Supplemental Tables 1-8 and
Supplemental Figures 1 and 2

Supplemental Table 1. Multiple Imputation Results

Primary Outcomes - ITT			
Outcome	Coef	SE	P Value
30-Day Readmissions	-0.14	0.26	0.594
30-Day Reutilizations	0.12	0.15	0.421
90-Day Readmissions	0.21	0.15	0.174
90-Day Reutilizations	0.19	0.10	0.067

Secondary Outcomes – ITT			
Outcome	Coef	SE	P Value
30-Day PHQ-9	-1.11	0.54	0.044
30-Day GAD-7	-0.79	0.52	0.129
30-Day Q-LES-Q-SF	2.17	1.86	0.251
30-Day PAM-13	0.92	0.4	0.021
90-Day PHQ-9	-0.54	0.59	0.366
90-Day GAD-7	-0.06	0.71	0.932
90-Day Q-LES-Q-SF	1.58	2.14	0.47
90-Day PAM-13	0.58	0.47	0.22

Secondary Outcomes – As-Treated			
Outcome	Coef	SE	P Value
30-Day PHQ-9	-0.34	0.27	0.224
30-Day GAD-7	-0.34	0.26	0.231
30-Day Q-LES-Q-SF	0.49	1.07	0.663
30-Day PAM-13	0.09	0.47	0.849
90-Day PHQ-9	-0.34	0.27	0.224
90-Day GAD-7	-0.34	0.26	0.231
90-Day Q-LES-Q-SF	0.49	1.07	0.663
90-Day PAM-13	0.09	0.47	0.849

Primary Outcomes – As-Treated			
Outcome	Coef	SE	P Value
30-Day Readmissions	-0.24	0.13	0.094
30-Day Reutilizations	-0.06	0.08	0.43
90-Day Readmissions	-0.08	0.03	0.037
90-Day Reutilizations	-0.05	0.03	0.17

Tables for ITT outcomes show coefficients, standard errors, and p-values from OLS regressions of 30-day and 90-day outcomes on study arm. Tables for as-treated outcomes show coefficients, standard errors, and p-values for 30- and 90-day outcomes on the number of sessions completed amongst interventions subjects only.

