The ABCs of Exercise Assessment and Prescription for the Prevention and Management of Chronic Diseases.

Pierre Frémont, MD, FCFM (SEM)
Dip Med Sport (ACMSE)
FMF, Vancouver, November 2016

Conflict of Interest

* Personally: none
* The following organisation provided funding for the development of the exercise prescription tool presented in this session:
OBJECTIVES:

1. Be able to discuss the spectacular potential of exercise.
2. Integrate the "exercise vital sign" in your practice.
3. Be able to use the prescription tool for basic exercise prescription.

If you have a previous version of this workshop before...

Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine

Jane S Thornton,1 Pierre Frémont,2 Karim Khan,3 Paul Poirier,4 Jonathon Fowles,5 Greg D Wells,6 Renata J Frankovich7

Br J Sports Med 2016; 50:1109-1114
Exercise Is Medicine Canada

Vision

“Physical activity is an integral part of prevention and treatment of chronic disease in the Canadian Health Care System.”

http://exerciseismedicine.org/canada/

SELF ASSESSMENT / REFLECTION

* Personally:
  * Do you know and meet the guideline recommendations?
  * What are the barriers to meeting the guidelines yourself?

* As a doctor:
  * Do you prescribe physical activity to your patients?
  * What are the challenges you face in counselling your patients on adopting a physically active lifestyle?
Typical barriers for exercise prescription in primary care

* Not being aware of its spectacular potential for health!
* To have the perception that:
  * You can harm your patient.
  * You don’t have the time.
  * You are not properly prepared or equipped.

“What if there was one prescription that could prevent and treat dozens of diseases, such as diabetes, hypertension and obesity?

Would you prescribe it to your patients?

Certainly.”

- Robert E. Sallis, M.D., FACSM, Exercise is Medicine™ Task Force Chairman
Available in French and English

http://exerciseismedicine.org/canada/
A collaborative project of several primary care organisations


The problem...
The global epidemic (WHO 2012)

Global Obesity

% of adult population classified as obese*

- 0-5%
- 5-10%
- 10-13%
- 15-20%
- 20-25%
- 25-30%
- 30-35%
- >35%
- No Data

Source: World Health Organisation (WHO), 2012**

*An obese adult is classified as having a BMI greater than 30.
**The map uses the latest available data which varies in year of data collection.

www.lovelljohns.com

Obesity in Canada (2014)

Adults who are obese in 2014 by province and territory

Population aged 18 and over who reported height and weight that classified them as obese

Compared to the national average of 20.2%

- Significantly below
- Not different
- Significantly higher
Diabetes: prevalence in 2000 and estimations for 2030 (millions)

Source: Chaire internationale sur le risque cardiometabolique
www.myhealthywaist.org


Physical activity as an important part of the solution!
Overview of some benefits of PA

Regular PA at the right intensity can:

* Reduce incidence of hypertension by 33-60%
* Reduce incidence of diabetes by 25-58%
* Reduce incidence of CVD by 33-50%
* Reduce risk of stroke by 31-45%
* Reduce risk of colon cancer by 30-60%
* Reduced mortality and risk of recurrent breast cancer by 50%
* Reduce risk of developing Alzheimer by 40%
* Treats depression as effectively as Prozac or cognitive behavioural therapy

* Reduce risk of premature death by 31-50%

Blair et al. EIM handbook, 2009; Warburton et al. IJBNA, 2010

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Effect of Fitness vs Obesity on Mortality

Attributable Fractions (%) for All-Cause Deaths

40,842 Men & 12,943 Women, ACLS

**Effect of obesity and cardio-vascular fitness on mortality in diabetic men.**

N = 2316

![Graph showing survival rate over years for different fitness levels.](image)

- Good cardio-respiratory fitness
- Poor cardio-respiratory fitness

Church et al. Arch Intern Med 2005; 165: 2114-20

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**Physical activity vs drugs**

![Graph showing odds ratio for different conditions.](image)

