A novel diet and exercise intervention to reverse metabolic syndrome

Dietitians of Canada
Ontario Family Health Teams RDs Conference
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Disclosures

I have received speaker honoraria and/or I have been paid from grants from the following companies:

- Nestlé Health Science
- Fresenius Kabi AG
- Baxter
- Abbott Laboratories
- Burnbrae Farms (Dietitians Coast to Coast Series)

Relationships with Not for Profit

- Employee of Metabolic Syndrome Canada
Objectives

1. Review the incidence of Metabolic Syndrome and the evidence on lifestyle intervention in primary care
2. Review the results of the C.H.A.N.G.E. feasibility study and details of the novel C.H.A.N.G.E. Program
3. Learn about the implementation of the C.H.A.N.G.E program into existing primary care practices
Background

Incidence of Metabolic Syndrome
Evidence on diet and exercise
Cost of Chronic Diseases

Growing prevalence of chronic conditions like diabetes and cardiovascular disease that account for 17% of all health care costs in Canada.

Table 2. Cost of Chronic Illness In Canada 1998 (C$2002 million)

<table>
<thead>
<tr>
<th>Diagnostic Category</th>
<th>Hospital</th>
<th>Doctor</th>
<th>Drugs</th>
<th>Other19</th>
<th>Total20</th>
<th>Premat. Death</th>
<th>Disability</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>4,560.4</td>
<td>901.0</td>
<td>1,942.6</td>
<td>4,620.1</td>
<td>12,024.0</td>
<td>9,040.1</td>
<td>3,730.9</td>
<td>24,795</td>
</tr>
<tr>
<td>Cancer</td>
<td>2,014.8</td>
<td>365.0</td>
<td>230.3</td>
<td>1,628.7</td>
<td>4,238.8</td>
<td>11,639.3</td>
<td>1,244.7</td>
<td>17,122.8</td>
</tr>
<tr>
<td>Respiratory</td>
<td>489.0</td>
<td>240.92</td>
<td>464.3</td>
<td>745.2</td>
<td>1,939.3</td>
<td>920.8</td>
<td>1,218.3</td>
<td>4,078.4</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>1,579.7</td>
<td>633.6</td>
<td>673.1</td>
<td>1,801.1</td>
<td>4,687.4</td>
<td>137.7</td>
<td>14,910.3</td>
<td>19,735.5</td>
</tr>
<tr>
<td>Endocrine23</td>
<td>522.7</td>
<td>280.1</td>
<td>896.6</td>
<td>1,060.4</td>
<td>2,759.7</td>
<td>1,109.2</td>
<td>950.5</td>
<td>4,819.4</td>
</tr>
<tr>
<td>Nervous System24</td>
<td>1,562.1</td>
<td>903.8</td>
<td>587.8</td>
<td>1,905.5</td>
<td>4,959.2</td>
<td>913.8</td>
<td>5,089.1</td>
<td>10,962</td>
</tr>
<tr>
<td>Mental</td>
<td>2,939.6</td>
<td>969.3</td>
<td>1,197.6</td>
<td>3,186.4</td>
<td>8,292.9</td>
<td>525.9</td>
<td>2,970.3</td>
<td>11,789.1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13,668.2</td>
<td>4,293.6</td>
<td>5,992.2</td>
<td>14,947.3</td>
<td>38,901.4</td>
<td>24,286.7</td>
<td>30,113.2</td>
<td>93,302</td>
</tr>
</tbody>
</table>


Metabolic syndrome (MetS) leads to chronic illnesses that account for 43% of all deaths in Canada.
Metabolic Syndrome

When 3 of these are present:

- High blood pressure (≥ 130/85 mm Hg, or receiving medication)
- High blood glucose levels (≥ 5.6 mmol/L, or receiving medication)
- High triglycerides (≥ 1.7 mmol/L, or receiving medication)
- Low HDL-Cholesterol (< 1.0 mmol/L in men or < 1.3 mmol/L in women)
- Large waist circumference (≥ 102 cm in men, ≥ 88 cm in women; ranges vary according to ethnicity)

www.metabolicsyndromeCanada.ca
Metabolic Syndrome is a health crisis hiding in plain sight

According to a 2014 study published in Chronic Diseases and Injuries in Canada (Rao et al, 2014), 19.1% of all Canadian adults — nearly 1 in 5 people — have Metabolic Syndrome (Natalie et al. CMAJ, 2011)

www.metabolicsyndromecanada.ca
Insulin Resistance

• Protects against malnutrition and death during famine
• During times of plentiful food results in:
  – Obesity
  – Hyperglycemia
  – Hyperlipidemia
  – Hypertension
• Insulin Resistance plays a significant role in Metabolic Syndrome
Aerobic Exercise and Insulin resistance

- N = 10 adult children of parents with NIDDM (insulin resistant), 8 normal subjects
- Studied at:
  - Baseline
  - After one session
  - After 6 weeks of aerobic exercise training
- Intervention:
  - Exercise consisted of stair climbing 45 min X 3/week, intensity 65% of VO2 Max

Perseghin et al NEJM 1996 Oct 31;335(18):1357-62
Lifestyle Intervention vs. Metformin

- 3234 non-diabetic persons with elevated fasting and post-load plasma glucose concentrations
- 3 groups:
  - placebo
  - metformin (850 mg twice daily)
  - lifestyle-modification program
- Lifestyle Goal: 7% weight loss, > 150min/wk activity

Knowler et al. NEJM 2002:346:393-403
Lifestyle Modification Study

- 2390 Self or Physician Referred subjects
- 12 week program
- Community based (home exercises, meal plans)
- Entry Criteria: More than 2 of the following:
  - SBP >140 mm
  - DBP >90 mm
  - LDL > 2.6 mmol/L
  - Glucose >6.1 mmol/L

