More than eighty years ago, a Swedish physician by the name of Eskil Kylin became attentive to the frequent association of hyperglycemia, hypertension and elevated serum uric acid and described it as the “hypertension-hyperglycemia-hyperuricemia syndrome.” In the late 1980s, Gerald Reaven coined the concept of the so-called “Syndrome X,” which he defined as the resistance to insulin-mediated glucose uptake, impaired glucose tolerance, hyperinsulinemia, high levels of very low-density lipoproteins (VLDL) and triglycerides, low levels of high-density lipoproteins (HDL), and hypertension. Interestingly, Reaven did not mention central obesity, a condition which already in 1947 was described by a French physician, Jean Vague, who distinguished the “android” – apple shape – form from the “gynaecoid” – pear shape – form of obesity. Vague observed that there is a connection between android obesity and the development of diabetes, hypertension, gout and atherosclerosis, indicating that the two forms of obesity have a different role as a risk factor for cardiovascular disease.

Today, the metabolic syndrome or insulin resistance syndrome is described as a constellation of metabolic abnormalities including glucose intolerance (type-2 diabetes, impaired glucose tolerance, or impaired fasting glycemia), insulin resistance, abdominal obesity, dyslipidemia (notably hypertriglyceridemia and decreased levels of HDL), and hypertension. Currently, there are at least half a dozen different definitions of the metabolic syndrome, all of which are based on consensus rather than scientific evidence. The three most commonly used definitions of this syndrome are those proposed by the World Health Organization (WHO), the National Cholesterol Education Program – Adult Treatment Panel III (NCEP-ATP III), and the newly introduced (April 2005) International Diabetes Federation (IDF) criteria.
The metabolic syndrome has been the topic of much discussion in clinical and research settings in Canada and throughout the world. Much of this is due to the ongoing debate regarding what the metabolic syndrome entails (i.e., providing an inclusive definition) and how, if at all, the classification of patients with the metabolic syndrome can help in patient management. The notion of the metabolic syndrome is based on the realization that various factors (obesity, dyslipidemia, hyperglycemia and hypertension) often cluster in the same patient, and the presence of the clustering of these factors is associated with increased risk for diabetes and cardiovascular disease. However, the controversies surrounding the metabolic syndrome in clinical care include the myriad of definitions for the metabolic syndrome and recent arguments that the classification of the metabolic syndrome does not provide any additional information above and beyond that of the component risk factors. In addition, given the high prevalence of the metabolic syndrome in the Canadian population, the ideal setting for the delivery of management and prevention strategies is not clear, as the clinical setting will only reach a small number of those individuals affected.

In this issue, there are a number of articles related to the metabolic syndrome from some of the premier experts in the country. To begin with, George Fodor outlines the various definitions of the metabolic syndrome and discusses the merits of each. This is followed by Peter Katzmarzyk’s article in which he discusses the important role that physical activity and physical fitness have in the prevention of the metabolic syndrome. A fitting complement to these two articles is Darcye Cuff and Michael Vralik’s outline of lifestyle and pharmacological therapies for managing the patient with metabolic syndrome.

With the increasing prevalence of obesity in children and adolescents, we are also seeing an increase in the prevalence of the metabolic syndrome in these populations. Geoff Ball and colleagues do an excellent job of presenting the current state of discussion of the metabolic syndrome in children, outlining existing definitions and the pros and cons.

Bringing us back to cardiac rehabilitation, Dana Riley and Sherry Grace report the results of a recent study investigating the role of discharge summaries from cardiac rehabilitation programs to primary care. The results of this study will be helpful for all programs that include discharge summaries following patient completion. As usual, our regular features: Program Profile, Research in Progress, References and Reviews, and Conference Dates, are full of information useful to us all.

Lastly, the CICRP editorial staff would like to acknowledge the tireless effort and contributions of Tiffany Blair, CACR Board member and Communications and CICRP Committee Chair, who over the past 6 years has served on the editorial board and recently as co-editor for CICRP. Tiffany steps down to continue work on her many other endeavours. Tiffany was instrumental for her vision in the transformation of the CACR Newsbeat into CICRP. Her dedication and attention to detail will be greatly missed and we all wish her well.

We hope you enjoy this issue and please let us know if you have any suggestions for future issues. Also, if you are interested in participating in the CICRP editorial board, feel free to contact us.
are several differences among these definitions, particularly between the WHO and NCEP-ATP III algorithms. For example, the NCEP-ATP III definition does not include insulin resistance obviously assuming that those individuals who fulfill 3 or more criteria of this definition will also be insulin resistant. On the other hand, the NCEP-ATP III definition highlights the importance of abdominal obesity estimated by the use of waist circumference. The new IDF definition takes abdominal obesity a step further by proposing different waist circumference cut-points for various ethnic groups. Not only does this move take into consideration ethnic differences with respect to central obesity, but it also endeavours to facilitate the comparison and impact of metabolic syndrome between countries.\(^{12}\)

A person diagnosed with the metabolic syndrome has a 2-3 fold increase in CVD risk and an almost 5-fold increase in the risk of developing T2DM.\(^{12}\)

Why all this interest in the metabolic syndrome? It is a widely accepted notion that the metabolic syndrome is an important risk factor for the development of cardiovascular disease (CVD)\(^{9,13-17}\) and type-2 diabetes mellitus (T2DM).\(^{9,13}\) Available data suggests that a person diagnosed with the metabolic syndrome has a 2-3 fold increase in CVD risk\(^{13-15}\) and an almost 5-fold increase in the risk of developing T2DM.\(^{13}\)

Using the NCEP-ATP III criteria, the overall prevalence of the metabolic syndrome is estimated in the U.S. at 22% (24% after age adjustment) with an age-dependent increase in the age group between 60-69 yrs to about 43%.\(^{18}\) Based on a nationally representative sample from the Canadian Heart Health Survey (1986-1992), the prevalence of metabolic syndrome was 17.0% in men and 13.2% in women.\(^{19}\) According to a more recent investigation which consisted of a multi-ethnic sample in Canada, it was found that the prevalence of the syndrome was 25.8% and varied substantially by ethnic group: 41.6% among Native Indians, 25.9% among South Asians, and 22.0% among Europeans as compared with 11.0% among the Chinese.\(^{20}\)

Some highly-regarded scientific bodies, like the American Diabetic Association and the European Association for the Study of Diabetes, have come forward and suggested that the entity called the “metabolic syndrome” does not exist at all, and that the list of cardiovascular risk factors which are considered to be a part of the metabolic syndrome add no further value as a cluster in predicting future cardiovascular risk than the sum of its individual components.\(^{21}\)

Apart from various theories and speculations, there are some facts that are well-supported by clinical and physiological observations. Central obesity is a condition that is characterized by an increase of visceral fat. Visceral fat has different properties as compared with subcutaneous fat. In particular, it releases large quantities of free fatty acids into the hepatic vein, which in turn stimulates an overproduction of very low-density lipoproteins resulting in an atherogenic lipid profile.\(^{22}\) Availability of fatty acids for energy production also leads to a reduced utilization of glucose, a phenomenon which is believed to be linked to the increase of insulin resistance.\(^{22}\) However, the exact mechanism of the development of insulin resistance is still unclear.

At present, specific therapeutic approaches concerning metabolic syndrome are limited. The NCEP-ATP III recommendations are to:

1) Treat the underlying factors of the syndrome, as well as encourage weight reduction and increase in physical activity, and
2) Begin drug intervention with clearly defined targets for blood pressure, weight, and levels of triglycerides, HDL-cholesterol and hemoglobin A\(^1_c\).

Use of medications in the thiazolidinedione class improves insulin resistance,\(^{23-25}\) but has not yet been shown to reduce cardiovascular morbidity or mortality.

The concept of metabolic syndrome itself is in a fluid state and there is a lack of clarity regarding its definition.\(^{26}\)

Conclusions

First, we have to be aware of the fact that the concept of metabolic syndrome itself is in a fluid state and that there is a lack of clarity regarding its definition. Which of the presently used criteria have the best predictive value and are most useful for everyday clinical management awaits data from well-designed trials. Second, it is still debated as to whether the components of the metabolic syndrome have an underlying unifying factor. For example, is insulin resistance the key component causing the clustering of all the other factors which are being put together in the concept of this syndrome? The question is also as
to whether all components of the metabolic syndrome are presently covered. Interestingly enough, the first observations regarding this syndrome stressed the role of serum uric acid, a factor which is completely ignored by all modern, internationally agreed definitions. Third, is the cardiovascular risk of metabolic syndrome greater than the sum of its individual components? Fourth, it is obviously prudent to treat individual risk factors as well as attempt to reduce overweight and increase physical activity; however, we should be aware of the fact that interventions aiming to reduce cardiovascular risk through behavioural modification in real-life situations have limited success.