(Naci & Ioannidis, BMJ 2013)
**Risk of Future Nursing Home Admissions**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>45-64 years Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>1.56 (1.23-1.99)</td>
</tr>
<tr>
<td><strong>Physical Inactivity</strong></td>
<td><strong>1.40 (1.05-1.87)</strong></td>
</tr>
<tr>
<td>BMI ≥30.0</td>
<td>1.35 (0.96-1.89)</td>
</tr>
<tr>
<td>High BP</td>
<td>1.35 (1.06-1.73)</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>1.14 (0.89-1.44)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.25 (2.04-5.19)</td>
</tr>
</tbody>
</table>

Valiyeva E et al. Arch Int Med 2006; 166: 985-90  
N = 6462 Adults

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**Benefits of NOT being Sedentary**

- **50% lower mortality**  
  For sitting < quarter of day
  - controlled for age, smoking, PA level on 17,000 Canadians  
    *(Katzmarzyk et al., MSSE, 2009)*

- **7-11% lower mortality, obesity, diabetes**  
  For each hour LESS of TV
  - Controlled for age, sex, waist circumference, PA  
    *(Mitchell et al. Diabeteologia, 2012)*
Effect of lifestyle interventions on the incidence of type 2 diabetes.

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

<table>
<thead>
<tr>
<th>RCTs of Diet &amp; Physical Activity Interventions to Prevent Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Da Qing</td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>% Risk Reduction</td>
</tr>
</tbody>
</table>

Physical activity and cancer

* 1.4 million participants from 12 studies
* Average age: 59 ans [19-98];
* 57% women
* 186,932 cancers
* 90th vs 10th percentiles of activity

### Physical activity and cancer

<table>
<thead>
<tr>
<th>Tumour Type</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oesophagus</td>
<td>0.58 (0.37-0.89)</td>
</tr>
<tr>
<td>Liver</td>
<td>0.73 (0.55-0.98)</td>
</tr>
<tr>
<td>Lung</td>
<td>0.74 (0.71-0.77)</td>
</tr>
<tr>
<td>Kidney</td>
<td>0.77 (0.70-0.85)</td>
</tr>
<tr>
<td>Stomach</td>
<td>0.78 (0.64-0.95)</td>
</tr>
<tr>
<td>Endometrium</td>
<td>0.79 (0.68-0.92)</td>
</tr>
<tr>
<td>Myeloid leukemia</td>
<td>0.80 (0.70-0.92)</td>
</tr>
<tr>
<td>Myeloma</td>
<td>0.83 (0.72-0.95)</td>
</tr>
<tr>
<td>Colon</td>
<td>0.84 (0.77-0.91)</td>
</tr>
<tr>
<td>Head and Neck</td>
<td>0.85 (0.78-0.93)</td>
</tr>
<tr>
<td>Rectum</td>
<td>0.87 (0.80-0.95)</td>
</tr>
<tr>
<td>Bladder</td>
<td>0.87 (0.82-0.92)</td>
</tr>
<tr>
<td>Breast</td>
<td>0.90 (0.87-0.93)</td>
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Note: controled for pour age, sex, race, tobacco, alcohol et education.


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### We are part of the problem!
Few Canadians receive counselling about nutrition and physical activity.

![Graph showing increase in physical activity and diet improvement with and without T2DM](image.png)

From their primary care physician!

Key message #1: Exercise is effective!

Exercise is effective. If exercise was a drug, it would be one of the most effective and safe ways to prevent and treat many chronic diseases such as heart disease, hypertension, diabetes, osteoporosis, anxiety disorders and depression!

Key message #2: the target dose!

CANADIAN PHYSICAL ACTIVITY GUIDELINES FOR ADULTS 18 YEARS AND OLDER

To achieve health benefits, adults aged 18 years and older should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more. It is also beneficial to add muscle and bone strengthening activities using major muscle groups, at least 2 days per week. More physical activity provides greater health benefits.
However, even a low-dose of moderate-to-vigorous physical activity reduces mortality.

