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Prevention of Adolescent Depression in Primary Care: Barriers and Relational Work Solutions

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Abstract

Background and Purpose: Depression affects millions of adolescents in the United States each year. This population may benefit from targeted preventive interventions. We sought to understand the internal factors that affect the ability of healthcare organizations to implement an intervention that involves mental health screening and depression prevention treatment of at-risk adolescents in primary care settings.

Methods: From November 2011 to July 2016 we conducted a study of the implementation of a multisite (N=30) phase 3 randomized clinical trial of an Internet-based depression prevention intervention program (CATCH-IT). We describe the prevalence of internal barriers on the screening and enrollment process by reporting REACH (the proportion of target audience exposed to the intervention).

Results: A total of 369 adolescents were randomized into the intervention or control program. Mean REACH values for the study clinics were 0.216 for screening and 0.181 for enrollment to CATCH-IT. Mean REACH enrollment lost due to internal barriers was 0.233. This translated to

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4,691 adolescents lost at screening and 2,443 adolescents lost at enrollment due to internal barriers.

Conclusion: We propose a model of the implementation process that emphasizes the importance of positive relational work that assists in overcoming internal barriers to REACH. We also provide implications for policy and practice.

Keywords

mental health; adolescent; primary health care; health care reform; delivery of health care

Introduction

It is estimated that 13–20% of adolescents living in the United States experience depression in any given year (Angold et al., 2002; National Research Council and Institute of Medicine, 2009; World Health Organization, 2014). Adolescents with depression have a higher incidence of physical illness and social problems (Janssens, Rosmalen, Ormel, van Oort, & Oldehinkel, 2010; Khalil et al., 2010; Knapp, King, Healey, & Thomas, 2011), and are at elevated risk for suicide and recurrent depressive episodes throughout their lifetimes (Keenan-Miller, Hammen, & Brennan, 2007; Pettit, Lewinsohn, Roberts, Seeley, & Monteith, 2009). In the last decade, the field of public health has begun exploring complex psychosocial preventive interventions that use technology to target high-cost conditions such as depression (Arnberg, Linton, Hultcrantz, Heintz, & Jonsson, 2014; Lokkerbol et al., 2014; Van Voorhees et al., 2011). We developed CATCH-IT (Competent Adulthood Transition with Cognitive-Behavioral Humanistic and Interpersonal Training), a 14-module Internet-based depression prevention intervention, to help address the needs of adolescents who are not receiving adequate mental health services.

External Barriers

Implementation of an intervention may be affected by political, organizational, and behavioral factors—both external and internal to healthcare organizations—that may delay or inhibit administration. Examples of external barriers include unanticipated events such as economic downturn, strict healthcare regulations, and terrorist attacks; these factors may restrict the time available for clinics to participate in an intervention or force a clinic to redistribute resources (McAlearney, Walker, Livaudais-Toman, Parides, & Bickell, 2016). Governmental policy regulations such as the Affordable Care Act of 2010 and the Health Insurance Portability and Accountability Act of 1996 may have complex overlapping policies and regulations that are designed to protect patient policy but actually impede the ability of policy makers to implement interventions (Bova, Drexler, & Sullivan-Bolyai, 2012; Midkiff et al., 2016; Ness, 2007). These external barriers may reduce the proportion of the target population that receives an intervention. However, it is difficult to quantify how much participation is reduced because of these external events and policies.

Internal Barriers

We now focus on internal barriers potentially relevant to successful implementation of our intervention. Our previous studies on the implementation of CATCH-IT during a phase 2

clinical trial, conducted from 2007–2010, considered internal barriers that prevented the intervention from reaching the target population. Internal barriers may relate to parent, adolescent, and primary care stakeholders. Our previous work describing such internal barriers included the varying intrinsic levels of motivation in adolescents who entered the study and the perceived authority of the physician from the adolescent perspective (Iloabachie et al., 2011; Ruby, Marko-Holguin, Fogel, & Van Voorhees, 2013; Van Voorhees et al., 2009). Other organizational internal barriers may include limited time and reimbursement for services, poor staff education and training, general disinterest or lack of knowledge in mental health prevention, poor administrative support for clinic staff during screenings, and lack of effective communication between members of the medical team (Hacker et al., 2013; Josyula & Lyle, 2013).

Internal barriers to successful implementation of an intervention can be quantified using the REAIM framework [Reach Effectiveness – Adoption Implementation Maintenance], which assesses the public health impact of an intervention in a real-world setting. We incorporated this framework with a focus of REACH on the proportion of the target audience exposed to the intervention (Eisen et al., 2013) to measure a site’s ability to screen at-risk adolescents. If an intervention focused on prevention cannot reach the target at-risk population, it is unlikely, no matter how effective the intervention, to significantly contribute to public health. Understanding REACH lost, and the contributory internal barriers, is a key step to successfully implementing a public health intervention in the current healthcare system. While several studies report REACH lost to various causes (Chung, Lee, Morrison, & Schuster, 2006; Sareen et al., 2007; Uema, Vega, Armando, & Fontana, 2008), to our knowledge this is the first report that quantifies and examines these internal barriers in relation to adolescent mental healthcare.

The focus of this paper is on the implementation of the recruitment process. We sought to describe the potential impact of internal barriers, how study staff worked to surmount these barriers, and the capability to implement mental health screening and treatment of at-risk adolescents within seven health systems.

