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Invited Commentary | Diabetes and Endocrinology

Modest Gains for Text Message Intervention in Type 2 Diabetes

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Cardiovascular complications are a major cause of morbidity and mortality in type 2 diabetes (T2D). Effective management depends on controlling modifiable risk factors, such as hyperglycemia, hypertension, and dyslipidemia, yet adherence to lifestyle changes and medication regimens remains a persistent challenge.[1] Grounded in behavioral science, text message–based interventions have emerged as a potential strategy to reinforce healthy behaviors and support long-term self-management.[2]

In this issue of *JAMA Network Open*, Zhang et al[3] present results from a multicenter randomized clinical trial evaluating a mobile text messaging intervention for adults with poorly controlled T2D and elevated cardiovascular risk. The study was conducted across 5 clinical sites in China, enrolling 819 participants with high retention rates over 12 months. Participants in the intervention group received 6 text messages per week related to general information about cardiovascular disease and T2D, healthy diet, medication adherence, glucose monitoring, physical activity, blood pressure control, and smoking cessation, while the control group received usual care.

At first glance, several unexpected findings emerge from the trial results reported by Zhang et al.[3] In this cohort of participants with significant hyperglycemia at baseline (hemoglobin A_{1c} [HbA_{1c}] >10%), the usual care group experienced substantial improvements over 12 months, including a 2.5% decrease in HbA_{1c} and an 11.9 mg/dL decrease in low-density lipoprotein cholesterol (LDL-C), despite receiving no active intervention. Most improvements occurred within the first 3 months, which is unusually rapid and greater in magnitude than what has been observed in usual care arms of trials with similar patient populations.[4,5] Such an improvement would typically be attributed to treatment intensification, such as initiation of insulin or glucagon-like peptide-1/glucose-dependent insulinotropic polypeptide receptor agonists. However, the authors indicate that use of antihyperglycemic and antihypertensive agents in the usual care group declined from baseline to 6 and 12 months, making pharmacologic intensification an unlikely explanation. Given the degree of hyperglycemia at baseline, one wonders if usual care had previously failed to bring this population under control, what changed during the study to suddenly render it effective? The observed improvements may partially reflect the Hawthorne effect, in which increased awareness leads participants to modify their behaviors and, here, to engage more actively in their diabetes management.

In the intervention group, reductions in HbA_{1c} (−2.8%), LDL-C (−11.1 mg/dL), and systolic blood pressure (−2.5 mm Hg) were statistically significant and clinically notable. Yet when compared with usual care, the net between-group differences were modest: −0.3% for HbA_{1c}, −2.4 mm Hg for systolic blood pressure, and no significant difference for LDL-C. These findings suggest that most observed improvements occurred regardless of intervention assignment. The study provides limited detail on what usual care entailed, complicating the interpretation of the results and raising questions about what drove the changes in both groups.

These net improvements in HbA_{1c} and systolic blood pressure are directionally favorable, but the risk reduction at the individual level would be very modest. A 0.3% reduction in HbA_{1c} is associated with an estimated 4% relative reduction in cardiovascular events, whereas a 2.4 mm Hg drop in systolic blood pressure corresponds to an estimated 3% reduction, based on linear extrapolation from large meta-analyses.[6,7] The lack of significant improvement in LDL-C further tempers the findings. Though limited, the net gains achieved with the text-based intervention may still be significant at the population level if broadly implemented.

These modest results invite closer examination of how the intervention was delivered. Participants in the intervention arm received 6 unidirectional text messages per week over the course of a year. The messages were informed by national guidelines, written in plain language, and adapted to cultural norms. The theoretical foundation for this approach is sound: diabetes is a complex, self-managed condition that requires daily behavioral decisions across multiple domains, making low-touch digital nudges a potentially useful tool. While well-intentioned, many of the text messages in the intervention were prescriptive and repetitive—for example, messages to "start with a brisk walk," eat more whole grains, or "set a repetitive alarm on your phone to remind you" to take your medicine. For patients already navigating the daily demands of diabetes management, such messages may feel generic or overly directive rather than truly supportive. In clinical practice, many patients with diabetes know they should exercise, eat healthier, or take medications consistently, but face barriers such as fatigue, stress, or competing responsibilities—factors that these messages do little to address.

Notably, there was no personalization of messages based on participants' risk profiles or observed behaviors—design features that have been associated with improved adherence and higher satisfaction in prior text messaging or nudge-based interventions. For example, some studies have used tailored timing matched to medication schedules, daily check-ins requiring confirmation or response, or personalized message content that referenced the patient's name, medication, or dosing instructions. Others have enabled bidirectional interaction or escalation protocols when participants failed to respond.[2] The static, uniform, 1-way messaging approach in this trial did not account for users' clinical context or preferences. Emerging approaches using artificial intelligence—such as reinforcement learning to optimize message timing or large language model chatbots to enable naturalistic 2-way dialogue—may offer more responsive and individualized forms of behavioral support. Without personalization, even clinically sound messages may risk becoming generic and easy to overlook, especially across a 12-month period.

The intensity of the intervention also warrants consideration. A fixed frequency of 6 messages per week aligns with prior short messaging service (SMS)-based interventions,[2,8] yet the optimal frequency for individuals with T2D remains uncertain. While some patients may find daily messages supportive, others may experience them as excessive or easy to tune out. Additionally, previous evidence suggests that fixed-frequency designs may be less effective than adaptive or tapering message schedules that evolve over time.[8] Although the study team monitored message delivery and administered satisfaction surveys at follow-up, detailed findings on acceptability, perceived burden, or user preferences were not reported. As a result, it remains unclear how participants experienced the message cadence and tone, or what frequency may be most effective and acceptable in this population.

This study by Zhang et al[3] represents a step in the right direction, demonstrating that a low-cost, scalable messaging intervention can lead to modest improvements in multiple cardiovascular risk factors among patients with T2D. However, the small magnitude of net benefit suggests that further refinement is needed before such interventions can be meaningfully integrated into clinical practice.

ARTICLE INFORMATION

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