Resilience Wellness Program for Suicide Prevention:

Implementing the VA Whole Health Paradigm

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December 2019

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Author Note

We would like to thank the Resilience and Wellness Center's clinicians and instructors for contributing their time and expertise to the program, in addition, The David Lynch Foundation's Trauma Project for contributing their Transcendental Meditation teachings. We would like to thank Dr. Nicholas Bowersox, Director, QUERI Center for Evaluation and Implementation Resources (CEIR), Investigator, VA Serious Mental Illness Treatment Resource and Evaluation Center (SMITREC), Office of Mental Health and Suicide Prevention, VA Central Office (10NC5), Staff Psychologist, Ann Arbor VA Psychosocial Rehabilitation and Recovery Center, and Associate Professor, University of Michigan Medical School Department of Psychiatry for his guidance and support in carrying out this Quality Improvement project. We would also like to thank Dr. Lisa Brenner, Director of the Rocky Mountain Mental Illness Research, Education and Clinical Center (MIRECC), Director of Research, Department of Physical Medicine and Rehabilitation, Director of Clinical Research, Marcus Institute for Brain Health, and Professor, Departments of Physical Medicine and Rehabilitation, Neurology and Psychiatry at the University of Colorado for her critical review of and feedback on the manuscript. Fatemeh Haghighi, PhD's (a recipient of the VA CSR&D Research Career Scientist Award; CX002074) laboratory and work is supported by CX001728, CX001395, BX003794, & RX001705 at the James J. Peters VA Medical Center.

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Abstract

Suicide is a major public health problem in the US, specifically among Veterans. The Resilience and Wellness Center (RWC) is an innovative program focused on suicide prevention. The RWC targets vulnerable veterans by augmenting traditional treatments with complementary and integrative health interventions. One critical problem in suicide prevention is lack of engagement in traditional mental health programs, with stigma an oft-cited barrier. The RWC, an alternative paradigm, attempts to break through this barrier by addressing isolation through promoting group camaraderie and accountability, integral to the success of the program. This innovative program provides a unique opportunity to enhance life skills through Whole Health intervention, including: meditation, yoga, music therapy, exercise/dance etc. Specifically, the RWC is a four-week outpatient program, where admission is determined via hospital-wide consults. With a focus on Measurement Based Care, Veterans complete baseline and post-program assessments such as the Personal Health Questionnaire (PHQ9) and scales measuring: depression, hopelessness, sleep quality, and diet & nutrition. Data for 9 cohorts to date demonstrate significant improvements, with large treatment effects as evidenced by reduction in PHQ-9 totals and feelings of depression and hopelessness, especially for Veterans with histories of suicide attempts or ideation. Overall, Veterans found the RWC program experience favorable, with > 98% completing. The RWC can be rapidly deployed in the VHA by drawing on existing hospital services and clinics. According to participants, the RWC engages Veterans in building a partnership to pave the way towards a healthier, more sustainable lifestyle.

Keywords: Suicide Prevention; Veteran; Whole Health; Complementary and Alternative Medicine; Mental Health

Resilience Wellness Program for Suicide Prevention:

Implementing the VA Whole Health Paradigm

Suicide is the tenth leading cause of death in the US. As compared to civilians, the rates of suicide are seven times more common amongst US Veterans. Suicide prevention is the top clinical priority of the VA as evidenced by: President Obama's August 31, 2013 executive order calling for stronger suicide prevention efforts (Service, 1999), the February 2015 passage of the Clay Hunt Suicide Prevention for American Veterans Act, and President Trump's 2019 Executive Order on the "President's Roadmap to Empower Veterans and End a National Tragedy of Suicide" (PREVENTS) Initiative(Rubin, 2019). As rates of suicide are still rising in the Veteran population, Veterans' groups are appealing for more "creative solutions" to address this dire problem (Basu, 03/2013).

Within the VA Healthcare system, the targeted psychotherapies for suicide prevention are dialectical behavior therapy (DBT) and cognitive behavior therapy (CBT). These are well-supported, evidence-based interventions for reducing the likelihood of future suicidal behavior (Brown et al., 2016; Ecker et al., 2019). The cornerstone of DBT is the learning of coping strategies that help recipients regulate emotions during periods of intense emotional distress. These episodes may precipitate suicidal behavior (DeCou, Comtois, & Landes, 2019). One method of adapting this modality to the veteran population is combining it with prolonged exposure therapy, thereby concurrently treating symptoms of PTSD which may compound risk for suicidal behavior (Meyers et al., 2017). This combined treatment strategy has resulted in moderate effect on reduction in suicidal ideation ((Meyers et al., 2017)). Additionally, CBT is another standard intervention for those at risk for suicidal behavior and uses methods such as teaching coping strategies, behavioral activation and relaxation training (C. J. Bryan, 2019). Veterans, in particular,

benefit from time limited and tailored approaches that target their most severe symptoms (Ecker et al., 2019). These therapeutic approaches have been implemented by the VA Healthcare System both as direct clinical interventions and as a means of engaging veterans identified as being at elevated risk for suicide while receiving other mental health interventions (Green, Kearns, Rosen, Keane, & Marx, 2018). All of these treatment modalities are typically offered under the auspices of Mental Health Services.

One critical problem in suicide prevention is that the majority of at-risk veterans do not willingly engage in mental health services, citing stigma as a barrier (Ganzini et al., 2013). While many VA medical centers offer alternative therapies that are not under the Mental Health Service and have been shown, with encouraging results, to have some effect on suicide ideation or behavior (e.g., yoga (Serpa, Taylor, & Tillisch, 2014), meditation (Birnbaum & Birnbaum, 2004)), to date none have combined these therapies to examine their cumulative efficacy. The Whole Health Initiative is a proactive approach to healthcare that shifts the focus from the classical provider-driven medical model of treatment for physical and mental health ailments to a patient-driven collaborative set of interventions. This approach directly involves Veterans in their care by linking health outcomes to personal goals, and encourages health management skills that empower and equip Veterans to take charge of their overall health and well-being. This paradigm fosters a partnership between patients and their healthcare providers in order to address physical and mental health as well as social and emotional barriers (V. O. o. P.-C. C. a. C. Transformation, 2018). The novel implementation of this initiative described herein seeks to target particularly vulnerable veterans by augmenting traditional medical treatments with a complementary and integrative health program.

