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A primary care first (PCP-first) model to screen and treat depression: A VitalSign[6] report from a second cohort of 32,106 patients

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ABSTRACT

Purpose: This report from VitalSign[6] project describes treatment selection, follow-up rates and remission outcomes by initial depression severity using the PCP-FIRST model.
Methods: This retrospective analysis included 32,106 patients aged ≥12 years screened with the Patient Health Questionnaire 2-item (PHQ-2) from November 2016 to July 2019 across 37 primary care clinics. PHQ-2 positive-screen patients (PHQ-2 ≥ 3) received 9-item PHQ (PHQ-9) and 7-item Generalized Anxiety Disorder scales, clinician assessments, and evaluation for pharmacotherapy management with measurement-based care (MBC).
Results: Of PHQ-2 screened patients, 18.7% (5994/32,106) were positive and received a PHQ-9. Of 5994 patients with PHQ-9, 2571 received a clinical diagnosis of depression of whom, 333 had none-mild depression (PHQ-9 < 10) and 2238 had moderate-severe depression (PHQ-9 ≥ 10). Of the 333 patients with none-mild depression and 2238 patients with moderate-severe depression, 266 and 1929 had at least 18 weeks of data available. Of these, 54.9% (146/266) with none-mild depression and 69.1% (1332/1929) with moderate-severe depression were started on pharmacotherapy. Of the 1478 patients with clinical diagnosis of depression, initiated on pharmacotherapy, 1046 returned for ≥1 follow-up and 616 returned for ≥3 follow-ups over 18 weeks. Of the 1046 patients with ≥1 follow-up visit within 18 weeks, remission rates for patients with mild depression, moderate-severe depression, and overall were 55.6% (66/99), 30% (282/941), and 32.4% (338/1040) respectively.
Conclusions: Despite this being a real-world, usual care sample, remission outcomes exceed real world remission rate expectations of 6% in primary care.

1. Introduction

Major depressive disorder (MDD) affects up to 10% of adults in the United States annually, but the use of effective treatments is suboptimal with an average of eight years between onset of MDD to treatment initiation [1,2]. The United States Preventative Services Task Force (USPSTF) has recommended universal screening for depression in individuals 12 years or older [3,4]. Depression screening and treatment in outpatient settings, however, remains poor, with over half of MDD cases being undetected [5–7]. In a national cross-sectional study of U.S. outpatient primary care visits, as few as 3% to 4% involved depression screening [8].

To address this problem, VitalSign[6] was developed based on a Primary Care First (PCP-First) model where primary care providers (PCPs)

Abbreviations: PHQ-2, Patient Health Questionnaire-2; PHQ-9, Patient Health Questionnaire-9; MDD, Major depressive disorder; PCP-FIRST, Primary Care First Model; USPSTF, United States Preventative Services Task Force; VS[6], VitalSign[6] software; MBC, Measurement-based care; PHQ-A, Patient Health Questionnaire for Adolescents; GAD-7, Generalized Anxiety Disorder 7; DSM5, Diagnostic and Statistical Manual 5th edition; ADHD, Attention-deficit/hyperactivity disorder; STAR*D, Sequenced Treatment Alternatives to Relieve Depression.

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are trained to administer measurement-based care (MBC) measures embedded in web-based software called VS[6] to screen for and treat depression [9]. VitalSign[6] provides a 4-h face-to-face, hands-on training of VS[6] and two-weeks of implementation support. Prior research has shown that using an MBC approach, remission rates in primary care clinics are similar to that of psychiatry clinics [10,11].

In the first cohort of patients in VitalSign[6] project (from August 2014 to November 2016; $n = 25{,}000$), depression screening by Patient Health Questionairre-2 (PHQ-2) was widely accepted, and MBC pharmacotherapy remission rates were 41.7% with ≥3 follow-ups; however, attrition was high. One-half of patients diagnosed with depression did not return over an 18-week follow-up period and only one-tenth followed-up for ≥3 visits. Of the initial cohort of patients in VitalSign[6] project, 30.2%, 12.6%, 11.6% of 1400 pharmacotherapy-treated patients treated returned for 1, 2, ≥3 follow-up visits after initial screen with remission rates of 20.3%, 31.6%, 41.7%, respectively [12]. Since then, the VitalSign[6] project team has continued to engage with clinics to better integrate MBC approach into clinic flow [13,14]. This report presents treatment patterns and outcomes based on initial self-report depression severity of the second cohort from VitalSign[6] project.