Gordon et al. Am J Cardiol 2004;94:1558-61

<table>
<thead>
<tr>
<th>TABLE 3 Effect of 12 Weeks of Therapeutic Lifestyle Changes on Coronary Heart Disease Risk Factors: Subjects Not Taking Antihypertensive, Antilipemic, or Antidiabetic Medications at Baseline or Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome Measurement</strong></td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Systolic BP (mm Hg)</td>
</tr>
<tr>
<td>Diastolic BP (mm Hg)</td>
</tr>
<tr>
<td>Total cholesterol (mg/dl)</td>
</tr>
<tr>
<td>LDL cholesterol (mg/dl)</td>
</tr>
<tr>
<td>HDL cholesterol (mg/dl)</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
</tr>
<tr>
<td>Fasting glucose (mg/dl)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
</tr>
<tr>
<td>Weight (lb)</td>
</tr>
<tr>
<td>Waist circumference (inches)</td>
</tr>
</tbody>
</table>

Values are mean ± SD. Changes from baseline were statistically significant where indicated (*p ≤0.05).

Normalized measurements WITHOUT medications
Mediterranean Diet: Cardiovascular Disease Prevention

N >5000 patients with Metabolic syndrome
- Control group
  - low fat diet
- Intervention group
  - Diet rich in Legumes, Fish, Vegetables, Whole grains
  - Low in sugar, meat and fast foods.
  - + Extra virgin Olive Oil (EVOO) or + Extra Nuts
- Unrestricted energy intake
- Exercise not promoted in either group
- Weight loss was not a goal
- Primary End Point: composite of CV disease (myocardial infarction, stroke or death from cardiovascular causes)
- Followed-up for 4.8 years

PREDIMED diet intervention

**Table 1. Summary of Dietary Recommendations to Participants in the Mediterranean-Diet Groups and the Control-Diet Group.**

<table>
<thead>
<tr>
<th>Food</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended</strong></td>
<td></td>
</tr>
<tr>
<td>Olive oil(^2) Extra virgin</td>
<td>≥4 tbsp/day</td>
</tr>
<tr>
<td>Tree nuts and peanuts(^†)</td>
<td>≥3 servings/wk</td>
</tr>
<tr>
<td>Fresh fruits</td>
<td>≥3 servings/day</td>
</tr>
<tr>
<td>Vegetables</td>
<td>≥2 servings/day</td>
</tr>
<tr>
<td>Fish (especially fatty fish), seafood</td>
<td>≥3 servings/wk</td>
</tr>
<tr>
<td>Legumes</td>
<td>≥3 servings/wk</td>
</tr>
<tr>
<td>Sofrito(^‡) Tomato sauce with OO, spices</td>
<td>≥2 servings/wk</td>
</tr>
<tr>
<td>White meat</td>
<td>Instead of red meat</td>
</tr>
<tr>
<td>Wine with meals (optionally, only for habitual drinkers)</td>
<td>≥7 glasses/wk</td>
</tr>
<tr>
<td><strong>Discouraged</strong></td>
<td></td>
</tr>
<tr>
<td>Soda drinks</td>
<td>&lt;1 drink/day</td>
</tr>
<tr>
<td>Commercial bakery goods, sweets, and pastries(^§)</td>
<td>&lt;3 servings/wk</td>
</tr>
<tr>
<td>Spread fats</td>
<td>&lt;1 serving/day</td>
</tr>
<tr>
<td>Red and processed meats</td>
<td>&lt;1 serving/day</td>
</tr>
</tbody>
</table>

30 gm as 15 g walnuts 7.5 gm almonds 7.5 gms hazelnuts

As compared to the control diet p=0.015


“…..an energy-unrestricted Mediterranean diet supplemented with either extra-virgin olive oil or nuts resulted in an absolute risk reduction of approximately 3 major cardiovascular events per 1000 person-years, for a relative risk reduction of approximately 30%, among high risk persons who were initially free of cardiovascular disease.”
Secondary analysis of the PREDIMED RCT

- Reversal of MetS in 958 (28.2%) of the 3392 participants who had MetS at baseline
- Mediterranean diet (olive oil or nuts) more likely to cause reversal of MetS than control
- Olive Oil Group - significant decreases in both central obesity and high fasting glucose ($p = 0.02$)
- Group supplemented with nuts showed a significant decrease in central obesity

Results

- % of patients with resolved MetS was 2.0 times greater (95% CI 1.5 to 2.7) for lifestyle intervention

- Decreased
  - blood pressure
  - triglycerides
  - waist circumference
  - fasting blood glucose

- 8 RCTs, 4000 pts

- lifestyle intervention of diet and exercise is effective in resolving MetS and reducing the severity of its related abnormalities
Current practice in primary care?
Identification and Management of Patients at Elevated Cardiometabolic Risk in Canadian Primary Care: *How Well Are We Doing?*

Canadian Initiative to Reduce Cardiometabolic Risk (CANREDUCE-CMR)

Multiple MDs from 9 PCTs and 88 Solo clinics

Suboptimal identification and management of patients with CMR

Teoh Canadian Journal of Cardiology 2013
Making Physical Activity Counseling a Priority in Clinical Practice

The Time for Action Is Now

Managing cardiometabolic risk in primary care

Summary of the 2011 consensus statement

Ananda Chatterjee MD  Stewart B. Harris MD MPH  FCFP  FACPM  Lawrence A. Leiter MD  FRCP  FACP
David H. Fitchett MD  FRCP  FACC  Hwee Teoh PhD  Onil K. Bhattacharyya MD PhD  CCFP

Canadian Family Physician 2012
A Lifestyle to Prevent or Combat the Metabolic Syndrome among Japanese Workers: Analyses Using the Health Belief Model and the Multidimensional Health Locus of Control