Methods

Study Design

From February 2012 to July 2016, we recruited participants for a phase 3 randomized clinical trial comparing the efficacy of CATCH-IT to a general health education control intervention program for preventing the onset of depressive episodes in an intermediate to high-risk group of adolescents. Recruitment occurred at a total of 30 sites centered in pediatric primary clinics in seven healthcare systems within urban and suburban areas of Chicago, IL, and Boston, MA. The analyses in this study involved clinics with medical assistants and/or registered nurses who conducted screenings for at least four months.

Adolescents between the ages of 13 and 18 were screened in a two-step process. First, at the primary care office, they answered a two-item questionnaire based on the Patient Health Questionnaire-Adolescent (PHQ-A) (Richardson et al., 2010). Next, as a part of the phone screening process, they were assessed using a 10-item shortened scale of the Center for

Epidemiologic Studies Depression (CES-D) (Garrison, Addy, Jackson, McKeown, & Waller, 1991). In addition to this routine screening, letters inviting participation were sent to registered patients, or their parents, who had visited the clinics in the previous two years and were within this age range; interested families contacted us for a phone screen to determine eligibility. Inclusion criteria included either a past major depressive disorder diagnosis, or a CES-D score of 8–17 (scores of 18–20 were considered with permission of the principal investigators). Anyone with a current diagnosis of major depressive disorder, comorbid mental health diagnosis of schizophrenia (current or past) or bipolar affective disorder, serious suicide risk, or alcohol/drug disorder was excluded. A complete description of the intervention and trial methods has been previously published (Gladstone et al., 2015).

Staff Training and Monitoring

The original communication and management strategy was revised during the course of the trial. We originally intended to show a professionally produced comprehensive study training video for 55 minutes. The intent of the video was to expedite implementation, reduce staff time devoted to training sites, and ensure consistency by essentially following a corporate training model. Similarly, we intended for staff to follow a very carefully developed communication strategy with adolescent and family participants to guarantee there was no confounding of study arms with extensive conversation at enrollment and the follow-up assessment points. These strategies did not resonate with staff and participants. Office staff reported feeling “off put” and “disengaged” from these videos and the structured communication strategies, which resulted in minimal participation in the study model. With regard to adolescent participants, we noted substantial problems maintaining interest and engagement in the trial. Additionally, study participants reported they felt study staff “were like robots” in conducting carefully scripted structured psychiatric interviews at baseline. Therefore, this training model was re-evaluated and revised as we were enrolling participants.

The principal investigators and staff developed new models placing all elements of the project into a relationship-centered and authentic (nonviolent) communication model (Nosek, 2012) with a particular focus on maintaining authenticity and sincerity. Based on work with theory of healthcare teams (DeFrino, 2009; Mickan & Rodger, 2005), staff were retrained to work on relationship building to develop trust before their actual training. Similarly, a consultant was engaged to revise the corporate engagement model. This revised approach included the shared motivations of the stakeholders to successfully complete the trial.

Sample/Data Collection

Over 40,000 adolescents were contacted for this study. A total of 439 participants were recruited and enrolled; of these, 369 were randomized into the CATCH-IT or health education program. The rest were dis-enrolled after the baseline assessment due to exclusion criteria that were found in the assessment. In this design, participants were assessed at time points of 2, 6, 12, 18, and 24 months. We collected data for each clinic from the beginning of the potential recruitment period through July 2016.

Measures Development of REACH Screening and Enrollment

We estimated that 21% of adolescents would initially screen positive based on PHQ-A scores, and that adolescents visit their primary care provider (PCP) once every 18 months (Uema, Vega, Armando, & Fontana, 2008; Van Voorhees, Melkonian, Marko, Humensky, & Fogel, 2010). Based on these estimates, we developed an equation to measure the proportion of the target audience that was assessed at each clinic of REACH screening. For those sites where months of screening participation was greater than 18 months we capped the value at 18 months. This was done because after 18 months, we assumed that all patients would have circulated through the clinic once.

Enrollment was defined as adolescents who completed baseline assessments. We determined that 6.8% of adolescents we screened would meet the criteria for study enrollment and be at risk for MDE (Jones, 2008). The proportion of the target audience at each clinic that was exposed to the intervention was calculated by REACH enrollment. For those sites where months of screening participation was greater than 18 months we capped the value at 18 months. This was done because after 18 months, we assumed that all patients would have circulated through the clinic once.

REACH Enrollment Lost to Internal Barriers

REACH enrollment lost to internal barriers was quantified by the difference between the theoretical gold standard for REACH enrollment and the REACH enrollment performance at each site. We defined the gold standard as the mean value of the three largest REACH enrollment values excluding the top outlying clinic with the highest REACH. Sites with negative values were considered as 0.00 REACH lost, as these sites would have performed better than the gold standard. Sites that were included in the calculation for mean value were considered to have REACH lost if the REACH enrollment value was above the gold standard value.

Analyses

The REACH Screening equation was: $(\text{number of positive screens}) / [(\text{total number of adolescent patients}) \times (0.21) \times (\text{months of screening participation}/18)]$. The REACH enrollment equation was: $(\text{number of enrollments}) / [(\text{total number of adolescent patients}) \times (0.068) \times (\text{months of participation}/18)]$. REACH enrollment lost to internal barriers was: $(\text{Gold standard REACH enrollment} - \text{REACH enrollment at the individual site})$.