Meta-analysis
122,000 participants
≥ 60 years
10 year follow-up

A dose-effect relationship


What terminology and examples can be used to describe PA intensity to patients?

What about intensity?

**WHAT ABOUT AEROBIC INTENSITY AND MUSCLE STRENGTHENING?**

**How can I assess intensity?**

- **Light exercise** will usually not cause adults to sweat and breathe harder. It is easy to have a conversation at this intensity. Walking is the typical example of light exercise.

- **Moderate-intensity exercise** will cause adults to sweat a little and breathe harder. It is possible to have a conversation in short sentences. Examples are brisk walking (as if you are late for the bus!) and bike riding.

- **Vigorous-intensity exercise** will cause adults to sweat and be "out of breath". It is difficult to have a conversation. Examples are jogging, swimming laps, cross-country skiing and hiking on hills.

**What is strength and resistance exercise?**

- Strength and resistance exercises make your muscles work harder by adding weight or resistance to the movement.
<table>
<thead>
<tr>
<th>Intensity</th>
<th>Objective measures</th>
<th>What patient feels*</th>
<th>Typical examples</th>
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<tbody>
<tr>
<td>Sedentary</td>
<td>&lt;1.6 METs</td>
<td>At rest with limited added movement</td>
<td>Sitting and reading, Watching TV, Driving a car</td>
</tr>
<tr>
<td>Light</td>
<td>1.6 – 3.0 METs</td>
<td>Active</td>
<td>Slow walking (ex. around the house)</td>
</tr>
<tr>
<td>Moderate</td>
<td>3.0 – 5.9 METs</td>
<td>Feels more than 10 minutes</td>
<td>Swimming, skiing</td>
</tr>
<tr>
<td>Vigorous</td>
<td>6 – 9 METs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>≥ 9 METs</td>
<td></td>
<td></td>
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</table>

• Typical examples of activities are for UNTRAINED individuals
• Will not apply once significant improvement of CV fitness is achieved
• The subjective sensation will remain applicable even with improving CV fitness.
• However, descriptions do not apply to symptomatic COPD patients.

Sedentary behavior: the “kill” zone... if you don’t kill it, it’s going to kill you!
### Light to moderate intensity physical activity (LMPA): the “over-the-counter” zone

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<td>At rest with limited added movement</td>
<td>Sitting and reading, Watching TV</td>
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<tr>
<td>Light</td>
<td>1.6 - 3.0 METs 40 - 55% HR max 20 - 40% VO2 max</td>
<td>Active, No noticeable change in breathing/heart rate</td>
<td>Slow walking, light work, cooking/washing dishes, playing an instrument</td>
</tr>
<tr>
<td>Moderate</td>
<td>3 - 6 METs 55 - 70% HR max 40 - 60% VO2 max</td>
<td>Increased breathing and sweating, still able to maintain a conversation</td>
<td>Brisk walk, low movement racket games, water aerobics, resistance exercise, mowing the lawn</td>
</tr>
<tr>
<td>Vigorous</td>
<td>6 - 9 METs 70 - 90% HR max 60 - 85% VO2 max</td>
<td>Feeling “out of breath”, difficult to maintain a conversation</td>
<td>Jogging, hiking, swimming with effort, higher movement racket games, fieldball games</td>
</tr>
<tr>
<td>High</td>
<td>≥ 9 METs ≥90% HR max ≥85% VO2 max</td>
<td>Intensity cannot be sustained for more than 10 minutes</td>
<td>Swimming, skiing, high intensity interval training</td>
</tr>
</tbody>
</table>

Abbreviations: MET, metabolic equivalent of task (1 MET = the energy to lie down quietly, HRmax = Theoretical maximal heart rate; usually estimated as (220 – age) x 0.6, VO2max, maximum oxygen uptake. (Adapted from Norton et al., 2010)
* Note: These descriptions usually don’t apply for symptomatic COPD patients.

