Exercise and Physical Activity for All Ages: 2012 Research and ACSM/ADA Prediabetes and Diabetes Guidelines

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Four-part Agenda

• Overview & Key Concepts
• Recent Important Clinical Exercise Trials
• ACSM/ADA Physical Activity Guidelines
• Practical Physical Activity Strategies
Overview & Key Concepts
Objective

• Just get your patients to move and move often!

You too!!
A large amount of evidence shows that exercise provides the best prevention and treatment for insulin resistance and type 2 diabetes.
Weekly Physical Activity and Cardiometabolic Benefits

<table>
<thead>
<tr>
<th>Walking</th>
<th>~5 miles</th>
<th>~10 miles</th>
<th>~15 miles</th>
<th>~20 miles</th>
<th>25+ miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>kcal per week</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500+</td>
</tr>
<tr>
<td>Benefit</td>
<td>Functional and metabolic benefits (glucose transport, AMPK, PPARγ, insulin sensitization)</td>
<td>Measurable body fat alterations, weight loss, lowered LDL-C, ...</td>
<td>Weight Loss Maintenance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sequence of Metabolic Events During One Muscle Contraction
# Bioenergetics of Moderate and High Intensity Exercise

<table>
<thead>
<tr>
<th></th>
<th>High Intensity Exercise</th>
<th>Low-Moderate Intensity Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATP Hydrolysis Rate</td>
<td>Very High (&gt;60% V02max)</td>
<td>Low (30 to 50% V02max)</td>
</tr>
<tr>
<td>Exercise</td>
<td>15 minutes 300 kcal 43 moles ATP</td>
<td>30 to 35 minutes 300 kcal 43 moles ATP</td>
</tr>
</tbody>
</table>

IHS Division of Diabetes
Cardiometabolic Risk and Exercise Training

• From a reduction in cardiometabolic risk perspective - total energy expenditure is the key prescriptive parameter:
  • Fundamentally a product of exercise intensity x exercise duration.
• There are added benefits of higher intensity exercise but with added risks.
Comparative Outcome Indicators
Body Weight Changes vs. Muscle Contractions

BODY WEIGHT
• (fat, water, muscle protein) loosely tied to adipokine, A1C, lipocentric changes

MUSCLE CONTRACTIONS
• Each intentional contraction/step: AMPK - PPARδγ activation, insulin sensitization
Adiposity Reduction (total body fat) vs. Weight Reduction

• Recording the actual behavior of muscle contraction, e.g., walking, is a more directly linked to insulin sensitization and other cardiometabolic risk reduction mechanisms (compared with assessing only body weight changes)

• Body weight changes do not entirely tell the story of fat weight changes (adiposity vs. body weight)

• Total physical activity energy expenditure is the most important cardiometabolic risk reduction parameter
### How Much Physical Activity?

<table>
<thead>
<tr>
<th>CMR Reduction</th>
<th>Weekly EE</th>
<th>Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>≥ 1000 kcal</td>
<td>≥2000 kcal</td>
</tr>
<tr>
<td>Prediabetes &amp; Metabolic syndrome</td>
<td>≥ 1000 kcal</td>
<td>≥2000 kcal</td>
</tr>
<tr>
<td>Pediatric</td>
<td>7 hrs, 12,000+ steps</td>
<td></td>
</tr>
</tbody>
</table>

IHS Division of Diabetes
Just move and Move Often!
Recent Important Clinical Exercise Trials

Publications and Research Trials 2011-2012
Exercise Dose and Insulin Sensitivity: Relevance for Diabetes Prevention

- 55 healthy volunteers (BMI 30.5) participated in a 16 week supervised endurance exercise intervention.
- Improved insulin sensitivity was significantly related to exercise dose in a graded dose–response relationship. No evidence of threshold or maximal dose–response effect was observed.
- Even an exercise dose of ~400 kcal per week (about 40%–50% of the guidelines for physical activity) was associated with a significant improvement in insulin sensitivity.