FACTORS THAT PROMOTE LIFESTYLE CHANGE

**Family MD** pointed out that they had Metabolic syndrome

**Family MD** advised patients that Metabolic syndrome was life threatening

**Patients** knew practical ways to combat Metabolic syndrome
Why are we not doing this with our patients?

Patients and physicians alike must overcome barriers to lifestyle modification

- For patients, personal and environmental factors may inhibit positive behavioural changes

- For physicians, system and provider barriers may stand in the way of motivating and supporting healthy lifestyle adaptations
THE C.H.A.N.G.E PROGRAM
Unique lifestyle Intervention program created by leading health professionals at Metabolic Syndrome Canada www.metsc.ca to provide family health clinics with the tools they need to offer effective, lasting lifestyle intervention to patients with metabolic syndrome

Based on the best evidence from diet and exercise research, the CHANGE Program focuses on long-term changes and overall well-being
Leaders in their professions, dedicated to improving Canadian health

Dr. Khursheed Jeejeebhoy
Board Member
Gastroenterology, Nutrition Research
Dr. Khursheed Jeejeebhoy is a Gastroenterologist, Emeritus Professor of Medicine at the University of Toronto, and Director of Nourishment Support for St. Michael’s Hospital in Toronto. Dr. Khursheed Jeejeebhoy has achieved an international reputation for...

Dr. Zane Cohen
Board Member
Surgery, Gastroenterology, University of Toronto
Dr. Zane Cohen is a Professor of Surgery at the University of Toronto and the Director of the Dr. Zane Cohen Digestive Diseases Clinical Research Centre Mount Sinai Hospital, a clinical research facility internationally acclaimed as a leader in the understanding and...

Dr. Doug Klein
Board Member
Family Medicine, Edmonton Oliver Primary Care Network, University of Alberta
Dr. Doug Klein is a practicing family physician and an Associate Professor with the Department of Family Medicine at the University of Alberta. He is also Director of the Doctor-Patient Relationship Program, which focuses on communication skills...

Dr. Kevin Smith
Board Member
Dr. Kevin Smith is currently the Presid Executive Officer of St. Joseph’s Health Executive Officer of St. Mary’s General Kitchener, and an Associate Professor. University School of Medicine. He also boards of directors of several organiza...

Dr. Paula Brauer
Advisor
Dietetics, Epidemiology, University of C...
Dr. Paula Brauer is on the faculty in the Nutrition program of the Department of Applied Nutrition, with adjunct status in Human Biology and Nutritional Science Guelph. Her research focuses on deve...

Dr. Caroline Réjaume
Advisor
Family Medicine, Physiology, Endocrinology, Kinesiology Université Laval
Dr. Caroline Réjaume is a primary care physician, assistant professor and clinical researcher at Laval University. She also holds a bachelor in kinesiology (1996), a master degree (1998) and a Ph.D. (2003) in Physiology...

Dr. Leah Gramlich
board Member
Gastroenterology, University of Alberta
Dr. Leah Gramlich is a physican-nurse researcher and Gastroenterologist. She is an Associate Professor in the faculty of Medicine at the University of Alberta with a focus on improve...
Overview

**Family Doctor**
- regular check up & blood work
- waist circumference

**Screening**
(Identify Patients)

**Baseline**
- Family Doctor/Delegate
  - assesses eligibility & suitability
  - encourages patient to adopt program
  - adjusts pharmacotherapy
  - involves RD & Kinesiologist

**Intervention (12 months)**
(Tailored Diet/Exercise)
- Dietitian/Kinesiologist
  - weekly visits for 3 months
  - monthly visits for 9 months
  - assessment
  - goal setting
  - individualized plan to reverse MetS

**1 yr Post Intervention**
- Family Doctor
  - follow up visits every 3 months
  - reviews blood work
  - assesses progress
  - encourages patient to continue program

**CHANGE**
What is CHANGE so different?

5 Keys to Success

What makes the CHANGE Program more effective at reversing metabolic syndrome (MetS) than other diets or workout plans?

- Your Family Doctor
- Personalized diet-exercise plan
- Close follow-up over 12 months
- A team approach
- Gradual intervention
CHANGE Feasibility Study
Feasibility Study Objectives

Develop and implement a program through Family MDs supported by kinesiologists and dietitians to show that a regimen of nutrition modification and graded exercise over a 1 year period will:

• Reduce components of the Metabolic syndrome
• Reduce reliance on pharmacological drug use
• Evaluate the feasibility of team-based approach to manage MetS

Focus of this project

• confirm that the intervention is effective
• acceptance of the lifestyle intervention
• ability to recruit patients, and
• usability of protocol tools and materials
Feasibility Study

- December 2012-2014
- n =305 patients
- 3 Primary Care clinics across Canada
- Diet and exercise intervention over 1 year
- Data collection on MetS variables, diet and exercise
- Genetic analyses
- Training provided by MetSC Team
- Coordinated by Queens University
Feasibility Study Results: Retention

Retention rates are quite comparable to other lifestyle intervention trials.

