Diabetes Education Resource for Children & Adolescents (DER-CA)

Annual Report

2015

Child Health Program
Winnipeg Regional Health Authority

Department of Pediatrics & Child Health
Max Rady College of Medicine
Rady Faculty of Health Sciences
University of Manitoba

This report is available online at:
http://umanitoba.ca/faculties/medicine/units/pediatrics/sections/links.html
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EXECUTIVE SUMMARY

The Diabetes Education Resource for Children and Adolescents (DER-CA) was established in 1985 and has therefore been operational for over 30 years. The DER-CA provides specialized evidence based care, education, support, advocacy, and research for approximately 800 children, aged 0 – 18 years, living with diabetes in Manitoba, along with Nunavut, northwestern Ontario and southeastern Saskatchewan. The team is an integrated, co-located, interprofessional team at the Children’s Hospital, Health Sciences Centre, Winnipeg. The DER-CA team is recognized locally, provincially and nationally as leaders in the care of children with type 1 and type 2 diabetes. Team members also partner with researchers in basic science, clinical science and population health to contribute to new knowledge and the translation of that knowledge to the communities, children, and families that they serve. This research is enhanced by collaboration with the DREAM (Diabetes Research Envisioned and Accomplished in Manitoba) team at the Children’s Hospital Research Institute of Manitoba (CHRIM). In addition to educating patients, families, and caregivers, DER-CA team members also are active in educating the greater community, health care professionals, and learners from various health care fields. Through partnership with community agencies, the DER-CA also aims to advocate for children living with diabetes to reach their potential.

This report provides an annual update and review of the programs at the DER-CA. It is the result of an incredible team effort throughout the year. Our clinical database is continuously updated to provide comprehensive and continuous annual audits for on-going quality improvement.

The number of children with type 1 and 2 diabetes referred to the DER-CA has increased significantly over the years since the DER-CA was established. Through the 2000s, the number of children referred with type 2 diabetes increased significantly including a noticeable spike in 2009. We predict that the number of children with type 2 diabetes will continue to increase, although perhaps at a slightly slower rate, due to many reasons including the known increasing incidence in our high risk populations in some part likely due to neonatal exposure to increasing rates of maternal diabetes prior to pregnancy and gestational diabetes. Mirroring worldwide trends, the number of children with type 1 diabetes should also continue to increase, although at a slower rate than type 2 diabetes.

In 2012, our research group published a seminal document reporting the long-term outcomes of children with type 1 and type 2 diabetes in Manitoba. This was a partnership between the DER-CA and the Manitoba Centre for Health Policy. The data showed a low rate of long term complications after 30 years of disease in the children with type 1 diabetes, but a disturbing high rate of complications and death in the children with type 2 diabetes. This data provides compelling evidence for the need for enhanced programs and approaches for improving the care of children with type 2 diabetes. This is a complex and challenging issue that involves consideration of the child living with diabetes, his or her caregivers, the family structure, and the greater community. Our care model in type 2 diabetes includes group teaching for patients and their families with the aim of enhanced patient involvement and education with the ultimate goal of improved glycemic control. To date, this model has been well received. The DER-CA is committed to continued efforts to improve the care provided to children living with type 2 diabetes.

Optimal care for children with Type 1 diabetes continues to be a major focus of the DER-CA. While the number of children with type 2 diabetes is increasing rapidly, children with type 1 diabetes still continue to make up about two thirds of the DER-CA patient population. From 2007 to 2011, there was a rise in the mean A1C in the children with type 1 diabetes followed at the DER-CA. Excellent glycemic control has obviously always been a goal of the DER-CA and its patients and families. We recognized this rising trend and made an even more concerted effort through program evaluation to work with patients and families to further improve glycemic control. We have seen good improvements in the mean A1C, back to baseline, since then. This process further emphasized the need for continued program evaluation and challenges us to continue to work with patients and families to find ways to improve diabetes management and care. In 2012, Manitoba Health announced the funding of the Manitoba Pediatric Insulin Pump (MPIP) program for children with type 1 diabetes who meet the eligibility requirements. The MPIP program has been a valuable addition to our clinic and is a major effort and program for the DER-CA. An insulin pump is valuable for some, but not all patients with type 1 diabetes. The DER-CA continues to support all our patients and families to make informed management choices, which may or may not include an insulin pump, that best suit their individual needs.
The DER-CA cares for children in Winnipeg, other urban centres, northern communities, and various rural locations. In 2015, 63% of our patients reside outside of Winnipeg. As the number of children with type 2 diabetes from northern communities has increased, there has been an increasing change in the rural: urban ratio. We continue to develop and evaluate our outreach and telehealth programs, along with our partnerships in the communities and health authorities, for patients with both type 1 and type 2 diabetes. In collaboration with the Child Health Program, we will aim to develop and enhance our provincial and rural mandates in the upcoming years.

2015 was a successful year for the DER-CA with continued stabilization of our team and program. We have achieved several worthy goals and remarkable achievements as outlined further in this annual report. We are very pleased that in 2015 the DER-CA was awarded the Interdisciplinary Health-Care Team Award by the College of Registered Nurses of Manitoba. The DER-CA team is proud of its accomplishments and its ongoing efforts to improve the lives of children with diabetes and their families in Manitoba and our greater catchment area both now and in the future.

S. Marks

DR. HEATHER DEAN

With a mixture of both sadness and happiness but undeniable vast respect, we recognize Dr. Heather Dean’s retirement from clinical care in 2015. Dr. Dean’s name is synonymous with pediatric diabetes care in Manitoba and beyond. It was her vision that established the DER-CA in 1985. While interprofessional care is standard in diabetes care today, it was innovative when the DER-CA was established in 1985. Dr. Dean is locally, nationally and internationally recognized for her clinical expertise and research in pediatric diabetes. She was at the forefront of the recognition of the growing epidemic of type 2 diabetes in children in the 1990s, and then dedicated herself to working with these children, their caregivers, and their communities to provide high quality care to these children. She literally was “breaking new ground”. On behalf of the children of Manitoba, the diabetes community, and the DER-CA we thank Dr. Dean for all she has done for the children of Manitoba and the world. Through her career and dedication she had an undeniable positive effect on the lives of children living with diabetes and their families.
DER-CA TEAM STATEMENT

The DER-CA and Pediatric Endocrinology team created a team statement in October 2013. We are committed to safe communication, to speaking truthfully, to support growth, to encourage strengths, to embrace fun and laughter, to share common goals, to support acceptance and equality, to enhance patient centered care and to respect each other. This leaves us feeling good, excited and hopeful. We agree to:

Be mindful in each interaction, inquiring if “right now is an okay time to talk”.

Speak in a calm, tactful, and non-reactive way. One should feel safe to express thoughts, as all options are valid.

A smile and good humor are appreciated.

Be appreciative of each other’s time.

Hear what others have to say. Do not assume you already know.

Be respectful of the different ways to accomplish the same task and be open to trying something in a new and/or different way.

Validate and acknowledge each contribution.

Communicate with everyone involved to find a comfortable solution.

Feel safe approaching others regarding conflict or being receptive when being approached regarding conflict.

We each have our strengths and bring something unique to the team. Collectively, these individual strengths make us a stronger team and allow us to grow.
DIABETES TEAM

Pediatric Endocrinologist, Medical Director .................................................. Seth Marks, MD, MSc, FRCPC
Pediatric Endocrinologist .................................................................................. Heather Dean, MD, FRCPC (to June)
Pediatric Endocrinologist .................................................................................. Celia Rodd, MD, MSc, FRCPC
Pediatric Endocrinologist .................................................................................. Elizabeth Sellers, MD, MSc, FRCPC
Pediatric Endocrinologist .................................................................................. Brandy Wicklow, MD, MSc, FRCPC

Clinical Psychologist ......................................................................................... Jennifer Ducharme, PhD
Clinical Psychologist ......................................................................................... Heather MacKenzie, PhD

Educators
Clinical Nurse Specialist .................................................................................. Julie Halipchuk, RN, MN, CDE
Dietitian ............................................................................................................. Megan Bale, RD, CDE (from June)
Dietitian ............................................................................................................. Lindsay Sawatsky, RD, CDE
Dietitian ............................................................................................................. Brie Seniuk, RD (to January)
Dietitian ............................................................................................................. Christine Unruh, RD, CDE (from January)
Dietitian ............................................................................................................. Norma Van Walleghem, RD, MSc, CDE (to June)
Nurse .................................................................................................................. Tracy Hollett, RN, BN, CDE
Nurse .................................................................................................................. Carol Janzen, RN, BN, CDE
Nurse .................................................................................................................. Rhonda Thorarinson, RN, CDE
Social Worker .................................................................................................. Kerrie Abel, BSW, MSW

Administrative Staff
Administrative Secretary .................................................................................. Jenna Sofronio (to May)
Administrative Secretary .................................................................................. Melissa Willman (from May)
Secretary .......................................................................................................... Jennifer Gamis-Matias
Secretary .......................................................................................................... Pauline Mohamed
Director ........................................................................................................... Laurie Osadick
Nursing Assistant ............................................................................................. Mary Stove
Nursing Assistant ............................................................................................. Cynthia Bousquet (from March)
Nursing Assistant ............................................................................................. Amanda Guerrerio (to September)
Nursing Assistant ............................................................................................. Andrea Neplyk (to March)

Other Team Members
Transition Co-ordinator (MAESTRO) ................................................................. Catherine MacDonald, BFA
The tables on the following pages are numerical tabulations of patient demographics, clinical and education activities. The demographics represent activity at the DER-CA and are not a complete documentation of all children aged 0-18 years with diabetes in Manitoba. However, the evidence indicates that 95% of children aged 0-14 years with type 1 diabetes in Manitoba are followed by the DER-CA (Blanchard J, Dean HJ, Anderson KA, et al. Diabetes Care 1997;20:512). We suspect we capture an even higher percentage today. The ascertainment of youth with type 2 diabetes remains difficult to determine due to the limitation of MHSC administrative data to classify type of diabetes (Dart A et al. Diabetes Care 2010;34:898-903) but a best estimate is 85%.

A database was established in 1990 for program planning and evaluation. Upgrades were performed in 1992, 2000 and 2006 to ensure its integrity. Statistics for the odd numbered years from 1987-2009 have been omitted from Table 1 and Table 2 due to space restrictions. The data is included in all Figures. These statistics are available upon request from the DER-CA.

Note: The DER-CA has chosen to continue using the previous 11 RHAs of Manitoba rather than the 5 reorganized RHAs for 2015 throughout this document to support regional program planning by area.

DEFINITIONS USED IN THE TABLES AND IN THIS REPORT

Total Patient Load (active): This includes all youth followed at the DER-CA at year end including new onset cases in that calendar year. All graduates in the calendar year are excluded even though they may have been followed in the program for part of the year.

Age: At year-end December 31, 2015.

Type of Diabetes: Clinical criteria and the presence or absence of diabetes associated autoantibodies are used to differentiate type 1 & type 2 diabetes. “Other” type of diabetes refers to secondary diabetes due to pancreatic disease or medications. The 2013 Canadian Diabetes Association criteria are used for the definition of pre-diabetes impaired fasting glucose (FPG = 6.0-6.9 mmol/L) and impaired glucose tolerance (2 hr pc PG = 7.0-11.0 mmol/L).

New Referrals: Any child referred to the DER-CA at diagnosis or within six months of diagnosis is considered a new onset case even though initial education may have been provided in the home community. For example, a child diagnosed and referred in November but not seen at the DER-CA until January is counted in the year of diagnosis.

Previous Diagnosis: Any child referred to the DER-CA at least six months after diagnosis. The majority of these cases are children with type 1 diabetes who have moved to Manitoba in the past year.

Diabetic Ketoacidosis: = pH <7.30. (Note: this definition was used by the SEARCH study in the USA.)

Severe hypoglycemia: = loss of consciousness or seizure.

ABBREVIATIONS:

<table>
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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<td>A1C</td>
<td>Hemoglobin A1C</td>
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<td>CDA</td>
<td>Canadian Diabetes Association</td>
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<tr>
<td>CDE</td>
<td>Certified Diabetes Educator</td>
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<td>C&amp;SS</td>
<td>Clinical &amp; Scientific Section of CDA</td>
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<tr>
<td>DES</td>
<td>Diabetes Educator Section of CDA</td>
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<tr>
<td>DKA</td>
<td>Diabetic Ketoacidosis</td>
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<tr>
<td>FPG</td>
<td>Fasting Plasma Glucose</td>
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<tr>
<td>IGT</td>
<td>Impaired Glucose Tolerance</td>
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<td>HSC</td>
<td>Health Sciences Centre, Winnipeg</td>
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<tr>
<td>JDRF</td>
<td>Juvenile Diabetes Research Foundation</td>
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<tr>
<td>MICH</td>
<td>Manitoba Institute of Child Health</td>
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<tr>
<td>NADA</td>
<td>National Aboriginal Diabetes Association</td>
</tr>
<tr>
<td>NMU</td>
<td>Northern Medical Unit</td>
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<tr>
<td>NW Ont</td>
<td>Northwestern Ontario</td>
</tr>
<tr>
<td>RD</td>
<td>Registered Dietitian</td>
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<tr>
<td>RHA</td>
<td>Regional Health Authority</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Nurse</td>
</tr>
<tr>
<td>SW</td>
<td>Social Worker</td>
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<tr>
<td>URIS</td>
<td>United Referral Intake System (for children with medical needs in schools)</td>
</tr>
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<td>Winnipeg Regional health Authority</td>
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**TABLE 1 – POPULATION DEMOGRAPHICS**

(Statistics for the odd numbered years 1987-2009 have been omitted due to space restrictions. The data are included in many figures in the report. These data are available upon request from the DER-CA. Pre-diabetes (IFG/IGT) were identified with database starting in 2006.

* Data Not Collected

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**Newly Dx – Type 1**

| Total            | 37   | 41   | 31   | 50   | 48   | 44   | 43   | 56   | 71   | 67   | 65   | 55   | 58   | 53   | 56   | 60   | 71   | 75   |
| Age 0-4 yrs      | 6    | 9    | 5    | 8    | 9    | 8    | 9    | 6    | 10   | 10   | 12   | 6    | 4    | 5    | 9    | 9    | 9    | 14   |
| 5-9 yrs          | 14   | 15   | 12   | 15   | 15   | 13   | 20   | 23   | 22   | 22   | 15   | 23   | 16   | 18   | 12   | 22   | 24   |
| 10-14 yrs        | 13   | 14   | 12   | 25   | 15   | 21   | 17   | 20   | 26   | 26   | 20   | 29   | 22   | 20   | 21   | 23   | 27   | 28   |
| 15-18 yrs        | 3    | 3    | 2    | 5    | 9    | 5    | 4    | 10   | 12   | 9    | 11   | 5    | 9    | 12   | 8    | 16   | 15   | 9    |

**Newly Dx – Type 2**

| Total            | 2    | 4    | 3    | 5    | 4    | 8    | 20   | 40   | 37   | 33   | 29   | 43   | 67   | 67   | 53   | 56   | 78   | 64   |
| Age 5-9 yrs      | 0    | 0    | 2    | 1    | 1    | 0    | 2    | 5    | 3    | 1    | 1    | 3    | 7    | 2    | 3    | 1    | 5    | 1    |
| 10-14 yrs        | 1    | 3    | 0    | 2    | 6    | 10   | 24   | 25   | 41   | 49   | 33   | 37   | 43   | 40   |      |      |      |      |
| 15-18 yrs        | 1    | 1    | 1    | 4    | 1    | 2    | 8    | 11   | 9    | 11   | 8    | 14   | 19   | 16   | 17   | 18   | 30   | 23   |
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† The DER-CA stopped accepting referral for “at risk children” with obesity in 2008 unless the child has pre-diabetes (impaired fasting glucose or impaired glucose tolerance).

‡ This number represents only the number of elective procedures at Children’s Hospital.
**TABLE 2 – COMMUNITY EDUCATION**

*Data Not Collected*  
‡As of 2014, this number includes child care facility & foster parent

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<td>Aboriginal Pre-Med Students</td>
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<td>Adult Endocrine Fellows</td>
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<td>Other Visitors</td>
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<td>4</td>
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*As of 2014, this number includes child care facility & foster parent*
Figure 1
ACTIVE PATIENT LOAD BY TYPE OF DIABETES BY YEAR

Figure 2
NEW CASES OF DIABETES BY TYPE OF DIABETES BY YEAR
The total excludes new referrals of children with pre-diabetes after 2006 and children who were previously diagnosed with diabetes and recently moved to the province.
Figure 3
NEW CASES OF TYPE 2 DIABETES REFERRED TO THE DER-CA BY YEAR

Figure 4
NEW CASES OF TYPE 2 DIABETES BY YEAR OF DIAGNOSIS AND GENDER

Note: The number of referrals in the top figure may not correspond to the new cases in this figure because the year of diagnosis and year of referral may not be the same.
INNOVATIONS AND NEW PROGRAMS

1. **Manitoba Pediatric Insulin Pump Program**: In April 2012, Manitoba Health announced the new Manitoba Pediatric Insulin Pump (MPIP) program, which includes coverage of insulin pumps for Manitoba children with type 1 diabetes for whom insulin pump therapy is appropriate and who meet the eligibility criteria. Prior to this announcement the DER-CA was involved in consultations regarding the format, clinical needs, and eligibility criteria of the program. After the Spring announcement and resulting funding, the DER-CA began operational planning and program implementation.

The first MPIP program patient and family group classes started in October 2012. On an ongoing basis, we continue to work with patients and families to determine those who are eligible and suitable for insulin pump therapy. We also continue to provide ongoing intense follow-up to patients now on insulin pump therapy. For some individual patients this can involve 15 emails or phone calls in a week! Over 100 children have initiated insulin pump therapy through the MPIP program. Prior to the program, an average of less than 12 patients annually initiated insulin pump therapy.