We calculated the number of adolescents we expected to screen positive = $(\text{total number of adolescent patients}) \times (0.21)$. Our measure of total adolescents lost to screening barriers = $\text{expected positive screens} - \text{observed positive screens}$. We calculated the number of adolescents at risk for MDE = $(\text{total number of adolescent patients}) \times (0.068)$. Adolescents lost to enrollment barriers = $\text{adolescents at risk for MDE} - \text{number of adolescents enrolled}$. A negative value for lost to enrollment was considered as 0.

Results

REACH Screening and Enrollment

Of the 30 participating clinics, there were 42,310 adolescents with data available from 29 clinics. Table 1 shows that for the Chicago sites, clinics yielded an average REACH screening of 0.216 (range: 0.034 to 0.591). As positive screen totals were not collected at the Boston sites, we could not calculate REACH screening for those sites. Across all clinics (N=30), 439 were enrolled through screening over an average of 27.6 months per site. Among clinics with total patients screened (N=29) the average REACH Enrollment was 0.181 (range: 0.009 to 1.023). Table 2 shows that 2,877 were identified as at risk for a major depressive episode.

REACH Lost to Internal Barriers

Table 1 shows that the top three performing clinics from both the Chicago and Boston sites, excluding the top outlier clinic, obtained REACH Enrollments of 0.458, 0.368, and 0.341, providing a gold standard (based on the “average” of these high performing clinics) of 0.389. REACH lost to internal barriers had a mean of 0.233 across all sites. A total of 4,691 adolescents were lost to screening barriers, and 2,443 adolescents were lost to enrollment barriers.

Implementation Model

We developed a Relational Work Implementation Model (Figure 1) based upon our study experience that we describe below. The participant is the focus of this process, with the outcome of the research process embedded in the participant. As the model shows, the study staff works with the PCP and clinic staff to engage the participant. However, this participant engagement process can be potentially hindered by various internal organizational barriers of clinic operational challenges. Ongoing relational communication work with study staff increases motivation among PCPs and clinic staff to continue the screening and participation in the study.

The specific relational work that was used to affect REACH included the impact of the PCP influence on the medical staff and the participant, the relationship between the clinic staff and the participant, and the importance of consistent, relational communication between the study staff and the clinic staff. For optimal screening, there had to be consistent and welcomed interaction between study staff and clinic staff where troubleshooting, appreciation, and gratitude were regularly expressed to the clinic staff and PCPs. This genuine acknowledgement of appreciation and occasional apologies for difficulties with the study, in any situation, was effective and necessary.

Further, relational work is key to motivating and maintaining active adherence in the study despite the mounting barriers. For example, PCP involvement in discussing the clinical experiences of treating adolescents with depression helped motivation in the study. The feeling of professional obligation to address mental health concerns in adolescents encouraged PCPs to fight through the daily internal barriers. In a similar manner, certain medical assistants developed a sustained motivation by recognizing the importance of their

role in mental health screening in the care of adolescent patients. As the study progressed, an increased confidence in the staffs' ability to deliver the screening tool was recognized, which improved communication with the patients.

Throughout, the Relational Work Implementation Model is a fluid and consistent evaluation by study staff. It is strengthened by relational involvement in evaluation of the progression of the study within the clinic. If the study staff are able to surmount internal organizational barriers, then any necessary revisions can be made and then incorporated into the study staff's work with the PCPs and clinic staff.

Discussion

Using the REACH component of the RE-AIM model to quantify the portion of adolescents at risk for depression who were identified through screening, we found a mean REACH screening of 0.216. The mean REACH enrollment was 0.181 across all sites, with the included gold standard sites achieving REACH enrollments of 0.458, 0.368, and 0.341 respectively. Internal barriers to screening and enrollment accounted for a mean REACH lost of 0.233.

REACH enrollment in this study may be lower than that observed for other prevention services. When investigating the success of the currently accepted prevention protocols for osteoporosis, human papillomavirus (HPV), and colon cancer, approximately 45–65% of eligible patients adhere to screening recommendations (Frazier, Colditz, Fuchs, & Kuntz, 2000; Meissner, Breen, Klabunde, & Vernon, 2006; Miller et al., 2005; Zhang et al., 2012), and 60–75% of these patients return for follow-up with their physicians (Paskett, White, Carter, & Joseph, 1990; Vijan, Hwang, Hofer, & Hayward, 2001). Averaging these REACH values yields a mean REACH enrollment of 0.292, which is higher compared to the 0.181 obtained in this study. However, as a trial screening protocol, we believe our approach is a feasible preventive intervention for adolescent depression. Barriers specific to our particular intervention, mental health prevention, and/or the present healthcare environment may explain this difference (Baker et al., 2010; Carnevale, 2013).

Internal barriers are important to address in the early stages of implementation. In this study, over 2,000 adolescents were not enrolled in the intervention because of internal barriers. Screening and engaging adolescents in primary care for the purpose of depression prevention involves both the choreography of complex practice activities and also a heightened level of emotional engagement between staff, adolescents, and parents. Others too have noted the challenge of introducing into the busy primary care workflow conversations with substantial prospect of emotional content which may cause either distress by staff from contact with these emotions or slow the medical activities of the practice. (Asarnow, Jaycox, & Anderson, 2002; Meredith et al., 1999).

