Cluster-Randomized Trial of a Mobile Phone Personalized Behavioral Intervention for Blood Glucose Control

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OBJECTIVE—To test whether adding mobile application coaching and patient/provider web portals to community primary care compared with standard diabetes management would reduce glycated hemoglobin levels in patients with type 2 diabetes.

RESEARCH DESIGN AND METHODS—A cluster-randomized clinical trial, the Mobile Diabetes Intervention Study, randomly assigned 26 primary care practices to one of three stepped treatment groups or a control group (usual care). A total of 163 patients were enrolled and included in analysis. The primary outcome was change in glycated hemoglobin levels over a 1-year treatment period. Secondary outcomes were changes in patient-reported diabetes symptoms, diabetes distress, depression, and other clinical (blood pressure) and laboratory (lipid) values. Maximal treatment was a mobile- and web-based self-management patient coaching system and provider decision support. Patients received automated, real-time educational and behavioral messaging in response to individually analyzed blood glucose values, diabetes medications, and lifestyle behaviors communicated by mobile phone. Providers received quarterly reports summarizing patient’s glycemic control, diabetes medication management, lifestyle behaviors, and evidence-based treatment options.

RESULTS—The mean declines in glycated hemoglobin were 1.9% in the maximal treatment group and 0.7% in the usual care group, a difference of 1.2% (P < 0.001) over 12 months. Appreciable differences were not observed between groups for patient-reported diabetes distress, depression, diabetes symptoms, or blood pressure and lipid levels (all P > 0.05).

CONCLUSIONS—The combination of behavioral mobile coaching with blood glucose data, lifestyle behaviors, and patient self-management data individually analyzed and presented with evidence-based guidelines to providers substantially reduced glycated hemoglobin levels over 1 year.

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Diabetes affects 38 million people in the U.S.; 40% are undiagnosed, and another 87 million are considered prediabetic. Costs exceed $100 billion annually (1,2). Changes in lifestyle/self-care behaviors, complex medical regimens, use of glucose-testing devices, and frequent data assessment by patients and providers are required to improve blood glucose and subsequent outcomes. In clinical trials, better self-care/lifestyle resulted in better diabetes outcomes (3–5). However, these clinical trials improved outcomes for circumscribed patient populations (6–9). Patients with diabetes are diverse, treatment may involve multiple specialists, and care by primary care providers (PCPs) is limited to 15-min visits. Only 55% of individuals with type 2 diabetes receive diabetes education (10); 16% report adhering to recommended self-management activities (11). Concern that elevated blood glucose levels result in microvascular comorbidity motivates behavioral change and monitoring interventions to assist patients and PCPs (12–14). The Mobile Diabetes Intervention Study, reported here, evaluated a diabetes-coaching system, using mobile phones and patient/provider portals for patient-specific treatment and communication. The hypothesis tested was that mobile telephone feedback on self-management of blood glucose results and lifestyle and clinical management offered to patients with type 2 diabetes and their providers can reduce glycated hemoglobin levels over 1 year.