Dube´, J. J., K. F. Allison, V. Rousson, B. H. Goodpaster, and F. Amati
Modest levels of physical activity are associated with a lower incidence of diabetes in a population with a high rate of obesity: The Strong Heart Family Study

Diabetes Care 2012;35:1743-1745.

• Cardiometabolic benefits do not appear to be limited to only the most active individuals; cardiometabolic health benefits may be achieved by adding as little as 2,500 steps (~1.3 miles walking) per day to baseline activity.

Impact of exercise intensity and duration on insulin sensitivity in women with T2D


• METHODS: 22 women with T2D participated in a supervised group exercise program for six months. The program combined endurance and resistance exercise.
  • Improvement in insulin sensitivity after six months is related to exercise intensity,
  • The reduction in HbA1c is related mainly to training volume (total kcal expenditure).
  • Metabolic effects of training may be seen in the absence of improved exercise capacity.
Key Point

• Most of the metabolic benefits of physical activity particularly for those with diabetes and prediabetes are generated by the total energy expenditure of the exercise session as compared to the mode or intensity of exercise.
Effects of intensity and volume on insulin sensitivity during acute bouts of resistance training


- 17 adults with IFG completed four separate bouts of resistance exercise under moderate intensity (65% 1RMax) or high intensity (85% 1RM) conditions within the confines of single set and multiple set protocols.
- High-intensity protocols resulted in greater insulin sensitivity (0.83 multiple set; 0.53 single set) as compared with moderate-intensity protocols. The high-intensity, multiple set bout yielded the greatest effect in both fasting glucose (0.61) and insulin sensitivity (0.83).
Both resistance- and endurance-type exercise reduce the prevalence of hyperglycemia in individuals with impaired glucose tolerance and in insulin-treated and non-insulin-treated type 2 diabetic patients

• 15 pts with IGT and 15 pts with T2D
• EndEx: 45 min cycling at 50% Wmax or
• ResEx: 45 min of lat pulls, chest press, leg press and extensions
• 3-5 sets of 10 reps at 55-75% of 1RMax
• A single session of EndEx or ResEx substantially reduces the prevalence of hyperglycemia and improves glycemic control during the subsequent 24 h period in individuals with IGT, and in insulin-treated and non-insulin-treated type 2 diabetic patients.
Daily Step Target to Measure Adherence to Physical Activity Guidelines in Children

Colley, R.C., I. Janssen, M.S. Tremblay

• Goal: find step count for moderate to vigorous physical activity

• N= 1613, 6-19 years; number of valid days =9879

  • 12,000 steps per day – a target to determine whether children 6-19 years of age are meeting the current physical activity guidelines of 60 minutes of daily moderate to vigorous physical activity.
Accelerometer Steps per day Translation of Moderate to Vigorous Activity


• 2005-2006 NHANES. N= 3,523 ADULTS.
  • 30 minutes per day of MVPA: 7,900 steps per day for males 8,300 steps per day for females.
  • In a subsample of participants (n=1,197) we found 150 minutes per week of MVPA translated to ~ 7,000 steps per day (or 49,000 steps per week).
  • Accumulating ~ 8,000 steps per day is a good proxy for 30 minutes of daily MVPA, while accumulating 7,000 steps per day every day is consistent with obtaining 150 minutes of weekly MVPA.
A popular belief is that exercise training results in body composition changes that generate an additional energy benefit mediated through Resting Energy Expenditure (REE) Measurements that are not so confounded suggest that the impact of exercise training on REE is negligible.

The origin of the “3500 kcal per pound” rule is based on the calculated energy content of body weight change and is often misapplied to predict the weight-change time course after a given intervention. This is a fundamental error because no time period is specified for that intervention.
Why do Individuals not Lose More Weight from an Exercise Intervention at a Defined Dose?

