ORIGINAL RESEARCH

Pilot Study of Implementation of an Internet-Based Depression Prevention Intervention (CATCH-IT) for Adolescents in 12 US Primary Care Practices: Clinical and Management/Organizational Behavioral Perspectives

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ABSTRACT

Objective: To explore the implementation of CATCH-IT (Competent Adulthood Transition with Cognitive-behavioral Humanistic and Interpersonal Training), an Internet-based depression intervention program in 12 primary care sites, occurring as part of a randomized clinical trial comparing 2 versions of the intervention (motivational interview + Internet program versus brief advice + Internet program) in 83 adolescents aged 14 to 21 years recruited from February 1, 2007, to November 31, 2007.

Method: The CATCH-IT intervention model consists of primary care screening to assess risk, a primary care physician interview to encourage participation, and 14 online modules of Internet training to teach adolescents how to reduce behaviors that increase vulnerability to depressive disorders. Specifically, we evaluated this program from both a management/organizational behavioral perspective (provider attitudes and demonstrated competence) and a clinical outcomes perspective (depressed mood scores) using the RE-AIM model (Reach, Efficacy, Adoption, Implementation, and Maintenance of the intervention).

Results: While results varied by clinic, overall, clinics demonstrated satisfactory reach, efficacy, adoption, implementation, and maintenance of the CATCH-IT depression prevention program. Measures of program implementation and management predicted clinical outcomes at practices in exploratory analyses.

Conclusion: Multidisciplinary approaches may be essential to evaluating the impact of complex interventions to prevent depression in community settings. Primary care physicians and nurses can use Internet-based programs to create a feasible and cost-effective model for the prevention of mental disorders in adolescents in primary care settings.

Trial Registration: ClinicalTrials.gov identifiers: NCT00152529 and NCT00145912

Depression is the most common mental disorder in adolescence, affecting school performance, personal relationships, and future aspirations.[1–9] A scarcity of providers dedicated to child and adolescent mental health, limited coverage for mental health services, recent recommendations for screening and treatment in primary care, and success of chronic care[10–12] and other model interventions[10–14] have reinforced the primary care physician role for intervening in adolescent depressive illness.[10–12] However, most adolescents do not seek treatment, and even with full implementation of evidence-based strategies, the burden of this disorder will only be partially reduced.[11,12] Also, few such programs have been found to decrease the incidence of depressive disorders in youth.[13,15] To date, the most effective programs utilize a group psychotherapy format, which is difficult to implement and is acceptable to only a minority of at-risk adolescents.[16,17] Internet-based approaches for treatment of adults with depressed mood and anxiety have demonstrated promise in trials in Europe and Australia, but few interventions have been developed for targeting adolescents.[18–25] Similarly, new and lower-cost approaches will be in increasing demand for the emerging patient-centered medical home and accountable care organization models.[26]

To address the need for a feasible and acceptable behavioral and preventive intervention for depression in the primary care setting, we developed CATCH-IT (Competent Adulthood Transition with Cognitive-behavioral Humanistic and Interpersonal Training) (ClinicalTrials.gov identifiers: NCT00152529 and NCT00145912).[27,28] The CATCH-IT intervention model consists of primary care screening to assess risk, a primary care physician interview to encourage participation, and 14 online modules of Internet training to teach adolescents how to reduce behaviors that increase vulnerability for depressive disorders.[13,29–31] The rationale for adding the primary care interview was to enhance the adherence and therapeutic aspects of the Internet modules.[15,18,23,25,32]

In order to determine how much physician contact would be required to engage adolescents with the Internet intervention, we conducted a randomized clinical trial comparing a primary care physician motivational interview to primary care physician brief advice. Both randomization groups substantially engaged the Internet site (motivational interview: 90.7% vs brief advice: 77.5%), and the motivational interview group demonstrated greater overall use. In both groups, 10-item Center for Epidemiologic Studies Depression Scale (CES-D-10) scores declined from baseline to 12 weeks (motivational interview: 24.0 to 17.0, $P < .001$; brief advice: 25.2 to 15.5, $P < .001$).[33,34] In both groups, the percentage of those

- ■ Motivational interview training of physicians in primary care accompanied by an Internet-based self-managed depression prevention/intervention demonstrates potential for significant public health impact.
- ■ Shifting the focus to the patient (motivational interview plus Internet-based program) and minimizing changes in practice work flow could address barriers to implementation of interventions for depressive disorders in primary care.

with clinically significant depression symptoms based on CES-D-10 scores declined (motivational interview: 52%–12%, $P < .001$; brief advice: 50%–15%, $P < .001$). However, the motivational interview group demonstrated fewer clinical depressive episodes at 2-, 6-, and 12-month follow-up.[33,34] Furthermore, both groups demonstrated increases in social support and reduction in depression, which were associated with reduced school impairment. While these results proved promising, the movement of evidence-based multicomponent interventions toward community practice implementation also proved to be challenging.[35–41] This implementation process for primary care–based depression prevention using an Internet-based model has not been described here.

