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Reducing Obesity Among Employees of a Manufacturing Plant

Translating the Diabetes Prevention Program to the Workplace

Karla K. Giese, DNP, RN, FNP-BC, CDE; Paul F. Cook, PhD

ABSTRACT

Obesity affects individuals physically and emotionally, contributing to direct and indirect employer costs. Targeted obesity interventions through the Diabetes Prevention Program Lifestyle Core Curriculum offered at the worksite could promote healthy lifestyle decisions resulting in weight improvement among overweight and obese employees. A pretest-posttest cohort design was used to evaluate changes in weight and body mass index among 35 Diabetes Prevention Program participants; they achieved statistically significant changes in body weight ($p < .001$) and body mass index ($p < .001$). As a process measure, Diabetes Prevention Program session attendance moderately correlated with weight loss ($r = .51$; $p = .002$). Many health care professionals, including occupational health nurses, can implement evidence-based worksite obesity interventions to support employee weight loss. [*Workplace Health Saf* 2014;62(4):136-141.]

Obesity, defined as a body mass index (BMI) of 30 or greater, currently affects approximately one-third (35%) of adults in the United States (Ogden, Carroll, Kit, & Flegal, 2012; U.S. Department of Health and Human Services, 2011). Obesity endangers health and well-being due to its link to chronic disease etiology, worsening of existing chronic disease, symptoms of lower self-esteem, increased personal and employer health care costs, and reduced employee productivity (Gates, Brehm, Hutton, Singler, & Poeppleman, 2006; Kopelman, 2007; Schmalz, 2010). The root cause of obesity is complex, including genetic, socioeconomic, home and work environment, emotional, behavioral, and lifestyle factors. Interventions addressing modifiable factors are recommended by leading government agencies (Centers for Disease Control and Prevention [CDC], 2009; Community Preventive Services Task Force, 2011; National Institutes of Health, 1998; U.S. Department of Health and Human Services, 2011). Offering obesity interventions that address modifiable factors in familiar, accessible community-based settings, such as the workplace, is also recommended by these agencies.

This article reports on a portion of a quality improvement project designed for a local New Mexican manufacturing plant with more than 400 employees for which the obesity rate has hovered in the 30% range since 2009. The aim of the project was to reduce employees' body weight by at least 2% over the course of the 16-week intervention for an overweight and obese cohort of manufacturing plant employees using the Diabetes Prevention Program Lifestyle Core Curriculum (CDC, n.d.-a) in the workplace.

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BACKGROUND

Clinical practice guidelines for the screening and management of obesity from the National Institutes of Health (1998), Department of Veterans Affairs and Department of Defense (2006), and the Community Preventive Services Task Force (2011) recommend identifying obesity through BMI measurement, establishing realistic weight loss goals, educating affected individuals about evidence-based di-

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etary and physical activity approaches to achieve caloric deficits, providing behavioral modification therapies, and considering bariatric surgical options in specific obesity categories. Evidence is strong for weight loss in either group (Aldana et al., 2006; Ali, Echouffo-Tcheugui, & Williamson, 2012; Katula et al., 2011) or individual-based (Knowler et al., 2002) lifestyle modification interventions. Similar interventions at the worksite have demonstrated modest weight reductions (Anderson et al., 2009).

For the worksite specifically, the Community Preventive Services Task Force (2011) and the Institute of Medicine (2012) recommend informational and educational strategies and behavioral and social strategies including coworker support. The CDC (n.d.-b) expanded on the informational, educational, behavioral, and social strategies to specifically recommend translation of the evidence-based Diabetes Prevention Program Lifestyle Core Curriculum as a worksite weight control intervention. In recent years, the Diabetes Prevention Program's lifestyle intervention has been introduced into community settings such as faith-based organizations, YMCAs, and hospital outpatient diabetes education departments with 4% to 7% body weight loss in participants over a 6- to 12-month intervention period (Ali et al., 2012; Dodani, Kramer, Williams, Crawford, & Kriska, 2009; Guyse et al., 2011; Katula et al., 2011, Kramer, McWilliams, Chen, & Siminerio, 2011).

