

Patient and Supporter Factors Affecting Engagement With Diabetes Telehealth

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More than 34 million adults in the United States have type 2 diabetes,¹ and successful management requires frequent patient follow-up to assess efficacy of treatment regimens, support self-care behavior, and detect emerging problems. Telehealth programs are an increasingly popular approach to facilitate this care by enhancing remote monitoring, communication, and collaboration among patients, caregivers, and health care providers.² Interactive voice response (IVR) calls, automated telephone calls that can provide tailored patient monitoring and self-care education, are one form of telehealth intervention that can facilitate self-care support between face-to-face visits and result in lower glycated hemoglobin A_{1c} (HbA_{1c}).³ IVR calls have some advantages over other forms of telehealth that involve smartphone apps or specialized devices because they can be used with any type of phone and thus present lower barriers relating to literacy, comfort with technology, internet connection, and smartphone or computer availability.^{4,5} As a result, IVR has been used successfully in diverse populations including older adults, Spanish-speaking patients, and veterans.⁶⁻⁸ However, little is known about which patients are most likely to engage with IVR and how IVR influences patient-provider interactions.

In addition to routine between-visit monitoring, using telehealth in certain key situations, such as prior to scheduled medical visits, can have particularly high impact on diabetes management. For patients with diabetes, visit preparation phone calls and messaging have been shown to significantly improve engagement in treatment decisions and adherence to lipid and HbA_{1c} testing, foot exams, and vaccinations.^{9,10} To enhance use of phone-based telehealth for visit preparation, we need to gain a better understanding of patient and visit factors that affect patient engagement with these calls.

One key factor that may enhance patient engagement in telehealth is family or caregiver support. Multiple studies have demonstrated that patients who enroll with a family supporter are more likely to answer intervention calls and have greater improvement in monitored behaviors than patients who enroll alone.^{11,12} IVR calls with caregiver feedback can also improve patient medication adherence and reduce diabetes distress.¹³ The specific effects of family supporter characteristics and diabetes support roles on

ABSTRACT

OBJECTIVES: To assess what patient, family supporter, and call characteristics predicted whether patients completed automated and coach-provided calls in a telehealth diabetes intervention.

STUDY DESIGN: A total of 123 adults with type 2 diabetes and high glycated hemoglobin A_{1c} (HbA_{1c}) or blood pressure, enrolled with a family supporter, received automated interactive voice response (IVR) and coach-provided visit preparation calls over 12 months.

METHODS: Data from baseline surveys and diabetes-related clinical information from patient medical records were entered into multilevel, multivariate regression models of associations between participant and call characteristics with call completion.

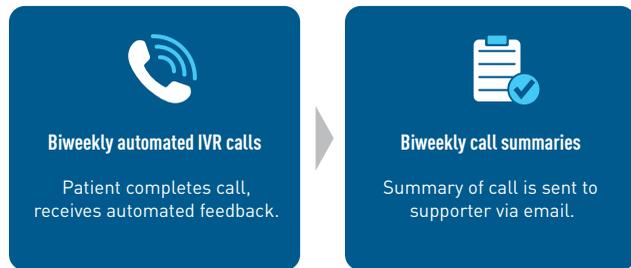
RESULTS: A total of 76.3% of 2784 IVR calls and 75.8% of 367 visit preparation calls were completed. For IVR calls, patients with recent call-triggered provider alerts had higher odds of call completion [adjusted odds ratio [AOR], 3.5; 95% CI, 2.2-5.5]; those with depressive symptoms [AOR, 0.4; 95% CI, 0.2-0.9], higher HbA_{1c} [AOR, 0.8; 95% CI, 0.6-0.99], and more months in the study [AOR, 0.9; 95% CI, 0.87-0.94 per month] had lower odds. For visit preparation calls, higher patient activation scores predicted higher call completion [AOR, 1.4; 95% CI, 1.1-1.9]; patient college education predicted less call completion [AOR, 0.3; 95% CI, 0.2-0.6]. Supporter help taking medications predicted less completion of both call types. Patient age did not predict call completion.

CONCLUSIONS: Patients of all ages completed telehealth calls at a high rate. Automated IVR calls were completed more often when urgent issues were identified to patients' providers, but less often if patients had high HbA_{1c} or depression. Visit preparation call content should be tailored to patient education level. Family help with medications may identify patients needing additional support to engage with telehealth.