There is an urgent need to carry out further studies which would assess the relative contribution of the presence of metabolic syndrome to the classical Framingham risk engine and implement therapeutic trials specifically aimed at this condition.

Table 1. Diagnostic criteria of the three most common metabolic syndrome definitions

<table>
<thead>
<tr>
<th>WHO*</th>
<th>NCEP-ATP III</th>
<th>IDF10,11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperinsulinemia (defined as the upper quartile of a measure of insulin resistance in the non-diabetic population) or fasting plasma glucose ≥6.1 mmol/L or diabetes mellitus diagnosis</td>
<td>Any 3 of the following: • BP ≥140/90 mmHg or medication • Dyslipidemia (TG ≥1.7 mmol/L or HDL &lt;0.9 mmol/L for men and &lt;1.0 mmol/L for women) • Obesity (BMI &gt;30 kg/m² or WHR &gt;0.9 for men and &gt;0.85 for women) • Microalbuminuria (excretion rate ≥20 ug/min)</td>
<td>Central obesity WC* – ethnicity-specific Plus any 2 of the following: • TG &gt;1.7 mmol/L or specific treatment for this lipid abnormality • HDL &lt;1.0 mmol/L for men and &lt;1.3 mmol/L for women or specific treatment for this lipid abnormality • BP ≥130/85 mmHg or medication • Fasting glucose ≥5.6 mmol/L or diabetes mellitus diagnosis</td>
</tr>
<tr>
<td>* Europids Men ≥94 cm Women ≥80 cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: BP = blood pressure; TG = triglycerides; HDL = high-density lipoproteins; BMI = body mass index; WHR = waist-hip ratio; WC = waist circumference.

References:
Physical Activity in the Prevention and Treatment of the Metabolic Syndrome
Peter T. Katzmarzyk, PhD, School of Physical and Health Education and Department of Community Health and Epidemiology, Queen’s University

The metabolic syndrome (MetS) is a cluster of risk factors, including abdominal obesity, dyslipidemia, hypertension and insulin resistance that predisposes towards the development of cardiovascular disease, type 2 diabetes and premature mortality. The limited information available suggests that the prevalence of the MetS in Canada is high, increases with age and varies considerably across ethnic groups. Thus, the prevention and treatment of MetS is a public health priority.

The use of therapeutic lifestyle therapies, including increases in physical activity and reduction of body weight, are indicated as important strategies for the prevention and treatment of MetS. However, the degree to which physical activity recommendations are being integrated into primary care practice is unknown. The purpose of this CICRP article is to outline and highlight the role of physical activity in the prevention and treatment of MetS.

Prevention

There is abundant evidence that physical activity has an important role to play in the prevention of MetS. Several studies have demonstrated a significant cross-sectional relationship between levels of physical activity or physical fitness and MetS. In a large, representative sample of Canadians, the odds of having the metabolic syndrome was 27% lower in physically active versus sedentary men and women. While no claim can be made for a cause-and-effect relationship based on these observations, these studies highlight the relationship between physical activity and MetS.

“...the odds of having the metabolic syndrome was 27% lower in physically active versus sedentary men and women.”

There is now some evidence from prospective cohort studies to support the association between physical activity or physical fitness and the development of MetS. The most recent study was conducted by LaMonte and colleagues from the Cooper Institute. They assessed physical fitness and the risk of incident MetS in 9,007 men and 1,491 women from the Aerobics Center Longitudinal Study who were free of MetS at baseline. Cardiorespiratory fitness was measured using a graded exercise test on a treadmill in all participants. After an average of 5.7 years of follow-up, 14.9% of the men...
and 3.8% of the women developed MetS. Figure 1 presents the relative risks of developing MetS from this study. There was an inverse gradient of risk across incremental thirds of cardiorespiratory fitness in both men ($p<0.001$) and women ($p=0.01$), after statistically adjusting for potential confounders.

![Figure 1](image)

**Figure 1.** Cardiorespiratory fitness and incident metabolic syndrome in the Aerobics Center Longitudinal Study.

In addition to the cross-sectional and prospective observational studies described above, the Diabetes Prevention Program in the United States examined the effectiveness of lifestyle modification (including 150 minutes of weekly physical activity) on the development of MetS. Using a randomized, controlled clinical trial, the investigators compared the use of metformin and lifestyle modification on the incidence of MetS among 1,523 participants without MetS at baseline. Over three years of follow-up, the incidence of MetS was 41% and 17% lower in the metformin and lifestyle modification groups, respectively, by comparison to placebo. Taken together, the weighted evidence from these studies suggests that physical activity has an important role to play in the primary prevention of MetS.

**Treatment**

The reduction of cardiovascular disease risk is a hallmark adaptation to physical activity. Over the last several decades, many studies have documented the role of physical activity in the reduction of individual cardiovascular disease risk factors, including blood lipids, blood pressure and insulin resistance. However, far fewer studies have examined the role of physical activity in reducing several risk factors simultaneously, or in reducing the prevalence of MetS per se.$^{25,26}$ A study we conducted among participants in the HERITAGE Family Study sought to determine the utility of physical activity in the treatment of MetS.$^{24}$ At baseline, 105 people had MetS, defined according to the U.S. National Cholesterol Education Panel.$^{13}$ These participants underwent supervised exercise training (3 times per week) for 20 weeks on a cycle ergometer, in which they started at 55% of their maximal aerobic capacity for 30 min per session and increased to 75% of their capacity for 50 min per session for the final 6 weeks of the program. At the conclusion of the exercise training program, 32 of the 105 participants no longer had MetS (30% of the initial sample). The Diabetes Prevention Program in the United States has also examined the effects of metformin and lifestyle modification on the resolution of MetS.$^{23}$ Among 1,711 participants at baseline who had MetS, 18% of the placebo group, 23% of the metformin group, and 38% of the lifestyle group no longer had MetS. The results of these two intervention studies highlight the importance of physical activity as a component of a healthy lifestyle in the treatment of MetS, which has been shown to be superior to pharmacotherapy (metformin treatment).

Another important question is whether physical activity or fitness can play a role in reducing health risks among people who have MetS. We examined this issue in 19,223 men from the Aerobics Center Longitudinal Study in collaboration with colleagues from the Cooper Institute.$^{9}$ We found a significant association between MetS and mortality in men over 10 years of follow-up, whereby men with MetS had an 89% higher risk of dying from cardiovascular disease by comparison to healthy men. However, the risk associated with MetS was significantly lower after the inclusion of cardiorespiratory fitness as a covariate (reduced to 23%). Further, the relative risk of cardiovascular disease mortality among physically fit men was significantly lower in men both with and without MetS, after statistical adjustment for potential confounders (Figure 2). These results suggest that moderate-to-high levels of physical fitness provide significant protection from premature mortality, even in men with established MetS.

“...moderate-to-high levels of physical fitness provide significant protection from premature mortality, even in men with established [metabolic syndrome].”
Conclusions

The majority of Canadians live a largely sedentary existence. Modern technology has allowed us to engineer physical activity out of our everyday lives, and an effort is required to replace sedentary pursuits with more active ones. There is clear evidence that physical activity prevents the development of MetS, and also has a role to play in its treatment. This line of evidence provides further rationale for a more prominent role for physical activity counseling by health care providers in the clinical setting.

References:

Metabolic syndrome has been shown to increase the risk of cardiovascular disease 1.5–3 fold, and diabetes 5-fold.1 The major underlying risk factors for the metabolic syndrome are obesity and insulin resistance, which are followed by the appearance of multiple risk factors, and may culminate in the development of type 2 diabetes, cardiovascular disease and the well-established complications of these diseases.2 Prevalence estimates of the metabolic syndrome are 24% in U.S. adults, and 45% in older adults (50–70 years of age) using the NCEP criteria.3 Canadian estimates suggest that the metabolic syndrome exists in 17% of Canadians.4 As the metabolic syndrome also includes risk factors that are not commonly identified in clinical practice, e.g. prothrombotic and proinflammatory states, the actual risk associated with the metabolic syndrome is even greater than the sum of its parts.2 Therefore, aggressive management of the metabolic syndrome is warranted.