• Thomas, D.M., et.al., Obesity Reviews 2012; June 11
• Review of 15 controlled studies
• We conclude that the small magnitude of weight loss observed from the majority of evaluated exercise intervention studies is primarily due to low doses of prescribed exercise energy expenditures compounded by a concomitant increase in caloric intake (i.e., energy compensation).
These results indicate that RMR is reduced when exercise is increased and energy intake is held constant, particularly among individuals with lower levels of muscle mass and hence lower RMR.

This metabolic adaptation reduces the size of the exercise-induced energy deficit and preserves body mass, primarily for leaner individuals.
Preferential Reductions in Intermuscular and Visceral Adipose Tissue with Exercise-induced Weight Loss Compared with Caloric Restriction


- One year of exercise-induced weight loss results in greater reductions in Intermuscular and Visceral Adipose Tissue than comparable weight loss induced by CR alone.
Sedentary Time and Metabolic Syndrome

Bankoski, A., Sedentary Activity Associated With Metabolic Syndrome Independent of Physical Activity Diabetes Care, February 1, 2011, 34:497-503, NIH and GMUSe
Sedentary Time, Breaks in Sedentary Time, and Metabolic Variables in People with Newly Diagnosed Type 2 Diabetes


- 528 adults (30–80 years) with newly diagnosed type 2 diabetes, who were in a diet and physical activity intervention. UK

- Results: In cross-sectional analyses each hour of sedentary time was associated with larger waist circumference of 1.89 cm; p<0.001, higher insulin of 8.22 pmol per l (p .003) and HOMA-IR 0.42 (p .004), and lower HDL-C–0.04 mmol per l (p .005).

- Conclusions and interpretation: Higher sedentary time is associated with a poorer- metabolic profile in people with type 2 diabetes
Breaks in Sedentary Time Beneficial associations with metabolic risk

Genevieve Healy, Diabetes Care, Feb. 2011  Aust.

• N=168 men and women
• Accelerometry study
• Findings: The greater the number of breaks taken from sedentary behavior, the lower the waist circumference, body mass index, as well as blood lipids and glucose tolerance.
  • This was true even if the total amount of sedentary time and physical activity time were equal between individuals – the one who took breaks more frequently during their time at the office or while watching television was less obese and had better metabolic health.
  • Importantly, the breaks taken by the individuals in this study were of a brief duration (<5 min) and a low intensity (such as walking to the washroom, or simply standing).
So, what did we learn from these recent trials?

• Moderate levels of physical activity by any measure can reduce T2D risk and increase insulin sensitivity.
• Higher intensity exercise generates somewhat greater insulin sensitization than moderate intensity exercise – but it can be risky.
• Step target for MVPA for all kids: 12,000 per day.
• 8,000 steps per day is a good proxy for 30 min of MVPA for adults.
• From a practical point of view the benefit of acute exercise on REE is negligible.
• Aerobic exercise training may in fact reduce RMR when energy intake is held constant or unchanged.
Recent Trial Summary (cont.)

• It appears that exercise intensity is more related to insulin sensitization whereas total exercise volume (total daily EE) is related to HbA1C
• A single 45-min dose of exercise (AE or RT) can decrease hyperglycemia ~30-35% for 24 hours
• The addition of exercise training to dietary weight loss preferentially reduces subcutaneous abdominal adipocyte size, reduces IMAT and visceral fat
• Sedentary time can significantly increase waist circumference, decrease insulin sensitivity and HDL-cholesterol. This trend can be reversed by taking regular work breaks, e.g., 5 min walking on the hour.
ACSM/ADA Physical Activity Guidelines
Consensus Guidelines on PA
• **Diabetes Physical Activity Guidelines**
  
  • ≥ 150 min per week of *moderate-intensity* aerobic physical activity (50–70% of maximum heart rate), spread over at least 3 days per week with no more than 2 consecutive days without exercise.
  