From November 2016 to July 2019, a second cohort of patients ($n = 32{,}106$) were screened for depression in VitalSign.[6] This report extends findings from the first VitalSign[6] cohort by stratifying patients diagnosed with depression based on their initial depression severity [none-to-mild depression (PHQ-9 < 10) versus moderate-to-severe depression (PHQ-9 ≥ 10)] to examine treatment selection, follow-up, and remission outcomes over the acute phase of 18 weeks. The 18 weeks (or 4 months) was chosen to examine remission rates (ideal treatment goal due to lower likelihood of subsequent relapse) to evaluate acute phase treatment outcomes and for consistency of reporting with the first VitalSign[6] cohort. According to current practice guidelines, pharmacotherapy should be initiated for moderate-severe depression (PHQ-9 ≥ 10) and non-pharmacological interventions should be started for none-mild depression (PHQ-9 < 10), unless the patient prefers pharmacological treatment or there is a clinical indication [15,16]. In this clinical observational study, we examined (1) primary care providers' selected treatments for depression in accordance with illness severity; (2) follow-up care for patients diagnosed with none-mild versus moderate-severe depression; and (3) remission rates, defined as a PHQ-9 < 5, of patients treated by MBC pharmacotherapy stratified by mild (PHQ-9 score 5–9) versus moderate-severe depression PHQ-9 ≥ 10.

2. Materials and methods

Clinical and treatment outcomes are based on de-identified data from 32,106 patients screened for depression in VitalSign.[6] The VS[6] software includes input of demographic information, self-report forms, clinician assessments, and utilizes treatment algorithms to provide MBC recommendations. Only data from this web-based application are reported. The UT Southwestern Medical Center Institutional Review Board approved this study with a waiver of the need to obtain informed consent from individual patients.

2.1. Clinical sites

The 37 clinics (23 adult primary care or family practice clinics, 1 adult specialty clinic, 8 pediatrician clinics, and 5 pediatric specialty clinics). Of note, 8 clinics were partners from the first cohort. Physicians, physician assistants, and/or advanced practice nurses managed patient care.

2.2. Universal depression screening

Patients aged ≥18 years were administered the PHQ-2, a 2-item self-report screen to screen for depression (sensitivity of 62.3%, specificity of 95.4% for any depressive disorder; 82.9% sensitivity, 90% specificity for MDD) [17]. Sad mood and anhedonia are rated on a 0–3 scale (range: 0–6) and positive screen is a score ≥ 3. Patients aged 12–17 were screened using depressed/irritable mood and anhedonia items from the Patient Health Questionnaire for Adolescents (PHQ-A) (sensitivity of 73%, specificity of 94% for MDD) using the same scoring process [4,18]. Positive screens completed additional self-report assessments.

2.3. Additional VS[6] self-reports for patients who screened positive on PHQ-2

The Patient Health Questionnaire-9 (PHQ-9) assesses symptom severity across all nine domains of a major depressive episode. Each item is scored 0–3 (range: 0–27), depression severity determined as none/minimal (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27) [19]. PHQ-9 ≥ 10 provides sensitivity and specificity of 88% for MDD [19].

The Generalized Anxiety Disorder 7 (GAD-7) is a 7-item self-report that measures symptoms of generalized anxiety disorder. Each item is rated 0–3 (range: 0–21) [20].

2.4. Clinical diagnosis of screen-positive patients

For patients who screened positive on the PHQ-2, clinicians conducted a clinical interview to further assess depression. Clinicians were encouraged to conduct a Diagnostic and Statistical Manual 5th edition (DSM5)-based interview using a diagnostic checklist in the VS[6] application for depression. Furthermore, our training programs encouraged clinicians to use the DSM-5 checklist for making the diagnosis of depression, with PHQ-9 scores serving as tools that inform the decision. Providers can select depressive disorder diagnoses including MDD, persistent depressive disorder, adjustment disorder with depressed mood, and unspecified depressive disorder. Consistent with the initial VitalSign[6] report [12], we grouped these diagnoses as depression. Other diagnostic selections available include adjustment disorder, disruptive mood dysregulation disorder, premenstrual dysphoric disorder, other psychiatric diagnoses (e.g. anxiety disorder, bipolar, ADHD), no psychiatric disorders, and unable to confirm (presence of or specific) psychiatric diagnosis.

2.5. Treatment and monitoring of patients with depression

Clinicians can select one or more treatment options including (1) *MBC pharmacotherapy* - an antidepressant was initiated after diagnosis, and subsequent visits were conducted, which included an algorithm that provided suggested dose adjustments based on symptoms self-report, side-effects and adherence; (2) *non-pharmacological treatment* – ongoing PCP monitoring and treatment with non-pharmacological treatments such as exercise, evidence-based psychotherapy, on-site behavioral treatment (e.g. group therapy, support groups, etc.), or VitalSign[6] provided teletherapy; (3) *refused treatment;* (4) *external referral*- PCP transfers care to psychiatry, evidence based psychotherapy, other therapy, or unspecified; (5) *no further follow-up indicated.* Of note, patients could engage in more than one type of non-pharmacological treatment under non-pharmacological treatment, such as a behavioral intervention and exercise. Various forms of behavioral interventions are provided by individual clinics, if available.