Jeejeebhoy et al in submission 2016
Feasibility Study Results: Baseline characteristics

<table>
<thead>
<tr>
<th>Baseline Characteristics</th>
<th>All eligible patients (n = 293)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>59.1±9.7</td>
</tr>
<tr>
<td>Female</td>
<td>152 (52%)</td>
</tr>
<tr>
<td>Charlson co-morbidity index</td>
<td>0.8±0.9</td>
</tr>
<tr>
<td>Height (meters)</td>
<td>1.7±0.1</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>90.8±14.7</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>31.9±3.3</td>
</tr>
<tr>
<td>Current smoker</td>
<td>29 (10%)</td>
</tr>
<tr>
<td>PROCAM risk</td>
<td>8.2±6.4</td>
</tr>
<tr>
<td>VO₂max (percentile)</td>
<td>46.8±24.0</td>
</tr>
<tr>
<td>HEI-C</td>
<td>57.9±14.2</td>
</tr>
<tr>
<td>Mediterranean diet score</td>
<td>4.7±1.6</td>
</tr>
<tr>
<td>LDL-C (mmol/L)</td>
<td>2.6±1.1</td>
</tr>
</tbody>
</table>

Jeejeebhoy et al in submission 2016
<table>
<thead>
<tr>
<th>Metabolic Syndrome Criteria</th>
<th>All eligible patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Blood pressure or pharmacotherapy</strong></td>
<td>256 (87%)</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>133.5±14.5</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>80.6±9.1</td>
</tr>
<tr>
<td>Received Pharmacotherapy for elevated blood pressure</td>
<td>218 (74%)</td>
</tr>
<tr>
<td><strong>2. Fasting blood glucose or pharmacotherapy</strong></td>
<td>240 (82%)</td>
</tr>
<tr>
<td>Blood glucose (mmol/L)</td>
<td>6.6±1.4</td>
</tr>
<tr>
<td>Received pharmacotherapy for elevated blood glucose levels</td>
<td>129 (44%)</td>
</tr>
<tr>
<td><strong>3. Triglyceride or pharmacotherapy</strong></td>
<td>187 (64%)</td>
</tr>
<tr>
<td>Triglyceride level (mmol/L)</td>
<td>2.2±1.7</td>
</tr>
<tr>
<td>Pharmacotherapy for triglyceride</td>
<td>11 (4%)</td>
</tr>
<tr>
<td><strong>4. HDL-C</strong></td>
<td>138 (47%)</td>
</tr>
<tr>
<td>HDL-C (mmol/L)</td>
<td>1.2±0.3</td>
</tr>
<tr>
<td><strong>5. Waist circumference</strong></td>
<td>277 (95%)</td>
</tr>
<tr>
<td>Waist circumference</td>
<td>108.1±9.4</td>
</tr>
</tbody>
</table>
Feasibility Study Conclusions

The CHANGE Program:

- is feasible in a Primary Care setting
- resulted in a reversal in MetS in 20% patients by month 12
- reduced the components of MetS in 40% patients by month 12
  - significant improvement in BP, HDL-C, trig, waist and weight
  - significant improvement in Mediterranean diet score and Health Eating Index

- reduced the 10 year risk of CVD (PROCAM Risk score [http://www.chdtaskforce.com/index.html](http://www.chdtaskforce.com/index.html) to determine the % risk of acute coronary in 10 years)
  - risk reduction was highest in those with high risk score at baseline

Jeejeebhoy et al in submission 2016
Table S1. Quantitative Score of Compliance with the Mediterranean Diet.

<table>
<thead>
<tr>
<th>Foods and frequency of consumption</th>
<th>Criteria for 1 point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you use olive oil as main culinary fat?</td>
<td>Yes</td>
</tr>
<tr>
<td>2. How much olive oil do you consume in a given day (including oil used for frying, salads, out of house meals, etc.)?</td>
<td>4 or more tablespoons</td>
</tr>
<tr>
<td>3. How many vegetable servings do you consume per day?</td>
<td>2 or more (at least 1 portion raw or as salad)</td>
</tr>
<tr>
<td>(1 serving = 200g - consider side dishes as 1/2 serving)</td>
<td></td>
</tr>
<tr>
<td>4. How many fruit units (including natural fruit juices) do you consume per day?</td>
<td>3 or more</td>
</tr>
<tr>
<td>5. How many servings of red meat, hamburger, or meat products (ham, sausage, etc.) do you consume per day? (1 serving = 100-150 g)</td>
<td>Less than 1</td>
</tr>
<tr>
<td>6. How many servings of butter, margarine, or cream do you consume per day? (1 serving = 12 g)</td>
<td>Less than 1</td>
</tr>
<tr>
<td>7. How many sweet/carbonated beverages do you drink per day?</td>
<td>Less than 1</td>
</tr>
<tr>
<td>8. How much wine do you drink per week?</td>
<td>7 or more glasses</td>
</tr>
<tr>
<td>9. How many servings of legumes do you consume per week?</td>
<td>3 or more</td>
</tr>
<tr>
<td>(1 serving = 150 g)</td>
<td></td>
</tr>
<tr>
<td>10. How many servings of fish or shellfish do you consume per week?</td>
<td>3 or more</td>
</tr>
<tr>
<td>(1 serving: 100-150 g fish, or 4-5 units or 200 g shellfish)</td>
<td></td>
</tr>
<tr>
<td>11. How many times per week do you consume commercial sweets or pastries (not homemade), such as cakes, cookies, biscuits, or custard?</td>
<td>Less than 3</td>
</tr>
<tr>
<td>12. How many servings of nuts (including peanuts) do you consume per week?</td>
<td>3 or more</td>
</tr>
<tr>
<td>(1 serving = 30 g)</td>
<td></td>
</tr>
<tr>
<td>13. Do you preferentially consume chicken, turkey or rabbit meat instead of veal, pork, hamburger or sausage?</td>
<td>Yes</td>
</tr>
<tr>
<td>14. How many times per week do you consume vegetables, pasta, rice, or other dishes seasoned with sofrito (sauce made with tomato and onion, leek, or garlic, simmered with olive oil)?</td>
<td>2 or more</td>
</tr>
</tbody>
</table>

* 0 points if these criteria are not met.
### Table 2

Components of Canadian adaptation of Healthy Eating Index, range of scores and scoring criteria