  • In the absence of contraindications, perform resistance training at least twice per week (at least one set of at least 5 different exercises).
Cardiometabolic Risk Reduction
Versus Weight Loss
Public Health vs. Weight Loss Physical Activity Recommendations

Public Health:
• 150 minutes per week = 30 minutes per day x 5 days per week
  • ~1000 to 1,500 kcal per week (20 to 30K+ steps per week)

Weight Loss:
• 250-300 minutes per week = ≥60 minutes per day x 5 or more days per week
  ~2,000 to 3,000 kcal per week (40 to 60K+ steps per week)

ACSM-AHA Public Health Guidelines 2007
ACSM Exercise Weight Loss Statement 2009
Resistance Training & Weight Loss

• Resistance training (e.g., free weights or machines) will not promote clinically significant weight loss. Evidence category A.
• Resistance training was not assigned a major role by the authors because it was believed that evidence for the efficacy of weight training for weight loss and maintenance was insufficient.
• Although the energy expenditure associated with resistance training is not large, resistance training may increase muscle mass which may in turn increase 24-h energy expenditure.

ACSM Weight Loss Guidelines 2009 (Donnelly)
“The modern world makes it very easy to out-eat exercise, and nearly impossible to out-exercise excessive eating.”

David Katz
Yale University Prevention Research Center
Time Required to...

• Eat one scone = 5 to 10 minutes
  • Calories consumed: 140 to 500
• Work off those calories = 25 to 90 minutes
  • Effort required: 1.4 to 5 mile walk
ACSM/ADA Joint Position

“Although physical activity (PA) is a key element in the prevention and management of type 2 diabetes, many with this chronic disease do not become or remain regularly active. High-quality studies establishing the importance of exercise and fitness in diabetes were lacking until recently, but it is now well established that participation in regular PA improves blood glucose control and can prevent or delay type 2 diabetes, along with positively affecting lipids, blood pressure, cardiovascular events, mortality, and quality of life.”

Diabetes Care  33e:147, 2010
“Structured interventions combining PA and modest weight loss have been shown to lower type 2 diabetes risk by up to 58% in high-risk populations. Most benefits of PA on diabetes management are realized through acute and chronic improvements in insulin action, accomplished with both aerobic and resistance training. The benefits of physical training are discussed, along with recommendations for varying activities, PA-associated blood glucose management, diabetes prevention, gestational diabetes mellitus, and safe and effective practices for PA with diabetes-related complications.”

-ACSM/ADA 2010
Diet vs. Exercise for Weight Loss

In randomized control trials, about one hour of daily moderate aerobic exercise produces at least as much fat loss as equivalent caloric restriction, with resultant greater insulin action.

Ross 2000, 2004
ACSM/ADA 2011
The optimal volume of exercise to achieve sustained major weight loss is probably much larger than the amount required to achieve improved blood glucose control and CV health.

ACSM/ADA 2011
Evidence Statement

A combination of aerobic and resistance exercise training may be more effective in improving BG control than either alone; however, more studies are needed to determine if total caloric expenditure, exercise duration, or exercise mode is responsible.
Supervision of Training

• Exercise intervention studies showing the greatest effect on blood glucose control have all involved supervision of exercise sessions by qualified exercise trainers.

• The most direct test of the incremental benefits of supervised training was the Italian Diabetes and Exercise Study.
Evidence Statement

• In addition to aerobic training, persons with type 2 diabetes should undertake moderate to vigorous resistance training at least two to three days per week.
Exercise Responses

Those prescribing exercise are required to understand that those with T2D for more than five to eight years tend to exhibit these exercise responses:

- Chronotropic incompetence (lowered heart rate)
- Blunted systolic blood pressure response
- Attenuated \( V\cdot O_2 \) kinetics (aerobic capacity)
- Anhydrosis (inadequate sweat response)

Monitor the signs and symptoms of hypoglycemia.

