Best Diabetes Practices in Canada

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Welcome to Vancouver, BC!

Objectives
- Overview of Canada and Canadian health care
- Overview of the scope of diabetes in Canada
- Highlights of Canadian research in diabetes
- Overview of standards of care for kids with T1D
- My own personal recommendations
- BCCH resources

Canada and Canadian Health Care

Our Home and Native Land

Canada
- parliamentary democracy, constitutional monarchy
- 34,224,000 people (36th)
- 9,984,670 km² (2nd)
- 3.41 people/km² (228th)
- 10 provinces, 3 territories
- GDP $39,668/person
- 10.0% of GDP spent on health
- $3,672/person on health
- life exp: 78 men, 83 women

USA
- federal constitutional presidential republic
- 310,101,000 people (3rd)
- 9,826,675 km² (3rd/4th)
- 32 people/km² (178th)
- 50 states, 14 territories
- GDP $46,381/person
- 15.3% of GDP spent on health
- $6,714/person on health
- life exp: 75 men, 80 women
Canadian Health Care

- "Socialized medicine"
- Canada Health Act of 1962
  - universally available to permanent residents
  - comprehensive in the services it covers
  - accessible without income barriers
  - portable within and outside the country
  - publicly administered (provincially)
- covered: physician services, hospitalizations
- not always covered: drugs, diabetes supplies, dental care, optometry, cosmetic surgery

Population Density

- 80% of Canadians live within 200 km (120 miles) of the border

The Scope of Diabetes in Canada

- More than 3 million Canadians have diabetes.
- Over 300,000 Canadians live with type 1 diabetes.
- About 1 in 320 Canadian kids has diabetes.
- About 1 in 2,350 Canadian kids will develop diabetes this year.
- Canada has the 6th highest incidence rate of T1D in children in the world.
- Diabetes and its complications cost the Canadian economy more than $17.4 billion a year.

NDSS: Diabetes in Canada, 2009

Worldwide Incidence of Diabetes

- More than 300,000 persons in BC have diabetes.
- About 2,000 kids (1–19 years) in BC have T1D (1 in 450).
- About 200 kids (1–19 years) in BC have T2D (1 in 4,500).
- About 240 BC kids will develop T1D this year (1 in 4,000).
  - 35 ages 1–4
  - 71 ages 5–9
  - 88 ages 10–14
  - 46 ages 15–19
- Direct cost for diabetes in BC is about $1 billion/year.

WHO DiaMond Study, 2000

Diabetes in BC

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Diabetes Research in Canada

- Public funding:
  - Canadian Institutes of Health Research
- Private funding:
  - Canadian Diabetes Association
    - $95 million since 1975
  - Juvenile Diabetes Research Foundation
    - $13.9 million toward a Clinical Trial Network in 2009
- Lawson Foundation
- Industry funding

Discovery of Insulin

- 1922
- University of Toronto

Transplants: Edmonton Protocol

- University of Toronto
- “Microencapsulation” with seaweed-derived polymer
- Have been shown to keep monkeys insulin-free for up to 3 years
- Islet cells from pigs

Transplants: Coated Islets

Oral-lyn™
RapidMist™ device
“buccal delivery”
absorbed from mouth
Canadian (Toronto)
in Phase 3 trials
approved in some countries

University of Calgary
Infected mice with a virus carrying a modified insulin gene
this gene is integrated and expressed in liver
liver insulin production is sufficient to keep blood glucose normal

University of Alberta
used viruses to genetically modify mice, which can make human insulin in the K cells of their stomach and duodenum
gut insulin production sufficient to keep blood glucose normal if β cells are destroyed
mice lived up to 6 months without insulin

Gene Therapy: K Cells

Gene Therapy: Viral Vectors

University of Calgary
Infected mice with a virus carrying a modified insulin gene
this gene is integrated and expressed in liver
liver insulin production is sufficient to keep blood glucose normal

GEMS™-Insulin (Gut Endocrine-cell Modification System)
non-viral (chitosan-ΦC31) gene transfer
large-animal trials (pigs) underway
next: human trials!
Canadian (Vancouver)

Transition Therapeutics Inc.