The MPIP program provides a standardized approach to assess patient eligibility for insulin pump therapy and for education and follow-up of these patients. We continue to monitor outcomes as part of the DER-CA’s continuous quality improvement program and as part of this annual report. To date, the MPIP program appears to be successful with short term evidence of safe and potentially improved diabetes management in those patients who were assessed as eligible and initiated insulin pump therapy. Feedback from families and patients participating in the MPIP program has been positive.

We continue to evaluate and improve the MPIP program. A major recent initiative has been an expansion of our screening process including the development of a psychosocial assessment, an expanded clinical assessment, and a more formal team review of potential patients. The aim is to ensure safety and efficacy for our patients and families.

2. **Group Classes for Type 2 Diabetes Clinics**: The first full year of group education classes provided for youth with type 2 diabetes and their caregivers occurred in 2013. We continue to assess and adapt these classes to better care for our patients and their caregivers.

3. **Type 2/Renal Clinic**: In September of 2012 a new combined clinical service was offered to patients with type 2 diabetes and renal disease in ambulatory care at Children’s Hospital. The goal of this joint collaboration between pediatric nephrology and pediatric endocrinology is to improve the coordination of care for children requiring multiple subspecialist visits. The joint clinic allows for a focused approach to lifestyle messaging, medication action and understanding of the inter-relatedness of diabetes and renal disease. In addition communication with community workers and primary care physicians occurs as a single letter from both the endocrinologist and nephrologist to state the treatment goals and focus of each clinic visit. The type 2 diabetes-renal clinic occurs the first Thursday of every month.

Criteria for the clinic include: <17 years of age, type 2 diabetes, macroalbuminuria on 1 random urine sample and/or persistent microalbuminuria (ACR>10 x 2 samples within 6 months), eGFR < 90 ml.min/1.73 m2. Eight patients are seen at each clinic. Patients are seen in clinic by the pediatric nephrologist (Dr. Allison Dart), endocrinologist (Dr. Brandy Wicklow), a renal nurse clinician and diabetes educators. As part of the clinic, patients attend a group education session to foster learning in a supportive peer-based environment. Topics include: Diabetes, Healthy Eating, Physical Activity, Insulin, Renal health and a key message chosen by the patients. The social worker is also available.
4. **Maestro2:** The transition program for young adults has been in operation since 2002 with a primary focus on young adults 18-25 years of age with type 1 diabetes. After establishment of the young adult clinic at Youville Diabetes Centre in 2009 and recognition that the fallout from medical surveillance was greater in the young adults with type 2 diabetes, the Maestro program shifted focus to type 2 diabetes in 2012. This shift required that the transition co-ordinator attend the weekly type 2 diabetes clinic to plan a unique transition model for this group. We learned that the loss to medical surveillance was most frequent between ages 16-18 years, before transfer from pediatric to adult care. The Maestro focused on establishing relationships with the youth in clinic at age 14 using a socio-ecological approach. In 2013, the Maestro2 program received funding from MICH (now CHRIM) to pursue “Storylines” a qualitative research project to explore what was working and what was not working in the provision of services for these adolescents age 16-18 years in type 2 diabetes clinic. The Maestro program continues to evaluate and develop new initiatives to enhance and aid in the transition of care young adults.

5. **Clinical Health Psychology:** In 2013, Clinical Health Psychology and Social Work developed a joint service within DER-CA designed to provide intervention for children and their families who struggle with treatment adherence, adjustment to illness, family stressors, anxiety, depression, and other mental health concerns. The psychosocial team is comprised of one social worker, and two psychologists equivalent to 1.0 FTE.

The psychosocial team is available to patients and their families when a request is made by the family, by a member of the DER-CA team, or by the psychosocial team identifying concerns. In addition, the clinical health psychologists are involved in program evaluation and psychological screening and assessment of children who are candidates for Manitoba Pediatric Insulin Pump (MPIP) program. This process was further formalized in 2015. In 2014, the team implemented a validated psychosocial screening measure with all patients with newly diagnosed type 1 diabetes to help identify patients and families at risk for co-morbidities.

As a result of this new service within DER-CA, outside consultation to the Department of Clinical Health Psychology and Psychiatry has decreased.

6. **Type 1 Education Handouts:** The DER-CA continually develops and revises our patient and family educational material. The New Diagnosis Binder is also regularly reviewed and edited.

7. **Review of High Risk Patients:** In 2015 we began a weekly chart review at our weekly team meeting of all patients with HbA1c measures \( \geq 14\% \). The goal is to identify patients in high risk and to develop strategies and management plans to try to ensure safety and ideally improve glycemic control. In addition, this regular review allows for collaboration and interprofessional team support of the patient’s Case Manager. Often management plans involve attempts to enhance psychosocial supports for the patient and his/her family and possible communications with community agencies.

8. **Electronic Medical Records:** An electronic medical record (EMR), Accuro, was introduced into the DER-CA for patient charting and records in December 2015 as part of a larger Winnipeg Health Sciences Centre roll out. Its implementation will require ongoing adjustments of current processes and assessments.

9. **Interdisciplinary Health-Care Team Award:** This award was presented to the DER-CA in 2015 by the College of Registered Nurses of Manitoba at the College’s annual award banquet.
REVIEW OF ACTIVITIES IN ESTABLISHED PROGRAMS

The DER-CA is a provincial program with a mandate for program development and delivery related to prevention (primary and secondary), care, education (families, health professionals and the public), advocacy and research.

1.0 PREVENTION:

1.1 Type 1 Diabetes: Secondary prevention of complications of diabetes is a major clinical focus of the DER-CA. This is promoted through educational efforts to empower parents, the children and youth to optimize glycemic control and through comprehensive surveillance for complications. Other risk reduction activities include ongoing counseling regarding smoking, sexuality, alcohol, driving, drugs and immunizations. Safety of children in schools is a major prevention program. A 24-hour emergency telephone service is available to reduce the risk of DKA and severe hypoglycemia. In order to prevent the morbidity and mortality associated with DKA, the DER-CA team worked with the Children’s Hospital Standards Committee and the Quality Team to distribute a standardized protocol for management of DKA in children at the Children’s Hospital and throughout the province.

1.2 Type 2 Diabetes: The program for secondary prevention of complications of type 2 diabetes differs from type 1 diabetes with a more intense surveillance program for earlier diagnosis and surveillance for complications from the time of diagnosis. Risk reduction counseling in clinic is tailored to this population. Our outreach clinics include community prevention activities usually as presentations in the schools, on local radio/TV, and grocery store tours. Primary prevention of type 2 diabetes in some children may be possible but requires a major commitment and support of many partners and leaders at the family, community, tribal council, provincial, national and international levels. The role of the DER-CA team is to support these activities by disseminating and sharing our experience with knowledge users and decision makers.

2.0 CARE:

2.1 Family Centred Practice: The DER-CA team continues to evaluate our service to ensure that our practice remains family-centred. We prioritize a group meeting with each new family at diagnosis of a child with type 1 diabetes to model our style of interprofessional teamwork for the family. We champion the empowerment of parents and adolescents to optimize self-management.

2.2 Regular Weekly Type 1 Diabetes Clinics: Children with type 1 diabetes are seen in follow-up 3 to 4 times per year. There are 3 to 4 type 1 clinics each week with the capacity to see 12-14 children in each clinic coordinated with all members of the interprofessional DER-CA team. Clinics are scheduled and staffed by nursing assistants. Point of care HbA1C testing is available at each clinic visit. If needed, follow-up diabetes education appointments are also available on other days of the week. Time is protected daily for the immediate education and initiation of management of children with new onset diabetes so there is no waiting time. Surveillance for complications begins in the clinic for all youth at age 12 years. Selected clinical activities and outcomes are recorded in the DER-CA database and summary letters are sent to primary care physicians and rural education teams at least once per year. The transition coordinator from the Maestro program reviews the transition process with selected youth at age 16-18 years for anticipation of transfer to adult services at age 18 years.

2.3 Regular Weekly Type 2 Diabetes Clinics: Children with type 2 diabetes are scheduled to be seen 3 to 4 times per year. There are 1 to 2 type 2 diabetes clinics each week with the capacity to see about 18 children in each clinic including two new patients. Patients are scheduled for fasting blood work and breakfast is provided. All patients and families are seen individually by a physician. Patients and families are also seen by a diabetes educator either individually or in a group education class. Clinics are scheduled and staffed by nursing assistants. Point of care HbA1C testing is available at each clinic visit. Surveillance for complications begins at diagnosis. Selected clinical activities and outcomes are recorded in the DER-CA database and summary letters are sent to primary care physicians, nursing stations, and rural education teams at least once a year. We also continue to collaborate with the School of Dental Hygiene, Rady Faculty of Health Sciences, to provide oral health education and care to our patients in the type 2 diabetes clinic. The transition coordinator meets with youth age 14 years and older for anticipation of graduation from our clinic at age 18 years.
2.4 Timetable of Diabetes Clinics:

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<th>Monday</th>
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<th>Wednesday</th>
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<tbody>
<tr>
<td>Morning</td>
<td>Type 1 Clinic (or Type 2 Clinic once monthly)</td>
<td>Type 2 Clinic</td>
<td>Type 1 Clinic</td>
<td>Type 2 - Renal Clinic (Monthly)</td>
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<tr>
<td>Afternoon</td>
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<td>Type 1 Clinic</td>
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<td>Type 1 Clinic (1-2 monthly)</td>
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2.5 New Onset Diabetes: Children with newly diagnosed type 1 diabetes are usually seen within 24 hours, outside of scheduled a clinic, for initial education and initiation of management including insulin. The initial education period typically involves 2 days with about 12 hours of direct educator contact. Children with newly diagnosed type 2 diabetes are triaged and scheduled into a future type 2 clinic or alternatively on an urgent basis, outside of a scheduled clinic, if medically indicated. The unpredictability of when children will present with new onset diabetes requires proper staffing numbers and flexibility in staff schedules to accommodate the need for urgent assessment and education.

2.6 Outreach Clinics: Outreach is a major focus for the DER-CA. It provides service to our patients and families in that it allows them to lessen requirements of travel to Winnipeg. In addition, it allows us to learn about their home communities, visit schools, visit local grocers, and present at local media outlets in addition to liaising with local health care providers. The planning of each outreach visit requires a major time commitment from our administrative staff and other members of our team in addition to obvious travel requirements for our team members. We believe that outreach is a vital part of the service we provide.

2.7 Telehealth: The DER-CA has a permanent telehealth drop that allows us to offer telehealth or “virtual” visits to our patients and families who live far from Winnipeg. Telehealth visits do not completely replace “live” clinic visits but are offered as an option for every other scheduled appointment. The planning of a telehealth visit requires extra time commitment from our administrative staff to schedule and to arrange local bloodwork prior to the visit. Telehealth provides service to our patients and families in that it allows them to lessen requirements of travel to Winnipeg.

2.7 Manitoba Pediatric Insulin Pump Program: The Manitoba Pediatric Insulin Pump (MPIP) program started in 2012 in partnership with Manitoba Health. Please see its annual audit in this report.

2.8 Home Visits/Guardians: The DER-CA team provides visits to family homes, day cares, group homes and institutions (such as the Manitoba Youth Centre) on a case-by-case basis in Winnipeg and surrounding communities. Guardians are most often non-custodial parents, foster parents, relatives, or institutional and school personnel.

2.9 Associated Autoimmune Diseases:

2.9.1 Celiac Disease: The DER-CA has a selective screening program for celiac disease Please see it’s annual audit in this report. All children with celiac disease have bloodwork for hemoglobin, liver enzymes and transglutaminase added to their diabetes surveillance annually. The team works closely with the Gastroenterology service at Children’s Hospital to coordinate surveillance.

Christine Unruh RD, CDE coordinates the Celiac Disease QA.
2.9.2 Thyroid Disease: At the DER-CA, all youth with type 1 diabetes are screened annually for hypothyroidism due to autoimmune thyroiditis using a serum TSH level. This practice is in accordance with the 2013 CDA Clinical Practice Guidelines which recommend screening in this population every two years. The DER-CA has chosen to screen annually for administrative ease.

As of December 31, 2015, 18 youth were being followed for hypothyroidism requiring L-thyroxine replacement therapy. In 2015, 1 new case of hypothyroidism was identified and one youth with pre-existing hypothyroidism was diagnosed with type 1 diabetes. After diagnosis and treatment is initiated, these children have TSH levels measured routinely to monitor the effectiveness of L-thyroxine therapy. Two young adults with type 1 diabetes and hypothyroidism graduated from the DER-CA in 2015.

There were a total of 7 youth with type 1 diabetes and hyperthyroidism (also known as Grave’s Disease) as of December 31, 2015 followed at the DER-CA. Of these, 2 were transitioned to adult care and there were no new cases of Graves identified. Youth with hyperthyroidism are also routinely screened at each DER-CA clinic visit.

Tracy Hoilett, RNBN, CDE is the DER-CA coordinator of the thyroid disease QA.

3.0 TRANSITION AND TRANSFER TO ADULT DIABETES CARE – MAESTRO: The DER-CA team has a comprehensive transition curriculum for all adolescents age 12-18 years. Unfortunately, this does not always guarantee successful transfer to adult diabetes care at age 18 years. In July 2002 the Maestro Program was initiated as an administrative support and systems navigation service for young adults transitioning from the DER-CA to adult diabetes care throughout the province. The mandate of the Maestro Program is to provide co-ordinated system navigation by an "administrative ombudsman" who can provide information regarding services for the care, education and support of diabetes in Manitoba for young adults age 18-25 years. The Transition Coordinator maintains contact with young adults to provide ongoing support and sends regular newsletters, research updates and invitations to participate in relevant events. The Maestro Program continues to receive international recognition for the use of a systems navigation model. Further information is published in a separate annual report that details the activities and status of the Maestro Program. For more information, please refer to: www.maestroproject.com.

4.0 EDUCATION: The traditional role of pediatric diabetes teams was education of families and caregivers regarding care of children with type 1 and type 2 diabetes. The initial education for type 1 diabetes requires 12-16 hours and for type 2 diabetes requires 4-6 hours or sometimes longer depending on treatment recommended. Education of families and youth continues until age 18 years with age-appropriate support, counseling and advocacy.

The expanded role of the DER-CA as a specialty team includes education of health professional students, health professionals in practice, community partners and the general public. These groups include, but are not limited to, the following:

4.1 Undergraduate Medical Students: The staff of the DER-CA are involved in three domains of the undergraduate medical curriculum relating to diabetes, namely the cognitive (lectures), problem-solving and clinical skills. The activities in the specific years of training are as follows:

4.1.1 Med II: Dr. Sellers presents lectures on pediatric diabetes and Dr. Marks and members of the DER-CA team present a seminar with a child with diabetes and their parents to the Med II students. These annual lectures and seminar cover the unique pediatric aspects of diagnosis, treatment including various insulin regimes, hypoglycemia and psychosocial issues of these age groups. It also showcases our integrated model of diabetes care, support and education.

4.1.2 Elective (University of Manitoba) Medical Students:
- Kelby Treloar, Med IV (March 9 – 27, 2015)
- Sara Bialczyk, Med IV (July 20 – August 16, 2015)
- Angella Griffith, Med IV (September 28 – October 9, 2015)
- Amit Bharj, Med IV (October 26 – November 6, 2015)
- Jordan Banman, Med IV (November 23 – December 4, 2015)
4.1.3 Med II Summer Students:
- Tanya Khaper, Dr. C. Rodd & Dr. B. Wicklow, Co-Supervisors (June - August 2015)
- Laura Tapley, Dr. B. Wicklow, Supervisor (May – August 2015)
- Jack Heard, Dr. B. Wicklow, Dr. Amanda Morris (Obstetrics and Gynecology), Co-Supervisors (May – August 2015)

4.2 Postgraduate Medicine:

Pediatric Residents at the University of Manitoba (one month rotation):
- Diana Popescu, PGY4 (February 5 – March 4, 2015)
- Maria-Elena Lautatzis, PGY1 (March 5 – April 1, 2015)
- Ivan Stevic, Clinical Biochemistry Resident (April 2 – 29, 2015)
- Preety Dhaliwal, PGY4 (April 30 – May 13, 2015)
- Audrey Javellana, PGY4 (July 1 – 29, 2015)
- Oana Florecescu, PGY1 (July 30 – August 26, 2015)
- Kari Wosnitza, PGY1 (August 27 – September 23, 2015)
- Huan Yu, Adult Endocrinology Resident (September 24 – November 18, 2015)
- Bhreagh Kennedy, PGY1 (November 19 – December 16, 2015)
- Santina Lee, PGY2 (December 17 – 31, 2015)

4.3 Social Work Students:

4.4 Dietetic Interns:
- Jill Anderson (January 5 – 23, 2015)
- Kayla Farquhar (January 26 – February 13, 2015)
- Chelsey Walchuk (March 9 – 27, 2015)
- Michelle Leaf (November 16 – December 4, 2015)

4.5 Faculty of Pharmacy (Pharm 4800) University of Manitoba: There were no Pharmacy students rotating through the DER-CA in 2015.

4.6 School of Dental Hygiene: In 2015, dental hygiene students attended type 2 diabetes clinics at the DER-CA. The goals of this collaborative effort were:
1. To enhance the quality of life of youth of the DER-CA by informing the youth and their families about the bi-directional relationship between type 2 diabetes and oral health.
2. To expose the dental hygiene students to interprofessional collaboration for family centered practice.
3. To sensitize the dental hygiene students to the challenges of type 2 diabetes management faced by youth with type 2 diabetes.
4. To establish a collaborative practice between the School of Dental Hygiene and the DER-CA.