Specifically, the Resilience and Wellness Center (RWC) at an urban VA Medical Center (VAMC) was created to provide a multi-faceted range of whole health services for at-risk Veterans currently receiving care at the VA. The mission of the RWC is to build on existing VA services for personalized care through a variety of complementary medical interventions & life skills classes such as: physical activity/dance, music therapy, diet and nutrition, creative writing, acupuncture, sleep, spirituality, enhanced peer support, financial literacy, stress management, and mindfulness meditation. By inculcating the skills for stress management and healthy living through these interventions, the goal is to directly target and reduce the behaviors associated with risk factors of suicidal behavior. The Interpersonal Theory of suicide has been well-documented over the past ten to fifteen years and postulates that distinct belief patterns predicts suicidal thinking (Craig J Bryan, Morrow, Anestis, & Joiner, 2010; Van Orden et al., 2010), positing that when individuals believe that they are thwarted from belonging to their close social groups (i.e. friends and/or family) or when they feel that their continued existence has become burdensome to those relationships, they may be at greater suicide risk. By adopting a cohort-design, the RWC program aims to promote social connectedness and attenuate suicidal thinking in fostering group comradery while simultaneously teaching basic life skills, leading to enhanced self-efficacy and sharing coping skills with which to combat everyday stress. This empowers Veterans to advocate for themselves as part of the larger community.

The RWC whole health approach has been conceptualized to target multiple risk factors of suicidal behavior, including social isolation, poor stress management, sleep quality, and diet, as well as lack of physical activity. Additionally, because many psychiatric disorders are comorbid with suicidal behavior, inclusion in the RWC program is transdiagnostic. Although Veteran participation is not predicated upon having a history of suicide ideation or attempt, for

assessment of the effectiveness of the RWC in suicide prevention we investigated how this treatment paradigm impacts those with history of suicidal ideation or attempt separately. We hypothesized that those Veterans at risk of suicide, with history of suicide ideation or attempt, might show greater treatment gains than those without. Because history of attempt is a prominent risk factor for future suicidal behavior(Rasouli et al., 2019), treatment outcomes pre and post RWC program completion were thus investigated by three groups comprising of Veterans with history of suicide ideation or attempt, and no history of ideation or attempt. As these groups potentially reflect the spectrum of at-risk and high-risk Veterans in context of suicide history, the primary goal was to investigate whether there is differential benefit in mental health symptomology, as this is not a directly psychotherapeutic intervention.

While the impact of some of these treatment outcomes on suicidal behavior have been investigated separately with modest effects(DeCou et al., 2019; Gotzsche & Gotzsche, 2017), none of these interventions have assessed the combined effect of these treatments towards the goal of mitigating suicide risk in Veterans. The RWC treatment paradigm aims to intensively address known suicide risk factors, offering the at-risk, heterogeneous population a multitude of skills to cope with acute stressors that can act as triggers for suicidal behavior. No program to date has used a comprehensive battery of complementary approaches to address suicide risk, hence another important goal of this study was to investigate whether these interventions cumulatively exert significant benefit for this vulnerable population.

Methods

Procedures

This Quality Improvement (QI) project is being conducted by a large urban VAMC under the Office of Whole Health. The study was reviewed and exempted by the local VAMC

IRB, and approved as a quality improvement project by the local VAMC QI executive committee.

The RWC program is founded on the VA Whole Health paradigm (Table 3), targeting at-risk and high-risk veterans with treatment and educational offerings in order to develop coping skills with which to manage stress and build community connections to reduce suicide risk. All Veterans are admitted to the RWC program through clinical consult (see detail below). The treatment interventions are tailored for a 3-hour per day, 5-day per week outpatient program.

RWC Participants

The demographic makeup of the RWC reflects the diversity of the population that seeks care at this VAMC. To date, 9-cohorts have completed the program consisting of 80 Veterans with 55 male and 25 female participants, ranging from 29-to-88 years of age.

Consult Procedure and Enrollment. Veterans are admitted to the RWC program via consult in which a hospital provider identifies reasons that a Veteran could benefit from this four-week outpatient program. All Veterans are then contacted directly by RWC staff to confirm understanding and willingness to attend a daily program for one month. The RWC team works closely with providers at all levels to engage healthcare services for at risk veterans through this whole health initiative. As noted above, inclusion to the program is transdiagnostic. It should be noted that all clinicians and instructors of the RWC are blinded to the Veteran participants' suicide history.

Whole Health Domains and Associated Treatment Interventions. Drawing from the Whole Health Initiative, the RWC has developed a curriculum that maps to the specific Whole Health treatment domains for our at-risk and high-risk veterans (See Table 3 for RWC curriculum and & treatment interventions with corresponding linkage to Whole Health domains)

Working Your Body. Consistent exercise can be a challenge to engage in for any population, so for Veterans with high frequencies of medical comorbidities, care was taken to approach exercise through a safe and dynamic method. This was a crucial aspect to include in the RWC approach, as regular cardiovascular exercise supports mental health(Deslandes et al., 2009; Mikkelsen, Stojanovska, Polenakovic, Bosevski, & Apostolopoulos, 2017), including reduced depressive symptomology(Carek, Laibstain, & Carek, 2011) and even cognitive benefits(Neviani et al., 2017) for depressive symptoms comorbid with risk of suicide(Abdollahi et al., 2017)

Line Dancing. is an active, movement-focused dance in which a group of people execute the choreographed steps at the same time. This unique form of exercise combines the exercise benefits with social engagement, encouraging Veterans to not only keep fit and healthy but also learn to master a dance and build relationships.

Personal Development. Several courses in the program target Personal Development, a key feature of engaging Veterans in their treatment goals; these target isolation, a risk factor for suicidal behavior (Baldessarini, 2019), and give Veterans skills to help them cope with common daily frustrations.

Narrative Therapy. Guided by the clinician, members free write on that day's topic, and then share what they have written with the group, with the goal of cultivating a larger understanding of group commonalities and generating solutions to problems raised. Narrative Therapy targets at-risk Veterans by providing a venue for self-expression, interpersonal understanding, sharing, and personal growth.

Financial Literacy. is defined as the education and understanding of commonly used financial areas, and focuses on topics such as managing personal budgets and investing, focusing on practical budgeting as a means to independence

Power of the Mind. These classes target stress management, key risk factor for suicidal behavior(Paykel, 1976; Smith, Dodd, Ortiz, Forrest, & Witte, 2019). Specifically, the classes reinforce the development of personal growth and bolster mind-body feedback towards the goal of calming the mind and encouraging veteran participants to examine their thoughts and temper distressing physical reactions.

Yoga. aims to increase bodily awareness, relieve stress, reduce muscle tension, strain, and inflammation, sharpen attention and concentration, and calm the central nervous system (Carter, Gerbarg, Brown, Ware, & D'Ambrosio, 2013; Hopkins & Hopkins, 1979; Hurst et al., 2018; Yadav, Magan, Mehta, Sharma, & Mahapatra, 2012). Tailored to the Veteran participants, Chair Yoga is offered, which allows participants to get the full mental and physical benefits of yoga without strain or physical risk.