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FIGURE. Intervention Call Types

Every 2 weeks throughout the year:



When patient has a primary care appointment:



IVR, interactive voice response.

how patients engage with phone-based care have previously not been studied.

In this study, we examined which patient, family supporter, and call characteristics predicted engagement in calls conducted as part of a telehealth intervention with adults with type 2 diabetes. The intervention used 2 types of calls. Automated biweekly IVR calls monitored for significant variations in glucose and blood pressure self-monitoring, symptoms, and issues with medication adherence, and prompted patient, family, and primary care provider actions when appropriate. Visit preparation calls conducted live by health coaches facilitated patient preparation for and engagement in scheduled provider visits. Our specific research questions were: (1) Which patient, family supporter, and call characteristics predicted completion of automated IVR calls?; (2) Which patient, family supporter, and call characteristics predicted completion of coach-patient visit preparation calls?; and (3) How did health care providers and patients respond to receiving automated IVR calls to monitor diabetes and the urgent alerts they generated?

METHODS

Study Design and Setting

In the Caring Others Increasing EngageMent in Patient-Aligned Care Teams (CO-IMPACT) study, 123 adult patients—each with type 2 diabetes, specific risk factors for complications, and 1 family supporter—received an IVR and visit preparation call intervention

over 12 months. Patients were veterans receiving primary care at 2 Veterans Health Administration sites, which provided comprehensive diabetes care with a primary care provider, clinical pharmacist, nutritionist, and diabetes self-management classes. This study was approved by the Veterans Health Administration Ann Arbor Institutional Review Board. Study enrollment began in November 2016 and final participant data collection occurred in June 2019.

Eligibility Criteria

Patients had to have a diagnosis of type 2 diabetes and have poor glycemic ($HbA_{1c} > 8\%$) or blood pressure (systolic blood pressure [SBP] > 160 mm Hg) control according to their most recent measurement in the previous 9 months. To identify a family supporter, patients were asked, "Do you have a family member or friend who gets involved with your health care in one of these ways..." followed by a list of specific support roles. Supporters could live with or apart from the patient but had to speak with the patient at least twice per month about their health issues or health care. Additional details on patient and health supporter eligibility, enrollment, and source study design can be found in the published study protocol.¹⁴

Intervention

Patient-supporter dyads received 3 components: an initial coaching session, biweekly IVR calls, and coach-delivered visit preparation phone calls (Figure). IVR calls allowed patients to report and receive information about diabetes- and hypertension-related concerns by responding to prerecorded prompts. Family supporters received summaries of issues identified in calls and information on how they could help with these concerns. When patients indicated they had hyperglycemia (glucose > 300 mg/dL), hypoglycemia (glucose < 70 mg/dL) or symptoms, hypertension (SBP > 170 mm Hg), or hypotension (SBP < 90 mm Hg) in IVR calls, urgent faxes were sent to the patient's primary care team notifying them of the patient's responses. Patients were notified at the time of the call that a message would be sent to their primary care team and had the option of being connected directly to the clinic via phone. Health coaches, who had a background in health education and received training in basic diabetes management, autonomy-supportive communication, and concepts underlying patient activation and action planning, made visit preparation calls prior to primary care visits and focused on identifying diabetes-related concerns and bringing self-monitoring results to appointments.

Outcome Measures

Our primary outcome measure was whether the patient answered a call during a time period eligible for call receipt.

IVR calls. Patients were eligible to receive an IVR call once in every 2-week period. The IVR system attempted to call the participant 3 times during this period, and times during which the patient indicated they would be unavailable (eg, for vacation) were excluded.

Visit preparation calls. Visit preparation calls were attempted 1 week prior to a primary care provider, nurse, or clinical pharmacist

visit. If a preparation call was completed but the patient did not attend the visit, or if a call was not attempted (eg, if the appointment was made last minute), that call or visit was excluded from analyses.

Independent Variables

Patient clinical characteristics. Sociodemographic and medical data were collected by patient survey at baseline. Blood pressure and HbA_{1c} measurements were collected during this baseline assessment.