Rating Perceived Exertion should also be used to assess exercise intensity.

-ACSM/ADA 2010
Aerobic, Muscle-strengthening, and Bone-strengthening Activities

Every day children and adolescents should do 1 hour or more of physical activity.
Aerobic activities. Most of the 1 hour a day should be either moderate or vigorous intensity aerobic physical activity, and include vigorous-intensity physical activity at least 3 days a week.

As a part of the 1 hour a day of physical activity, the following should be included:

- Muscle-strengthening on at least 3 days a week. These activities make muscles do more work than usual during daily life. They should involve a moderate to high level of effort and work the major muscle groups of the body: legs, hips, back, abdomen, chest, shoulders, and arms.

- Bone-strengthening on at least 3 days of the week. These activities produce a force on the bones that promotes bone growth and strength through impact with the ground.

Youth should be encouraged to engage in physical activities that are appropriate for their age, enjoyable, and offer variety.

No period of activity is too short to count toward the Guidelines. -CDC 2012
## Aerobic Activities by Level of Intensity

—CDC 2012

<table>
<thead>
<tr>
<th>Type</th>
<th>Children</th>
<th>Adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vigorous–Intensity</strong></td>
<td>• Active games involving running and chasing, such as tag</td>
<td>• Active games involving running and chasing, such as flag football</td>
</tr>
<tr>
<td></td>
<td>• Bicycle riding*</td>
<td>• Bicycle riding*</td>
</tr>
<tr>
<td></td>
<td>• Jumping rope</td>
<td>• Jumping rope</td>
</tr>
<tr>
<td></td>
<td>• Martial arts, such as karate</td>
<td>• Martial arts such as karate</td>
</tr>
<tr>
<td></td>
<td>• Running</td>
<td>• Running</td>
</tr>
<tr>
<td></td>
<td>• Sports such as ice or field hockey, basketball, swimming, tennis or gymnastics</td>
<td>• Sports such as tennis, ice or field hockey, basketball, swimming, soccer</td>
</tr>
<tr>
<td></td>
<td>• Cross-country skiing</td>
<td>• Vigorous dancing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Aerobics</td>
</tr>
<tr>
<td><strong>Muscle-Strengthening</strong></td>
<td>• Games such as tug of war</td>
<td>• Cross-country skiing</td>
</tr>
<tr>
<td></td>
<td>• Modified push-ups (with knees on the floor)</td>
<td>• Games such as tug of war</td>
</tr>
<tr>
<td></td>
<td>• Resistance exercises using body weight or resistance bands</td>
<td>• Push-ups</td>
</tr>
<tr>
<td></td>
<td>• Rope or tree climbing</td>
<td>• Resistance exercises with exercise bands, weight machines, hand-held weights</td>
</tr>
<tr>
<td></td>
<td>• Sit-ups (curl-ups or crunches)</td>
<td>• Climbing wall</td>
</tr>
<tr>
<td></td>
<td>• Swinging on playground equipment/bars</td>
<td>• Sit-ups (curl-ups or crunches)</td>
</tr>
<tr>
<td><strong>Bone-Strengthening</strong></td>
<td>• Games such as hop-scotch</td>
<td>• Hopping, skipping, jumping</td>
</tr>
<tr>
<td></td>
<td>• Hopping, skipping, jumping</td>
<td>• Jumping rope</td>
</tr>
<tr>
<td></td>
<td>• Jumping rope</td>
<td>• Running</td>
</tr>
<tr>
<td></td>
<td>• Running</td>
<td>• Sports such as gymnastics, basketball, volleyball, tennis</td>
</tr>
<tr>
<td></td>
<td>• Sports such as gymnastics, basketball, volleyball, tennis</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- * indicates activities that are commonly available at schools or community centers.
Exercise in Children and Adolescents with Diabetes

• It is especially important to plan for long duration or intense aerobic exercise, or else hypoglycemia is almost inevitable. Nearly all forms of activity lasting > 30 minutes will be likely to require some adjustment to food and insulin.