E1-L.N.T.™ and GLP1-L.N.T.™ (Islet Neogenesis Therapy)
use of epithelial growth factor (E1) or GLP-1 and gastrin (TT-223) analogs to stimulate the growth of new islets
E1-L.N.T.™ Phase 2a trials: lowers insulin needs in T1D and lowers A1C in T2D
Canadian (Toronto)

Diabetes Research at BCCH

Centre for Research on Childhood Diabetes
CFRI Translational Research Building
funding from CDA, JDRF, Canada Foundation for Innovation and the BC Knowledge Development Fund
Research areas:
  • genetics of T1D
  • islet-cell biology and transplantation
  • viral pathogenesis of T1D
  • immunology of T1D
  • clinical diabetes research
Standards of Care for Children with T1D

Standards of Care

- Canadian Diabetes Association 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada
- Evidence-based guidelines
- Majority of diabetes specialists in Canada involved in development, review and dissemination of Guidelines
- Revised every 5 years

Standards of Care

Other Guidelines

CDA: A1C and Glucose Targets

- A1C:
  - Under 8.5% for ages 0 to 5 years
  - Under 8.0% for ages 6 to 12 years
  - 7% or under for ages 13 and up
- Pre-meal blood glucose:
  - 6–12 (108–216) for ages 0 to 5 years
  - 4–10 (72–180) for ages 6 to 12 years
  - 4–7 (72–126) for ages 13 and up
- 2-hour post-meal blood glucose:
  - 5–10 (90–180) for ages 13 and up

CDA 2008 Clinical Practice Guidelines

ADA: A1C and Glucose Targets

- A1C:
  - 7.5–8.5% for ages 0 to 5 years
  - Under 8.0% for ages 6 to 12 years
  - Under 7.5% for age 13 and up
- Pre-meal blood glucose:
  - 100–180 (5.5–10) for ages 0 to 5 years
  - 90–180 (5–10) for ages 6 to 12 years
  - 90–130 (5–7.2) for age 13 and up

ADA 2010 Clinical Practice Recommendations
ISPAD: A1C and Glucose Targets

- **A1C:** under 7.5% for all ages
- pre-meal blood glucose: 5–8 mmol/L (90–145 mg/dL)
- 2-hour post-meal blood glucose: 5–10 mmol/L (90–180 mg/dL)
- bedtime blood glucose: 6.7–10 mmol/L (120–180 mg/dL)
- overnight blood glucose: 4.5–9 mmol/L (80–162 mg/dL)

Access to Care

- All children with diabetes should have access to an experienced pediatric diabetes health care team and specialized care starting at diagnosis.

Initial Management

- Children with new-onset type 1 diabetes who are medically stable should receive their initial education and management in an outpatient setting, providing appropriate personnel and daily telephone consultation service are available in the community.

Transition

- To ensure ongoing and adequate metabolic control, pediatric and adult diabetes care services should collaborate to prepare adolescents and young adults for the transition to adult diabetes care.

A1C >10%

- Children with persistently poor diabetes control (e.g. A1C >10%) should be referred to a tertiary pediatric diabetes team and/or mental health professional for a comprehensive interdisciplinary assessment.
- Intensive family and individualized psychological interventions aimed at improving glycemic control should be considered to improve chronically poor metabolic control.

Initial Management

- Children with new-onset diabetes should be started on at least 2 daily injections of short-acting insulin or rapid-acting insulin analogs combined with an intermediate- or long-acting insulin.
Insulin

- Insulin therapy should be assessed at each clinical encounter to ensure it still enables the child to meet A1C targets, minimizes the risk of hypoglycemia and allows flexibility in carbohydrate intake, daily schedule and activities. This assessment should consider:
  - increased frequency of injections
  - change in the type of basal (long-acting analog) and/or prandial (rapid-acting analog) insulin
  - change to pump

Glucagon

- In the home situation, severe hypoglycemia should be treated with glucagon:
  - in children 5 years of age or under: use 0.5 mg
  - in children over 5 years of age: use 1 mg
- The episode should be discussed with the diabetes healthcare team as soon as possible and consideration given to reducing insulin doses for the next 24 hours to avoid further severe hypoglycemia.

