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Rationale and Methods of a Trial to Evaluate a Depression Telemonitoring Program that Includes a Patient-Selected Support Person

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Abstract

Objective: To test the effectiveness of an automated telemonitoring program for patients with depression that includes feedback to clinicians and support for a family member or friend serving as a non-professional caregiver.

Methods: Prior to being randomized to receive one year of either the Care Partners for Depression (CP-D) intervention or usual care alone, depressed patients from primary care clinics serving primarily low-income populations in rural and urban Michigan select a supportive adult from outside their home (their "Care Partner;" CP) to assist them in their depression self-management. In the CP-D arm, patients receive weekly automated telephone calls that provide monitoring and self-management guidance, CPs receive emailed guidance on supporting the patient's self-management based on patient-reported information, and primary care providers receive notifications about any urgent issues. At Baseline, Month 6, and Month 12, we assess depressive symptom severity (primary outcome) and several secondary outcomes.

Conclusion: To date, this is the only mHealth intervention for any psychiatric condition that involves a patient-selected support person. If it proves effective and cost-efficient, a new sustainable intervention would be available to patients with significant depressive symptoms,

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Authors' Contributions

Authors JEA and JDP drafted the manuscript, AS designed the statistical analysis, DE designed the cost analysis, and MDF designed the mixed methods analysis. All of the authors contributed to the study design, participated in preparing the grant application, and edited the manuscript.

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providing new management alternatives for patients who are medically underserved or socially isolated.

Keywords

Depression; Telemonitoring; Illness self-management

Introduction

Depression is the world's fourth most prevalent health problem [1], costing $40 billion yearly in medical costs and lost productivity in the United States alone. Among primary care patients, roughly 70% report significant depressive symptoms, 35–43% currently meet criteria for mood disorder, and 10–14% currently meet criteria for major depression [2–4]. Primary Care Providers (PCPs) are the sole mental health providers for well over half of these patients [5].

Unfortunately, many depressed patients do not receive the between-visit clinical support they need in order to achieve optimal outcomes [6]. While telephone-based depression care management improves outcomes [6–9], large patient panels prevent clinicians from being as proactive as guidelines recommend, and care programs for depression often do not include strategies to detect early warning signs and prevent exacerbations [10,11]. Automated mobile health (mHealth) services, including Interactive Voice Response (IVR) calls, might help address these barriers, given that patients with a variety of psychiatric conditions will engage with automated calls and provide valid data via IVR [12–17].

A second potentially untapped resource for improving depression management is social support [18–20]. While many depressed patients receive valuable support from a significant other in their home, these in-home caregivers (ICGs) are at risk for burnout [21] and usually lack the formal tools needed to systematically monitor a depressed patient's mood and provide as-needed assistance [22]. Many other patients live alone, with the majority reporting insufficient support, and many even attributing their depression to their social isolation [23,24]. These data all point towards a mismatch between depressed patients' need for assistance and the assistance provided by most clinics between face-to-face clinical encounters.

In order to address these problems, we have developed and pretested an automated mHealth program that provides depressed patients with weekly IVR mood assessments and self-management messages. The "Care Partners for Depression" (CP-D) intervention was designed with input from over 30 primary care physicians, psychiatrists, nurses, and experts in health behavior change, as well as from numerous patients. Building on a model originally developed for improving self-management support among patients with chronic medical conditions such as heart failure, the program aims to enhance linkages between patients, their support persons, and their primary care teams (Figure 1) [25]. In our preliminary six-month evaluation of CP-D, patients completed 68% of scheduled IVR assessments, and the system generated a manageable number of clinician notifications, most of which could be handled by allied health professionals with limited physician oversight [26]. Among patients who were initially non-adherent to antidepressant medication, those

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who participated with a Care Partner were significantly more likely to show improved adherence and achieve depression remission [27] (Figure 1).

Based upon these encouraging preliminary results, we are now conducting a randomized controlled trial (RCT) to more rigorously evaluate the long-term effectiveness of CP-D. Here, we describe the details of this study protocol. Our primary hypothesis is that, compared to usual care controls, intervention patients will demonstrate lower depressive symptom severity at Months 6 and 12. We are also exploring effects on the secondary outcomes of depression remission, depression-related functional impairment, depression self-management behaviors, healthcare costs, relationship quality, caregiving behaviors, and caregiver burden.