We believe that careful evaluation of complex interventions early in the development cycle is critical in identifying key factors that may interfere with or promote implementation and the eventual public health impact. Many barriers have been identified including provider attitudes,[42,43] intervention complexity,[44,45] and practice context and structure.[46] Unfortunately, interventions are rarely subjected to rigorous evaluations of their actual potential public health impact. Recognizing this dilemma, Glasgow et al[47] developed the RE-AIM model to assess the public health impact of interventions in actual settings. RE-AIM is a systematic method designed to estimate such factors as program Reach, Efficacy, Adoption, Implementation, and Maintenance on public health impact. Although there are limited empirical data on RE-AIM metrics, they extend current methods that identify interventions most likely to impact population health and provide evidence that such programs are worth sustained investment because of their feasibility and sustainability in real-world environments.[47]

The purpose of this study was to explore the implementation of a first-of-its-kind primary care, Internet-based depression intervention for adolescents. Specifically, we examine practice structure/setting, knowledge and capability to perform the intervention, attitudes of providers toward the intervention, and the potential public health impact of the intervention (RE-AIM framework). We then take the next step to explore the relationship between these potential barriers, structure/setting, knowledge and capability to perform the intervention, and the attitudes of providers toward the intervention, on the 5 RE-AIM outcomes (reach, efficacy, adoption, implementation, maintenance on public health impact). First, we hypothesized that providers would

have favorable attitudes toward the CATCH-IT intervention even if they held less favorable ones toward conventional mental health interventions. Second, we hypothesized that physicians could gain basic minimal proficiency in motivational interviewing after just a 1-hour instruction session during lunch. Third, we hypothesized that, with regard to public health impact, clinical practices might vary considerably in their ability to perform the intervention and that this variability would affect the potential public health impact.

METHOD

Overall Study Design

Participants and eligibility. Adolescents and emerging adults from 14 to 21 years of age were recruited from February 1, 2007, to November 31, 2007, by direct primary care screening for risk of disorder (subthreshold depressive symptoms) and by posted advertisements.[48] Those adolescents with positive screens provided informed consent (or had their parents provide informed consent and they provided assent) to either study staff or the principal investigator. We followed adolescents to evaluate their clinical outcomes by telephone at 6 and 12 weeks and with a self-administered poststudy questionnaire at 4 to 6 weeks. All protocols were approved by the University of Chicago Institutional Review Board, Chicago, Illinois. A detailed description of the trial methods has been previously reported.[34]

Intervention. We conducted a randomized controlled trial comparing motivational interview + Internet program (motivational interview group) versus brief advice + Internet program (brief advice group) in 12 US primary care sites (for purposes of this analysis, 2 primary care sites located 1 block from each other were combined for the total of 12 sites described in this study) within 5 different health systems spanning 4 states located in the US Midwest and Southeast. Primary care physicians performed initial and follow-up interviews for each participant, while nurses performed the screening for risk. For the brief advice condition (1–2 minutes), the physician used a "directive" approach to advise the adolescent that he/she was experiencing depressed mood and was at risk for depressive disorder and recommended using the CATCH-IT Internet site. With regard to the motivational interview condition (6–15 minutes), the physician employed an "autonomy-focused" approach to help the adolescent develop a positive personal cost/benefit assessment toward completing the intervention and building resiliency. Both groups received equal and private (secure sign-in) access to the Internet site. The CATCH-IT Internet component consists of 14 modules based on behavioral activation, cognitive-behavioral therapy,[30,49] interpersonal psychotherapy,[31,50] and a community resiliency concept model, with the overarching goal of providing a sense of mastery over emotions in a range of domains (eg, peer, family, school). Acknowledging that risk factors occur within ecological contexts and across multiple domains, a workbook supporting the development of resiliency in adolescence was provided to the parents of adolescents.[51]

The development and content of the intervention have been extensively described in prior publications.[27,28]

Recruitment. Recruitment was accomplished by screening all adolescents visiting the primary care physician for risk of depressive disorder (presence of at least 1 core symptom of depressive disorder for at least 2 weeks)[52] as well as through advertisements posted in and around the clinics. Adolescents (aged 14–21 years) who reported any core symptoms of depressive disorder for 2 weeks at 2 separate assessment points were enrolled in the study. Adolescents with borderline symptoms of major depression and directly supervised by their primary care provider were also enrolled in the study. Exclusion criteria were applied to adolescents with major depression, with frequent self-harm thoughts/intent, or with other mental disorders (not including alcohol abuse). Study staff contacted the adolescents by telephone and conducted a full eligibility assessment. Qualified assessors (blinded to group assignment) completed postintervention assessments of adolescents' clinical status.[53]

Training of providers. All providers (primary care physicians and nurses/medical assistants) were trained during two 1-hour sessions (lunchtime) at baseline and subsequently after the completion of the intervention by all participants as a booster session. The sessions included 40 minutes of didactic material on the screening, study design, and interview components. This 40-minute didactic session was followed by a 20-minute video demonstration of the brief advice and motivational interview approaches using the scripts provided in the study. This session also included a postvideo discussion. Physicians were provided with a copy of the video as well as a script (1 page) on the day of the interview. Similarly, adolescents receiving the motivational interview were provided a preinterview goal-setting questionnaire to prepare for the physician interview that included the motivational interview questions. Nurses/medical assistants were also provided with a short description script on how to introduce the study to the participants. All interviews between the physicians and the participants were audio recorded. Nurses/medical assistants received $100 for completing training, assisting in the study, and completing a poststudy questionnaire. The physicians received $100 for training and a poststudy questionnaire and $50 for each interview they completed with the participant. All physician providers provided consent for study participation and audio recording of the interviews.

Measures

Survey design and collection of recorded interviews. All health care providers implementing CATCH-IT in their offices were eligible to complete a survey following completion of the program by all participants. The study was administered in 2 phases. In the first phase, health care providers completed a questionnaire after implementing the program in order to assess their attitudes and ability for implementing the online program. The second phase included rating physician skills for executing the 2 interviewing methods of brief advice and motivational interview. All interviews were transcribed and rated by 3 independent reviewers.