In the workplace, obesity interventions may reach beyond individual employee health improvement by affording companies return on investment. Anderson et al. (2009) documented return on investment through reduced health care costs, chronic disease development, absenteeism, and presenteeism.

Attendance patterns and attrition in a Diabetes Prevention Program could affect efficacy. Hughes and Walker (2011) reported that attrition in non-completers was related to lost motivation, practical issues, and unsatisfactory results. Ali, Echouffo-Tcheugui, & Williamson (2012) identified a correlation between session attendance and weight loss.

Local Context

The New Mexico manufacturing plant's health service mission is to provide leadership and resources that support the well-being of employees. Resource provision for early detection of disease and subsequent intervention is emphasized. Historically, employees submitted a voluntary, self-reported, electronic health risk assessment profile on an annual basis. Health profile completion was encouraged to promote health awareness, identify needed lifestyle changes or common biometric risks (e.g., blood pressure, lipids, blood sugar, and BMI), and engage employees in a journey toward optimal health and well-being. A monetary incentive of a health insurance premium reduction was offered to benefit-eligible employees for health profile completion. However, if an employee scored "high risk" in two or more areas of the health profile (e.g., obesity and physical inactivity), third-party telephonic health counseling was required for the monetary incentive.

In early 2012, a nurse practitioner with endocrinology, family practice, and weight management background in addition to being a certified diabetes educator was hired by the health service. Nurse practitioner services were an employee benefit. Translating the Diabetes Prevention Program into a manufacturing worksite via a group weight loss intervention was expected to improve individual employee BMIs.

Theoretical Framework

Decreasing the obesity rate is slow and requires both individual and environmental interventions using a blend of nursing and social systems theories. Jean Watson's (2012) Theory of Human Caring directed nursing in this project. Watson's theory describes 10 caring processes, of which sensitivity to others, developing authentic trusting-caring relationships, and relational teaching-coaching are most applicable at the worksite (Watson, 2012). Caring and trust are interrelated in authentic relationships, especially those involving vulnerable lifestyle disclosures. Trusting-caring behavior is therefore imperative as human dignity is respected while facilitating challenging lifestyle behavior changes at the worksite.

Although caring underpins nursing and nurses' relationship with employees, Watson's theory does not fully address the complex interrelationships between individual, environmental, and social factors that contribute to weight imbalances. The systems-based social ecological model, based on Bronfenbrenner's (2005) work, provides a theoretical framework to support these dynamic interdependent relationships. The social ecological model framework suggests that human health is influenced by a variety of personal attributes and behavioral patterns, environmental circumstances, and other social influences (Stokols, 1996).

Individuals both influence and are influenced by those around them. In a work setting, an employee might actively make dietary modifications to address weight and discuss the process with coworkers at break, hoping to secure social support and motivate others to participate in the process. Food choices change during weight control efforts. An individual's food choices can have reciprocal effects on other employees. Employees seek congruent cafeteria selections, which may influence cafeteria management to evaluate menu items and portion size. Thus, a lifestyle change for a few employees could affect a larger population. Combining the strengths of caring theory at the individual level within the larger social ecological model context underpinned this quality improvement project.

Systems-level interventions included ongoing education about weight, free health screenings, and portion control and cafeteria healthy meal option interventions, which will be reported separately. Within this context of health promotion, potential Diabetes Prevention Program participants were screened and recruited for individual weight loss interventions in the context of a caring nursing relationship.

METHODS

This project involved overweight and obese employees, using a group-based 16-week Diabetes Prevention Program Lifestyle Core Curriculum. Based on participant availability, the curriculum was offered in two time slots:

prior to second shift and after first shift. Hourly employees attended on their own time. Exempt employees' time away from work was handled on an individual basis by each employee's manager.

