The Diabetes Prevention Program: A Worksite Experience

Steven G Aldana; Marilyn Barlow; Rebecca Smith; Frank G Yanowitz; et al

AAOHN Journal; Nov 2005; 53, 11; ProQuest Nursing & Allied Health Source

pg. 499

The Diabetes Prevention Program

A Worksite Experience

by Steven G. Aldana, PhD, Marilyn Barlow, BSN, Rebecca Smith, MS, Frank G. Yanowitz, MD, Ted Adams, PhD, MPH, LaDonne Loveday, BSN, Janae Arbuckle, BS, and Michael J. LaMonte, PhD, MPH

ABSTRACT

The purpose of this study was to determine if the U.S. National Institutes of Health Diabetes Prevention Program (DPP) could be successfully implemented in a worksite setting. Thirty-seven adult employees of BD Medical Systems of Sandy, Utah were enrolled in a single-group time-series study using the DPP. Two-hour oral glucose tolerance tests (OGTT) and other outcomes were measured at baseline, 6 months, and 12 months. Weight, body mass index, waist circumference, 2-hour OGTT, very low density lipoproteins, triglycerides, and aerobic fitness were significantly improved at 6 and 12 months and showed overall significant improvement across time. Fasting blood insulin, total cholesterol, low density lipoproteins, and total cholesterol/high density lipoproteins ratio were significantly improved at 6 months, but not at 12 months. Eighteen of the program participants (51%) were no longer in the prediabetes and diabetes categories after 1 year. Existing worksite health promotion and occupational health professionals can successfully offer the DPP and help employees improve glucose tolerance.

Diabetes is the sixth leading cause of death in the United States and is recognized as a major independent modifiable risk factor for coronary heart disease (Davis, 1998; Grundy et al., 1999; National Center for Chronic Disease Prevention and Health Promotion, 2002). Type 2 diabetes affects approximately 9% of the adult population (American Diabetes Association, 2004). Although genetic determinants of type 2 diabetes have been identified (Hamman, 1992; Moller & Flier, 1991), lifestyle-related behavioral factors, physical activity, and dietary habits are thought to more greatly influence an individual's risk of developing type 2 diabetes (Edelstein et al., 1997; Lipton, Liao, Cao, Cooper, & McGee, 1993). Therefore, the efficacy of pharmaceutical treatment of type 2 diabetes varies (Ghazzi et al., 1997; UK Prospective Diabetes Study Group, 1998).

Observational studies demonstrate that diabetes risk increases with a sedentary lifestyle (Johnson & Ballin, 1996), an unbalanced diet (Franz et al., 1994), and excessive body weight (Kiernan & Winkleby, 2000), which suggests that lifestyle interventions affecting these habits could improve glucose tolerance. Lifestyle trials such as the U.S. National Institutes of Health Diabetes Prevention Program (DPP) provide strong evidence for the primary prevention of type 2 diabetes (Knowler et al., 2002; Pan et al., 1997; Tuominen et al., 2001). Despite evidence supporting the use of lifestyle interventions to prevent diabetes and improve glucose tolerance (with reductions of the incidence of diabetes by 58%), translating and disseminating the DPP into community settings where it can affect large populations has been challenging. The cost of screening large groups of individuals to identify those who have prediabetes and diabetes is problematic. It is equally difficult to plan and administer the DPP without adequately trained personnel and staff available to provide careful management of the program.
One possible target for dissemination of the program is the worksite. Worksites have several characteristics that may encourage employees to reduce the burden of diabetes. Most adults spend more than half of their waking hours at the job site working, eating, and socializing. Many worksites have qualified staff, equipment, and facilities as part of existing workplace safety, health, or wellness programs. Worksite health programs offer the opportunity to provide intensive health-related screening, education, and intervention services among large populations of individuals in an often "capitive" environment. Employed adults also receive social support from coworkers and peers—social and peer support is a strong determinant factor in successful behavior change (Dishman, Oldenburg, O'Neal, & Shephard, 1998). Because employers are directly responsible for funding the continually increasing costs of employee health care, worksites able to help employees reduce the burden of diabetes can potentially reduce employee-related health care expenses. The purpose of this study was to determine if the DPP could be successfully implemented in a worksite setting.