Methods

An overview of the research protocol is provided in the flow chart Figure 2.

Entry criteria

In order to participate, patients must: (a) have physician-identified depression as indicated by a depression diagnosis in their problem list or billing record (ICD9 codes: 296.20-.26, . 30-.36, 300.4, 309.0-., 309.28, 311.00) during the past two years; (b) have at least two outpatient primary care visits in the past two years, one of which must be within the past 13 months; (c) have at least moderate depressive symptom severity, as indicated by scoring ≥10 on the Patient Health Questionnaire −9 (PHQ-9) [28]; (e) be ≥ 21 years old; (f) be comfortable speaking English; (g) be able to use a touch-tone phone; (h) be able to identify at least 1 eligible CP; (i) not be in palliative care, on transplant waitlist, or have <1 year life expectancy; (j) be free of major cognitive impairment; (k) not be acutely suicidal or otherwise in need of hospitalization; and (l) not a victim of domestic abuse or stalking as indicated by a modification of the Women Abuse Screening Tool [29] and a recently developed stalking measure [30]. These screenings were included due to concerns that introducing a CP into the caregiving dyad might trigger or escalate domestic abuse and because abuse/stalking-induced depression is unlikely to respond to supportive interventions. Patients are not required to use or have access to a computer.

For each patient, we enroll a CP. To be eligible, CPs must: (a) reside outside of the patient's household but in the continental United States; (b) have communicated withthe patient either in person or by phone at least once monthly for the preceding six months; (c) have a home telephone or mobile cell phone; (d) have access and ability to use email; (e) be free of significant psychiatric distress, as indicated by scoring < 11 on the Hospital Anxiety and Depression Scale [31]; (f) be comfortable speaking English; and (g) be ≥ 21 years old. In our preliminary study, only 13% of eligible patients were unable to identify an eligible CP. We identified patients' in-home caregivers (ICGs) using structured queries, e.g., *"Is there anyone in your household who helps you manage your depression?"* To reduce risk of inter-caregiver conflict, we stipulate that patients with an ICG cannot enroll unless their ICG also enrolls.

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Recruitment

We are recruiting patients from seven primary care clinics that are geographically distributed throughout rural, suburban and urban Michigan and range in size from solo practices to mid-sized group practices comprised of up to eight providers. Potentially eligible patients are identified from both electronic health records and conventional medical charts. After patients are sent an introductory letter describing the study, they are screened for eligibility by telephone and (if eligible) solicited for participation. If patients screen positive for either suicidal risk or domestic abuse, then one of our clinician investigators contacts them immediately to assess their safety and provide information about therapeutic and legal resources. Patients' written informed consent is collected by mail. By engaging a diverse variety of clinics from urban, suburban, and rural Michigan, we hope to sample enough minority patients to represent US racial/ethnic distributions.

Patients are asked to nominate between one and four potential Care Partners, and then rate each on the Norbeck Social Support Questionnaire [32] in order to provide a basis for soliciting the most supportive individual. To screen out CP nominees who might not be compatible with any existing ICG, we also ask patients: (a) *"Overall, how supportive would [ICG] be of [CP] as your Care Partner?"* and (b) *"How do [CP] and [ICG] get along with each other?"* Whenever a CP nominee disqualifies, we solicit the next-ranked one. We are stratifying recruitment so that 50% of participating patients will have an ICG, and obtaining verbal consent from qualifying CPs and ICGs.

Randomization

As shown in Figure 2, after Baseline assessment, patient-CP pairs are randomized to receive twelve months of either CP-D (intervention) or usual care (control). We are blocking randomization using the minimization method [33] to allocate the patient-CP pairs to arm, within strata defined by clinical site and the presence of an ICG (Figure 2).

Control arm

Patients: As seen below in Table 1, patients in the control arm receive usual medical care, and printed materials on depression self-management. Their CPs receive information on supporting the patient's self-management, and instructions to: (a) talk with their patient-partner at least once weekly for at least five minutes, (b) include the ICG on calls when possible, (c) use supportive comments and avoid criticism, (d) review recent trends, (e) review progress, barriers, and goals, (f) practice effective communication skills when discussing new and recurring problems, (g) monitor ongoing issues (e.g., medication supplies, appointments) as needed. We specifically discourage CPs from acting as an intermediary between the patient and his/her physician, except in case of an emergency. To minimize the risk that any ICG feels undermined by a CP, we also specifically structured the CP's role as assistive to the ICG. We additionally recommend that, when talking by telephone with the patient, the CP include any ICG on an extension or speakerphone whenever possible, and ask how they can help the ICG support the patient. Our preliminary work suggested that under these arrangements, ICGs welcome CP support.