Provider characteristics. All providers and office staff completed questionnaires characterizing their professional backgrounds (eg, medical assistants, nurses, and physicians, including specialty and board certification status), practice ownership models (eg, community or hospital not for profit, group practice physician owned, medical school), practice size (intermediate practices [5–10 providers]), small practices [≤ 4 providers]) and large practices (> 10 providers), location (rural, urban, suburban), race/ethnicity, gender, and age.

Adolescent outcome measure. All adolescents completed self-reported questionnaires at baseline and 6- and 12-weeks' postenrollment. Trained assessors evaluated depressed mood at follow-up at 6- and 12-weeks' postenrollment. We report outcomes as derived from the CESD-10.[54] Cronbach α for the CESD-10 was 0.83 at baseline. We used CESD-10 scores measured at baseline and 12-week follow-up to calculate pre/post effect sizes for each clinic.

Provider knowledge and attitudes. The survey was organized into 2 categories for evaluation: (1) knowledge (true/false response, eg, "Even 1 episode of major depression can raise a patient's risk of substance abuse or suicide.") and (2) attitudes (Likert scale ratings: 1 = strongly disagree to 5 = strongly agree) in several areas that include rating scales for the CATCH-IT intervention, such as feasibility screening (eg, "The screening process was easy to use."), interview (separate scales for each type of interview, eg, "The script was easy to use."), and Internet (eg, "The modules were easy to read for my patients."); barriers (eg, "The screening is difficult for the nursing staff."); willingness (eg, "I believe that primary care physicians should recognize symptoms of depression."); capability (eg, I can recognize the symptoms of major depression."); global appraisal (eg, "My patients benefited from the early intervention process."); and sustainability (eg, "I would implement the entire program in my office, even if I were not enrolled in the study."), and primary care interventions for depression in general. The items comprising the knowledge and attitudes can be found in Table 1.

Motivational interview performance. In order to assess clinicians' motivational interview performance, we also implemented the Motivational Interview Treatment Integrity 3 (MITI3) coding manual using 2 trained raters.[55,56] The MITI3 divides the assessment into 2 main parts: global spirit score and behavior counts.

The global spirit score captures raters' judgment on the relationship between the patient and the physician on the key motivational interview elements of evocation (eliciting motivation), collaboration (power sharing), autonomy (supporting patient perception of choice), direction (focus on behavior change), and empathy (understanding). Each category is rated on a Likert-type scale (1 = low to 5 = high), for which the coder assumes a beginning score of "3" (average knowledge and proficiency in motivational interview performance), moving up for higher knowledge and proficiency or down for lower knowledge and proficiency in motivational interview performance.

Table 1. Descriptions of Provider Knowledge and Attitude Variables

Provider Knowledge

Knowledge (true/false response)
1. Even 1 episode of major depression can raise a patient's risk of substance use and suicide
2. CATCH-IT attempts to intervene before depressed mood becomes a "full-blown" episode
3. Motivational interviewing recommends giving a strong, explicit recommendation to visit the site
4. During brief advice, the physician helps the patient develop his/her own motivation
5. Reflective listening is the most important technique in motivational interviewing
6. Transient thoughts of suicide are, by themselves, an immediate emergency
7. During brief advice, the physician is the "expert" and provides specific advice to the patient
8. In motivational interviewing, the physician guides the patient in developing his/her goals
9. You can demonstrate attention by looking directly at the patient, occasionally nodding your head
10. You can demonstrate empathy by repeating back what the patient just said

Provider Attitudes

Feasibility: screening (Likert scale[a] response)
1. The screening process was easy to understand for my nursing staff
2. The screening process was easy to use for my nursing staff
3. The screening process was easy to understand for my patients
4. The screening process was easy to use for my nursing patients

Feasibility: interview (Likert scale[a] response)
1. The script was easy to read
2. The script was easy to understand
3. The script was easy to use
4. The interview brought up sad or angry feelings for me
5. The interview brought up sad or angry feelings for my patients
6. The interview was very helpful for my patients
7. The interview takes too long

Feasibility: Internet (Likert scale[a] response)
1. The modules were easy to read for my patients
2. The modules were easy to understand for my patients
3. The modules brought up sad or angry feelings for my patients
4. The modules had helpful exercises for my patients
5. The modules made patients want to change their thoughts to be more realistic and positive
6. The modules were effective in helping my patients deal with depressed mood

Barriers (Likert scale[a] response)
1. The screening is difficult for the nursing staff
2. The screening identifies many patients with depression symptoms requiring treatment
3. I do not feel comfortable diagnosing and treating depression
4. The motivational interviews are too long
5. The motivational interview is too difficult
6. Insurance companies may not pay for it

Willingness to provide care for depression (Likert scale[a] response): "I believe that primary care providers should …"
1. Recognize symptoms of depression
2. Ask directly about depressive symptoms during well-child visits
3. Provide education about major depressive disorder to families
4. Provide behavioral interventions to treat depressive symptoms
5. Prescribe medication to treat depressive symptoms
6. Be able to diagnose major depressive disorder
7. Schedule follow-up visits to discuss psychosocial issues

Capability to provide care for depression (Likert scale[a] response)
1. I have adequate knowledge about adolescent depression
2. I can recognize the symptoms of major depression
3. I have adequate skills to talk about major depression

Global appraisal of CATCH-IT intervention (Likert scale[a] response)
1. The screening process identified patients in my practice who I would not have known were experiencing depression
2. The early intervention process resulted in timely referral of patients in need of treatment of depression
3. The early intervention process was an effective strategy for addressing depressive disorders in my practice
4. My patients benefited from the early intervention process

Sustainability of the CATCH-IT intervention (Likert scale[a] response)
1. I would implement the entire program (interview and referral to Internet site) in my office, even if I were not enrolled in the study
2. I would recommend the intervention to my child or a friend's child

[a]1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, and 5 = strongly agree.
Abbreviation: CATCH-IT = Competent Adulthood Transition with Cognitive-Behavioral Humanistic and Interpersonal Training.

