

Efficacy of the Home-Based Mental Health Evaluation (HOME) Program for Engaging Patients in Care After Hospitalization

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Objective: The risk of suicide is elevated in the days and weeks after discharge from a psychiatric hospitalization, and lack of treatment engagement posthospitalization is also associated with suicide. The authors sought to determine whether the Home-Based Mental Health Evaluation [HOME] Program is efficacious in helping patients engage in care after psychiatric hospitalization.

Methods: This study was a nonrandomized, controlled, two-arm (HOME Program versus enhanced care as usual [E-CARE]) trial that took place at four Department of Veterans Affairs medical centers. Participants (N=302) were patients admitted to a psychiatric inpatient unit. The HOME Program consists of phone- and home-based contacts that include suicide risk assessment, safety planning, and problem-solving around barriers to care. The primary outcome was treatment engagement, as documented in the electronic medical record.

Results: Veterans in the HOME Program group were 1.33 (95% confidence interval [CI]=1.29–1.37) times more likely to engage in treatment, compared with veterans in the E-CARE group ($p<0.001$). HOME Program participants were estimated to have attended 55% more individual appointments (95% CI=12%–113%, $p=0.02$), compared with those in the E-CARE group. The adjusted difference in median time to treatment engagement was 15 days (95% CI=3.5–27.0) such that HOME Program participants engaged in treatment more quickly than participants at the E-CARE sites.

Conclusions: Findings suggest that participation in the HOME Program can help individuals at high risk of suicide engage in care after psychiatric hospitalization.

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Among U.S. military veterans, suicide is a major health concern (1). In 2015, the age-adjusted suicide rate for veterans utilizing the Veterans Health Administration (VHA) was 37.6 per 100,000 person-years (2). In contrast, the age-adjusted suicide rate for the general U.S. population was 16.3 per 100,000 person-years (2). Research among military service members, veterans, and civilians has demonstrated that recent discharge from psychiatric inpatient treatment is a strong suicide risk factor. In two separate population-based studies, one with patients engaged in VHA treatment for depression (3) and one with active duty service members (4), posthospitalization suicide rates were approximately five times higher than those reported among nonhospitalized cohorts. Research conducted in civilian mental health systems has similarly identified heightened risk of suicide after inpatient discharge (5–8), with the highest period of risk in the first weeks after hospitalization (9). Research has suggested that during the first 2 weeks after hospitalization, the highest number of deaths by suicide occurred within 1 day of discharge (6). Moreover, 40% of suicides occurred prior to

the first postdischarge treatment appointment in the community (6).

Limited research has been conducted to directly examine patients' postdischarge experiences; however, one study

HIGHLIGHTS

- The HOME Program supports patients after they are discharged from a psychiatric inpatient unit, offering telephone-based outreach and a home visit until the patient is engaged in care.
- HOME Program contacts include suicide risk assessment, safety planning, and problem solving around barriers to care.
- Compared with a control group, participants who enrolled in the HOME Program were more likely to engage in care, and they engaged in care more quickly and attended more outpatient appointments.
- Treatment engagement is a well-established protective factor against suicide.

found that patients reported significantly lower self-esteem and higher worry (both suicide risk factors) after returning home, compared with when they were evaluated in the emergency department (ED) after their suicide attempt (10). Findings from various studies suggest that posthospitalization suicide risk may be elevated because patients have been discharged from a structured and safe environment back to their complex and challenging home environments and because of a lack of follow-up with outpatient mental health care (6, 9, 11, 12). In a report on continuity of care, Knesper (13) concluded that only about half of individuals sought mental health treatment after discharge from an ED or inpatient psychiatric unit. These findings are particularly concerning given that poor continuity of postdischarge care is associated with higher rates of suicide (14).

To address these gaps in care, we developed the Home-Based Mental Health Evaluation (HOME) Program (15). The HOME Program is evidence informed, based on literature suggesting that postdischarge follow-up should include ongoing assessment, active (16) and early (6) follow-up, review of discharge plans (10), and integration of inpatient and outpatient services (6, 17). Initial evaluation of the HOME Program suggested that veterans who participated in the program were more likely to follow up with outpatient treatment, engaged in care more quickly, and attended more individual mental health appointments than those in an archival control group (15). Because of these promising findings, we rigorously examined the efficacy of the HOME Program through a multisite clinical trial.