Mini-Dose Glucagon

- In children, the use of mini-doses of glucagon should be considered in the home management of mild or impending hypoglycemia associated with inability or refusal to take oral carbohydrate.
  - 10 μg per year of age
  - minimum 20 μg (2 units)
  - maximum 150 μg (15 units)

DKA Prevention

- To prevent DKA in children with diabetes:
  - Targeted public awareness campaigns should be considered to educate parents and other caregivers (e.g. teachers) about the early symptoms of diabetes.
  - Comprehensive education and support services, as well as 24-hour telephone services, should be available for families of children with diabetes.

Kidney Complications (Nephropathy)

- screen if age 12 years and above after 5 years or more of diabetes
- first-morning albumin-creatinine ratio (ACR)
- follow-up with timed overnight ACR
- treat as for adults if 3 or more high values

Eye Complications (Retinopathy)

- screen if age 15 years and above after 5 years or more of diabetes
- screen annually thereafter
- can screen every 2 years if control good and duration under 10 years
**Nerve Complications (Neuropathy)**
- Screen if after 5 years or more of diabetes and poor control
- Ask about numbness, pain, cramps and tingling
- Examine for skin sensation, vibration sense, light touch and ankle reflexes

**Lipid Problems (Dyslipidemia)**
- Screen kids under 12 years if family history and/or obesity (BMI >95th percentile)
- Screen all kids at 12 and then again at 17 years
- Do full lipid panel (total, HDL, LDL, triglycerides)
- Treat abnormal results as for adults

**High Blood Pressure (Hypertension)**
- Check all kids’ blood pressure twice a year
- Treat BP ≥95th percentile for age with lifestyle modification, weight loss
- Treat persistent high blood pressure as for non-diabetic kids

**Thyroid Disease**
- Thyroid problems occur in 15–30% of people with T1D
- TSH and thyroperoxidase antibodies at diagnosis
- Repeat every 2 years
- More frequent if goiter, positive antibodies, or symptoms of hyper/hypothyroidism

**Celiac Disease**
- Celiac disease occurs in 4–9% of people with T1D
- 60–70% of these have no symptoms
- Screen for celiac disease (IgA-tissue transglutaminase antibodies) if classical or atypical symptoms
- Gluten-free diet if affected
- Screening in asymptomatic cases remains controversial

**Other Recommendations**
- Offer the influenza vaccine
- Smoking prevention/cessation
- Contraception (especially) for girls
- Screen girls for eating disorders
  - 2-fold increase
My Recommendations

- Learn as much as you can about diabetes.
- Get the A1C in target.
- Fear hyperglycemia as much as you fear hypoglycemia.
- Intensify the insulin regimen as much as possible.
  - Go from two shots day to three, from three to four.
  - Add in extra shots for extra food or high blood sugars.
  - Move to multiple daily injections or a pump.
  - Fine-tune the carb counting, adjust for protein and fat
  - Use the advanced features of the pump (combo/dual-wave bolus, patterns, temp basals)
  - Consider CGMS, at least intermittently.
  - Download, analyze, and implement changes frequently.

- Maximize your clinic visits by being prepared.
  - Work with your team, they’re nice people!
  - Come prepared: logbook, meter and/or pump downloads.
  - Write down questions.
My Recommendations

- Send your kid to camp—you both need a break!

My Recommendations

- Advocate for your child/yourself.
- Lend financial and emotional support.

BC Children’s Hospital Resources

BCCH Online Insulin Dose-Adjustment Program

BCCH MDI Handout

BCCH EDU Website

http://endodiab.bcchildrens.ca
Enjoy the conference!
Have fun and make new friends!