Behavior counts measure specific behaviors determined by categorization and decision rules, avoiding having to rely on the coder's judgment. This component of the MITI3 includes open-ended versus closed-ended questions, simple versus complex reflections, and an adherence versus nonadherence to motivational interview approach. We report these counts as both the absolute mean value and the percentage of the desired behavior from the total in that category, eg, ratio of reflections to questions (simple + complex reflections)/(open-ended questions + closed-ended questions), percent of open-ended questions (number of open-ended questions/(open-ended questions + closed-ended questions), percent of

complex reflections (complex reflections/complex + simple reflections), and percent of motivational interview adherent behaviors (total motivational interview adherent behaviors/ motivational interview adherent behaviors + motivational interview nonadherent behaviors).

Beginners' level of competence. The score thresholds for this part of the MITI3 vary depending on the nature of the behavior to achieve beginners' level of performance. Motivational interview performance is rated at a beginners' level of competence if global spirit score > 5.0, reflections to questions ratio ≥ 1.0, percent of open-ended questions ≥ 50%, percent of reflections that are complex ≥ 40%, and behaviors categorized as motivational interview adherent > 90%. Further information about MITI3 score thresholds have been previously published.[58] Two raters, trained in the method by a certified motivational interview trainer and rater, independently rated all of the tapes and then reconciled any differences by consensus.[58]

Provider comments. Comments were collected during the study and also at poststudy meetings with providers. They were asked to provide general comments about the study and intervention as well as any barriers. The site principal investigators provided a summary consensus.

Statistical Analysis

We present descriptive statistics and compare mean differences between physicians and nurses/medical assistants with analysis of variance. We also conducted exploratory bivariate linear regression analysis to examine the relationship between predictors (eg, practice structure/context, provider attitudes, and provider motivational interview performance) on RE-AIM model outcomes. Stata 11 (StataCorp LP, College Station, Texas) was used to conduct the analysis.

RE-AIM Public Health Impact Analysis

RE-AIM is a 5-dimension model based on the factors of reach, efficacy, adoption, implementation, and maintenance.[47] Reach was calculated as the proportion of at-risk adolescents identified in each primary care setting. This calculation was determined by dividing the number who screened positive at the clinic by the number of "probable" positive screens based on the performance of 1 "gold standard" clinic that was thought to have achieved nearly complete implementation of screening. The specific reach formula used was as follows: number of months in study × number of physicians × specialty factor (eg, pediatrics = 1 vs family medicine or medicine pediatrics = 1/3 because of smaller number of adolescent visits) × observed proportion of positive screens per physician/month at a defined gold standard clinic. Efficacy was calculated as the mean effect size of the CESD-10 score change from baseline to 12 weeks for adolescents enrolled from that clinic. Adoption was calculated as the proportion of physicians approached willing to participate. Implementation was calculated as the proportion of adolescents completing the intervention. Maintenance was calculated as the proportion of primary care sites agreeing to continue the intervention following the

pilot program. Finally, the factors were multiplied to calculate the public health impact (reach × efficacy × adoption × implementation × maintenance = public health impact).

RESULTS

Sample Characteristics

Provider characteristics. Participants included 63 nurses/ medical assistants and physicians, of which 36 were identified as nurses/medical assistants (n = 23/36, 64% response) and 27 as primary care physicians (n = 19/27, 70% response). The responding nurses/medical assistants (mean age = 38.3 years, SD = 12.8, 30.4% [n = 7/23] ethnic minority) comprised the following: 60.9% (14/23) medical assistant, 26.1% (6/23) registered nurse, 8.7% (2/23) licensed practical nurse, and 4.4% (1/23) "other." Of the responding physicians (mean age = 42.6 years, SD = 11.8, 38% [n = 7/19] ethnic minority), 57.9% (11/19) were board certified in pediatrics and 42.1% (8/19) were board certified in internal medicine. Practice ownership models included 57.9% (11/19) community or hospital not for profit, 15.8% (3/19) group practice physician owned, and 26.3% (5/19) medical school. With regard to practice size, 44.4% (8/18) of physicians reported that they were in intermediate practices (5–10 providers), 38.9% (7/18) in small practices (≤ 4 providers), and 16.7% (3/18) in large practices (> 10 providers). With regard to setting, 52.6% (10/19) reported urban location, 21.1% (4/19) suburban location, and 26.3% (5/19) rural location. Representation of nurses and medical assistants in terms of practice size and location was similar to that of the physicians (data not shown).