Ethical Considerations

Oversight and approval for this project was secured from the University of Colorado, Denver, College of Nursing DNP Capstone Bridge Committee to ensure the project was consistent with quality improvement principles. Neither a research consent form nor institutional review board approval was required because the project was not a research study. Each participant was assigned a number and completed an entrance enrollment form that served as consent to receive weight loss support. Data collected were de-identified as each participant's data were documented according to an assigned number.

Breach of confidentiality is always a risk, especially in a worksite-based health intervention. This risk was minimized by storing Diabetes Prevention Program data using a chronological numbering system on a password-protected laptop and kept in a locked office. The employer did not have access to individual data. De-identified and aggregated Diabetes Prevention Program data analyses were presented at the end of the project to stakeholders including local plant management and corporate health services.

Except for breach of confidentiality, risks were negligible and participation in all aspects of the project was completely voluntary. Previous research established the safety and efficacy of the Diabetes Prevention Program Lifestyle Core Curriculum (Knowler et al., 2002). Education regarding risks associated with physical activity was built into the curriculum.

Setting and Target Population

The manufacturing plant was located in urban New Mexico, where plant employee demographics included 52% Hispanic, 21% Asian, 18% White, 6% Native American, and 3% African American, with 65% female and 35% male. At the start of the project, various fitness challenges, telephonic or multimedia health advising, and healthy eating initiatives (previously poorly received) were in place. As previously described, the plant employee obesity rate had remained unchanged since 2009.

Due to the weight loss focus for this project, the only enrollment criterion was a BMI of 25 or greater. A total of 47 employees enrolled in the group Diabetes Prevention Program. The CDC requires attendance in at least four sessions for inclusion in data analysis and a mean attendance of nine sessions. Thirty-five participants attended at least four sessions. Twelve participants completed fewer than four sessions and were contacted at the conclusion of the project regarding factors contributing to attrition. Final demographics included 31 females (89%) and 4 males (11%), 24 Hispanic (69%), 8 White (23%), 1 Asian (3%), 1 African American (3%), and 1 Native American (3%). More females but fewer Asians completed the project than was represented by the overall plant population.

QUALITY IMPROVEMENT PROCEDURE

Recruitment and Screening

A presentation highlighting the Diabetes Prevention Program lifestyle intervention and BMI qualifications was presented at quarterly plant meetings on all three shifts. BMI screenings were conducted in the fitness center and at the annual health fair. The nurse practitioner author was present at the screenings to encourage appropriate candidates' participation and answer questions. Plant digital flat screen monitor announcements, consistent with worksite culture for employee communication, were also used.

Diabetes Prevention Program as a Weight Loss Intervention

The Diabetes Prevention Program Lifestyle Core Curriculum, which is publically available online, was used for interested employees who met inclusion criteria previously discussed. The curriculum is a group-focused, evidence-based intervention of 16 weekly sessions addressing root causes of obesity (**Table 1**). Randomized controlled trials have demonstrated success using this program to reduce participants' weight and progression from pre-diabetes to overt type II diabetes (Knowler et al., 2002). Translation into this worksite involved using the existing expertise within the health service and company. Fat and calorie reduction sessions were facilitated by a company dietitian. The on-site fitness staff facilitated physical activity sessions. Two of the behavioral and mental health content sessions were facilitated by the on-site licensed professional clinical counselor. The remaining nine sessions were facilitated by the nurse practitioner/certified diabetes educator. The Diabetes Prevention Program ran for 16 consecutive weeks from spring until fall 2012.

Measures

Data collected for each Diabetes Prevention Program session included weight on the fitness center's calibrated scale and self-reported physical activity minutes for the previous week. Despite education on physical activity reporting, Diabetes Prevention Program facilitators believed that participants' self-reported physical activity minutes were inflated, perhaps in an effort to please the project author. These data were therefore not analyzed. In contrast, weight change data were valid based on collection methodology.