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Intervention arm

Participants in the intervention arm receive all of the elements that are provided in the control arm. In addition to receiving the instructions given to patients in the control arm, they are also: (a) asked to review the most recent IVR assessment with the patient, (b) asked to collaboratively form behaviorally oriented action plans with the patient and ICG, and (c) provided with the following components:

Automated IVR calls: As indicated in Table 1, patients in the intervention arm receive weekly automated IVR assessments with problem tailored guidance on self-management. The IVR calls are scheduled at three patient-selected day/time combinations. The calling system reattempts unsuccessful attempts (no pickup, busy signal, unavailable) every 20 minutes, up to three times, and thus attempts to call patients up to nine times per week. The system asks the person answering the telephone to confirm that they are the patient or bring the patient to the phone. If neither option is chosen, then the call is automatically reattempted later.

Completed calls typically last between 5 and 10 minutes. Call content is governed by a tree-structured algorithm that determines which prerecorded queries patients hear. Patients are asked to respond to these queries using their telephone touchtone keypad. Based upon their responses, they then hear algorithm-determined health messages that are designed to provide either positive reinforcement or self-management guidance. An example of a reinforcement message is as follows:

> It sounds like your depression symptoms are getting better. That’s great news. Remember that if you are prescribed a medication for depression, it’s important that you keep taking it exactly as prescribed to help keep your symptoms from getting worse. Also if you’ve made some changes in your lifestyle that you think have helped you feel better, you should talk about those with your Care Partner. The two of you might be able to think of other ways you can build on your success.

A second example of self-management guidance, in this case specific to worsening yet mild depressive symptoms, is as follows:

> It sounds like you are experiencing some depression symptoms and that they have gotten worse since the last time I called. Worsening symptoms of depression may mean that you should think about making a change in your treatment. If you are prescribed an antidepressant medication – keep taking it as prescribed so that it has the greatest possible chance of helping you. You should also consider making an appointment with your doctor to talk about whether you need a change in your treatment plan. I’ll give you the phone number of your doctor’s office at the end of this call.

Another example of self-management guidance, in this case related to mild antidepressant non adherence, is as follows:

> I’m sorry to hear that you are having problems taking your medications. If it is hard for you to remember to take them, consider getting a weekly pill box. Also, think about ways you can remind yourself to take your medicine by making it part of

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> your routine. For some people, it helps to put their medicine right next to their tooth brush or next to their coffee pot so they see it the same time every day."

Even if patients report no problems, they can still opt to hear self-management messages regarding medication adherence, physical activity, sleep, and other key self-management issues. Further details on call processes and content are available from the corresponding author. Patients, ICGs and CPs can access toll-free live support during business hours.

Email messages to CPs: As indicated in Table 1, the program automatically sends the patient's CP a weekly structured email report summarizing the patient's mood status, any symptoms or behaviors of concern, specific self-management support actions, and a timeframe for interacting with the patient. An example of a self-management support message is as follows:

> Based on your partner's recent assessment, it looks like his symptoms of depression are getting worse. Some fluctuations in mood are normal, especially if there has been a recent stressful event like a job loss, financial stress, argument with a loved one, or a new health problem. However, worsening mood is concerning among patients with depression. Contact your partner. Try to understand what is bothering him without necessarily trying to solve his problems. Show that you understand and care and that he is important to you. You may want to offer to do something fun or social with him if you live nearby. Ask how you can be helpful. Use your judgment about whether he wants to discuss issues like medications and treatment. Try to be encouraging, but accept that his depression treatment is his own decision and responsibility.