In recent years several expert groups have published diagnostic criteria to be used in clinical practice to identify patients with the metabolic syndrome. Notable definitions have included reports from the World Health Organization (WHO),5 the European Group for Study of Insulin Resistance (EGIR),6 the National Cholesterol Education Program – Adult Treatment Panel III (NCEP-ATP III),7 and most recently, statements from the American Heart Association/National Heart, Lung and Blood Institute (AHA/NHLBI),8 and the International Diabetes Federation.9 Despite historical variations between the various definitions, it seems the most recent definitions of the metabolic syndrome as described by the International Diabetes Federation (IDF) and the AHA/NHLBI have largely been harmonized (Table 1). These definitions agree on the central features of the metabolic syndrome including glucose intolerance, obesity, hypertension and dyslipidemia, although with variations in emphasis. Elevated waist circumference is a prerequisite of the IDF definition, and the cut-off is 6-8 cm lower as compared to the AHA/NHLBI definition. Both definitions allow for variation in waist circumference cut-offs with respect to ethnic origin. Either or both definitions are easily applicable in a clinical setting, and encourage the recognition of increased cardiovascular disease and diabetes risk and promote implementation of proactive treatment strategies.

Clinical management of the Metabolic Syndrome

The primary goal in clinical management of the metabolic syndrome is to reduce risk for atherosclerotic cardiovascular disease and type 2 diabetes. The emphasis in the management strategy is to mitigate the underlying risk factors of obesity, physical inactivity, and atherogenic diet through lifestyle changes. If overall cardiovascular risk is high enough, drug therapy for individual risk factors may be considered concomitant with lifestyle therapy (see Pharmacological Therapy below).

Lifestyle Therapy

Lifestyle modification, including weight loss, increased physical activity, and an anti-atherogenic diet, is the primary therapeutic goal for treatment of the metabolic syndrome (Table 2).4 Lifestyle intervention has the potential to ameliorate all the features of the metabolic syndrome, yet is underutilized in routine practice. Initiation of lifestyle therapy early in the syndrome can delay the progression and/or severity of risk factor development and the need for pharmacological therapy. Drug therapy used alone does not completely reduce risk, and lifestyle therapies provide a multifaceted approach to reduce this residual risk.10 Once metabolic syndrome is diagnosed, lifestyle therapies should be introduced, reinforced, and monitored.

“Lifestyle intervention has the potential to ameliorate all the features of the metabolic syndrome, yet is underutilized in routine practice.”

Body fat should be reduced and maintained via a caloric deficit of 500–1,000 calories per day, through a combination of reduced intake and increased expenditure (physical activity). A weight reduction of 7–10% over 6–12 months will reduce the severity of most, or all of the metabolic risk factors.9

Physical activity is a component of successful weight loss and weight loss maintenance programs. Physical activity also exerts independent beneficial effects on metabolic risk factors and overall cardiovascular disease risk. Public health recommendations suggest 30 minutes of accumulated...
moderate-intense activity on most or all days of the week for reduction of risk for disease. However, recent guidelines encourage 60-90 minutes of moderately brisk activity if weight loss or weight maintenance is a goal. Greater amounts of activity are associated with greater health benefits, and can be achieved through a combination of moderately brisk activities (e.g. brisk walking, jogging, and swimming), increased activities of daily living (e.g. gardening, walking breaks at work) and reduced sedentary activities (e.g. television watching, computer time).

There are several dietary features beyond calorie reduction that are also important for effective lifestyle treatment. Total fat intake is recommended to remain within 25-35% of energy intake, as higher or lower fat intakes are associated with exacerbation of lipid profiles. Low intake of saturated fat (<7% of calories) and minimal trans fat intake is encouraged. Within the suggested overall fat intake, sources should include monounsaturated, polyunsaturated and omega-3 containing foods. Dietary cholesterol, salt, and simple sugars should be reduced, with a greater emphasis on high fibre containing foods (whole grains, fruit and vegetables, and meat alternates).

These changes in eating and activity patterns are most successfully achieved through behavioural change strategies. Multimodal strategies appear to work best, and greater weight loss is achieved with greater intensity (i.e. number of contacts and duration) of the intervention. Weight loss is most likely maintained if behavioural intervention is continued over the longer term. Changes in lifestyle behaviour can be achieved either in a group setting or individual basis, although the former has the advantage of lower cost. Some effective lifestyle intervention strategies are outlined in Table 3.

### Pharmacological Therapy

Initiation of pharmacological treatment in patients with the metabolic syndrome must be based on the evaluation of global cardiovascular risk using the standard risk assessment tools. As the Framingham risk score does not take into account all risks associated with the metabolic syndrome, the Canadian guidelines suggest increasing the calculated risk by one category when the metabolic syndrome is present. Thus, all metabolic syndrome patients with the calculated Framingham risk greater than 10% should be considered candidates for pharmacological treatment if not achieving target levels for individual risk factors.

Specific pharmacotherapy of the metabolic syndrome does not exist. Therefore, the individual components of metabolic syndrome should be treated according to the guidelines of expert societies. The selected drug should not only effectively improve the intervened measure but also possess neutral, or beneficial impact on the other metabolic syndrome components. What are the first-line pharmacological options in patients with the metabolic syndrome?

**Obesity**

There are currently two effective pharmacological treatments that should be considered in patients with obesity resistant to the lifestyle measures. Orlistat (Xenical™) is a selective blocker of pancreatic lipase in the intestine causing fat malabsorption. It has been shown not only to effectively reduce weight but also significantly improve glucose tolerance and dyslipidemia. Another option is sibutramin (Meridia™), which has also been successfully used in patients with metabolic syndrome. However, pharmacological treatment of obesity must be considered adjunct to the necessary lifestyle changes.

**Dyslipidemia**

Lipid lowering drugs are indicated in all metabolic syndrome patients who are not at their lipid targets. Based on the results of recently published clinical trials, statins have been recommended as the hypolipidemic therapy of choice in patients with the metabolic syndrome. If patients do not reach target with statin therapy, a combination of lipid lowering drugs may be necessary. Despite the negative results of a recently published FIELD trial, fenofibrate can be considered a suitable option in patients on statin treatment with persistent hypertriglyceridermia and low HDL levels. A combination of statin and niacin is another alternative. Even in patients with diabetes, no clinically relevant deterioration in glycemic control has been documented. Ezetimibe can be used either in combination or as a monotherapy in those intolerant to other lipid lowering medications.

**Hypertension**

Angiotensin-converting enzyme inhibitors (ACEIs) effectively lower blood pressure and provide the advantages of decreasing insulin resistance, offer nephroprotection and direct antiischemic effects. In those intolerant to ACEIs, angiotensin receptor blockers (ARBs) should be considered.
Hyperglycemia
In those with impaired glucose tolerance (IGT) or type 2 diabetes, the pharmacological treatment must be selected to target one of the principal components of the metabolic syndrome (i.e. insulin resistance). Metformin and glitazones (thiazolidinediones) are the two medications fulfilling this criterion. Both of them have been shown to effectively improve glucose control and favourably influence plasma lipids. Clinical studies also showed they can prevent or delay the onset of diabetes.21,22

Antiplatelet Therapy
All patients at high risk for cardiovascular disease should be administered low-dose aspirin. This is of particular importance for patients with the metabolic syndrome who have increased thrombogenic susceptibility. The most recent guidelines for metabolic syndrome management suggest low-dose aspirin in these patients who are at moderate or high cardiovascular risk as an attractive therapeutic option to lower vascular events.4

“Drug therapy may be considered based on overall risk category, and implemented according to current medical guidelines concomitantly with a lifestyle program.”

Conclusion
The metabolic syndrome represents a collection of features that increase risk for cardiovascular disease and type 2 diabetes. The definition, criteria and diagnostic value of metabolic syndrome will continue to be developed and refined, but the treatment strategy is clear. Lifestyle therapy that addresses abdominal obesity, physical inactivity and an atherogenic diet should be implemented, supported and monitored. Drug therapy may be considered based on overall risk category, and implemented according to current medical guidelines concomitantly with a lifestyle program.