• Young people with T1D have been found to have decreased aerobic capacity as measured by VO2 max, compared to nondiabetic control subjects.

Pediatric Diabetes 2009;10 (Suppl.12) 1-2
International Society for Pediatric and Adolescent Diabetes
Hypoglycemia

- When regular (soluble) insulin has been injected prior to exercise, the most likely time for hypoglycemia will be 2-3h after injection.
- The high risk time after rapid-acting analog insulin is between 40 and 90 minutes.

-ISPAD 2009
Key Exercise Recommendations
Pediatric T1D

• Avoid exercise if BG < 100 or > 300 mg per dL.
• Check ketones if BG > 250 and exercising.
• Take 15g of carbohydrates for every 30 min.
• Check BG every 30-60 min during exercise.
• Avoid using legs for injections e.g., running (increased absorption) – abdomen better.
Just get Your Patients to Move and Move Often!
Practical Physical Activity Strategies
Practical Strategies to Getting Patients to Move

• Start by adding ~1000 kcal of physical activity per week.
• This is equivalent to ~9-10 miles per week of walking or ~ 20,000 pedometer steps.
What is \(~1000\) kcal of Physical Activity?

- Assumes 150-170 lb body weight (heavier individuals expend more kcal)
- 10 miles of walking at \(~3\) mph *
- 2.5-3 hours of continuous exercise at \(~55-65\)% of maximum effort level
- Three 45-50 minute aerobics classes
- 3-hour hike over variable terrain with 10 pound backpack
- 3 hours of cycling at 10-12 mph
- 3 sets of singles tennis
- 3 miles of freestyle swimming (women)
- 2.5 miles of free-style swimming (men)

* Note that you don’t have to do the above activities all at once but spread out over the course of a week
100 kcal = ~ 1 mile per day of walking

• Over the last 50 years in the U.S. we estimate that daily occupation-related energy expenditure has decreased by more than 100 calories and this reduction in energy expenditure accounts for a significant portion of the increase in mean U.S. body weights for women and men.

Church T et.al. 2011; PlosOne. Pennington Res. Inst. (NHANES 2006)
Time-efficient 1600+ kcal Weekly Program

- Monday: 20-min walk (or 5 x 4 min at work)
- Wednesday: 20-min walk (or 5 x 4 min at work)
- Friday: 20-min walk (or 5 x 4 min at work)
- 1 weekend day: 2hr+ drop-off variable terrain walk-hike

TOTAL EE: 400 + 1200 kcal = 1600+ kcal *

* Add 10-25% kcal at BMI’s > 34
Multi-intensity continuous aerobic exercise session

30 – 45 min
Weight Factor

• Overweight and obese prediabetes and diabetes patients expend more calories for a given walking workout than those who are normal weight
Weight Factor (cont.)

• Thus, even walking may represent a difficult exercise modality for obese individuals because they can use as much as 56% VO2max (some at BMI’s >40 using 64-98% VO2max) to meet the demand of such an activity compared with only 35% in normal-weight subjects.

56% vs 35%

Workplace EE

Feasibility of a Portable Pedal Exercise Machine for Reducing Sedentary Time in the Workplace:

• 5 min per hr  X  7 hrs
• 35 min @  3-4 kcal per min
• 2000-2500 steps
• 100 – 140 kcal (insulin sensitization – e.g., 10-15 mg metformin)
Systematic Pedometry

• Domestic or household circuit activity
http://www.ihs.gov/MedicalPrograms/Diabetes/index.cfm?module=toolsQuickGuides
www.ihs.gov/MedicalPrograms/Diabetes/index.cfm?module=toolsPAHowto
Systematic Clinical Pedometry

• The application of the systematic use of well-engineered pedometers as objective activity outcomes measures in prediabetes and diabetes
Pediatric 7-Day Step Activity Assessment

Youth Stepcount Activity Log

Name:

Instructions:
- Wear the pedometer tightly on your waist (beltline) and directly over your right leg.
- Reset your pedometer to ZERO after each day.
- Record your total stepcount for two full SCHOOL DAYS (e.g., 7 a.m. to bedtime).
- Record your total stepcount for two full WEEKEND DAYS (e.g., 7 a.m. to bedtime).