Urgent problems: Although we inform patients that the program is not a medical alert system, it does include mechanisms for responding to urgent issues requiring clinical attention. Each IVR call offers instructions on seeking emergency medical help, including contact information for the patient's own PCP. If the patient's IVR responses suggest an urgent situation (e.g., serious medication side effects, suicidality, etc.) then the system: (a) instructs the patient to either seek emergency medical attention or contact their PCP as soon as possible, (b) immediately faxes the PCP, and (c) emails the CP Patients reporting suicidal ideation are additionally instructed to call a 24-hour crisis line, and are offered a direct transfer to that hotline. In these cases the system also alerts the study mental health clinician, the PCP, and the CP.

Assessments

Patient assessments: Most of the quantitative variables are assessed by research staff over the telephone at Baseline, and Months 6 and 12, except that sociodemographic characteristics are assessed at Baseline only, user satisfaction is assessed at Month 12 only, and health care utilization is assessed at Month 12 using both patient self-report and clinical sites' administrative databases. We are using the well-validated PHQ-9 [33,34] to assess depressive symptoms (primary outcome) and the presence of Major Depressive Episode and/or Dysthymic Disorder. Functional status is being measured with the Sheehan Disability Scale [35–37] and the Medical Outcomes Study Short Form 12 (SF-12) [38]. We assess

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antidepressant adherence with the Brief Medication Questionnaire (BMQ) [39], which is highly sensitive to repeat and sporadic non adherence as detected by electronic monitoring [40]. Self-reported health services utilization is measured with standard items covering medication use, outpatient visits, inpatient stays, and emergency department visits. We measure depression self-management using the validated Recovery Assessment Scale [41], items from a trial of telephone psychotherapy for depression [42], and the seven-item Task-Oriented portion [43] of the Coping Inventory for Stressful Situations [44]. As noted above, social support is measured with the well-validated Norbeck Social Support Questionnaire [32]. We assess the frequency and content of CP contacts over the past two months, perceived caregiving stress, affective response to CP [45]. Satisfaction with the intervention and depression care is assessed with the validated Client Satisfaction Questionnaire [46]. Medical comorbidity is being measured using a checklist of common chronic conditions, and difficulties in comprehending medical information is being measured by an abbreviated form of the Test of Functional Health Literacy [47].

Caregiver (CPs and ICGs) assessments: At Baseline, Month 6, and Month 12, research staff also administer self-report measures by telephone to both CPs and ICGs. We are measuring caregiver burden with the Modified Caregiver Strain Index, which measures 4 domains with good reliability and validity [48]. We are calculating opportunity costs [49] from the Chronic Illness and Caregiving Survey [50] items quantifying monthly caregiving time and lost work time [51]. We administer the PHQ-9 [34] to monitor CP's for the development of psychiatric distress. Caregiver relationship quality and quantity is being assessed with adaptions of the corresponding patient scales [45]. We evaluate CPs' and ICGs' perceptions of patient outcomes with modifications of the patient version of the PHQ-9, and additional single items covering the CP's perception of the patient's health. Finally, CP and ICG satisfaction with the intervention is being measured with a brief measure developed specifically for this study.

Economic assessment: To complement patients' self-report data on service utilization, we are also using site-specific administrative databases to measure health care utilization. When these two data sources conflict, we assume that the administrative data are more accurate, but also query sites about any substantial inconsistencies. From these data we calculate health care costs separately using site-specific and Medicare reimbursement rates. Intervention-specific costs are calculated from logs of hourly time spent by research staff on managing the intervention system and generating notifications for CPs and PCPs, which we translate to costs based on their corresponding wages and reimbursement rates. Finally, intervention supplies and telephone use charges are being tracked and translated to costs.

Qualitative assessment: This project includes a mixed-methods analysis [52,53] designed to enrich our interpretation of any statistical associations, and to help us discover new strategies to enhance the intervention's acceptability, effectiveness, and sustainability. An experienced qualitative interviewer is conducting semi-structured exit interviews with up to 20 intervention patients (sampled across the ranges of age, gender, race, improvement, and satisfaction). We are also conducting brief parallel interviews of these patients' CPs and ICGs, and interviewing approximately 10 participating PCPs. These final sample sizes will

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be determined by saturation, defined as the point when the interviews fail to elicit new substantive information. The domains summarized in Table 2 are being assessed using a semi-structured set of non-directional, open-ended questions to elicit participants' perceptions and encourage them to tell their story in their own words. After warm up, we use grand tour items to elicit the nature of participants' experience from prior to intervention until the present, and then use a variety of open-ended questions and probes to assess each domain. After completing each interview, the interviewer then reviews key findings with other members of the study team, and the iterative analysis interviewing cycle will resume. As indicated, additional questions are added to the interview to explore issues generated by the interviews that the research team did not anticipate.