<table>
<thead>
<tr>
<th>Component</th>
<th>Range of scores</th>
<th>Scoring criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequacy†</td>
<td>0 to 80 points</td>
<td>Minimum: 0</td>
</tr>
<tr>
<td>Total vegetables and fruit</td>
<td>0 to 10 points</td>
<td>Maximum: 4 to 10 servings*</td>
</tr>
<tr>
<td>Whole fruit</td>
<td>0 to 5 points</td>
<td>Minimum: 0</td>
</tr>
<tr>
<td>Dark green and orange</td>
<td>0 to 5 points</td>
<td>Maximum: 0.8 to 2.1 servings (21% of recommendation for total vegetables and fruit*)</td>
</tr>
<tr>
<td>vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total grain products</td>
<td>0 to 5 points</td>
<td>Minimum: 0</td>
</tr>
<tr>
<td>Whole grains</td>
<td>0 to 5 points</td>
<td>Maximum: 1.5 to 4 servings (60% of recommendation for total grain products*)</td>
</tr>
<tr>
<td>Milk and alternatives</td>
<td>0 to 10 points</td>
<td>Minimum: 0</td>
</tr>
<tr>
<td>Meat and alternatives</td>
<td>0 to 10 points</td>
<td>Maximum: 2 to 4 servings*</td>
</tr>
<tr>
<td>Unsaturated fats</td>
<td>0 to 10 points</td>
<td>Minimum: 0</td>
</tr>
<tr>
<td>Moderation†</td>
<td>0 to 40 points</td>
<td>Maximum: 30 to 45 grams*</td>
</tr>
<tr>
<td>Saturated fats</td>
<td>8 to 10 points</td>
<td>Minimum 7% to 10% of total energy intake</td>
</tr>
<tr>
<td>Sodium</td>
<td>8 to 10 points</td>
<td>10% to maximum 15% of total energy intake</td>
</tr>
<tr>
<td>“Other food”</td>
<td>0 to 20 points</td>
<td>Adequate intake to tolerable upper intake level</td>
</tr>
</tbody>
</table>

*according to age and sex, as specified in Canada’s Food Guide
†for adequacy components, 0 points for minimum or less, 5 or 10 for maximum or more, and proportional for amounts between minimum and maximum
‡for moderation components, 10 or 20 points for minimum or less, 0 points for maximum or more, and proportional for amounts between minimum and maximum

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**Article**

**Diet quality in Canada**

by Didier Garriguet

August, 2009
The Next Steps
C.H.A.N.G.E. Phase 2
C.H.A.N.G.E. Phase 2

Implementation and Dissemination of the CHANGE Program in Primary Care across Canada

- Working with Family MDs clinics/FHTs that are interested and have some existing infrastructure to adopt program

- Working with multiple partners for funding and to spread message for implementation in practice (government, private industry, associations, organizations, etc)

CHANGE ALBERTA, Dr. Doug Klein
- Cluster RCT of CHANGE vs. control in 16 Primary Care Networks
- Funded by Alberta Legacy Cancer Fund, CIHR & MetSC
- Cost effectiveness, patient satisfaction, post 12 months

www.changealberta.net
Metabolic Syndrome Canada Team

MetSC Team
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- Rupinder Dhaliwal, Director of Operations, CHANGE Program
- Doug Klein, Family Physician, CHANGE Alberta Principal Investigator, University of Alberta
- Caroline Rheaume, Family Physician, Laval University
- Lew Pliamm, Family Physician, Polyclinic, Toronto
- Paula Brauer, Dietetics & Epidemiology, University of Guelph
- Dawna Royall, Dietetics & Epidemiology, University of Guelph
- Angelo Tremblay, Division of Kinesiology, Laval University
- David Mutch, Nutrigenomics, University of Guelph
- Leah Gramlich, Medical Lead for Nutrition Services, Alberta Health
- Kevin Smith, President and Chief Executive Officer of St. Joseph’s Healthcare Hamilton
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- Ken Flood, President, Kitchener, ON
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CHANGE Alberta
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- Jeff Vallance, Physical Activity and Cancer, Athabasca University
- Denise Campbell Scherer, Family Physician, University of Alberta
- Madiha Mueen, CHANGE Alberta Research Assistant, University of Alberta
PCN Edmonton Example

- Changing the service delivery model to one that works more intensely with patients can help:
  - patients make life-long lifestyle changes and
  - lower health systems costs and improve Quality of Life scores

- CHANGE Alumni program includes...
  - a patient portal
  - MOVE program
  - App (CHANGE Assistant)
  - patient self-management
  - team access over a lifetime
Phase 2 Clinic Team Procedures
### The Physician’s Goals

1. **motivate** patients to make healthy lifestyle choices through nutrition and physical activity levels to improve health outcomes.

2. **support** patients’ access to resources and other members of the health care team such as nutritionists and exercise specialists.

3. Provide continuing support in the face of **ambivalence or resistance** to change, successes and relapses.

4. Use the **doctor-patient relationship** to enable behavioural changes; use lifestyle counseling to enhance the doctor-patient relationship.
**Program Overview**

**Assessment**
- Family Doctor regular check-up
  - Assesses suitability
  - Blood work for blood sugars, lipids

**Start**
- Registered dietitian and kinesiologist baseline assessments
  - Develop goals for next visits over 12 months
  - Implement individualized CHANGE plan to reverse Metabolic Syndrome

**Months 1-3**
- Weekly Follow up visits
  - Dietitian & kinesiologist
    - Assess progress
    - Modify plan and goals
    - Provide support

**Months 4-12**
- Monthly Follow up visits
  - Dietitian & kinesiologist
    - Assess progress
    - Review blood work
    - Modify plan and goals
    - Provide support
    - Advise Family Doctor

**Quarterly visits**
- Family Doctor
  - Every 3 month visits
  - Orders blood work
  - Reviews progress
  - Encourages patient to continue with program
Role of the Family MD