RESULTS

Primary Outcome

Statistically significant differences between weeks 1 and 16 were noted in weight ($Z = 3.89$, $p = < .001$, $r = .66$) and BMI ($Z = -3.83$, $p < .001$, $r = .65$) using Wilcoxon signed rank tests. Weight change ranged from a gain of 3.1% to a loss of 9.7% (median = 2.5% loss; interquartile range: 0.2% to 3.6% loss). Twenty-seven of the 35 participants lost weight: two had greater than 7% loss, five had 4% to 7% loss, 12 had 2% to 3% loss, two had 1% loss, and six had less than 1% loss. Eight participants gained weight: three had less than 1% gain and five had 1% to 3.1% gain. Subgroups were too small for formal statistical analysis, but no patterns

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TABLE 1

Diabetes Prevention Program 16-Week Curriculum

Week	*Foundational Skills*	*Controlling External Environment*	*Psychological Issues Related to Long-term Change*
1	Welcome		
2	Be a Fat and Calorie Detective		
3	Reducing Fat and Calories		
4	Healthy Eating		
5	Move Those Muscles		
6	Being Active: A Way of Life		
7	Tip the Calorie Balance		
8		Take Charge of What's Around You	
9		Problem Solving	
10		Four Keys to Healthy Eating Out	
11		Talk Back to Negative Thoughts	
12			The Slippery Slope of Lifestyle Change
13			Jump Start Your Activity Plan
14			Make Social Cues Work for You
15			You Can Manage Stress
16			Ways to Stay Motivated

Data from Centers for Disease Control and Prevention. (n.d.-a). The National Diabetes Prevention Program lifestyle curriculum.

related to ethnicity were noted. Both participants with more than 7% body weight loss were male.

Process Measures

Session attendance (mean = 9, standard deviation = 3.01) correlated with body weight loss (r = .51, p = .002) (**Figure 1**). Patterns of attrition clustered around personal motivation, lack of weight loss, competing personal life issues, competing work-related issues, and health-related factors (e.g., difficulty exercising due to plantar fasciitis, arthritis, or surgeries).

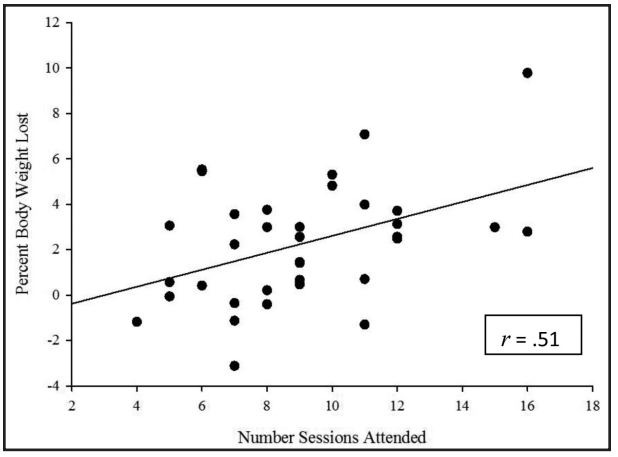

Figure 1. Session attendance predicts percent weight loss.

DISCUSSION

Quality improvements enhance the performance of a process or produce more desirable outcomes via increased effectiveness (Kovner & Knickman, 2011). This worksite program resulted in decreased individual body weights following the evidence-based Diabetes Prevention Program Lifestyle Core Curriculum intervention. Worksite obesity rates had not changed over the past few years using third-party telephone counseling. Employee participants in the Diabetes Prevention Program with BMIs greater than 30 would have enrolled in third-party telephonic counseling for weight reduction the previous years. Why weight loss did not occur in the past is unclear; perhaps the connotation of "required" telephonic counseling, lack of motivation or readiness, and lack of human connection were contributing factors. Consistent with Watson's theory (2012), translation of the Diabetes Prevention Program into this worksite using on-site health professionals resulted in caring, trusting, authentic relationships. New behaviors were learned, practiced, and refined. Barriers and vulnerabilities were shared. Personal transparencies followed by breakthroughs were experienced, all within the safety of active, established relationships. Nursing practice change therefore favors voluntary intensive on-site weight interventions over required telephonic intervention based on authentic re-