4.7 Other Health Professionals and Special Guests:
- Arlene Griffiths, Registered Nurse (January 19 – March 13, 2015)
- Tarun Prashar, Clerk (March 2, 2015)
- Razvun Purza, Med IV (May 12, 2015)
- Michelle Reimer, Diabetes Nurse (August 5, 2015)
- Jenna Gim, Clerk (August 24, 2015)
- Rucha Chhibba, Clerk (September 14, 2015)
- Nadia Marion, Med IV (September 21, 2015)
- Claudine Lanthier, Gynecology Resident (October 5, 2015)
- Gurmeet Gujral, MN Student (November 2, 2015)
4.8 Interprofessional Education (IPE) at the DER-CA: Collaborative practice in health care teams is at the core of health care reform for professional students. The Royal College of Physicians and Surgeons of Canada (RCPSC) requires that all postgraduate medical trainees in Pediatrics receive formal explicit training in the collaborator role of the Can MEDS competencies. All faculties of health professions at the University of Manitoba now require training in teamwork. In 2007 we recognized our unique opportunity to teach teamwork to all health professional students who choose clinical placement electives at the DER-CA, including students from Medicine, Nursing, Social Work, Nutrition, Pharmacy, Dental Hygiene, Psychology and Kinesiology.

IPE requires students from two or more health professions learning about, with and from each other. Julie Halipchuk, RN, Carol Janzen, RN and Heather Dean, MD have had formal training as IPE facilitators. The DER-CA team recognized that although the systems for communication, shared care, roles and responsibilities of the team had evolved over 30 years to an efficient highly integrated team, there were functions that we could improve to enhance how we teach our model of collaborative practice. The most important of these was encouraging students to practice teamwork. A six-year experience of IPE at the DER-CA was submitted for publication in 2014. Clinical placement schedules and the number of students participating at the DER-CA this year are shown in the table 2 of this report.

4.9 Family Research Symposium: There was no symposium in 2015. Plans are underway for a 2017 symposium.

4.10 Teacher’s Workshop: The 29th annual DER-CA “Children Living with Type 1 Diabetes in the Classroom” day-long workshop was held in Winnipeg, Manitoba on Friday, September 25, 2015. There were 28 school personnel including 18 teachers, 7 educational assistants, 1 principal, 1 vice principal, and 1 administrator, along with 6 URIS nurses, 2 social workers, and 2 early childhood educators that attended in person.

4.11 DER-CA Journal Club: Monthly journal club organized by DER-CA with telehealth link across Manitoba and N.W. Ontario.

5.0 ADVOCACY: In addition to the individual counseling sessions provided at the DER-CA, the team provides the following support programs:

5.1 Toll-free number: The 1-866 telephone number, initiated in August 2001, is to encourage daytime telephone calls for counseling and education from families living outside of Winnipeg (see audit in this report).

5.2 24-hour Emergency Telephone Advice: This service is provided by all professional members of the DER-CA team during office hours and by the physicians in the evenings and on weekends and holidays.

5.3 Newsletter: The DER-CA staff publishes and distributes a newsletter three times per year in the spring, late summer and early winter to all families affected by type 1 diabetes and registered in the DER-CA program. Families, diabetes education teams in the RHAs, corporate partners, CDA and JDRF receive the newsletter by email. For those families who don’t have an email address, copies of the newsletters are displayed in the waiting room. Topics for the newsletter are based on questions frequently asked by families at the DER-CA, changes in education and advice on self-care strategies, administrative changes, research studies in Manitoba and upcoming community events for families.

5.4 Christmas Hampers: Each year at Christmas the DER-CA staff assembles hampers for 1-2 families living with diabetes.

5.5 Prevention of DKA and a Strategy to Prevent Delay in Diagnosis of Children with New Onset Type 1 Diabetes: Data from our clinic shows that approximately 30% of children with new onset type 1 diabetes present in DKA. Overall approximately 60% of our children with new onset type 1 diabetes are referred from a family physician and 20% have a delay in diagnosis due to waiting for an unnecessary fasting blood glucose level. A strong proactive strategy was initiated in the context of this low volume, high risk solution to prevent DKA. In 2007 we created a system change with Diagnostic Services of Manitoba (DSM) by legislating a notification of a critical result by laboratories for any glucose in a urinalysis or plasma RBG >11.1 mmol/L in a child <18 years of age.
An automatic computer-generated written recommendation on the lab printout that says “If this child is not known to have diabetes, urgent consultation to the Manitoba Pediatric Diabetes Service is recommended by calling 204-787-2071.” This serves as an educational notice especially for family physicians trained outside of Manitoba. This was initiated in rural Manitoba in late 2007. Provincial coverage was achieved in early 2008 but is not yet all inclusive, particularly in private laboratories. An audit was completed in December 2009.

6.0 CAMP: The DER-CA staff participates in Camp Briardale, in the CDA residential week-long camp for children ages 7-16 years with type 1 diabetes (Camp Briardale). In 2015, we had 12 Medical Counsellors (Medical Students), 3 Nutrition Counsellors (Nutrition Students), 3 Nighttime Testers (Psychologist, Social Worker and a non-medical person) and 73 Campers between the ages of 7 and 16 attend Camp Briardale.

The Camp experience is an exceptional “interprofessional team experience”, for health professional students in the Faculty of Health Sciences (nursing, pharmacy and medicine). Each cabin group is composed of a Medical Counsellor, Nutrition Counsellor, and a Program Counsellor (YMCA Camp Counsellor), they work closely together as a team for the week to provide care for a group of approximately 8 campers. Nutrition Counsellors and Medical Counsellors consult with our senior medical team (Pediatric Endocrinologist, Nurses, Dietitians) multiple times throughout each day and work collaboratively to determine insulin doses and treatments for campers when needed.

This experience allows the students a unique opportunity to understand the day-to-day issues of living with type 1 diabetes and to develop skills in working as part of an interprofessional team. The camp counselors serve as “program counselors”. The experience is under review by the University of Manitoba, for eligibility as an extracurricular service learning event. It is also a formal interprofessional learning activity, as the students are formally trained in teamwork skills and have formal debriefing sessions at camp about teamwork and collaboration. The students can apply for the experience to be recorded in their co-curricular record at the University of Manitoba.
PARTNERSHIPS AND CONSULTATIONS WITH COMMUNITY ORGANIZATIONS

NATIONAL

CANADIAN DIABETES ASSOCIATION: (CDA national office – Toronto)
• CDA-DES Pediatric Interest Group: Educators are members of this national group of specialized pediatric diabetes educators.
• Canadian Journal of Diabetes: H. Dean is Editor Emeritus from 2010 - present. She also serves on the editorial board as a member and reviewer and on the publications working committee. E. Sellers is Associate Editor from 2009-2015 and Deputy Editor 2015 - present.
• National Camp Medical Standards Committee: E. Sellers
• Diabetes in Pregnancy Study Group, Elected Member: H. Dean from 2011 to present
• Clinical Practice Guidelines 2013 – E. Sellers (First author for evidence-based guidelines for chapter on type 2 diabetes in children. Co-author on chapter on type 1 diabetes in children.)
• Canadian Diabetes in Pregnancy (CanDips) Group – B. Wicklow

NATIONAL ABORIGINAL DIABETES ASSOCIATION: (National office – Winnipeg)
• Contributions to newsletter on type 2 diabetes in youth in every issue

PROVINCIAL

CANADIAN DIABETES ASSOCIATION (CDA) Manitoba Division:
• Camp Program – Medical Director: E. Sellers. See Camp Briardale audit in this report
• CDA Diabetes Educator Section, Winnipeg Chapter – all educators
• CDA Advocacy Task Force – C. MacDonald, H. Dean

JUVENILE DIABETES RESEARCH FOUNDATION (JDRF) Manitoba Chapter:
• JDRF activities are promoted by the DER-CA in the newsletter and the bulletin board in the DER-CA waiting room.
• The JDRF Bag of Hope is provided to all new onset type 1 diabetes patients
• Member of the Executive Board – K. Abel

NORTHERN MEDICAL UNIT (University of Manitoba):
• Outreach clinics were held in Norway House (February 11, 2015) and St. Theresa Point and Garden Hill (April 30 – May 1, 2015 & Sept 22-23, 2015).

MANITOBA ASSOCIATION OF OPTOMETRISTS (MAO):
• The MAO provides the DER-CA with an annual list of optometrists available for retinal screening including those who conduct retinal screening using digital photography.

MANITOBA FIRST NATION DIABETES COMMITTEE (MFNDC):
• The Chair of MFDNC is a member of the community advisory committee of the DREAM research team (see Research)

DIABETES INTEGRATION PROJECT (DIP): www.diabetesintegrationproject.ca
• The Maestro Transition Co-ordinator meets to synchronize activities of the DER-CA, Maestro and DIP to optimize transition of care of youth with type 2 diabetes after age 18 years with minimal gaps in continuity of care and surveillance.

REGIONAL HEALTH AUTHORITIES OF MANITOBA:
• The DER-CA team organizes a monthly Journal Club with telelink capabilities to more than 20 sites in Manitoba and northwestern Ontario for diabetes health professionals.
• The DER-CA team provides professional consultation to regional chronic disease teams on a regular basis.
• Outreach Clinics in Thompson, The Pas and Flin Flon are coordinated with the staff of the Northern RHA
CHILD & FAMILY SERVICES (CFS):
- Ongoing review of the use of the high-risk information sheet for support workers that is placed on every CFS medical form for children in care (both type 1 and type 2 diabetes).

MANITOBA HEALTH:
- DER-CA collaborates with Manitoba Health in the implementation of the Manitoba Pediatric Insulin Pump (MPIP) program.

HEALTHY CHILD MANITOBA:
- In 2012, Heather Dean provided consultation on the Families First Screening Form to differentiate moms with type 2 diabetes in pregnancy from mothers with gestational diabetes because the fetal exposure during the first trimester is very different and may have important fetal effects. This new form was implemented in 2013. This data will facilitate more robust analysis of the long term effects of the maternal prenatal environment using databases housed at the Manitoba Center for Health Policy. 83% of all births in Manitoba are screened by public health nurses using this form. Unfortunately, this does not include First nations children living on reserve. Nevertheless this adjustment of the form can be used for future development of a First Nations specific form.

REGIONAL (Winnipeg)

CHILDREN’S HOSPITAL AND HEALTH SCIENCES CENTRE:
- Department of Clinical Chemistry
  - All diabetes clinics at the DER-CA have point-of-care A1C testing (using DCA2000) supported by the laboratory for QA.
- Nephrology, Gastroenterology, Oncology, Hematology and Cystic Fibrosis Clinics (see Table 1)
  - The DER-CA team participates in shared care of children with hypertension, albuminuria, celiac disease, fatty liver disease, cystic fibrosis and drug-related secondary diabetes (usually leukemia or post transplantation).
- Department of Nutrition and Food Services
  - The DER-CA dietitians co-ordinate food services for children admitted to Children’s Hospital and PY-1 (Psychiatry) with new onset type 1 diabetes. This includes a review of hospital routines for children with diabetes on wards on an annual basis.
- Neonatology
  - Seth Marks collaborated with Neonatology on updated WRHA Neonatal Hyperglycemia Guidelines in 2015.

CHILDREN’S HOSPITAL FOUNDATION (CHF) AND CHILDREN'S HOSPITAL RESEARCH INSTITUTE OF MANITOBA (CHRIM)
- CHF and CHRIM have supported DER-CA and Maestro activities in many ways since 1985 including research funds, salary support, studentships, conference funds, space and infrastructure support.

MEDIA: The DER-CA responds to any request from the media for information on all types of diabetes in youth because of the important public awareness that is required for these diseases. Interviews in 2015 included:

- 40 Voices, February 2015, H. Dean
- Radio Show, February 11, 2015, E. Sellers, T. Hollett
- Lancet Diabetes/Endocrine, March 2015, H. Dean
- CBC Iqaluit, March 2015, C. Rodd
- Diabetes Dialogue, April 2015, E. Sellers
- CTV Winnipeg, May 2015, C. Rodd
- Diabetes Camp, August 19, 2015, DER-CA Team
- Diabetes Talk, August 20, 2015, B. Wicklow
- CRNM, September 3, 2015
- CTV Winnipeg, October 7, 2015, B. Wicklow
- Global TV Winnipeg, November 3, 2015, DER-CA Team
- Contemporary Pediatrics, December 2015, E. Sellers
RESEARCH
(Active Grant funding)

TYPE 1 DIABETES

Natural History of Type 1 Diabetes:
Principal Investigator (local): Dr. S. Taback
Co-investigator: Dr. S. Marks
Funding: TRIALNET (www.trialnet.org)

This study tests first degree relatives for immune markers for type 1 diabetes. It is a longitudinal global study established in 2004.

TRIGR:
Principal Investigator (international): Dr. Mikhail Knip (previously Dr. John Dupre)
Principal Investigator (local): Dr. Shayne Taback.
Co-investigator: Dr. Heather Dean

This international study started in 2002 to investigate whether avoidance of early exposure to cow's milk would reduce the incidence of type 1 diabetes in children at risk because of shared HLA immune genes with the family member with type 1 diabetes (parent or sibling). Although recruitment of infants to this study ended in 2007, the study follow-up has been extended to 2017 to allow documentation of the number of children who develop type 1 diabetes by age 10 years. To our knowledge, none of the 90 children born and recruited to TRIGR in Manitoba have developed type 1 diabetes.

VIGOR Trial:
Principal Investigator: Dr. J. McGavock
Co-Investigator: Drs. S. Marks, H. Dean, E. Sellers, B. Wicklow
Funding: Lawson Foundation 2012-2014

This study is designed to test the effect of intensive exercise on blood glucose levels in youth with type 1 diabetes.

TYPE 2 DIABETES MELLITUS IN YOUTH

DREAM: The Diabetes Research Envisioned and Accomplished in Manitoba (DREAM) theme at CHRIM was approved in April 2012, by the Board of Directors as a new research theme related to type 2 diabetes in children. The Co-Principal Investigators are Drs. Jon McGavock and Grant Hatch. The three sub-themes (and their leaders) are Developmental Origins of Health and Disease (DOHaD) - Dr. Heather Dean; Complications – Dr. Elizabeth Sellers, and Interventions - Drs. Vern Dolinsky and Brandy Wicklow. The DREAM theme includes 12 basic and clinical scientists as well as a number of collaborators, administrative staff, research assistants and students.

Risk of Type 2 Diabetes in Offspring of Parents with Youth-Onset Type 2 Diabetes in Manitoba: The Next Generation (Next Gen) Birth Cohort:
Principal Investigator: Dr. B. Wicklow
Collaborators: Drs. E. Sellers, H. Dean, J. McGavock
Funding:
Canadian Diabetes Association; 2003-2004
Kidney Foundation of Canada (Manitoba Branch) (2011)
Manitoba Institute of Child Health
Network of Aboriginal Health Research (NEAHR)
Lawson Foundation 2012-2014

The Next Gen cohort started in July 2003 and now includes greater than 150 offspring. Annual surveillance of growth measurements plus screening for type 2 diabetes at age 7 and older has demonstrated high rates of obesity (100%) and type 2 diabetes (35% in children age 10 and older).
Peridontal Disease in Youth with Type 2 Diabetes:
Principal Investigator: Dr. S. Todescan
Co-investigators: Drs. E. Sellers, H. Dean, B. Wicklow
Funding: Manitoba Medical Services Foundation

This study is a rigorous standardized assessment of the oral health status in youth with type 2 diabetes to inform a future controlled intervention study to determine whether improvement of oral health will have a positive impact on clinical and biochemical parameters related to type 2 diabetes.

