

Case Study: Weight Loss Leads to Cost Savings and Improvement in Metabolic Syndrome

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Presentation

C.Y. is an obese 52-year-old white man with type 2 diabetes for 11 years, who is placed on a medically supervised weight-loss plan.

The plan begins with a 16-week medically directed weight-loss treatment that provides intensive skill-based lifestyle education and a nutritionally complete diet. The plan consists of at least 520 kcal/day using prepackaged products, vitamins, fiber, and ursodiol for prevention of gallstones. The patient sees the physician and nursing staff weekly in addition to attending the 1.5-hour behavioral education class. Patients are enrolled in maintenance classes after the initial 16 weeks of elective weight loss are completed.

Laboratory tests are performed at scheduled intervals throughout the program. At the start of the program, C.Y.'s physical examination and laboratory assays yielded the following data:

- Height: 73.5 inches
- Weight: 474.7 lb
- BMI: 60.2 kg/m²
- Hemoglobin A_{1c} (A1C): 6.7%
- Triglycerides: 164 mg/dl
- Total cholesterol: 167 mg/dl
- LDL cholesterol, calculated: 102 mg/dl
- HDL cholesterol: 34 mg/dl
- Creatinine, serum: 1.1 mg/dl
- Glucose, serum: 182 mg/dl
- Blood pressure: 136/80 mmHg

At the start of the program, the patient's medications and supplements included:

- Losartan/hydrochlorothiazide (HCTZ), 50/12.5 mg twice daily
- Metoprolol extended release, 200 mg daily
- Verapamil SR, 240 mg daily
- Glyburide, 5 mg twice daily
- Glyburide/metformin, 5/500 mg twice daily

- Pioglitazone, 45 mg daily
- Meloxicam, 7.5 mg daily
- Ursodiol, 300 mg twice daily

C.Y. was diagnosed with hypertension in 1990, type 2 diabetes in 1993, and sleep apnea in 1995. He has a history of shortness of breath, pain in his knees because of arthritis, excessive weight, and sciatica.

He attributes his excess weight to compulsive overeating, oversized portions, and an increased intake of fats and sugars. He has tried numerous other weight-loss programs in the past, unsuccessfully. C.Y.'s average monthly expenditure on prescription medications, based on drugstore.com, is \$652.58.

Questions

1. How does weight loss change a patient's medication requirements?
2. How does weight loss affect insulin resistance?
3. How does weight loss affect glycemic control?

Discussion

In 2000, diabetes was the sixth-leading cause of death, based on the 69,301 death certificates listing it as the underlying cause. This number underestimates the actual value because diabetes is likely underreported as the cause of death. In 2002, 18.2 million people had diabetes, and only 13 million of them were diagnosed.¹

The cost of diabetes in the United States in 2002 was a staggering \$132 billion. This included \$92 billion in direct medical costs and \$40 billion in indirect costs. Direct costs include the cost of medical care and services, whereas indirect costs include costs

of short-term and permanent disability, including loss of work and premature death. These numbers do not represent the true effects of diabetes on society, because intangibles, such as pain and suffering and care provided by nonpaid caregivers, are not included.²

In a recent nationwide survey, researchers found that, because of prescription costs, there was an increased financial burden leading to debt, borrowing money, and cutting back on other essential needs, such as food or heat. Nearly one in five people with diabetes in the survey reported cutting back on prescription medications in the previous year, and 15% used less of their medications at least once per month.^{3,4} The combined cost of insulin, delivery supplies, and oral agents was > \$12 million in 2002. This explains why it is such a struggle to deal with the financial cost of diabetes.

Diabetes has also been associated with numerous comorbidities. Among these are retinopathy, neuropathy, coronary heart disease, hypertension, and abnormal lipid profiles.^{5,6} These complications add to the already overwhelming costs of diabetes care.

Caloric restriction and weight loss have been shown to improve insulin resistance, prevent or delay diabetes, improve and maintain normal glycemic levels, and improve A1C concentrations.⁶ Lifestyle management, along with weight loss, is associated with improved quality of life, lower fasting glucose levels, and a reduced need for diabetes medications, especially insulin and secretagogues.^{6,7} Weight loss helps improve and control hypertension, dyslipidemias, and physical functioning. This

improvement can lead to pain-free range of motion and improve symptoms in arthritic conditions.⁶

In the case above, C.Y. needed interventions to lower his blood glucose and A1C, help him lose weight, increase his exercise tolerance, control his portion sizes, and decrease his intake of fats and sugars. Before starting the program, his blood glucose, blood pressure, and A1C were all above target range.