1. Identify the presence of the syndrome
2. Assess the suitability of the patient to follow the CHANGE program
3. Determine & review pharmacotherapy, medical conditions
4. Encourage the patient to adopt the CHANGE program
5. Interact with Dietitian and Exercise therapist about the regimen
6. Follow progress q 3 months, encourage compliance
   - Fasting blood glucose, HgA1C*
   - Triglycerides, HDL-C, LDL-C*, Total cholesterol*

* To assist with assessment, not criteria for MetS per se
Dietary Management Care Map

- Registered Dietitian (RD) at each clinic will be responsible for providing individualized dietary intervention
- Provides some structure while respecting RDs usual practice as much as possible, including group sessions, tours, etc.
- All dietetic approaches currently recommended for metabolic syndrome are to be included in the **Dietary Management Care Map**
- No special diet is being promoted other than components of the Mediterranean Diet

*Detailed training, resources & mentoring to be provided by Dr. Paula Brauer et al, University of Guelph before start of program*
Dietitian Visits

Baseline
1. Conduct a complete nutrition assessment
2. Review the basic principles of dietary intervention for MetS with an emphasis on the risk factors present
3. Engage in a joint goal setting exercise with the client to discuss and prioritize risk factors
4. Develop an individualized dietary intervention based on risk factors using components of the Mediterranean diet
5. Remove barriers to compliance as needed

Weeks 1-12: weekly follow up

Months 4-12: monthly follow up
Exercise/Fitness Program

- Exercise Specialist is responsible for the assessment, development of an individualized, graded exercise intervention.
- Tests are selected on the basis of their applicability to the physical condition of low to moderately fit individuals and are recommended by the Canadian Society of Exercise Physiology (CSEP).
- Unsupervised activity (outside of the clinic) will be encouraged.
- Attention will be paid to safety in order to prevent injuries and discomfort of any nature (certification of Exercise Physiologist by CSEP).

Detailed training & mentoring to be provided by Dr. Angelo Tremblay, Universite Laval, before start of program.
Exercise Specialist Visits

Baseline
1. Conduct a complete fitness assessment
2. Conduct aerobic and resistance training assessments
3. Develop exercise plan and set goals for patient for next visit for aerobic exercise and resistance training

Weeks 1-12: weekly follow up
Months 4-12: monthly follow up
Program Evaluation

To help MetSC to continue to evaluate the reversal of MetS through the CHANGE Program, a minimal amount of data will need to be collected:

- status of enrollment
- attendance at the Family MD, Dietitian and Exercise Specialist visits
- reversal of MetS components (includes medications)
- changes in predicted cardiovascular risk according to the PROCAM risk score (Assmann G et al Circulation. 2002 Jan 22;105(3):310)
- changes in diet and fitness levels
Suitability of clinics

- Family MD(s) must be interested in lifestyle intervention for their patients (at least ONE)
- Some level of existing funding/in-kind to support the CHANGE Program
  - Access to a registered dietitian* & willing to dedicate dietitian time
  - Access to an exercise specialist* & willing to dedicate exercise specialist time
  - Access to a gym* for patients
  - Other staffing to support the program*
- Willingness to adopt CHANGE program without alterations to key elements of the program
- Willingness to place ~50 patients on CHANGE over 1-2 years*
- Collect data/report submissions to help MetSC evaluate the reversal of MetS
- Willingness to engage in discussions around assisting MetSC expand the program beyond year initial phase*

* MetSC to engage in more discussions on these
Evidence: changing practice in primary care?

Most practices in Primary Care are “Complex interventions” involving changes at multiple levels

Delay exists in translating evidence based interventions into every day clinical practice

- Despite large body of studies, the evidence on the best implementation strategies remains inconclusive
- There is no “One size fits all”
- Strategies for implementation must be tailored to local circumstances

**BMJ Open**

Achieving change in primary care—effectiveness of strategies for improving implementation of complex interventions: systematic review of reviews

Oct 2015
How can MetSC help your clinic?

Explore ways to make the program feasible in your setting

Provide interested family health care teams with:

- Family MD, dietitian and exercise specialist toolkits
- Procedures to integrate roles of the clinic team members
- Ongoing training/assistance related to the program
- Options to maximize your existing funding to enable long term lifestyle changes in your patients
- Connect you with other family clinics implementing the program
- Tools to evaluate the reversal of metabolic syndrome in your patients
Other considerations

- some patients would be part of normal caseload
- willing to consider more group vs individual sessions, where relevant, to save staffing time
- willing to explore implementation strategies that would work locally
- direction provided if willing to write up/analyse your local results
Clinic Toolkit
1 in 5 Canadian adults has METABOLIC SYNDROME.

DO YOU HAVE:
- High blood pressure?
- High blood sugar?
- High triglycerides?
- Low levels of HDL cholesterol?
- A waist measurement greater than 40" (men) or 30" (women)?

If you answered "yes" to 2 or more of these questions, you may be at risk.

YOUR FAMILY DOCTOR CAN HELP YOU
This clinic offers the CHANGE Program, a practical diet and exercise program designed to reduce and control risk factors specifically for people with metabolic syndrome.

FIVE REASONS CHANGE WORKS:
- YOUR FAMILY DOCTOR
- A TEAM APPROACH
- PERSONALIZED PLAN
- GRADUAL STEPS
- CLOSE FOLLOW-UP OVERT 12 MONTHS

ARE YOU READY FOR CHANGE?
Learn more about metabolic syndrome and the CHANGE program at: www.MetabolicSyndromeCanada.ca

CHANGE
Chronic Health Abatement
Neatness and Gradual Exercise

METABOLIC SYNDROME?
Metabolic Syndrome (MS) is a cluster of risk factors related to increased insulin resistance that increases the risk of developing cardiovascular disease, stroke, diabetes and cancer. It is diagnosed when one has 3 of the following 5 conditions:
- High blood pressure or receiving medication
- High blood glucose or receiving medication
- High triglycerides or receiving medication
- Low HDL-Cholesterol
- Large waist circumference

Pathophysiology
The underlying pathogenesis of metabolic syndrome is complex but insulin resistance remains at its core, with the most important site being the muscle.
In the muscle, insulin resistance reduces the insertion of the glucose transporter into the cell membrane thereby reducing the entry of glucose into muscle cells.
- This reduces the phosphorylation of glucose in muscle necessary for its use.
- This leads to increased formation of glycogen for energy storage in muscle.