Emotional Freedom Techniques (EFT). expands on yoga's mind-body feedback by focusing on using acupressure points and cognitive behavioral therapy techniques to teach participants how to manage daily stress more effectively(Church, Yount, & Brooks, 2012). Participants learn how to tap on specific acupressure points to relieve stress while identifying problems and core issues.

Transcendental Meditation (TM). is a consistent practice found to be effective for reducing stress and stress-related disorders, including hypertension (Anderson, Liu, & Kryscio, 2008; Hjelle, 1974), anxiety, depression (Brooks & Scarano, 1985; Rosenthal, Grosswald, Ross, & Rosenthal, 2011), and insomnia (Woolfolk, Carr-Kaffashan, McNulty, & Lehrer, 1976), while increasing creativity, energy, and focus. Participants are taught to enter a state of relaxed awareness of thoughts and physical sensations. Veterans are encouraged to practice outside the course to extend benefits.

Mindfulness Exercises. are offered briefly 4 times a week to teach Veterans to be mindfully aware of their physical and emotional responses and environment in the present moment without judgement. Veterans are engaged in breath, body, movement, and sound awareness experiences for a duration of 5 minutes to help bridge the transition from home to program.

Food and Drink. The benefits of a routinely nutritious diet are many and varied. A nutrient-dense, plant-based diet can also play a significant role in treatment for depression and anxiety (Daneshzad et al., 2019; Molendijk, Molero, Ortuno Sanchez-Pedreno, Van der Does, & Angel Martinez-Gonzalez, 2018), key outcomes of interest for this program.

Nutritional Counseling & Cooking Demonstration. teaches the important role that healthy cooking skills play in promoting resilience and physical and mental wellness. Taught by a trained chef, Veteran participants try new recipes, improve their basic cooking skills, learn about dietary modifications, and experiment with a variety of ingredients. This multi-faceted course is an interactive, dynamic and personalized cooking experience. Participants are taught sustainable ways to incorporate these recipes and cooking techniques into their daily meal planning to support healthy lifestyle behaviors.

Recharge. With the high rates of chronic pain, sleep disturbances, and depression and anxiety amongst the veteran population(Alexander et al., 2016; McCarren, Goldberg, Ramakrishnan, & Fabsitz, 1994; Trivedi et al., 2015) it was essential for the RWC program to provide alternative measures of coping with pain and teach skills to create healthy spaces to rest and recuperate.

Acupuncture. is a non-pharmacological approach to pain management. In combination with standard treatment that the participant is prescribed, acupuncture has been found to have

significant benefits that outweigh standard treatment alone(Cherkin et al., 2009; Lee et al., 2013). Acupuncture therapy is the only RWC class that is offered one on one and aims to target secondary symptoms of depression, anxiety, poor sleep and other associated quality of life issues, in addition to physical pain.

Sleep Hygiene. teaches the development of healthy sleep habits/spaces at home, which can benefit multiple aspects of both physical and mental health(Alexander et al., 2016). Veterans learn about what factors foster and maintain high quality sleep and about habits that might sabotage the sleep process.

Music Therapy. The goal is to increase personal insight into their inter- and intra-personal communication and health behaviors and learn strategies for using music independently to manage anxiety, depression, and chronic pain. Music therapy emphasizes a dynamic combination of passive and active interventions, including guided imagery, songwriting, singing/playing familiar music, lyric discussion, and thematic percussion improvisation..

Family, Friends, Co-workers. The RWC recognizes that interpersonal skills are vital to well-being, cultivating healthy communication skills can reduce isolation, risk factor for suicidal behavior (Baldessarini, 2019).

Interpersonal Effectiveness. teaches assertiveness techniques so participants can ask for their wants while balancing the need for health relationships and self-respect. Grounded in DBT-based protocols (McKay, Wood, & Brantley, 2010), this course emphasizes the use of coping skills in the setting of healthy boundaries.

Spirit and Soul. A spirituality course was incorporated to provide Veteran participants with guidance in addressing intense distress in a spiritual manner.

Spirituality. is based on Viktor Frankl's Meaning-Centered Logotherapy and Existential Analysis (Fabry, 1980), hands-on techniques for addressing crises by fostering personal meaning and purpose using an integrated Mind-Body-Spirit Approach (Frankl, 1960). With the goal of empowering Veteran participants, instructors focus on personal meaning making.

Assessment Battery Used to Measure QI Outcomes. We measured key areas associated with mental and general health, focusing on symptoms related to depressed mood and hopelessness, both risk factors for suicidal behavior, as well as sleep quality and diet. Mental health measures include the Patient Health Questionnaire – 9 (Kroenke & Spitzer, 2002), the Beck Depression Inventory (Beck, Steer, & Brown, 1996), and the Beck Hopelessness Scale (Beck, Weissman, Lester, & Trexler, 1974). The Beck Depression Inventory is one of the most widely used measures in assessing depression severity, a key risk factor in future suicidal behavior(Rihmer & Rihmer, 2019), and demonstrates high internal consistency and content validity(Richter, Werner, Heerlein, Kraus, & Sauer, 1998). In tandem with the BDI, the PHQ-9 is a frequent clinical tool for evaluation of depressive and suicidal symptoms within the VA Healthcare System (Viguera et al., 2015). Both questionnaires show similar response to change during the course of treatment for depression symptoms (Titov et al., 2011), and together confirm the change in depressive symptomology post RWC intervention. Because hopelessness is often associated with increased risk for suicide, we also included the Beck Hopelessness Scale, which has been adapted and validated as suicide risk screening tool (Aloba, Awe, Adelola, Olatunji, & Aloba, 2018). These three assessments form the core of mental health measures employed by the RWC. Additionally, we included measures of sleep quality (via Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), diet and nutrition (via Healthy Diet Questionnaire(V. O. o. P. C. C. C. Transformation, 2018) and the

Healthy Kitchen Questionnaire (developed within the VA, see supplemental materials for copy of this assessment). As poor sleep quality and diet have recently been identified as independent risk factors for suicide(Li, Zhang, & McKeown, 2009; Perlis et al., 2016) and are modifiable lifestyle factors that are included in the RWC program, it was essential to include assessments that indicated degree of change in these lifestyle patterns. Information was collected from Veterans' electronic medical records to create measures of patient demographic factors, including: age, sex, race, and ethnicity, percentage of "no show" rates to medical appointments, as well as lifetime history of suicidal ideation or attempt. In addition, at the end of the program, Veterans were asked to rate the program and its impact on their health and lifestyle.