Adolescent characteristics. The participants included 83 individuals with a mean age of 17.5 years (SD = 2.04). More than half were female (n = 47, 56.2%), with whites comprising the majority of the sample (n = 49, 59.0%), followed by blacks (n = 19, 22.9%), Asians (n = 5, 6.0%), Hispanics (n = 4, 5.0%), other (n = 3, 3.6%), and 3 participants (n = 3, 3.6%) who chose not to disclose their race/ethnicity. More than half (n = 56/81, 69.1%) lived at home with both parents. An almost equal number of adolescents reported parents being divorced (n = 16/79, 20.3%) or never married (n = 17/79, 21.5%). The majority came from families in which both parents had completed college (n = 35/74, 47.3% of fathers and n = 30/76, 39.5% of mothers). Most reported having completed at least 2 years of high school (n = 43/74, 58.1%), with 20 (n = 20/74, 27.0%) having completed at least 2 years of college. There was a mean baseline CESD-10 score of 24.4 (SD = 12.6), with the majority reporting no current depressive disorders (n = 64/83, 77.1%), although 18 (n = 18/83, 21.7%) reported having received prior counseling, 13 (n = 13/83, 15.7%) reported having been treated with medication, and 23 (n = 23/83, 27.7%) reported a family history of depression. Almost half (n = 37/83, 44.6%) reported at least 1 core symptom of generalized anxiety disorder and almost half (n = 40/83, 48.2%) reported less than 1 core symptom for panic disorder. Almost one-fifth (n = 15/83, 18.1%) disclosed at least 1 core symptom to meet eligibility for substance abuse.

Table 2. Provider Attitudes Analysis

Variable	α	Physicians		Nurses	
		n	Mean (SD)	n	Mean (SD)
Screening (scale)	0.83/0.94	17	3.90 (0.56)	20	4.02 (0.83)
Screening process was easy to understand for my nursing staff		18	3.89 (0.76)	21	4.05 (1.02)
Screening process was easy to use for my nursing staff		18	3.94 (0.87)	21	4.10 (0.94)
Screening process was easy to understand for my patients		18	4.06 (0.54)	21	3.90 (0.94)
Screening process was easy to use for my nursing patients		17	3.88 (0.60)	20	4.00 (0.97)
Motivational interview (scale)	0.88	17	3.19 (0.20)	NA	NA
The script was easy to read		17	4.00 (0.61)	NA	NA
The script was easy to understand		17	4.12 (0.60)	NA	NA
The script was easy to use		17	4.00 (0.61)	NA	NA
Interview brought up sad or angry feelings for me		17	1.71 (0.77)	NA	NA
The interview brought up sad or angry feelings for my patients		17	2.41 (0.94)	NA	NA
The interview was too long		16	2.44 (0.81)	NA	NA
The interview was very helpful for my patients		17	3.59 (0.71)	NA	NA
Brief advice interview (scale)	0.95	18	2.98 (0.20)	NA	NA
The script was easy to read		18	4.17 (0.62)	NA	NA
The script was easy to understand		18	4.11 (0.68)	NA	NA
The script was easy to use		18	4.11 (0.58)	NA	NA
Interview brought up sad or angry feelings for me		18	1.61 (0.78)	NA	NA
The interview was too long		17	1.88 (0.86)	NA	NA
The interview brought up sad or angry feelings for my patients		17	1.88 (0.78)	NA	NA
Internet component (scale)	0.78	6	21.83 (3.25)	NA	NA
The modules were easy to read for my patients		6	3.83 (0.75)	NA	NA
The modules were easy to understand for my patients		6	3.83 (0.75)	NA	NA
The modules brought up sad or angry feelings for my patients		6	2.83 (0.98)	NA	NA
The modules had helpful exercises for my patients		6	4.17 (0.75)	NA	NA
The modules made patients want to change their thoughts to be more realistic and positive		6	3.33 (1.03)	NA	NA
The modules were effective in helping my patients deal with depressed mood		6	3.83 (1.17)	NA	NA
Barriers (scale)	0.70	16	2.82 (0.50)	NA	NA
The screening is difficult for the nursing staff		16	2.31 (1.01)	NA	NA
The screening identifies many patients with depression symptoms requiring treatment		16	3.50 (0.89)	21	3.48 (1.12)
I do not feel comfortable diagnosing and treating depression		17	2.82 (1.33)	21	2.19 (1.12)
The motivational interviews are too long		16	2.31 (0.79)	NA	NA
The motivational interview is too difficult		16	2.25 (0.77)	NA	NA
Insurance companies may not pay for it		17	3.71 (0.85)	NA	NA
Willingness (scale)	0.84/0.80	16	1.56 (0.77)	19	1.83 (0.38)
Recognize symptoms of depression		17	1.24 (0.44)	20	1.40 (0.60)
Ask directly about depressive symptoms during well-child visits		17	1.65 (0.70)	20	1.65 (0.75)
Provide education about major depressive disorder to families		17	1.47 (0.62)	20	1.60 (0.50)
Provide behavioral interventions to treat depressive symptoms		17	1.65 (0.49)	19	2.21 (0.85)
Prescribe medication to treat depressive symptoms		17	1.76 (0.66)	19	2.53 (0.51)
Be able to diagnose major depressive disorder		17	1.59 (0.71)	19	1.74 (0.65)
Schedule follow-up visits to discuss psychosocial issues		16	1.53 (0.64)	19	1.68 (0.67)
Capability (scale)	0.40/0.81	16	2.42 (0.50)	19	2.86 (0.56)
I have adequate knowledge about adolescent depression		16	2.19 (0.40)	19	2.37 (0.60)
I can recognize the symptoms of major depression		16	1.24 (0.44)	19	2.26 (0.65)
I have adequate skills to talk about major depression		16	2.13 (0.50)	19	2.37 (0.60)
Global appraisal screening (scale)	0.85	16	3.78 (0.64)	NA	NA
The screening process identified patients in my practice who I would not have known were experiencing depression		16	3.56 (0.89)	NA	NA
The early intervention process resulted in timely referral of patients in need of treatment of depression		16	3.69 (0.79)	NA	NA
The early intervention process was an effective strategy for addressing depressive disorders in my practice		16	3.88 (0.62)	NA	NA
My patients benefited from the early intervention process		16	4.00 (0.73)	NA	NA
Sustainability					
I would implement the intervention if not enrolled in the study		17	3.82 (0.81)	20	3.65 (1.04)
I would recommend the intervention to my child or a friend's child		NA	NA	21	3.91 (1.04)

Abbreviation: NA = not applicable.