The Next Generation: In Utero, Epigenetic and Environmental Influences on the Development of Childhood Type 2 Diabetes:
Principal Investigator: Dr. B. Wicklow
Co-Investigators: Dr. E. Sellers, C. MacDonald
Funding: Children’s Hospital Research Institute of Manitoba

The Manitoba Developmental Origins of Chronic Diseases in Children Network (DEVOTION):
Principal Investigator: Drs. A. Halayko, J. McGavock
Funding: Canadian Institutes for Health Research
Research Manitoba
Lawson Foundation

The Improving Renal Complications in Adolescents with Type 2 Diabetes through Research (iCARE) Cohort Study:
Principal Investigator: Drs. B. Wicklow, A. Dart
Funding: Canadian Institutes for Health Research

Breastfeeding for the Prevention of Type 2 Diabetes in Offspring Exposed to Type 2 Diabetes In Utero:
Principal Investigator: Dr. B. Wicklow
Co-Investigators: Drs. N. Nickel, W. Phillips-Beck, G. Shen, E. Sellers
Funding: Children’s Hospital Research Institute of Manitoba

Corneal Confocal Microscopy: A Novel, Non-Invasive Methodology to Detect Early Neuropathy in Children with Type 2 Diabetes:
Principal Investigator: Dr. E. Sellers
Co-Investigators: Drs. B. Wicklow, J. MacGavock, I. Clark
Funding: Children’s Hospital Research Institute of Manitoba

OBESITY RELATED

Aboriginal Youth Mentorship Program (AYMP) for Increasing Physical Activity in Youth in Northern Aboriginal Communities:
Principal Investigator: Dr. J. McGavock
Co-Investigators: Drs. B. Wicklow, E. Sellers, J. Halas, K. Storey
Funding: CIHR 2013-2016

This proposal expands the AYMP from three communities (Garden Hill, Winnipeg and Pine Creek near Dauphin) to four new communities of Sagkeeng, Brokenhead, Norway House and Split Lake. It is based on a participatory action community program of youth leaders trained to be mentors for elementary school children regarding healthy lifestyle decisions.
OTHER ACADEMIC ACTIVITIES RELATED TO DIABETES

Research Groups:
1. Canadian Obesity Network (CIHR-NCE) – E. Sellers, B. Wicklow
2. Children’s Hospital Research Institute of Manitoba (CHRIM) – S. Marks, C. Rodd, E. Sellers, B. Wicklow
3. Developmental Origins of Chronic Disease in Childhood (DeVotion) – E. Sellers, B. Wicklow
4. Diabetes Research Envisioned and Accomplished in Manitoba (DREAM) – E. Sellers, B. Wicklow
5. Treatment and Research of Obesity in Pediatrics (TROPIC) – E. Sellers
6. TrialNet: Screening of Subjects at Risk for Type 1 Diabetes Mellitus – S. Marks

Abstract Reviews in 2015:
2. Canadian Pediatric Endocrine Group, Montreal, Quebec - B. Wicklow
3. Canadian Diabetes Association Annual Scientific Meeting - E. Sellers
4. International Society of Pediatric and Adolescent Diabetes (ISPAD) - E. Sellers, B. Wicklow
5. Pediatric Endocrine Society Annual Meeting - S. Marks, E. Sellers
6. DREAM Research Symposium – E. Sellers, B. Wicklow
7. International Diabetes Federation Annual Scientific Meeting – E. Sellers
8. Endocrine Society – C. Rodd
9. CSEM Annual conference-Scientific Committee and abstract reviewer – C. Rodd
10. Canadian Association of Advanced Practice Nurses Biennial Conference – J. Halipchuk

Journals: Manuscript Reviews in 2015:
1. Journal of Pediatrics - B. Wicklow
2. PLOS - B. Wicklow
3. Annals of Internal Medicine - B. Wicklow
4. Diabetes Care – E. Sellers, B. Wicklow
5. Diabetic Medicine - B. Wicklow
10. The Lancet Diabetes & Endocrinology – C. Rodd
12. Current Nutrition and Food Science – C. Rodd
13. JAMA Pediatrics – C. Rodd
14. Bone – C. Rodd
15. Paediatrics & Child Health – C. Rodd
16. Pediatric Nephrology – C. Rodd
17. CMAJ Open- Growth – C. Rodd

Research Grant Panel:
1. Lawson Foundation - H. Dean
2. MSI Evaluating Growth Charts – C. Rodd

Graduate Students:
1. Meaghan Rempel, Masters Committee Member, Kinesiology - S. Marks
   *Interruption of Intensity Exercise Can Reduce the Risk of Hypoglycemia and Glycemic Variability Compared to Moderate Intensity Exercise*
2. Rayzel Shulman, PhD candidate Committee Member(External Examiner) - E. Sellers
   *An Evaluation of a Universal Funding Program for Insulin Pumps for Children and Teens with Type 1 Diabetes*
3. Elizabeth Huynh, Masters Committee Member, Kinesiology - B. Wicklow
   *A Place Where I Belong*: Exploring the meaning of social support among Manitoban youth living with type 2 diabetes through a grounded theory analysis.
Pediatric Endocrine Society:
1. Program Committee Chair - S. Marks

Canadian Pediatric Endocrine Group:
1. President - E. Sellers
2. Chair, Fellowship Training Program - C. Rodd

Royal College of Physicians and Surgeons of Canada:
1. Specialty Committee in Endocrinology & Metabolism, Chair Elect - E. Sellers
2. Endocrinology and Metabolism Examination Committee – C. Rodd

Treatment and Research of Obesity in Pediatrics in Canada (TROPIC):
1. Steering Committee Member - E. Sellers

Faculty of Health Sciences, University of Manitoba:
1. College of Medicine Executive Council – S. Marks
2. Chair, Interprofessional Implementation committee, Faculty of Health Sciences - H. Dean

Canadian Diabetes Association:
1. Chair, Pediatric Special Interart Group - J. Halipchuk
2. Executive Committee Member, Diabetes in Pregnancy Group – B. Wicklow
3. Camp Medical Standards Committee – E. Sellers
4. Associate Editor, Canadian Journal of Diabetes – E. Sellers

Other:
1. Chair, Data and Safety Monitoring Board (DSMB), Continuous Glucose Monitoring at the time of Initiation of Glucose Monitoring in Established Pediatric Diabetes (CCM-TIME) Trial. Juvenile Diabetes Research Foundation, Canadian Clinic Trial Network (CCTN) - H. Dean
2. Member, DSMB. TODAY Study - Treatment of Diabetes in Adolescents and Youth. National Institutes of Health - H. Dean
3. Member, DSMB transition to adult care. JDRF-CCTN - H. Dean
4. Member, DSMB, Safety and Efficacy of Resveratrol for the Treatment of Non-Alcoholic Fatty Living Disease and Associated Insulin Resistance in Overweight and Obese Adolescent - S. Marks
5. Member, Scientific Advisory Board, Lawson Foundation, Canada - H. Dean
6. Member, Standards committee, National Accreditation of IPE - H. Dean
7. Member, CPEG working group modifying 2010-WHO growth curves for Canada - C. Rodd
8. Chair, Committee to Harmonize Growth Charts in Manitoba – C. Rodd
9. Member, CSEM, Choosing Wisely Canada, Endocrinology - C. Rodd
10. Member, Data safety monitoring board (DSMB) DIVA study- Vitamin D in asthma,, PI Dr. Francine Ducharme, U de Montreal – C. Rodd
11. Member, Endocrine Core Curriculum Committee, Undergraduate Medical Education, University of Manitoba – E. Sellers
12. Member, Adult Endocrine Training Committee – E. Sellers
13. Member, CH Medicine Patient Care Team Committee - C. Rodd
14. Chair, ASK Curriculum-- Development &Implementation of an Academic Skills rotation for PGY1 curriculum – C. Rodd
15. Chair, Committee to enhance vitamin D supplementation use across Manitoba (involves Health Science Centre, St Boniface Hospital, Health Canada (Winnipeg), Winnipeg Regional Health Authority – C. Rodd
16. Chair, Health Sciences Centre Nursing Research & Evidence Informed Practice Committee – J. Halipchuk
17. Member, Health Sciences Centre Nursing Practice Council – J. Halipchuk
18. Convenor, Health Sciences Centre Nursing Grand Rounds – J. Halipchuk
PUBLICATIONS (2015 only)


ABSTRACTS


PRESENTATIONS

1. Type 2 Diabetes in Youth. Diabetes Integration Project Inc. Nursing Collaboration and Strategic Directions: Chronic Disease and Foot Care in Manitoba First Nations, Winnipeg, MB Feb 2015 (E. Sellers)

2. Pediatric Type 2 Diabetes: Children are not small adults. Laurence Becker Annual Symposium on Advances in Laboratory Medicine. Toronto, ON, June 2015 (E. Sellers)

3. Diabetes in Indigenous Populations. Joint Meeting of the International Society for Pediatric and Adolescent Diabetes (ISPAD) and the Australian Pediatric Endocrine Group (APEG). Brisbane, Australia, Oct 2015 (E. Sellers)

4. Type 2 Diabetes in Indigenous Youth: from bedside to bench and back again. DREAM Symposium, Children’s Hospital Research Institute of Manitoba, Winnipeg, MB, Nov 2015 (E. Sellers)


8. Endocrine Considerations of Turner’s Syndrome. The International Turner’s Syndrome Society Annual Conference. Winnipeg, MB, June 2015 (B. Wicklow)


12. D-Mystifying D (Vitamin D) Internal Medicine Grand Rounds. Winnipeg, MB April 2015 (C. Rodd)


16. Unprecedented Rates of Type 2 Diabetes in Youth: The time is now to innovate, collaborate and lead. Canadian Association of Advanced Practice Nurses Biennial Conference. Winnipeg, MB Sept 2015 (J. Halipchuk)

17. Type 2 Diabetes in Youth – A Road Less Travelled. Pediatric Endocrine Nursing Society. Savannah, GA May 2015 (J. Halipchuk)
ADMINISTRATIVE REPORT

Annual Report Compilation: Jenna Sofronio, Seth Marks and submissions from various team members as credited throughout report.

Copyrights:
2002: Carbohydrate Counting Made Simple
2004: Building Connections: A Resource for Young Adults with Type 1 Diabetes

Administrative Medical Duties:
Section Head: Seth Marks
Medical Director DER-CA: Seth Marks

Undergraduate Medical Education:
Med 2 Curriculum: Elizabeth Sellers
Student Electives and Rotations: Brandy Wicklow

Postgraduate Medical Education:
Pediatric Residents: Brandy Wicklow
Obstetrics and Gynecology Residents: Brandy Wicklow
Adult Endocrinology Fellows: Elizabeth Sellers
Pharmacy Students: Brandy Wicklow

Interprofessional Education: Heather Dean, Kerrie Abel, Julie Halipchuk, Carol Janzen

Newborn Screening: Brandy Wicklow

Manitoba Pediatric Insulin Pump Program: Tracy Hoilett, Seth Marks

Teacher’s Workshop: Lindsay Sawatsky

Accuro “Champions”: Kerrie Abel, Julie Halipchuk, Seth Marks

Newsletter: Megan Bale, Julie Halipchuk

Project Leadership:
Celiac Disease: Christine Unruh
Cystic Fibrosis: Christine Unruh
Insulin Pumps: Tracy Hoilett/Norma Van Walleghem
Lipids: Carol Janzen
Renal: Rhonda Thorarinson
Thyroid: Tracy Hoilett

In addition to professional organizations that the DER staff belong to and contribute to, they also participate in various activities of the following organizations not listed in the body of this report:

HSC: Nurse Clinician Group; HSC Nursing Research Committee; HSC Case Management Committee (Child Health), HSC Advanced Practice Nurses Committee

Provincial: Association for School Health; Manitoba Community Nutrition Network, CDA Diabetes Educator Section

The incidence of Diabetic Ketoacidosis (DKA) in children with known type 1 diabetes followed at the DER-CA is lower than international benchmark of 8 per 100-patient-years (Rovers, 2002). Of note, the number of episodes of DKA shown in Table 1 is higher than the unique number of children with DKA due to recurrent episodes of DKA in some children. In 1999-2002 there were two high risk adolescents in foster care that accounted for most of the episodes of DKA. While our number of episodes of DKA per 100-patient-years remains lower than the international benchmark of 8 per 100 patient years, we aim to lower this incidence even more so as DKA is often preventable with proper outpatient management. We provide a 24 hour on-call service to assist patients and families with intercurrent illness and ketone management to help prevent hospital admissions for DKA.

Looking at the past trends, the increased trend from 2006 to 2008 may have been due to the lack of a social worker from January 2006 to October 2008. More recently, we note a higher incidence in 2015 than previous years. This became evident to us even prior to calculating the statistics for this report. To address this possible increasing trend and to decrease the incidence of DKA in our patients in general, we have rededicated our emphasis on illness and ketone management education both at initial education at diagnosis and at follow up appointments. We will continue to monitor this trend.
HEMOGLOBIN A1C AND GLYCEMIC CONTROL

In this report, the mean Hemoglobin A1C (A1C) for each child is calculated from all of the A1C results measured for each child during the year 2015. Each child contributes one mean A1C for the year to the overall mean A1C for the age group. Children and adolescents with new onset diabetes are excluded from this analysis but children and adolescents who graduated or moved during the year are included. A1Cs are performed by DCA2000 point-of-care testing at clinic visits. On rare occasions, A1C measurements are performed in other hospitals’ laboratories. The mean A1C may be skewed as the HSC laboratory reports a maximum A1C of \( \geq 14\% \). Conversely, the rural laboratories often report the absolute values for measured A1Cs >14%. From 2012 and beyond, we report the maximum A1C as 14%.

Target A1C: The Diabetes Control and Complications Trial (DCCT) demonstrated improved glycemic control decreases the risk of vascular complications in patients with type 1 diabetes (1). Similarly, the UK Prospective Diabetes Study (UKPDS) demonstrated the importance of glycemic control in type 2 diabetes (2).

There is no international consensus on the target A1C in children with diabetes. Current guidelines for type 1 diabetes in the USA and Canada are age based with higher targets in younger children due to the concern of an increased risk of hypoglycemia with lower A1Cs. The current Canadian Diabetes Association (CDA) guidelines for type 1 diabetes suggest targets of <8.0% for children aged under 6 years, \( \leq 7.5\% \) for children aged 6-12 years, and \( \leq 7.0\% \) for adolescents aged 13-18 years (3). The International Society for Pediatric and Adolescent Pediatrics (ISPAD) guidelines suggest \( \leq 7.5\% \) for all children with type 1 diabetes. The optimum target for all persons with type 2 diabetes is often stated as an A1C of <7% and this is what the Canadian guidelines suggest in youth with type 2 diabetes (3).

Benchmarks: Historically, a realistic goal for children and adolescents with diabetes has been thought to be an A1C of 8%. Poor control is often defined for both types of diabetes as an A1C \( \geq 9\% \), while high risk for DKA and future vascular complications is often defined as an A1C \( \geq 12\% \).

There has been no large Canadian study looking at A1C data in children with type 1 diabetes. A recent large US study involving more than 13,000 patients in 67 centers showed mean A1Cs of 8.2 +/- 1.1% in children aged under 6 years, 8.3 +/- 1.2% in patients aged 6-12 years, and 8.8 +/- 1.7% in patients aged 13-20 years (4). The ISPAD target of \( \leq 7.5\% \) was achieved by 25% of patients. Success in meeting target A1Cs was higher in the younger age groups.

Clinical benchmarks for A1C in youth with type 2 diabetes are limited due to a rarity of large multicenter studies. As stated above, the target A1C for all persons with type 2 diabetes is often suggested to be <7% but this recommendation is generally based on adult patients and data. This is a difficult goal to achieve in adolescents.

Results:

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>N</th>
<th>Mean HbA1C</th>
<th>Median HbA1C</th>
<th>Range HbA1C</th>
<th>Mean # tests/child</th>
<th>HbA1C &lt;=7.5%</th>
<th>HbA1C &gt;=9.0%</th>
<th>HbA1C &gt;=12%</th>
<th>CDA CPG Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>25</td>
<td>8.5</td>
<td>8.5</td>
<td>6.8 – 11.8</td>
<td>3.1</td>
<td>4 (16%)</td>
<td>6 (24%)</td>
<td>0 (0%)</td>
<td>5 (20%) [&lt;8%]</td>
</tr>
<tr>
<td>6-12</td>
<td>147</td>
<td>8.5</td>
<td>8.2</td>
<td>5.8 - 14.0</td>
<td>2.9</td>
<td>22 (15%)</td>
<td>39 (27%)</td>
<td>0 (0%)</td>
<td>21 (14%) [&lt;7.5%]</td>
</tr>
<tr>
<td>13-18</td>
<td>253</td>
<td>8.8</td>
<td>8.3</td>
<td>5.4 - 15.4</td>
<td>2.9</td>
<td>48 (19%)</td>
<td>70 (28%)</td>
<td>19 (8%)</td>
<td>17 (7%) [&lt;7.0%]</td>
</tr>
<tr>
<td>Overall</td>
<td>425</td>
<td>8.7</td>
<td>-</td>
<td>-</td>
<td>2.9</td>
<td>74 (17%)</td>
<td>115 (27%)</td>
<td>19 (4%)</td>
<td>43 (10%)</td>
</tr>
</tbody>
</table>
Type 2 Diabetes
2015

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>N</th>
<th>Mean HbA1C</th>
<th>Median HbA1C</th>
<th>Range HbA1C</th>
<th>Mean # tests/child</th>
<th>#xHbA1C &lt;=7.5%</th>
<th>#xHbA1C &gt;=9.0%</th>
<th>#xHbA1C &gt;=12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-12</td>
<td>29</td>
<td>9.5</td>
<td>9.1</td>
<td>5.9 - 14.2</td>
<td>2.6</td>
<td>3 (10%)</td>
<td>14 (48%)</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>13-18</td>
<td>169</td>
<td>9.7</td>
<td>9.4</td>
<td>5 - 16.5</td>
<td>2.6</td>
<td>44 (26%)</td>
<td>55 (33%)</td>
<td>39 (23%)</td>
</tr>
<tr>
<td>Overall</td>
<td>198</td>
<td>9.5</td>
<td>-</td>
<td>-</td>
<td>2.6</td>
<td>47 (24%)</td>
<td>69 (35%)</td>
<td>41 (21%)</td>
</tr>
</tbody>
</table>

MEAN ANNUAL HEMOGLOBIN A1C FOR TYPE OF DIABETES

MEAN ANNUAL HEMOGLOBIN A1C FOR AGE FOR TYPE 1 DIABETES FROM 2000 – 2013
Discussion: The mean A1C in children and adolescents with type 1 diabetes in all age groups at the DER-CA is above national and international target levels. Yet, a small percentage of individual patients do meet the target levels. The number of DER-CA patients with type 1 diabetes who meet the ISPAD target of ≤7.5% is only 17% in 2015 (22% in 2014) and this is now slightly below findings in multicenter studies. The mean A1C level in each age category at the DER-CA is similar to benchmarks set in other large population studies in type 1 diabetes. Like in published studies, younger children at the DER-CA have greater success in reaching A1C target than older children. However, his year the mean A1C of our two groups of younger children has risen from last year and is beyond reported findings in large studies. Interestingly our oldest group of children still has a mean A1C comparable to those found in the large population studies. There is no Canadian database for us to compare our outcomes with other Canadian centers. Regardless, achieving target glycemic control is still a big challenge for many children and adolescents with type 1 diabetes despite the ongoing advances in diabetes care and technology.

Over the years, there has been a considerable variation in mean A1C in children with type 1 diabetes in the DER-CA. There was a nadir of 8.4% in 2005. This was followed by a concerning rise that reached a peak mean A1C of 9.1% in 2011. A concerted effort to try and address this rise was made. We have since seen an improved mean A1C annually leading to the 2014 mean of 8.5%. In 2015, the mean A1C is up slightly to 8.7%. The improvement from the peak of 9.1% in 2011 is likely multifactorial but possible positive influences include the DER-CA’s ongoing attempt to improve patient and family education on the significance of A1C levels, the ongoing re-assessment of our educational materials, the introduction of the Manitoba Pediatric Insulin Pump (MPIP) program, and a significant increase in our staffing levels of educators, physicians, and the addition of dedicated psychology services. The slight rise in the mean A1C in 2015 is cautionary and we need to follow this closely to ensure it’s not a start of another rising trend.