Table 1. The American Heart Association/National Heart, Lung and Blood Institute (AHA/NHLBI) and the International Diabetes Federation (IDF) criteria for the diagnosis of the metabolic syndrome

<table>
<thead>
<tr>
<th>AHA/NHLBI (2005)*</th>
<th>IDF (2005)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any 3 of 5 features listed constitute diagnosis of the metabolic syndrome</td>
<td>Meeting the waist circumference criteria is required, plus any 2 of the other features, for diagnosis of the metabolic syndrome</td>
</tr>
<tr>
<td>Waist circumference ≥102 cm in men, ≥88 cm in women</td>
<td>Waist circumference ≥94 cm for men, ≥80 cm for women of European, Middle Eastern or African origin</td>
</tr>
<tr>
<td>94-101 cm in men or 80-87 cm in women of white, black, or Hispanic origin; may benefit from life habit changes due to a strong genetic contribution to insulin resistance</td>
<td>≥90 cm for men, ≥80 cm for women of S. Asian, South/Central American, or Chinese origin</td>
</tr>
<tr>
<td>≥90 cm in men, ≥80 cm in women of Asian origin may be appropriate</td>
<td>≥85 cm for men, ≥90cm for women of Japanese origin</td>
</tr>
<tr>
<td>Triglycerides ≥1.7 mmol/L or on drug treatment for elevated triglycerides</td>
<td>Triglycerides ≥1.7 mmol/L or specific treatment for this lipid abnormality</td>
</tr>
<tr>
<td>HDL cholesterol &lt;0.9 mmol/L in men &lt;1.1 mmol/L in women, or drug treatment for reduced HDL-C</td>
<td>HDL cholesterol &lt;1.0 mmol/L in males and &lt;1.3 mmol/L in females, or specific treatment for this abnormality</td>
</tr>
<tr>
<td>Blood pressure ≥130 mm/Hg systolic or ≥85 mm/Hg diastolic or on antihypertensive drug treatment in a patient with a history of hypertension</td>
<td>Blood pressure ≥130 mm/Hg systolic or ≥85 mm/Hg diastolic</td>
</tr>
<tr>
<td>Fasting blood glucose ≥5.5 mmol/L or on drug treatment for elevated glucose</td>
<td>Fasting blood glucose ≥5.6 mmol/L or previously treated type 2 diabetes</td>
</tr>
</tbody>
</table>

Table 2. Goals for lifestyle therapy

<table>
<thead>
<tr>
<th>Lifestyle Risk Factor</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Obesity</td>
<td>reduce body weight by 7-10% of baseline during a 6-12 month period</td>
</tr>
<tr>
<td>Physical Inactivity</td>
<td>1. 30-60 minutes of regular moderate-intense activity (e.g. brisk walking) most days</td>
</tr>
</tbody>
</table>
Table 2. (cont’d)

<table>
<thead>
<tr>
<th>Physical Inactivity (cont’d)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Include daily lifestyle activities, reduce sedentary activities</td>
</tr>
<tr>
<td>3.</td>
<td>Encourage inclusion of resistance training 2 days/week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Atherogenic Diet</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Limit total fat intake to 25-35% of total calories</td>
</tr>
<tr>
<td>2.</td>
<td>Reduce intake of saturated fat (&lt;7% of energy), trans fat, and cholesterol</td>
</tr>
<tr>
<td>3.</td>
<td>Remaining fat should consist of mono-unsaturated, poly-unsaturated, &amp; omega-3 fatty acids</td>
</tr>
<tr>
<td>4.</td>
<td>Appropriate use of high fibre foods</td>
</tr>
<tr>
<td>5.</td>
<td>Limit intake of simple sugars and salt</td>
</tr>
</tbody>
</table>

Table 3. Lifestyle intervention strategies

<table>
<thead>
<tr>
<th>Goal-setting</th>
<th>Setting achievable, realistic short-term goals, with regular evaluation and revision.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-monitoring</td>
<td>Keeping weight, food and activity records to raise awareness of current eating and exercise habits, and to provide a tool for evaluation and feedback.</td>
</tr>
<tr>
<td>Problem solving around barriers</td>
<td>Identifying barriers to goals, e.g. eating out and late-evening snacking, and developing strategies to work around these barriers.</td>
</tr>
<tr>
<td>Cognitive restructuring</td>
<td>Moderating unrealistic goals about weight loss and body image, reducing self-defeating thoughts and feelings, and using self-affirming statements.</td>
</tr>
<tr>
<td>Preventing relapse</td>
<td>Anticipating lapses in lifestyle change and practicing coping strategies to get back on track.</td>
</tr>
<tr>
<td>Social support</td>
<td>Involving family and friends to maintain motivation and provide positive reinforcement.</td>
</tr>
<tr>
<td>Contracting</td>
<td>Writing down 1 or more realistic short-term goals with a signature, which serves as a commitment.</td>
</tr>
</tbody>
</table>

References:
19. Simons L, Tonkon M, Masana L. Effects of ezetemibe added to ongoing statin therapy on the lipid profile of hypercholesterolemic patients with diabetes mellitus or metabolic syndrome. *Curr Medical Res Opinion*
Metabolic Syndrome in Children and Adolescents
Geoff DC Ball,1 Paul W Franks,2 Terry T-K Huang3

Introduction

The metabolic syndrome (MetS) is a cluster of risk factors that is thought to predict the development of several chronic diseases including cardiovascular disease (CVD), type 2 diabetes, non-alcoholic liver disease, renal disease and some forms of cancer.1-4 In general, the syndrome is characterized by central obesity, dyslipidemia, high blood pressure and glucose intolerance. Currently, standard definitions of the MetS (typically defined by the presence of ≥3 of the above risk components) exist for adults.1,5,6 However, a universal definition of the syndrome for children and adolescents is not available. Many pediatric studies employ or adapt adult definitions of the MetS, but there is considerable variability with regards to the individual risk factors and cutoffs used. “…a universal definition of the [metabolic] syndrome for children and adolescents is not available.”

The MetS is increasingly prevalent and parallels the emergent epidemic of overweight and obesity among children and adolescents in many Western countries.7-10 While many studies have documented the presence of the MetS in boys and girls, the impact of the syndrome is greatest among the overweight. For example, Cook et al.11 reported that 28.7% of overweight (BMI ≥95th percentile) U.S. adolescents aged 12-19 years had the MetS, compared to only 0.1% in those who were normal weight (BMI <85th percentile). Among 8- to 13-year-old overweight Hispanic children, the MetS was present in 30% of the sample (n=126)12 while another study categorized ~50% (n=195) of severely obese children and adolescents with the syndrome.13 African-American, Hispanic, and Native American children are particularly at risk for the metabolic abnormalities associated with the syndrome.14 If the prevalence of overweight and obesity continues to increase in the pediatric population, similar increases in the prevalence of metabolic derangements would be expected.

Clustering of Metabolic Components

There is widespread consensus that the components of the MetS tend to cluster and the presence of the cluster increases the risk for CVD and type 2 diabetes.1,15 Data from the U.S. National Health and Nutrition Examination Survey 1999-200016 suggest that the prevalence of the MetS among 12- to 17-year-olds (n=1,366) is 5.2% (males: 6.3%; females: 4.1%). In the same population-based sample, another 26% presented with one component and 11.1% presented with two components of the syndrome; only 56.7% of the adolescents had no components. Indeed, the clustering nature of these metabolic factors occurs early in life, and the fact that these factors tend to occur simultaneously appears to be independent of age, sex, and ethnicity.17 In addition, the strong heritability of these metabolic components further support their tendency to cluster.18

Validity and Utility of the MetS

Though ample evidence supports the clustering of the metabolic parameters that comprise the MetS, there are opposing views regarding its validity and utility.

Strengths of the Syndrome

The American Heart Association (AHA) and National Heart

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Lung and Blood Institute (NHLBI) position statement indicates that a syndrome is not necessarily a perfectly defined, uniform entity. While both insulin resistance and central obesity appear to be important, this does not negate the possibility of more fundamental factors underlying the metabolic clustering. As such, the definition of the syndrome will likely evolve as more data elucidate the science. In addition, the general justification for the exclusion of other related metabolic factors is that measurement may not always be clinically practical and/or cost-effective. Proponents of the syndrome emphasize that characterizing the metabolic cluster as a syndrome may encourage screening of multiple components if one component is abnormal. This concept may also be useful in the public health context once a working pediatric definition is determined, particularly with regard to chronic disease prevention interventions in at-risk populations. Finally, improving the modifiable, underlying risk factors such as obesity, physical inactivity and an atherogenic diet are likely to exert positive effects on all of the metabolic risk factors.