Patient baseline surveys. Baseline patient measures included patient activation (Patient Activation Measure-13 [PAM-13]¹⁵), activation in health care appointments (Perceived Efficacy in Patient-Physician Interactions^{16,17}), diabetes-related distress (Problem Areas In Diabetes scale¹⁸), and satisfaction with primary care team (1 item from Consumer Assessment of Healthcare Providers and Systems survey¹⁹). Variables related to patient–family supporter relationship and communication included level of autonomy support perceived by the patient, measured by the Important Other Climate Questionnaire,²⁰ and items measuring family supporter involvement in specific aspects of diabetes care and helpfulness, included in **eAppendix Table 1** (eAppendix available at ajmc.com). The Brief Health Literacy Screen assessed patient health literacy and was dichotomized consistent with prior studies among veterans.²¹ The Patient Health Questionnaire screened for depressive symptoms and was considered positive for scores of 3 or greater.²²

Follow-up surveys. At the end of the 12-month intervention, patients rated how much the components of the intervention helped them manage their diabetes on a 4-point scale (1, helped me a great deal; 4, seemed to make things worse) and provided open-ended feedback on the intervention calls.

Family supporter factors. Family supporters completed baseline surveys assessing their own sociodemographic and medical characteristics and health literacy.

Call characteristics. For visit preparation calls, we included months in study at time of call and the type of provider for the clinic visit. For IVR calls, we included months in study at time of call, call completion, and urgent fax receipt in the prior 4 weeks.

Data Analysis

Patient, supporter, and call characteristics were examined in 2 separate mixed effects regression models designed to predict IVR and visit preparation call completion. To adjust for the effect of varying call completion rates between and within dyads, each model was fit to predict call completion while incorporating random effects for dyad-level characteristics. To assess the effect of recent urgent fax on IVR call completion while accounting for confounding with recent call completion, a trilevel variable of prior 4-week call completion by fax received was created. Only patients with nonmissing data were included (all variables missing $\leq 2\%$). After full initial models, parsimonious models were created through manual backward selection, removing variables at each step with a P value $> .10$, then retaining 3 of the most theoretically important variables from prior literature on diabetes self-management: age,

insulin use, and baseline HbA_{1c}. This modeling approach balanced considerations of both clinical and statistical significance when choosing among the many predictor variables available, allowing us to compare effects of variables with known clinical relevance to diabetes care as well as discover novel predictors of engagement. Results of the final models are presented in main tables, and full initial model results are presented in **eAppendix Tables 2 and 3**. Data were analyzed using SAS 9.4 (SAS Institute Inc).

For each urgent fax generated, the electronic health record was reviewed to determine if the primary care team documented receipt of the fax, the role of the person responding to the fax (registered nurse, primary care provider, pharmacist), qualitative information on actions taken in response, and whether a primary care visit was scheduled to occur within 2 weeks. Patient ratings of intervention satisfaction are summarized descriptively. For open-ended participant feedback, informally selected quotes are used as context in the discussion of main quantitative results.

RESULTS

A total of 123 patient–supporter pairs were enrolled in the intervention and completed the baseline assessment. Of these, 8 patients and 15 family supporters died or withdrew prior to completing the 12 months of the intervention period, but any data collected on eligible calls prior to termination of study participation were included in analyses.

Patient and Family Supporter Characteristics

Of the 114 patients in visit preparation call models and 116 participants in IVR call models, 111 patient and supporter pairs were included in both. Baseline characteristics were similar between the 2 model cohorts (**Table 1**).

Predictors of IVR Call Completion

Among 2784 eligible automated biweekly IVR call periods, 2124 (76.3%) calls were completed, with a median of 25 (range, 6–28) per patient over the 12-month intervention. Higher baseline HbA_{1c} (adjusted odds ratio [AOR], 0.80; 95% CI, 0.64–0.99 per 1% increase), patient depressive symptoms (AOR, 0.36; 95% CI, 0.15–0.87), and family supporters assisting patients with taking medications (AOR, 0.45; 95% CI, 0.24–0.84) were associated with lower odds of call completion (**Table 2**). More months in the study at time of IVR call was also associated with lower odds of call completion (AOR, 0.91; 95% CI, 0.87–0.94 per additional month). Having a call completed in the prior 4 weeks that did not trigger an urgent fax predicted current call completion (AOR, 2.87; 95% CI, 1.99–4.15 vs no recent call completion). Having a call completed in the prior 4 weeks that did trigger an urgent fax was associated with even higher odds of call completion (AOR, 3.42; 95% CI, 2.15–5.42 vs no recent call completion). There was no significant association between other variables and call completion (see eAppendix Table 2 for full model results).