Follow-up visits were recommended for every 2 to 4 weeks but occurred based on the physician and patient availability. This report includes data from any patient who had been enrolled for at least 18 weeks since initial visit. At each visit, the VS[6] software could be accessed to administer self-reports for symptoms (PHQ-9, GAD-7), with options to administer additional self-reports, including measures of adherence, side effects, pain, as well as other psychiatric symptom measures.

The VitalSign[6] program and training recommend starting either pharmacotherapy or an evidence-based non-pharmacotherapy for patients diagnosed with mild depression and to use shared decision-

making with the patient to guide treatment selection. The program recommends pharmacotherapy for those with PHQ-9 ≥ 10.

Remission is defined as a PHQ-9 score < 5. Remission was calculated for patients with at least one post-baseline PHQ-9 score, equivalent to at least one follow-up.

2.6. Statistical analyses

Data on continuous baseline characteristics were summarized as mean (standard deviation, SD) and were compared using Student's *t*-tests or one-way analyses of variance (ANOVA) analyses. Categorical variables were summarized as frequency and percentages and were compared using chi-square tests. *P*-values less than 0.05 were judged as statistically significant. All analyses were done using SAS 9.4 (SAS Inc., Cary, NC).

3. Results

Among 32,106 patients screened with the PHQ-2, the mean age was 40.8 years (± 16.6 years), and the majority of PHQ-2 screened patients were female (70.3%; 21,590/30,670) and Hispanic (57.6%; 7561/13,125) (Table 1).

3.1. PHQ-2 screen-positive patients

Across clinics, 18.7% of patients were PHQ-2 screen-positive (5994/32,106). There were significant differences in all demographic categories between those who screened positive and those who screened negative on the PHQ-2 (Table 1). Specifically, positive PHQ-2 screens were higher among females, African-American, non-Hispanic, and English-speaking individuals, and the mean age was lower among those with a positive PHQ-9 screen. All patients who screened positive on the PHQ-2 were administered the PHQ-9; the average PHQ-9 score for those with a positive screen was 13.9 ± 5.7.

Table 1
Baseline patient characteristics.

Baseline characteristic	All[a] (*n* = 32,106)	PHQ-2 Negative (*n* = 26,112)	PHQ-2[b] Positive (*n* = 5994)
Sex total	30,670	24,864	5807
Female, No. (%)	21,590 (70.3)	17,345 (69.7)	4245 (73.1)
Language total[c]	31,905	26,028	5877
English, No. (%)	20,761 (65.1)	16,507 (63.4)	4254 (72.3)
Spanish	11,144 (34.9)	9521 (85.4)	1623 (14.6)
Race total	17,333	13,790	3543
African American, No. (%)	2105 (12.1)	1547 (11.2)	558 (15.7)
White, No. (%)	9569 (55.2)	7605 (55.1)	1964 (55.4)
American Indian or Native Alaskan, No. (%)	2704 (15.6)	2226 (16.1)	478 (13.5)
Other, No. (%)	2955 (17.0)	2412 (17.5)	543 (15.3)
Ethnicity total	13,125	10,299	2826
Hispanic, No. (%)	7561 (57.6)	6145 (59.7)	1416 (50.1)
Age Group total	32,106	26,112	5994
12–17, No. (%)	4249 (13.2)	3326 (12.7)	923 (15.3)
18–65, No. (%)	26,143 (81.4)	21,370 (81.8)	4773 (79.6)
65+, No. (%)	1714 (5.3)	1416 (5.4)	298 (5.0)

PHQ-2 = Patient Health Questionnaire 2-item; df = degrees of freedom; SD = standard deviation.

[a] Not every 32,106 patients submitted demographic data for each category (per row). The number of missing responses for each category can be found by subtracting the total from 32,106. Percentages are calculated as each category total/column (all, PHQ-2 negative, PHQ-2 positive).

[b] PHQ-2 positive if score ≥3.

[c] Other available language is Spanish.

3.2. Patients diagnosed with depression

All individuals who screened positive and completed the PHQ-9 were then clinically evaluated by a provider who determined the clinical diagnosis. Over 40% of the 5994 PHQ-2 screen positive patients (2571/5994) were diagnosed with a depressive disorder, defined as either MDD, adjustment disorder with depression, dysthymia, or unspecified depressive disorder (Table 2). MDD was the most common depressive diagnosis (77.4%, 1989/2571) and persistent depressive disorder was the least (2.4%; 61/2571). Most patients who screened positive on the PHQ-2 (60%; 3423/5994) were not given a clinical diagnosis of depressive disorder by the treating provider. Of the overall sample of 32,106 who received PHQ-2 screening, 1% (333/32,106) and 7% (2238/32,106) were clinically diagnosed with depression by a provider and scored respectively within the none-mild depression range and the moderate-to-severe depression range (Fig. 1). Anxiety was higher in patients with greater PHQ-9 depression severity levels.