The mean A1C in youth with type 2 diabetes at the DER-CA is above acceptable targets. Overall, this mean A1C has trended upwards since 2006. The rise in the mean A1C of youth with type 2 diabetes at the DER-CA has corresponded to an unprecedented significant increase in the incidence of type 2 diabetes in Manitoba that rivals prevalence numbers for youth anywhere in the world. There was a small decrease in the mean A1C in 2013 but then a rise again in 2014. In 2015, we again have a slight improvement in the mean A1C down to 9.5%. While this slight decrease is encouraging, it is still too high. The number of youth with mean A1Cs in the defined high risk range of ≥12% is concerning.
Much of the population of children and adolescents followed at the DER-CA with type 2 diabetes have complex psychosocial situations including poverty, complex living situations, and many live in remote rural communities distant from Winnipeg. The DER-CA continues to assess the many components of care involved in the care of youth with type 2 diabetes including outreach, telehealth, community partnerships, medical management options, clinic structure, and the impact of the remarkable increasing prevalence. With these ongoing efforts we hope to improve the glycemic control and care of youth with type 2 diabetes.

Conclusions:
1. Increased efforts and staffing levels seem to have positively impacted the glycemic control of children and adolescents with type 1 diabetes at the DER-CA over the last 5 years. Glycemic control in patients with type 1 diabetes at the DER-CA has approached published findings from other centers. However, in 2015, we see a slight rise in the mean A1C. This is noted with caution. We will continue efforts to try to further improve the care and glycemic control of the children and adolescents with type 1 diabetes. We hope that the slight rise this year is not the start of a trend.

2. The glycemic control of youth with type 2 diabetes at the DER-CA is suboptimal. This is concerning as this population is at high risk for diabetes complications and morbidity and the prevalence of disease is increasing. The reasons for the poor glycemic control are multifactorial and complex. This is not unique to the youth followed at DER-CA and is consistent with findings in other centers who care for youth with type 2 diabetes. Increased psychosocial support is likely necessary but difficult to provide in the current model of care. We are encouraged somewhat by the slightly improved mean A1C in this group in 2015. Careful ongoing assessment of the current care models and overall approach to the care of these youth is required.

References:


S. Marks
PREVALENCE OF OVERWEIGHT AND OBESITY IN THE POPULATION OF CHILDREN AND YOUTH WITH TYPE 1 DIABETES FOLLOWED AT THE DER-CA 2015

Background: The prevalence of overweight and obesity is increasing in Canadian children. Because of modern treatment and glycemic control of children with type 1 diabetes, we do not expect that the prevalence of overweight and obesity should differ from the general Canadian population.

Question:
- Does the prevalence of overweight and obesity differ in children with type 1 diabetes from the general Canadian population?
- How has the prevalence of overweight and obesity been changing in children with type 1 diabetes followed by the DERCA?

Definitions:
- Overweight: BMI > 85th percentile and < 95th percentile for age and gender = BMI z-score > 1.04 and <1.64
- Obese: BMI > 95th percentile for age and gender = BMI z-score > 1.64

Population:
Inclusion Criteria:
- Children and youth with type 1 diabetes currently followed by the DERCA (<18 years of age) on the 31st of December, 2015
Exclusion Criteria:
- Children who were diagnosed within the last 6 months were excluded
- Children who did not have a clinical visit, or had a clinical visit but no height or weight was recorded during the preceding 12 months were excluded
- Children < 2 years of age were excluded

Total population included = 440

Methods:
- BMI z-score from the last clinical visit was taken from the DERCA clinical data base on December 31, 2015
- The population was divided into three age groups: 2-5 years old, 6-11 years old, and 12-17 years old (inclusive) as well as divided by gender.
- As a comparison, the prevalence of overweight and obesity was taken from the 2004 Canadian Health Survey Shields, Statistics Canada, Cat. No.82-620-MWE using Fisher's exact test when the cell size was small (less than 10) or Chi square test.

Results:
- The prevalence of overweight and obesity in boys with type 1 diabetes does not differ significantly from the general Canadian population.
- the prevalence of overweight in girls age 12-17 with type 1 diabetes who are followed by the DER-CA differs significantly from the general Canadian population (p = 0.0122)
- the prevalence of obesity in girls age 12-17 with type 1 diabetes who are followed by the DER-CA differs significantly from the general Canadian population (p = 0.0041).
- Since 2007, the prevalence of overweight in girls age 12-17 with type 1 diabetes who are followed by the DER-CA has been increasing by an average of 0.76% per year.
- Since 2007, the prevalence of obesity in girls age 12-17 with type 1 diabetes who are followed by the DER-CA has been increasing by an average of 1.08% per year.
The prevalence of obesity in girls aged 6-11 years and 12-18 years with type 1 diabetes followed at the DER-CA is significantly greater than that in the general Canadian population ($\chi^2= 4.440$, $p=0.0351$ and $\chi^2=14.275$, $p=0.0002$ respectively).

Summary/Discussion:
- The prevalence of overweight and obesity in girls age 12-17 followed by the DER-CA has increased over the last 9 years, despite the prevalence remaining constant in girls age 6-17 in the general Canadian population according to Health Promotion and Chronic Disease Prevention in Canada.

Conclusion:
- The prevalence of overweight and obesity in girls age 12-17 followed by the DER-CA is significantly higher than in the general Canadian population.
- The prevalence of overweight and obesity in girls age 12-17 followed by the DER-CA has increased over the last 9 years, despite the prevalence remaining constant in girls age 6-17 in the general Canadian population according to Health Promotion and Chronic Disease Prevention in Canada.

Action: The DER-CA educational team will continue to:
- Emphasize the important of regular height and weight measurements and BMI calculations
- Emphasize the plotting and careful review of measurements and trajectory
- Provide education to prevent rapid weight gain after diagnosis with early introduction of insulin to carbohydrate ratios for calculation of rapid insulin doses.
- Educate to decrease over treatment of hypoglycemia with oral carbohydrate
- Provide information regarding lower calorie options for treatment of hypoglycemia
- Emphasize the importance of decreasing insulin for planned exercise
- Emphasize “Eating well with Canada’s Food Guide” and discourage over-consumption of calorie dense, carbohydrate poor foods (e.g. peanuts, cheese, meat)
- Reinforce exercise guidelines according to Canada’s Physical Activity Guide
- Continue to review the prevalence of overweight and obesity in children with type 1 diabetes in the DER-CA on an annual basis.

References:
- Shields, Statistics Canada - Cat. No. 82-620-MWE

<table>
<thead>
<tr>
<th>Table 1. Prevalence of Overweight by Gender and Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>2-17 years old</td>
</tr>
<tr>
<td>2-5 years old</td>
</tr>
<tr>
<td>6-11 years old</td>
</tr>
<tr>
<td>12-17 years old</td>
</tr>
</tbody>
</table>

* Statistically significant ($p \leq 0.05$) when compared to general Canadian population
Table 2. Prevalence of Obesity by Gender and Age group

<table>
<thead>
<tr>
<th>Age group</th>
<th>Overall</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-17 years old</td>
<td>57/346 (16.5%)</td>
<td>27/148 (18.2%)</td>
<td>30/198 (15.2%)</td>
</tr>
<tr>
<td>2-5 years old</td>
<td>6/23 (26.1%)</td>
<td>3/11 (27.3%)</td>
<td>3/12 (25.0%)</td>
</tr>
<tr>
<td>6-11 years old</td>
<td>11/95 (11.6%)</td>
<td>6/41 (14.6%)</td>
<td>5/54 (9.3%)</td>
</tr>
<tr>
<td>12-17 years old</td>
<td>40/228 (17.5%)</td>
<td>18/96 (18.8%) *</td>
<td>22/132 (16.7%)</td>
</tr>
</tbody>
</table>

* Statistically significant (p ≤ 0.05) when compared to general Canadian population

Figure 1

Prevalence of Overweight by Age

Prevalence of Obesity by Age

*There were no significant differences between groups (p>0.05 in all instances)
**Figure 2**

Prevalence of Overweight by Age and Gender

* Groups significantly different p>0.05

Prevalence of Obesity by Age and Gender

* Groups significantly different p>0.05
Figure 3

DER-CA Prevalence of Overweight in Girls 12-17

\[ y = 0.7645x + 25.599 \]
\[ R^2 = 0.124 \]

* Groups significantly different p>0.05

Figure 4

DER-CA: Prevalence of Obesity in Girls 12-17

\[ y = 1.0804x + 9.3694 \]
\[ R^2 = 0.3987 \]

*Groups significantly different p>0.05

S. Cowden (University of Manitoba Med 3)
E. Sellers
INSULIN REGIMES FOR TYPE 1 AND TYPE 2 DIABETES

Objective: Document the insulin regimes in children with type 1 and type 2 diabetes in order to describe trends over time.

Method: DER-CA database review at year end. Only children seen at DER-CA clinic during the 2015 calendar year and had their insulin regime recorded were included in the analysis. Insulin regime at last visit in 2015 used for analysis.

Subjects: All children who were active in the DER-CA program at year end.

Regimens:
None: Not taking insulin
OD: One injection per day
BID: Two injections per day
TID: Three injections per day
MDI: Multi-dose insulin (basal-bolus):4-6 injections per day
Pump: Insulin delivered by continuous subcutaneous infusion

RESULTS
Type 1 Diabetes

<table>
<thead>
<tr>
<th>TYPE 1</th>
<th>TOTAL</th>
<th>OD</th>
<th>BID</th>
<th>TID</th>
<th>MDI</th>
<th>Pump</th>
<th>Not Seen/Not Coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>476</td>
<td>4</td>
<td>36</td>
<td>256</td>
<td>132</td>
<td>31</td>
<td>17</td>
</tr>
<tr>
<td>2007</td>
<td>484</td>
<td>0</td>
<td>40</td>
<td>247</td>
<td>155</td>
<td>41</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>495</td>
<td>0</td>
<td>37</td>
<td>244</td>
<td>157</td>
<td>53</td>
<td>2</td>
</tr>
<tr>
<td>2009</td>
<td>516</td>
<td>0</td>
<td>21</td>
<td>259</td>
<td>173</td>
<td>56</td>
<td>7</td>
</tr>
<tr>
<td>2010</td>
<td>495</td>
<td>2</td>
<td>28</td>
<td>229</td>
<td>167</td>
<td>64</td>
<td>5</td>
</tr>
<tr>
<td>2011</td>
<td>487</td>
<td>3</td>
<td>31</td>
<td>222</td>
<td>165</td>
<td>62</td>
<td>4</td>
</tr>
<tr>
<td>2012</td>
<td>492</td>
<td>3</td>
<td>42</td>
<td>205</td>
<td>165</td>
<td>76</td>
<td>1</td>
</tr>
<tr>
<td>2013</td>
<td>488</td>
<td>2</td>
<td>41</td>
<td>196</td>
<td>166</td>
<td>83</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>499</td>
<td>1</td>
<td>48</td>
<td>170</td>
<td>137</td>
<td>101</td>
<td>42</td>
</tr>
<tr>
<td>2015</td>
<td>497</td>
<td>1</td>
<td>53</td>
<td>194</td>
<td>112</td>
<td>94</td>
<td>6</td>
</tr>
</tbody>
</table>

*These represent children during the honeymoon phase shortly after diagnosis.

Observations - Type 1 Diabetes:
1. The percentage of children choosing multiple dose insulin (basal-bolus) has remained stable for the past 5 years.
2. The percentage of children using insulin 3 times per day has decreased by about 10% with a concomitant increase in pump use by 10% over the past 5 years.
3. The percentage of children using insulin pumps for continuous subcutaneous insulin infusion is the highest to date at 22%. The percentage of use of pumps varies worldwide and is changing. In Denmark, the percentage of children using pumps increased from 5% to 50% between 2005 and 2011 (Olsen, 2014). Some of the factors affecting the use of pumps are family preference, family dynamics, professional support, system support (school & community), and the start of the Provincial Program.

4. The number of children not coded is too high and needs to be corrected through improved charting.

RESULTS

Type 2 Diabetes

<table>
<thead>
<tr>
<th>TYPE 2</th>
<th>TOTAL</th>
<th>None (%)</th>
<th>OD (%)</th>
<th>BID (%)</th>
<th>TID (%)</th>
<th>MDI (%)</th>
<th>Pump</th>
<th>Not Seen/Not Coded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>134</td>
<td>66 (49%)</td>
<td>3 (2.2%)</td>
<td>52 (39%)</td>
<td>3 (2.2%)</td>
<td>0</td>
<td>0</td>
<td>10 (7.5%)</td>
</tr>
<tr>
<td>2007</td>
<td>135</td>
<td>80 (59%)</td>
<td>1 (0.7%)</td>
<td>53 (39%)</td>
<td>1 (0.7%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>147</td>
<td>72 (48.9%)</td>
<td>4 (2.7%)</td>
<td>66 (44.9%)</td>
<td>1 (0.7%)</td>
<td>1 (0.7%)</td>
<td>0</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>2009</td>
<td>157</td>
<td>61 (38.8%)</td>
<td>3 (1.9%)</td>
<td>75 (47.8%)</td>
<td>1 (0.64%)</td>
<td>5 (3.2%)</td>
<td>0</td>
<td>12 (7.6%)</td>
</tr>
<tr>
<td>2010</td>
<td>176</td>
<td>75 (43%)</td>
<td>1 (0.6%)</td>
<td>95 (54%)</td>
<td>2 (1.1%)</td>
<td>2 (1.1%)</td>
<td>0</td>
<td>1 (0.57%)</td>
</tr>
<tr>
<td>2011</td>
<td>209</td>
<td>86 (41%)</td>
<td>0</td>
<td>117 (56%)</td>
<td>2 (1%)</td>
<td>4 (2%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>211</td>
<td>94 (41.4%)</td>
<td>12 (5.3%)</td>
<td>100 (44.1%)</td>
<td>1 (0.4%)</td>
<td>3 (1.3%)</td>
<td>0</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>2013</td>
<td>237</td>
<td>112 (43.7%)</td>
<td>2 (1%)</td>
<td>107 (45%)</td>
<td>0</td>
<td>2 (1%)</td>
<td>0</td>
<td>14 (5.9%)</td>
</tr>
<tr>
<td>2014</td>
<td>251</td>
<td>121 (48.2%)</td>
<td>5 (1.99%)</td>
<td>114 (45.4%)</td>
<td>2 (0.8%)</td>
<td>2 (0.8%)</td>
<td>0</td>
<td>7 (2.7%)</td>
</tr>
<tr>
<td>2015</td>
<td>244</td>
<td>130 (53.3%)</td>
<td>4 (1.6%)</td>
<td>100 (41%)</td>
<td>1 (0.4%)</td>
<td>2 (0.8%)</td>
<td>0</td>
<td>7 (2.86%)</td>
</tr>
</tbody>
</table>

Observations - Type 2 Diabetes:
1. The percentage of children using no insulin and presumable lifestyle as monotherapy has varied from 39% in 2009 to 59% in 2007.
2. The number of children prescribed metformin or glyburide, the only 2 oral medications used in our type 2 diabetes clinic, is not documented in our database.
3. This data reflects the insulin prescribed. We do not capture the number of children who do not take the insulin regularly in our database.

MANITOBA PEDIATRIC INSULIN PUMP (MPIP) PROGRAM

Background:

- In April 2012, the Minister of Health announced funding for the new Manitoba Pediatric Insulin Pump (MPIP) program. The program covers the cost of insulin pumps for Manitoba children who meet the program's eligibility criteria:
  - Applicant is under 18 years of age
  - Applicant has type 1 diabetes (T1D)
  - Completed discussion between child (if applicable), family and DER-CA team on appropriateness of insulin pump therapy
  - Home blood glucose monitoring a minimum of 4/day with results recorded
  - Regular attendance at DER-CA (minimum 3 in a 12-16 month period
  - No more than 1 episode of diabetic ketoacidosis in previous 12 months
  - Three most recent A1c <10% (minimum of 2 months between each HbA1c)

- Initially, components of the MPIP program included an individual clinical assessment, two group education classes and an individual pump start:
  - **Clinical Assessment**: This standardized assessment is part of a regular clinic follow-up appointment with an interested youth, their family, a Pediatric Endocrinologist and a Diabetes Educator. Upon completion of this assessment, if the youth met the program criteria and it was determined that insulin pump therapy was appropriate; he/she was scheduled for an upcoming pump class.
  - **Class #1**: “The Foundations of Insulin Pump Therapy”: This three hour group class provides an overview of basal-bolus theory, carbohydrate counting, insulin: carbohydrate ratios, correction doses and insulin sensitivity factors, blood glucose testing, record keeping, ketone testing (using a Freestyle Precision Neo blood ketone meter), DKA prevention, school care planning, exercise guidelines, removing the pump temporarily, pattern management and making insulin adjustments, options for pumps and choosing infusion sets.
  - **Class #2**: “Buttonology”: One month after Class #1, smaller groups are formed based on the families’ pump choice. This is a hands-on class to teach all aspects of programming the insulin pump and inserting infusion sets. A saline trial is initiated at the end of the class, and the youth wears the pump home with saline instead of insulin.
  - **Pump Start**: One week after the completion of Class #2, families return for an individual appointment to program and start the pump with insulin. After pump initiation, daily contact with an educator (either by email or telephone) is arranged to review blood glucose records and to adjust basal/bolus doses.