Supplemental Table 2. Robustness to Selection Effects: Impact of Number of Sessions (<3 vs. ≥3) ofthe Telephonic Intervention on Clinical and Demographic Variables at 30 and 90 Days
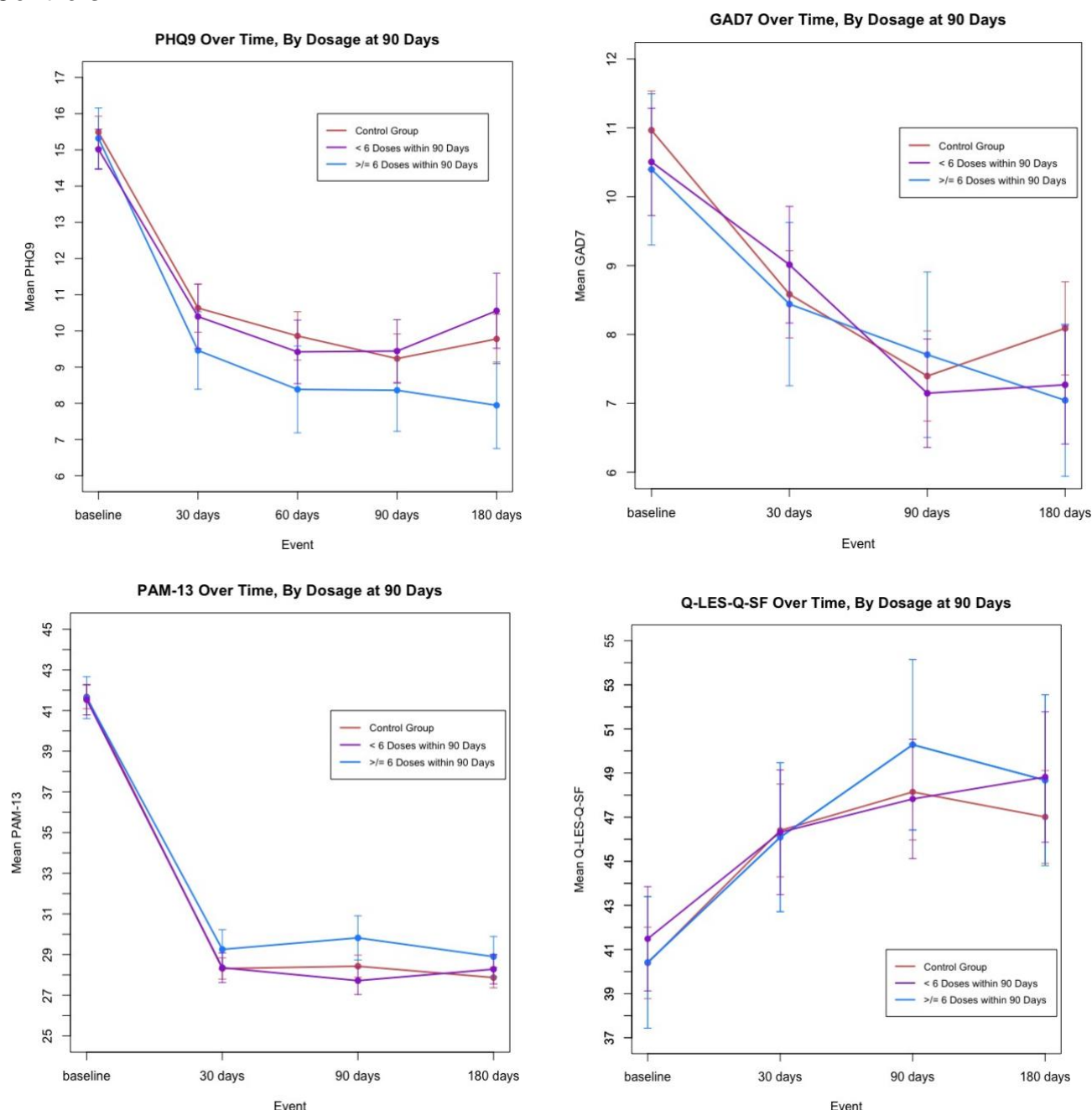
30 d after index hospitalization

	Fewer than 3 Doses of RED-D			3 or More Doses of RED-D			
	mean (SD)	n	p-value (vs. control)	mean (SD)	n	p-value (vs. control)	p-value (dose vs. dose)
PHQ-9 (baseline)	14.87 (3.95)	223	0.106	15.54 (4.66)	105	0.843	0.207
MDD	0.39 (0.50)	141	0.001	0.49 (0.49)	73	0.136	0.220
GAD-7 (baseline)	10.25 (5.74)	214	0.112	10.62 (5.86)	101	0.496	0.599
PAM-13 (baseline)	41.86 (5.48)	223	0.777	41.08 (5.40)	105	0.288	0.224
Education	4.39 (2.70)	223	0.721	4.57 (2.90)	105	0.419	0.604
Income	7.05 (4.04)	223	0.338	6.46 (3.90)	105	0.573	0.214
Gender	0.38 (0.49)	223	0.185	0.27 (0.45)	105	0.283	0.047
Age	48.94 (13.76)	223	0.042	53.17 (12.51)	105	0.215	0.006

90 d after index hospitalization

	Fewer than 6 Doses of RED-D			6 or More Doses of RED-D			
	mean (SD)	n	p-value (vs. control)	mean (SD)	n	p-value (vs. control)	p-value (dose vs. dose)
PHQ-9 (baseline)	15.01 (4.04)	207	0.340	15.32 (4.45)	110	0.931	0.549
MDD by interview[1]	0.42 (0.51)	126	0.003	0.45 (0.53)	81	0.036	0.648
GAD-7 (baseline)	10.51 (5.71)	197	0.333	10.40 (5.85)	107	0.346	0.876
PAM-13 (baseline)	41.53 (5.48)	207	0.715	41.63 (5.49)	110	0.895	0.878
Education	4.35 (2.67)	207	0.790	4.72 (2.92)	110	0.180	0.283
Income	6.91 (4.03)	207	0.468	6.68 (3.93)	110	0.943	0.627
Gender	0.36 (0.48)	207	0.409	0.33 (0.47)	110	0.909	0.608
Age	47.90 (13.58)	207	0.007	53.95 (12.28)	110	0.049	0.000