3.3. Most patients with depression were treated or monitored in primary care

Of the 2571 patients diagnosed with depression, 2238 had moderate-severe depression severity based on the PHQ-9 (total score ≥ 10), and 333 had none-mild depression (PHQ-9 < 10). Of the 2238 patients with clinically diagnosed moderate-severe depression, 1929 were enrolled in the VitalSign[6] program for at least 18 weeks and included in the treatment selection analyses (Fig. 1). Among the 1929 patients with moderate-severe depression at enrollment, 1332 (69.1%) were assigned to MBC Pharmacotherapy, 455 (23.6%) were assigned to non-pharmacotherapy interventions, and 76 (3.9%) were referred to external specialty care; the remainder either refused treatment or did not return for a follow-up visit. Among the 333 patients with clinically diagnosed none-mild depression, 266 were enrolled for 18 weeks and included in the treatment selection analyses. Of the 266 patients with none-mild depression, 146 (54.9%) were assigned to MBC pharmacotherapy, 101 (38%) to non-pharmacotherapy interventions, and 5 (1.9%) were referred to specialty care; the remainder either refused treatment or did not return for a follow-up visit.

Patients with none-mild depression were more likely to be under active surveillance by providers [38.0% (101/266) vs 23.1% (455/1929), $p < 0.0001$] and less likely to be treated with pharmacotherapy [54.9% (146/266) vs 69.1% (1332/1929), <0.0001] compared to patients with moderate-severe depression. Referral to specialty care, however, was extremely low for both groups, and not statistically different [1.9% (5/266) vs 3.9% (76/1929), $p = 0.0948$].

3.4. Follow-up visits for patients with depression and at least 18 weeks enrollment

As noted above, 2195/2571 patients (266 none-mild and 1929 moderate-severe) were enrolled for at least 18 weeks. Approximately one-third of patients with none-mild depression (35.3%; 94/266) and moderate-severe depression (31.6%; 610/1929) did not return for any follow-up care (Supplemental tables 1, 2). Among the 1332 patients with moderate-severe depression, 38.7% of those assigned to non-pharmacological intervention (38.7%; 176/455) did not return compared to 27.3% (364/1332) of those on MBC pharmacotherapy (Suppl. Table 2). Among the 266 patients with none-mild depression, 47.5% (48/101) of patients assigned to non-pharmacological intervention did not return compared to 24.7% (36/146) of those assigned to MBC pharmacotherapy (Suppl. Table 1). Over a third of those with none-mild depression and over 40% of patients with moderate-severe depression on MBC pharmacotherapy returned for ≥3 follow-up visits.

At the end of 18 weeks enrollment, 30.1% (80/266) of patients with none-mild depression and 38.4% (740/1929) of patients with moderate-severe depression returned for ≥3 visits. Overall, of the 2195 patients

Table 2
Baseline characteristics of PHQ-2 screen positive patients by PHQ-9 depression severity ($N = 5994$)[a].

Baseline characteristic	Category Total, *N*	PHQ-9 Depression Severity				
		Minimal *N* (%)	Mild b *N* (%)	Moderate *N* (%)	Severe *N* (%)	Very Severe *N* (%)
All ($n = 5994$)		264 (4.4)	1230 (20.5)	1840 (30.7)	1568 (26.2)	1092 (18.2)
Sex ($n = 5807$)						
Female	4245	144 (3.4)	804 (18.9)	1318 (31.0)	1178 (27.8)	801 (18.9)
Male	1562	116 (7.4)	387 (24.8)	465 (29.7)	346 (22.2)	248 (15.9)
Race ($n = 3543$)						
African American	558	32 (5.7)	107 (19.2)	169 (30.3)	158 (28.3)	92 (16.5)
White	1964	67 (3.4)	317 (16.1)	620 (31.6)	603 (30.7)	357 (18.2)
American Indian or Native American	478	15 (3.1)	75 (15.7)	143 (29.9)	132 (27.6)	113 (23.6)
Other	543	35 (6.5)	130 (23.9)	163 (30.0)	110 (20.3)	105 (19.3)
Ethnicity ($n = 2826$)						
Hispanic	1416	68 (4.8)	302 (21.3)	441 (31.1)	376 (26.6)	229 (16.2)
Non-Hispanic	1410	56 (4.0)	215 (15.2)	444 (31.5)	437 (31.0)	258 (18.3)
Age Group, n (%)						
12–17	923	63 (6.8)	205 (22.2)	278 (30.1)	243 (15.5)	134 (14.5)
18–65	4773	182 (3.8)	957 (20.0)	1457 (30.5)	1253 (26.3)	924 (19.4)
65+	298	19 (6.4)	68 (22.8)	105 (35.2)	72 (24.2)	34 (11.4)
Diagnosis ($n = 5994$)						
Major Depressive Disorder	1989	7 (0.3)	156 (7.8)	593 (30.0)	699 (35.1)	534 (26.8)
Adjustment Disorder with Depression	230	1 (0.4)	74 (32.2)	97 (42.2)	37 (16.1)	21 (9.1)
Persistent Depressive Disorder (Dysthymia)	61	0 (0.0)	18 (29.5)	27 (44.3)	12 (19.7)	4 (6.5)
Unspecified Depressive Disorder	291	3 (1.0)	74 (25.4)	114 (39.2)	77 (26.5)	23 (7.9)
No Psychiatric Disorder	247	42 (17)	134 (54.3)	50 (20.2)	15 (6.1)	6 (2.4)
Other Psychiatric Disorder	363	6 (1.6)	78 (21.5)	106 (29.2)	103 (28.4)	70 (19.3)
No Diagnosis Selected	1503	177 (11.8)	349 (23.2)	413 (27.5)	325 (21.6)	239 (15.9)
Unable to Confirm	1310	28 (2.1)	347 (26.5)	440 (33.6)	300 (22.9)	195 (14.9)

