Long-term Weight Management in Obese Diabetic Patients

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Obesity on track as No. 1 killer

Inactivity, poor diet may overtake tobacco

For more parents, kids are a charm

...
Obesity and Diabetes: the Twin Epidemics

- Rates of diabetes and obesity are dramatically high worldwide, with an average of
  - 17% of people suffering from obesity
  - 7% of people with diabetes

http://dx.doi.org/10.1787/health_glance-2011-18-en

http://dx.doi.org/10.1787/health_glance-2011-13-en
Number of US Individuals with Obesity

CDC/NCHS, National Health and Nutrition Examination Survey, 2009–2010
Objectives

1- Can long-term weight loss be achieved?

2- What are the keys for long-term maintenance of weight loss?

3- Is non-surgical weight reduction cost-effective?
Type of Intervention

Short-term Weight Loss (< 1 year)
- Advice to change lifestyle: +/- 5 lbs (2%)
- Lifestyle intervention program: - 5-10 lbs (2-5%)
- Intensive lifestyle intervention program: -10-20 lbs (5-7%)
- Optimal intensive lifestyle intervention program: -20-30 lbs (10-15%)

Long-term Weight Loss (4-8 years)
- Intensive lifestyle intervention program: - 4.7%
- Optimal intensive lifestyle intervention program: - 6.3%
Weight Losses in ILI were Significantly Greater Than in DSE and Sustained Over a 4-year Period (Look AHEAD Study)

Weight Loss Through Year 8 (Look AHEAD study)

![Graph showing weight loss percentages through year 8.]

- DSE: -4.7%
- ILI: -2.1%

P < .001 for comparisons at all years

Four-Year Weight Loss Trajectories of 887 ILI Participants Who Had Lost ≥ 10% Initial Weight at Year 1

Long-term Reduction in Body Weight after Optimal Lifestyle Intervention in Clinical Practice

Weight Loss in Pounds

N= 120

Hamdy O. et al. ADA, Philadelphia, 2012
Long-term Reduction in Body Weight after Optimal Lifestyle Intervention in Clinical Practice

Weight Loss in Pounds

Weight Regain (52% of Participants) -8.0 (-3.3%)
Total Group -15.6 (-6.3%)
Weight Maintenance (48% of Participants) -24.1 (-9.5%)

<table>
<thead>
<tr>
<th>0</th>
<th>12 W</th>
<th>3 M</th>
<th>6 M</th>
<th>9 M</th>
<th>12 M</th>
<th>15 M</th>
<th>18 M</th>
<th>21 M</th>
<th>24 M</th>
<th>27 M</th>
<th>30 M</th>
<th>33 M</th>
<th>36 M</th>
<th>39 M</th>
<th>42 M</th>
<th>45 M</th>
<th>48 M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>0</td>
<td>-29.2</td>
<td>-31.98</td>
<td>-34.3</td>
<td>-32.8</td>
<td>-31.5</td>
<td>-29.4</td>
<td>-27.1</td>
<td>-26.6</td>
<td>-23.9</td>
<td>-22.8</td>
<td>-23.98</td>
<td>-22.4</td>
<td>-23.5</td>
<td>-23.8</td>
<td>-24.6</td>
<td>-23.8</td>
</tr>
<tr>
<td>Group B</td>
<td>0</td>
<td>-19.6</td>
<td>-16.66</td>
<td>-13.88</td>
<td>-8.2</td>
<td>-5.59</td>
<td>-6.4</td>
<td>-5.9</td>
<td>-3.3</td>
<td>-6.9</td>
<td>-5.3</td>
<td>-6.2</td>
<td>-7.3</td>
<td>-6.3</td>
<td>-5.9</td>
<td>-5.99</td>
<td>-6.4</td>
</tr>
</tbody>
</table>

N= 120 (Group A 57, Group B 63)
A versus B * p<0.05, ** P<0.01, *** P<0.001
Hamdy O. et al. ADA, Philadelphia, 2012
Distribution of Levels of Weight Maintenance at 1 Year and 2 Year Follow-up Assessments by Method of Initial Weight Loss

NWCR registry: Weight loss ≥13.6 and maintaining ≥ 13.6 kg for a year
Average weight loss 56 kg and maintenance of ≥13.6 kg for 5.5 years

Keys to Optimal Lifestyle Intervention for Long-term Weight Reduction

1. Aim for meaningful weight loss goal (5-10%)

2. Gradual and balanced and individualized physical activity
   1. Duration of exercise
   2. Type of exercise
   3. Exercise records

3. Structured dietary intervention & modified macronutrient composition
   1. Relatively higher protein, LGI & higher fibers
   2. Provided menus
   3. Food records
   4. Diabetes specific meal replacement (GTSN)

4. Medication adjustment and frequent BG monitoring

5. Counseling and cognitive behavioral change

6. Group intervention and frequent participant contact

7. Daily weighing
1- Aim for Modest Weight Loss through Defining a SMART Goal

Effect of weight loss on insulin sensitivity

BMI = body mass index; W/H = waist-to-hip-ratio.

