Rationale and Implementation of the SLICK Project

Screening for Limb, I-Eye, Cardiovascular and Kidney (SLICK) Complications in Individuals with Type 2 Diabetes in Alberta's First Nations Communities

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ABSTRACT

Objective: Identifying diabetes complications through screening using portable laboratory equipment in Aboriginal communities, and providing education and client empowerment for improved follow-up care and self-care.

Participants: First Nations people with known diabetes.

Setting: Screening was carried out in temporary clinics and laboratories set up at the local health centre in each of Alberta's 44 First Nations.

Intervention: Two mobile units ("SLICK vans"), equipped with professionally trained staff, portable lab instruments and a retinal camera, travelled to all 44 Alberta First Nations communities to facilitate implementation of the Canadian Diabetes Association Clinical Practice Guidelines (CPGs). The project provided relevant education and counselling in conjunction with screening activities.

Outcomes: SLICK screened 1,151 clients between December 2001 and July 2003, and the project remains ongoing. A preliminary evaluation of the project's 19-month implementation period showed screening activities and satisfaction with diabetes services were low prior to SLICK. There were modest improvements in some program outcomes at 6-12 months follow-up.

Conclusion: The SLICK project is designed to address the impact of diabetes by utilizing evidence-based CPGs with respect to screening for complications at the community level. It had a successful implementation period facilitated by community acceptance.

MeSH terms: Aboriginal, North American; type 2 diabetes mellitus; diabetes-related complications; screening; mobile health units; rural communities

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Sources of funding: Initial funding from Canadian Health Infrastructure Partnership Program (CHIPP), Office of the Information Highway, Health Canada. Ongoing funding through Health Canada (FNIHB) and the University of Alberta.

Acknowledgements: Thanks are due to many individuals who contributed to discussions through the Alberta Aboriginal Diabetes Task Force, especially Doris Grey Eyes and Linda Auger, and Joyce D. Cardinal who coined the name SLICK. Linda Steinhauer was instrumental in getting the project off the ground. The Department of Ophthalmology at the Royal Alexandra Hospital in Edmonton, in particular Chris Talbot, provided support for preliminary work. Alison Meikle provided valuable data management. Kelli Ralph-Campbell provided editorial assistance.

In 2003, over 1.2 million Canadians reported having diabetes,¹ and an estimated one third of all diabetes cases remained undiagnosed.^{2,3} Given current prevalence trends, it is projected that 2.4 million people in Canada's general population will have diabetes by 2016.⁴

Rare in Aboriginal populations before the 1950s,⁵ national estimates from the First Nations and Inuit Regional Health Survey revealed age-standardized prevalence rates of type 2 diabetes among First Nations men and women to be 3.6 and 5.3 times, respectively – higher than other Canadians.⁶ Crude prevalence was 13% for women and 8% for men; though this is likely an under-representation.

In the remote Aboriginal community of Sandy Lake, Ontario, 41% of all diabetes cases were detected only through systematic screening.⁷ Age-adjusted prevalence was 26.1%,⁷ and continuous diabetes surveillance saw prevalence increase 45% over ten years.⁸ Similarly, prevalence among First Nations adults on Saskatchewan reserves doubled from 1980-1990.⁹ Finally, type 2 diabetes is increasing in Aboriginal youth:¹⁰⁻¹⁴ screening in the pediatric population (ages 6-18) of Manitoba First Nations revealed prevalence approaching 1%.¹⁴

Within First Nations communities, diabetes is believed to result from consumption of 'white man's junk food'.¹⁵ Studies of Pima Indians suggest the risk of developing diabetes is reduced by maintaining a traditional diet¹⁶ and lifestyle.¹⁷ Prevalence varies with language group, culture area, geography, degree of isolation,¹⁸ age, gender, degree of Aboriginal ancestry, level of obesity, and parental diabetes status.¹⁹⁻²¹ Barriers that First Nations people in remote communities experience in accessing health care services amplify the burden of diabetes.²²

A recent study projected total health care costs for diabetes (including costs associated with complications, lost productivity and mortality) will rise from \$4.66 billion (Canadian dollars) in 2000 to \$8.14 billion by 2016, a 75% increase.⁴ The study projected co-morbid cardiovascular disease will account for 27.0% of total health care costs for people with diabetes by 2016; nephropathy and dialysis for 6.8%; ophthalmic diseases for 2.5%; and 64% attributable to other reasons, including amputations.⁴