- The education classes have been run from September to June annually, with a hiatus over the summer months. This allows for re-evaluation of the program and to ensure that adequate staffing is available to support the educational needs of patients, as well safe dose adjustment.
- During the summer of 2015, upon re-evaluation of the assessment process a formal psychosocial assessment was added to the program, which precedes the clinical assessment and insulin pump classes.
- As a result, patients who express interest in initiating insulin pump therapy are seen individually by one of our Pediatric Clinical Psychologists prior to the clinical assessment.
- The purpose of the psychosocial assessment is to screen for common concerns the youth or family may have (including those related to their diabetes care, family conflict and support, and mood, behavioral or other difficulties) and to assess their readiness for the pump from a psychosocial perspective, as well as to determine whether additional support or resources may be helpful for the family to successfully manage diabetes using insulin pump therapy.
- Between November 28, 2012 and December 31, 2014, 85 youth initiated insulin pump therapy under the MPIP program. There were an additional 19 pump initiations between January 1, 2015 and December 31, 2015, some of whom were seen by a clinical psychologist as part of their education.
Objective:

- This report provides a quality assurance update of the MPIP program.
- This report examines changes in blood glucose control in a cohort of youth with T1D initiating insulin pump therapy from January 1, 2015 to December 31, 2015.
- It will also indicate the incidence of acute complications, the rates and reasons youth discontinued pump therapy during that time, as well as the number of youth transitioning to adult care using insulin pumps.

Methods:

1. Glycemic Control - glycemic control was measured as A1C at pump initiation, 6 months after pump start and then annually.
2. Data Base Review - the MPIP database was reviewed during the time frame of January 1, 2015 and December 31, 2015.

Results

Assessment:

- Between January 1, 2015 and December 31, 2015 there were 24 youth who had expressed interest in insulin pump therapy.
- 15 youth had been assessed and started insulin pump therapy in 2015 prior to the implementation of the new psychosocial assessment.
- Two youth voluntarily withdrew from the program prior to the commencement of any assessment process.
- 1 patient failed to follow thru with the clinical assessment process.
- 14 youth underwent the new psychosocial assessment prior to proceeding to the clinical assessment and insulin pump classes.
  - Of these, 4 youth were started on insulin pumps in 2015.
  - The remaining 10 patients started insulin pump therapy in 2016.

Insulin Pump Initiation:

- As of January 1, 2015, a total of 85 youth had been started on insulin pump therapy under the MPIP program and 15 had been transitioned to adult care. Therefore, 70 of these youth were still being followed by DER-CA as of January 1, 2015.

- Between January 1, 2015 and December 31, 2015 there were 19 additional insulin pump starts.
  - There were 13 males and 6 females.
  - The mean age was 13.7 years old.
  - The mean pre-pump A1C was 7.6%.

Glycemic Control:

- A1C data (pre and post-pump start) for the 19 patients initiating insulin pump therapy in 2015 are reported by gender and by all youth shown in the table below.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean A1C Pre-Pump</th>
<th>Mean A1C 6 Months Post Pump</th>
<th>Mean A1C 12 Months Post Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males (n=)</td>
<td>N=13 7.8%</td>
<td>N=10 7.9%</td>
<td>N=6 8.3%</td>
</tr>
</tbody>
</table>
An A1c target of <7.5% for children with type 1 diabetes is recommended by the IDF/ISPAD 2011 Global Guidelines for Diabetes in Childhood and Adolescence.

Prior to starting insulin pump therapy, 47% (9/19) of all youth who started were meeting the A1c target of <7.5%. When examined separately 38% (5/13) of males were meeting the target, while 67% (4/6) of females had an A1c <7.5%.

At 6 months 30% (3/10) of males were at A1C target and 50% (3/6) females had an A1c of <7.5%.

At 1 year, 33% (2/6) of males and 50% (2/4) of females were meeting the A1c target.

### Mean A1C – All MPIP patients

<table>
<thead>
<tr>
<th></th>
<th>Mean A1C Pre-Pump</th>
<th>Mean A1C 6 Months Post Pump</th>
<th>Mean A1C 12 Months Post Pump</th>
<th>Mean A1C 24 Months Post Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Youth</td>
<td>N=121 7.7</td>
<td>N=95 7.7</td>
<td>N=76 7.8</td>
<td>N=27 7.8</td>
</tr>
</tbody>
</table>

Mean A1C has remained consistent over 3 years in all patients initiating insulin pump therapy in the MPIP program. While there has not been a decrease in mean A1C, as importantly there has not been deterioration in glycemic control.

**Transition:**
- Between January 1, 2015 and December 31, 2015 a total of 77 youth were transitioned to adult care from the DER-CA. Of these, 14 youth were using insulin pumps.
- The average months of pump use prior to transition was 15.5 months.
- Therefore, by December 31, 2015 there were a total of 75 patients being followed that had started insulin pump therapy under the MPIP program.

**Discontinuation of pump:**
- Two patients that had started under the MPIP program discontinued using the pump in 2015. The reasons for discontinuing the pump were:
  - 17 year old female - did not like wearing the pump.
  - 13 year old male - parents felt the youth was not being responsible with using the pump to manage his diabetes.
- They had 4 months and 15 months of pump use respectively.

**Acute complications:**
- Diabetic ketoacidosis (DKA): There were 2 episodes of DKA in 2015 (2.6 per 100 patients years). One of these patients had been started on the insulin pump in 2013 and the other in 2014.
- Severe Hypoglycemia: There was 1 youth who suffered a severe low in 2015 (1.3 per 100 patient years). This patient had started on the pump in 2013.
Insulin Pump Renewals:

- In an effort to maintain and optimize glycemic control, Insulin Pump Renewal Classes were added to the insulin pump curriculum. These classes were for existing pump users who required new insulin pumps and qualified for funding under the MPIP program. In this class basic pump theory, as well as rate adjustment and pump options are reviewed. In November 2015 the first renewal class was held and attended by 3 patients.

**Conclusion:** The MPIP program provides patients with a standardized approach to assessment, education, initiation and follow up of insulin pump therapy. Interest in insulin pump use continues to be consistent at the DER-CA with relatively few patients reverting back to insulin injection via syringe or pen.

The overall mean A1C at pump start is lower for those entering the MPIP program compared to the mean A1C of DER-CA patients (7.6% vs. 8.7% respectively). Although most of the youth in this cohort are not meeting the target of <7.5%, the majority are still below the overall mean A1C at the DER-CA even at 6 months and 1 year. However, the 2015 cohort appears to have a slightly increased A1C at 6 months and 1 year as compared to the overall A1C results of MPIP patients. Close attention to this trend will need to be observed. As reported by others (1,2), insulin pump therapy does not necessarily result in long term improvement in glycemic control but similarly does not lead to significant deterioration in glycemic control. Patients and families often have other reasons to pursue insulin pump therapy.

The relatively low incidence of DKA is reassuring but demonstrates that while we make efforts to educate families in prevention, it still remains a risk. The same can also be said in regards to severe lows. A main effort of the MPIP process continues to try to ensure safety.

Constant efforts continue to re-evaluate and improve the MPIP program. This includes re-assessment of educational resources, assessment procedures and staff training and certification related to insulin pumps, as well as continuous glucose monitors. The introduction of a standard psychosocial assessment, a major initiative in 2015, also provides an opportunity to identify and overcome potential barriers to success with insulin pump therapy. We believe this is a vital addition to the program. It will be of interest if this new step in the process changes patient outcomes.

**References:**


T. Hoilett
AUDIT OF SCREENING FOR DIABETIC NEPHROPATHY

Background: The DER-CA screening protocol for diabetic nephropathy recommends annual screening for early diabetic nephropathy beginning at age 12 years in all youth with Type 1 Diabetes using a random albumin/creatinine ratio (ACR). Prepubertal children and those diagnosed within 5 years are at very low risk of microalbuminuria. The likelihood of intermittent orthostatic microalbuminuria is higher during the early peripubertal years. The DER-CA protocol is consistent with the 2013 Canadian Diabetes Association Clinical Practice Guidelines (Ref). Youth with abnormal results, defined as an ACR ≥2.5 mg/mmol, have a random sample repeated. If 2/3 samples are elevated then a first morning sample is requested. A first morning urine ACR has high sensitivity and specificity for the detection of non-orthostatic microalbuminuria but a random ACR is associated with greater compliance (CDA, 2013).

Standard: Each youth with Type 1 Diabetes age ≥ 12 years has an ACR measured annually.

Goal: 95% compliance with the standard as an arbitrary benchmark.

Method: DER-CA database review. Youth with Type 1 Diabetes ≥ 12 years on January 1, 2015 and <18 years of age as of March 31, 2016 who attended a DER-CA clinic appointment in 2015 were included in the analysis. End date of March, 2016 was chosen as sample collection time frame is ±3 mos from 12th birthday, coordinating with a clinic visit. For the youth that turned 18 during the 2015 calendar year, screening was considered successful if an ACR was measured within the 12 month period prior to transfer of the youth to an adult clinic. The review included youth who did NOT have an ACR measured in the previous year. In addition, the paper chart and e-chart were reviewed.

Results:
- The total number of youth within the target age range 13-18 years was 302 (57% male; 43% female).
- 258 of 302 youth (85%) had ACR screening performed.
- Of the 44 youth who met the inclusion criteria but did NOT have an ACR in the year.
- 21 (48%) female and 23 (52%) male, no screening
- Of the 44 youth that did not have an ACR collected in 2015, a chart review was performed with the following results:
  - 11 (25%) youth were frequent no shows or <1-2 appointments in 2015
  - 1 (2%) youth was developmentally delayed
  - 1 (2%) youth transferred to Adult Care without sample being collected
  - 1 (2%) youth was given a sample bottle & requisitions at clinic appointments, to collect once menstrual period was completed, not submitted
  - 14 (32%) turned 12 years by end of March 2016
  - 2 (5%) youth had note to collect at next appointment
  - 1 (2%) youth had a urinalysis only, no ACR
  - 2 (5%) youth had an ACR submitted at another clinic
  - 2 (5%) youth had submitted sample, result not in database, found in e-Chart
  - 7 (16%) youth did not submit sample, unclear from chart review why not.
  - 2 (5%) youth had sample submitted post time period

Discussion: Potential reasons that affected the number of tests performed:
- 25 of 44 patients (56%) tests NOT performed were accounted for by 1.) frequent no shows to clinic and 2.) had had 12th birthday within the outlined time frame.
- Menses-samples not collected during menses
- Knowledge deficit-patients not knowing what test is for & frequency, why it is important to screen for diabetic nephropathy, who to give the sample to once collected? How to collect? “hats” available in washroom for females?
- Missed or cancelled appointments-may miss out on screening period for their anniversary date
- Embarrassment-may contribute to not submitting sample, clear bag given to patients
- Electronic charting implementation in Dec 2015, appointments were changed to accommodate smaller clinic sizes during transition period.
- Tracking of urine collections-how is this being done in electronic chart?

**Plan:**
- Prior to clinic, the Nursing Assistant makes a note if patient is due for annual ACR and prepares requisition, bottle and label. At time of clinic, the Nursing Assistant informs patient of need for urine sample. If this is the 1st urine collection that patient has done, NA will note that is “to check your kidneys”, and will let the educator who meets with patient know that this is the 1st time patient is collecting a urine sample and teaching can be done by the educator about Diabetic Nephropathy. As part of the transition process, complications are discussed as part of the education completed before transferred to Adult Care.
- If patient has history of no shows, have urine done with every appointment they do attend.
- When submitting a sample, ensure patient knows how to collect and for females, offer use of “hat”; ensure patient knows who and where to take the sample once collected.
- Upon request, provide brown paper bag to put the clear plastic bag with requisition/sample into; brown bags are in top cupboard of lab area.
- Tracking in electronic ACCURO system as part of Patient Management band for when urine is due for patients>12 years of age.
- DER-CA secretary notified of patients’ for whom results need to be added to database.


R. Thorarinson
# CELIAC DISEASE IN CHILDREN WITH TYPE 1 DIABETES

**Background:**
- Routine versus selective screening for celiac disease (CD) in children with type 1 diabetes (T1DM) continues to be controversial. The expert committees of the Canadian Diabetes Association and the National Institutes of Health (NIH) recommend selective screening for CD based on insufficient evidence for long term benefit of treatment in asymptomatic CD (1,2).
- The DER-CA has been performing selective screening for CD in children with T1DM since 2000.

**Objectives:**
- To update the prevalence of CD in children with T1DM seen at the DER-CA in 2015.
- To highlight the clinical indices of children with T1DM and CD followed at the DER-CA in 2015.

**Methods:**
- Children with T1DM were screened for CD based on classical and non-classical clinical symptoms of CD or if they had a first degree relative with CD.
- Clinical surveillance using biochemical markers collected annually at DER-CA clinic appointments.
- Those children with positive serum transglutaminase (tTG) levels are referred to pediatric gastroenterology for consultation and a confirmatory biopsy.

**Results:**
- In 2015, 21 children (7 male, 14 female) with CD and T1DM were followed at the DER-CA (prevalence 21/485 = 4.3%).

## MEAN CLINICAL FOLLOW-UP INDICES FOR 2015

<table>
<thead>
<tr>
<th>Indices</th>
<th>Mean Result</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMI Z score</strong></td>
<td>0.4</td>
<td>(n=19) -0.7-1.9</td>
</tr>
<tr>
<td><strong>A1C (%)</strong></td>
<td>9.2%</td>
<td>(n=19) 7.5-14</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>12.9</td>
<td>(n=19) 5-17</td>
</tr>
<tr>
<td>(Years as of Dec. 31, 2015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AST (U/L)</strong></td>
<td>19.9</td>
<td>(n=19) 8-43</td>
</tr>
<tr>
<td><strong>ALT (U/L)</strong></td>
<td>16.7</td>
<td>(n=17) 8-43</td>
</tr>
<tr>
<td><strong>GGT</strong></td>
<td>13.8</td>
<td>(n=16) 8-32</td>
</tr>
<tr>
<td><strong>Hemoglobin (g/L)</strong></td>
<td>140</td>
<td>(n=15) 124-173</td>
</tr>
<tr>
<td><strong>Ferritin (ug/L)</strong></td>
<td>52.6</td>
<td>(n=14) 17-129</td>
</tr>
<tr>
<td><strong>Iron (umol/L)</strong></td>
<td>15.9</td>
<td>(n=13) 12.7-21</td>
</tr>
<tr>
<td><strong>FT4 (pmol/L)</strong></td>
<td>16.4</td>
<td>(n=11) 13.3-23</td>
</tr>
<tr>
<td><strong>TSH (mU/L)</strong></td>
<td>3.0</td>
<td>(n=17) 0.85-9.57</td>
</tr>
<tr>
<td><strong>Vitamin D (nmol/L)</strong></td>
<td>68.5</td>
<td>(n=15) 48-112</td>
</tr>
<tr>
<td><strong>Vitamin B12 (pmol/L)</strong></td>
<td>543.1</td>
<td>(n=14) 270-1088</td>
</tr>
<tr>
<td><strong>Folate (mmol/L)</strong></td>
<td>2203.1</td>
<td>(n=14) 1423-3000</td>
</tr>
<tr>
<td><strong># of Clinic DER-CA visits/year</strong></td>
<td>2.4</td>
<td>(n=20) 0-4</td>
</tr>
<tr>
<td><strong>tTG Titre EU/L &lt; 20</strong></td>
<td>7.6</td>
<td>(n=7) 0.5-20</td>
</tr>
<tr>
<td><strong>tTG Titre EU/L &gt; 20</strong></td>
<td>63.8</td>
<td>(n=10) 22-250</td>
</tr>
</tbody>
</table>

(means exposure to gluten ie: non-adherent to gluten-free (GF) diet)
SELECTIVE SCREENING

<table>
<thead>
<tr>
<th>Reason for Screening</th>
<th># of screens = 31</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(6.4% of type 1 population seen at the DER-CA in 2015)</td>
</tr>
<tr>
<td>Positive transglutaminase</td>
<td>1 (3.2%)</td>
</tr>
<tr>
<td>Referral to gastroenterology</td>
<td>1 (3.2%)</td>
</tr>
<tr>
<td>Positive biopsy</td>
<td>1 (3.2%)</td>
</tr>
<tr>
<td>Poor growth</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>Gastrointestinal complaints</td>
<td>19 (61%)</td>
</tr>
<tr>
<td>Unexplained hypoglycemia</td>
<td>2 (6.5%)</td>
</tr>
<tr>
<td>1st degree relative with celiac disease</td>
<td>2 (6.5%)</td>
</tr>
<tr>
<td>Unexplained weight loss</td>
<td>5 (16%)</td>
</tr>
<tr>
<td>Food cravings (salty foods)</td>
<td>1 (3.2%)</td>
</tr>
<tr>
<td>Parent or Primary MD requested</td>
<td>1 (3.2%)</td>
</tr>
</tbody>
</table>

- Patients screened had no previous history of celiac disease.
- Some patients reported more than one reason for screening (ie: GI complaints + weight loss).
- One patient had a positive TTG several years ago and agreed to be screened yearly (but has declined any GI follow up and refuses a GF diet).

Children Diagnosed with Celiac Disease by Selective Screening and Biopsy Confirmation by Year

Observations:
- Three patients were transitioned to adult care in 2015.
- There was one new diagnosis of celiac disease in 2015.
- One patient moved to another country in 2015.
- On average, children with T1DM and celiac disease had vitamin D levels that were insufficient (i.e. less than 75 nmol/L).
- On average, 90% of children with T1DM and CD had suboptimal glycemic control in 2015.
- By presence of positive transglutaminase antibodies, 59% of children with CD and a completed tTG (n=17) were not adhering to a strict GF diet.
- 62% (n=13) of those with T1DM and celiac disease followed at the DER-CA received 100% of their clinical indices in 2015. Two patients did not have any blood work completed in 2015 due to transitioning and moving out of the country.
- Poor linear growth, gastrointestinal complaints and unexplained weight loss make up the majority (~93%) of CD screening referrals at the DER-CA.
Conclusions:

- The DER-CA will continue to screen selectively for CD in the population of T1DM based on classical or non-classical clinical symptoms or signs of CD and those with first-degree relatives diagnosed with CD.
- To ensure that all diabetes team members are aware of the clinical symptoms (classical and non-classical) of CD, we will meet with the pediatric gastroenterology team annually.
- To ensure all patients with T1DM and CD receive all annual clinical surveillance indices, an updated patient list with lab indices (discussed with current Pediatric gastroenterologists) was given to DER-CA unit assistants. All charts for patients with CD were reviewed to ensure they are coded appropriately and a reminder note has been placed in each chart to complete celiac blood work annually. In addition, the ACCURO charting/database system will be reviewed and updated to ensure a “pop up reminder” appears to complete annual celiac blood work for active children with CD and T1DM followed at the DER-CA.
- A thorough review of diet history as well as education on the GF diet will be carried out by a Registered Dietitian (RD) at the DER-CA annually to encourage maintenance of the GF diet. Through the diet history, the RD can approximate vitamin D intake. If vitamin D intake is low – supplementation may be recommended.
- Celiac blood work collected annually by the DER-CA will be forwarded to pediatric gastroenterology in order to reduce repetition of blood work at clinic appointments.
- To increase the patient’s awareness of the association between CD and T1DM, an article on CD and T1DM will continue to be placed annually in the DER-CA newsletter that is distributed quarterly to all families living with T1DM followed at the DER-CA.
- The DER-CA will continue to provide medical surveillance of the children with T1DM and CD and report a quality audit in the annual report.