Study hypotheses were that relative to the comparison group, veterans participating in the HOME Program would be significantly more likely to engage in treatment within 3 months of discharge, would attend significantly more individual mental health appointments at 3 months postdischarge, and would have a significantly shorter time to treatment engagement.

METHODS

Study Design and Setting

A nonrandomized, controlled, two-arm trial design was employed to reduce the risk of contamination between HOME Program and E-CARE participants. Allocation was based on site, independent of patient characteristics, thereby enhancing the comparability of potential confounders between the conditions. Participants were recruited from psychiatric inpatient units at two HOME Program and two E-CARE Veterans Affairs medical centers. Institutional review board (IRB) approval was obtained from local site IRBs and the Department of Defense (study sponsor). All participants provided written informed consent after receiving a description of the study.

Participants

From March 24, 2014, through April 14, 2016, new patients admitted to the four psychiatric inpatient units were screened

for eligibility via review of the medical record. If they appeared to meet criteria, a brief in-person screening interview was conducted by a research assistant to confirm eligibility. Veterans had to be between the ages of 18 and 89, provide a phone number and the location of a residence where they could be reached postdischarge, have a discharge plan that included returning to an environment that was determined by study staff to be safe for a provider to visit (considering factors such as veteran history of aggression with health care professionals and presence of unconcealed weapons), agree to receive the HOME Program intervention (HOME Program sites only), and adequately respond to questions regarding informed consent. Potential participants were excluded if they were receiving services from VHA's Mental Health Intensive Case Management program, which provides home-based care; were transferring directly to further inpatient, residential, or domiciliary care; or were enrolled in other intervention studies that could affect the outcome of this study or if they were prisoners.

Because treatment engagement of participants was to be determined at the HOME Program and E-CARE sites, accounting for possible intraclass correlation (ICC) within sites when considering power and sample size was necessary. Therefore, detectable differences in proportions were calculated by using the two independent proportions cluster power analysis within the 2008 Power Analysis and Sample Size software. This analysis assumed an expected 145 participants per cluster, assuming 80% power and a significance level of 0.05. For ICCs of 0.01, 0.025, and 0.05, the detectable differences in proportions were 0.15, 0.19, and 0.24, respectively.

Data Collection and Primary Outcome

Demographic and military information was collected at baseline. Participants also completed the following measures at baseline and at 1 week, 1 month, and 3 months postdischarge: Attitudes Toward Seeking Professional Psychological Help Scale (18), Beck Hopelessness Scale (BHS) (19), Scale for Suicide Ideation (SSI) (20), Brief Symptom Inventory-18 (BSI-18) (21), and Columbia-Suicide Severity Rating Scale (22). Follow-up data were collected by assessors blinded to condition. Data regarding treatment utilization in the 90 days following hospital discharge was collected by using VA's Compensation and Pension Record Interchange and Corporate Data Warehouse, which contain administrative and clinical data from the VHA electronic medical record. These data pertained to attendance at mental health individual and group outpatient visits. For this study, "engagement in treatment" was defined as attendance at two outpatient mental health appointments (either two individual appointments or one individual and one group appointment) in the 90 days following hospital discharge.

After hospital discharge, participants in both arms received standard treatment and participated in follow-up assessments. In most cases, standard treatment included a

follow-up mental health contact within 1 week of discharge, as mandated by VHA (23). Given that follow-up assessment can have therapeutic effects in clinical trials (24), the participants at the nonintervention sites are described as receiving “enhanced care as usual” (E-CARE). An unblinded study staff member confirmed during the follow-up assessments that no participants received any other in-home postdischarge mental health care (other than case management or medication-related visits).

