

## Financial Incentives Improve Long-Term Smoking Cessation Rates

Volpp KG, Troxel AB, Pauly MV, et al. A randomized, controlled trial of financial incentives for smoking cessation. *N Engl J Med* 2009;360:699–709.

### Study Overview

**Objective.** To evaluate the effectiveness of financial incentives in improving long-term rates of smoking cessation.

**Design.** Randomized controlled trial.

**Setting and participants.** 878 employees of a large U.S.-based multinational company were randomly assigned to receive information about smoking cessation programs ( $n = 442$ ) or smoking cessation programs plus financial incentives ( $n = 436$ ). Employees aged  $> 18$  years who smoked  $\geq 5$  cigarettes per day were recruited through the company's intranet as well as on-site. Employees were excluded if they used tobacco products other than cigarettes or planned to leave the company within 18 months. Financial incentives totaled \$100 for completion of a smoking cessation program, and an additional \$250 was given for complete smoking cessation within 6 months after study enrollment, verified by saliva or urine assay. Furthermore, \$400 was given for complete smoking abstinence for an additional 6 months after initial cessation, confirmed by biochemical assay. Study participants were randomized in blocks of 4 and stratified according to work site, heavy or nonheavy smoking, and income levels.

**Main outcome measures.** The primary endpoint was smoking cessation 9 or 12 months after enrollment, depending on whether cessation was first reported at 3 or 6 months. Secondary endpoints included smoking cessation within the first 6 months after enrollment and rates of participation in and completion of smoking cessation programs.

**Main results.** 1903 employees expressed interest in participating, of which 878 (46%) were enrolled. Demographic characteristics, smoking behavior, nicotine dependence, readiness to quit, and health status were similar in the control and incentive groups. Participants in both groups smoked an average of 1 pack of cigarettes per day; 5% to 6% of participants were heavy smokers ( $> 2$  packs/day). The majority of participants had incomes of more than 500% of the poverty level, and 90% were white. A similar number of participants in both groups were lost to follow-up. The incentive group had significantly higher rates of smoking

cessation than the control group at 9 or 12 months after enrollment (14.7% vs. 5.0%;  $P < 0.001$ ) and at 15 or 18 months after enrollment (9.4% vs. 3.6%;  $P < 0.001$ ). For the secondary endpoints, incentive group participants had significantly higher rates of enrollment in a smoking cessation program (15.4% vs. 5.4%;  $P < 0.001$ ), completion of the smoking cessation program (10.8% vs. 2.5%;  $P < 0.001$ ), and smoking cessation within the first 6 months after enrollment (20.9% vs. 11.8%;  $P < 0.001$ ). In a logistic regression model adjusting for the baseline smoking and demographic variables, the odds ratio for quitting by 9 or 12 months was significantly higher in the incentive group than in the control group (odds ratio, 3.16 [95% confidence interval, 1.88–5.32]).

**Conclusion.** Financial incentives for smoking cessation significantly increased rates of smoking cessation up to 18 months after trial enrollment.

### Commentary

Tobacco use remains the leading cause of preventable death in the United States [1]. A vast majority of smokers want to quit, but few succeed. Increasing the number of successful smoking cessation attempts is a tobacco control strategy with arguably the most immediate mortality benefit, but this has remained elusive due to low rates of smoking cessation program participation, physician counseling, and smoking cessation medication use.

Moving the locus of smoking cessation from the clinic to the workplace and utilizing nonmedical strategies are potential options for increasing cessation rates. Specifically, employer-funded financial incentives present an attractive option for companies and employees alike to increase quit rates and decrease the high annual health and productivity costs associated with smoking. However, the evidence on these strategies has been decidedly mixed. First, most financial incentives for smoking cessation have been studied and distributed at the provider level, rather than at the patient level [2]. Several studies of patient-level financial incentives for smoking cessation have shown higher rates of participation in smoking cessation programs and a short-term increase in cessation rates [3–5]. However, a systematic review from 2005 [6], which was subsequently updated in 2008 [7], showed no long-term increase in smoking cessation

rates among employees receiving financial incentives to quit smoking. Most studies were hampered by small incentives and inadequate sample sizes.

This randomized controlled trial by Volpp et al sought to discern whether larger financial incentives provided by an employer in a stepwise manner can increase long-term (up to 18 months) smoking cessation rates. The study found a threefold increased odds of smoking cessation, both in the short and long term. At up to 18 months from enrollment, smoking cessation rates were 9.4% as compared with 3.6% in controls. These findings expand upon the limitations of previous studies of financial incentives for smoking cessation and are consistent with recent behavioral economics and health policy research suggesting that incentives may be more effective if directed at patients rather than providers [8,9]. These findings are consistent with recent findings suggesting that use of financial incentives may also increase short-term weight loss [10]. This current study is notable for its rigorous randomized design and low number of participants lost to follow-up. The investigators used the most stringent biochemical validation of smoking cessation instead of relying on patient self-reported cessation as many previous studies have done. Finally, most patients were followed for a longer period than in previous studies.

A few limitations to this study deserve mention. Most importantly, selection bias cannot be excluded. Smokers who enrolled in this study were probably more motivated and likely to quit than smokers who chose not to enroll. However, the randomization procedure likely accounted for measured and unmeasured differences within this group of smokers once they enrolled. Thus, the internal validity of the results is sound, despite the fact that the external validity relating to unmotivated smokers in the general population may be challenged. Furthermore, the study's generalizability is limited by the fact that study participants were from 1 company in the United States, and they were predominantly white, highly educated, and had high incomes. Finally, the achieved rate of long-term cessation is still low in absolute terms (9%). Compared with medication or com-

bined medication and counseling strategies, financial incentives appear to be less effective.

### Applications for Clinical Practice

Providing employees with financial incentives for smoking cessation significantly increased long-term rates of cessation. However, the overall success rate was relatively low. Further work should evaluate the cost-effectiveness of such incentives and then focus on adjusting the incentive structure to improve long-term cessation rates.

—Review by Asaf Bitton, MD

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