**Shortcomings of the Syndrome**

Currently, there is no universal agreement on either the components that comprise the MetS, the standardized cutoffs or the thresholds of risk for many of the individual syndrome components in children and adolescents. As boys and girls grow and mature, physical markers of health risk also change, so percentiles of these markers have been developed based on data from large-scale investigations. However, there is no consensus as to which percentile threshold should be used as the cutoff of risk for each component, or if cutoffs should vary depending on the specific component. For example, overweight is often defined as a sex- and age-specific BMI $\geq 95^{th}$ percentile while abdominal obesity is defined using a sex- and age-specific waist circumference $>90^{th}$ percentile. Impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) have been dichotomized using absolute cutoff values, but an additional issue that may require clarification is the use of adult-derived criteria for IFG and IGT in the pediatric population.

The American Diabetes Association (ADA), in conjunction with the European Association for the Study of Diabetes (EASD), recently published a position statement calling the MetS into question. In principle, the organizations issued four main criticisms vis-à-vis the syndrome. First, there is no standard definition of the syndrome in pediatrics and existing definitions in adults are variable. There are currently three widely cited definitions in adults: the third report of the National Cholesterol Education Program – Adult Treatment Panel (NCEP-ATP III), World Health Organization (WHO), and the International Diabetes Federation (IDF). The differences among these definitions are that: 1) In addition to the five components aforementioned and included in the NCEP-ATP III, the WHO definition requires the mandatory inclusion of diabetes, impaired fasting glucose, impaired glucose tolerance, or insulin resistance; and 2) The IDF definition states that central adiposity is a required component and ethnicity-specific cutoffs for waist circumference are provided. Underlying these definitions is the belief that abnormal glucose/insulin metabolism or abdominal obesity is a central feature of the MetS. However, because both the WHO and IDF definitions include individuals with diabetes, they preclude the use of the syndrome as a tool to solely identify individuals at risk for diabetes. More recently, the AHA and NHLBI updated the NCEP-ATP III definition by including individuals receiving drug treatment for elevated glucose, high blood pressure or dyslipidemia.

Second, the ADA/EASD argues that for a syndrome to be valid, the relative risk of disease (e.g. type 2 diabetes) for having the syndrome as a whole should be greater than the additive risks of its individual parts. This requirement is not satisfied with the MetS. For example, when two or more predictor variables are strongly correlated, the risk of disease by these variables in combination is less than the sum of the risk explained by each of these variables alone. Thus, if two predictor variables explain a similar proportion of the risk of disease, but this risk is largely overlapping, measuring both factors is inefficient. The choice of which individual variable to measure depends on the purpose of the study, but may relate to where on the causal pathway the variables are thought to be located, and the ease with which each variable can be measured. Nevertheless, there is yet no consensus on the fundamental causal pathway underlying the MetS.

Third, some have argued that other related metabolic factors should be included. Variables such as C-reactive protein, adiponectin and plasminogen activator inhibitor may be considered for inclusion since an underlying degree of inflammation is thought to link components of the MetS.

Finally, researchers calling for a critical evaluation of the syndrome point to the fact that at least pharmacologically, treatment for the syndrome remains on a component-by-component basis.
Other Factors to Consider in Defining the MetS in Children and Adolescents

Defining the MetS in children and adolescents poses unique challenges. Cutoffs, whether as percentiles or absolute numbers, need to be established for each component in relation to some hard, objective disease endpoint(s) in order for the cutoffs to be meaningful. In addition, as children grow, cutoffs should vary depending on age and/or sexual maturation. Given the different risk profiles across ethnicities, it is also unclear whether the same set of criteria can be applied to different ethnic groups. Thus, the universality of any pediatric definition must be critically evaluated.

“In children and adolescents in particular, lifestyle intervention should always be the frontline therapy for improving obesity and metabolic risk.”

Conclusions

While ongoing debate regarding the usefulness of the MetS continues, the health risks associated with each individual component are real and warrant attention. Given that evidence strongly suggests the clustering of obesity, dyslipidemia, high blood pressure and impaired glucose regulation, the presence of any one abnormality should prompt the screening of others. Furthermore, the importance of establishing and maintaining healthy lifestyle behaviours are likely to benefit all components of the syndrome simultaneously. In children and adolescents in particular, lifestyle intervention should always be the frontline therapy for improving obesity and metabolic risk. Assuming that nutrition and physical activity behaviours that are established early in life tend to track over time, the adoption of healthier lifestyles in childhood can reduce the metabolic risk profile in adulthood. Research is currently underway at the U.S. National Institutes of Health, in collaboration with experts in pediatric obesity and metabolic risk, to define the MetS in the pediatric population. Using existing datasets, the investigation of different cutoffs of various metabolic components in relation to the MetS and disease endpoints in adulthood should yield considerable insight into the nature of the MetS in children and adolescents.

Contents of this publication do not necessarily reflect the views or policies of the National Institutes of Health.

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Cardiac Rehabilitation Discharge Summaries: Do they provide information desired by primary care physicians?

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**Background**

The involvement of the primary care physician post-cardiac rehabilitation (CR) should increase the likelihood of sustaining the benefits achieved by CR, and enhance the continuity of care that cardiac patients receive. To facilitate appropriate continuity of care, a discharge summary should be sent from the CR program to the primary care physician. However, there is currently no understanding of what data are being transferred to primary care, nor is there knowledge regarding what data are desired by primary care physicians. Therefore, the objectives of this research were to determine: (1) what information is being transferred between CR programs and primary care physicians in discharge summaries; and (2) what information the primary care physicians would like to receive.

**Methods**

As part of a larger study, 661 consenting participants provided the name of their primary care physician and reported their participation (if any) in a CR program. Participation data were sorted according to the CR site, and each of these 21 CR sites was cross-referenced with the corresponding participants’ primary care physicians, generating the sample of physicians from which to gain access to CR discharge summaries.

When physicians indicated that they had not received a discharge summary from the CR program, the CR site was contacted directly to confirm participation. When a CR discharge summary was available, the document was obtained directly from the CR site.

To increase the possibility for generalizing the data, 53 additional CR discharge summaries were requested directly from CR sites across Canada that were not the targets of referral in the larger study. The list of CR sites was generated from the online Canadian Cardiac Rehabilitation Foundation database (available at www.cardiacrehabilitation.ca/rehab_centres.php).

Corresponding discharge information provided by the CR sites was enumerated using a Discharge Data Inventory (DDI). The DDI enables quantification of the information that was provided by the CR site to the primary care physician who is assuming care of the cardiac patient. Each item on the DDI was enumerated based on its presence (yes=1) or absence (no=0) in the CR discharge summary.

**Qualitative Methods**

Qualitative methods were employed to examine primary care physicians’ perceptions of care data received in CR discharge summaries. A semi-structured interview guide was used to gather in-depth opinions from 17 primary care physicians regarding CR information received and preferred. These interviews probed for gaps in the continuity of care of cardiac patients, and ascertained usage of CR discharge summary data in ongoing patient care.

**Results**

**Participants**

Overall, 89 primary care physicians were contacted to request their participation in the study. Of these 89 primary care physicians, 50 participated, 31 declined participation...
and eight were deemed ineligible (unable to identify or locate primary care physician or participant did not attend CR), resulting in a response rate of 61.7%.

Content of Discharge Summaries
Twenty-one (42.0%) primary care physicians received the intended discharge summary from the CR site. Six (12.0%) indicated that they had received the CR discharge summary, however upon verification of these documents, it was determined that they did not originate from a CR program. Most of these documents were hospital discharge summaries that were generated following acute care admission due to cardiovascular disease that preceded CR participation. Twenty (40.0%) had patients who were verified to participate in CR, yet they reported that they did not receive a summary. The remaining three (6.0%) primary care physicians reported that they did not receive a CR discharge summary (unverifiable due to an inability to make contact with the corresponding CR program). As a result, 19 discharge summaries were obtained, which corresponded to 21 CR sites.

Of the additional 53 CR sites which were contacted, 31 participated in the study (64.6% participation rate) and 17 declined. Five CR sites (9.4% of CR sites contacted) were deemed ineligible due to their lack of use of a CR discharge summary, since patients in those programs do not terminate participation in CR after a predetermined length of time, and therefore are not discharged.

Using these two retrieval sources, a total of 50 discharge summaries were enumerated using the DDI. The results are presented in Table 1. Forty-four (88.0%) discharge summaries were standardized forms and six (12.0%) were dictated notes that followed a fixed format.

Qualitative Themes
Seventeen semi-structured telephone interviews were conducted, and coding of the interview transcripts led to the identification of four major themes.

Theme 1: Patient Behavioural Management Issues
This theme included specific information about the patients’ current health status and recommendations for the maintenance of their ongoing cardiac care. The primary care physicians expressed a need for information regarding their patients’ current state of health, their level of participation in the CR program, directions on how to promote continued health behaviour modification, and recommendations for the patient to continue modification of risk factors.

