Testing for Rewards: A Pilot Study to Improve Type 1 Diabetes Management in Adolescents

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OBJECTIVE
To evaluate the effectiveness of monetary reinforcement to increase the frequency of self-monitoring blood glucose (SMBG).

RESEARCH DESIGN AND METHODS
Ten adolescents with poorly controlled diabetes enrolled in a 12-week program in which they earned monetary reinforcers based on SMBG frequency ($0.10 per test, with bonuses for ≥4 tests per day, and $251.40 maximum).

RESULTS
SMBG increased from 1.8 ± 1.0 to 4.9 ± 1.0 tests per day (P < 0.001) with 90% completing four or more tests per day. Mean A1C fell from 9.3 ± 0.9% to 8.4 ± 1.5% (P = 0.05). Adolescents and parents reported high satisfaction with procedures.

CONCLUSIONS
Reinforcing adolescents for SMBG may increase testing and improve A1C.

Adolescents with type 1 diabetes (T1D) have difficulty carrying out the tasks needed to achieve target A1C levels (1,2), and decreased frequency of self-monitoring blood glucose (SMBG) is associated with increased A1C levels (3). Interventions to increase SMBG have had only limited success (4).

Behavioral economics involves provision of monetary-based reinforcers for behavior change. Studies in adults find this is an efficacious means of decreasing substance use (5), reducing weight (6), enhancing exercise (7), and improving medication adherence (8). A multicomponent procedure involving monetary reinforcers for parents and adolescents along with intensive counseling demonstrated promise in improving diabetes management (9), but the study design could not isolate effects of reinforcement. Raiff and Dallery (10) reported an increase in SMBG in four adolescents reinforced for submitting computer-generated videos of SMBG testing for 5 days, but this period is too short to assess effects on metabolic control. Anecdotally, some clinicians provide incentives to youth with T1D for SMBG, A1C levels, or other behaviors, suggesting acceptability of this approach, but the procedures are not standardized and have not been evaluated empirically. The goal of this proof-of-concept study was to assess the preliminary effectiveness of a novel and specific intervention in youth that reinforced SMBG directly via regular glucose meter uploads. The hypothesis was that youth reinforced for SMBG would increase SMBG frequency and A1C levels would decrease.

RESEARCH DESIGN AND METHODS
Subjects were recruited from the Yale T1D clinic if they were 12–21 years old; diagnosed with T1D ≥12 months; had an average A1C during the past year.
determined whether additional reinforcement for using SMBG data to make self-adjustments of treatment might result in even greater improvements in A1C and
whether all intervention aspects (alarms, texts, encouraging clinic calls) are critical to its effectiveness.

While A1C levels remained reduced in many subjects a year after study completion, a criticism of reinforcement interventions is that they are costly. In the case of T1D, savings in preventing acute and long-term vascular complications might recoup the relatively low $10 per week costs of the intervention, even if provided long-term. These results show the effectiveness of monetary rewards to sharply increase SMBG and lower A1C and provide a compelling rationale for randomized studies in much larger samples over longer periods to evaluate the efficacy and cost-effectiveness of this intervention.

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References