METHODS
This study was conducted in two phases. Phase I was a screening of all interested employees to identify those suspected of having pre-diabetes or diabetes. A 2-hour oral glucose tolerance test (OGTT) was administered to those employees suspected of having pre-diabetes. Phase II was the intervention, where employees shown to be pre-diabetic or diabetic by the 2-hour OGTT participated in a worksite version of the 12-month DPP.

Participant Recruitment
All adult employees (N = 1,023) of BD Medical Systems of Sandy, Utah, were given the opportunity to participate in the study. The average age of BD employees was 46 years. The work force was 54% women. The racial breakdown was 54% White, 34% Asian/Pacific Islander, and 11% Hispanic individuals. Employees diagnosed with diabetes and receiving health care for the disease (n = 54) were excluded from the study. The majority of the employment positions at the worksite were hourly. Recruitment was conducted via mass e-mail distribution using the company Intranet, posted flyers, and word of mouth. Of the total employee population, 603 (more than 60%) volunteered for Phase I screening and provided informed consent. The study was reviewed by the Institutional Review Board of Intermountain Health Care's (IHC) LDS Hospital.

Phase I Screening
The screening of interested employees (n = 603) consisted of a fasting finger stick glucose test (Rolka et al., 2001), height and weight measurement, and waist girth measurement. Employees also completed a short diabetes and demographic survey (Pearson, Pronk, Tan, & Halstenson, 2003; Rolka et al., 2001). Single capillary blood samples were analyzed with a glucometer (SureStep®, LifeScan Inc., Milpitas, CA) calibrated with a known standard prior to testing. Standing height and weight were measured using a calibrated clinical balance beam scale and stadiometer. Body mass index (BMI) was computed as body weight (kg) divided by height squared (m²). Waist girth was measured level with the iliac crest according to published standards (Kiernan & Winkleby, 2000). A single blood pressure measurement was taken on the right arm after 5 minutes of quiet sitting. Registered nurses employed by BD and IHC conducted the diabetes survey, finger stick for fasting glucose, and measurements. Pre-diabetes was suspected if an employee had any of the following (Grundy et al., 1999):

- BMI ≥ 30 kg/m².
- Fasting finger stick glucose ≥ 95 mg/dL.
- Waist girth ≥ 40 in men; ≥ 35 in women.

Employees were also considered suspect if they had the presence of any three of the following (Edelstein et al., 1997; Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2002; Kiernan & Winkleby, 2000): (Information other than the BMI and blood pressure was obtained from the health history questionnaire.)

- Single birth ≥ 9 lbs.
- Gestational diabetes.
- BMI 25 to 29.9 kg/m².
- Little to no regular exercise.
- Polycystic ovarian syndrome.
- Family history of type 2 diabetes.
- Use of hyperlipidemic medication.
- Use of antihypertensive medication.
- Blood pressure ≥ 140 mmHg systolic or ≥ 90 mmHg diastolic.
- Hispanic, Asian, Native American, or African-American ethnicity.

Employees suspected of having pre-diabetes (n = 320) according to the above criteria were asked to return at a scheduled time to complete a fasting baseline OGTT. The OGTT screening required a 12-hour fast before a baseline venipuncture. Following the blood draw, participants ingested a standardized 75 gram glucose solution (Glucola, Custom Laboratories, Baltimore, MD). They then attended a 2-hour diabetes education class during which participants were seated and non-ambulatory. The class was conducted by a health educator and covered general information related to diabetes, cardiovascular disease, and the rationale for worksite diabetes screening and intervention. The second blood draw was performed 2 hours after ingestion of the Glucola solution. All venipunctures were drawn by trained phlebotomists. Participating employees were given a $5 lunch voucher for the company cafeteria after completing the procedure. Of the 320 employees, 276 had normal OGTT results.