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### Moderate to vigorous intensity physical activity: the TARGET intensity zone

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For 150 minutes (2.5 hours/week)
- 3 METs = 7.5 METs x h/week
- 6 METs = 15 METs x h/week
- 9 METs = 22.5 METs x h/week

Abbreviations: MET, metabolic equivalent of task (1 MET = the energy to lie down quietly, HRmax = Theoretical maximal heart rate; usually estimated as (220 – age) x 0.6, VO2max, maximum oxygen uptake. (Adapted from Norton et al., 2010)
* Note: These descriptions usually don’t apply for symptomatic COPD patients.

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HIGH intensity physical activity: the “high yield” and “weekend warrior” intensity zone

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<td>Light</td>
<td>1.6 - 3.0 METs 40 - 55% HR max 20 - 40% VO₂max</td>
<td>Active</td>
<td>No noticeable change in breathing/wrassing.</td>
</tr>
<tr>
<td>Moderate</td>
<td>3 - 6 METs 55 - 70% HR max 40 - 60% VO₂max</td>
<td>Can be sustained for 1 hour or more.</td>
<td>Light work while standing (ex: cooking, washing dishes)</td>
</tr>
<tr>
<td>Vigorous</td>
<td>6 - 9 METs 70 - 90%</td>
<td>Cross-country skiing</td>
<td>Swimming (singles tennis)</td>
</tr>
<tr>
<td>High</td>
<td>≥ 9 METs ≥ 90% HRmax ≥ 85% VO₂max</td>
<td>Cross-country skiing</td>
<td>Swimming (singles tennis)</td>
</tr>
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</table>

Abbreviations: MET, metabolic equivalent of task (1 MET = the energy to be at quiet); HRmax, Theoretical maximal heart rate; usually estimated as (220-age) x 0.96; VO₂max, maximum oxygen uptake. (Adapted from Norton et al., 2010)

* Note: These descriptions usually don’t apply for symptomatic COPD patients.

Pre-exercise Screening

How can I determine if my patient is fit to exercise independently?
You may get referrals for clearance following a screening questionnaire...

The safe zone for **mild to moderate** intensity exercise

The presence of 1 or 2 stable and controlled chronic diseases is not a problem!

Bredin SSD et al; PAR-Q+ and ePARmed-X+. Cam Fam Physician 2013; 59: 273-277
**The targeted exercise dose for diabetes?**

2013 CDA recommendations...

- **Aerobic exercise:** minimum of 150 minutes of moderate- to vigorous-intensity each week (over at least 3 days; no more than 2 consecutive days without exercise).
- **Resistance exercise** at least twice a week an eventual instruction and periodic supervision.
- Setting specific physical activity goals, anticipate likely barriers to physical activity.
- Structured exercise programs supervised by qualified trainers should be implemented when feasible.
- With possible CVD or microvascular complications of diabetes who wish to undertake exercise that is substantially more vigorous than brisk walking (ie: vigorous intensity):
  - Medical evaluation for conditions that might increase exercise-associated risk: history, physical examination, resting ECG and, possibly, exercise ECG stress testing.

Adapted from: Can Diabetes Association 2013

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**Key messages regarding cardiovascular safety of the « target zone » (MVPA)**

- For **healthy individuals**, progression towards MVPA is safe.
  - If inactive, begin with lower intensity and progress in duration and intensity over time.
- For **patients with chronic diseases**, progression toward MVPA can be prescribed:
  - If inactive: following a normal clinical evaluation.
  - If already engaged in LMPA: medical evaluation is recommended before engaging in vigorous activities.

Based on clinical evaluation, who should be investigated?

Investigate if...

- History suggests:
  - Unstable angina
  - Uncharacterised arrhythmias
  - Decompensated heart failure

- Physical reveals:
  - Heart murmur
  - Pulmonary overload
  - Severe hypertension (>200/110 mmHg)

Can someone do too much exercise?