TABLE 1. Baseline Participant Characteristics

Characteristic	Participants included in visit preparation call model (114 dyads)	Participants included in IVR call model (116 dyads)
Baseline participant measures		
Age in years, mean (SD)	60.36 (8.3)	60.5 (8.3)
Sex: female, n (%)	4 (3.5)	4 (3.5)
Race: White non-Latino/a, n (%)	80 (70.8)	82 (71.3)
College completed, n (%)	28 (24.6)	29 (25.0)
Low health literacy, n (%)	50 (43.9)	53 (45.7)
Systolic blood pressure, mean (SD)	141.5 (18.0)	141.8 (18.2)
Glycated hemoglobin A _{1c} , mean (SD)	8.42% (1.44%)	8.35% (1.45%)
Patient activation (PAM-13) score, mean (SD)	63.1 (11.3)	63.1 (11.3)
Engagement in visits (PEPPI) score, mean (SD)	4.3 (0.8)	4.4 (0.8)
Diabetes distress (PAID) score ≥8, n (%)	37 (32.5)	37 (31.9)
Depressive symptoms (PHQ-2) score ≥3, n (%)	17 (14.9)	16 (13.8)
Satisfaction with primary care team (0-10), mean (SD)	9.0 (1.6)	9.0 (1.6)
Duration of diabetes in years, mean (SD)	13.9 (10.0)	13.9 (10.0)
Insulin use, n (%)	75 (65.8)	74 (63.8)
Calls completed per participant, mean (SD)	2.4 (1.85)	18.3 (7.26)
Baseline support person measures		
Diagnosis of diabetes, n (%)	21 (18.8)	21 (18.4)
Low health literacy, n (%)	34 (29.8)	37 (31.9)
Depressive symptoms (PHQ-2) score ≥3, n (%)	7 (6.2)	7 (6.1)
Distress about participant diabetes (PAID-S) score ≥8, n (%)	37 (32.5)	38 (32.8)
Participant relationship to support person		
Spouse/partner, n (%)	71 (62.3)	72 (62.1)
Cohabitation, n (%)	80 (70.2)	82 (70.7)
Supporter reminds participant to take medications, n (%)	55 (48.3)	56 (48.3)
Supporter reminds participant to perform home testing, n (%)	34 (32.1)	36 (33.0)
Supporter attends medical visits, n (%)	39 (34.2)	38 (32.8)
Supporter suggests issues to discuss at medical visits, n (%)	74 (64.9)	76 (65.5)
Participant satisfaction with support person support, n (%)	78 (69.0)	81 (70.4)
Autonomy support of participant (IOCQ) score, mean (SD)	5.47 (1.0)	5.49 (1.0)

IOCQ, Important Other Climate Questionnaire; IVR, interactive voice response; PAID, Problem Areas In Diabetes; PAID-S, PAID-Supporter; PAM-13, Patient Activation Measure-13; PEPPI, Perceived Efficacy in Patient-Physician Interactions; PHQ-2, Patient Health Questionnaire-2.

Predictors of Visit Preparation Call Completion

Among 367 eligible primary care visits, 278 (75.8%) visit preparation calls were completed. A median of 2.0 (range, 0-13) visit preparation calls were completed per patient over the 12-month intervention period. Higher patient activation (AOR, 1.42; 95% CI, 1.09-1.85 per 10-point increase in PAM-13) predicted higher odds of call completion (Table 3). College education predicted lower odds of call completion (AOR, 0.32; 95% CI, 0.18-0.57). As with IVR calls, the only family supporter factor significantly associated with call completion was assistance with taking medications (AOR, 0.52; 95% CI, 0.30-0.90). There was no significant association between other predictors and call completion (see eAppendix Table 3 for full model results).

Urgent Fax Responses and Patient Satisfaction

Of 116 participants with IVR call data, 76 had at least 1 urgent fax generated, with a mean of 2.9 faxes per participant over the 12-month period. The most common reasons for urgent faxes were hyperglycemia, high blood pressure, and hypoglycemia symptoms. For 47% of alerts, the fax was acknowledged in the patient’s chart or a primary care visit occurred within 2 weeks. The majority of faxes were acknowledged by the primary care nurse (60%), and responses included bringing the patient into clinic early for follow-up and delivering self-management advice or medication adjustment over the phone. At the end of the intervention, the majority of patients (69% for visit preparation and 75% for IVR calls) reported that the calls were helpful to their diabetes management.