IN SUMMARY

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Translating the Diabetes Prevention Program to the Workplace

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1. Translation of the Diabetes Prevention Program Lifestyle Core Curriculum is an effective worksite obesity intervention.
2. Authentic relationships built between on-site health services providers and participants may be more effective in promoting weight related lifestyle change than third-party telephonic counseling.
3. Factors unique to the worksite, such as competing work demands and overtime, can affect individual attendance.

lationship building. Based on participants' weight loss, nursing practice change for this project favors voluntary intensive on-site weight interventions over the required third-party telephonic counseling discussed previously in "local context." The difference could be related, at least in part, to authentic relationship building that weekly group classes promoted compared to a stranger providing telephone obesity interventions.

Consistent with Hughes and Walker's (2011) attrition patterns in non-completers previously discussed, attrition (12 participants) in this worksite group was due to lost motivation and lack of weight loss and practical issues, particularly health problems (e.g., plantar fasciitis and arthritic pain limiting activity, prolonged illness, and surgeries).

Unique to the worksite, work priorities also affected attrition and session attendance. Many participants were hourly employees making modest wages. Opportunities for overtime work (highly valued by hourly employees) occur before or after usual shifts, and thus directly conflict with Diabetes Prevention Program session times. Similarly, exempt employee absences and attrition affected company project deadlines. In the workplace, business needs trump on-site personal health improvement interventions.

In addition to new relationships and participant weight loss, other project strengths included interest in and engagement with the worksite Diabetes Prevention Program. Approximately 10% of the plant signed up for the Diabetes Prevention Program intervention, indicating interest in weight management. Not all participants remained engaged. Those who persisted achieved a 2.5% median body weight loss over 4 months. Most important, engagement as evidenced by session attendance was predictive of successful weight loss. Although short of the 4% to 7% body weight loss reported in other community settings over a 6- to 12-month period (Katula et al. = 6% and Ali et al. = 4%), this Diabetes Prevention Program was only 4 months long due to doctoral course constraints. Future worksite Diabetes Prevention Program offerings should be unrestricted by course timelines, and may therefore result in 4% to 7% body weight loss over 6 to 12 months.

Success is best exemplified by individual impact. A warehouse worker entering the Diabetes Prevention Program with a BMI of 56.3 achieved a 9.7% body weight reduction and subsequent BMI of 50.3 at the final Diabetes Prevention Program session. The employee marveled at the improved stamina for lifting and moving boxes, reduced foot pain, and improved sleep. Similarly, another employee entered the Diabetes Prevention Program with a BMI of 36 and concluded the intervention at a BMI of 33 feeling increased energy and motivation to continue these successful lifestyle modifications. Despite statistical significance, BMI changes were not enough for obesity reclassification for most participants in this short duration quality improvement project. Despite remaining categorically obese, both worker examples experienced clinically and personally meaningful weight improvement. Employee perception of improved work performance adds additional value to a worksite obesity reduction intervention.

Limitations

Although bringing obesity interventions to the worksite can reduce cost, time, and travel barriers associated with these interventions, it does not affect employees' abilities to buy healthy foods. Self-reported weekly physical activity minutes appeared significantly inflated despite re-education efforts, and thus were not analyzed for trends. Finally, the Diabetes Prevention Program Lifestyle Core Curriculum includes a 6-month "post-core" monthly session for continued weight loss or weight loss maintenance. Project time constraints did not allow "post-core."

CONCLUSION

This project demonstrates that obesity interventions championed by a nurse practitioner, employed at the worksite, and adhering to clinical practice and evidence-based guidelines can improve employee weights. Each worksite is a unique community setting with implications for further study. Internal and external workplace motivators for weight loss deserve attention. Qualitative exploration of employees' lived experiences participating in worksite obesity interventions along with exploration of non-participant health profile attributes would also be valuable. Such qualitative research is within the realm of advanced practice nursing and would lend further understanding to directing worksite obesity interventions.

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