Physical Activity Counseling & Exercise Prescription in Diabetes Clinical Practice

Capital Health Diabetes Education Conference

Jonathon Fowles, Ph.D., CSEP-CEP

Chair, Canadian Society for Exercise Physiology
Health and Fitness Program
Co-director, Centre of Lifestyle Studies (COLS)
Associate Professor, School of Recreation Management and Kinesiology
Learning Objectives

- Why we need Physical Activity & Exercise
  - Important take home messages

- Addressing challenges for Physical Activity Counseling in routine clinical practice
  - Practical messages for your patients

- Important points on Exercise Prescription
  - Identifying challenges patients have in adopting an active lifestyle
Why we need physical activity & exercise…. 

We are ‘programmed’ to consume food AND

Our bodies were designed to MOVE!!...

Hunter gatherers & stationary farmers of yesteryear expended large amounts of energy

But we are also programmed for efficiency…
Domains of Physical Activity

- Leisure time (reported)
  - (emphasis: sports and recreation)
  - ‘Active’ to very inactive

- Commuting or ‘active’ transportation

- Occupational

- Chores or Personal Care
New PA Guidelines for Canadians

Guidelines

• To achieve health benefits, adults aged 18-64 years should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more.

• It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week.

• More physical activity provides greater health benefits.

Similar guidelines aged 65 years and older
Measured Physical Activity in Canada
(Colley et al. 2011, Health Reports, CHMS 2007-2009)

Canadians reporting Mod-Vigorous PA = 52%

Canadians aged 20-79 actually attaining PA criteria:
- Average > 10,000 steps per day
  35%
- > 150 min MVPA / wk in bouts >10 min
  15% (i.e CSEP & CDA Guidelines)
- 30 min MVPA, in 10min bouts, 5 out of 7 days:
  5%

Sedentary: ~10 h/day, light PA ~2h/day, MVPA: 24 min
The Obesity Epidemic

Past 40 years

Fig 1

The ‘average’ N.A. adult gains 0.5-1 kg/year
An imbalance of ~100 kcal/day (Hill & Wyatt, 2005)

(redrawn from Hill and Wyatt, JAP, 2005)

Physical Activity & Exercise Tool-kit
Why we need physical activity & exercise….

Physical activity is a basic physiological NEED
  like breathing, eating and sleeping

Modern innovation creates
  ‘im-balance’ or “dis-ease”

We are battling strong genetic programming to be healthy in today’s society

(adapted from the “The Shape of Things to Come”, Copyright© 2003 “The Economist”)
Environment/Lifestyle Factors

Energy Imbalance
- Abnormal muscle/adipose biology
- Excess adipose tissue
- Abdominal obesity
- Insulin resistance
- Hyperinsulinemia
- Dyslipidemia
- Dysglycemia

Genetics

Physical INACTIVITY Accelerates

FFA Adipokines Inflammatory Molecules

Physical Activity ATTENUATES

CHD & ↑ Mortality

DIABETES
- Hypertension
- Hypercholesterolemia
Incident Diabetes by CR Fitness
Aerobics Centre Longitudinal Study (ACLS)

Trend $P < 0.001$

Adapted from Wei et al., Ann. Intern. Med. 1999
8633 non-diabetic men, follow up 6 years
Reduction in Type 2 Diabetes – Lifestyle Intervention Trials

*Adapted from Gillies, C. L et al. BMJ 2007;334:299*
CDA 2008 PA Recommendations

- “People with diabetes should accumulate a minimum of 150 minutes of moderate- to vigorous-intensity aerobic exercise each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise”

- “People with diabetes (including elderly people) should also be encouraged to perform resistance exercise 3 times per week in addition to aerobic exercise”
  - Initial instruction and periodic supervision by an exercise specialist are recommended.
Who is meeting CDA Guidelines?

Patients Pre-Test (n=203)  Fowles, Shields, et al., in progress

- Report Moderate Physical Activity
  38% (≥ 3x/week)

- Aerobic Exercise
  9.6% (≥3x/week);  83% none

- Resistance Exercise
  9.6% (≥ 3x/week);  83% none

- Both Aerobic AND Resistance Exercise
  2.4% (both ≥ 3x/week)
The best exercise program in the world doesn’t work, if nobody does it.

Jonathon Fowles
Practical Message #1

“First and foremost, regardless of the starting point, a regular pattern of activity should be advice given repeatedly by all members of the health-care team, including the primary physician.”

(Riddell & Fowles, Med. Post, 2010)

- Sedentary behavior is a key contributor to metabolic dysfunction and there is strong evidence to this link; however, physical activity is a message that is often lost in the time constraints of a busy medical visit.
Would You Prescribe a Drug without Understanding How it Works or it’s Dose-Response Characteristics?