Relational work between the PCPs, medical staff, parents, study staff, and the adolescents can help alleviate the REACH lost to internal barriers in clinical practice (Becker & Maiman, 1980; Charlton, Dearing, Berry, & Johnson, 2008; Gittell, Godfrey, & Thistlethwaite, 2013; Kaplan, Greenfield, & Ware, 1989). We found that working with the

staff to instill a high level of motivation in the study by maintaining relational communication between study staff and clinic staff can strengthen and sustain a high efficacy of screening and enrollment. Also, as adolescents see the dedication and motivation of their PCP and medical staff, they are more likely to fill out the screening questionnaire and follow-through with treatment. In such situations, REACH improves (Kyngäs, Hentinen, & Barlow, 1998). Study staff, PCPs, and clinic staff members must maintain open and frequent conversations to move forward with the study and maintain momentum.

The Relational Work Implementation Model demonstrates the plausible internal barriers that ultimately impact the participant or, in nonresearch settings, the patient and population as a whole. It brings further explanatory power to the implementation process. Our model is similar to a nonlinear theory model cited in Coryn and colleagues (2011) that assesses planning and implementation of a program. Their model, like ours, includes a change model that actively responds to occurrences and needs during the implementation process. We too consider how internal barriers impact study implementation. Our model allows researchers and all stakeholders a clear view of how a study is implemented, in addition to whether the intervention is successful.

To our knowledge this is the first report that quantifies barriers to an adolescent preventive mental health intervention in primary care. A strength of our study is our use of actual clinics instead of simulated encounters, which allowed us to observe the problems that routinely arise in the current healthcare system. The study is highly generalizable due to the large sample of participants and clinics involved, and their locations in urban and suburban locations. Furthermore, our study spanned five years.

Limitations

Limitations of the study include the methods by which REACH lost to internal barriers was constructed in reference to the definition of “gold standard.” Due to the limited research available on the utilization of depression prevention interventions, and also more specifically among adolescents, it is difficult to determine the optimal clinical value of REACH. Another study weakness is the low enrollment values as compared to the expected positive screens. However, this could be secondary to an overestimated value of at-risk adolescents circulating within the clinics, as the actual number of at-risk adolescents may vary considerably from clinic to clinic and between the Chicago and Boston areas. Also, the narrow range of the depressive symptom instrument of the CES-D, although increasing the specificity for enrollment, leaves the possibility of a significant number of false negatives being excluded. Finally, we are unable to quantify external barriers such as time lost due to terrorism, economic downturn, or regulations imposed by the government. Although we recognize they are responsible for time lost in the study, there are many factors that influence the participation of a clinic, and these factors may be outside the control of study staff.

Conclusion

Our findings have implications for policy and practice. Our results may challenge our understanding of the impact of healthcare reform and corporatization of medicine. Well-intentioned policies and integration strategies may ironically increase barriers to innovation

both by adding new steps and process barriers and by simply fatiguing staff in clinical practice. Similarly, in the modern regulatory state, complex overlapping policies and regulations may actually impede the ability of policy makers to implement new and innovative strategies. It is now ironic, and perhaps fitting, that in trying to develop and implement mass prevention models for prevention of mental disorders such as depression, the very trends (e.g., social isolation, anonymity) that may contribute to the elevated risk of depression in our society may in fact impede preventing it. The answer may be a refocus on the relational work that may at least humanize work environments and ease the burden of the increasing regulatory and corporate structural burdens. Successful implementation needs to address the competing demands of health policy that focuses on population health improvements and the emphasis by providers on personalized medical care that focuses on an individual's needs. For the prevention of mental disorders in children and adolescents in primary care, this can only be done by maintaining and increasing the humanitarian aspects of the practices while availing practices of the all the improved managerial systems of corporate healthcare.

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References

- Angold A, Erkanli A, Farmer EMZ, Fairbank JA, Burns BJ, Keeler G, & Costello EJ (2002). Psychiatric disorder, impairment, and service use in rural African American and white youth. *Archives of General Psychiatry*, 59(10), 893–901. doi:10.1001/archpsyc.59.10.893 [PubMed: 12365876]
- Arnberg FK, Linton SJ, Hultcrantz M, Heintz E, & Jonsson U (2014). Internet-delivered psychological treatments for mood and anxiety disorders: A systematic review of their efficacy, safety, and cost-effectiveness: E98118. *PLoS One*, 9(5). doi:10.1371/journal.pone.0098118
- Asarnow JR, Jaycox LH, & Anderson M (2002). Depression among youth in primary care: Models for delivering mental health services. *Child and Adolescent Psychiatric Clinics of North America*, 11(3), 477–497. [PubMed: 12222079]
- Baker R, Camosso-Stefinovic J, Gillies C, Shaw EJ, Cheater F, Flottorp S, & Robertson N (2010). Tailored interventions to overcome identified barriers to change: Effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews (Online)*, 3(3), CD005470. doi:10.1002/14651858.CD005470.pub2
- Becker MH, & Maiman LA (1980). Strategies for enhancing patient compliance. *Journal of Community Health*, 6(2), 113–135. doi:10.1007/BF01318980 [PubMed: 7204635]
- Bova C, Drexler D, & Sullivan-Bolyai S (2012). Reframing the influence of the health insurance portability and accountability act on research. *Chest*, 141(3), 782–786. doi:10.1378/chest.11-2182 [PubMed: 22396563]
- Carnevale TD (2013). Universal adolescent depression prevention programs: A review. *The Journal of School Nursing*, 29(3), 181–195. doi:10.1177/1059840512469231 [PubMed: 23269544]
- Charlton CR, Dearing KS, Berry JA, & Johnson MJ (2008). Nurse practitioners' communication styles and their impact on patient outcomes: An integrated literature review. *Journal of the American*