Theme 2: Health System Factors
This theme included references to the referral process and positive perceptions of continuity, such as the benefits of CR. Several primary care physicians perceived a lack of continuity, including duplication of services and medication issues. Some of the barriers to continuity included inequalities, however many physicians provided suggestions for improvement.

Theme 3: Efficiency of Data Transfer
This theme incorporated the need for effective communication of CR discharge data in a time-sensitive manner. Discharge summaries were identified as a crucial component of the follow-up care of the patient. The use of electronic medical records, a means for increasing the efficiency of data transfer, was also discussed by numerous primary care physicians.

Theme 4: Communication Issues
Many primary care physicians expressed a desire for improved communication between CR programs and primary care physicians. Coordination between physicians and the quality of the CR discharge summary were identified as key factors in improving the communication issues regarding the continuity of care for cardiac patients.

Discussion
Overall, there was a consistent attempt among CR programs to report discharge data to the primary care physicians who assume care of the cardiac patient. The majority of the discharge summaries analyzed in this study included pertinent information, such as CR contact personnel, the length of the CR program and an exercise prescription for the home/community. All of the discharge summaries were one to two pages in length, indicating that the CR programs acknowledge the importance of providing CR discharge data in a concise, user-friendly manner.

“…only 40% of primary care physicians received the CR discharge summary which was intended for them.”

Primary care physicians reported that CR discharge data are useful for facilitating patient care. However, only 40% of primary care physicians received the CR discharge summary which was intended for them. Oftentimes, as verified by the CR programs, the discharge summary was being sent to the cardiologist who made the CR referral, while the primary care physician was also interested in receiving it. This reflects the importance of maintaining continuity between health care providers by disseminating CR discharge data to all participating physicians.

Furthermore, CR discharge summaries do not consistently report clinical data that are deemed relevant by primary care physicians for the follow-up care of patients. For example,
physicians expressed a need for individually tailored behaviour change information, yet only 26.0% received information regarding the CR participants’ personal rehabilitation plan. Information regarding CR services and patients’ status is being inadequately conveyed to the primary care physician. As illustrated by the qualitative data, primary care physicians’ perceptions of important information, such as CR attendance and recommendations for continued risk factor management, should be incorporated into standardized CR discharge summaries.

“…primary care physicians’ perceptions of important information, such as CR attendance and recommendations for continued risk factor management, should be incorporated into standardized CR discharge summaries.”

Conclusion

Since this research has identified areas of improvement regarding the flow of information between CR programs and primary care physicians, future research should be directed at the feasibility and implementation of standardized CR discharge summaries. By increasing CR discharge summary quality and consistency, continuity of cardiac care may be improved. Principally, primary care physicians desire brief and user-friendly discharge summaries regarding CR attendance, long-term behavioural modification and medication information to ensure appropriate long-term follow-up and maintenance of cardiovascular risk reduction. Greater continuity may ultimately improve cardiac patients’ health outcomes, satisfaction, and adherence, potentially decreasing CVD-related morbidity and mortality.

Acknowledgements

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We would like to acknowledge the CR staff who took the time to supply us with anonymized discharge summaries where requested.

| Table 1. Frequency (%) of Data Included in CR Discharge Summaries (n=50) |
|-----------------------------------|---------------------|-------------------|-------------------|
| Description of Item              | Ontario n=30        | Non-Ontario n=20  | Total n=50        |
| CR Contact Information           | 23 (76.7)           | 14 (70.0)         | 37 (74.0)         |
| CR Contact Personnel             | 27 (90.0)           | 19 (95.0)         | 46 (92.0)         |
| Exercise Capacity at Intake (METs)| 14 (46.7)           | 6 (30.0)          | 20 (40.0)         |
| Exercise Capacity at Discharge (METs) | 17 (56.7)     | 9 (45.0)          | 26 (52.0)         |
| TC/HDL Ratio at Intake           | 11 (36.7)           | 9 (45.0)          | 20 (40.0)         |
| TC/HDL Ratio at Discharge        | 12 (40.0)           | 12 (60.0)         | 24 (48.0)         |
| Blood Glucose                    | 17 (56.7)           | 13 (65.0)         | 30 (60.0)         |
| Resting Blood Pressure at Intake | 15 (50.0)           | 9 (45.0)          | 24 (48.0)         |
| Resting Blood Pressure at Discharge | 19 (63.3)   | 14 (70.0)         | 33 (66.0)         |
| Target Heart Rate at Intake      | 8 (26.7)            | 4 (20.0)          | 12 (24.0)         |
| Target Heart Rate at Discharge   | 14 (46.6)           | 7 (35.0)          | 21 (42.0)         |
| BMI (or weight) at Intake        | 18 (60.0)           | 10 (50.0)         | 28 (56.0)         |
| BMI (or weight) at Discharge     | 21 (70.0)           | 16 (80.0)         | 37 (74.0)         |
| Waist Circumference at Intake    | 16 (53.3)           | 9 (45.0)          | 25 (50.0)         |
| Waist Circumference at Discharge | 19 (63.3)           | 10 (50.0)         | 29 (58.0)         |
| Symptoms on Exertion             | 14 (46.7)           | 8 (40.0)          | 22 (44.0)         |
| Length of CR Program             | 22 (73.3)           | 13 (65.0)         | 35 (70.0)         |
| Exercise Training Received During CR | 8 (26.7)   | 4 (20.0)          | 12 (24.0)         |
| Medications                      | 11 (36.7)           | 10 (50.0)         | 21 (42.0)         |
| Estimated Percentage of CR Attendance | 7 (23.3) | 6 (30.0)          | 13 (26.0)         |
| Written Comments Regarding Comorbidities | 3 (10.0) | 4 (20.0)        | 7 (14.0)          |
| Family History                   | 5 (16.7)            | 2 (10.0)          | 7 (14.0)          |
| Exercise Prescription for Home/Community | 13 (43.3) | 13 (65.0)      | 26 (52.0)         |
| Personal Rehabilitation Plan     | 6 (20.0)            | 7 (35.0)          | 13 (26.0)         |
| Nutrition Counseling Received    | 11 (36.7)           | 9 (45.0)          | 20 (40.0)         |
| Smoking Cessation Counseling     | 12 (40.0)           | 13 (65.0)         | 25 (50.0)         |
| Vocational Counseling            | 1 (3.3)             | 2 (10.0)          | 3 (6.0)           |
| Psychosocial Assessment /Counseling | 14 (46.7)  | 3 (15.0)          | 17 (34.0)         |
References:

Obesity is a major threat to the health and economic well-being of Canadians. It is estimated that about 5.5 million Canadian adults and half a million Canadian children are obese. In 2001, obesity costs represented $4.3 billion (or 2.2% of Canada’s total health care budget). There are also substantial costs to Canada’s economy in terms of absenteeism or short or long-term disability. Like other chronic diseases of civilization, obesity results from complex interactions between environmental and biological factors. The determinants of this epidemic are entrenched in social trends, including urban sprawl, sedentary lifestyle, unhealthy diets, stress and nutritional illiteracy.

In March 2006, creation of the Canadian Obesity Network (CON) with an initial $800,000 federal government investment over two years under the Networks of Centres of Excellence program was announced by Irving Gold, Director, Knowledge Transfer and Exchange of the Canadian Health Services Research Foundation and Chair of the inaugural CON Board. Funding for the Canadian Obesity Network was won amongst stiff competition from over 40 other applicants to the National Centres of Excellence program.

The vision of the Canadian Obesity Network (CON) is to reduce the humanistic and economic impact of obesity on Canadians through collaborations that will advance knowledge in obesity prevention and treatment. CON’s mission is to become the primary Canadian network of health professionals, researchers, policy makers, and other commercial and non-commercial stakeholders interested in preventing and reducing the mental, physical and socioeconomic consequences of excess body weight. The multidisciplinary nature of obesity is reflected in the broad support of the network by more than 130 leading Canadian obesity health professionals and researchers from the social sciences and humanities, health sciences, natural sciences, engineering, and agriculture. The network is also supported by public advocacy groups, professional associations, and other non-profit and governmental bodies. CON seeks to engage and mobilize Canadian industry as a responsible partner for health and wellness innovation in the marketplace, workplace, and community.