Using standard guidelines based on those provided by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2002), employees who had fasting OGTT plasma glucose values of 110 to 125.9 mg/dL or a 2-hour post-challenge plasma glucose of 141 to 200 mg/dL were considered to have pre-diabetes. Employees with a fasting plasma glucose greater than 126 mg/dL or a 2-hour post-challenge plasma glucose values greater than 200 mg/dL were screened as possibly hav-
ing diabetes and were referred to a health care provider for diagnosis. At the completion of the intervention, the eight diabetic participants reported that none of them had visited with their health care provider during the intervention despite earlier encouragement to do so.

For newly diagnosed pre-diabetic and diabetic employees, the following items were measured at a local laboratory:
- Triglycerides.
- Serum glucose.
- Total cholesterol (CHL).
- Hemoglobin A1c (HbA1c).
- Low density lipoprotein (LDL).
- High density lipoprotein (HDL).
- Very low density lipoprotein (VLDL).
- Serum insulin (an estimate of glucose tolerance and uptake).
- High-sensitivity C-reactive protein (hsCRP) (generally considered a global measure of inflammation).

All employees within the range of pre-diabetes (n = 36, 6% of screened population), as well as the newly diagnosed employees with diabetes (n = 8), were invited to participate in Phase 2—the Worksite Diabetes Prevention Program (WDP). Prior to Phase 2, all program participants were asked to complete submaximal aerobic fitness tests by walking for 3 minutes on a motorized belt-driven treadmill at 2.5 miles per hour and 12% grade or Stage II of the Bruce Treadmill Protocol (American College of Sports Medicine [ACSM], 1995). The heart rate response, blood pressure, and rating of perceived exertion (6 to 20 point Borg scale) were obtained during the last 30 seconds of walking. The heart rate was used to classify participants' fitness levels and guide exercise prescriptions during the intervention. The fitness tests were administered on-site by an exercise physiologist.

**Phase II Intervention**

The WDP used the same basic protocol and curriculum as the DPP (Knowler et al., 2002). This program consisted primarily of an educational curriculum focused on diet, exercise, and behavior change activities. Pharmacological therapy was not part of this program. Participants were encouraged to participate in the project for 1 year. BD administration allowed employees to participate in program activities during regular work hours without loss of pay or personal time. Participation was completely voluntary, and the identity of employees who participated or who refused to participate was not disclosed to company management. Program participants were expected to provide all required outcome data at baseline, 6 months, and 12 months. At 12 months, participants received a $10 gift certificate for repeating the testing procedure. During the program they also received a pedometer, extensive diabetes risk assessment, and diabetes education at no cost. The intervention program was administered by two registered nurses and a certified health educator. A physician oversaw the safety and delivery of the program. Unlike the DPP the employees were not routinely called at home; however, they were seen frequently at the worksite.

Program participants were encouraged to achieve and maintain at least 150 minutes of moderate to vigorous physical activity per week (approximately 700 to 1,000 kcal per week), and achieve and maintain a weight loss of at least 7% of baseline body mass through changes in diet and physical activity.

The focus of group and individual education sessions was:
- Proper food selection and portion control.
- Social networks to facilitate achievement of the intervention goals.
- Identifying barriers to change, including overcoming physical activity barriers.

During the first 24 weeks, a class was offered once per week. Participants were asked to attend a minimum of 16 sessions during the first 24 weeks. During the final 6 months of the program, participants attended monthly sessions. Participants were encouraged to contact a case manager as needed during the entire 12-month intervention. Worksite nurses held one-on-one conferences with participants at least each quarter. Adherence to the program was monitored by the research team through measuring body weight each month and tracking reports of physical activity, diet, daily steps (pedometer count), and class attendance.