References:


C. Unruh
AUTOIMMUNE THYROID DISEASE SCREENING

Background: Children with type 1 diabetes have an increased risk for developing autoimmune thyroid disease. In accordance with the current CDA Clinical Practice Guidelines (2013) all children with type 1 diabetes should be screened at diagnosis and subsequently every 2 years for autoimmune thyroiditis. Early detection and treatment will not only prevent growth failure, but will also alleviate other symptoms related to hypothyroidism. As of December 31, 2015, 19/575 patients or 3.3 % of the youth with type 1 diabetes seen in DER-CA had been diagnosed with hypothyroidism. There were 7/575 youth (1.2%) with Grave’s Disease, or hyperthyroidism. In 2015, 2 youth with hypothyroidism graduated from the program, as did 2 with Grave’s Disease. Once the diagnosis of autoimmune hypothyroidism or Grave’s Disease has been made thyroid function tests are measured routinely at clinic visits in order to evaluate the effectiveness of therapy.

Purpose: The DER-CA has instituted a screening protocol for the presence of autoimmune thyroiditis, which includes having a serum thyroid stimulating hormone (TSH) level drawn annually. A quality assurance audit was performed to assess the effectiveness of this protocol.

Goal: A 95% compliance rate with the standard of annual screening.

Method: A review of the DER-CA database, e-chart and ACCURO was conducted. Included in the review were children with type 1 diabetes that were followed between January 1, 2015 to December 31, 2015. However, the 19 children that were diagnosed with hypothyroidism were excluded from the review, as were the 7 children diagnosed with Grave’s Disease. Also excluded from the audit were the 72 children who were newly diagnosed with type 1 diabetes within the 2015 year.

Results: There were 477 youth that met the inclusion criteria. Review of all thyroid function tests conducted by the DERCA indicate that 405/477 (85%) had a least one TSH level measured in 2015. Therefore, 72/477 (15%) had not had an annual TSH drawn in 2015. Unfortunately the goal of a 95% compliance rate had been not achieved. Of these 72 patients, further analysis was required to determine why an annual TSH level had not been drawn.

Discussion: Of the 72 youth, the reasons they did not have a serum TSH drawn at least once in 2015 were as follows:

- In 2015, 77 youth graduated from the program and were transitioned to adult care. Of those 77 youth, 22 (30%) had not had a serum TSH drawn in 2015, as they graduated prior to their annual TSH due date.
- Missed clinic appointments accounted for 20 youth (28%)
- 10 (14%) of these children had their TSH drawn within 1 clinic visit of their due date
- In 20 (28%) of these children, no reason could be identified

Possible contributing factors include the turnover of administrative staff, the transition to EMR and the need to see patients every 4 months as opposed to every 3 months with decrease in physician staff.

The Canadian Clinical Practice Guideline recommends that a TSH level be measured at diagnosis and then biannually in children with type 1 diabetes. Of the 477 youth included in the audit, only 1 child did not meet the clinical practice guideline (.2%) Therefore, overall the current screening practice has been 99.8% effective in maintaining the Canadian Clinical Practice Guideline for screening of hypothyroidism in youth with type 1 diabetes.

Future Considerations:

- Efforts to ensure that each child is screened annually will continue.
- To avoid missed screening opportunities, children with infrequent visits should be each clinic appointment.
- Youth that will be transitioned may need to have a TSH level drawn prior to transition, as follow up with an adult endocrinologist may not be timely.
- For missed appointments, if the next visit lies outside of the screening timeframe, laboratory requisitions can be mailed to parents to have a TSH level measured prior to the next visit.
- The date of annual TSH screen has been added to the patient information band in the EMR record.
- Efforts to train new and temporary administrative staff regarding need for annual TSH screen continue.

Reference:


T. Hoilett
PATIENT REPORTED SATISFACTION OF OUR CLINICAL MODEL
FOR YOUTH WITH TYPE 2 DIABETES

Objective: To describe patient reported satisfaction of our current clinical care model for youth with type 2 diabetes (T2D).

Methods: Within our current clinical care model, youth with T2D are scheduled to be seen 3 to 4 times per year, while individuals with impaired fasting glucose or impaired glucose tolerance are scheduled to be seen 2-4 times per year. Clinics can offer appointments to as many as 18 individuals, and may include up to two new patients as well as two telehealth appointments. Each patient, along with their family is seen by a physician, and in addition is seen either individually by a diabetes educator or in a group education class facilitated by diabetes educators. Group education was chosen to foster learning in a supportive, peer-based environment with a variety of pertinent topics. Point of care HbA1C testing is available at each clinic visit and blood work is drawn in our clinic setting, with a light and healthy breakfast provided in case patients have been fasting. Partners in our clinical program include students of the School of Dental Hygiene and our Maestro Transition Coordinator. Research assistants are often available if research participation is offered and accepted by an individual and their family.

When patients and families were agreeable, this survey was administered during a clinic visit by a member of our team who was not providing clinical care to the patient on that day; all surveys in this study period were administered by one of two team members. The study period included clinics held during the months of January 2014 to June 2014. Criteria for survey inclusion simply included being followed at the DER-CA, being seen in-person during a clinic time (versus via Telehealth) and consenting to participate in the verbally administered survey. We attempted to assess patient satisfaction utilizing a non-validated survey tool, which included open-ended questions and Likert scales. The survey was administered by 2 team members to enhance consistency in both application and interpretation of questions, as well as enhancing survey completion by participants. Topics of questions in this survey included: clinic visit, group education, inclusion of dental care in clinic, inclusion of research opportunities in clinic, transportation, as well as a discussion of topics that families may wish to have included in our educational offerings (see Appendix V).

Results: 36 individuals and their families agreed to participate while 2 families that were approached declined participation (95% participation). The age of participants ranged from 10 – 17 years. 83% of those surveyed agreed that they are getting what they need from their diabetes team, while 78% agreed that the time they spent in clinic was worth it, even if it was all morning. Of those who had attended group education classes (n=30), 86% reported feeling safe and welcome in that group, and 64% agreed that they always learn something in group. When families were asked which clinic model of education they would prefer if given a choice, 28% chose group education, 28% chose an individual appointment with an educator, 33% chose both group and an individual appointment, while the remaining 11% did not state a preference. Families receiving some of their care on outreach encompassed only 25% of those surveyed (n=9); of that 25%, 44% stated they would prefer to be seen in Winnipeg and the other 54% provided no answer. Only 22% of families surveyed had received care from a dental hygiene student, though the majority thought they would like to see them again but not necessarily every visit. 25% of families had been offered the opportunity to participate in research, and all agreed that they liked hearing about those opportunities. When asked if transport to clinic appointments was difficult to arrange, 75% stated it was not difficult and some stated they disliked arriving so early to clinic. The most commonly requested group education topics were healthy eating, diabetes complications and exercise; additional requests for education included smoking, mind and body well-being, traditional foods and teen pregnancy. Suggestions to improve our diabetes team included: family want to be notified of what to expect next within the clinic visit, “have movies in the waiting room”, “shorten the time we have to stay here”, “keep serving breakfast”, and “keep up the good work”.

Discussion: Family satisfaction with this current clinical model, which includes an interactive educational component, is high. Family preference for group education versus individual education was certainly varied, and encourages our team to vary the mode of education throughout the year, as well as allowing patients to state their preference. The addition of a team member acting within a coordinator role has since been implemented in clinic to positively impact both patient flow and communication. The number of patients in this survey who are also seen on outreach trips was low, making it difficult to assess patient satisfaction with our outreach program.

Of those who stated they would prefer to be seen in Winnipeg instead of on outreach, some of their reasons included that they wanted a trip to Winnipeg to shop, and that outreach clinics “feel less professional than Winnipeg” and “feel too rushed”. The type 2 diabetes clinic model at the DER-CA has been successful in delivering a unique model of care to this population.

Action Items: Further efforts to evaluate our outreach program from both a program and patient perspective will be considered, and should be done within the outreach setting. Dental hygiene and research assistants will continue to be part of the clinic program. Educators will examine the list of topics as suggested by families when designing new type 2 group class curriculum. Ongoing efforts to include the patient voice within evaluations of our clinical program should continue.

J. Halipchuk
**TOLL-FREE TELEPHONE SERVICE**

**Objective:** To determine the value of the toll-free telephone number to families outside of Winnipeg to encourage daytime telephone counseling and education.

**Method:** The toll-free telephone number is provided to all patients/families during initial diabetes education and is printed on DER-CA business cards and advertised in the DER-CA newsletters.

**Results:** In 2015, there was an average of 45 calls/month. Most of these calls were from rural Manitoba, the rest of Canada and from the United States. The average cost per month was $1.90. There was an average of approximately 3.4 calls/month from within the City of Winnipeg.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># local calls</td>
<td>22</td>
<td>14</td>
<td>14</td>
<td>29</td>
<td>23</td>
<td>25</td>
<td>34</td>
<td>17</td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td># Manitoba calls</td>
<td>1162</td>
<td>997</td>
<td>925</td>
<td>966</td>
<td>909</td>
<td>779</td>
<td>736</td>
<td>450</td>
<td>428</td>
<td>288</td>
</tr>
<tr>
<td># Canada calls</td>
<td>365</td>
<td>401</td>
<td>479</td>
<td>367</td>
<td>233</td>
<td>186</td>
<td>148</td>
<td>169</td>
<td>127</td>
<td>101</td>
</tr>
<tr>
<td># USA calls</td>
<td>3</td>
<td>7</td>
<td>21</td>
<td>9</td>
<td>20</td>
<td>18</td>
<td>8</td>
<td>91</td>
<td>379</td>
<td>108</td>
</tr>
<tr>
<td>Total # calls</td>
<td>1552</td>
<td>1419</td>
<td>1439</td>
<td>1371</td>
<td>1185</td>
<td>1008</td>
<td>926</td>
<td>727</td>
<td>978</td>
<td>538</td>
</tr>
<tr>
<td>Total # minutes</td>
<td>2784</td>
<td>3006</td>
<td>2395</td>
<td>2659</td>
<td>1996</td>
<td>1838</td>
<td>1860</td>
<td>1983</td>
<td>2691</td>
<td>1432</td>
</tr>
<tr>
<td>Total Cost (including GST)</td>
<td>$115.67</td>
<td>$116.62</td>
<td>$36.36</td>
<td>$37.54</td>
<td>$29.03</td>
<td>$26.22</td>
<td>$26.30</td>
<td>$23.42</td>
<td>$40.26</td>
<td>$22.83</td>
</tr>
<tr>
<td>Average Cost (monthly)</td>
<td>$10.52</td>
<td>$9.72</td>
<td>$3.03</td>
<td>$3.13</td>
<td>$2.42</td>
<td>$2.19</td>
<td>$2.19</td>
<td>$1.95</td>
<td>$3.36</td>
<td>$1.90</td>
</tr>
</tbody>
</table>

*data was unavailable for the month of June 2006

**Conclusion:** The toll-free telephone number is a cost-effective way for families outside of Winnipeg to contact the DER-CA educators during regular office hours. The families can also access the hospital operator to contact the doctor-on-call for urgent matters by pressing #9 at the toll-free telephone number voice prompt.

**Future Plans:** Continue this toll-free service indefinitely.
FINANCIAL REPORT

OPERATING:

January 1, 2015 – December 31, 2015

Expenditures:  Salaries & Benefits $ 796,487.93
                Operating $ 86,090.06
                Total $ 882,577.99

TRUST ACCOUNTS

The DER-CA trust account is divided into:

1. DER-CA Family Centered Care Trust: patient resources (newsletter, teaching materials, newly diagnosed binders, coffee, treatment for hypoglycemia, food for type 2 clinic breakfast).

2. Diabetes Education Travel Fund: continuing education for educators.

We are indebted to the following companies and individuals for financial support. This money is deposited into our trust account and used for specific educational projects for families or caregivers on a cost-recovery basis with any excess used for travel for continuing staff education.

INCOME

DER-CA Family Centered Care Trust:

<table>
<thead>
<tr>
<th>Source</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario Ministry of Health ADP Reimbursement</td>
<td>500.00</td>
</tr>
<tr>
<td>Eli Lilly Canada Inc</td>
<td>30.00</td>
</tr>
<tr>
<td>Roche (Family Research Day 2014)</td>
<td>750.00</td>
</tr>
<tr>
<td>Sioux Lookout Meno Ya Win Health Ctr (Books)</td>
<td>80.00</td>
</tr>
<tr>
<td>Waywayseecappo First Nation Medical (Books)</td>
<td>80.00</td>
</tr>
<tr>
<td>Outreach Per Diem</td>
<td>400.00</td>
</tr>
</tbody>
</table>

Diabetes Education Travel Fund:

<table>
<thead>
<tr>
<th>Source</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equitus Consulting Inc. (Honorarium)</td>
<td>30.00</td>
</tr>
<tr>
<td>Outreach Per Diem</td>
<td>300.00</td>
</tr>
</tbody>
</table>

Total $ 2170.00
FUTURE DER-CA PROGRAM DEVELOPMENT GOALS

1. Advocate for improved clinical, research, and educational space to provide specialized care for children with diabetes and their caregivers in an interprofessional environment.

2. Advocate for system to ensure safe and comprehensive transition from pediatric to adult care for all adolescents with type 1 and type 2 diabetes. The challenges of these two populations are unique and carry a high burden of illness that is intensified during the period of transition.

3. With the implementation of the electronic medical record (EMR), Accuro, the DER-CA will work to develop effective charting methods, improved clinic flow, and systems for letter communication with care providers in the community. This will need to be in conjunction with ensuring accuracy of our current database.

4. Audit the presence of diabetes ketoacidosis (DKA) at diagnosis to assess the need for further intervention, such as a public awareness campaign, to decrease its prevalence.

5. Evaluate current clinic structure in regards to patient satisfaction, patient outcomes, and glycemic control in conjunction with the realities of staff resources, clinic space, and rising prevalence of both type 1 and 2 diabetes.

6. Continual audit of our clinical practice and outcomes in children with type 1 and type 2 diabetes including the consideration of implementing new formal audits (e.g. cystic fibrosis related diabetes, patient involvement with Child and Family Services (CFS), group classes in type 2 diabetes clinics, outreach, and telehealth).

S. Marks
### APPENDIX I:
PREVALENCE OF DIABETES IN CHILDREN BY REGIONAL HEALTH AUTHORITY (RHA) DEC. 31, 2015

The DER-CA decided to maintain the previous 11 RHAs to provide useful regional data for program planning.

<table>
<thead>
<tr>
<th>Regional Health Authority</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Other</th>
<th>At Risk</th>
<th>IFG/IGT</th>
<th>Monogenic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB - unknown</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Assiniboine</td>
<td>32</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>41</td>
</tr>
<tr>
<td>Brandon</td>
<td>22</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>Burntwood</td>
<td>5</td>
<td>34</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>Central</td>
<td>52</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>65</td>
</tr>
<tr>
<td>Interlake</td>
<td>33</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>47</td>
</tr>
<tr>
<td>ILTC</td>
<td>1</td>
<td>53</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>0</td>
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<tr>
<td>Norman</td>
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<td>37</td>
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<td>North Eastman</td>
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<td>0</td>
<td>2</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Parkland</td>
<td>22</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>South Eastman</td>
<td>33</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Winnipeg</td>
<td>238</td>
<td>52</td>
<td>4</td>
<td>0</td>
<td>12</td>
<td>2</td>
<td>308</td>
</tr>
<tr>
<td>Nunavut</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ontario</td>
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<td>49</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>68</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>503</td>
<td>267</td>
<td>10</td>
<td>0</td>
<td>32</td>
<td>5</td>
<td>817</td>
</tr>
</tbody>
</table>

*ILTC = (Island Lake Tribal Council: St. Theresa Point, Wasagamack, Red Sucker Lake, Garden Hill)
APPENDIX II:
CASE MANAGER SYSTEM AT MANITOBA DER-CA

The Manitoba DER-CA education program is based on a case manager system that has evolved over the past many years. A highly integrated and coordinated case management system has been shown to be the best model for optimum service delivery. At diagnosis, the educators share the newly diagnosed content usually divided by conventional professional roles using a checklist. During follow-up, the nurse educators and dietitians share many functions such as discussing glycemic goals, BGM records, hypoglycemia, insulin regimes, school issues, sick day management and carbohydrate counting. This integrated “cross-profession” role strengthens a consistent team approach.

Children are assigned a case manager at diagnosis or initial referral by a rotating roster schedule. All of the educators function as case managers. The social worker is assigned as case manager only to the children with serious and complex social problems living in dysfunctional environments. A list of children assigned to each case manager is generated biannually. Families are encouraged to direct their calls to their case manager. Realistically, telephone coaching calls for insulin adjustment and sick day management are handled by whoever is available (RN or RD) and communicated, if necessary, to the case manager. All telephone calls are documented and recorded in the patient's chart.

There is no assignment of patients to one specific doctor in our program. The children will see all of the doctors at the DER-CA depending on which day of the week they arrange follow-up visits.