*If you play sports include the pedometer stepcount during that sport (when the pedometer can be worn with your athletic gear).

Return this log to the next Personal Fitness merit badge class.

Total # of Steps

<table>
<thead>
<tr>
<th>School day</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>School day</th>
<th>Date:</th>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>Weekend day</th>
<th>Date:</th>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th>Weekend day</th>
<th>Date:</th>
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</table>

Comments:
## Walk Your Way to Health

### RECORD SHEET

<table>
<thead>
<tr>
<th>Week</th>
<th>Instructions</th>
<th>Record Steps Taken Daily</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day 1</td>
<td>Day 2</td>
</tr>
<tr>
<td>Week 1</td>
<td>Wear your pedometer every day. Record the number of steps you normally take on each day. Do not increase your walking in this first week. This will be used to calculate your baseline.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Baseline (Average Daily Baseline Steps)</td>
<td>To calculate your baseline, add the number of steps you took during week 1 and divide by 7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 1 Total Steps</td>
<td>+ 7</td>
<td>=</td>
<td>steps</td>
</tr>
<tr>
<td>Week 2</td>
<td>If baseline was:</td>
<td>Aim for:</td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td>2,500 steps</td>
<td>3,000 steps on at least 3 days</td>
<td></td>
</tr>
<tr>
<td>Baseline (Average Weekly Baseline Steps)</td>
<td>After you have calculated your baseline steps, gradually increase your steps as recommended below for each week. Aim for the recommended number of steps for at least 3 or 5 days (as indicated below).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 2 Total Steps</td>
<td>+ 7</td>
<td>=</td>
<td>steps</td>
</tr>
<tr>
<td>Week 3</td>
<td>If baseline was:</td>
<td>Aim for:</td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td>2,500 steps</td>
<td>3,000 steps on at least 6 days</td>
<td></td>
</tr>
<tr>
<td>Baseline (Average Monthly Baseline Steps)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 3 Total Steps</td>
<td>+ 7</td>
<td>=</td>
<td>steps</td>
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<tr>
<td>Week 4</td>
<td>If baseline was:</td>
<td>Aim for:</td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td>2,500 steps</td>
<td>3,000 steps on at least 3 days</td>
<td></td>
</tr>
<tr>
<td>Baseline (Average Quarterly Baseline Steps)</td>
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</tr>
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<td>Week 4 Total Steps</td>
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<tr>
<td>Week 5</td>
<td>If baseline was:</td>
<td>Aim for:</td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td>2,500 steps</td>
<td>3,000 steps on at least 6 days</td>
<td></td>
</tr>
<tr>
<td>Baseline (Average Yearly Baseline Steps)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 5 Total Steps</td>
<td>+ 7</td>
<td>=</td>
<td>steps</td>
</tr>
<tr>
<td>Week 6</td>
<td>If baseline was:</td>
<td>Aim for:</td>
<td></td>
</tr>
<tr>
<td>Dates</td>
<td>2,500 steps</td>
<td>3,000 steps on at least 3 days</td>
<td></td>
</tr>
<tr>
<td>Baseline (Average Annual Baseline Steps)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 6 Total Steps</td>
<td>+ 7</td>
<td>=</td>
<td>steps</td>
</tr>
</tbody>
</table>

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[IHS Division of Diabetes](http://lancaster.unl.edu/FOOD/walk.pdf)
RX

for Outpatient Exercise Pedometry

Patient name: __________________________ Date: __________________________

Therapeutic code: __________________________

Order for following patient physical activity pedometer:

