expanding the scope of practice for nurses and allied health professionals have demonstrated that increasing medication use can lead to an increased achievement of patient targets (32–34). The DREAM3 study found a significant reduction in diastolic BP when nurses focused on achieving target BP ($\leq$130/80) through the use of a predefined algorithm of antihypertensive medications (32). Similarly, hypertensive patients in the STITCH study treated according to a medication algorithm were 20.0% more likely to reach target BP (33). Lastly, a significant decrease in HbA1c levels was established in patients treated by physicians who followed a stepwise protocol for glycemic control, compared to physicians following guideline-based practice (34).

Since 1996, Eeyou Istchee has benefited from a diabetes management and surveillance system (35). While both the surveillance and registration of patients with

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diabetes function well to provide ongoing updates to the leadership of the communities and the health care system, the local clinical management component of the system has not always performed to its full potential due to a lack of computer hardware access and the high turnover of healthcare workers. However, the existence of longitudinal diabetes prevalence and management data offers a tremendous advantage for identifying actions for improving diabetes management and assessing outcomes from these actions.

As the study underlying this paper was based on retrospective chart audits, the strength of this paper is limited by the disadvantages related to that methodology: incomplete documentation including missing charts and information that is unrecoverable or unrecorded, difficulty interpreting information found in documents (e.g. jargon, acronyms, handwriting), difficulty establishing cause and effect and variance in the quality of information recorded by medical professionals (36). Results from this study are generalizable to other First Nations' communities given the relatively large sample size of 685 patients. This included all patients with diabetes in communities with less than 100 patients and random samples of 66–114 patients in communities with greater than 100 patients. Further, all 9 communities in Eeyou Istchee were included in this study. As there is only 1 clinic in each community that services all patients with diabetes and referral results are sent back to each clinic, confidence can be placed on the completeness of the data collected.

Conclusion

Glycemic control and adherence to screening guidelines suggests adequate, though not optimal, overall diabetes care in Eeyou Istchee. However, the high number of diabetes-related clinical visits and suboptimal management of risk factors and complications suggest clinical care gaps. In order to improve diabetes control and prevent further increases in diabetes-related complications, barriers to reaching adequate diabetes management need to be elucidated. Future strategies may include culturally sensitive community-based multidisciplinary education on the importance of multifactorial diabetes management incorporating western clinical and traditional approaches, appropriate follow-up and education about medication use and a patient, family and community centered approach, including better counseling and support for diabetes self-management. Emphasis should also be placed on improved training of community healthcare workers, greater use of tools for diabetes management and improved communication between patients and healthcare workers during clinic visits. There is likely an increased challenge to these strategies due to the small size and remote locations of Aboriginal communities across Canada along with high turn-over of non-Aboriginal professional staff.

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The authors declare that they have no conflicts of interest.

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