Specific emphasis was placed on a gradual increase in brisk walking or activities of similar intensity. Participants received a free membership to the employee fitness center and were encouraged to participate in exercise classes offered daily. The fitness center membership lasted for 6 months and was renewable for an additional 6 months. Participants were encouraged to reduce dietary fat intake to less than 25% of calories. A calorie goal was added if weight loss did not occur through fat restriction alone. The calorie goal was particularly important among Asian participants who already reported eating low-fat diets (e.g., rice, vegetables). Calorie goals were determined according to American Diabetes Association dietary recommendations (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2002).

To help participants become more aware of their daily dietary intake, they were encouraged to use tracking cards to monitor their nutrient intake. To maximize the success of achieving and maintaining these lifestyle goals, the intervention emphasized self-esteem, empowerment, and social support through individual and group education in diet, exercise, and behavior modification. A schedule of worksite education classes and their descriptions were provided. Participants were given a binder of educational materials related to nutrition, exercise, stress management, and diabetes risk and worksheets pertaining to class goals. The educational materials used were those used by the DPP, and can be accessed on the Web at www.bsc.gwu.edu/dpp/index.htmlVdoc.

**Statistical Analyses**

Repeated measures multivariate ANOVA and the Wilks' lambda statistic were used to evaluate the overall effect of each outcome variable. Comparisons
between 6-month values and baseline and 12-month values and baseline were conducted with repeated measures ANOVA. Analyses were performed using SAS version 9.0. (SAS Institute Inc., Cary, NC).

RESULTS

The Figure shows the flow of participants. Of the employees who completed OGTT screening, 36 were shown to be pre-diabetic and 8 were diabetic. Of these 44 pre-diabetic or diabetic employees, 7 refused to participate and 2 dropped out of the study. Complete data sets for 35 participants were collected. Attendance averaged 67% for all participants in all program classes and exercise sessions. The highest attendance was 96% and the lowest attendance was 48%.

Table 1 shows the frequency of various demographic variables for the WDPP participants. More than half of the participants were ethnic minorities. Table 2 shows the results of the multivariate analysis of outcome variables. Weight, BMI, waist circumference, 2-hour OGTT, VLDL cholesterol, triglycerides, and aerobic fitness were significantly improved at 6 and 12 months, and showed overall significant improvement across time. Fasting blood insulin, total cholesterol, LDL cholesterol, and total cholesterol/HDL ratio were significantly improved at 6 months, but not at 12 months. Each of these, with the exception of fasting blood insulin, also showed a significant effect for time. HbA1c failed to show significant improvement at 6 months, was significant at 12 months, and had a significant time effect. High-sensitivity C-reactive protein and HDL cholesterol were the only outcome variables to show no significant change.

Ten program participants had HbA1c levels greater than 6% at baseline, but only four participants tested greater than 6% after 12 months. Four participants had 12-month 2-hour OGTT values higher than at baseline, two had worsened fasting blood insulin levels, and seven had HgA1c values that had worsened at 12 months. The number of participants in each of the OGTT categories at baseline, 6, and 12 months is shown in Table 3. During the 12-month program period, a dramatic number of participants regained glycemic control and had normal glucose tolerance tests.