Payments for participation

We reimburse participants a $50 cash card for completing each of their three scheduled 30–45 minute telephone assessments. Thus, each patient, CP and ICG will be paid up to $150 for their time and effort. Additionally, qualitative interviewees are compensated $25 and physician interviewees are compensated $50 for completing the 30-minute qualitative interviews.

Data analysis

Sample size

The patient is the unit of randomization and analysis. For our main hypothesis, based upon pilot data we expect a 0.9 point standard deviation (SD) units difference in the PHQ-9 Baseline to Month 6 change scores with intervention. We assumed that controls improve 0.3 SDs, group SDs remain constant over time, pre-post correlation is 0.50, and that intervention benefits diminish by 0.1 SD between Month 6 and Month 12. We then estimated the minimum sample needed for 90% power to detect a 0.5 SD difference in effect size with a 2.5% Type I error rate (Bonferroni correction for two related tests: Baseline vs. Month 6, Baseline vs. Month 12), which is considered to be a clinically significant degree of improvement [54]. With these assumptions, a two-sided independent-samples t-test requires 101 subjects per group, or 202 total. To allow for a worst-case scenario up to 35% attrition, we are enrolling up to 311 patients, 311 CPs, and 156 ICGs.

Missing data

We are using the chained equation method to impute missing data [55], which allows for categorical and continuous variables without a multivariate joint distributional assumption. In this approach, missing values are sequentially updated using bootstrap or Markov Chain Monte Carlo based on multiple regressions with the other variables as covariates, repeated to generate 10 datasets to be combined per Rubin [56].

Descriptive and preliminary analyses: We are computing descriptive statistics (frequency, range, mean, SD) for patients' sociodemographic and clinical characteristics. We are also characterizing call completion rates, contact frequency, CP report-to-action time, and user satisfaction.

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Analysis of primary outcome: Our primary hypothesis is that, compared to controls, intervention patients will exhibit lower depressive symptom severity at Months 6 and 12. We are testing this hypothesis using a mixed linear regression model framework to analyze PHQ-9 total scores with group (Intervention, Control) as the between-subject factor and time (Baseline, Month 6, Month 12) as the within-subject factor. Of primary interest is the group X time interaction, representing differential change in PHQ-9 within groups. A random subject intercept accounts for intra-subject correlation, and we are adjusting the model for both clinical site and presence of an ICG. Distributional checks and model diagnostics are being conducted along with any needed remedial actions. Finally, we are performing within-group, Bonferroni-adjusted post-hoc comparisons for Baseline vs. Month 6 and Baseline vs. Month 12.

Analysis of secondary outcomes: For continuous secondary outcomes (e.g., use of effective self-management behaviors), we are repeating the above primary analytic strategy. For the dichotomous secondary outcome of depression remission, we are using a clustered logistic regression model under a generalized linear mixed model framework.

Analysis of costs: In calculating costs, we are differentiating between fixed costs associated with intervention startup and variable costs incurred by intervention delivery. The main cost in the former is the training time needed for clinicians and staff to adopt the intervention. The main costs in the latter are medical utilization; and staff time spent on email, online reports, and phone calls. We are calculating the total costs of these two categories separately as well as combined, and then comparing the intervention and control groups. We are also conducting an exploratory cost effectiveness analysis by calculating the intervention's incremental costs divided by the incremental effectiveness (mean PHQ-9 reduction). We are translating health gains into Quality of Life Years (QALYs) using the Medical Outcomes Study Short Form 12 (SF-12) [38] data from Baseline and Months 6 and 12, and constructing confidence intervals and cost-effectiveness acceptability curves using Monte Carlo bootstrapping simulations [57].