Approximately 40% of Canadians with diabetes develop microvascular (retinopathy, neuropathy, nephropathy) and macrovascular (coronary artery, peripheral vascular, cerebrovascular disease) complications.² In a national survey of First Nations, 50% of respondents with diabetes reported hypertension, 26% reported heart disease – 3.3 and 3.9 times, respectively, more than respondents without diabetes.⁶ A study of Mohawks in Kahnawake, Quebec, showed over 60% of patients with diabetes had at least one major complication.²³ Women on reserves are five times more likely than other Canadians to die from diabetes.²⁴

Risk of complications increases with duration of hyperglycemia,²⁵ and will likely increase as the age of onset of diabetes decreases.¹⁰⁻¹³ Among the James Bay Cree of Quebec, factors associated with retinal or renal complications include duration of diabetes greater than five years, poor glycemic control and hypertriglyceridemia.²⁶

Intensive treatment of diabetes prevents or delays progression of complications, and improved glycemic control reduces long-term economic costs, suggesting substantial benefits from early screening for complications.²⁷⁻³⁰

Therefore, Canada's Clinical Practice Guidelines (CPGs) state diabetes care: "should be organized around a multi- and interdisciplinary diabetes healthcare (DHC) team that can establish and sustain a communication network between the person with diabetes and the necessary healthcare and community systems.... Where possible, diabetes programs and services should be culturally appropriate, community based and respectful of age, gender and socioeconomic condition."³¹ The CPGs then recommend evidence-based practices for screening for and treating complications of diabetes.

The SLICK project (Screening for Limb, I-Eye, Cardiovascular and Kidney complications of type 2 diabetes) is an ongoing Alberta First Nations – Health Canada (FNIHB) – University of Alberta initiative to facilitate implementation of the CPGs. The project's primary tool is community-based screening. Essential components of a screening program include: 1) the condition under study is an important health problem; 2) the screening test is simple, safe, and validated; and 3) effective treat-

Figure 1. SLICK at a glance – a single visit

ment is available for those identified through early detection.³² SLICK's rationale is consistent with these principles.

The project received approval from the Health Research Ethics Board at the University of Alberta.

METHODS

Two "SLICK vans" transport point-of-care laboratory equipment and a retinal camera to all 44 Alberta First Nations. A community health nurse (CHN) and retinal photographer staff the vans; staff are either First Nations (Cree speakers, where possible), or individuals with Aboriginal-specific training. A local CHN, community health representative (CHR), home-care nurse or personal care attendant (PCA) within each First Nation Health Centre facilitates van visits. Figure 1 depicts a single van visit.

Clients enroll through self-referral in response to advertising, or referral by community health care workers. Upon each client's initial visit, informed consent and research permission is sought for aggregate analysis and dissemination (reporting to stakeholders, publication, etc.).

A 53-item survey is administered to clients at baseline, and re-administered at 6-12 months follow-up. Questions include

those developed by the investigators, plus selected questions modified from the SF-12 physical and mental health survey,³³ and from the Michigan Diabetes Research and Training Center (MDRTC) Diabetes History questionnaire³⁴ and Brief Diabetes Knowledge Test.³⁵ Questions target health services utilization and clinical history (based on self-report with a one-year recall); satisfaction with diabetes care and services (Table I); perceived health status (based on a four-week recall); and knowledge of diabetes, prior to SLICK implementation. A community health care worker administers the surveys verbally in English, with translation provided when necessary. The results of these surveys are to be reported elsewhere; an evaluation framework is noted in the Appendix. Here, we describe the program and its initial evaluation.

SLICK encompasses three key activities: screening for diabetes complications; education; and community-based care.