**Weekly exercise volume vs mortality for the general population**

- Significant benefits below the recommended volume
- Maximal benefits at +/- 40 METs x h/week (or 2.5 x recommended volume)

How about high intensity interval training (HIIT)?

2 recent systematic reviews on HIIT

* HIIT vs Continuous endurance training in healthy adults
  (Milanovic et al. Sports Med. 2015; 45: 1469–81)
* HIIT vs MICT in chronic disease patients

HIIT could be slightly superior to continuous endurance training to improve CRF
HIIT vs Continuous endurance training

- 19 studies (N = 382)
- Healthy young adults
- No analysis of adverse effect reported
- Possible publication bias
- Claims that HIIT is safe based on 2 studies involving 18 HIIT patients
- HIIT is slightly superior to continuous MVPA

Fig. 5: Effects of HIIT vs endurance training on maximal oxygen uptake. CL confidence limits. HIIT, high-intensity interval training.

Milanovic et al. Sports Med. 2015; 45:1469–81

HIIT vs moderate intensity continuous training (MICT)

- 7 RCT (N = 182)
- Mostly chronic disease patients
- No analysis of adverse effect reported
- HIIT has a greater positive influence on CRF than MICT.

Is HIIT the cost-effective way to CVF?

PLoS ONE 2016; 11(4): e0154075

Key message about HIIT

* Initiation of **high intensity physical activity**, such as HIIT, should be preceded by establishing a “base fitness level” over several weeks through regular MVPA.

* The possible benefits of HIIT cannot imply that unsupervised high intensity exercise in unfit individuals is safe!

Adapted from: ACSM 2014
(https://www.acsm.org/docs/brochures/high-intensity-interval-training.pdf)
Back to the barriers for exercise prescription in primary care...

* You are now aware of the spectacular potential of exercise!  
* You know that moderate exercise is safe for the vast majority of your patients.
* But you may still feel that...
  * You don’t have the time.
  * You are not properly prepared or equipped.

How can I integrate exercise assessment and prescription in my practice?
Counseling Opportunities

**Discussed today**

**Brief**
- **Ask**: 2-4 min
- 30 seconds

**Comprehensive**
- **Ask**: 5-20 minutes

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**ASK: THE EXERCISE VITAL SIGN!**

* Determine patient’s current level of activity
  * If active: quantify.
  * If not, willingness to:
    * learn about exercise
    * exercise

ASK EVERY PATIENT EVERY TIME
Am I the right person to prescribe physical activity to my patients?
We are the preferred source of health information (Blair et al., 1998)

We have high population reach (CIHI, 2003)

75-80% of Canadians visit their family physician over the course of a year (Wilson and Ciliska, 1992)

We aim to prevent and we manage chronic diseases.

Physical inactivity is an important risk factor.

Physical activity is THE most potent intervention!

Your best chance of success: the motivational interview!

Aims to help the patient identify how he can successfully modify his behaviours.

A strategy based on an exchange of information about:

- Risks and benefits.
- Values, preferences, past experiences.
- Perceived or real barriers

An iterative process that takes into consideration the level of motivation of the patient every time new objectives are being defined.

More efficient than direct recommendation

Rollnick et al., BMJ 2010; 340: c1900
Studies on the effects of a written exercise prescription

* ↑ Physical activity
  (Elley et al. 2003; Grandes et al. 2009)
* ↑ Physical fitness
  (Petrella et al. 2010)
* ↑ Quality of life
  (Kallings et al. 2008)
* Adherence > 50% at 12 months
  (Leijon et al. 2010; Kallings et al. 2009)

ADVISE - The sceptical patient!

* “but I tried to exercise in the past but I never lose weight....”
* “but I can’t afford to join a gym...”
* “but I am afraid me knees will hurt more and I don’t want to damage them....”

- Improving fitness is more important than losing weight. Low cardiovascular fitness is associated with a much higher risk of disease and death than being overweight.
- Walking is free anywhere and any day of the year!
Efficacy of strengthening or aerobic exercise on pain relief in people with knee osteoarthritis.