Continuous variables		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age	5994	38.9 (18.8)	39.9 (17.3)	39.7 (17.0)	39.5 (16.7)	39.8 (15.8)
PHQ-9	5994	3.4 (0.5)	7.4 (1.4)	12.0 (1.4)	16.9 (1.4)	22.5 (2.1)
GAD-7	5654	1.4 (2.6)	5.8 (4.1)	9.3 (4.7)	13.3 (4.6)	16.7 (4.4)

PHQ-9 = Patient Health Questionairre-9; GAD-7 = Generalized Anxiety Disorder 7-item; SD = standard deviation.
[a]Not all 5994 PHQ-2 screen-positive patients submitted demographic data for each category (per row). All 5994 patients were then given a PHQ-9, clinically assessed and diagnosed by a provider.

with at least 4 months enrollment, 1426 (66.9%) had at least one follow-up visit. Women were more likely to return.

3.5. Remission of depressed patients on MBC pharmacotherapy and ≥1 follow-up

Of the 1478 patients initiated on MBC pharmacotherapy, 400 patients did not return to clinic to complete an exit PHQ-9 and 32 patients followed-up in clinic but did not complete an exit PHQ-9 to monitor symptoms, and so were excluded from the remission analysis. In addition, six patients had a baseline PHQ-9 < 5 and so were also excluded from the remission analysis, leaving 1040 patients for analysis (99 with mild depression, 941 with moderate-severe depression).

Remission was attained within 18 weeks in 30% of moderate-severe depression cases (282/941), 55.6% of mild depression cases (56/99), and 32.4% overall (338/1040) (Fig. 2). Remission rates were significantly higher for patients with any level of depression (PHQ-9 ≥ 5) with higher numbers of follow-up visits: 23.1% (59/255), 35.7% (60/173), 36% (218/612) for 1, 2, ≥3 visits, respectively ($p = 0.0008$). Remission for patients with mild depression at 1, 2, ≥3 visits were 44.1% (15/34), 61.1% (11/18), 61.7% (29/47), respectively, and for patients with moderate-severe depression were 19.9% (44/221), 31.6% (49/155), 33.5% (189/565), respectively.

4. Discussion

This report evaluated the treatment selection and follow-up rates for patients with none-mild versus moderate-severe depression and the remission outcomes of patients with mild versus moderate-severe depression treated with MBC pharmacotherapy over 18 weeks across 37 under-resourced primary care clinics in this quality improvement program. As expected, more patients with moderate-severe depression than mildly depressed patients were treated with pharmacotherapy. Overall, of patients treated with MBC pharmacotherapy that returned for at least one follow-up visit and were enrolled for 18 weeks, 32.4% (338/1040) of those with PHQ-9 ≥ 5 reached remission. Of patients with mild depression that returned at least once, 55.6% (56/99) were in remission at 18 weeks, while 30% (282/941) of patients with moderate-severe depression reached remission. Importantly, rates of remission improved with number of follow-ups, with those having at least 3 follow-up visits having the greatest remission rate. Our PCP-First approach results are comparable to real-world collaborative care outcomes and also suggest further benefits if the two approaches are combined [21,22]. Three-fourths of patients diagnosed with depression returned at least once, and overall attrition improved compared to the first VitalSign[6] cohort, which were 30.2%, 12.6%, and 11.6% for 1, 2, and ≥ 3 follow-up visits, respectively.