Abdominal obesity is now widely recognized as a leading factor in the development of cardiovascular disease. Both the NCEP-ATP III and the International Diabetes Federation (IDF) include a measure of abdominal obesity (waist circumference) in their definitions of the metabolic syndrome. This is well in line with the results of the recent INTERHEART study that showed a strong relationship between the presence of abdominal obesity (measured as waist-to-hip ratio) and the risk for acute myocardial infarction in a large case-control study in almost 30,000 individuals in over 50 countries. This study emphasizes the fact that at any level of BMI, increased abdominal fat can elevate the risk for coronary artery disease – thereby suggesting that the burden of cardiac disease attributable to excess body weight may be substantially greater than has been assumed so far.

As a founding partner, the Canadian Association of Cardiac Rehabilitation aims to work closely with the
Canadian Obesity Network to address one of the most prevalent risk factors for cardiovascular disease. Cardiac rehabilitation patients, recovering from coronary events, represent a special population in which overweight and obesity are highly prevalent. Yet, little attention has been devoted towards examining the relationship between obesity and associated co-morbidities (e.g. the metabolic syndrome) or the impact of increased body weight on rehabilitation outcomes in cardiac patients. In a recent analysis of patients undergoing cardiac rehabilitation at an exercise-focussed cardiac rehabilitation program at the Hamilton Health Sciences Centre, over two-thirds of patients were found to be overweight or obese. Obese patients (BMI ≥ 30 kg/m$^2$) had a more adverse CVD risk profile, including a higher prevalence of smoking, hypertension and diabetes mellitus. The metabolic syndrome, defined according to the ATP III criteria, was highly prevalent in both sexes. The odds of the metabolic syndrome were 2.3 times greater in obese men compared to the non-obese men, while obese women were at two times higher risk of the metabolic syndrome compared to their non-obese counterparts. At completion of the 6-month rehabilitation program, there was no significant change in body weight and despite overall improvements in metabolic parameters, the prevalence of the metabolic syndrome remained high in men (51.3%) and women (50.0%) with class II/III obesity.

Weight management is often stated as an essential component of most cardiac rehabilitation or secondary prevention programs. According to the 1998 NHLBI guidelines and Ades et al., body weight should initially be reduced by at least 10% from baseline at a rate of one to two pounds per week over a period of six months in cardiac rehabilitation patients. Successful short-term weight loss, however, is not always achievable because targeted weight reduction interventions are not available as a core component of existing cardiac rehabilitation programs. Moreover, there is increasing recognition that obesity treatments require more than just lifestyle and cognitive approaches, which unfortunately have seldom been shown to produce long-term weight maintenance in clinical practice. Whether or not there is a place for pharmacological or surgical management of grade II/III obesity in the secondary prevention of heart disease is currently unclear. This is clearly an area of future research in the setting of cardiac rehabilitation.

The CON has just launched a website (www.obesitynetwork.ca) as a dynamic portal linking viewers to a cornucopia of constantly changing information on obesity – from daily media stories, to research interests of members, to emerging opportunities for funding. Registration on this website is open to all individuals with a professional interest in obesity. Registered users can also subscribe to a weekly obesity newsletter produced by the CIHR/Merck-Frost Obesity Chair at Laval University.

It is hoped that the Canadian Association of Cardiac Rehabilitation will work closely with the CON in all matters relevant to obesity prevention and management to decrease the burden of cardiac disease attributable to excess body weight for all Canadians.

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Family History & Risk Factor Screening

Family members of patients with coronary heart disease (CHD) may be at increased risk for developing CHD for genetic, biochemical and/or behavioural reasons.\textsuperscript{3,5} Family history of CHD has been identified as an independent risk factor for CHD\textsuperscript{3} and familial aggregation of CHD has been described.\textsuperscript{1,6} A positive family history is generally associated with a 1.5- to two-fold increase in the risk of CHD among first-degree relatives. Much of this disease aggregation can be explained by familial aggregation of established coronary risk factors.\textsuperscript{6-9}

Over the past few years, screening and treatment for people at high risk for future CHD has gained wider acceptance in Canada. Canadian guidelines for the prevention of cardiovascular disease recommend screening for those with a family history of CHD and other cardiovascular disease.\textsuperscript{10} However, despite the fact that family members of patients with documented CHD have been shown to be an “at risk” population, reported coronary risk screening of this population is very low (<15%) and general lifestyle advice is provided to family members of CHD patients in only 25-50% of cases.\textsuperscript{6,11} Without intervention, family members of individuals who experience a cardiac event are no more likely to alter their risk profile than those who do not.\textsuperscript{12} Targeted approaches aimed at family members of those with established CHD may be a cost-effective way to identify high-risk persons and link them to effective risk factor modification interventions.

A Teachable Moment

Hospitalization of patients with CHD for treatment may provide an opportunity to identify, screen and counsel family members of these patients. Hospitalization of a loved one for treatment of CHD may also coincide with an increase in a family member’s motivation to take actions to reduce personal risk. Targeted programs for family members may “activate” these individuals to seek medical advice and intervention and/or to change health-related behaviours (smoking, physical activity, dietary practices) to reduce risk.

The University of Ottawa Heart Institute (UOHI) in collaboration with the New York Presbyterian Hospital (NYPH) is currently piloting a risk factor screening, counselling and follow-up program for family members (spouses, siblings and offspring) of patients hospitalized with coronary heart disease (CHD) called “The Passport Family Heart Health Program” (PFHH). The purpose of this pilot is to determine the feasibility and value of a PFHH program for identifying new cases of individuals at moderate and high risk for CHD.

Pilot Study Design

A total of 300 family members will be recruited via CHD patients at UOHI. The dependent variables of primary interest will be: (1) the percentage of patients who identified one or more family members for the PFHH; (2) the average number of family members identified by a patient; (3) the percentage of identified family members who register in the program; and (4) the percentage of new moderate- and high-risk cases. Outcomes of secondary interest will include measures of activation, including initiation of medical therapy, and initiation of lifestyle change. Secondary variables will be assessed 14 weeks post-PFHH initiation.

Recruitment of Family Members

In- and out-patients with CHD will complete a family tree identifying their siblings, spouse and children. Eligible family members will then be mailed a personal invitation from the patient inviting them to enroll in the PFHH program. If the
Enrolled PFHH participants will undergo a risk assessment which will include completing a questionnaire to identify medical history, lifestyle behaviours, and knowledge of coronary risk factors, as well as having measures of height, weight, waist circumference, blood pressure and cholesterol taken.

Following the risk assessment, participants will receive a one-on-one counselling session from a Health Educator. The goal of the counselling session is to: a) provide an overview of heart disease, family history, and risk factors; b) provide guidance and information in the interpretation of personal risk; c) use counselling strategies to promote behaviour change through the development of an action plan; and d) link participants to existing UOHI and community resources to support behaviour change.

During the counselling session, participants will receive a pocket-sized booklet called “The Passport to Heart Health,” which contains a record of their risk assessment results and the recommended risk factor targets. It will also include additional educational information for those risk factors identified as being “off target,” as well as a summary of the participant’s goals and heart health action plan.

Personally relevant postcards containing messages and tips to reinforce behaviour change will be mailed to participants at 3, 6 and 10 weeks following their risk assessment.

Post-Assessment Telephone Interview

A follow-up telephone interview will be conducted 14 weeks after the risk assessment. The purpose of the interview will be to evaluate the success of the PFHH in activating heart-healthy behaviours.

Analysis of Results

Descriptive statistics will be used to summarize the feasibility of recruiting family members to a PFHH program. To estimate the value of the PFHH for identifying “new cases” of individuals at moderate and high risk for CHD, the 10-year risk of CHD will be calculated using the Framingham risk equation. Predicted 10-year risk will be compared to self-assessed risk of CHD. New cases correspond to the following: 1) Individuals at high risk for CHD whose self-rated perceived risk was low or moderate; 2) Individuals at moderate risk for CHD whose self-rated perceived risk was low; 3) Individuals with risk factors “off target” but not currently being treated.

Anticipated Implications

It is expected that this pilot study will demonstrate that it is feasible to systematically identify, screen and counsel family members of patients hospitalized at the UOHI. Furthermore, it is hypothesized that the pilot will show that the PFHH program is valuable for identifying new cases of individuals at moderate and high risk for CHD.

References:
Although the benefits of formal cardiac rehabilitation and exercise training (CRET) programs in the secondary prevention of CHD are well-known, there are limited studies assessing the effects of CRET programs in people with diabetes mellitus (DM) or at least significant obesity and/or metabolic syndrome (MetS). Lavie & Milani review the role of fitness in MetS and DM, as well as the role of CRET programs in obesity, MetS, and DM. They also review the impact of CRET programs on psychological factors, glucose control, and specific complications in patients with DM.