Intervention

At the HOME Program sites, prior to discharge from the inpatient unit, the HOME Program provider met with participants to provide additional information, answer questions regarding the HOME Program and schedule the initial phone or in-person clinical contacts. The HOME provider then called the participant within 1 business day of discharge, conducted a home visit during the first week postdischarge, and called the patient at least weekly until he or she was engaged in follow-up mental health care.

During clinical contacts, the provider and participant collaboratively evaluated the veteran’s current level of suicide risk. Specific areas for discussion included suicidal thoughts or behavior and other potential contributors to acute risk (e.g., sleep difficulties and substance use). The provider also ensured that the veteran had a complete and updated safety plan (25). Finally, the provider and veteran reviewed upcoming appointments and problem solved around barriers that might preclude attendance. When desired by the participant, members of his or her support system were involved in these contacts.

All HOME Program providers participated in a manualized training regarding the delivery of the HOME Program and weekly case review phone calls. They were provided the HOME program provider manual for ongoing reference. Fidelity checklists were completed for all electronic medical record (EMR) documentation entries for 25% of each provider’s participants. The fidelity checklist is divided into five contact types (e.g., enrollment and first phone call), each with separate content items to be evaluated (e.g., assessed recollection of safety plan). Eighty-five percent of items per EMR entry had to be completed to meet fidelity for each entry. Fidelity was met for all EMR entries checked.

Statistical Analyses

All analyses assumed a two-sided test of hypothesis and a significance level of 0.05. Regarding comparison of baseline characteristics between treatment groups, if the ICC (correlation between participants within each site) was estimated to be greater than zero, methods appropriate for clustered data were used and the ICC is reported. For continuous variables, linear mixed models were used with a random site effect, and nonnormal data were transformed. For binary variables, generalized linear mixed models were

used with a logit link. When the ICC was negligible, *t* tests were used for continuous variables, unless data were non-normal, in which case Wilcoxon rank-sum tests were used; chi-square or Fisher’s exact tests were used for binary variables. For categorical variables, random-effects multinomial models were considered to account for clustering, but because of convergence issues simple chi-square or Fisher’s exact tests were utilized.

To address hypothesis 1 and account for the potential correlation between individuals within a site as well as to estimate a relative risk, given the common outcome of treatment engagement, a modified Poisson regression was used to model treatment engagement as defined above (yes-no) as a function of group (HOME Program or E-CARE) (26). Variables that were theoretically related to treatment engagement were assessed as potential confounders. These included length of any inpatient stay during the 90-day follow-up, baseline BHS score, baseline BSI-18 scores (somatic, depression, and anxiety domains), baseline past-week SSI scores, homelessness (yes-no), age, sex, race (Caucasian, African American, multiracial, or other), education (high school or less; some college; or associate’s, bachelor’s, or master’s degree), and employment (any, not seeking, seeking, and retired). Initially, the model with only group (HOME Program or E-CARE) was run, and then each potential confounder was added separately. If the parameter estimate associated with the group variable changed by more than 10% when the potential confounder was added to the model, the potential confounder was retained in the final model (27). As a sensitivity analysis, the percentage cutoff for assessing confounding was relaxed to >5%.

For hypothesis 2, we looked at individual mental health appointments, group appointments, and individual and group appointments combined and utilized mixed-effects negative binomial regression for each outcome. The same potential confounders were considered for these analyses as for the primary analysis, and the same procedure was used to determine the final models. The final models for individual and combined appointments included only the group variable, and the final model for group appointments included group and employment. For hypothesis 3, a proportional hazards model was first used to determine whether any of the above-noted potential confounders should remain in a final model.

Once the final covariates were identified, the adjusted difference between HOME Program and E-CARE groups in median time to treatment engagement was estimated based on inverse probability-weighted Kaplan-Meier curves, with associated 95% confidence intervals (CIs) constructed by using a bootstrap (28). When the 5% cutoff was used, associations were strengthened in every model and significance did not change. An additional sensitivity analysis was performed for all hypotheses such that the fee-based data were included. The methods employed were the same as above, and the results were consistent.