Data and Statistical Analyses. The analyses of demographic information were based on all 80 participants. Analyses were performed using R 3.6.1. Three group comparisons, where groups were defined relative to history of suicidal behavior, were performed using Kruskal-Wallis rank-sum test for age and Fisher's exact test for all the count variables. In total, the study includes three subgroups, defined as having no history of suicidal ideation or attempt (No SI/SA), a history of or current suicidal ideation but no attempt (SI), and those with a history of suicide attempt (SA). QI outcome analyses were based on ~78% (up to 62/80) of Veteran participants who had assessments completed at orientation and completion of the RWC program. Kruskal-Wallis rank-sum test was used when assessing group cohesion. For quantitative assessment scales and subscales, the difference between pre/post assessment totals/subscales were calculated (post - pre), with outliers winsorized and censored to the nearest non-outlier values. The one sample t-test was used to assess the intervention effect on each diagnostic group separately and the p-value and corresponding t-statistic was reported (with all analyses meeting normality assumptions). The treatment effect size reported was determined by Cohen's d (Cohen,

1992). Pearson correlation was used to assess the relationship between the BDI and PHQ9 change scores (differences in pre vs. post changes by subject). The primary goal of the analysis was estimation of effect sizes for within-group change, rather than testing, thus significance levels, where presented, were not adjusted for multiple testing.

Results

Data are presented for 9-cohorts totaling 80 Veterans who have completed the program, with 31% being female Veterans. Across the cohorts, 75% of Veterans had a lifetime history of suicide attempt or ideation. Approximately 19% of participants have had a high risk flag for suicide in their EMR at least once in the past 5 years. We found no disparity in group cohesion across the 3-groups, i.e. those with no history of suicidal ideation/attempt (No SI/SA), history of ideation with no attempt (SI), and those with history of suicide attempt (SA), at program completion as measured by the Group Cohesion Scale(Treadwell, Lavertue, Kumar, & Veeraraghavan, 2001) (Figure 1, p=.4804). Also, no significant group differences were observed by age, sex, service connectivity, or comorbid psychiatric diagnoses (Table 1).

Mental Health Outcomes. Veterans participating in the RWC intervention have shown remarkable improvements in mental health symptoms. We assessed whether the RWC suicide prevention program, resulted reduction in depressive symptoms by group, where groups were delineated by presence or absence of lifetime history of suicidal ideation or attempt. We found significant improvements across all groups (from baseline (day-1) program orientation to completion) through decrease in depressive and hopelessness symptoms measured by BDI, PHQ9, and BHS (Figure 2 and Table 2). Specifically, significant treatment effects in terms of reduction in depressive symptoms were observed in PHQ9 and BDI outcomes, with Veterans that have a history of suicide ideation or attempt exhibiting greater improvements than the non-

suicide group (for ideators PHQ9 SI t= -5.72, p<0.0001, mean delta= -7.95 & for attempters PHQ9 SA t= -5.36, p<0.0001, mean delta= -8.2 ,and for ideators BDI SI t= -3.3, p=0.0053, mean delta= -8.13 & for attempters BDI SA t= -5.58, p=0.0001, mean delta = -14.07 ; see Table 2 and Figure 2B & 2D). In these cohorts, the improvements in outcome for both the BDI and PHQ9 assessments were significantly correlated, with convergent validity ($p<.0001$, $r^2=.6358$). Related to depressive symptomology, we also assessed possible improvements in symptoms of hopelessness measured by the BHS and found significant reduction in feelings of hopelessness across all groups (Table 2 and Figure 2E & 2F). The group analysis comparing RWC treatment efficacy amongst suicide ideators and attempters respectively also showed significant improvements in symptoms of hopelessness (for ideators BHS SI t= -2.54, p=0.0185, mean delta = -2.29 & for attempters BHS SA t= -3.75, p=0.0012, mean delta = -3.68; Table 2 and Figure 2E & 2F). We also quantified the magnitude of the treatment effect using cohen's d, and found that the RWC intervention resulted in large treatment effects in improving depressive and hopelessness symptoms (|d|>0.8; Table 4). The treatment gain was distinctly greater for the ideator and attempter groups for all mental health assessments employed (Table 4), underscoring the potential clinical impact of the RWC intervention in suicide prevention.

Physiological and Lifestyle Outcomes. Sleep disturbances and a poor diet are persistent problems in the veteran population and risk factors for suicidal behavior. Therefore, we measured self-reported sleep quality as measured by the PSQI at the beginning and completion of RWC program. Although Veterans with prior history of suicide attempt showed no attenuation in sleep disturbances (p=.4286), the other two groups showed significant improvements in sleep quality measured by total PSQI scores (for ideators SI, t= -2.78, p=.0.0112, mean delta = -1.35; Table 2 and Figure 3). Also, Veterans with history of ideation

showed large treatment effects in sleep quality (|d|=-1.040.84; Table 4 and Figure 3). Moreover, Veterans were assessed to determine whether they showed improvements in making healthy dietary choices following RWC program completion. This was evaluated using the Healthy Diet (HD) questionnaire by the Institute for Functional Medicine (HD)(V. O. o. P.-C. C. a. C. Transformation, 2018), as well as the VA Healthy Kitchen (HK) questionnaire (see supplemental material). No significant improvements were detected across the three groups for the HD assessment of diet (Table 2, and supplementary figure S1). Amongst the Veterans with history of suicide ideation, there was a significant improvement with corresponding treatment effect observed in the Food Frequency subscale of the Healthy Kitchen assessment (SI t=4.79, p=0.0001, mean delta= 2.3, |d| =1.41; Tables 2 & 4 and Figure S2,), with no significant improvements in other HK subscales for all groups (Table 4, and Figure S2).

Veteran Program Experience and Evaluation. It was also important for the program to get feedback on the experience of Veteran participants and learn about what program domains were most beneficial. Two program evaluations (given at the completion of the RWC program) were developed to gauge Veteran perceptions of the program – one examining which health behavior outcomes the Veteran participants felt were most impacted and another examining their experience with the classes and instructors of the program. Responses are on a 5 point Likert scale ranging from “strongly disagree” to “strongly agree.” Overall, Veterans responded overwhelmingly positively to these evaluations (see Figures 4A and 4B), in particular the question regarding whether they would recommend this program to fellow Veterans (Figure 4A). On the Program Outcome Evaluation, highest average scores were recorded for the questions regarding “knowing how to eat better,” “feeling more connected to their fellow Veterans,” and “being more mindful.” The lowest average score was recorded for the question regarding

"feeling more engaged in their community." Further, Veterans responded highly to the Program Experience Evaluation (Figure 4B), with average scores between 4 ("Agree") and 5 ("Strongly Agree") for all questions. Notably, responses were highest for feeling "Treated with Respect" by providers.