PHQ9 Over Time, By Dosage at 90 Days

GAD7 Over Time, By Dosage at 90 Days

PAM-13 Over Time, By Dosage at 90 Days
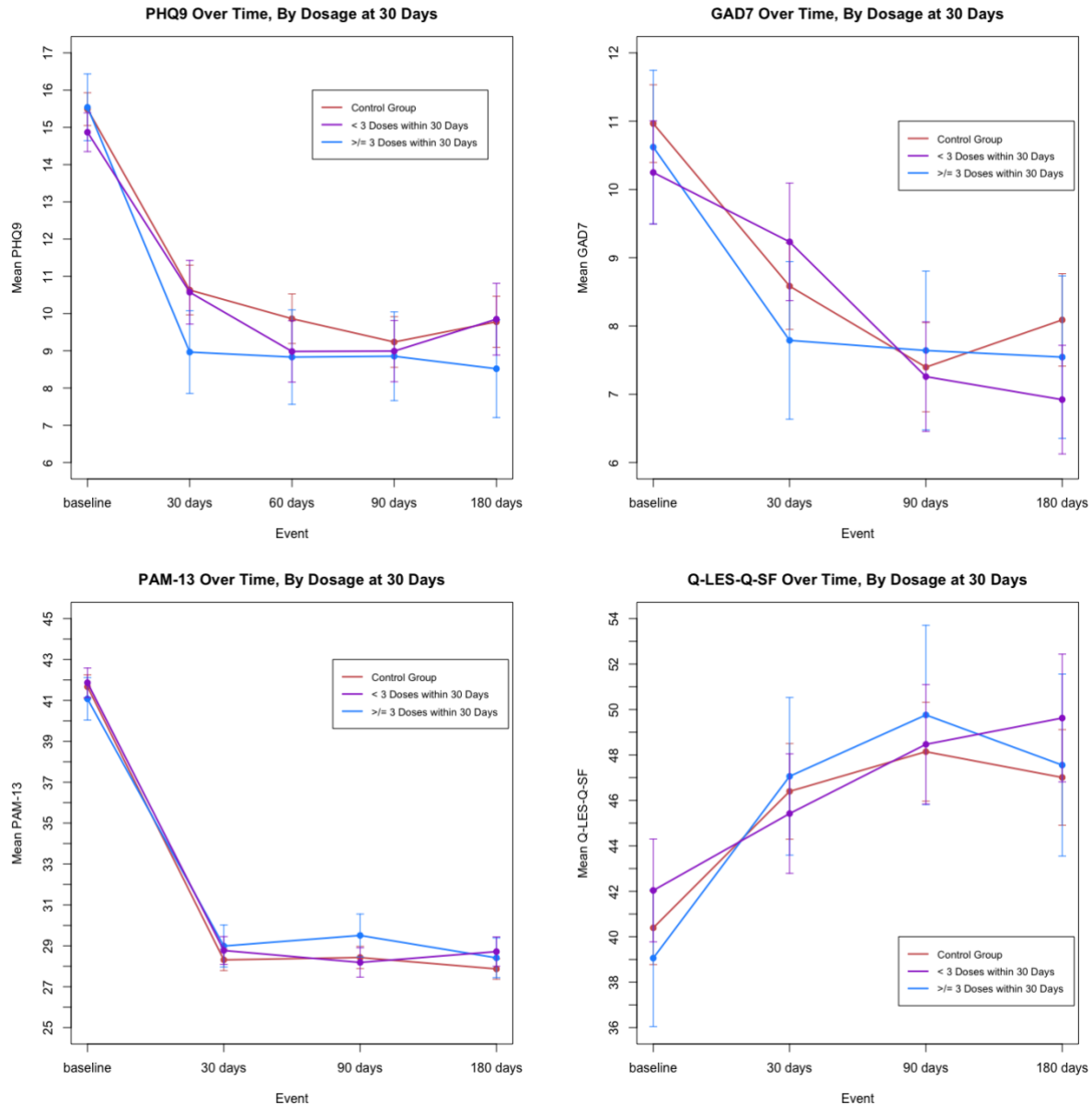
Q-LES-Q-SF Over Time, By Dosage at 90 Days