RESULTS

Site and Participant Characteristics

Postdischarge treatment engagement data during the quarter prior to the initiation of recruitment (October 1–December 31, 2013) (29) is provided for HOME Program and E-CARE sites in Table 1. These data are not specific to our sample and facilitate comparison of any preexisting site differences. A total of 323 participants were enrolled in this study, and 21 withdrew, yielding a final sample of 302 (166 HOME Program and 136 E-CARE participants) [CONSORT diagrams are included in an online supplement to this article]. Baseline characteristics for the two groups are provided in Table 2. Participants in the two groups were significantly different on the following demographic characteristics: race, education, employment, and homelessness. Participants at the E-CARE sites were more likely to have been deployed and had more deployments and combat tours. E-CARE participants had higher baseline scores on the BSI-18, BHS, and SSI (worst ideation in the past week). Higher scores on these three instruments indicate higher levels of symptomatology (e.g., suicidal hopelessness).

Intervention Characteristics

Eighty-seven percent (N=145) of HOME Program site participants completed at least one HOME Program phone call after hospitalization; the median number of phone calls was two (range 1–13). The median length of phone calls was 22.5 minutes (range 5–65). Sixty-six percent (N=109) of participants received a home visit, and the median length of home visits was 42.5 minutes (range, 10–90). Reasons for not receiving a home visit included veteran not home at the time of the visit (N=13), unable to contact veteran prior to visit (N=12), veteran engaged in care prior to visit (N=9), veteran canceled visit (N=9), provider canceled because home visit was no longer safe or feasible (N=9), veteran canceled because he or she preferred to meet at the medical center (N=3), and veteran withdrew from the HOME Program (N=1). Of the 166 home visits, 26% (N=43) included a member of the patient's support system. Home visits also provided the opportunity to revisit lethal-means safety (step 6 of the safety plan) in the context where the means previously or currently existed.

Treatment Engagement

Ninety-two percent (N=152) of HOME Program participants and 75% (N=102) of E-CARE participants engaged in care in the 90 days posthospitalization. The BSI-18 anxiety score met the criterion and was retained in the final model. Those in the HOME Program group were 1.33 (95% CI=1.29 to 1.37) times more likely to engage in treatment than those in the E-CARE group ($p<0.001$). Compared with participants in the E-CARE group, HOME Program participants were estimated to have attended 55% (95% CI=12% to 113%, $p=0.02$) more individual appointments, 68% (95% CI=–46% to 424%, $p=0.24$) more group appointments, and 70%

TABLE 1. Characteristics of psychiatric inpatient units at VA medical centers before study initiation, by treatment arm^a

Variable	HOME Program (mean %)	E-CARE (mean %)	p ^b
Patients with any mental health care within 7 days of discharge	67.5	65.3	.14
Patients readmitted within 14 days of discharge	6.6	8.7	.01
Patients readmitted within 30 days of discharge	12.3	13.9	.14

^a HOME, Home-Based Mental Health Evaluation Program; E-CARE, enhanced care as usual.

^b Chi-square test.

(95% CI=6% to 172%, $p=0.04$) more individual and group appointments. None of the potential confounders remained in the final individual or combined appointment models, but employment status, sex, and the BSI-18 anxiety and somatic scores remained in the final group appointment model.

Median number and range of appointments attended per group are included in Table 3. The adjusted difference in median time to treatment engagement was 15 days (95% CI=3.5 to 27.0), such that HOME Program participants engaged in treatment more quickly than E-CARE participants. For all models, associations were strengthened and significance did not change when a 5% cutoff was used to assess potential confounders. Results were consistent across models when the fee-based data were included.

DISCUSSION

The HOME Program is a postdischarge home- and telephone-based intervention for veterans discharged from VHA inpatient psychiatry units. HOME Program participants were provided with early and frequent opportunities to work collaboratively with a provider who assessed and managed suicide risk while facilitating treatment engagement. Veterans enrolled in the HOME Program were significantly more likely to engage in outpatient mental health care after discharge, compared with those who received E-CARE. Moreover, HOME Program participants attended more individual mental health sessions than those receiving E-CARE and engaged in mental health treatment more quickly. These findings are striking given the strong association between poor continuity of care postdischarge and suicide (14).