*P<0.001

2- Gradual, balanced and individualized physical activity

- Duration of exercise
- Type of exercise
- Short versus long-bouts of exercise
- Exercise records/exercise monitor

The benefits of Exercise and or Increased Physical Activity include:

- Visceral Fat
- BP & lipids
- Metabolic Control
  Physical Fitness & QOL
  Maintenance of Weight Loss
- Vascular Resistance
Diabetes, a Common Comorbidity, Significantly Accelerates Loss of Muscle Mass, Strength and Quality

Loss of Total Muscle Mass [g/ year]  

p<0.05*  
Exercise Preserves Muscle Mass During Weight Reduction

- *P<0.05

Balanced Exercise Model

Flexibility
- Stretching
- Yoga

Aerobic
- Walking
- Swimming
- Biking
- Dancing

Strength
- Resistance tubing
- Weight lifting
- Yoga

Strength exercise is particularly important during weight reduction.
Gradual and balanced exercise intervention*

<table>
<thead>
<tr>
<th>Week</th>
<th>Frequency of Exercise*</th>
<th>Duration of Exercise</th>
<th>Type of Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>4 days /wk</td>
<td>20-40 min</td>
<td>AEX + STCH + CST + CT</td>
</tr>
<tr>
<td>5-8</td>
<td>5 days /wk</td>
<td>40-45 min</td>
<td>AEX + CT+ IT + STCH + Y + CSE</td>
</tr>
<tr>
<td>9-12</td>
<td>6 days /wk</td>
<td>50-60 min</td>
<td>IT + CT + CSE + SS + Y + STCH</td>
</tr>
</tbody>
</table>

AEX – Aerobic Exercise  
SS -Superset Training  
IT – Interval Training  
CSE - Core Stability Exercise

CT – Circuit Training  
STCH – Stretching Exercise  
CST- Cross Training  
Y- Yoga (Vinyasa flow)

* Model used in the Why WAIT program

Shahar J et al, ADA 2009
Changes in % Body Fat, Fat Mass & Lean/Fat Ratio after 12 Weeks of Balanced Exercise Plan

<table>
<thead>
<tr>
<th>Fat Mass (lbs)</th>
<th>Body Fat (%)</th>
<th>Lean/Fat Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>103.2</td>
<td>43.9</td>
<td>1.57*</td>
</tr>
<tr>
<td>84.8</td>
<td>40.2</td>
<td></td>
</tr>
</tbody>
</table>

n = 85
* p <0.05 ** p <0.01 *** p <0.001


n = 85
* p <0.05 ** p <0.01 *** p <0.001

Percent Weight Loss for Categories of 24-month Physical Activity

(N = 170)

Effect of Long vs. Short Bouts of Exercise on Adherence and Weight Loss

Long bout = one 40-min session.
Short bout = four 10-min sessions.

3- Structured dietary intervention & modified macronutrient composition

- Relatively higher protein, LGI & higher fibers
- Provide structure menus
- Calorie replacements
- Food records

Calorie intake
Carbs to 40-45%

Glycemic index

Protein intake to 30%
Fiber
MUFA

Saturated fat and sodium

Natural food (dinner menus and snacks) and Calorie Replacement
Diets with High or Low Protein Content and Glycemic Index for Weight-Loss Maintenance (26 weeks)

n= 773
Initial weight loss ≥8%
13% protein (LGI/HGI) versus 25% protein (LGI/HGI)

The Metabolic Effect of Different Protein/Carbohydrates Ratios in Type 2 DM

Protein to carbohydrate to fat: 30:40:30 Versus 15:55:30

-0.3%
-0.8%

Total glycated hemoglobin response of subjects to the control (15% protein) and high-protein (30% protein) diets over the 5-wk study period.