DISCUSSION

With rapidly growing reliance on telehealth in diabetes care, the ability to identify and address issues limiting patient engagement with telehealth will be increasingly important. In this phone-based intervention with adults with type 2 diabetes and a family supporter, engagement was high for patients of all ages. Nearly half of urgent alerts to clinicians generated by IVR responses were acknowledged in the medical chart, facilitating identification of time-sensitive issues between visits. Consistent with prior literature, IVR calls were perceived as helpful by the majority of patients and were answered more than 75% of the time.^{8,11,23}

We identified several notable predictors of engagement with automated IVR calls. Our finding that patients with higher baseline HbA_{1c} and more depressive symptoms were less likely to complete IVR calls is consistent with prior literature.^{8,24} This may indicate that these patients need additional support to facilitate IVR engagement, such as treatment of depression prior to automated call interventions or incorporation of depression symptom or medication monitoring into IVR calls.^{25,26} It is worth noting, however, that even if a patient responded to only half of the possible IVR calls, this would still result in 13 additional contacts during a 1-year period compared with the 4 face-to-face visits most patients have annually. Additionally, there was no association between patient age and IVR call completion, supporting the idea that telephone-based interventions can overcome barriers that older patients may face when engaging with other forms of virtual care.

Although our findings align with prior evidence that engagement with telehealth interventions tends to decrease over time,^{11,27,28} our finding that patients with recent urgent concerns flagged by IVR responses were more likely to complete calls demonstrates that the population with active issues may be more engaged in automated monitoring. Alerts to primary care teams may have fostered patients' sense that IVR calls were useful, as patients had clear feedback that their responses were being communicated to their care teams. This sentiment was expressed in several interview responses from patients at the end of the study; for example, one patient noted: "If I reported something high or low my doctor would call me. It helped me but I also think it helped my doctor care for me better. I only see the doctor every 4 months and so if I had a bad 2 weeks, my doctor would call and have me adjust my medicine over the phone so I don't have to come in."

We also identified important patient factors that predicted visit preparation call engagement. Patient activation has been associated with increased engagement with other telehealth interventions.^{28,29} Our finding that college education was associated with less visit preparation call completion was unexpected, as prior literature has shown that higher education predicts more engagement in telemonitoring for diabetes.³⁰ One possible explanation is that patients with higher education levels routinely perform visit preparation on their own and thus found visit preparation calls less useful. This sentiment was reflected by multiple patients at the end of the study; for example, one patient noted: "I already knew what to do, so when she called me, I told her, I already have that ready and the logs and know what I am going to ask the doctor."

Multiple studies have demonstrated the beneficial effect of family supporters on patient engagement with telehealth interventions.^{11,12,24,31} In our study, we examined more nuanced family supporter behaviors to delineate which contributed to patients' call engagement, and we surprisingly found that for both call types, patients who had support for taking medications had lower rates of call completion. One possible explanation is that this support role identifies patients who are more dependent on supporter help in general; alternatively, patients with high levels of in-person support may not feel the need to use technology to connect to supporters. Further research should determine what needs these patients have that would facilitate engagement with telehealth calls; it is possible that "live" monitoring calls that include both patients and supporters would be more beneficial for these patients than automated calls to patients alone.

Limitations

There are limitations of this study that should be considered when interpreting our findings. Our sample included predominantly male veterans with limited racial and ethnic diversity, and the study was conducted in 2 primary care sites in 1 geographic region, all of which may limit generalizability of findings to other populations and settings. The smaller number of visit preparation calls may have limited statistical power to identify factors associated with

TABLE 2. Adjusted OR for Completed IVR Calls: Final Model Results

Characteristic	Adjusted OR	95% CI
Participant characteristic		
Age (per 10-year increase)	1.16	0.81-1.67
Baseline glycated hemoglobin A _{1c} (per 1% increase)	0.80	0.64-0.99
Insulin use	0.71	0.36-1.40
College degree	0.93	0.46-1.85
Depressive symptoms (PHQ-2 score ≥3 vs <3)	0.36	0.15-0.87
Call characteristic		
Months in study at time of call (per 1-month increase)	0.91	0.87-0.94
Call completed without urgent fax generated in prior 2 periods	2.82	1.95-4.07
Call completed with urgent fax generated in prior 2 periods	3.45	2.17-5.48
Support person role		
Reminds participant to take medications	0.45	0.24-0.84

IVR, interactive voice response; OR, odds ratio; PHQ-2, Patient Health Questionnaire-2.