The inability of the muscle to take-up insulin results in reduced glucose disposal and hyperglycemia, which causes hyperinsulinemia.

Metabolic syndrome is a health crisis hiding in plain sight.
FAMILY DOCTOR PROCEDURES

Screening
Can be done by other team members in advance
- Identify patients that are likely to meet the 3 out of 5 criteria for MetS
- Assess suitability of patient
- Review suggested exclusions
- Order blood work
  - Fasting blood glucose
  - HgA1C
  - Triglycerides
  - HDL-C
  - LDL-C
  - Total cholesterol

Book Baseline visit after blood results are available

Baseline visit
- Review blood work from screening
- Take Blood Pressure readings
- Obtain Waist Circumference
- Determine if patient is eligible
- Determine if patient is ready
- Assess pharmacotherapy & medical conditions
- Encourage patient to adopt the CHANGE program
- If eligible and willing, patient starts Change Program.
  - Refer to Dietitian and Kinesiologist
  - Arrange to book a 3-month follow up visit after diet and exercise intervention starts
  - Order blood work for 1 week before 3-month visit

Follow-up visits
(Month 3, 6, 9 and 12)
(after Dietitian and Kinesiologist 12 week visit)
- Take Blood Pressure readings
- Review waist circumference reading
- Review blood work
- Review progress with diet and exercise
- Encourage patient to continue with program
- Assess medical conditions and possible reduction in pharmacotherapy
- Arrange to book follow up visits after the corresponding diet and exercise follow up visits at 6, 9 and 12 months from start of program
- Order blood work for 1 week before each follow up visit

Forms to complete:
- Family MD Baseline: Inclusion
- Family Baseline: Med history
- Laboratory
- MetS Medications

Measurement of Waist Circumference
1) Locate the top of the iliac crest
2) Position the tape in the horizontal plane around the abdomen at the top of the iliac crest
3) Fit tape snugly but do not compress the skin
4) Measure at end of normal expiration, with relaxed abdominal muscles

Suggested Blood Pressure Measurement
- Take 3 readings and average the result or use other method preferred by Family MD

The CHANGE program is an initiative of Metabolic Syndrome Canada.
You have been invited to participate in The CHANGE Program

The CHANGE program is a 1-year individualized diet and exercise program that is being offered at your Family Doctor's clinic.

The program is aimed at adults with Metabolic Syndrome.

Metabolic Syndrome is diagnosed if you have any three of the following:
- high fasting blood sugars
- high blood pressure
- high fats in your blood
- being on medication for high blood sugars or high blood fats
- having a large waistline

Studies have shown that a diet rich in fruits, vegetables, nuts, whole grains, and legumes can significantly reverse metabolic syndrome and can even reduce the risk of heart disease. Regular exercise that increases your heart rate has also been shown to prevent diabetes as well as reduce the need for medication in diabetes patients.

What are the benefits?

By the end of the 12-month program we hope to see an improvement in your health. You may have better control of your blood sugars, blood fats and blood pressure. You may experience positive benefits such as improved energy, sleep, and flexibility. There is also a chance that you may not see these benefits.

The focus of the CHANGE Program is to reduce your risk of developing diseases and it may result in improvements in your blood and waist size with or without weight loss.

Family MD visit and Progress

Keeping track of the following will help you see your progress over time

<table>
<thead>
<tr>
<th>FAMILY MD VISIT</th>
<th>DATE</th>
<th>WEIGHT</th>
<th>BLOOD PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASELINE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 MONTHS</td>
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<tr>
<td>6 MONTHS</td>
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<td>9 MONTHS</td>
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<tr>
<td>12 MONTHS</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Your dietitian is:  
NAME  
CONTACT

Your exercise specialist is: 
NAME  
CONTACT

metabolicsyndromecanada.ca
CHANGE Program Phase 2
Dietary Program Guidelines

For use by the CHANGE Registered Dietitian

The CHANGE Program is an initiative of

MetSC

DRAFT July 28, 2016

CHANGE Project: Canadian Health Advanced by Nutrition and Graded Exercise

Supplementary Diet Counselling Resource
For Metabolic Syndrome

- Fact Sheets
- Complete Resource List

Revised and Updated July 2016

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WHAT IS METABOLIC SYNDROME?

Did you know? Nearly 1 in 5 Canadians have metabolic syndrome. For those 65 years or older, the risk increases to 2 out of every 5 adults.

Do you have metabolic syndrome?

Metabolic syndrome is a group of conditions that raise your risk of health problems like heart disease, stroke, and diabetes. If you have 3 or more of the 5 conditions below, you have metabolic syndrome. Circle the conditions you have.

1. Visceral Obesity
   Excess fat around your waist, or having an “apple-shaped” body.

2. Low HDL-Cholesterol
   HDL is the “good” cholesterol in your blood and the bad cholesterol and fat. You want HDL to be high. Good levels for HDL are >1.0 mmol/L for men and >1.3 mmol/L for women.

3. Insulin Resistance
   You know insulin is not being used well by your body if you have a high fasting blood sugar (>6.6 mmol/L or more) or are on medication for this.

4. High Triglycerides
   Triglycerides are a type of bad fat in the blood. Your triglycerides are high if your levels are >1.7 mmol/L or you are on medication for this.