Discussion

Launched in October 2018, the RWC was developed by a team of clinicians and researchers, with the aim of providing complementary and integrated Health interventions for veterans at risk for suicide. The treatment interventions (described above and outlined in Table 3) target key risk factors of suicidal behavior. The RWC program curriculum includes: education classes on stress management and mindfulness, meditation, yoga, music therapy, nutrition and cooking, and sleep hygiene, amongst others. To motivate the different services to get involved, VA staff with these skills and training were approached to lead 1-3 classes throughout the week, with workload going to their service line. Services who have graciously contributed staff time to date consist of Rehab Medicine, Mental Health, Nutrition, Chaplaincy, and Research. The structure of the program is flexible, allowing for rapid deployment in the VA health system where these Services and an abundance of staff expertise are readily accessible. It is easily adaptable, as the curriculum can be modified to meet the specific needs of Veterans across majority of the VAMCs. Resources in the VA system are already in place that can be leveraged for implementation of the RWC model throughout the VA Healthcare system. The QI data presented herein suggest that this multi-faceted approach has benefits in multiple domains for Veterans at-risk for suicide. Indeed, the RWC serves as a Whole Health incubator for rapid development and delivery of treatment interventions for suicide prevention.

A key strength of the RWC treatment paradigm is that it is not based on the traditional clinician-driven diagnostic treatment and care. Rather it is patient-driven, providing healthy living skills-based education classes to at-risk Veterans to take charge of their health long term. To assess the potential sustainability of the RWC treatment intervention, using short term preliminary data, we examined no-show rates 3 months pre and post RWC program participation (based on maximum time-interval available for all 9-cohorts). The "no-show" rate corresponds to the number of missed medical appointments. For the 72 Veterans across the 9-cohorts with available no-show data, remarkably, we found >20% reduction across mental health, primary care, and specialty services (Figure 5). Although the 3 months' time point potentially reflects short term treatment response, the data are highly encouraging in demonstrating subject engagement and warrant further investigation to determine the long term sustainability of the program.

The RWC treatment intervention has a number of limitations. As this program is grounded in the Whole Health treatment paradigm with integration of various treatment interventions, it is not possible to determine which treatment(s) contribute to the significant outcome improvements reported. Also, since the RWC program is based on a cohort model, through their participation Veterans develop connections and friendships that may attenuate their feelings of social isolation. Therefore, it is possible that the cohort-design rather than the specific interventions spurred the observed improvements. In this treatment model, it is difficult to tease apart what treatment invention contributed to each outcome, but an argument could be made that it is the holistic approach itself that is crucial. Because to date no single treatment modality has been conclusively shown to adequately address the myriad of risk factors within the at-risk and high-risk populations in suicide prevention, the RWC's approach could be a novel avenue.

Still within the RWC program, not all treatment interventions resulted in improved outcomes. Specifically, the RWC did not yield appreciable improvements in the Veterans' diets and nutritional lifestyle. The treatment interventions in those areas may have been too time-limited to have had lasting impact. Also, even though improvements in sleep quality were observed for the non-suicidal and ideator groups, the majority of Veterans showed clinically significant sleep disturbance even after program completion (PSQI≥10, Figure 3A) threshold for sleep disturbance used in service members and Veterans for clinically significant insomnia (Matsangas & Mysliwiec, 2018). Only a few of the Veterans demonstrated sufficient improvement in sleep quality following RWC program (Figure 3A) and having participated in the sleep hygiene curriculum. It is possible that the self-reported sleep quality may not be accurate, and examination of wearable devices (such as actigraphy devices, wrist band accelerometers commonly used in assessment of activity and sleep patterns in clinical and outpatient settings) may provide a more objective measure of sleep improvement associated with RWC program participation. Insomnia is the most prevalent behavioral sleep disorder among veterans (Bramoweth & Germain, 2013), and as such, treatment interventions that target chronic insomnia, possibly in conjunction with RWC, might lead to clinically significant improved outcomes in sleep quality.

The RWC program has resulted in substantial improvements in mental health outcomes in depression and hopelessness, two factors strongly associated with suicidal behavior. It provides a non-stigmatizing environment and participants demonstrate considerable gains, in terms of mental health outcomes, as a result of their participation. Veterans have a high prevalence of depression and hopelessness, and previous literature has demonstrated that complementary treatment interventions, such as those offered in the RWC, can target and help

alleviate these symptoms. For example, music therapy (Maratos, Gold, Wang, & Crawford, 2008), meditation(Kearney, McDermott, Malte, Martinez, & Simpson, 2012), and exercise(Davidson, Babson, Bonn-Miller, Souter, & Vannoy, 2013) have all been shown to decrease the subjective severity of depression. The RWC program has shown, for the first time, that these treatments in concert have remarkable efficacy in context of suicide prevention.

Within this VAMC, the RWC program has proven to be a safe and supportive environment, where Veteran alumni drop by for impromptu visits, and continue to engage in enrichment activities drawn from the existing offerings. During the program, Veterans, if interested, are connected with Veteran Mentors through the ProVetus program (https://www.provetus.org/), with a subset of program graduates training to become mentors themselves. As part of the Next-Steps session of the program (Table 3), which occurs near the time of program completion, Veterans are connected with ongoing programs in the medical center such as music therapy, yoga, dance, and narrative therapy, with up to 10 of the 14 classes of the RWC offered independently by hospital services on an ongoing basis. In this way, Veterans can engage with specific treatment interventions that they found most helpful and engaging. Additionally, the RWC program has established community partnerships so treatment gains can be bolstered with ongoing programming. The Next-Steps program establishes memberships to community institutions (such as the local botanical gardens & the YMCA) for participating Veterans. These efforts offer participants a way of continuing to practice their healthy living skills in the community beyond the boundaries of the VAMCs.