TABLE 3. Adjusted OR for Completed Visit Preparation Calls: Final Model

Characteristic	Adjusted OR	95% CI
Participant characteristic		
Age (per 10-year increase)	1.37	0.98-1.91
Baseline glycated hemoglobin A _{1c} (per 1% or 11 mmol/mol increase)	0.88	0.74-1.05
Insulin use	1.00	0.54-1.86
College degree	0.32	0.18-0.57
Higher activation (PAM-13, per 10-point increase)	1.42	1.09-1.85
Support person role		
Reminds participant to take medications	0.52	0.30-0.90

OR, odds ratio; PAM-13, Patient Activation Measure-13.

completion of this type of call in the initial model given the number of covariates included.

Despite these limitations, our study has several important implications. In the midst of the COVID-19 pandemic and rapid growth of telehealth, there has been concern about marginalized populations, specifically elderly patients, who often have less technological literacy, being left behind with unmet care needs while confined to their homes.³² Our findings suggest that telephone-based interventions may be an effective way to augment monitoring of patients with diabetes, including older patients and those unable to complete video calls or engage with online portals. Our results indicate that diabetes telehealth programs will need to be carefully adapted to the needs of patients with poor glycemic control, with depression, and who require assistance with medication

regimens. Automated call interventions may be more effective if they include a mechanism for feedback between clinicians and patients to encourage action on concerning diabetes-related issues and to reinforce the benefits of engagement with automated calls for patients.

CONCLUSIONS

Our findings indicate that adults with type 2 diabetes had high engagement with both automated and coach-delivered diabetes management calls over the span of 12 months and high satisfaction with this mode of care. Groups at increased risk of poor diabetes outcomes, including older patients and those with low health literacy, engaged with intervention calls at rates similar to groups without these risk factors. Optimizing the reach, engagement, and effectiveness of diabetes telehealth, particularly for those most vulnerable to poor diabetes outcomes, will only grow in importance as we work to improve the efficiency and quality of diabetes care in an increasingly technological era of care delivery. ■

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eAppendix Table 1. Wording of support person role and satisfaction survey items

<p>Involvement in self-management roles</p> <p>How often does (support person name) do the following:</p> <p>Help you remember to take your medicines Help you remember to do home testing, for example, check your sugar or blood pressure at home</p> <p>Rating: Likert scale 1 (none of the time) to 5 (almost always)</p>
<p>Involvement in medical visits</p> <p>In the past six months, how often did (support person name) come in the exam room with you for your VA primary care appointment?</p> <p>In the past six months, before your VA primary care appointments, how often has (support person name) suggested things for you to tell or ask your doctor?</p> <p>Rating: Likert scale 1 (never) to 5 (every visit)</p>
<p>Satisfaction with support person support</p> <p>I would be worse off if it weren't for (support person name) helping me with my diabetes care</p> <p>Rating: Likert scale 1 (strongly disagree) to 7 (strongly agree)</p>

eAppendix Table 2. Adjusted OR Completed IVR Calls: Initial/Full Model Results

Participant Demographic or Clinical Characteristic	AOR	95% CI
Age (per 10 year increase)	1.05	0.99, 1.10
Baseline HbA1c (1% increase from mean)	0.76	0.58, 1.01
Baseline systolic blood pressure (per 10mmHg increase)	1.00	0.97, 1.02
Insulin use	0.57	0.22, 1.47
Duration of diabetes (per 10 year increase)	0.99	0.95, 1.03
College degree	0.76	0.30, 1.91
Engagement in visits (PEPPI, per 1 point increase)	0.80	0.42, 1.52
Satisfaction with primary care team (per 1 point increase)	1.23	0.94, 1.61
Cohabitation with support person	1.00	0.39, 2.55
Participant satisfaction with support person support	0.81	0.28, 2.30
Patient Activation (PAM-13, per 1 point increase)	1.21	0.74, 1.96
Participant-Support Person Pair Level Characteristic		
Participant health literacy low, support person health literacy not low (compared to both participant and support person not low)	0.47	0.16, 1.35
Participant health literacy not low, support person health literacy low (compared to both participant and support person not low)	2.06	0.60, 7.12
Participant and support person health literacy low (compared to both participant and support person not low)	0.59	0.18, 2.02
Participant with depressive symptoms, support person without depressive symptoms (compared to both participant and support person without depressive symptoms)	0.44	0.13, 1.49
Participant without depressive symptoms, support person with depressive symptoms (compared to both participant and support person without depressive symptoms)	0.34	0.04, 3.16
Participant and support person with depressive symptoms (compared to both participant and support person without depressive symptoms)	0.37	0.04, 3.63
Participant diabetes distress high, support person diabetes distress low (compared to both participant and support person diabetes distress low)	0.52	0.18, 1.46
Participant diabetes distress low, support person diabetes distress high (compared to both participant and support person diabetes distress low)	0.83	0.27, 2.51
Participant and support person diabetes distress high (compared to both participant and support person diabetes distress low)	0.87	0.23, 3.32
Support Person Characteristic		
Diagnosis of diabetes	1.02	0.38, 2.77
Autonomy support of patient (IOCQ, per 1 point increase)	0.81	0.46, 1.45
Call Characteristic		
Months in study at time of call (per 1 month increase)	0.90	0.87, 0.93
Call completed without urgent fax generated in prior 2 periods	2.51	1.71, 3.70
Call completed with urgent fax generated in prior 2 periods	3.41	2.09, 5.55