Screening for diabetes complications

SLICK staff and community health care workers collect anthropometric data through standard physical exams. Body Mass Index (BMI; weight in kg/height in m²) – a useful indicator for assessing weight-related health risks^{31,36,37} – is mea-

TABLE 1

SLICK Survey: Client Satisfaction Section

To assess satisfaction with diabetes care and services prior to SLICK intervention, clients are asked to rate the following as poor, fair, good, very good or excellent:

1. Health care providers informing (client) about the state of (client's) diabetes and/or its complications.
2. Health care providers keeping (client) informed about the next step in (client's) care.
(Modified from Diabetes History, MDRTC; section 3, question 3a.)³⁴
3. Health care providers being up to date on (client's) current treatments and recent test results.
(Modified from Diabetes History, MDRTC; section 3, question 3b.)³⁴
4. Communication between the different health care providers caring for (client).
(Modified from Diabetes History, MDRTC; section 3, question 3c.)³⁴

sured. Abdominal obesity – a risk factor for coronary artery disease, stroke, high blood pressure and diabetes^{38–40} – is assessed measuring waist circumference. World Health Organization (WHO) Guidelines are applied for risk related to BMI and waist circumference.³⁷ Physical exams also include blood pressure readings.

Glycated hemoglobin (A1c) reflects glucose control over the preceding 2–4 months, and is a good indicator of metabolic control.³¹ Leakage of small proteins (microalbumin) in urine is the earliest clinically detectable sign of progressive nephropathy.⁴¹ Urine dipsticks are used to detect large proteins and white blood cells (WBC). If white cells >25 are present, infection is sought and microalbumin is not measured.^{31,36} A1c and microalbumin are measured using the Bayer DCA2000[®]+, and glucose and lipids using the Cholestech L.D.X[™] portable analyzers.

For retinal screening, eye drops are administered for pupil dilation. Digital, three-dimensional retinal images are then captured with the Zeiss 450 Fundus Camera and Kodak Professional DCS 760 Digital Camera. These images are delivered to retinal specialists at the Tele-Ophthalmology Unit, Royal Alexandra Hospital in Edmonton for assessment.

Feet assessments use microfilament wire to detect peripheral neuropathy. WHO foot grades, from 0 to 3, are applied: 0 = no abnormality; 1 = sensory loss (low risk); 2 = sensory loss and presence/history of deformity (moderate risk); 3 = presence/history of plantar ulcer (high risk).⁴²

Clinical results and socio-demographic information (gender, age, Band, etc.) are entered into a clinical database at the time of the client's initial visit.

Education

The CPGs recommend: "People with diabetes should be offered initial and ongoing needs-based diabetes education in a timely

manner to enhance self-care practices and behaviours".³¹ Clients receive a copy of their results at the time of service delivery; these same results are sent to primary care providers. Education is at a "teachable moment", considering test results are being discussed. SLICK also educates local care providers about appropriate screening tests for complications, management strategies and lifestyle challenges.

Community-based Care

A central CPG recommendation is that diabetes care be "organized around the person with diabetes using a multi- and interdisciplinary DHC team approach".³¹

SLICK promotes integration, coordination, and collaboration of community services among family physicians, CHNs, CHRs, home-care nurses, PCAs, diabetes educators, nutritionists, lab services and medical consultant services.

Responsibility for arranging follow-up lies with the client, facilitated by community health care workers. The Tele-Ophthalmology Unit in Edmonton coordinates follow-up eye care.

This model of shared-care entailing ongoing communication among all members of the DHC team is known to increase commitment and self-care of the patient,^{43–45} and achieves one intermediate outcome of the SLICK project: client empowerment.

A preliminary cost-minimization analysis compared SLICK services versus the same services delivered conventionally via the health care system, considering only those costs that can be directly compared (i.e., materials; personnel; travel associated with SLICK vs. travel for clients associated with the conventional system).

RESULTS

Detailed baseline and follow-up data are presented in the SLICK Evaluation

Report.⁴⁶ Outcomes were evaluated in eight areas (see Appendix).

In total, 1,151 clients (741 female, 410 male) with known diabetes enrolled, having their initial visit between December 2001 and July 2003 (SLICK's implementation period). This represents 14% of the estimated total of known diabetes cases in Alberta's First Nations population.^{47,48} SLICK clients ranged in age from 13 to 92 years, the mean being 54 years.

Of the 1,151 SLICK clients, 732 (64%) completed a baseline survey. We found (data not shown): A1c had never been tested in 22% of survey respondents; only 32% were tested within the prior six months. Thirty-eight percent had no urine analysis done within the previous year; of those who did, 16% had been told there was "protein leakage/kidney damage". Fifty percent had previously been told they had high blood pressure, however only 39% of males and 42% of females were taking pills for hypertension. Only 35% underwent a dilated eye examination in the previous year; of those who did, 23% were aware of previous "eye damage or retinopathy". Fifty-nine percent had never had a foot assessment; of those who did, 30% of males and 16% of females ($p \leq 0.005$) had previously had a "foot or leg ulcer or sore that would not heal for more than one month". Twenty-six percent had never undergone cholesterol assessments.