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	N	Suicide Attempter (SA)	Suicide Ideator (SI)	Control (No SI/SA)	Group Comparison P-value
N	**80**	**30**	**30**	**20**	**--**
		mean ± sd	mean ± sd	mean ± sd	--
Demographic:					
Age (Years)	80	51.37 ± 13.83	56.83 ± 11.63	60.45 ± 10.86	0.1082
Sex (Male)	80	20	20	15	0.8646
Service Connection (Yes)	80	22	26	16	0.4397
Depression (Yes)	80	9	9	8	0.789
PTSD (Yes)	80	17	15	8	0.5373
Substance Use (Yes)	80	2	1	1	1
SMI (Yes)	80	7	8	1	0.1299

Table 1: Demographics of groups

	N	Suicide Attempter (SA)	Suicide Ideator (SI)	Control (No SI/SA)
N	**80**	**30**	**30**	**20**
		mean ± sd (t test p value)	mean ± sd (t test p value)	mean ± sd (t test p value)
Mental Health: Delta values (pre - post) are used for all the analysis				
Personal	53	-8.20 ± 6.84	-7.95 ± 6.21	-2.85 ± 3.60

Health Questionnaire (PHQ-9)		(p = 0.0147)	(p < 0.0001)	(p < 0.0001)
Beck Depression Inventory (BDI)	44	-14.07 ± 9.76 (p = 0.0001)	-8.13 ± 9.55 (p = 0.0053)	-6.00 ± 7.05 (p = 0.0072)
Beck Hopelessness Scale (BHS)	62	-3.68 ± 4.60 (p = 0.0012)	-2.29 ± 4.43 (p = 0.0185)	-2.44 ± 3.01 (p = 0.0055)
Physiological & Lifestyle: Delta values (pre - post) are used for all the analysis				
Pittsburgh Sleep Quality Index (PSQI)	57	-0.36 ± 1.98 (p = 0.4286)	-1.35 ± 2.28 (p = 0.0122)	-1.02 ± 1.29 (p = 0.0085)
Healthy Diet (HD)	53	2.25 ± 6.74 (p = 0.1520)	0.1 ± 6.69 (p = 0.9474)	-0.54 ± 5.91 (p = 0.7482)
Health Kitchen (HK): Food Frequency	59	0.36 ± 3.03 (p = 0.5797)	2.30 ± 2.30 (p = 0.001)	0.50 ± 3.08 (p = 0.5543)
HK: Cooking Confidence	57	0.58 ± 1.80 (p = 0.1790)	0.52 ± 2.41 (p = 0.3104)	0.40 ± 2.10 (p = 0.4724)
HK: Healthy Alternatives	52	-0.42 ± 4.74 (p = 0.7032)	-1.05 ± 3.89 (p = 0.2540)	-1.50 ± 5.16 (p = 0.2961)

Table 2: Outcomes for mental health and physiological assessment differences.

Whole Health Domains	**RWC Program Curriculum**
Working Your Body	Exercise through line dancing
Personal Development	Narrative therapy Music therapy Financial Literacy
Power the Mind	Yoga Emotional Freedom Technique Transcendental meditation
Food and Drink	Nutritional Counseling/Cooking
Recharge	Acupuncture Sleep Hygiene
Family/Friends/Coworkers	Interpersonal effectiveness
Spirit and Soul	Spirituality
Surroundings/Community	Next Steps
Table 3: RWC treatment interventions and corresponding mapping to Whole Health domains.	

Outcomes	Magnitude Treatment Effect

		(|Cohen's d|)		
		No SI/SA	SI	SA
Mental Health				
PHQ9		1.12 (Large)	1.81(Large)	1.70(Large)
BDI		1.20 (Large)	1.20 (Large)	2.04 (Large)
BHS		1.15 (Large)	0.73(Medium)	1.13 (Large)
Physiological & Lifestyle				
PSQI		1.12 (Large)	0.84 (Large)	0.26 (Small)
HD		0.13 (Negligible)	0.02 (Negligible)	0.47 (Small)
	Food Frequency	0.23 (Small)	1.41 (Large)	0.17 (Negligible)
HK	Cooking Confidence	0.27 (Small)	0.31 (Small)	0.45 (Small)
	Healthy Alternatives	0.41 (Small)	0.38 (Small)	0.13 (Negligible)

Table 4: Significance of treatment outcomes as measured by associated effect sizes (d), where absolute values of d, denoted by |d| correspond to negligible (|d|<0.2), small (|d| <0.5), medium (|d|<0.8), and large effect size beyond. Here we present signed values of d to identify the directionality of change in outcome.

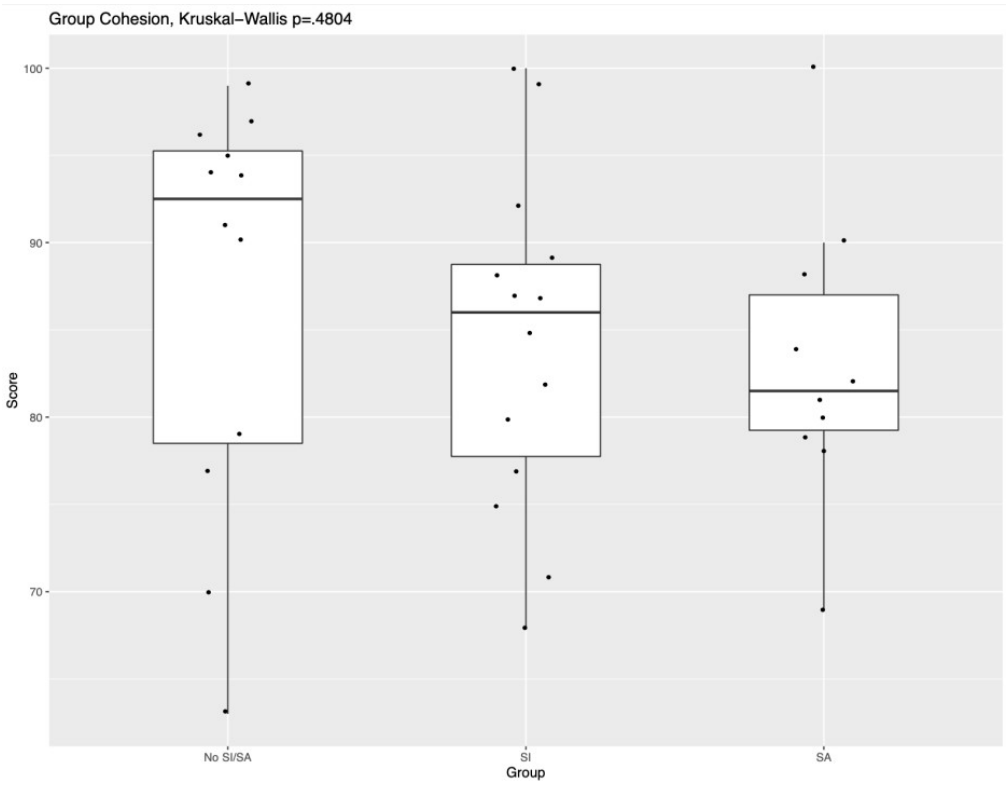

Figure 1. Group cohesion scores by, non-suicide (No SI/SA n=12), suicide ideation (SI n=14) and attempt (SA n=10) history. No difference is observed by group upon RWC program completion.