□ Pedometer: Eagle 2720 pedometer

Rx: steps per day _____ steps per week per month _____ /

Other Rx: __________________________

Patient instructions: See attached physical activity and pedometer guidelines

________________________________________ M.D.

Referring provider/physician
Pedometer Trekking

• Three to ten customized paths or trails of varying length and terrain (one to six miles) with known step count requirements.
IHS DDTP P Trekking Rx

Trekking Levels and Courses

• Level 1: 1000 – 3000 steps (.5-1.5 mile courses)
• Level 2: 3000 – 6000 steps (1.5 – 3 miles)
• Level 3: 6000 – 10,000 steps (3 - 5 miles)
• Level 4: >10,000 steps (>5 miles)

Level of difficulty: Easy (minimum terrain/grade), Moderate (moderate terrain/grade), Difficult (significant variable terrain and graded)
Trek Rx

• Ped Rx 1: 1 to 3K steps
• Ped Rx 2: 3 to 6K steps
• Ped Rx3: 6 to 10K steps
• Ped Rx 4: More than 10K steps
Daily Fit Log

- pec@pecentral.org
IHS Physical Activity Kit

www.ihs.gov/hpdp/index.cfm?module=dsp_hpdp_resources_physicalactivitykit
PAK Books

- Young People - Book #1
- Mt. Pathways Challenge - Book #2
- Modified American Indian Games - Book #3
- Exercise Breaks - Book #4
- Young Children - Book #5
- Adults and Family - Book #6
- Older Adults - Book #7
- Resources - Book #8
Are There Risk Reduction Differences?

• An active lifestyle expending more than 1500 kcal per week from a variety of domestic, recreational, and work-related activities

• An inactive work and recreational lifestyle but works out 3-5 days per week for 1500 kcal per week
Diverse Types of Moderate Exercise

• Diverse types of moderate exercise are also associated with lower incidence of diabetes and CVD mortality.
  • This includes such utilitarian activities as walking, gardening, climbing, and household/yard chores.
  • Those who expend 1000 - 1500 kcal per week in such utilitarian activities may require very little additional exercise to lower diabetes and CVD risk.

Lakka TA. Et.al. NEJM 1994;330:1549
Fransson E. et.al. Scan J Pub Health 2003;31:324
Meisinger C et.al. Diabetologia 2005;48:27
Marcus B et.al. Circ. 2006;114: 2739
Holme I et.al. BMC Public Health 2007, 7:154
Household-Community Circuit Rx (20 to 90 minutes)

- 2-minute rest/water break between stations
- Always start and end session with warm-up/cool down exercise as prescribed
- Do not continue exercise or go the next station if you experience chest discomfort, palpitations, dizziness or unusual fatigue
Utilitarian-domestic Activities do Condition and Reduce Risk

- Yardwork
- Gardening
- Housework
- Painting, cleaning, shoveling, scrubbing, washing
- Repair work
- ADL’s
You can’t fool these labs!!

- Triglycerides and non HDL-C tell us more about the patient’s lifestyle (and physical activity volume) than any other single laboratory measure.
Lifestyle Lab Panel

Primary:
• Triglycerides
• Non HDL-C
  • Non HDLC=TC-HDL
• Sys BP

Secondary:
• FPG &/or A1C
• Subscap SF
• Waist circumference
GXT’s with ECG Prior To Exercise Programming

Diabetic patients who have been previously sedentary and who plan to regularly engage in moderate to vigorous exercise require a medical examination and graded exercise treadmill test with ECG (GXT) prior to participation.

- Moderate: 40-60% of V02 max
- Vigorous: 60%+ of V02 max (>75% HRmax)

ACSM 2009
Just get your patients to move and move often!

You too!!
Questions?

Clinical Exercise Science Resources?
rlaforge@nc.rr.com