Provider Attitudes and Comments

Both types of providers generally rated intervention components in the neutral/agree range (Table 2). This pattern was seen for screening, the motivational interview, the brief advice interview, the Internet component, global appraisal screening, and sustainability. There were some variations from this general pattern. Barriers and capability had ratings that were in the "disagree/neutral" range. For willingness, ratings were in the "strongly disagree/disagree" range. Nurses/medical assistants had significantly higher ratings than physicians only for capability (P value = .02). With regard to comments, providers expressed interest and enthusiasm for a preventive model that might address the issue of depression, a presentation often seen in primary care

Table 3. Knowledge and Performance Analysis

Item	n[a]	Value
Knowledge of overall intervention, n (%)	42	
Correct on knowledge test (nurse)		9 (39.13)
Correct on knowledge test (physician)		12 (63.16)
Knowledge of motivational interview	19	
Correct on knowledge test (physician)		7 (36.84)
Global ratings (performance), mean (SD)		
Evocation		3.46 (1.2)
Collaboration		3.78 (1.16)
Autonomy/support		3.60 (1.42)
Direction		4.53 (−0.88)
Empathy		4.00 (0.94)
Global spirit total score		3.61 (1.18)
Behavior counts (performance), mean (SD)	28	
Motivational interview adherent		1.57 (1.81)
Motivational interview nonadherent		1.25 (1.10)
Closed-ended questions		3.71 (2.15)
Open-ended questions		7.00 (4.21)
Reflect complex		1.51 (1.31)
Reflect simple		2.14 (1.48)
Beginning levels of motivational interview competency	28	
Interviews with spirit score ≥ 5.0, n (%)		5 (17.85)
Interviews with empathy score > 5.0, n (%)		9 (32.14)
Interviews > 50% open-ended, n (%)		28 (100.00)
Interviews > 1 ratio, n (%)		0 (0.00)
Interviews > 40% complex reflections, n (%)		18 (64.29)
Interviews > 90% behaviors adherent, n (%)		4 (14.29)
Percent of questions open-ended, mean (SD)		62.43 20.04
Ratio of reflections/questions, mean (SD)		33.90 19.69
Percent complex reflections (> 40% complex reflections), mean (SD)		39.17 (19.63)
Percent motivational interview–adherent (> 90% behaviors adherent)		52.83 (25.77)
Knowledge of brief advice, n (%)	19	
Correct on knowledge test (physician)		5 (26.32)

[a]Total number of providers assessed.

settings. Providers identified several concerns as follows: (1) lack of local mental health specialists to treat cases of major depression identified by screening, (2) difficulty implementing screening within a busy practice schedule, (3) difficulty incorporating the shared decision-making style of motivational interviewing into their counseling approach, and (4) limited practice time to manage follow-ups with other competing priorities (data not shown).

Knowledge and Performance

The mean percent correct for knowledge of the intervention components was 39.13% for nurses/medical assistants and 63.16% for physicians (Table 3). Most physicians scored above the cutoff for demonstrating beginners' level of competency on the direction and empathy scales (mean = 4.69, SD = 0.54 and mean = 4.03, SD = 0.91, respectively). In terms of demonstrating behavior that exemplifies appropriate use of motivational interview, physicians demonstrated at least 1 behavior that was motivational interview adherent and 1 behavior that was motivational interview nonadherent in each interview (mean = 1.57, SD = 1.81 and mean = 1.25, SD = 1.10, respectively). Physicians employed more open-ended questions during interviews (mean = 7.00, SD = 4.21) than closed-ended questions (mean = 3.71, SD = 2.15). Physicians averaged approximately one and a half complex

reflection questions (mean = 1.51, SD = 1.31) and 2 simple reflection questions (mean = 2.14, SD = 1.48). In terms of achieving standards of beginners' competency, there was excellent competency of 100% for "> 50% open-ended questions" and strong (64.29%) competency for "percent of interviews with > 40% complex reflections." However there was weaker competency for the other areas of the global spirit score, such as the "reflections to questions ratio > 1," which was not reached in any of the interviews performed. Similarly, the percent of motivational interview adherent behaviors > 90% was achieved by only 4 of the 28 physicians who completed such interviews.

Practice Structure and Setting and RE-AIM Outcomes

RE-AIM analysis revealed a range of values for the different practice locations for total public health impact ranging from 0.00 to 0.59 (Table 4). The adoption statistic ranged from 0.50 to 1.00. Reach (proportion of adolescents at risk actually identified) varied from 0.30 at a federally qualified community health center to 1.00 at a suburban, multispecialty group. Efficacy (CESD-10 score change from baseline sustained to 3 months) varied from 0.19 at an urban physician hospital organization to 1.86 at a health maintenance organization model clinic. Implementation ranged from 0.00 in 2 Midwest, urban, physician hospital