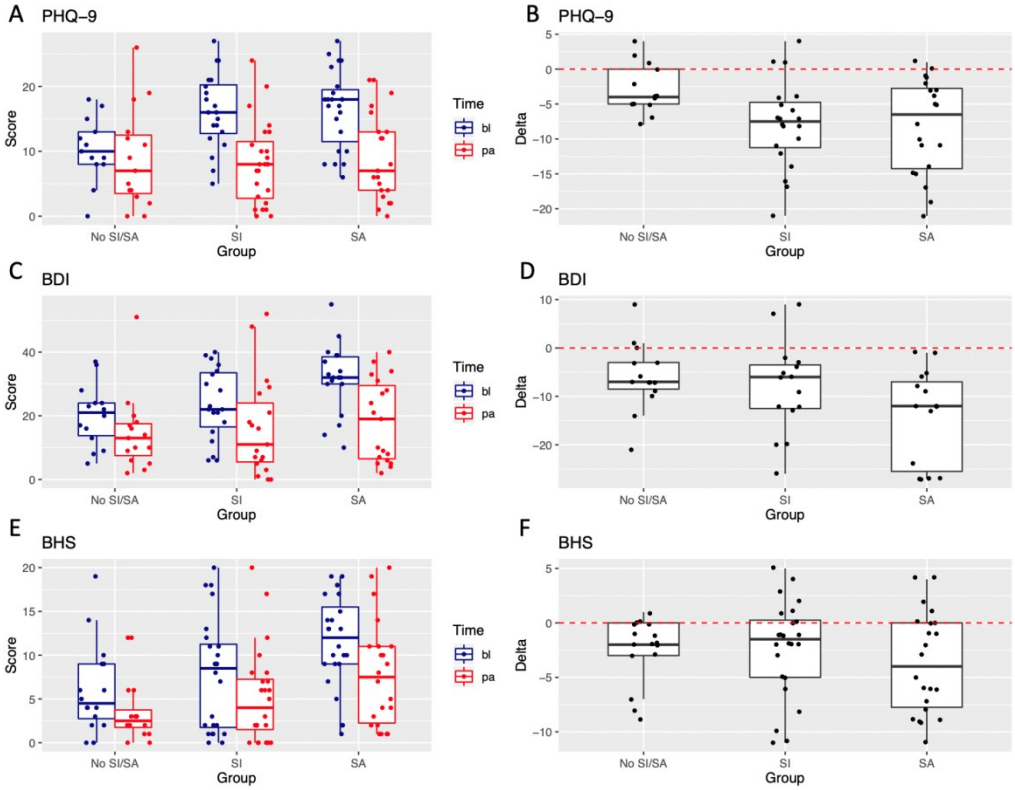

Figure 2. Mental health outcomes including PHQ-9, BDI and BHS for each group consisting of No SI/SA), SI, and SA. Left panels show unwinsorized scores pre vs. post RWC program completion, and right plots show differences in scores [delta=(post-pre)]

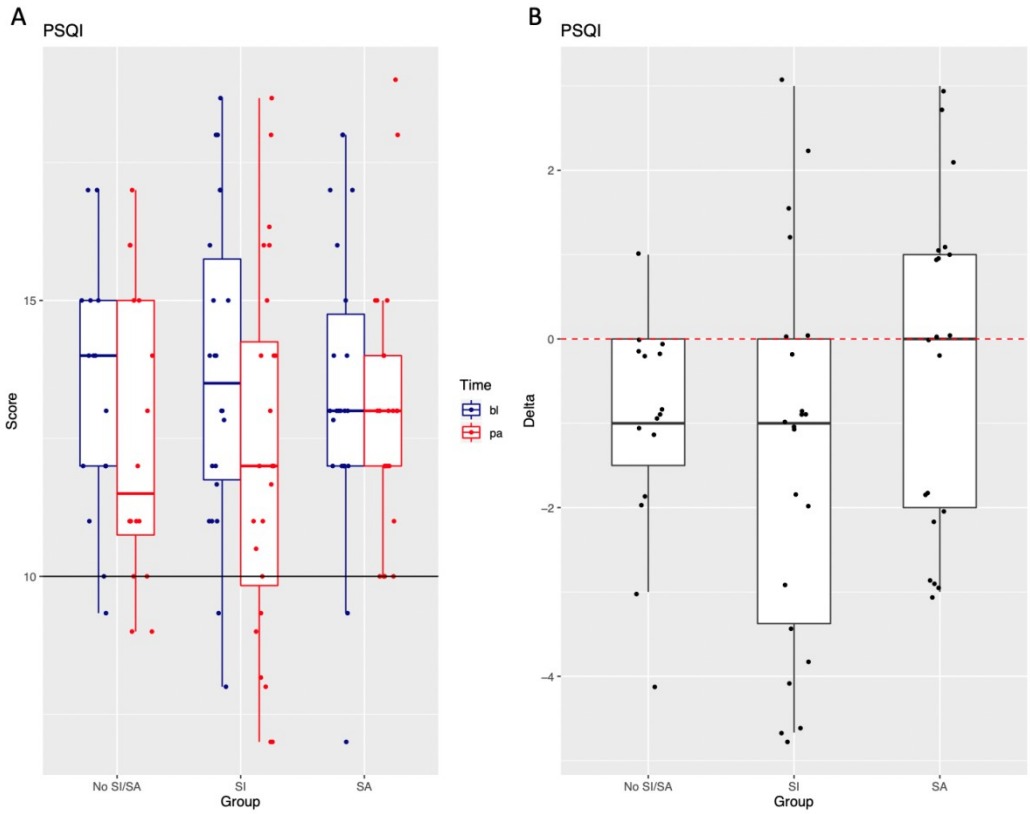

Figure 3. Sleep quality outcome measured by PSQI with groups/samples consisting of No SI/SA n=15, SI n=22, and SA n=20. Left panel show unwinsorized PSQI scores pre vs. post RWC program completion, and right plot show differences in PSQI scores [delta=(post-pre)]