- Academy of Nurse Practitioners, 20(7), 382–388. doi:10.1111/j.1745-7599.2008.00336.x [PubMed: 18638178]
- Chung PJ, Lee TC, Morrison JL, & Schuster MA (2006). Preventive care for children in the United States: Quality and barriers. *Annual Review of Public Health, 27*(1), 491–515. doi:10.1146/annurev.publhealth.27.021405.102155
- Coryn CLS, Noakes LA, Westine CD, & Schroter DC (2011). A systematic review of theory-driven evaluation practice from 1990 to 2009. *American Journal of Evaluation, 32*(2):199–226.
- DeFrino DT (2009). A theory of the relational work of nurses. *Research and Theory for Nursing Practice, 23*(4), 294–311. [PubMed: 19999747]
- Eisen JC, Marko-Holguin M, Fogel J, Cardenas A, Bahn M, Bradford N, ... Van Voorhees BW (2013). 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. *The Primary Care Companion for CNS Disorders, 15*(6).
- Frazier AL, Colditz GA, Fuchs CS, & Kuntz KM (2000). Cost-effectiveness of screening for colorectal cancer in the general population. *Journal of the American Medical Association, 284*(15), 1954–1961. doi:10.1001/jama.284.15.1954 [PubMed: 11035892]
- Garrison CZ, Addy CL, Jackson KL, McKeown RE, & Waller JL (1991). The CES-D as a screen for depression and other psychiatric disorders in adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry, 30*(4), 636–641. doi:10.1097/00004583-199107000-00017 [PubMed: 1890099]
- Gittel JH, Godfrey M, & Thistlethwaite J (2013). Interprofessional collaborative practice and relational coordination: Improving healthcare through relationships. *Journal of Interprofessional Care, 27*(3), 210–213. doi:10.3109/13561820.2012.730564 [PubMed: 23082769]
- Gladstone T, Marko-Holguin M, Rothberg P, Nidetz J, Diehl A, DeFrino D, ... Van Voorhees, B. (2015). An internet-based adolescent depression preventive intervention: Study protocol for a randomized control trial. *Trials, 16*(1), 203. doi:10.1186/s13063-015-0705-2 [PubMed: 25927539]
- Hacker K, Goldstein J, Link D, Sengupta N, Bowers R, Tendulkar S, & Wissow L (2013). Pediatric provider processes for behavioral health screening, decision making, and referral in sites with colocated mental health services. *Journal of Developmental and Behavioral Pediatrics, 34*(9), 680–687. doi:10.1097/01.DBP.0000437831.04723.6f [PubMed: 24247911]
- Iloabachie C, Wells C, Goodwin B, Baldwin M, Vanderplough-Booth K, Gladstone T, ... Van Voorhees BW (2011). Adolescent and parent experiences with a primary care/Internet-based depression prevention intervention (CATCH-IT). *General Hospital Psychiatry, 33*(6), 543–555. doi:10.1016/j.genhosppsych.2011.08.004 [PubMed: 21958447]
- Janssens KAM, Rosmalen JGM, Ormel J, van Oort Floor V. A, & Oldehinkel AJ (2010). Anxiety and depression are risk factors rather than consequences of functional somatic symptoms in a general population of adolescents: The TRAILS study. *Journal of Child Psychology and Psychiatry, 51*(3), 304–312. doi:10.1111/j.1469-7610.2009.02174.x [PubMed: 19788552]
- Jones RC (2008). The effects of depressed mood on academic outcomes in adolescents and young adults (Doctoral dissertation). University of South Florida, Tampa, FL Available at <http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1321&context=etd> Accessed October 15, 2016.
- Josyula LK, & Lyle RM (2013). Barriers in the implementation of a physical activity intervention in primary care settings: Lessons learned. *Health Promotion Practice, 14*(1), 81–87. doi: 10.1177/1524839910392991 [PubMed: 21709132]
- Kaplan SH, Greenfield S, & Ware JE (1989). Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Medical Care, 27*(3), S110–S127. [PubMed: 2646486]
- Keenan-Miller D, Hammen CL, & Brennan PA (2007). Health outcomes related to early adolescent depression. *Journal of Adolescent Health, 41*(3), 256–262. doi:10.1016/j.jadohealth.2007.03.015 [PubMed: 17707295]
- Khalil AH, Rabie MA, Abd-El-Aziz MF, Abdou TA, El-Rasheed AH, & Sabry WM (2010). Clinical characteristics of depression among adolescent females: A cross-sectional study. *Child and Adolescent Psychiatry and Mental Health, 4*(1), 26. doi:10.1186/1753-2000-4-26 [PubMed: 20932340]