DISCUSSION

These results support the hypothesis that the DPP can be successfully conducted in an existing workplace health promotion program and can significantly improve glucose tolerance and avert the transition from pre-diabetes to type 2 diabetes during a 1-year period. Program participants were also able to demonstrate significant improvements in most clinical outcomes. Based on the 2003 guidelines from the American Diabetes Association (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 2002), 18 of the program participants had OGTT scores below 140 mg/dL and were no longer in the pre-diabetic and dia-
betic categories (Table 3). This represents a 51% reduction in the prevalence of at least pre-diabetes. This result compares favorably with the findings from other lifestyle trials. Pan et al. (1997) reported that the 6-year incidence of type 2 diabetes was approximately 22% ($p \leq .05$) lower among Chinese men and women receiving intensive diet, exercise, and behavior modification interventions (incidence = 46%) compared with controls (incidence = 68%). Tuomilehto et al. (2001) reported a significantly ($p \leq .05$) lower 4-year incidence of type 2 diabetes among Finnish men and women receiving intensive lifestyle intervention (incidence = 11%) than among controls (incidence = 23%). The DPP (Knowler et al., 2002) demonstrated that the 3-year reduction in type 2 diabetes incidence was greater ($p \leq .05$) among men and women receiving intensive lifestyle intervention (58% reduction) compared with individuals treated pharmacologically with metformin (31% reduction).

Two other trials used diet and physical activity to improve glucose tolerance (Mensink et al., 2003; Watanabe, Yamaoka, Yokotsuka, & Tango, 2003). Watanabe et al. (2003) reported a 15% reduction in fasting blood glucose after 12 months. Participants were encouraged to decrease the number of calories they consumed at dinner. Mensink et al. (2003) helped Dutch participants improve their diets and become physically active. Participants in this study reduced 2-hour plasma glucose concentrations by 8%. At 6 months, the present study participants experienced a 25% reduction in plasma glucose, and at 12 months, a 21% reduction from baseline.

Improvements in nutrition and physical activity are associated with improvements in other risk factors besides serum glucose. Because participants also experienced improvements in blood lipids, weight, waist circumference, and fitness, it is possible that the risk of cardiovascular diseases and even certain cancers may have been reduced.

The first step in implementing this worksite intervention to prevent type 2 diabetes was to identify individuals with pre-diabetes. Low-cost screening methods, such as fasting finger sticks (capillary blood), glucose measures, and self-reported risk factors obtained through interview-based questionnaires, were used to identify undiagnosed pre-diabetes in a study by Rolka et al. (2001). Using a fasting serum glucose of $\geq 110$ mg/dL or a 2-hour post-load serum glucose of $\geq 140$ mg/dL as criteria for prediabetes, they reported reasonable sensitivity and specificity parameters for a simple risk factor questionnaire (69% and 54%), a fasting finger stick blood glucose $\geq 120$ mg/dL (62% and 90%), and the combined methods (45% and 95%). The sensitivity and specificity of the capillary blood measure may have been better if participants had been fasting. Without OGTT results from all participants, it is impossible to determine the specificity and sensitivity of the screening protocol used in the present study. Regardless, the protocol did identify 44 pre-diabetic individuals.

BD management did not conduct a detailed cost analysis of the screening or the intervention, but several factors did help to keep the cost of this effort low. BD has a partnership with their health care provider. BD employee health staff and IHC health care personnel who oversee the company's health promotion program conducted the screening and the WDPP as part of BD health promotion programming. Because of the large number of glucose tests and venipunctures performed, special pricing was obtained.

Although cost effectiveness of diabetes screening has been suggested to be low (Licks et al., 2004; Wake et al., 2000), there is tremendous variability in the screening protocol used. Screening techniques vary considerably by cost and sensitivity. The decision to screen large populations has to be made using local input to balance the effectiveness, efficiency, and cost of screening methods. BD used capillary blood glucose tests as part of the first, larger screening because they are efficient and relatively inexpensive. For follow-up screening, they used OGTT with greater specificity. Zhang et al. (2003) found that testing all individuals with OGTT was the most effective strategy, but the capillary blood glucose test and risk assessment questionnaire were the most cost effective.