- Weight loss?
- Glucose uptake?
- Improved insulin action?
Insulin Signaling in Type 2 Diabetes

Shepard Kahn et al. NEJM 1999;341:248-57
Role of Exercise

Kennedy; *Diabetes* 48:1192
Acute Exercise and Insulin Sensitivity

Bordenave et al. Diabetes Metab. 2008; 34:250-7
Acute Changes in Blood Glucose

30 minutes of Exercise in Type 2 Diabetes Patients

Fowles, Barron, Dillman, *in progress*, N=8
Benefits of Exercise – Evidence

Meta-Analyses: Boule et al., 2001; Boule et al. 2003; Snowling & Hopkins, 2006
Sigal et al., 2006 ADA Consensus; Bassuk & Manson, 2005, Periera et al. 2009

- Aerobic OR resistance exercise ↓ A1C by ~ 0.7%
- Beneficial effect independent of weight loss
- Dose response effects

- **Aerobic exercise:**
  - 150 minutes per week = reduction A1C of ~0.5-0.9%
  - Direct enhancement insulin sensitivity 24-72 h.
  - Brisk walking is easy to do, consumes glucose & calories

- **Resistance training:**
  - 60-90 minutes/ week ↓ A1C by ~0.5-1.0%
  - Activate muscles not typically used
  - Helps preserve ACTIVE muscle mass
  - Good alternative for those with mobility problems
Exercise and A1C

Sigal R et al *Ann Int Med* 2007147:357

![Bar chart showing the absolute change in A1C for different exercise types.](chart.png)
Practical Message #2: Physical Activity & Exercise gives you CONTROL

- PA & Exercise lowers blood glucose directly by:
  - Increasing glucose uptake
  - Increasing insulin sensitivity

- The benefits occur in a dose-response manner
  - Any Physical Activity is good, but more is better
  - Exercise provides more ‘bang for the buck’

- Regular PA can reduce co-morbidities
  - Exercise is Medicine®
The Side-Effects of Exercise….. (EIM)

- Reduce risk of death by 40-60%
- Reduce risk of colon cancer by 60%
- Reduce mortality and risk of recurrent breast cancer by 50%
- Reduce incidence of CHD by 40%
- Reduce incidence of hypertension by 40%
- Reduce risk of developing Alzheimer's by 40%
- Reduce risk of stroke by 27%
- Decrease depression as effectively as Prozac or cognitive behavioural therapy
Opportunity is missed by most people because it is dressed in overalls and looks like work

Thomas Edison
## Most important method of improving physical health, by CHB

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Start / increase exercise sports / physical activity</td>
<td>62%</td>
<td>58%</td>
<td>62%</td>
<td>67%</td>
<td>64%</td>
<td>60%</td>
</tr>
<tr>
<td>Change diet / improve eating habits</td>
<td>13%</td>
<td>15%</td>
<td>13%</td>
<td>11%</td>
<td>15%</td>
<td>12%</td>
</tr>
<tr>
<td>Lose weight</td>
<td>6%</td>
<td>5%</td>
<td>7%</td>
<td>6%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Quit smoking / reduce amount smoked</td>
<td>6%</td>
<td>5%</td>
<td>6%</td>
<td>3%</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Reduce stress level</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Receive medical treatment</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Take vitamins</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Drink less alcohol</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
<td>7%</td>
<td>5%</td>
<td>6%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Nothing</td>
<td>6%</td>
<td>8%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>6%</td>
</tr>
</tbody>
</table>

CHB Survey results (2009) of n=2200 patients
Interesting Relationship DE-Client

Dillman, Shields, Fowles et al., CJD, 2010

- Identified DE barrier:
  - lack of interest by client (34%)
  - Perceived client attitudes as negative (2.8/5)

  however,

  Actual confidence by Client is Higher

  Client attitude toward PAE is 6/7
What you think becomes what you say.
What you say becomes what you do.
What you do shapes the world around you.
Practical Message #3 – Give the benefit of the doubt

- Many patients are aware PA is good for them
  - But may not know HOW good it can be…
  - Value what physical activity can do for you and your diabetes

- Bridge the ‘Awareness-Action’ Gap
  - Individually relevant recommendations
  - Follow with ‘How-to’ information to build confidence
“Regular PA is important for health and reducing risks of disease. As your health care provider I recommend you meet the following physical activity prescription”:

1. **Increase physical activities in your day and reduce sedentary time.**
   - No more than 2 h per day of recreational screen time

2. **Begin a regular program of physical activity:**
   - three to four days per week for 10 to 15 minutes per session

3. **Begin an introductory resistance activity:**
   - one to two days per week for 15 to 30 minutes per session