Mixed methods analysis: We are transcribing audiotapes, entering this data into ATLAS.ti [58], and checking all transcripts for accuracy. Next, two independent readers are developing a coding scheme that includes objective definitions, inclusion / exclusion criteria, and examples. Our *a priori* domains (Table 3) will be used as preliminary codes, with *de novo* codes added based on emerging themes. These are entered into the ATLAS tree diagram, after which we perform revise-retest cycles until reaching consensus. First, we are examining the qualitative dataset based on our specific questions and conducting further searches as needed to answer new questions that arise. Next, we are constructing a matrix with columns for participant type and rows for themes to facilitate interpretation of intra- and inter-group patterns. Finally, we will integrate the quantitative and qualitative results to explore unexpected associations and quantitative trends that do not reach statistical significance [53]. After testing the quantitative hypotheses, we will match the statistical model's major predictors with their most relevant qualitative themes.

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Ethical approval

The above study protocol was approved by the IRB at the University of Michigan.

Results

We began recruiting participants in March 2014. To date, we have recruited 111 patients, representing 28% of our targeted sample. Twenty-four participants have completed their Month 6 assessment, and none are yet due for their Month 12 assessment. The current Month 6 attrition rate is 9%. We are scheduled to perform interim analyses in June 2015. We project that we will complete recruitment by late 2015 or early 2016, with data collection completed one year afterwards.

Discussion

Here, we present the rationale and protocol for a RCT to test the benefits of a unique mHealth program that incorporates a patient-selected support person. From a wide variety of community based primary care clinics, we recruit patients with moderate or more severe depressive symptoms. These patients nominate a close friend or adult relative from outside their home who is willing and able to support their depression self-management.

Patient-CP pairs are then randomized to receive one year of usual care either alone or supplemented by the Care Partners for Depression (CP-D) intervention. Patients in the CP-D arm receive a weekly automated telemonitoring program that both monitors their depressive symptoms and provides them with problem-targeted self-management suggestions. The program also provides patients' CPs with emailed updates on the patient's status along with guidance on supporting the patient's self-management, and notifies patients' PCPs about any clinically urgent issues that are detected. At Baseline, Month 6, and Month 12 we are assessing the primary outcome of depressive symptom severity with Month 12 as the primary endpoint. We are also exploring secondary effects on depression remission, depression-related functional impairment, depression self-management behaviors, healthcare costs, relationship quality, caregiving behaviors, and caregiver burden. Although our projected effect size is moderate in magnitude, our CP-D intervention is probably inexpensive to implement and maintain because the majority of its costs are attributable to its initial development and testing.

Potential limitations

Because the control arm does not include telemonitoring without notifications, the study design cannot separate the effects of having a Care Partner from the effects of telemonitoring alone. While an "mHealth-alone" arm that did not include Care Partners would provide this comparison, our prior studies indicate that telemonitoring outcomes are significantly better for patients who participate with a CP than for those who participate alone [27,59]. Therefore, our main objective was to test the clinical effectiveness of the aggregated mHealth CP-D program rather than disentangle the incremental effects of its components. Also in line with the principles of effectiveness (as opposed to efficacy) research, we chose to maximize external validity by not blinding participants to their assigned condition, which is extremely difficult to achieve in effectiveness trials of behavioral interventions.

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A second potential limitation is that almost all of the outcomes are measured by self-report, which can be biased by recall and social desirability biases. Subsequent studies might therefore be strengthened by including alternative data sources such as direct observation, medical records review, corroboration from significant others, and electronic monitoring. However, most of our self-report instruments have good psychometric characteristics, health care costs are being assessed objectively, and our mixed methods analysis should help us make stronger inferences. Related to this, some patients might underreport their symptoms during IVR calls in order to abbreviate the call, or due to discomfort with the automated interface. However, IVR methods have been extensively validated for measuring depressive symptoms [60], and we previously established that our IVR system provides clinical information that is reliable and valid [12].

While attrition is always a concern in clinical research, we do not expect this to be a substantial problem due to our use of patient-preferred calling times and the general patient-centeredness of the calling system. Given budgetary and logistical limitations, our cost-effectiveness analysis is only meant to be preliminary, and thus does not capture all of the potential indirect healthcare costs. Finally, our IVR script is currently only available in English although a Spanish-language version is under development.

Conclusion

If the present study confirms that our intervention is effective without increasing PCP burden or marginal costs, then its subsequent implementation could yield major public health benefits, especially in medically underserved populations. Additionally, societal benefit may also occur through the promotion of helping behavior and social connectedness. Given the chronic shortages in health care financing and available care management personnel, incorporating patient-designated support persons into automated mHealth programs may help fill the gap between patients' needs and the limitations faced by many resource-constrained healthcare settings. Follow-up research might extend the focus of the Care Partners program to other psychiatric disorders beyond unipolar depression, and in fact we are now actively testing Care Partners for diabetes, congestive heart failure, and chronic pain.