- Knapp M, King D, Healey A, & Thomas C (2011). Economic outcomes in adulthood and their associations with antisocial conduct, attention deficit and anxiety problems in childhood. *Journal of Mental Health Policy and Economics*, 14(3), 137–147. [PubMed: 22116171]
- Kyngäs H, Hentinen M, & Barlow JH (1998). Adolescents' perceptions of physicians, nurses, parents and friends: Help or hindrance in compliance with diabetes self-care? *Journal of Advanced Nursing*, 27(4), 760–769. doi:10.1046/j.1365-2648.1998.00608.x [PubMed: 9578206]
- Lokkerbol J, Adema D, Cuijpers P, Reynolds C, Schulz R, Weehuizen R, & Smit F (2014). Improving the cost-effectiveness of a healthcare system for depressive disorders by implementing telemedicine: A health economic modeling study. *American Journal of Geriatric Psychiatry*, 22(3), 253–262. doi:10.1016/j.jagp.2013.01.058 [PubMed: 23759290]
- McAlearney AS, Walker DM, Livaudais-Toman J, Parides M, & Bickell NA (2016). Challenges of implementation and implementation research: Learning from an intervention study designed to improve tumor registry reporting. *SAGE Open Medicine*, 4. doi:10.1177/2050312116666215
- Meissner HI, Breen N, Klabunde CN, & Vernon SW (2006). Patterns of colorectal cancer screening uptake among men and women in the United States. *Cancer Epidemiology Biomarkers & Prevention*, 15(2), 389–394. doi:10.1158/1055-9965.EPI-05-0678
- Meredith LS, Rubenstein LV, Rost K, Ford DE, Gordon N, Nutting P, ... Wells KB (1999). Treating Depression in Staff-Model Versus Network-Model Managed Care Organizations. *Journal of General Internal Medicine*, 14(1), 39–48. doi:10.1046/j.1525-1497.1999.00279.x [PubMed: 9893090]
- Mickan SM, & Rodger SA (2005). Effective health care teams: A model of six characteristics developed from shared perceptions. *Journal of Interprofessional Care*, 19(4), 358–370. doi:10.1080/13561820500165142 [PubMed: 16076597]
- Midkiff KD, Andrews EB, Gilsenan AW, Deapen DM, Harris DH, Schymura MJ, & Hornicek FJ (2016). The experience of accommodating privacy restrictions during implementation of a large-scale surveillance study of an osteoporosis medication: Are privacy restrictions impeding health research? *Pharmacoepidemiology and Drug Safety*, 25(8), 960–968. doi:10.1002/pds.4008 [PubMed: 27091234]
- Miller RG, Ashar BH, Cohen J, Camp M, Coombs C, Johnson E, & Schneyer CR (2005). Disparities in osteoporosis screening between at-risk African-American and White women. *Journal of General Internal Medicine*, 20(9), 847–851. doi:10.1111/j.1525-1497.2005.0157.x [PubMed: 16117754]
- National Research Council and Institute of Medicine. (2009). Preventing mental, emotional, and behavioral disorders among young people: Progress and possibilities. Washington, DC: The National Academies Press. doi: 10.17226/12480
- Ness RB, for the Joint Policy Committee, Societies of Epidemiology. (2007). Influence of the HIPAA Privacy Rule on Health Research. *Journal of the American Medical Association*, 298(18), 2164–2170. doi:10.1001/jama.298.18.2164 [PubMed: 18000200]
- Nosek M (2012). Nonviolent communication: A dialogical retrieval of the ethic of authenticity. *Nursing Ethics*, 19(6), 829–837. doi:10.1177/0969733012447016 [PubMed: 22717406]
- Paskett ED, White E, Carter WB, & Joseph C (1990). Improving follow-up after an abnormal pap smear: A randomized controlled trial. *Preventive Medicine*, 19(6), 630–641. doi:10.1016/0091-7435(90)90060-W [PubMed: 2263574]
- Pettit JW, Lewinsohn PM, Roberts RE, Seeley JR, & Monteith L (2009). The long-term course of depression: Development of an empirical index and identification of early adult outcomes. *Psychological Medicine*, 39(3), 403–412. doi:10.1017/S0033291708003851 [PubMed: 18606049]
- Richardson LP, Rockhill C, Russo JE, Grossman DC, Richards J, McCarty C, ... Katon W (2010). Evaluation of the PHQ-2 as a brief screen for detecting major depression among adolescents. *Pediatrics*, 125(5), e1097–e1103. doi:10.1542/peds.2009-2712 [PubMed: 20368315]
- Ruby A, Marko-Holguin M, Fogel J, & Van Voorhees BW (2013). Economic analysis for an accountable care organization centered primary care Internet-based depression prevention intervention. *Journal of Mental Health Policy and Economics*, 16(3), 121–130. [PubMed: 24327482]
- Sareen J, Jagdeo A, Cox BJ, Clara I, Ten Have M, Belik S, ... Stein MB (2007). Perceived barriers to mental health service utilization in the United States, Ontario, and the Netherlands. *Psychiatric Services*, 58(3), 357–364. doi:10.1176/appi.ps.58.3.357 [PubMed: 17325109]