Exercise for OA and MSK pain: should we reassure our patients?

Impact of Exercise Type and Dose on Pain and Disability in Knee Osteoarthritis

ARTHRITIS & RHEUMATOLOGY
Vol. 66, No. 3, March 2014, pp 622–636

Walking Exercise for Chronic Musculoskeletal Pain: Systematic Review and Meta-Analysis

About musculoskeletal safety...

* Considering...

  * The documented effect of exercise on OA and chronic MSK pain,
  * The other highly documented impact of exercise on the prevention and treatment most chronic diseases...

* Basic exercise prescription should be part of the management of patients with active OA and other sources of chronic MSK pain.

- Exercise is safe for your joints. Regular low impact exercise and gradual muscle strengthening can stabilise and protect your joints from osteoarthritis and reduce the risk of falls and injuries that is associated with poor physical fitness.
A simple suggestion...

* Walking poles:
  * Reduce weight baring on the lower limbs
  * Increase active muscle mass
  * Increased stability
  * More favourable self image for many...

Photos: http://urbanpoling.com/

Technology can be a source of motivation!

* Meta-analysis of pedometer use demonstrates average increases of over 2000 steps per day*.

* Interactive wearable technologies can directly monitor activity objectives.

Case 1: Amanda Walker

* A 58 year old woman seen for her periodic visit with hypertension as her only known health condition.
* Your evaluation reveals good control of her hypertension and no suspected new conditions.
* She is about to retire and your PA assessment reveals that she takes a 20-30 min walk with her husband 3-4 times a week.
* **What would be your exercise prescription?**
One possible prescription for Amanda…

* A 39 year old man seen for a follow-up following a glucose tolerance test.
* He is a computer analyst working 60 hours a week, sedentary and obese (BMI = 33).
* His average blood pressure 145/85
* His lab results are just below the threshold for dyslipidemia and diabetes diagnosis.
* As part of your general counseling regarding metabolic syndrome...
* What would be your exercise prescription?

Case 2: John Sweet

* A 39 year old man seen for a follow-up following a glucose tolerance test.
* He is a computer analyst working 60 hours a week, sedentary and obese (BMI = 33).
* His average blood pressure 145/85
* His lab results are just below the threshold for dyslipidemia and diabetes diagnosis.
* As part of your general counseling regarding metabolic syndrome...
* What would be your exercise prescription?
Reducing sedentary behaviours can be the initial target

One possible prescription for John...

One step at a time toward a more active lifestyle!
Case 3: Susan Fitt

* A healthy 31 year old teacher seen for her periodic health evaluation and oral contraceptive renewal.
* She reports that her IT band syndrome rapidly resolved following your suggestions and that she was able to participate in her first 10 km run last August.
* She says she would like to run a half-marathon next year and asks you for counseling on how to prepare for such an objective.
* What would be your exercise prescription?

One possible prescription for Susan...

A perfect opportunity to work with an exercise professional!
When should referral to an exercise professional be considered?

* When the aim is performance (ex: Susan Fit)
* When motivation is high!
* When motivation is low...but the will to develop motivation is there.
* When supervised exercise is indicated (ex: CVD)

More about resistance exercise in the handout on the FMF website...

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

Or just Google: resistance + exercise + diabetes
SUMMARY

* Exercise Vital Sign – ASK EVERY PATIENT EVERY TIME!
* Educate your patient that exercise is good medicine.
* For most patients, exercise is an over the counter medication.
* Assist and support your patient in the behaviour change process.
* Individualize your exercise prescription.
* Just do it!

MERCI!

Acknowledgements

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  * Renata Frankovich, MD, MSc
  * Sue Boreskie, MPE
  * Michelle Fortier, PhD
  * Susan Yungblut, BScPT, MBA, EIMC Task Force Manager
  * Jonathon Fowles, Ph.D., CSEP-CEP, CSCS

pierre.fremont@fmed.ulaval.ca