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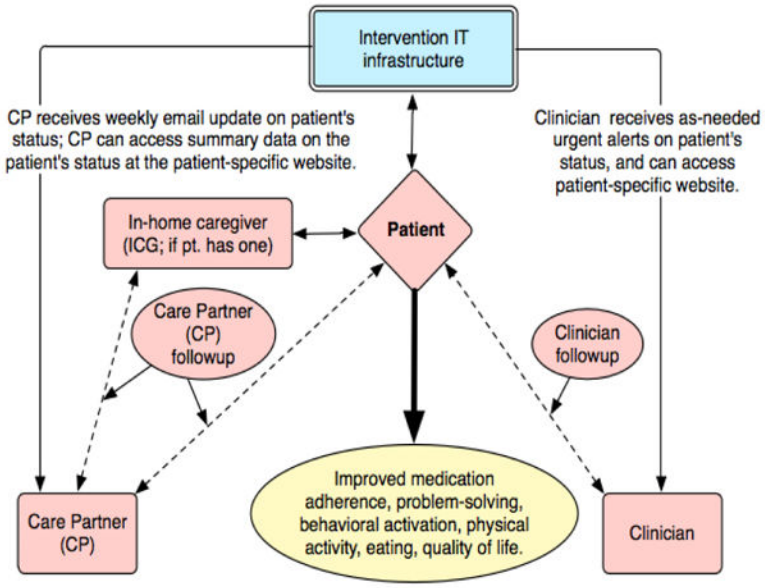

Figure 1:
Hypothetical mechanisms of CarePartner intervention and outcomes.

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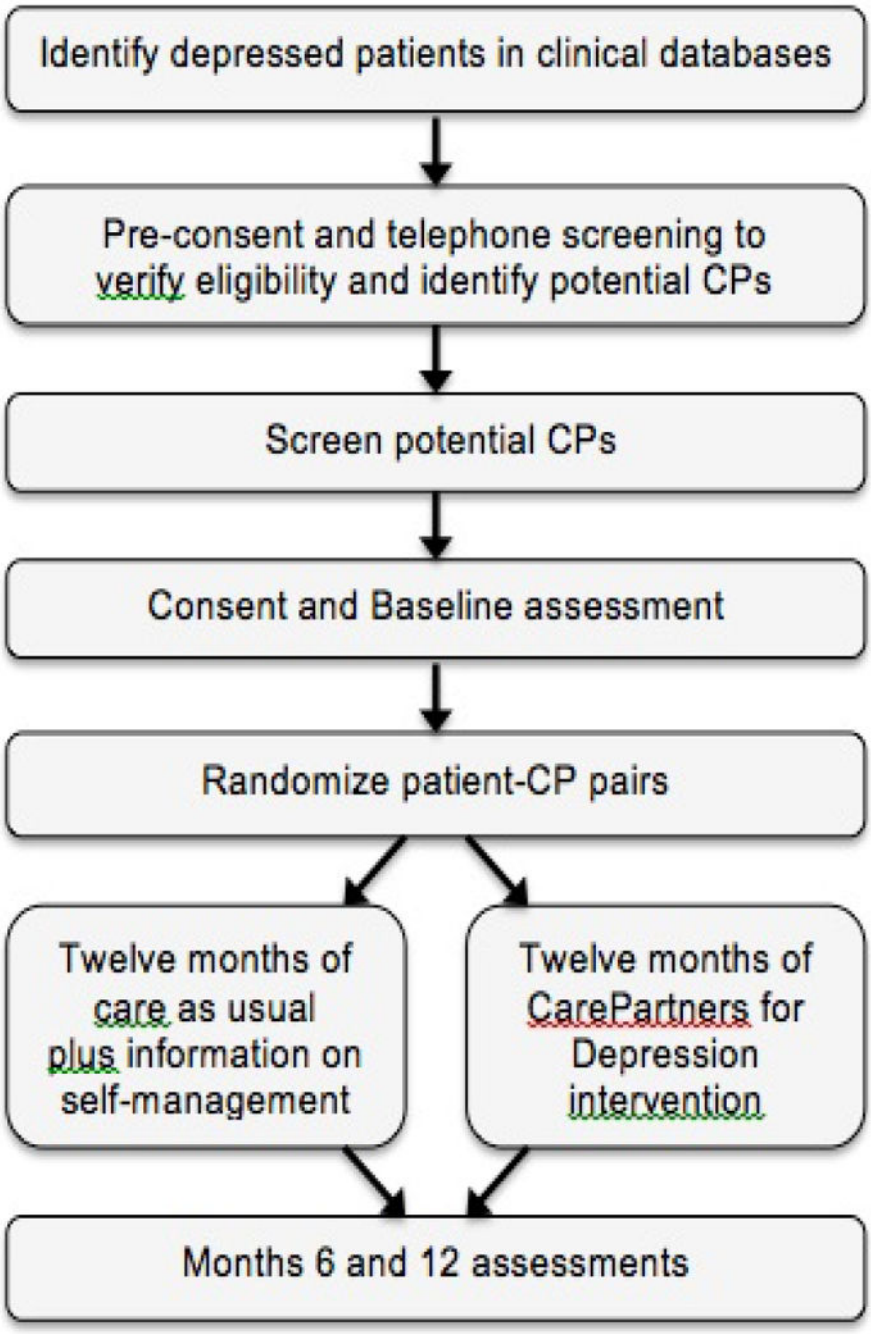