4. **Maintain aerobic exercise:**
   - five days per week for a minimum of 30 minutes per session

5. **Do resistance exercise:**
   - two or more days / week for 30 minutes or more per session
Tools for the ‘How to’

Diabetes Physical Activity & Exercise Toolkit
2nd Edition, 2010

For diabetes care providers wanting to get their clients moving in the right direction

“Significant problems we face cannot be solved at the same level of thinking we were at when we created them.”
Albert Einstein

Planning for Regular Physical Activity

Introductory Resistance Program

Diabetes Physical Activity & Exercise Toolkit

Diabetes Physical Activity & Exercise Toolkit
Low Adherence and Self-efficacy - Patients

- Disease creates challenge for PA and Exercise
  - ↓ ex tolerance, *discomfort*
  - Medications on weight gain; BMI on CRF
  - Obesity on reduction in motivation for PA

- Co morbidities = Restraints & fear of complication
  - may stop someone from starting

- Exercise requires knowledge & skill
  - Exercise is a modern invention
  - Specific individual challenges & techniques
Primary Barriers to PA for Patients

- Generalized Barriers
  - TIME
  - Motivation
  - Know how
  - Cost, Facilities, Transport

- Disease Dependent Barriers (examples)
  - Tend to avoid doing more harm than doing good
    - Loss of blood sugar control (diabetes)
    - Inflammation and soreness (arthritis)
    - Increased heart rate impact (MI, CVD)
Practical Message # 4: Relative Risk of Exercise

- Remember that most people are at greater risk from sedentary behaviour than from exercise.
- Be aware of the short-term and long-term complications of diabetes.
- Goals of pre-exercise screening:
  - To identify problems that might make exercise-associated risks outweigh the benefits.
  - To expedite treatment of such problems.
Potential exercise-induced adverse events

- Hypoglycemia (low blood glucose) → impaired thinking, loss of consciousness, seizures, auto accidents
- Hyperglycemia (high blood glucose)/diabetic ketoacidosis or hyperosmolar state.
- Eyes: vitreous hemorrhage or retinal detachment → sight loss
- Neuropathy/PVD → injuries, infections
- Cardiovascular: sudden cardiac death, myocardial infarction, angina, arrhythmia
Exercise-induced Hypoglycemia

- Common in type 1 diabetes; can have serious consequences.
- Sometimes occurs in type 2 diabetes if treated with insulin or drugs that increase insulin secretion.
- Can occur during exercise, soon after exercise, and/or many hours after exercise.
- Risk minimized by glucose monitoring, adjustment of insulin and/or carbohydrate intake.
Exercise and hyperglycemia: some precipitants

- Brief or intermittent, very intense exercise
- Dehydration
- Insulin omission
- Dietary carbohydrate excess
Hyperglycemia: when is it best to postpone exercise

- If glucose is over 15 and ketones are positive (more than “trace”)
- If glucose is over 20, with or without ketones (although probably ok to proceed if patient feels perfectly well).

- (If exercising with high blood glucose, ensure hydration is adequate, especially in hot weather.)
Where do we go from here?

- Do we continue to do the same things and expect different results?

“At your age, good health is pretty much a thing of the past. My advice is, find an illness you enjoy.”
Summary Points

1. Regular PA should be a consistent message
2. Exercise can give control over their situation
3. Give the benefit of the doubt: bridge the Awareness-Action Gap
4. Remember that most people are at greater risk from sedentary behaviour than from exercise.
5. Think creatively about strategies to include PA Exercise into messages/programs/facilities
Acknowledgements

The Team

- Co-investigators
  - Chris Shields
  - Rene Murphy
  - Matt Durant

- Project/Research Coordinator
  - Arlene Perry, Brittany Barron

- DCPNS staff
  - Peggy Dunbar
  - Barb Patterson
  - Bev Harpell, Brenda Cook
  - Lynne Harrigan

This project supported through generous contributions of:

The Lawson Foundation

ACADIA UNIVERSITY

DIABETES CARE PROGRAM OF NOVA SCOTIA

CSEP | SCPE
THE GOLD STANDARD IN EXERCISE SCIENCE AND PERSONAL TRAINING

Physical Activity & Exercise Tool-kit
World’s First Evidence-Based Sedentary Behaviour Guidelines

Guidelines

For health benefits, children aged 5–11 years should minimize the time they spend being sedentary each day. This may be achieved by:

- Limiting recreational screen time to no more than 2 hours per day; lower levels are associated with additional health benefits.
- Limiting sedentary (motorized) transport, extended sitting and time spent indoors throughout the day.

© Canadian Society for Exercise Physiology, 2011. All rights reserved.

Similar guidelines for Teens aged 12-17
Adult guidelines currently in review