Participation in the screening was voluntary. Among the employees who opted to participate in the initial screening ($n = 603$, 59%), 36 (6%) were found to be pre-diabetic and 8 (1.3%) were identified as diabetic. Employees who had previously been diagnosed with diabetes (n = 54) were not invited to participate in the initial screening because their care was already being managed by the on-site nurse manager. Nationally, the estimated prevalence of diabetes among adults was 8.7% in 2002 (American Diabetes Association, 2004). Based on national-

| Table 1: Frequency of Selected Demographic Variables for the Worksite Diabetes Prevention Program Participants |
|-------------------------|-----------------|-----------------|
| **Gender**              | **Number**      | **Percent**     |
| Men                     | 12              | 34.3            |
| Women                   | 23              | 65.7            |
| **Race**                |                 |                 |
| White                   | 17              | 48.6            |
| Hispanic/Latino         | 5               | 14.3            |
| Asian                   | 10              | 28.6            |
| Pacific Islander        | 3               | 8.6             |
| **Marital status**      |                 |                 |
| Never married           | 2               | 5.7             |
| Married                 | 22              | 62.9            |
| Separated/divorced      | 10              | 28.6            |
| Widowed                 | 1               | 2.9             |
| **Annual family income**|                 |                 |
| $0 to $20,000           | 3               | 8.6             |
| $20,001 to $40,000      | 17              | 48.6            |
| $40,001 to $60,000      | 9               | 25.7            |
| $60,000 and more        | 6               | 17.1            |
| **Education**           |                 |                 |
| High school             | 19              | 54.3            |
| Some college            | 14              | 40.0            |
| Post college            | 2               | 5.7             |
al estimates, an employee group of this size with a large number of racial minorities should be expected to have a prevalence rate of at least 8.7% (89) diabetic individuals.

It was never the intention of the researchers to demonstrate that the DPP could improve glucose tolerance, thus issues related to sample size and statistical power for a specified effect size were not considered in advance. This work has been previously documented using large randomized clinical trials (Knowler et al., 2002; Pan et al., 1997; Tuomilehto et al., 2001). The goal of this study was to determine if a version of the DPP could be successfully implemented in a worksite setting. The screening protocol successfully identified diabetic and pre-diabetic employees at BD. However, as a result of this program, most participants significantly improved glucose tolerance.

Design limitations cannot eliminate a host of possible alternate explanations for these findings. These explanations include:

- Self-selection biases—only motivated employees may have decided to participate.
- Regression to the mean—high scores tend to be reduced and low scores tend to increase naturally.
- Historical effects—events occurring simultaneously that could encourage participants to adopt healthy lifestyles (e.g., public service announcements).
- Maturation—changes that occur with the passage of time (e.g., individuals tend to have a better diet as they age).

No known risks are associated with participating in the program. In fact, individuals who chose not to participate and not to adopt healthy eating and exercise behaviors are likely to be at greater risk than the study participants.

This study documents an attempt to integrate a version of the DPP into a worksite setting. Based on these results, other worksites may be encouraged to do the same. As the prevalence of diabetes continues to increase among both adults and children, aggressive, community-based efforts