Table 4. RE-AIM Analysis

Clinic Descriptors	Practice Characteristics			Adoption	Reach	Efficacy	Implementation	Maintenance	Public Health Impact
Practice	Type of Health Care Organization	Income, US $	Proportion Ethnic Minority	Proportion Physicians Approached Participating	Proportion At-Risk Adolescents Identified	Effect Size of CES-D Change at 3 Months	Proportion Adolescents Completing Intervention	Proportion Primary Care Sites Agreeing to Continue Intervention	RE-AIM Calculation
Midwest									
A	MSG	50,478	0.95	1.00	1.0	0.61	0.90	1.00	0.55
B	MSG	37,547	1.00	1.00	0.10	1.20	1.00	1.00	0.15
C	MSG	59,975	0.20	1.00	0.50	0.81	0.80	1.00	0.17
D	PHO	60,549	0.50	0.50	0.50	0.19	0.83	1.00	0.09
E	FQHC	31,571	0.85	1.00	0.60	1.04	0.57	0.67	0.25
F	FQHC	23,228	1.00	1.00	0.30	1.18	0.88	1.00	0.26
G	Public hospital	28,026	1.00	1.00	NA	NA*	1.00	0.00	0.00
H	PHO	NA	NA	1.00	0.8	NA	0.00	1.00	0.00
I	PHO	NA	NA	1.00	0.10	NA	0.00	1.00	0.00
J	HMO model	23,228	0.33	0.50	0.40	1.86	1.00	0.80	0.59
Southeast									
A	PHO	33,516	0.67	1.00	0.80	0.60	0.67	1.00	0.11
B	PHO	38,246	0.42	0.71	0.40	0.74	0.71	0.83	0.31
All	NA	40,000	0.40	0.81	0.60	0.90	0.85	0.80	0.29

*Enrolled 1 participant but insufficient for effect size calculation.
Abbreviations: CES-D-10 = 10-item Center for Epidemiologic Studies Depression Scale, FQHC = federally qualified health center, HMO = health maintenance organization, MSG = multispecialty group, NA = clinic did not enroll participant in study, PHO = physician-hospital organization, RE-AIM = reach, efficacy, adoption, implementation, and maintenance of the intervention.

organizations to 1.00 at a Midwest, suburban, multispecialty physician group. With regard to maintenance, overall, 85% of all primary care sites agreed to continue the intervention. Interestingly, a federally qualified health center (practice F) had the third greatest efficacy statistic at 3 months (1.18), as well as 100% adoption, very high implementation, and 100% maintenance values, but due to lower reach values, had an overall public health impact of 0.26, only the fifth highest value of the participating clinics.

Predictors of RE-AIM Outcomes

The exploratory regression analyses identified several significant predictors in terms of both practice context and structure, as well as in provider attitudes (Table 5). With regard to practice context and structure, lower median household income was significantly associated with higher efficacy and higher implementation, while higher median household income was significantly associated with higher maintenance and higher public health impact. Also, a lower percentage of ethnic minority patient participants was significantly associated with higher adoption and higher reach. With regard to provider attitudes, feasibility screening was significantly associated with higher maintenance and higher public health impact. Also, feasibility of the Internet component of the intervention was significantly associated with higher efficacy and higher implementation. The provider knowledge performance measure was not significantly associated with any RE-AIM outcome.

DISCUSSION

Providers were able to implement the intervention with adequate competence and with potential for public health impact. Providers had neutral/agree ratings for many of the attitude measures of screening, the motivational interview, the brief advice interview, the Internet component, global appraisal screening, and sustainability. This finding lends partial support to our first assumption stating that providers would have favorable attitudes toward the CATCH-IT intervention even if they held less favorable ones toward conventional mental health interventions. The motivational interview performance scores marginally support our second assumption that physicians could gain basic minimal proficiency in motivational interviewing after just a 1-hour instruction session during lunch, as we found that basic minimal competence in the intervention could be obtained in 1 brief training session for open-ended questions and complex reflections but not for other components of the global spirit score (reflections to questions ratio > 1 and motivational interview adherent behaviors > 90%). Our last assumption that clinical practices might vary considerably in their ability to perform the intervention and that this variability would affect the potential public health impact was supported by evidence of positive impact. Also, we found that certain aspects of both practice context/structure and provider attitudes may influence public health impact.

The finding that primary care physicians and nurses/medical assistants find an Internet depression prevention intervention model valuable and sustainable is a new finding. Despite studies and recommendations for primary care–based studies of Internet-based interventions for depression, little is known about how primary care physicians perceive them.[20,22] However, the relative indifference with regard to feasibility and the slightly negative approach to barriers are consistent with reports of primary care physician discomfort diagnosing and treating major depression among adolescents.[42,43,58,59] Also, concerns about challenges

Table 5. Predictors of REACH[a]