- Uema SA, Vega EM, Armando PD, & Fontana D (2008). Barriers to pharmaceutical care in argentina. *Pharmacy World & Science*, 30(3), 211–215. doi:10.1007/s11096-007-9167-2 [PubMed: 17978859]
- Van Voorhees BW, Fogel J, Reinecke MA, Gladstone T, Stuart S, Gollan J, ... Bell C (2009). Randomized clinical trial of an internet-based depression prevention program for adolescents (project CATCH-IT) in primary care: 12-week outcomes. *Journal of Developmental and Behavioral Pediatrics*, 30(1), 23–37. doi:10.1097/DBP.0b013e3181966c2a [PubMed: 19194326]
- Van Voorhees BW, Mahoney N, Mazo R, Barrera AZ, Siemer CP, Gladstone TRG, & Muñoz RF (2011). Internet-based depression prevention over the life course: A call for behavioral vaccines. *Psychiatric Clinics of North America*, 34(1), 167–183. doi:10.1016/j.psc.2010.11.002 [PubMed: 21333846]
- Van Voorhees BW, Melkonian S, Marko M, Humensky J, & Fogel J (2010). Adolescents in primary care with sub-threshold depressed mood screened for participation in a depression prevention study: Co-morbidity and factors associated with depressive symptoms. *The Open Psychiatry Journal*, 4, 10–18. [PubMed: 23795221]
- Vijan S, Hwang EW, Hofer TP, & Hayward RA (2001). Which colon cancer screening test? A comparison of costs, effectiveness, and compliance. *The American Journal of Medicine*, 111(8), 593–601. doi:10.1016/S0002-9343(01)00977-9 [PubMed: 11755501]
- World Health Organization. (2014, 8). Mental health: A state of well-being. Available at http://www.who.int/features/factfiles/mental_health/mental_health_facts/en/ Accessed September 1, 2016.
- Zhang J, Delzell E, Zhao H, Laster AJ, Saag KG, Kilgore ML, ... Curtis JR (2012). Central DXA utilization shifts from office-based to hospital-based settings among Medicare beneficiaries in the wake of reimbursement changes. *Journal of Bone and Mineral Research*, 27(4), 858–864. doi: 10.1002/jbmr.1534 [PubMed: 22190195]