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline Means (SD)</th>
<th>Baseline to 6-Month Change</th>
<th>Baseline to 12-Month Change</th>
<th>Significance *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight, lbs</td>
<td>193.57 (63.37)</td>
<td>-6.30*</td>
<td>-10.58*</td>
<td>.01</td>
</tr>
<tr>
<td>Body mass index</td>
<td>32.01 (8.42)</td>
<td>-0.78*</td>
<td>-1.65*</td>
<td>.01</td>
</tr>
<tr>
<td>Waist circumference, inches</td>
<td>39.40 (7.47)</td>
<td>-1.55*</td>
<td>-1.95*</td>
<td>.0001</td>
</tr>
<tr>
<td>Oral glucose tolerance test 2-hour, mg/dL</td>
<td>173.51 (38.64)</td>
<td>-43.28*</td>
<td>-36.76*</td>
<td>.0001</td>
</tr>
<tr>
<td>Fasting insulin, µIU/mL</td>
<td>14.15 (10.32)</td>
<td>-3.45*</td>
<td>-1.26</td>
<td>.09</td>
</tr>
<tr>
<td>Hemoglobin A1c, %</td>
<td>5.71 (5.53)</td>
<td>-0.04</td>
<td>-0.18*</td>
<td>.01</td>
</tr>
<tr>
<td>High-sensitivity C-reactive protein, mg/L</td>
<td>4.51 (5.16)</td>
<td>-0.59</td>
<td>0.77</td>
<td>.20</td>
</tr>
<tr>
<td>Total cholesterol (CHL), mg/dL</td>
<td>181.62 (33.40)</td>
<td>-20.04*</td>
<td>-11.28</td>
<td>.011</td>
</tr>
<tr>
<td>High density lipoprotein (HDL), mg/dL</td>
<td>50.31 (12.79)</td>
<td>2.89</td>
<td>-0.31</td>
<td>.33</td>
</tr>
<tr>
<td>Low density lipoprotein, mg/dL</td>
<td>111.45 (24.33)</td>
<td>-11.39*</td>
<td>-5.68</td>
<td>.06</td>
</tr>
<tr>
<td>Very low density lipoprotein, mg/dL</td>
<td>36.70 (15.39)</td>
<td>-11.27*</td>
<td>-4.15*</td>
<td>.001</td>
</tr>
<tr>
<td>CHL/HDL ratio</td>
<td>6.06 (10.88)</td>
<td>-0.77*</td>
<td>-0.22</td>
<td>.001</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>221.31 (202.23)</td>
<td>-81.76*</td>
<td>-48.35*</td>
<td>.01</td>
</tr>
<tr>
<td>Aerobic fitness, ml/kg/min</td>
<td>35.50 (16.92)</td>
<td>8.49*</td>
<td>11.90*</td>
<td>.0001</td>
</tr>
</tbody>
</table>

*Significance values that are .05 or less mean there is less than a 5% chance that the change in that outcome was due to chance.

| Number of Participants by Baseline, 6-, and 12-Month Diabetes Categories |
|----------------|----------------|----------------|----------------|
| Diabetes Category                              | Baseline | 6 Months | 12 Months |
| Normal glucose tolerance (Oral Glucose Tolerance Test [OGTT] 2-hour < 140 mg/dL) | 0       | 22       | 18       |
| Impaired glucose tolerance (OGTT 2-hour ≥ 140 mg/dL and < 200 mg/dL)     | 31      | 11       | 16       |
| Provisional diagnosis of diabetes (OGTT 2-hour ≥ 200 mg/dL)              | 4       | 2        | 1        |
are needed to control this epidemic. The DPP is one such effort that has shown clinical effectiveness and currently appears to be viable in worksite settings.

REFERENCES


IN SUMMARY

The Diabetes Prevention Program
A Worksire Experience
Aldana, S.G., Barlow, M., Smith, R., Yanowitz, F.G., Adams, T., Loveday, L., Arbuckle, J., & LaMonte, M.J.


1 Several randomized clinical trials have demonstrated that individuals who have impaired glucose tolerance can avoid becoming diabetic if they follow accepted nutrition and physical activity guidelines.

2 This study demonstrates that existing worksite health promotion staff can use several screening techniques to successfully identify employees who have pre-diabetes and diabetes. These employees can then successfully participate in a worksite diabetes prevention program to improve glucose tolerance.

3 As diabetes becomes one of the nation’s most pressing health care challenges, worksites are uniquely positioned to provide effective interventions and supportive environments.


The Diabetes Prevention Program: A Worksite Experience

1. Which of the following has the least influence on an individual's risk of developing type 2 diabetes? 
   A. Genetic determinants of type 2 diabetes. 
   B. Physical activity. 
   C. Dietary habits. 
   D. Lifestyle-related behaviors.

2. All of the following were included in Phase I screening of all interested employees except: 
   A. Height and weight measurement. 
   B. Waist girth measurement. 
   C. Diabetes and demographic survey. 
   D. Fasting baseline OGTT.