Predictor	Adoption		Reach		Efficacy		Implementation		Maintenance		Public Health Impact	
Item/clinic	β (SE)	P Value	β (SE)	P Value	β (SE)	P Value	β (SE)	P Value	β (SE)	P Value	β (SE)	P Value
Practice context and structure												
Median income[b]	0.44 (6.55E-063)	.20	0.44 (6.55E-06)	.20	−0.74 (8.59E-06)	**.02**	−0.74 (8.59E-06)	**.02**	0.77 (1.29E-05)	**.04**	0.77 (1.29E-05)	**.04**
Physician (n)	0.08 (0.03)	.80	0.08 (0.03)	.80	−0.26 (0.05)	.51	−0.26 (0.05)	.51	−0.38 (0.05)	.32	−0.38 (0.05)	.32
Ethnic minority	−0.75 (0.19)	**.01**	−0.75	**.01**	0.21 (0.52)	.58	0.21 (0.52)	.58	−0.51 (0.65)	.24	−0.51 (0.65)	.24
Provider knowledge performance												
MITI3 global scale	−0.49 (0.05)	.22	−0.49 (0.05)	.22	0.16 (0.13)	.7	0.16 (0.13)	.70	0.33 (0.2)	.53	0.33 (0.2)	.53
Provider attitudes												
Feasibility screening	−0.42 (0.18)	.22	−0.42 (0.18)	.22	0.21 (0.24)	.61	0.21 (0.24)	.61	0.68 (0.26)	**.04**	0.68 (0.26)	**.04**
Feasibility Internet	−0.22 (0.35)	.83	−0.22 (0.35)	.83	1.00 (0.02)	**.03**	1.00 (0.02)	**.03**	−0.71 (0.14)	.29	−0.71 (0.14)	.29
Feasibility barriers	0.13 (0.22)	.64	0.13 (0.22)	.64	−0.72 (0.15)	.11	−0.72 (0.15)	.11	0.04 (0.36)	.93	0.04 (0.36)	.93
Capability scale	0.54 (0.39)	.11	0.54 (0.39)	.11	0.2 (0.67)	.64	0.2 (0.67)	.64	0.12 (0.83)	.76	0.12 (0.83)	.76
Willingness scale	0.45 (0.21)	.20	0.45 (0.21)	.20	−0.32 (0.29)	.45	−0.32 (0.29)	.45	0.19 (0.57)	.63	0.19 (0.57)	.63
Global appraisal	0.23 (0.26)	.66	0.23 (0.26)	.66	0.43 (0.22)	.47	0.43 (0.22)	.47	0.46 (0.41)	.36	0.46 (0.41)	.36
Sustainability scale	0.5 (0.05)	.14	0.5 (0.05)	.14	−0.34 (0.07)	.41	−0.34 (0.07)	.41	NA	NA	NA	NA

[a]Bolded values indicate statistical significance.
[b]The error terms have many zeros in front of them and thus are represented in scientific notation (E-05, E-06, and E-063).
Abbreviations: MITI3 = Motivational Interview Treatment Integrity, NA = not applicable.

in treating depressive disorders and difficulties in implementing components are consistent with prior qualitative studies of depression in primary care.[43]

The challenge of using brief training methods for primary care physicians to attain sufficient competence to practice a complex, if short, psychosocial intervention is apparent. Most reports focus on training mental health providers in motivational interviewing techniques using much longer training programs than our training session.[60] Achieving some level of competence by primary care physicians (most aptly described as "novice") in motivational interviewing using a brief session of only 60 minutes has not been reported. We found, similar to previous studies, that physicians can be trained in motivational interviewing techniques.[61] However, lack of formal training in counseling approaches for primary care physicians[62] may relate to a number of areas for which we did not find high levels of competency. Studies of training psychologists in motivational interview show that optimal performance may be achieved after several days of training over several months.[60] Similarly, the brevity and simplicity of the training to implement this intervention stand in contrast to those required to implement complex interventions for depression using collaborative[44] or integrated care models.[63]

Application of the RE-AIM framework to a primary care–based intervention for depression is a new approach. Our findings are consistent with prior RE-AIM studies that demonstrate moderate uptake by primary care practices and schools for physical health promotion interventions and complement the case-based approaches used for depressive illness interventions in primary care.[41,64,65] With regard to our exploratory analyses, our findings are consistent with prior empirical and theoretical work implicating aspects of practice context/structure and provider attitudes as promoting care for depressive illness or conversely serving as barriers.[41,43,63] However, this relationship has not been demonstrated previously for a preventive intervention for mental disorders in a primary care setting. Further, our findings for the association of patient median household income and race/ethnicity in the assessment of public health impact have not been previously examined.

The major strength of this study is the many factors that influence implementation of a novel preventive intervention in a wide range of clinics, including suburban practices and community health centers across the Southeastern and Midwestern United States. There are several limitations. First, selection bias (physicians who are more favorably disposed to the intervention enrolled in the study) and response bias (favorable responses to please the investigator) may have resulted in more positive appraisals for intervention implementation than would be found in a representative sample of providers. Second, the RE-AIM model is limited in that it assumes that each of the 5 factors interact multiplicatively and that all 5 dimensions are of equal importance and given equal weight.[47] Third, the regression models are limited by the small sample size and make our conclusions exploratory. Fourth, we did not include any measure of the presence or absence of the medical home model at the sites.[26]

Future Directions

We are currently conducting a 5-year, multisite clinical trial (supported by the National Institutes of Health) implemented at 11 primary care practices in 4 major US health systems. This active study

seeks to include a representative sample of adolescents and their parents/legal guardians and primary care providers (physicians, nurses, medical assistants, and administrative staff). Preliminary results suggest implementation of an Internet depression prevention program in primary care settings continues to be a complex process. Barriers such as provider attitudes, intervention complexity, and practice context/structure continue to be prevalent in the most practices. Among providers' attitudes, screening for depression continues to be a major barrier, especially in practices that serve adolescents from hard-to-reach populations. These practices have also noted factors such as scheduling for motivational interviews and time to accomplish screening to be major impediments, primarily due to a heavy work flow. Regardless of the practice context/structure, common elements such as Health Insurance Portability and Accountability Act compliance requirements and insurance compensation are major challenges in implementing an Internet depression prevention program.

In conclusion, a relatively simple training and implementation approach can successfully introduce a detailed Internet-based preventive intervention for depression in primary care that demonstrates the potential for significant public health impact. By shifting the focus to the patient (Internet-based self-management) and minimizing changes in practice work flow, this approach may represent a "reengineering" around barriers to implementation of interventions for depressive disorders in primary care. Such a model could be an important addition to the patient-centered medical home/accountable care organization, which depends on patient empowerment and use of lower-cost approaches to modify and preempt disease course.[26] This study represents the first step in adding a new technology-based armamentarium to the therapeutic kit of the primary care physician and nurse to create a feasible and cost-effective model for the prevention of mental disorders in adolescents in primary care settings.

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