Support Person Roles		
Reminds participant to perform home testing	0.65	0.21, 2.00
Reminds participant to take medications	0.50	0.19, 1.28
Suggests issues to discuss at medical visits	1.42	0.55, 3.70
Attends medical visits	2.23	0.82, 6.03

Initial models included a wide range of call and dyad level variables that were considered theoretically relevant to call completion. To address collinearity among subsets of these initial variables, one variable from each correlated subset was chosen based on strongest theoretical relevance to call completion.

eAppendix Table 3. Adjusted OR for Completed Visit Preparation Calls: Initial/Full Model Results

Participant Demographic or Clinical Characteristic	AOR	95% CI
Age (per 10 year increase)	1.53	0.97, 2.40
Baseline HbA1c (per 1% increase)	0.85	0.68, 1.06
Baseline systolic blood pressure (per 10mmHg increase)	1.13	0.92, 1.37
Insulin use	0.86	0.36, 2.05
Duration of diabetes (per 10 year increase)	1.01	0.68, 1.52
College degree	0.28	0.14, 0.58
Engagement in visits (PEPPI)	1.36	0.79, 2.35
Satisfaction with primary care team (per 1 point increase)	0.88	0.67, 1.10
Cohabitation with support person	0.95	0.40, 2.24
Participant satisfaction with support person support	0.68	0.30, 1.54
Patient Activation (PAM-13, per 10 point increase)	1.09	0.71, 1.67
Participant-Support Person Pair Level Characteristic		
Participant health literacy low, support person health literacy not low (compared to both participant and support person not low)	0.49	0.21, 1.18
Participant health literacy not low, support person health literacy low (compared to both participant and support person not low)	0.67	0.26, 1.75
Participant and support person health literacy low (compared to both participant and support person not low)	0.37	0.12, 1.12
Participant with depressive symptoms, support person without depressive symptoms (compared to both participant and support person without depressive symptoms)	0.99	0.44, 2.24
Participant without depressive symptoms, support person with depressive symptoms (compared to both participant and support person without depressive symptoms)	0.65	0.04, 9.55
Participant and support person with depressive symptoms (compared to both participant and support person without depressive symptoms)	5.48	0.43, 70.28
Participant diabetes distress high, support person diabetes distress low (compared to both participant and support person diabetes distress low)	1.81	0.68, 4.86
Participant diabetes distress low, support person diabetes distress high (compared to both participant and support person diabetes distress low)	0.99	0.37, 2.67
Participant and support person diabetes distress high (compared to both participant and support person diabetes distress low)	1.14	0.38, 3.45
Support Person Characteristic		
Diagnosis of diabetes	0.63	0.29, 1.38
Autonomy support of patient (IOCQ, per 1 point increase)	1.04	0.62, 1.75
Call Characteristic		

Months in study at time of call (per 1 month increase)	1.04	0.95, 1.13
Visit with primary care provider (reference visit with RN/other provider)	1.84	0.96, 3.54
Support Person Roles		
Reminds participant to perform home testing	0.96	0.36, 2.52
Reminds participant to take medications	0.57	0.24, 1.34
Suggests issues to discuss at medical visits	0.83	0.37, 1.86
Attends medical visits	1.50	0.64, 3.55