Figure 2:
Flow sheet for study protocol.

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Table 1:

Active components for each trial arm.

	Arm	
	Control	**Intervention**
Patient		
Usual medical care	✓	✓
Printed material on depression self-management	✓	✓
Weekly automated assessments with tailored self-care guidance		✓
Access to the program website and email summaries of their telephone assessments		✓
DVD and printed material covering communication and the IVR calling system		✓
CarePartner (CP)		
Printed information about depression and providing depression self-management support	✓	✓
DVD and printed material covering communication and the IVR calling system		✓
Email reports based on patient's weekly assessment		✓
Access to the program website with summaries of telephone assessments		✓
In-home caregiver (ICG)		
Printed information about depression and providing depression self-management support	✓	✓
Guidelines for collaborating with a CP		✓
Access to the program website and email summaries of their telephone assessments		✓
Primary care provider (PCP)		
Automated alert calls when patient reports an urgent problem		✓

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Table 2:

Qualitative assessment domains.

Assessment domain	(Participant type)[a] and sample item
Subjective experience of process / outcomes	(All) Starting from the beginning, what has it been like to be in the program? (MDs) How did the program affect the way patients manage their depression?
Relationship effects	(ICGs) How did the program affect your relationship with (patient, CP)? (MDs) How did the program affect your doctor-patient relationships?
Strengths/weaknesses	(All) What did you like least about the program? (MDs) How did the program change the way you clinically manage depression?
Strategies to improve	(All) What would you change about the program? (MDs) How could we make the program more sustainable in your clinical practice?

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Table 3:

Expected outcomes of mixed methods analysis

Possible qualitative results	Possible quantitative results					
	Main effect of intervention		H3: Main effects on ICG[a] relationships, burden		H4: Interaction effects (moderators)	
	Confirmed	Disconfirmed	Confirmed	Disconfirmed	Confirmed	Disconfirmed
Deeper understanding of intervention outcomes (Pts, CPs, ICGs, MDs)[a]	Identify mechanisms underlying improvement	Identify reasons for lack of improvement	Identify Mechanisms underlying ICG benefit	Identify reasons for lack of ICG benefit	Identify mechanisms for selective benefit	Discover new general moderators
Full characterization of effects on relationships between patients, CPs, ICGs, and MDs.	Explain role of positive relationships in greater improvement	Explain role of negative relationships in lack of improvement	Explain role of positive relationships in ICG benefit	Explain role of negative relationships in lack of ICG benefit	Identify Interpersonal reasons for selective benefit	Discover new Interpersonal moderators
Identification of user-perceived strengths, weaknesses, and areas for modification.	Identify strategies to improve intervention acceptability, effectiveness, and sustainability					

[a]. Pt.: Patient; MD: Medical Doctor (physician); “All” includes Patients, Physicians, CPs and ICGs.