Suicide rates continue to rise, and novel, feasible, acceptable, and effective suicide prevention interventions aimed at increasing protective factors, such as treatment engagement, are needed (30). Studies have shown that the postdischarge period is one of particularly high risk, and interventions focused on individuals transitioning from inpatient to outpatient care are needed. Of specific interest to us was the finding of a study in the Netherlands that 86% of the patients seen in the ED after a suicide attempt who reported that they did not need support postdischarge changed their mind after returning home (10).

TABLE 2. Baseline characteristics of participants in the HOME program or E-CARE^a

Characteristic	HOME Program (N=166)			E-CARE (N=136)			p
	Total N	N	%	Total N	N	%	
Age (M±SD)	166	48.8±13.8		136	49.3±14.0		.97
Sex	166			136			.26
Male		139	84		109	80	
Female		25	15		21	15	
Other		2	1		6	4	
Race	145			128			.01
Caucasian		89	61		99	77	
African American		37	26		17	13	
Multiracial		8	6		2	2	
Other		11	8		10	8	
Hispanic	138	14	10	128	18	14	.48
Marital status	144			129			.06
Married or cohabitating		42	29		55	43	
Single		40	28		31	24	
Widowed, separated, or divorced		62	43		43	33	
Student	144	10	7	129	18	14	.16
Education	144			129			.003
Less than high school		14	10		11	9	
High school diploma		35	24		13	10	
Some college		81	56		78	60	
Associate's, bachelor's, or master's degree		14	10		27	21	
Employment	144			129			.04
Full- or part-time		23	16		34	26	
Unemployed, not seeking		43	30		41	32	
Unemployed, seeking		43	30		22	17	
Retired		35	24		32	25	
Homeless	145	40	26	128	9	7	.03
Ever homeless	145	88	61	128	55	43	.06
N of homelessness episodes (M±SD)	128	1.9±2.7		118	1.0±1.8		<.001
Deployed	145	85	59	123	87	71	.04
N of deployments (M±SD)	138	1.1±1.7		121	1.6±1.9		.007
Combat	144	57	40	123	62	50	.08
N of combat tours (M±SD)	143	.57 ±.87		122	.82 ±.97		.02
Clinical variables							
Attitudes scale total score (M±SD) ^b	146	24.7±4.5		132	24.2±4.4		.21
BSI-18 total score (M±SD) ^c	155	22.6±14.0		133	35.5±15.3		<.001
Somatic domain	155	4.94±4.60		133	7.50±5.20		.07
Depression domain	155	9.36±6.40		133	15.3±6.4		<.001
Anxiety domain	155	8.28±5.90		133	12.7±6.6		<.001
BHS total score (M±SD) ^d	150	5.97±5.20		131	8.73±6.50		<.001
Suicidal ideation intensity score (M±SD) ^e	153	13.7±7.3		128	13.5±6.0		.40
Suicidal ideation severity score (M±SD) ^f	155	2.95±2.00		129	3.64±1.70		.13
SSI score (past week) (M±SD) ^g	141	7.13±9.70		128	17.0±9.5		<.001
SSI score (most severe) (M±SD) ^g	146	19.8±11.5		127	20.8±10.2		.68
Prior suicide attempt	154	83	54	129	76	59	.61
N of suicide attempts (M±SD) ^h	82	2.94±3.60		76	3.33±5.90		.68
Any suicidal behavior	155	114	74	130	102	78	.52

^a HOME, Home-Based Mental Health Evaluation Program; E-CARE, enhanced care as usual.^b Attitudes Toward Seeking Professional Psychological Help Scale. Possible scores range from 0 to 30, with higher scores indicating more positive attitudes toward seeking professional help.^c Brief Symptom Inventory-18. Possible scores range from 0 to 72, with higher scores indicating higher levels of distress. Possible scores on each domain range from 0 to 24, with higher scores indicating higher levels of distress.^d Beck Hopelessness Scale. Possible scores range from 0 to 20, with higher scores indicating higher levels of hopelessness.^e Measured by the Columbia Suicide Severity Rating Scale. Possible scores range from 0 to 25, with higher scores indicating more intense suicidal ideation. For the intensity score, the square of the variable was used to reduce the left skew.^f Measured by the Columbia Suicide Severity Rating Scale. Possible scores range from 0 to 5, with higher scores indicating more severe suicidal ideation.^g Scale for Suicide Ideation. Possible scores range from 0 to 38, with higher scores indicating more severe suicidal ideation.^h Measured by the Columbia Suicide Severity Rating Scale among those with at least 1 prior attempt. A natural log transformation was used to reduce the right skew.

