Improving Diabetes Care among Patients Overdue for Recommended Testing: A Randomized Controlled Trial of Automated Telephone Outreach

Brief Running Title: Automated Telephone Outreach for Diabetes

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Objective: The study’s objective was to assess the effects of automated telephone outreach with speech recognition (ATO-SR) on diabetes-related testing.

Research Design and Methods: We identified 1200 health plan members who were overdue for diabetes-related testing and randomly allocated 600 to ATO-SR and 600 to usual care (no intervention). The intervention included three interactive calls encouraging recommended testing. The primary outcome was retinopathy testing, since this was the health plan’s principal goal. Tests for glycemia, hyperlipidemia and nephropathy were secondary outcomes.

Results: In total, 232 participants (39%) verbally responded to the calls. There was no difference between the intervention and usual care groups in the primary outcome (adjusted hazard ratio 0.93, 95% confidence interval 0.71 – 1.22) and no effect of the intervention on any of the secondary outcomes.

Conclusions: Fewer than 40% of patients randomized to ATO-SR interacted verbally with the system. The intervention had no effect on study outcomes.
Automated Telephone Outreach for Diabetes

Widely accepted guidelines define effective strategies for the care of patients with diabetes. However, many patients with diabetes do not undergo recommended testing. Two published randomized controlled trials found that automated telephone programs using live nurse follow-up improved diabetes outcomes. The objective of this study was to assess the effects of automated telephone outreach with speech recognition (ATO-SR) on rates of testing for retinopathy, glycemia, hyperlipidemia, and nephropathy in a diverse population of privately insured patients with diabetes.

RESEARCH DESIGN AND METHODS

This randomized controlled trial was conducted at Harvard Pilgrim Health Care, a not-for-profit health plan. A flow diagram of study participation is shown in supplementary Figure 1 (available in an online appendix at http://care.diabetesjournals.org). In 2006, we identified all 35,065 adult health plan members with diabetes, 95% of whom had type 2 diabetes. We limited the sample to individuals with no insurance claim for a dilated eye examination in the prior year and no claim for one or more of the following tests: glycated hemoglobin, LDL-cholesterol, or microalbumin. From 5,140 eligible patients, we randomly selected 1200 individuals and randomly allocated them to intervention (N=600) and usual care (N=600).

We mailed a letter to all 600 patients in the intervention group, informing them that they would receive a series of automated calls from Harvard Pilgrim to support their diabetes care. We developed the intervention based on prior studies. In particular, we conducted a series of interviews with Harvard Pilgrim patients and physicians to characterize their willingness to interact with ATO-SR and identified topics of interest. The computerized system placed three calls to participants’ home telephone numbers, encouraging participants to fulfill recommended testing if it had not been performed in the preceding year. A summary of the call content is shown in supplementary Table 1. The computerized system used speech recognition to respond to participants with segments of recorded text spoken with a human voice. The automated system offered a live telephone call back to assist in scheduling tests and also offered to send participants the following items: (1) a voucher that would allow the provider to waive the copayment for dilated eye examination; (2) an educational nutrition video; (3) a cookbook; or (4) a pill-box. For each of the three intervention calls, the automated telephone system made up to six attempts to reach the patient, leaving up to two messages requesting a call back.

We used health plan membership and claims records for all analyses. The primary outcome measure was completion of dilated eye examination among individuals without evidence of examination in the preceding year. Secondary outcome measures were completion of glycated hemoglobin, LDL-cholesterol, and microalbumin testing.

Statistical Analyses. The main analyses included all subjects in the groups to which they were randomized. We used the Kaplan-Meier method and log-rank test to assess differences between intervention and usual care groups in time to receipt of recommended testing and segmented proportional hazards regression to account for baseline differences in measured variables and for differential completion of testing prior to the intervention.

RESULTS

Compared with the usual care group, the intervention group was younger (50 years vs. 52 years, p = 0.02) and had a greater proportion of men (64% vs. 41%, p = 0.04); the groups were comparable on other sociodemographic measures and clinical indicators,
as shown in supplementary Table 2. A total of 232 participants (39%) verbally responded to the calls. Factors associated with call participation are shown in supplementary Table 3.

In the primary analysis, there was no difference in time to completion of dilated eye examination and no difference in time to completion of glycated hemoglobin and microalbumin tests; the intervention group had a shorter time to LDL-cholesterol testing (p = 0.045 by the log-rank test). The Kaplan-Meier curves are shown in supplementary Figure 2. In multivariate analyses, there was no difference between intervention and usual care groups in time to dilated eye examination (adjusted hazard ratio [HR] 0.93, 95% confidence interval [CI] 0.71 – 1.22) and no effect on times to the secondary outcomes of glycated hemoglobin testing (HR 0.72, 95% CI 0.38 - 1.37), LDL-cholesterol testing (HR 1.31, 95% CI 0.56 - 3.05), and microalbumin testing (HR 1.14, 95% CI 0.69 - 1.89).

CONCLUSIONS
In this randomized controlled trial, only 39% of health plan members randomized to automated telephone outreach interacted verbally with the system. The intervention had no effect on study outcomes.

Previous studies have shown modest effects of automated telephone outreach interventions to improve diabetes care, although those interventions capitalized on the involvement of a nurse or diabetes educator.\(^{(6,7)}\) To enhance participants’ engagement, this study included token gifts, which could reasonably be included in a real-world intervention program, but these gifts appeared to have no effect on the outcome. Our intervention appeared to fail in part because a majority of targeted patients did not meaningfully interact with the system.

The study has several limitations. First, the intervention was designed to rely on automated systems, rather than human interactions; targeted outreach by clinicians may have yielded higher participation rates. Second, the high overall rates of recommended testing in our health plan population and the study’s focus on members who had not completed testing in the prior year may have limited effectiveness; this intervention might have larger effects in other populations with lower baseline testing rates. Third, although we compared ATO-SR with usual care, comparing this approach with a telephone intervention using human callers would also be useful. Fourth, some patients may have been told by their doctor that they need not obtain an annual eye exam; because this was a randomized trial, these patients were likely distributed with similar frequency in both study groups, making confounding unlikely.

Automated telephone outreach may be a valuable adjunct to programs for improving diabetes care in large populations. As with any technological intervention, refinement of this approach may enhance its effectiveness; this “negative” study does not rule out the potential for future success. To be effective, these interventions need to incorporate methods for ensuring greater participation, possibly through partnership with clinicians. Further research is also needed to understand the characteristics of patients who may resist this type of intervention in order to develop alternative approaches that might be more effective.

AUTHOR CONTRIBUTIONS
SRS obtained funding, designed the study, interpreted results, and wrote the manuscript. CMT contributed to study design, interpreted results, and reviewed/edited the manuscript. SBS contributed to study design, interpreted results, and reviewed/edited the manuscript. JDP contributed to study design and reviewed/edited the manuscript. JBM contributed to study design and reviewed/edited the manuscript. PS carried
out statistical analyses and reviewed/edited the manuscript. AE collected data, managed data bases, and reviewed/edited the manuscript. DRD contributed to study design, interpreted results, and reviewed/edited the manuscript.

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