The rates of PHQ-2 screen-positive is similar between this cohort (18.5%) and the first VitalSign[6] cohort (17%) [12], and the rates of clinically diagnosed depression (8%) is comparable to other primary care studies and the first cohort [12,23]. Most patients (69.1%) with moderate-severe depression were initiated on pharmacotherapy, which is in line with guidelines [15,16], and at a higher rate than reported nationally (42.7%) [24]. Of interest, over half of those with none-mild depression also received pharmacotherapy, possibly due to the patient's preference, provider's clinical judgement, clinics or patients without access to non-pharmacological treatments such as behavioral health, patient preference, patient past history, or depression episode

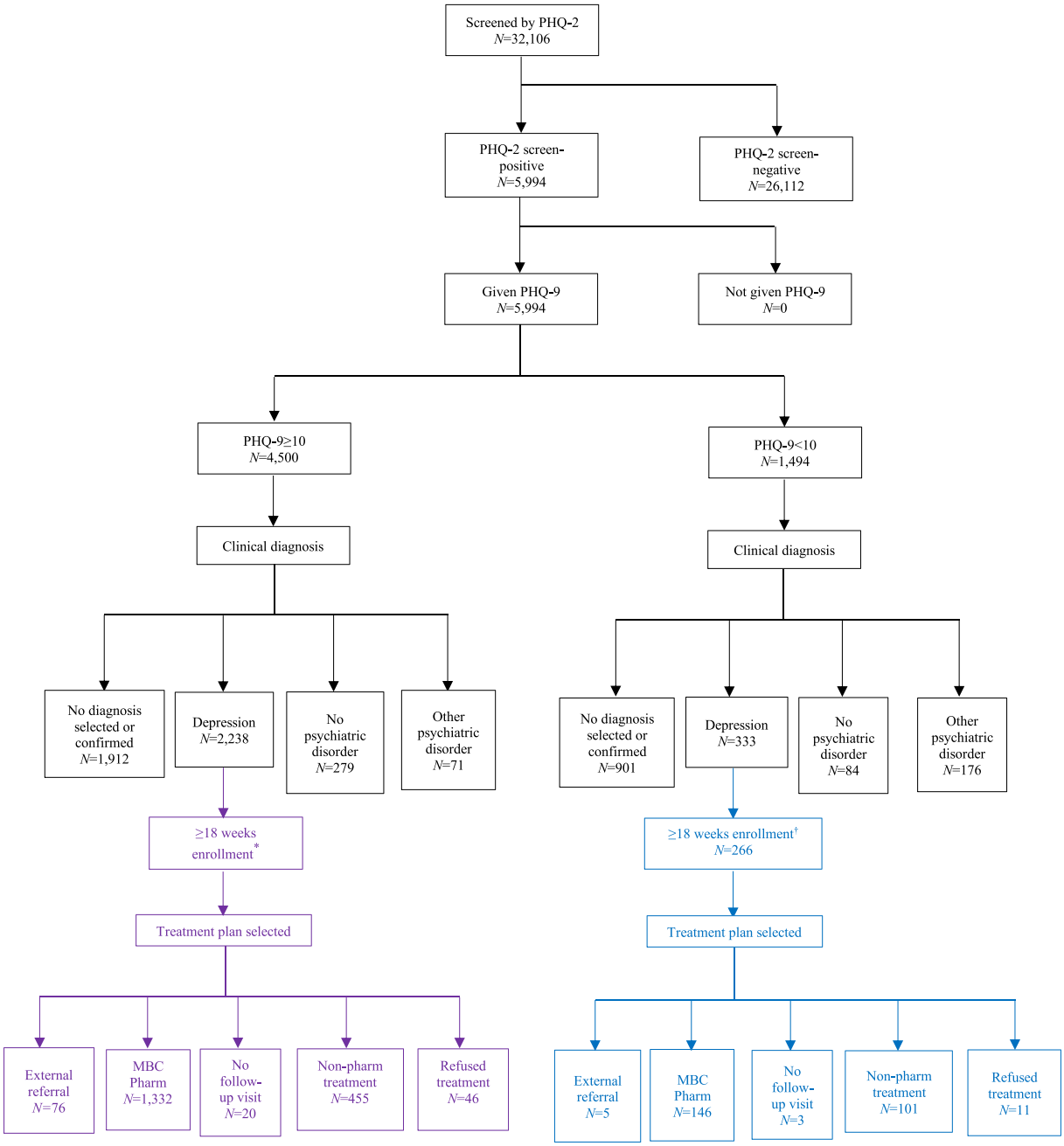

Fig. 1. Flowchart of depression screening and treatment in primary care clinics ($N = 37$).
*1929 patients with moderate-severe depression followed for at least 18 weeks (shown in purple).
†266 patients with none-mild depression followed for at least 18 weeks (shown in blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

status. [25] There are a variety of reasons providers and patients may elect to begin treatment with an antidepressant even in the absence of moderate to severe symptoms, such as convenience, evidence of the start of relapse, or troublesome functional impairment. While we cannot know all the details to evaluate the rationale for prescribing practices, it is noteworthy that over 90% of patients entering MBC pharmacotherapy had moderate-severe depression based on PHQ-9.