Worthy of discussion is the important role of the relationship between HOME Program providers and veterans. Because veterans may experience increased distress after returning home and thus be less able to connect with a new provider, the intervention was developed to begin the process of building a therapeutic alliance prior to discharge. As noted in a recent systematic review (31), key components associated with building a therapeutic alliance with individuals at risk of suicide include adopting a strong empathic approach, providing time and space for the individual to tell his or her story, and unconditional positive regard (32, 33). All three of these areas were emphasized throughout the intervention. In addition, the intervention occurred in part in an environment where the veteran was in control of providing access to his or her home and in a context outside the health care setting—thereby reinforcing the patient-centered nature of the HOME Program (34). This may have facilitated more effective safety planning, because HOME Program providers reported that some veterans were more willing to engage in lethal-means safety discussions during the home visit than they were during other types of contacts. Further research should test components of the HOME Program and their relationship to the outcomes.

Although we expended significant effort to ensure the rigor of this study, limitations existed. One potential limitation of our design was that site differences may have accounted for some of the overall findings. Although the site characteristics presented in Table 1 suggest that patients' postdischarge treatment engagement was fairly similar across conditions, it is possible that site differences not captured by our data affected overall findings. Moreover, it should be noted that VHA policy at the time mandated follow-up for veterans discharged from a psychiatric inpatient setting within 7 days, thereby potentially limiting the utility of the intervention. Nonetheless HOME Program participants received more care in a more expedient manner. The HOME Program exceeds VHA requirements; it involves early and frequent contact until treatment engagement is achieved, a home visit, and prescribed core components of each contact (e.g., conducting safety planning and addressing barriers to care).

In addition, given that participants at the E-CARE sites did not have to consent to an intervention to enroll in the study, there was the potential for sampling bias such that those who enrolled at the HOME Program may have been more motivated to engage in treatment than those at the E-CARE sites. E-CARE sites also had a higher rate of refusal (39%) compared with the HOME Program (30%), which may have introduced additional bias potentially related to the fact that the E-CARE participants were not offered additional services. Finally, "treatment engagement" is challenging to operationalize. Increasing or decreasing the number of sessions needed to meet our threshold for treatment engagement could have affected the study outcomes. Although the study did not have the power to detect an

TABLE 3. Mental health appointments attended by veterans after discharge from inpatient psychiatric care, by treatment arm^a

Appointment type	HOME Program		E-CARE		p ^b
	Median	Range	Median	Range	
Individual	5.0	0–28	3.0	0–25	.02
Group	1.0	0–72	0.0	0–42	.16
Combined individual and group	7.5	0–93	3.5	0–63	.04

^a HOME, Home-Based Mental Health Evaluation Program; E-CARE, enhanced care as usual.

^b From the negative binomial regression models.

impact on death by suicide, our findings in the context of the literature lead us to suspect that improved treatment engagement via the HOME Program may help mitigate postdischarge suicide risk. Evaluation of this outcome is likely better suited for a future larger effectiveness trial. In future publications, we plan to evaluate additional outcomes, such as attitudes toward mental health care and facilitators and barriers to treatment, with a specific focus on the HOME Program.

CONCLUSIONS

Findings from this large, nonrandomized, controlled, two-arm trial among psychiatrically hospitalized veterans at risk of suicide suggest that participation in the HOME Program resulted in individuals' engaging in treatment more quickly and attending more appointments. Considering the suicide risk among veterans who are discharged from inpatient psychiatric care, findings support exploration of implementation strategies to bring the HOME Program to this cohort of individuals.

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