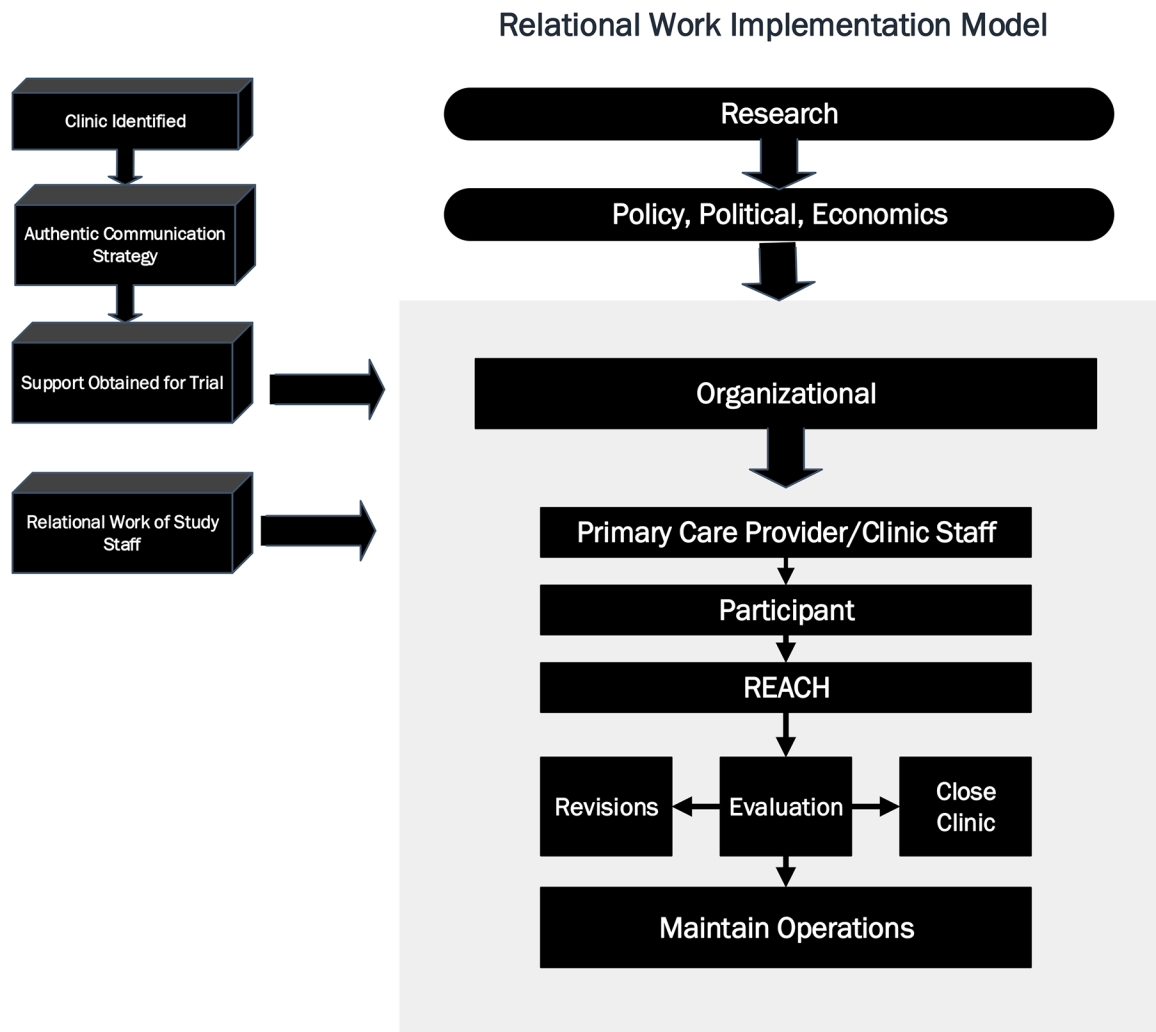


Figure 1: The Relational Work Implementation Model is based on a participant-centered approach to the research process

Table 1.

REACH Lost at Chicago and Boston Sites

PATH Site	Patients	Months of Screening	Positive Screens	REACH Screening ^a	Number Enrolled	REACH Enrollment ^b	REACH Lost to Internal Barriers ^c
Chicago 1	---	8	68	---	3	---	---
Chicago 2	1,568	15	33	0.120	10	0.113	0.276
Chicago 3	2,500	44	95	0.181	35	0.206	0.183
Chicago 4	4,120	8	102	0.265	12	0.096	0.293
Chicago 5	1,947	6	8	0.059	8	0.181	0.208
Chicago 6	1,200	23	43	0.171	15	0.184	0.205
Chicago 7	2,500	23	88	0.168	36	0.212	0.177
Chicago 8	1,400	25	148	0.503	28	0.294	0.095
Chicago 9	800	14	14	0.107	2	0.047	0.342
Chicago 10	1,485	12	7	0.034	1	0.015	0.374
Chicago 11	589	44	---	---	8	0.200	0.189
Chicago 12	862	44	107	0.591	20	0.341	0.048
Chicago 13	1,568	44	20	0.061	1	0.009	0.380
Chicago 14	5,091	54	488	0.456	86	0.248	0.141
Chicago 15	500	33	24	0.229	2	0.059	0.330
Chicago 16	500	34	19	0.181	1	0.029	0.360
Chicago 17	450	33	25	0.265	14	0.458	0.000
Chicago 18	1,487	24	46	0.147	4	0.040	0.349
Chicago 19	450	34	12	0.127	2	0.065	0.324
Boston 1	733	50	---	---	51	1.023	0.000
Boston 2	320	19	---	---	8	0.368	0.021
Boston 3	1,922	41	---	---	33	0.252	0.137
Boston 4	803	39	---	---	10	0.183	0.206
Boston 5	3,000	32	---	---	15	0.074	0.315
Boston 6	800	31	---	---	7	0.129	0.260
Boston 7	1,015	29	---	---	8	0.116	0.273
Boston 8	350	9	---	---	1	0.084	0.305
Boston 9	550	7	---	---	1	0.069	0.320

PATH Site	Patients	Months of Screening	Positive Screens	REACH Screening ^a	Number Enrolled	REACH Enrollment ^b	REACH Lost to Internal Barriers ^c
Boston 10	2,000	34	---	---	11	0.081	0.308
Boston 11	1,800	15	---	---	6	0.059	0.330
Total	42,310	828	1,347	NA	439	NA	NA
Mean	1,458.97	27.60	74.83	0.216	14.63	0.181	0.233

Note: NA=not applicable

^aProportion of the total number of adolescents seen at each clinic who screened positive during the screening months and were expected to screen positive

^bProportion of the total number of adolescents seen at each clinic who were enrolled during the study and were expected to enroll

^cDifference between the average REACH enrollment of the top-performing sites and the proportion of adolescents enrolled at each clinic

Table 2.

Adolescents Lost at Screening and Enrollment

PATH Site	Expected Positive Screens	At Risk for MDE	Lost Screening	Lost Enrollment
Chicago 1	---	---	---	---
Chicago 2	329	107	296	97
Chicago 3	525	170	430	135
Chicago 4	865	280	763	268
Chicago 5	409	132	401	124
Chicago 6	252	82	209	67
Chicago 7	525	170	437	134
Chicago 8	294	95	146	67
Chicago 9	168	54	154	52
Chicago 10	312	101	305	100
Chicago 11	124	40	---	32
Chicago 12	181	59	74	39
Chicago 13	329	107	309	106
Chicago 14	1,069	346	581	260
Chicago 15	105	34	81	32
Chicago 16	105	34	86	33
Chicago 17	95	31	70	17
Chicago 18	312	101	266	97
Chicago 19	95	31	83	29
Boston 1	154	50	---	0
Boston 2	67	22	---	14
Boston 3	404	131	---	98
Boston 4	169	55	---	45
Boston 5	630	204	---	189
Boston 6	168	54	---	47
Boston 7	213	69	---	61
Boston 8	74	24	---	23
Boston 9	116	37	---	36

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PATH Site	Expected Positive Screens	At Risk for MDE	Lost Screening	Lost Enrollment
Boston 10	420	136	---	125
Boston 11	378	122	---	116
Total	8,885	2,877	4,691	2,443

Note: MDE=Major Depressive Episode