Remission rates for patients with moderate-severe depression at ≥2 follow-ups and by study end are comparable to that of other effectiveness studies of MBC pharmacology treatment for outpatients with depression [11,21], and higher than that of real-world collaborative care clinics [10]. A large effectiveness study of collaborative care for depression showed respective 3- and 6-month remission rates of 18% and 19% for clinics receiving basic support, and 25% and 29% for clinics receiving enhanced support, which included on-going technical support and implementation support for 3–6 months before and 12 months afterwards [21]. In this study, patients with two PHQ-9 scores within 12 month and 3–6 months of follow-up data were included.

Previously, the first VitalSign[6] cohort had a higher remission rate at ≥3 follow-ups (41.3%), but also included patients with none-mild depression that tend to have high remission, which could account for the discrepancy [12]. Here, we showed overall, mild, and moderate-severe depression remission rates separately.

Attrition improved compared to the first VitalSign[6] cohort: 75% of patients on MBC pharmacotherapy returned for at least 1 follow-up; over half returned for a second visit, and 40% returned for ≥3 visits,

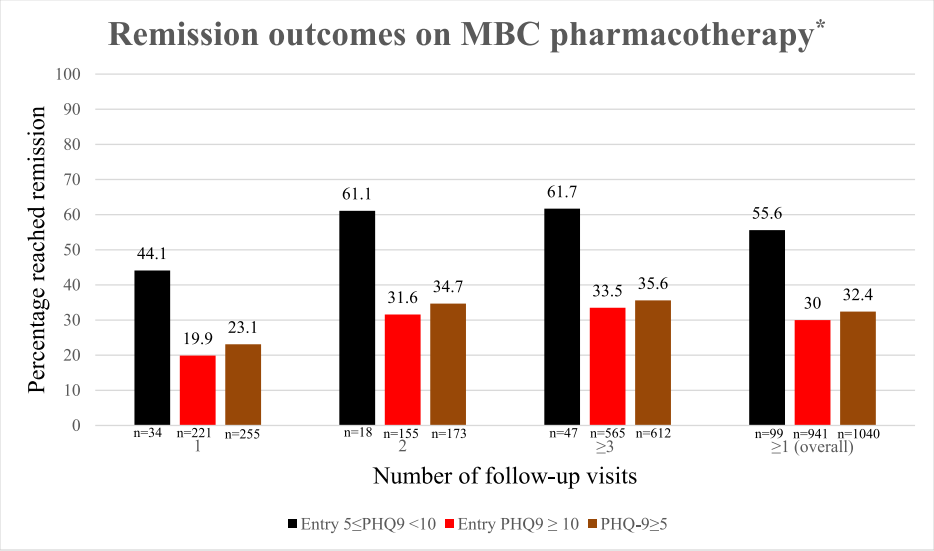

Fig. 2. Remission outcomes of patients on MBC pharmacotherapy with ≥1 follow-up visit and 18+ weeks enrollment ($N = 1040$) stratified by entry PHQ-9. The x-axis indicates remission by number of follow-up visits (225 patients total with 1; 173 total patients with 2; 612 total patients with 3; and overall, for 1040 summative patients at the end of 18 weeks).
Remission = PHQ < 5. MBC = measurement-based care.
*Of 1478 patients were placed on MBC pharmacotherapy, 400 patients had no follow-up and 32 patients with follow-up who did not complete an exit PHQ-9 were excluded from analysis. Of 1046 remaining patients, 6 participants had starting PHQ-9 < 5 and were excluded.

compared to 30.2%, 12.6%, 11.6%, respectively, in the first cohort [12]. Improved patient retention is likely due to continued VitalSign[6] team implementation efforts and better clinic workflow integration over time [26].

In this VitalSign[6] cohort, two out of three patients were managed by primary care providers using pharmacotherapy, one out of four were monitored without pharmacotherapy or psychotherapy, and less than one out of twenty were externally referred, demonstrating that this approach can assist clinics with independent depression management without a specialist on staff. Nationally, only 28.7% of PHQ-2 screen-positive patients and one-fifth of those with more severe psychological distress received any treatment, and were more likely to receive treatment from psychiatrists/mental health specialists than PCPs [27]. Although the collaborative care model has shown improvement in remission and response rates compared to usual care in the context of randomized controlled trials [28,29], implementation into real-world health systems has not always shown improvement [22]. VitalSign[6] could be integrated along with collaborative care approaches or implemented prior to adapting a collaborative care model that faces challenges of systems-level reimbursement, onsite masters-level care managers, frequent contact with a psychiatrist and an extended implementation process [9]. Further research is needed to understand which clinics are most successful at implementing VitalSign,[6] and continual feedback with program revision is needed to continue to improve program implementation.