3. An employee was suspected of having pre-diabetes according to this criterion: 
   A. BMI equal to or greater than 23 kg/m². 
   B. Blood pressure equal to or greater than 135 mm Hg systolic. 
   C. Use of hyperlipidemic medication. 
   D. Single birth equal to or greater than 12 lbs.

4. Program participants were encouraged to remain in the Phase II intervention for _______ months: 
   A. 3. 
   B. 6. 
   C. 9. 
   D. 12.

5. Program participants were encouraged to achieve and maintain at least _______ minutes of moderate to vigorous physical activity per week. 
   A. 130. 
   B. 140. 
   C. 150. 
   D. 160.

6. Which of the following outcome variables was significantly improved at 12 months? 
   A. 2-hour OGTT. 
   B. LDL cholesterol. 
   C. High-sensitivity C-reactive protein. 
   D. Fasting blood insulin.

7. Study results showed that _______ of the program participants had OGTT scores below 140 mg/dL and were no longer in the pre-diabetic and diabetic categories. 
   A. 16. 
   B. 18. 
   C. 20. 
   D. 22.

8. Selected demographic variables revealed that the majority of program participants were: 
   A. Men. 
   B. Married. 
   C. Asian. 
   D. College-educated.

9. Out of the initial 603 employees who participated in the screening, _______ were identified as pre-diabetic and _______ were identified as diabetic. 
   A. 18, 8. 
   B. 24, 10. 
   C. 36, 8. 
   D. 44, 6.

10. Employees improving their diet as they age exemplifies this alternative explanation for the study results: 
    A. Maturation. 
    B. History. 
    C. Regression to the mean. 
    D. Self-selection.

Directions: Circle the letter of the best answer on the answer sheet provided. (Note: You may submit a photocopy for processing.)
ANSWER SHEET
Continuing Education Module
The Diabetes Prevention Program: A Worksite Experience
November 2005

(Goal: To gain ideas and strategies to enhance personal and professional growth in occupational health nursing.)

Mark one answer only!
(You may submit a photocopy of the answer sheet for processing.)

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
10. A B C D

EVALUATION (must be completed to obtain credit)
Please use the scale below to evaluate this continuing education module.

1. As a result of completing this module, I am able to:
   A. Describe the need for a Diabetes Prevention Program at the worksite.
   B. Discuss the methodology of the Phase I and II Interventions.
   C. List the results of the study and possible explanations for each.
   4 - To a great extent
   3 - To some extent
   2 - To little extent
   1 - To no extent
   4  3  2  1
   4  3  2  1
   4  3  2  1

2. The objectives were relevant to the overall goal of this independent study module.
   4  3  2  1

3. The teaching/learning resources were effective for the content.
   4  3  2  1

4. How much time (in minutes) was required to read this module and take the test?
   50  60  70  80

Please print or type: (this information will be used to prepare your certificate of completion for the module).
DEADLINE: OCTOBER 31, 2006. Allow up to 4 weeks for processing.

NAME ___________________________________ MEMBERSHIP NUMBER ____________________
ADDRESS __________________________________________________________
CITY ___________________ STATE ______ ZIP __________
PHONE ____________________________

LICENSE NUMBER __________________________

Processing Fees: On-line $10.00, check or money order $15.00 payable to AAOHN in U.S. Funds or bill my credit card:
☐ M/C ☐ Visa ☐ AMEX
Mail to: Professional Affairs — CE Module
AAOHN
Stc. 100
2920 Brandywine Rd.
Atlanta, Georgia 30341
Cardholder's Name ____________________________
Cardholder's Signature __________________________
# ______ - ______ - ______ Expiration Date

AN AUTHORIZED SIGNATURE IS REQUIRED FOR ALL CREDIT CARD ORDERS. CREDIT CARD ORDERS MAY BE FAXED TO (770) 455-7271.