5. Hypertension
   High blood pressure is when your top reading is higher than 130 or bottom reading is higher than 85, or you are on medication for this.

What do I do if I have metabolic syndrome?

Learn how to improve metabolic syndrome and prevent the onset of diseases by following The CHANGE Program. For more details, contact: MetSC

EATING THE MEDITERRANEAN WAY

How should I eat to improve my health?

Many of the effects of metabolic syndrome can be reversed by eating the Mediterranean way. This eating plan helps you to eat more fruits and vegetables, extra-virgin olive oil, nuts, beans, fish, and poultry. It will also help you to eat smaller amounts of red meat, processed meats, and baked goods like doughnuts, cakes and cookies.

Below are the basic principles of a Mediterranean way of eating. Check off the principles you would like to start this week:

**DO EVERY DAY**

- Use extra virgin olive oil as your main source of fat for cooking, salad dressing, and in salads. Try to consume up to 5 tablespoons (80 ml) per day based on your weight.
- Eat at least 4 servings of vegetables every day with at least 2 of these servings as raw vegetables or in a salad.
- Eat at least 3 pieces of fresh or frozen fruit every day. Limit fruit juice.
- Choose chicken and turkey (skinless) more often than red meat or processed meat.
- Choose whole grains instead of white flour, bread, and pasta.
- Drink less than 1 sugar drink per day. Sugar drinks include pop, soft drink, multi-flavored drinks, sports drinks, and energy drinks.
- Eat less than 1 tbsp (15 ml) of butter, cream, or hard (hydrogenated) margarine.
- Drink alcoholic drinks only 1 serving a day and choose wine (50 or 150 ml).

**DO EVERY WEEK**

- Three times a week: Eat one serving of nuts, including shelled nuts and peanuts.
- Three times a week: Eat one serving of legumes (kidney beans, white or black beans, lentils, split peas, chickpeas).
- Three times a week: Eat one serving of fish or seafood. Ton that is naturally very low in fat no more than 2.5 oz (50 g) per week.
- Twice a week: Eat pasta sauce made by simmering extra-virgin olive oil with garlic, onions, or garlic and tomato sauce.
- Three times a week: Limit red meat to less than 100g (3-4 oz) per day or 600 g (1-2 lbs) per week.
- Limit processed meats like ham, bacon, sausage or luncheon meats to once a week.
- Limit store-bought sauces, pastes, salad dressings, and condiments. Choose whole grain, low-sodium, and low-salt snacks to less than three times per week.
- Limit fast food restaurants and frozen processed foods such as pizza, takeout, and fast food restaurants.

What is 1 serving?

**Vegetables**
- 1 cup (125 ml) fresh, frozen or canned
- 1 cup raw leafy vegetables

**Legumes**
- Includes beans, lentils, split peas, soybeans and their flour.
- 1 cup (175 ml) cooked

**Nuts**
- 1 cup (40 ml) shelled
- 2 tbsp nuts butter like peanut butter

**Fruits**
- 1 cup (125 ml) fresh or frozen fruit
- 1 cup (250 ml) 100% fruit juice — limit to 1 cup per day

**Rich/Seafood**
- 100 g (3-4 oz) of fish
- 200 g (6-8 oz) of chicken
- 1 1/4 cup of seafood
- 1 1/4 cup of fish
- 200 g (6-8 oz) of chicken
- 1 1/4 cup of seafood
CHANGE Program Phase 2
Physical Activity Program Guidelines

For use by the CHANGE Program Exercise Specialist

The CHANGE Program is an initiative of

MetSC

CHANGE
Canadian Health Advanced by Nutrition and Graded Exercise

Convert Speed: kph = mph

Speed = mph
Steady-State Heart Rate = bpm
Age = years
Gender =

\[ \text{VO}_2\text{max} = \text{ml/(kg*min)} \]
Aerobic Fitness Score =
Phase 2 Program Evaluation
Worksheets and Instructions

MetSC
METABOLIC SYNDROME CANADA

Progress Report template
by
Grant Recipient/Principal Investigator
Dr.
Name of Clinic

Date of Report _________ for period QX 201X

Instructions:
1. Dr________ delegate to complete report at end of each quarter as per contract/agreement with MetSC
2. Report is to be submitted to Rupinder Dhillon, Director of Operations MetSC
3. Payment to be forwarded by MetSC upon satisfactory review/approval by MetSC

Version September 2, 2010
For years, you’ve told patients to eat well and exercise.

The warning signs of metabolic syndrome will be all too familiar: high blood glucose levels, high blood pressure, high triglycerides, low HDL, and a large waist circumference. One in five Canadians has three or more of these conditions, and can be diagnosed with metabolic syndrome.

Metabolic syndrome is a predictable, preventable condition. The latest research demonstrates its links to specific genetic traits, and the significantly increased risk patients face of developing chronic diseases including hypertension, cardiovascular disease, strokes, diabetes and their complications.

The Progression of MetS
1. Genetic trait
2. Accumulated body fat
3. Develop MetS
4. Progression to disease (ex. diabetes, CVD, hypertension, etc.)

“A growing body of medical evidence shows that the progression of metabolic syndrome is the best predictor of pervasive, chronic conditions, including diabetes, cardiovascular disease and hypertension. Family medicine clinics are the optimal means to address metabolic syndrome early, through implementing a closely monitored and manageable diet-exercise lifestyle intervention program for patients.”

— Dr. Khursheed Jeejeebhoy, Emeritus Professor of Medicine at the University of Toronto, and Director of Nutrition Support for St. Michael’s Hospital in Toronto
Questions?

Contact Rupinder Dhaliwal at Rupinder.Dhaliwal@metsc.ca

www.metabolicsyndromecanada.ca or www.metsc.ca

Download brochure at www.metsc.ca/brochure