Despite decreased attrition rates, patient retention remains a challenge to MBC treatment in primary care. Up to 29% of those identified through screening and placed on MBC pharmacotherapy did not return and only about 40% of patients returned for ≥3 visits over 18 weeks. The attrition rate is higher than that of Sequenced Treatment Alternatives to Relieve Depression (STAR*D) study (26% attrition by 12 weeks) [30], although STAR*D had the benefit of research trial coordinators who could assist with patient adherence, whereas real-world clinics may encounter limited resources leading to challenges with scheduling follow-ups. Possible methods to improve patient retention could be psychoeducation, addressing treatment barriers (e.g. transportation issues, stigma, etc.), or support for appointment scheduling and reminders [31]. Telehealth, which has been widely used since the Covid-19 pandemic, could also be a strategy to increase retention and access to care.

This study represents one of the largest registries of patients with depression treated in outpatient primary care clinics and offers an assessment of how PCPs can independently manage depression using health technology and with limited specialist assistance. Low-income, minority patients make up a substantial proportion of the study patients, making results applicable to clinics serving this demographic as well.

Among study limitations, sociodemographic data and other data were commonly missing. In addition, because this was a quality improvement program, there was not a research-level diagnosis, so we are unable to evaluate the accuracy of the diagnoses. As part of the VitalSign[6] program, we provided robust training for providers around diagnosis and treatment, yet there are no data available to confirm diagnostic criteria. There was also no systematic collection of relevant factors influencing likelihood of remission, including psychiatric comorbidities, differential diagnoses for screen-positive patients not diagnosed with a depressive disorder, and disease and episode duration. This limits analyzing covariates that influence screening, treatment decisions, and outcomes, and limits understanding of why some screen-positive patients are not given a diagnosis or have an unconfirmed diagnosis. Another limitation is that the remission rate was calculated for patients who remained enrolled for at least 18 weeks and engaged in care, rather than all patients diagnosed with depression, as the remission status of patients who did not follow-up would not be known. Though attrition drastically improved from the first cohort, engagement in care continues to remain a major concern. While measurement-based care approaches utilize self-report assessments of adherence, this report is limited by lack of other adherence-related measures such as pharmacy records (dispensation of prescriptions) or electronic monitoring systems.

Our focus in this manuscript was on PCP-delivered pharmacotherapy. However, almost one out of four patients with moderate-severe depression and one out of three patients with mild depression were treated with non-pharmacological interventions. As noted in the methods, non-pharmacological interventions were varied, and could include evidence-based psychotherapy, exercise, supportive therapy, etc. Non-pharmacological treatment also included active monitoring by

the provider, which is not simply passive monitoring. Rather, it is continued assessment of symptoms to guide treatment decisions. Furthermore, patients were often prescribed more than one non-pharmacological treatment. Finally, we cannot say that all non-pharmacological interventions given, including evidence-based psychotherapies, are equally effective or the same in quality. As a result, we cannot adequately evaluate the "non-pharmacological treatment" group due to the varying interventions and small numbers of each treatment or combination of treatments.

This study suggests that over time, continual implementation approaches of a PCP-First model using a web-based MBC program can improve depression attrition and treatment in primary care and would further benefit from a combined approach with Collaborative Care. Importantly, a substantial number of mildly depressed individuals began MBC pharmacotherapy, despite practice guidelines to recommend non-pharmacological treatment first. The VitalSign[6] program offers pharmacological therapy as an option for mildly depressed individuals and emphasizes making a treatment decision with patients in a collaborative manner in the training. Further investigation should determine if factors such patient preference, history, availability of non-pharmacological resources, provider judgement play a role in this observed pattern. Study replication should examine if this pattern persists. Mildly depressed individuals who received MBC pharmacotherapy had remission rates substantially higher than with overall remission rates of large-scale trials [11]. While this may be in part due to enhanced ability to achieve remission based on lower baseline PHQ-9 scores, it has important clinical relevance, as untreated and unremitted depressive symptomatology is associated with poorer overall disease course and reduced functioning and quality of life [32]. These considerations may be relevant to improving stepped-care treatment approaches to depression in primary care.

Future areas of investigation would examine remission and treatment variability across clinics and identify predictive factors. Future investigation would measure implementation fidelity and project implementation success using established frameworks, such as RE-AIM. Examining the retention and remission rates of VitalSign[6] patients in the continuation and maintenance phases of treatment would be another future area of investigation of program outcomes.

In conclusion, this report from the second cohort of the VitalSign[6] project demonstrates the feasibility of universal screening of depression and supports the PCP-First approach of enabling primary care providers to initiate evidence-based care without delay in patients who screen positive for depression.

Prior presentation

This material has not been published or presented elsewhere. Our manuscript word count is 3,313 with 2 tables, 2 figures and 2 supplemental tables.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.genhosppsych.2021.11.001.

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