*Significantly different from the control diet, $P < 0.05$

The rate of decline was also significantly greater after the high-protein diet, $P < 0.001$

Adapted from Gannon MC et al. Amer J Clin Nutr 2003;78:734-741
Strong Correlation Between Calorie Replacement and Weight Loss (Look AHEAD Study)

Number in the bar is mean number of MRs used in that quartile

Reduction in Initial Weight in ill participants (%)

1st: -5.9%
2nd: -7.2%
3rd: -9.4%
4th: -11.2%

MRs = meal replacements.
Reproduced with permission from Wadden TA et al. Obesity 2009; 17:713-722
4- Adjusting medications that affect the body weight

- Diabetes medications
- Antidepressants
- Weight loss medications

Avoid weight promoting medications
## Diabetes Medications and Body Weight

<table>
<thead>
<tr>
<th>List A</th>
<th>List B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Identify</td>
<td>1- Identify</td>
</tr>
<tr>
<td>2- Plan</td>
<td>2- Plan</td>
</tr>
<tr>
<td>3- Change</td>
<td>3- Change</td>
</tr>
</tbody>
</table>

### List A

- **Weight Gain**
  - Significant
  - Modest

### List B

- **Weight Neutral**
  - Weight Loss

#### Medications

**List A**

- **Pioglitazone**
- **SUs**
  - Glyburide
  - Glipizide
- **Insulin**
  - NPH
  - Glargine
  - Regular
  - Aspart
  - Lispro
  - Glulisine
- **SUs**
  - Glimepiride
  - Glipizide XL
- **Glinides**
  - Repaglinide
  - Nateglinide
- **Insulin**
  - Detemir
  - Glulisine (PP)

**List B**

- **Metformin**
- **DPP-4 Inhibitors**
  - Sitagliptin
  - Saxagliptin
  - Linagliptin
- **α-glucosidase Inhibitors**
  - Acarbose
  - Miglitol
- **GLP-1 Analoges**
  - Exenatide
  - Exenatide ER
  - Liraglutide
- **Pramlintide**
- **Colestevanam**
- **Bromocriptine**

#### Actions

- **List A**: Stop, Reduce or Switch
- **List B**: Continue
- **List B**: Add

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This table outlines the relationship between diabetes medications and body weight changes, with specific actions for each medication based on weight gain, neutral, or loss.
Results of Optimal Intensive Lifestyle Intervention

Changes in Metabolic & CV Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td>HbA1c (%)</td>
<td>7.5</td>
<td>6.6</td>
</tr>
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</table>

n = 115
* P<0.001

Cost-effectiveness of non-surgical and surgical weight management

- Health Care Cost and Diabetes-Related Cost
- Cost utilization (Hospitalization, Clinic visits)
Cost-effectiveness of Intensive Lifestyle Intervention

- A 10-year analysis of the Diabetes Prevention Program trial showed lifestyle intervention was cost-effective compared with placebo in prevention of diabetes in high-risk adults.

- From a payer perspective, investment in lifestyle management for diabetes prevention provides good value.

Economic Impact of Non-Surgical Weight Loss in One Year in Patients With Diabetes

Cost Saving (1% wt loss)

- $256
  (-3.6%)\(^1\)

Estimated Saving with (7% wt loss)

- $1,946
  (-27%)

- $996
  (-44%)

<table>
<thead>
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<th>Cost saving per year</th>
<th>Health Care Cost</th>
<th>Diabetes Related Cost</th>
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<tbody>
<tr>
<td>- $256</td>
<td></td>
<td>(-3.6%)(^1)</td>
</tr>
<tr>
<td>- $131</td>
<td></td>
<td>(-5.8%)(^2)</td>
</tr>
<tr>
<td>- $996</td>
<td></td>
<td>(-44%)</td>
</tr>
<tr>
<td>- $1,946</td>
<td></td>
<td>(-27%)</td>
</tr>
</tbody>
</table>

1) \(p<0.5\)  2) \(p<0.01\)

YU AP et al. Curr Med Res Opin. 2007;23(9):2157-69
Impact of Bariatric Surgery on Healthcare Utilization & Costs in Patients with DM over 6 Years

7,806 patients with diabetes who received bariatric surgery

Conclusion
In the six years following bariatric surgery, individuals with type 2 diabetes did not have lower healthcare costs than before surgery.

In Conclusion

1. Long-term weight reduction can be achieved through non-surgical weight management.
2. Exercise type and duration significantly impact long-term weight maintenance.
3. Changing macronutrient compositions, providing structured meal plan plus adding calorie replacements are effective dietary intervention.
4. Adjusting diabetes medications is important for effective long-term weight reduction in patients with diabetes.
5. Long-term weight reduction is cost-effective for prevention and treatment of diabetes.