Of those who had an initial assessment, 298 (26%) SLICK clients returned for a follow-up visit between April 2002 and July 2003. Clinical outcomes did not change appreciably, except for a significant ($p = 0.000$) increase in retinopathy and a trend towards a drop in blood pressure ($p = 0.065$) (Table IIa). A significant reduction in body weight was observed (mean BMI 33.89 kg/m² at baseline versus 33.31 kg/m² at follow-up) with a non-significant reduction in waist circumference.

Only 63 (21% of 298) return clients completed the survey a second time, at follow-up. Rates of health services utilization did not change significantly, except for a drop in the number of emergency room visits that was significant (Table IIb). There was no significant impact on clients' subjective assessments of diabetes-related health status or services in the short term. However, knowledge (self-assessment) improved significantly in this small sample of second survey respondents.

TABLE IIa**Clinical Outcomes Across Time: Diabetes Control and Complications**

	At Baseline	At Follow-up (6-12 months)	t-value (p)
Diabetes Control			
HbA1c (n=285)	8.12%	8.01%	1.358 (0.176)
Cardiovascular Risk Factors			
Average Body Mass Index (BMI) (n=285)	33.89	33.31	2.014 (0.045)
Average Waist Circumference (n=49)	111.55 cm	109.20 cm	1.393 (0.170)
Average Blood Pressure (n=298) (0=normal; 2=high)	0.95	0.84	1.855 (0.065)
Kidney Complications			
Urine Microalbumin/Creatinine*			
Males (n=66)	3.41	4.13	1.537 (0.129)
Females (n=96)	3.97	2.96	1.141 (0.257)
Limb Complications			
Average Foot Risk Category (n=274) (0=no abnormality; 3=high risk)	0.54	0.50	0.809 (0.419)
Eye Complications			
Retinopathy (n=62)	25.8%	29%	Chi-square = 35.780; p=0.000

*When urine protein and WBC negative

TABLE IIb**Clinical Outcomes Across Time: Health Care Utilization, Self-rated Health, Satisfaction with Services, Diabetes Knowledge**

	At Baseline	At Follow-up (6-12 months)	t-value (p)
Health Services Utilization			
Number of visits to a doctor in past year (n=57) (1=never; 4=more than 5 times)	3.37	3.42	0.501 (0.616)
Number of hospitalizations in past year (n=55) (1=never; 5=more than 5 times)	1.49	1.40	1.043 (0.301)
Number of ER visits in past year (n=56) (1=never; 5=more than 5 times)	1.89	1.57	2.813 (0.007)
Self-rated Health			
Overall Health (n=56) (1=very poor; 5=excellent)	3.02	3.00	0.139 (0.890)
Diabetes-related Health (n=55) (1=very poor; 5=excellent)	3.07	3.05	0.145 (0.886)
Satisfaction with Diabetes Services			
Feeling of "Team" Approach (n=50) (% saying yes)	66%	74%	0.082 (0.775)
Information Received: State of Disease (n=51) (1=very poor; 5=excellent)	2.92	2.98	0.319 (0.751)
Information Received: Next Step (n=49) (1=very poor; 5=excellent)	2.55	2.71	0.831 (0.410)
Health Care Providers Are Up to Date (n=49) (1=very poor; 5=excellent)	2.59	2.73	0.816 (0.418)
Communication Between Health Care Providers (n=47) (1=very poor; 5=excellent)	2.83	2.91	0.400 (0.691)
Knowledge of Diabetes and Diabetes Services			
Knowledge: Self-Assessment (n=55) (1=very poor; 5=excellent)	2.80	3.24	2.736 (0.008)
Knowledge: Complications (n=29) (1=very poor; 5=excellent)	4.34	4.48	0.550 (0.586)
Knowledge: Screening (n=32) (1=very poor; 5=excellent)	1.72	1.84	0.466 (0.645)

The preliminary cost-minimization analysis revealed a SLICK service costs \$356.55 (Canadian dollars) compared to \$504.89 for the same service delivered through conventional means (transportation to a town or city, standard lab services, traditional visit with general practitioner or diabetes educator, etc.).⁴⁶

DISCUSSION

In this paper, we show that we have been able to implement a large-scale clinical and educational remote diabetes complications screening program. Baseline and follow-up clinical and process-related outcomes support the need for diabetes control programs in Alberta's First Nations communi-

ties, and provide evidence for the short-term effectiveness of the SLICK project. An important success was that, primarily, First Nations health professionals ran this technologically innovative, community-based program.⁴⁶

Limitations

Clients were volunteer participants, and project protocol did not include chart reviews, precluding SLICK from being a population-based study.