This randomized, double-blind, placebo-controlled trial of 3,045 obese (BMI >30) or overweight (BMI >27 and treated or untreated with hypertension or dyslipidemia) adults compared the efficacy and safety of rimonabant with placebo, in combination with diet and exercise. Patients were randomized to a placebo group, 5 mg/d of rimonabant, or 20 mg/d of rimonabant. After 1 year, the rimonabant groups were re-randomized to a placebo group or continued to receive the same rimonabant dose with the placebo group continuing to receive the placebo. The group receiving 20 mg/d of rimonabant had significant weight loss at year 1, greater reductions in waist circumference and level of triglycerides, and a greater increase in HDL cholesterol compared to the placebo group. Patients who continued with 20 mg/d of rimonabant had maintained the weight loss at year 2, while rimonabant-treated patients re-randomized to the placebo group at 1 year regained a substantial amount of the weight they had lost. The authors suggest that the results may reflect the potential usefulness of long-term therapy with rimonabant.

This study randomized 224 men and women to one of 4 treatment groups and followed them over 1 year. The groups included sibutramine alone (15 mg per day); lifestyle-modification counselling alone (30 group sessions); combined therapy (sibutramine plus 30 group sessions of lifestyle-modification counselling); or sibutramine plus brief therapy (lifestyle-modification counselling delivered by a primary care provider in 8 visits of 10-15 minutes). Results showed that after 1 year, subjects who received combined therapy had a greater weight loss (12.1 ± 9.8 kg) than subjects in the groups that received medication or lifestyle modification alone (p<0.001). Subjects in the combined therapy who kept a frequent record of their food intake also lost more weight than those who recorded infrequently. These results highlight the importance of combining pharmacotherapy with a comprehensive lifestyle-modification program for weight reduction.

The relationship between metabolic syndrome (MetS) incidence and cardiorespiratory fitness has not been fully established. The authors in this study sought to clarify the relationship further, especially in the case of women. The subjects included 9,007 men and 1,491 women aged 20 to 80 years and of middle-to-high socioeconomic status who had no diagnosis of MetS according to the National Cholesterol Education Program criteria. The subjects were followed for a
mean time of 5.7 years in which 1,346 men and 56 women developed MetS. Cardiorespiratory fitness was measured during incremental treadmill testing and for analysis was split into low, medium and high fitness. The study found that low cardiorespiratory fitness was a strong predictor of incidence of MetS in men, even when taking variables such as other cardiovascular risk factors into account. The same independence was not found in women across the three fitness categories but the low power in the analysis was most likely due to small numbers in each group. The authors conclude that there is a biologically plausible and graded association in the relationship between cardiorespiratory fitness and MetS, and that the most prudent approach to addressing the health concern, both clinically and health promotion-wise is to promote higher levels of fitness at the population level.

**Chronic Stress at Work and the Metabolic Syndrome: Prospective Study**


This study investigated the association between stress at work and the metabolic syndrome (MetS) over 14 years of follow-up. The 10,308 men and women recruited were part of the Whitehall II study. Work stress was assessed using the iso-strain model on four occasions with the MetS being measured in the final phase. After adjusting for occupational status and health behaviours, results revealed a dose-response relation between exposure to work stress and the MetS (trend \( p < 0.05 \) for men; \( p < 0.01 \) for women). Employees with chronic work stress had double the odds of having the MetS than those without work stress. The authors conclude by stating that these results may provide evidence of a possible biological link between chronic psychological stress and the risk of heart disease.

**Clinical Value of the Metabolic Syndrome for Long-Term Prediction of Total and Cardiovascular Mortality: Prospective Population-Based Cohort Study**


Sundstrom, et al. set out to determine if the cardiovascular risk from metabolic syndrome (MetS) was additional to the risk from established risk factors. If so, then MetS could possibly be used as a prognostic indicator for those at risk of cardiovascular disease (CVD). A sample of 2,322 white males was followed for up to 32.7 years and investigated at ages 50 and 70. Using both the WHO and National Cholesterol Education Program (NCEP) definitions of MetS in their investigation, the researchers found that the diagnosis of MetS did indeed give prognostic information, but only according to NCEP criteria, and for individuals whose risk factors for CVD were known. The prognostic ability was significant for individuals at age 50, but not at age 70, and decreased when traditional risk factors were included in the analysis. Since the sample included only white, middle-aged men, the results are not generalizable to the wider population, but the authors suggest that additional studies may help determine if defining MetS would aid in clinical prognoses.

**BOOK REVIEW**

**Trusted Heart Health Advisor Program: Providing Canadians with expert advice on the best available information on heart disease and prevention**

The Trusted Advisor Program

As health professionals we are often asked about the best sources of information on heart disease and heart disease risk factors. To assist with providing Canadians with the best available information, Indigo Books & Music Inc., Canada’s largest book retailer, and the University of Ottawa Heart Institute (UOHI) have teamed up to ensure Canadians get the best information about matters relating to heart disease and prevention.

UOHI has joined Indigo’s Trusted Advisor Health program to provide specific book recommendations for heart health information. A panel of health experts from the Institute, including cardiologists, nurses, dietitians and other allied health professionals, as well as patient advocates, are responsible for reviewing books and expressing a professional opinion about the book’s overall quality in achieving a desired goal: to educate Canadians with accurate, insightful and entertaining cardiovascular information.

“There is a staggering amount of medical and other heart information available in print and electronic form. Our health professionals are eager to help Canadians cut through the clutter and make wise selections that help satisfy their cardiovascular questions and concerns.” (Dr. Andrew Pipe, Director, Prevention and Rehabilitation Centre, UOHI)

To assist with easily directing patients, family members, and anyone interested in learning more about heart disease to the best sources of information, Trusted Advisor Approved books are identified with an Approved sticker and can be found in the “Trusted Advisor” section of Chapters and Indigo stores.
The Trusted Health Advisor Expert Review Process

The UOHI Trusted Advisor panel has reviewed over 90 books in Indigo’s collection since the program began one year ago. The panel reviews books in topic areas relevant to heart disease and prevention ranging from managing an existing heart condition to quitting smoking. A total of 44 books have been approved and 22 have received Trusted Advisor Approved status. In making a recommendation, the panel has considered 3 factors including: (1) scientific validity (accuracy and currency of the information), (2) readability (clarity and style of the writing), (3) overall value (appropriateness for the target audience and the organization of the book). The review process ensures that each book is rated by two independent reviewers. The review process is illustrated in Figure 1.

Figure 1. Overview of Trusted Advisor Expert Review Process

The Top 10 Heart Health Trusted Advisor Books

From the list of Trusted Advisor Approved books, the panel also makes their “Top 10” choices of strongly recommended titles. The Top 10 heart health choices are listed below.

Heart Health “Top 10” Picks:
1. The Mayo Clinic Heart Book
   Bernard J. Girsh (editor)
2. Take a Load off Your Heart
   Joseph C. Priscatella
3. Heart Disease
   Rob Myers
4. Success with Heart Failure
   Marc Silver
5. Women are Not Small Men
   Nieca Goldberg
6. Thriving with Heart Disease
   Wayne Sotile
7. HeartMates
   Rachael Freed
8. Quitting Smoking for Dummies
   David Brizer
9. Anne Lindsay’s Lighthearted Everyday Cooking
   Anne Lindsay
10. AHA’s Low Salt Cookbook
    American Heart Foundation

Trusted Advisor Approved books can be found in the “Trusted Advisor” section of Chapters and Indigo stores and online at www.indigohealth.ca
University of Ottawa Heart Institute Trusted Advisors

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Conferences and Events

CACRC

16th Annual Meeting & Symposium
Theme: Expanding the Boundaries of Cardiac Rehab:
Seeing Cardiac Rehab As Chronic Disease Management
October 20-22, 2006
Vancouver Convention Centre, Vancouver, BC
For more information: www.cacr.ca

AACVPR Annual Meeting
September 14-17, 2006
Charleston, West Virginia
For more information: www.aacvpr.org

Canadian Cardiovascular Congress
October 21-25, 2006
Vancouver Convention Centre, Vancouver, BC
For more information: www.cardiocongress.org

CCCN Annual Meeting and Scientific Sessions
October 22-24, 2006
Vancouver, BC
For more information: www.cardiovascularnurse.com

Canadian Society for Exercise Physiology
CSEP Annual Scientific Conference
November 1-4, 2006
Halifax, NS
For more information: www.csep.confmanager.com
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