At the start of the program, C.Y.'s glyburide was discontinued. After the first 4 weeks, he had lost 45.2 lb; his glucose ranged from 86 to 141 mg/dl; his average blood pressure was 114/75 mmHg; his losartan/HCTZ, 50/12.5 mg, was decreased to once daily; and his glyburide/metformin combination was discontinued. After 8 weeks, C.Y.'s compliance with behavioral and

educational requirements was excellent. His metoprolol extended release was decreased to 100 mg daily; he had lost 69.5 lb; his glucose ranged from 98 to 138 mg/dl; and his blood pressure averaged 121/77 mmHg. After 12 weeks, he had lost 85.1 lb; his glucose ranged from 77 to 126 mg/dl; and his blood pressure averaged 115/70 mmHg. Following the 16-week initial weight-loss core classes, he continued his weight loss. By the end of 30 weeks, C.Y. had lost 119.5 lb; his average blood pressure was 109/67 mmHg; his serum glucose ranged from 81 to 114 mg/dl; his A1C was 5.1%; and his metoprolol, extended release 100 mg, was discontinued. (See Tables 1 and 2.)

With his decreased caloric intake and weight reduction, C.Y. was able to decrease the number and dosages

of medications he was previously taking. Over the course of the program, three medications were stopped completely and one was decreased by half. This netted a cost savings of \$207.96 per month or > \$2,500 per year. In 10 years, the savings would be enough to cover the cost of a new car. With these medication reductions, corresponding physical examination and laboratory values, e.g., blood pressure and serum glucose, were still within normal limits. C.Y.'s A1C decreased 1.6 percentage points to 5.1% even as the oral diabetes medications were discontinued.

This weight-loss program mimics that used in the successful Diabetes Prevention Program, with ongoing support from health coaches. An ongoing dilemma is that weight is often regained after a weight-loss

Table 1. C.Y.'s Performance in a Medically Supervised Weight-Loss Program

Performance at a Glance

Week Number	3	6	9	12	15	18	21	24	27	30
Shakes/3 weeks*	67	107	113	114	116	112	104	107	97	97
Entrees/3 weeks	25	38	43	43	24	12	5	3	11	8
Benefit Bars/3 weeks	0	1	0	0	1	0	5	0	0	0
Total fruits and vegetables/3 weeks†	0	0	0	0	0	22	58	89	112	121
Kcal burned/3 weeks ‡	1,850	5,440	6,450	6,650	8,850	5,025	2,350	1,200	2,000	2,750
Weight change/3 weeks	-27.4	-24.7	-17.4	-15.2	-12.6	-13.8	-7.2	-2.6	-2.7	+4.1
Medicinal changes			Decreased metoprolol and losartan/HCTZ. Discontinued glyburide/metformin.			Discontinued metoprolol.	Discontinued meloxicam.			

*Program requires 105 shakes/3 weeks.

†Program omits fruits and vegetables until week 16 is completed and then allows for 105/3 weeks.

‡Program requires 6,000 Kcal to be burned/3 weeks.

Table 2. C.Y.'s Physical Examination and Laboratory Values

Week #	A1C (%)	Glucose (mg/dl)	Blood Pressure (mmHg)	BMI (kg/m ²)	Total cholesterol (mg/dl)	LDL cholesterol (mg/dl)*	HDL cholesterol (mg/dl)	Triglycerides† (mg/dl)
Baseline	6.7	182		62.5	167	102	34	154
1-3			116/80	60.2				
4-6			119/75	56.7				
7-9		121	116/69	54.3	161	89	34	191
10-12			117/73	52.3				
13-15		117.1	12/69	50.4	177	106	36	175
16-18			113/71	48.6				
19-21			115/73	47.3				
22-24	5.1	130	103/67	46.5				

*At the time of the study, the LDL goal was < 100 mg/dl.

†Nonfasting lipid panel

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program and its coaching ends. A feature of the program used here is the availability of a maintenance phase, which C.Y. entered after losing about 120 lb.

As this case demonstrates, weight loss brings many benefits related to diabetes, metabolic syndrome, and cost reduction of medical care.⁸⁻¹⁰ Medically supervised weight-loss programs facilitate safe and effective weight reduction. The next critical step is for clinicians to continue to follow patients and ensure their participation in maintenance programs.

Clinical Pearls

- Weight loss improves insulin resistance and reduces the need for medication in all areas of the metabolic syndrome.
- Health coaching, record keeping, and weekly goal setting increase the likelihood of weight-loss success.
- “Maintenance” coaching is one successful method to help keep weight off.

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