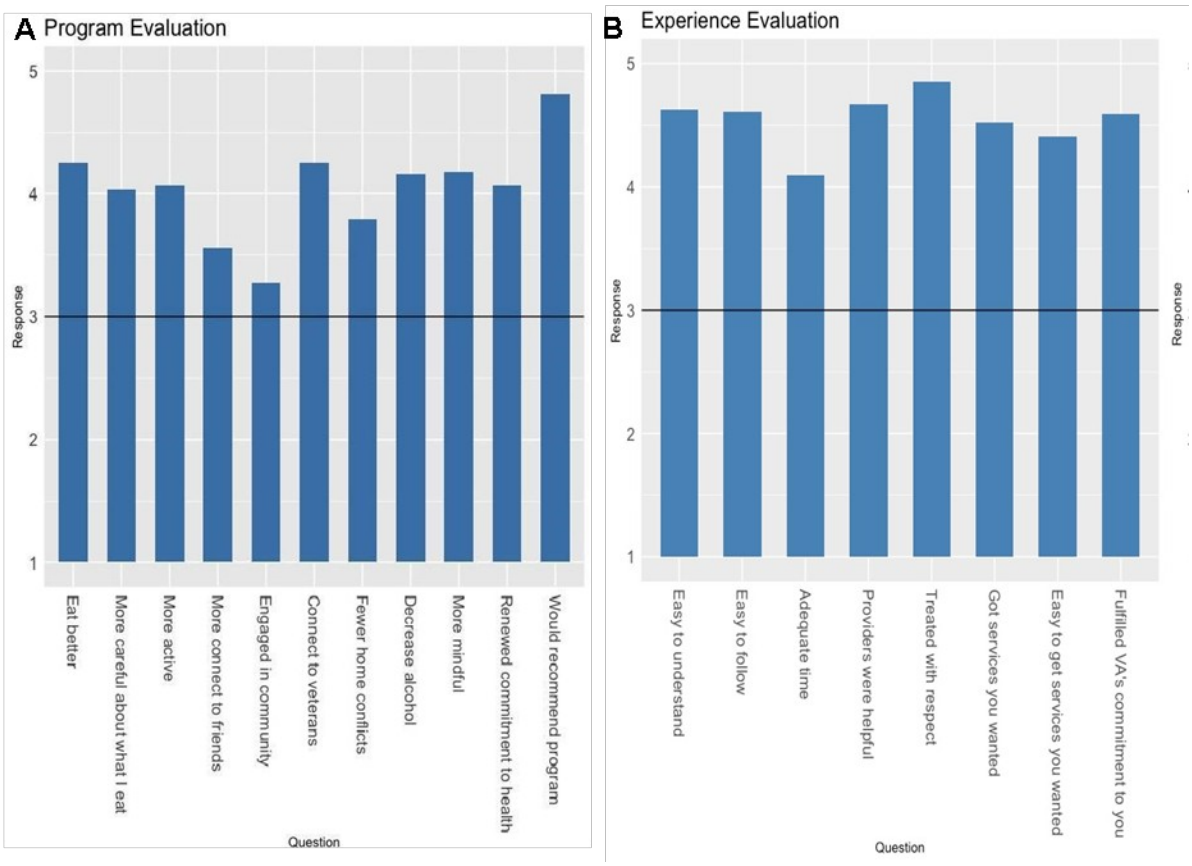

Figure 4. 4A - Summary of results of RWC Program Outcome Evaluation, showing average scores of all Veteran participants on a scale from 1 – "Strongly Disagree" to 5 – "Strongly Agree." Horizontal black line indicates an average response score of "Neutral." 4B - Summary of results of Program Experience Evaluation, showing average scores of all Veteran participants on a scale from 1 – "Strongly Disagree" to 5 – "Strongly Agree." Horizontal black line indicates an average response score of "Neutral."

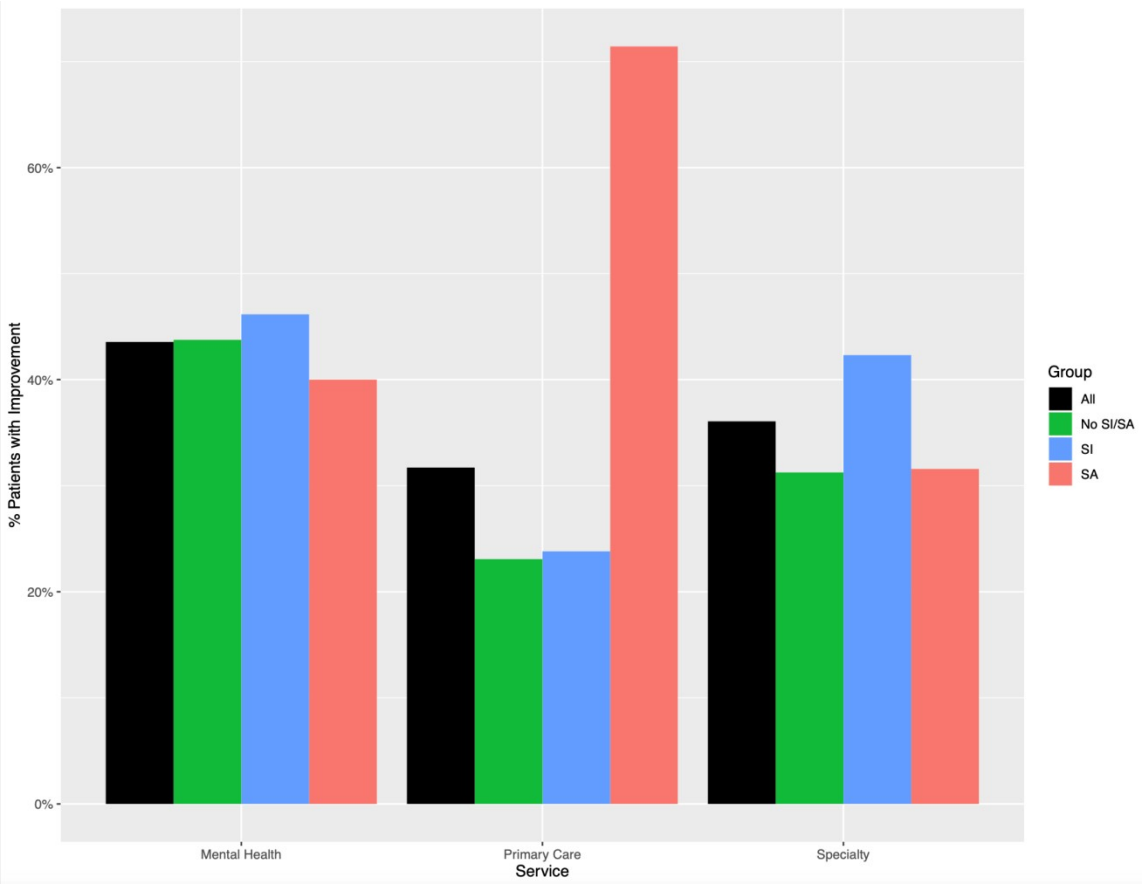
60%
40%
20%
0%
% Patients with Improvement
Mental Health
Primary Care
Specialty
Service
Group
All
No SI/SA
SI
SA

Figure 5. Reduction of no-show rate across services 3 month following RWC treatment intervention.