Because the SLICK project did not undertake a chart review, it is impossible to determine whether self-reported information was accurate, therefore comparison of survey results with SLICK measurements is speculative.

While the vast majority of clients underwent all assessments, only 596 (52%) received retinal screening. Possible reasons for this included: screening was not indicated; clients had no one to drive them home after vision was blurred from eye drops; consent was not given; or technical difficulties (the latter constituting less than 5%).

The interval between baseline and follow-up visits was very short for assessing many of the project's anticipated outcomes. The small sample size at follow-up limits the ability to detect significant changes in outcomes across time.

Next steps

Despite these limitations, positive trends emerged over SLICK's 19-month imple-

mentation period, supporting the effectiveness of the project's design.

Acceptance by First Nations communities has been key to the implementation of the SLICK project. The collaboration with the University of Alberta allows for aggregate data collection and analysis, in partnership with FNIHB and the Alberta First Nations. The current aim is to bring screening services to the majority of the target population at recommended intervals. Long-term project goals are decreased mortality and morbidity related to diabetes, and improved quality of life for First Nations people with diabetes (see Appendix). Achievement of these goals is anticipated through consistent follow-up (both clinical assessments and education) and continued capacity-building within First Nations communities.

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RÉSUMÉ

Objectif : Cerner les complications du diabète dans les communautés autochtones en procédant à un dépistage dans des laboratoires mobiles, sensibiliser la clientèle, et renforcer son autonomie afin d'améliorer le suivi et les autosoins.

Participants : Les membres des Premières nations ayant reçu un diagnostic de diabète.

Lieu : Le dépistage s'est effectué dans des cliniques et des laboratoires temporaires mis sur pied dans le centre sanitaire local de chacune des 44 Premières nations de l'Alberta.

Intervention : Deux unités mobiles (les « minibus SLICK »), dotés d'un personnel qualifié, d'appareils de laboratoire portatifs et d'un rétinographe, se sont rendues dans les 44 communautés des Premières nations de l'Alberta pour faciliter la mise en œuvre des lignes directrices de pratique clinique (LDPC) de l'Association canadienne du diabète. On a aussi offert des activités de sensibilisation et de counselling pour accompagner les activités de dépistage.

Résultats : Le projet SLICK a administré des tests de dépistage à 1 151 personnes entre décembre 2001 et juillet 2003, et ces activités se poursuivent. Une évaluation préliminaire des 19 premiers mois de mise en œuvre a montré que les activités de dépistage et la satisfaction par rapport aux services offerts aux diabétiques étaient faibles avant le projet. Lors du suivi entre 6 et 12 mois, on a constaté de légères améliorations de certains résultats.

Conclusion : Le projet SLICK vise à atténuer l'impact du diabète en utilisant des LDPC fondées sur la recherche pour dépister les complications à l'échelle communautaire. La mise en œuvre réussie du projet a été facilitée par son acceptation dans les communautés.