In pediatric care, no case file is ever closed unless the family moves to another jurisdiction and transfer of care is arranged. The children are our patients and as such, they are dependents. Parents (or guardians) must provide for their safety and wellbeing as defined by law.

ROLE OF THE CASE MANAGER:
1. First line contact person for administrative staff.
2. Co-ordinate schedule of educator visits/ bloodwork for initial education during the first three days after diagnosis.
3. Communicate with regional diabetes education team for rural families.
4. Co-ordinate care with school and community agencies (eg. CFS) as required.
5. Arrange initial follow-up schedule for education and clinical review at 2, 6 and 12 weeks post diagnosis. (subsequent follow-up is co-ordinated by the unit clerk).
6. Initiate follow-up coaching telephone calls after diagnosis and as required.
7. Review case manger list biannually to ensure all children have been seen at least once at the DER-CA. Most children are seen at the DER-CA every four months. Contact the family if there are problems in follow-up. Identify children who have had repeated cancellations or no-shows at clinic and make a work plan to help the family. For cases involving child welfare agencies, the case manger role may be transferred to the social worker.
8. Share concerns at weekly team meeting if there are ongoing difficulties with any family.
9. Identify the need for a home visit for families in crisis.
10. Complete forms as requested by family (eg. pump insurance coverage, social assistance food allowance).

References:
APPENDIX III: GUIDELINES FOR INVESTIGATION AND TREATMENT OF DYSLIPIDEMIA IN CHILDREN AND YOUTH WITH TYPE 1 DIABETES MELLITUS (updated 2015)

Background: Cardiovascular disease is the primary cause of mortality in adults with type 1 diabetes (1). Age-adjusted, cause-specific mortality rates for coronary artery disease is 2-4 times higher in adult diabetic versus non-diabetic populations (1). It has recently been shown that the presence and clustering of cardiovascular risk factors including increases in LDL-c is associated with increased arterial stiffness over a five year period in adolescents with type 1 diabetes (SEARCH CVD). However, it is not yet known if improvements in the lipid profile will improve arterial stiffness and/or decrease CVD in type 1 diabetes. In the absence of this evidence, a standardized approach to the diagnosis and treatment of dyslipidemia in youth with type 1 diabetes will identify high-risk patients with hypercholesterolemia and direct treatment, based on the best available evidence.

1. Patients to be screened:
   - Children and youth with type 1 diabetes mellitus at age 12 and 17 years of age*
   - Children and youth with type 1 diabetes <12 years of age if:
     a) BMI > 95thile for age and gender or
     b) Family history of dyslipidemia or premature cardiovascular disease event (1st or 2nd degree male relative < 55 yrs, female < 65 years)
     c) Other high risk factor e.g. hypertension, other medical condition deemed high risk
   *Diagnosis of diabetes made according to CDA Clinical Practice Guidelines (2), clinical characteristics plus or minus positivity of the diabetes associated autoantibodies used to assign type of diabetes (2).

Screening:
- Random lipid profile (Total cholesterol, triglycerides, HDL-c, LDL-c)
- If triglycerides or LDL-c elevated must be repeated in fasting state (>8 hours)
- Delay screening at diagnosis of diabetes until metabolic control stabilized – first screen 1 year post diagnosis

2. Persistent dyslipidemia (see table 1):
   - Persistent dyslipidemia is defined as a high value on one or more components of the lipid profile on 2 measurements over a 1-3 month period
   - “High” results for total cholesterol, LDL-c and triglycerides defined by the 95thile (borderline by 75thile)
   - Low HDL-c defined by the 10thile
   - See table 1 for targeted lipid levels

Table 1: Targeted Lipid Levels*

<table>
<thead>
<tr>
<th></th>
<th>Acceptable</th>
<th>Borderline</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>&lt;4.4</td>
<td>4.4 – 5.16</td>
<td>≥5.18</td>
</tr>
<tr>
<td>LDL-c</td>
<td>&lt;2.85</td>
<td>2.85-3.34</td>
<td>≥3.35</td>
</tr>
<tr>
<td>TG</td>
<td>&lt;1.02</td>
<td>1.02-1.46</td>
<td>≥1.47</td>
</tr>
<tr>
<td>HDL-c</td>
<td>&gt;1.17</td>
<td>1.03-1.17</td>
<td>≤1.03</td>
</tr>
</tbody>
</table>

* (ref number XX)

3. Treatment standards to be implemented:
   A. Efforts aimed at improving glycemic control.
   B. Dietary counseling for lipid-reduced diet will be initiated when the diagnosis of dyslipidemia is made.
   C. Counseling aimed to increase physical activity (frequency and duration) and decreased sedentary activity.
   D. Pharmacologic intervention
     - Statin therapy is indicated in patients over 10 years old, with persistent LDL-c ≥ 4.1 mmol/L despite a trial of A & B & C (typically 3-6 month trial)
- In cases where statin therapy is initiated, therapy will continue unless the clinical risk profile changes.
- However, initiation of pharmacologic intervention will be individualized and reviewed on case by case basis.

4. Specific treatment algorithms for elevated LDL-c and triglycerides:
- See Figures 1 and 2

5. Monitoring for those on pharmacologic therapy (See Figure 1):
- Lipid profile checked every 3 months (at each clinic visit)
- Dietary assessment at each clinic visit
- Patients treated with statin medication should have CK, AST, ALT checked after one month of therapy then every 3 months for the first year, then every 6 months thereafter.

6. Monitoring for those with abnormal (high) lipid profiles but not on pharmacologic therapy:
- Fasting lipid profile every 6 month

7. “Borderline” levels of any lipid parameter:
   A. Efforts aimed at improving glycemic control
   B. Review for secondary causes.
   C. Dietary counseling for lipid-reduced diet will be initiated
   D. Counseling aimed to increase physical activity (frequency and duration) and decreased sedentary activity.
   E. Repeat fasting lipid profile annually

8. Statin use and pregnancy:
- Data supports that statins are not major human teratogens, however data limited
- It is currently recommended that statins be discontinued immediately upon recognition of pregnancy, or before conception ideally (4).
- Potential teratogenicity should be discussed with all females at time of initiation of therapy. Families should be provided with written information (appendix x. statin pamphlet).

Guideline re-evaluation: The following guidelines are based on the 2013 Canadian Diabetes Association Guidelines for the Prevention and Treatment of Diabetes and the Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents National Heart, Lung and Blood Institute (NIH). They are intended to standardize the approach to therapy, but reflect largely “best practice” recommendations. These guidelines are intended to be reviewed in 1-2 years or if new data on therapy becomes available.

References:
4. Pregnancy reference (Motherisk)
**Type 1 Diabetes LDL-C Treatment Algorithm**

**LDL ≥ 3.35 mmol/L**

- LDL-C > 3.35 mmol/L
  - Individual review for severe dyslipidemia

- Review for 2° causes
  - Evaluate other risk factors
  - Dietary Intervention X 3 - 6 months

- Repeat Fasting Lipid Profile

**LDL-C < 3.35**
- Continue dietary intervention
- Lipid profile annually

**LDL-C > 3.35 - < 4.14**
- No other risk factors
  - Dietary Intervention
  - Lipids q6 months

**LDL-C ≥ 4.14**
- CK, AST, ALT, Baseline and every 3 months for 1 year, then every 6 months
- Fasting lipid profile every 3 months x1 Year
- Then re-assess
Type 1 Diabetes – Triglycerides

Fasting Lipid Profile x 2
1 – 3 months apart

TG > 1.45 mmol/L

If LDL-c also increased follow LDL-C algorithm

TG > 5.64
Individual review for severe dyslipidemia

Dietary intervention and lifestyle modification and weight loss as needed x 6 months

Repeat Lipids

If TG > 1.45 mmol/L
Intensify dietary and lifestyle intervention

*glycemic control important
GUIDELINES FOR INVESTIGATION AND TREATMENT OF DYSLIPIDEMIA IN CHILDREN AND YOUTH WITH TYPE 2 DIABETES MELLITUS (updated 2015)

Background: The major cause of mortality in adults with type 2 diabetes is cardiovascular disease (1). 75% of deaths in the adult type 2 population are attributable to cardiovascular causes. Age-adjusted, cause-specific mortality rates for coronary artery disease is 2-4 times higher in diabetic versus non-diabetic populations (1). Early descriptions of the natural history of child onset type 2 diabetes suggest that atherosclerotic complications may occur early and aggressively. Until long term outcome data is well established in youth onset type 2 diabetes, it is reasonable to consider children and youth with type 2 diabetes to be at high-risk for cardiovascular disease (add dart et al 2013). In the presence of elevated triglycerides, LDL-c is typically smaller and denser and maybe more susceptible to oxidation. Chronic hyperglycemia promotes oxidation of LDL-c particles. Both oxidation and glycation increase the atherogenicity of LDL-c. A particularly atherogenic lipid profile has been identified in the youth followed at the DER-CA with elevated triglycerides and apoB in the presence of normal LDL-c levels (Sellers et al).

This guideline is an aid to help in a standardized approach to identify high-risk patients with hypercholesterolemia and direct appropriate treatment, based on the available evidence.

1. Patients to be screened:
   - Children and youth (all ages) with type 2 diabetes mellitus
   - Diagnosis of diabetes made according to CDA Clinical Practice Guidelines (4), clinical characteristics plus or minus negativity of the diabetes associated autoantibodies used to assign type of diabetes (4).

Screening:
   - Annual fasting lipid profile (including ApoB, ApoA1 and TG)
   - Screening is positive in patients with:
     - LDL >3.5 mmol/L OR
     - TG >1.5 mmol/L
     - HDL-c <
     - Apo B >0.9

If lipid abnormality identified, lipid profile should be repeated every 6 months
   - If LDL > 3.35 mmol/L: lipid profile should be repeated approximately every 3 months
   - If TG >1.5 mmol/L (confirm fasting): lipid profile should be repeated approximately every 3 months

2. Persistent dyslipidemia (see table 1):
   - Persistent dyslipidemia is defined as a high value on one or more components of the lipid profile on 2 measurements over a 1-3 month period.
   - “High” results for total cholesterol, LDL-c, triglycerides and apoB defined by approximately the 95th percentile (borderline by 75th percentile)
   - Low HDL-c defined by the 10th percentile
   - See table 1 for targeted lipid levels

Table 1: Targeted Lipid Levels*:

<table>
<thead>
<tr>
<th></th>
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</tr>
<tr>
<td>TG</td>
<td>&lt;1.02</td>
<td>1.02-1.46</td>
<td>≥1.47</td>
</tr>
<tr>
<td>ApoB**</td>
<td>&lt;0.9</td>
<td>1.09</td>
<td>≥1.1</td>
</tr>
<tr>
<td>HDL-c</td>
<td>&gt;1.17</td>
<td>1.03-1.17</td>
<td>≤1.03</td>
</tr>
</tbody>
</table>

* ref #6
** ref # 7
Persistent hypercholesterolemia is defined as LDL >3.5 mmol/L on 3 measurements over a 6-12 month period.

**Treatment standards to be implemented:**

E. Dietary counseling for lipid-reduced diet will be initiated when the diagnosis of hypercholesterolemia is made.
F. Counseling aimed to increase physical activity (frequency and duration)
G. Efforts aimed at improving glycemic control
H. Pharmacologic intervention – aimed specifically at persistent elevation in LDL-c and/or TG
   - Statin therapy will be considered in patients over 10 years old, with persistent LDL-c > 3.5 mmol/L despite a trial of A & B & C (typically 3-6 month trial)
   - In cases where statin therapy is initiated, therapy will continue unless the clinical risk profile changes

3. Persistent hypertriglyceridemia:
   I. Persistent hypertriglyceridemia is defined as TG >1.5 mmol/L on 3 measurements over a 6-12 months period
   J. Mild elevation >1.5 mmol/L; moderate >4.5 mmol/L; severe >9 mmol/L (at risk for acute pancreatitis).
   K. Treatment standards for isolated hypertriglyceridemia have yet to be formalized, and treatment will be determined on an individualized basis.
   L. If associated with significant hyperglycemia and individual not on insulin – consider insulin initiation.
   M. A & B & C for sure!

4. Monitoring of individuals on pharmacologic therapy (statin):
   - Lipid profile checked every 3 months (at each clinic visit)
   - Dietary assessment at each clinic visit
   - Patients treated with statin medication should have CK, AST, ALT checked after one month of therapy then every 3 months for the first year, then every 6 months thereafter.
   - Note: multiple drug interactions associated with statins, must not consume grapefruit

5. Statin use and pregnancy:
   - Data supports that statins are not major human teratogens, however data limited
   - It is currently recommended that statins be discontinued immediately upon recognition of pregnancy, or before conception ideally (5).
   - Potential teratogenicity should be discussed with all females at time of initiation of therapy.

**Guideline re-evaluation:** The following guidelines are intended to standardize the approach to therapy, but reflect largely “best practice” recommendations. These guidelines are intended to be reviewed in 1-2 years or if new data on therapy becomes available.

**References:**

2. Dart AB,
3. Sellers
5. Pregnancy reference (Motherrisk)
APPENDIX IV:
DER-CA SCREENING PROTOCOL FOR DIABETIC NEPHROPATHY
(UPDATED 2015)

Purpose: To screen children seen at the DER-CA for early nephropathy.

Policy:
- Youth with type 1 diabetes: screening will occur annually beginning at age 12 years.
- Youth with type 2 diabetes: screening will begin at diagnosis and continue annually.

Rationale: Diabetic nephropathy is the leading cause of end stage renal failure in adults. The first sign of diabetic nephropathy is microalbuminuria, which may progress to macroalbuminuria and ultimately end stage renal failure (ESRF) requiring renal replacement therapy. Albuminuria is also a marker of significant increased cardiovascular morbidity and mortality for individuals with diabetes. It is imperative to identify albuminuria early as progression can be prevented, with early interventions having the greatest impact. In adults, improved control of blood glucose and blood pressure slows the rate of progression to ESRF.

Screening for albuminuria will begin at age 12 years in children with type 1 diabetes. The Canadian Diabetes Association Clinical Practice Guidelines recommend screening in type 1 diabetes to start at age 12 and five years duration of diabetes. The DER-CA has chosen to screen at 12 years of age in all children with type 1 diabetes for practical, administrative reasons. No harm is anticipated with a more aggressive screening protocol. In children with type 2 diabetes, less is understood about the natural history of albuminuria. Thus, until better data is available, screening is recommended to start at diagnosis.

Screening Test: A random urine albumin/creatinine ratio (ACR) is used to screen for diabetic nephropathy. The specificity of a random ACR is compromised in adolescents because of an increased frequency of postural proteinuria and exercise-induced proteinuria in this population. However, a random ACR is associated with greater compliance than with a first morning ACR. For this reason, the initial screening test will be a random ACR. If elevated, confirmation with a first morning ACR is required.

Definitions:
- Normal ACR: <2.0 mg/mmol

Definition of Albuminuria:

<table>
<thead>
<tr>
<th>Albuminuria</th>
<th>Urine albumin to creatinine ratio (ACR) **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microalbuminuria</td>
<td>2.0-20.0 mg/mmol</td>
</tr>
<tr>
<td>Macroalbuminuria</td>
<td>&gt;20.0 mg/mmol (male)</td>
</tr>
</tbody>
</table>

*Confirmation with either first morning urine sample or overnight urine collection.

**Persistent albuminuria defined as 2/3 positive samples over a 3-6 month period. Samples must be at least one month apart and must be either first morning or overnight collection.

Education: Formal education regarding the potential long-term complications of diabetes including nephropathy will begin at age of 12 years.

Documentation:
1. Lab values are entered into the diabetes clinical database.
2. All communication with the family and consult services will be recorded in the clinic chart.

References:

# Type 2 Diabetes Clinic

**Completed by:** Patient _______ Family Member _______ Other _______

**How long since you were diagnosed?** ___________  **Current Age** ___________

<table>
<thead>
<tr>
<th><strong>Rate 1= disagree to 5= agree</strong></th>
<th><strong>Clinic Visit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>I understand the importance of coming to Diabetes Clinic.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I am getting what I need from my diabetes team.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>The time I spend in clinic is worth it, even though it is all morning.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td><strong>Outreach</strong> – are you seen on Outreach?</td>
<td>Yes _____ No _____</td>
</tr>
<tr>
<td>If yes, are you getting what you need from your diabetes team on those outreach visits?</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>If you had a choice, would you prefer: a) outreach clinic in your community, b) clinic in Winnipeg, or c) a mix of clinic in Winnipeg &amp; outreach?</td>
<td>Choice _____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rate 1= disagree to 5= agree</strong></th>
<th><strong>Group Education</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>How many group classes have you attended?</td>
<td>Number ______</td>
</tr>
<tr>
<td>I feel welcome and safe in group.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I feel comfortable asking questions in a group.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>I always learn something in the group education session.</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>If you had a choice, would you prefer a) group education, b) an individual appointment with nurse or dietitian, or c) both group &amp; individual appointment?</td>
<td>Choice _____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rate 1= disagree to 5= agree</strong></th>
<th><strong>Dental</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you seen the dental hygiene students while in clinic?</td>
<td>Yes _____ No _____</td>
</tr>
<tr>
<td>If yes, did you think it was helpful to see them? If no, would you like to see them at clinic another time?</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rate 1= disagree to 5= agree</strong></th>
<th><strong>Research</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you heard of any of the research projects that you could participate in?</td>
<td>Yes _____ No _____</td>
</tr>
<tr>
<td>If yes, did you like hearing about those research opportunities? If no, would you be interested in hearing about research opportunities?</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
### Transportation

It is not difficult for me to get to the clinic.

If you disagree (1), what are the biggest difficulties for you?

### Topics

|---|---|---|---|---|---|---|---|

Do you have any suggestions as to how we could improve your diabetes team?

---

**Above information gathered by:** Individual with: ____________________________

**Today’s Date:** ____________