APPENDIX

Outcomes Evaluated in Eight Areas

PURPOSE OF EVALUATION:	To determine if the SLICK Program addresses its goals and expected outcomes.							
ASPECTS TO EVALUATE:	1. Clinical Outcomes (Complications)	2. Satisfaction with Diabetes Services	3. Knowledge about Diabetes/Services	4. Attitudes about Diabetes/Services	5. Behaviours related to Diabetes Care	6. Quality of Life	7. Cost of Diabetes Care	8. Administrative Outcomes
OUTCOMES (GOALS) ADDRESSED:	Increase Identification of Complications Arrange Follow-up and Treatment Improve Client Health Decrease Complications, Morbidity/Mortality from Diabetes (Reduce Complications of Diabetes)	Improve Services (Increase accessibility, Provide quality care, Appropriate quantity of care, Identify Lessons Learned, Technology meets needs, Privacy maintained)	Increase Awareness Client Empowerment (Provide quality care, Foster integration, coordination, collaboration of health services)	Increase Awareness Client Empowerment (Provide quality care, Foster integration, coordination, collaboration of health services)	Increase Awareness Client Empowerment (Provide quality care)	Improve Client Health Decrease Morbidity and Mortality from Diabetes Decrease Social Cost of Diabetes (Provide quality care)	Decrease Socio-economic Cost of Diabetes (Provide cost-effective diabetes care)	Improve Services Describe clients and SLICK program (Increase accessibility, Appropriate quantity of care, Technology meets needs, Privacy maintained)
DATA FROM WHOM:	- Clients - Nurse - Lab	- Clients - Family - Providers (CHN, CHR, GPs/FPs, Ophthalmologist, Nutritionist) - Community Leaders (Health Directors, Chiefs) - Administration (Implementation Committee, AB Health & Wellness, RHAs)	- Clients	- Clients - Family	- Clients	- Clients	- Clients - Treasury Board Costing	- Clients - Providers
WHEN COLLECTED:	- Baseline - Throughout - End - Long-term	- Baseline - Throughout - End	- Baseline - End	- End	- End	- End	- Baseline - End - Long-term	- Baseline - Throughout
HOW COLLECTED:	- SLICK Survey – Part 1 (Self-report) - SLICK Clinical Database	SLICK Survey – Part 2 Throughout: client Feedback box Provider – incident-report, log sheets End: - Focus groups (clients, providers, family) - Questionnaire (all) (to be developed)	SLICK Survey – Part 3	Focus groups	Focus groups	Focus groups	- Treasury Board database - SLICK Clinical Database - SLICK Survey (self-report)	- SLICK Survey - SLICK Clinical Database - Program documentation - Correspondence with SLICK team
METHODS OF ANALYSIS:	Quantitative: - descriptive - inferential	Quantitative: - descriptive - inferential Qualitative	Quantitative: - descriptive - inferential	Qualitative	Qualitative	Qualitative	Cost Benefit Analysis	Quantitative: - descriptive Qualitative
INDICATORS	A) Health Service/Resource Utilization B) Diabetes Health (Self-Report) C) Complications (Self-Report) D) Clinical Exam E) Lab Test Results	Satisfaction/lessons learned/suggestions, complaints about: A) program/services B) quality of care C) quantity of care D) accessibility E) privacy issues F) technology G) procedures	A) Self-assessment of knowledge B) Knowledge of diabetic complications C) Knowledge of screening	A) Health Beliefs B) Attitudes C) Self-efficacy	Self-care Behaviours: A) Diet B) Exercise C) Blood sugar testing D) Foot care E) Smoking F) Medication use	A) General physical health/independent living B) General emotional/mental health	A) Clinical Costs/Benefits B) Social Costs/Benefits	A) Socio-demographics B) Program Documentation C) Administrative Successes/Failures

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Received: February 3, 2005

Revisions requested: April 20, 2005 and August 4, 2005

Revised mss: June 29, 2005 and August 18, 2005

Accepted: September 1, 2005

L'Institut de la santé publique et des populations des Instituts de recherche en santé du Canada (IRSC) et l'Initiative sur la santé de la population canadienne, établie par l'Institut canadien d'information sur la santé, sont fiers de lancer une nouvelle publication conjointe sur l'application des connaissances.

L'ouvrage, intitulé « *Mise en application des connaissances sur la santé publique et des populations – Recueil de cas d'application des connaissances* », présente des exemples originaux provenant d'un peu partout au Canada sur les enseignements tirés de différentes activités d'application des connaissances, bonnes et moins bonnes, et montre l'incidence que ce genre de recherche peut avoir sur l'élaboration des politiques et le renouvellement de la pratique.

Le recueil couvre plusieurs types d'expériences en santé autochtone, en santé des enfants et des adolescents, en santé des femmes, en santé au travail et avec les maladies infectieuses et chroniques. Il se veut un outil permettant aux chercheurs, aux responsables des politiques et aux membres des collectivités d'apprendre de l'expérience des autres et de trouver de nouvelles façons novatrices de mettre la recherche en pratique.

On peut consulter le recueil à l'adresse <http://www.cihr-irsc.gc.ca/f/29489.html>.

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