Footnotes for Supplemental Figure 1

*   Figures show the mean PHQ-9, GAD-7, PAM-13, and Q-LES-Q-SF scores and 95% confidence intervals at 0, 30, 90, and 180 days (and 60 days for PHQ-9 score) for controls, intervention patients receiving <6 sessions and intervention patients receiving ≥6 sessions within 90 days of hospital discharge.

†   PHQ-9. Patient Health Questionnaire-9 is a nine item scale. A score of ≥10 indicates moderate depressive symptoms.[16]

‡   Q-LES-Q-SF. Quality of Life Enjoyment and Satisfaction Questionnaire Short Form is a 16 item scale indicating the degree of enjoyment and satisfaction experienced by subjects in various areas of daily functioning. The reported

score is the sum of the question responses rescaled to 100. Higher scores indicate higher enjoyment and satisfaction.[21]

** GAD-7. Generalized Anxiety Disorder 7 is a 7 item scale. A score of 10-14 indicates possible clinically significant generalized anxiety and ≥15 indicates that treatment is probably warranted.[23]

† PAM-13. Patient Activation Measure 13 is a 13 item scale indicating the degree of patients' willingness and ability to take independent actions to manage their health and care. Raw scores converted to range from 0–100 with ≤47.0 not believing activation important; 47.1–55.1 indicating a lack of knowledge and confidence to take action; 55.2–67.0 beginning to take action; and ≥67.1 taking action. [22]

Supplemental Figure 2. Secondary Outcomes: PHQ-9, GAD-7, PAM, and Q-LES-Q-SF AmongSubjects Receiving ≥3 sessions at 30 days, <3 sessions at 30 days and Controls*

* Figures show the mean PHQ-9, GAD-7, PAM-13, and Q-LES-Q-SF scores and 95% confidence intervals at 0, 30, 90, and 180 days (and 60 days for PHQ-9 score) for controls, intervention patients receiving <3 sessions and intervention patients receiving ≥3 sessions within 30 days of hospital discharge.

† PHQ-9. Patient Health Questionnaire-9 is a nine item scale. A score of ≥10 indicates moderate depressive symptoms.[16]

‡ Q-LES-Q-SF. Quality of Life Enjoyment and Satisfaction Questionnaire Short Form is a 16 item scale indicating the degree of enjoyment and satisfaction experienced by subjects in various areas of daily functioning. The reported score is the sum of the question responses rescaled to 100. Higher scores indicate higher enjoyment and satisfaction.[21]

** GAD-7. Generalized Anxiety Disorder 7 is a 7 item scale. A score of 10-14 indicates possible clinically significant generalized anxiety and ≥15 indicates that treatment is probably warranted [23]

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Supplemental Table 3. Secondary Outcomes, Intention-to-Treat

	30 days			90 days		
	control	intervention	p-value	control	intervention	p-value
Q-LES-Q-SF, *mean (SD)* †	51.94 (20.14)	52.35 (19.59)	0.836††	54.27 (21.61)	54.67 (19.95)	0.852††
PHQ-9, *mean (SD)* *	10.56 (6.36)	10.00 (6.23)	0.357††	9.20 (6.50)	8.97 (6.16)	0.715††
PAM-13, *mean (SD)* §	36.30 (13.76)	37.63 (14.30)	0.344††	36.30 (14.15)	37.13 (15.06)	0.581††
GAD-7, *mean (SD)* ‡	8.58 (6.22)	8.69 (6.35)	0.873††	7.30 (6.22)	7.56 (6.12)	0.711††
Do you have a Primary Care Provider (PCP)?, *mean (SD)* **	0.96 (0.20)	0.97 (0.18)	0.623‡‡	0.96 (0.18)	0.96 (0.19)	0.954‡‡
Did you see your PCP in the last month?, *mean (SD)* **	0.64 (0.48)	0.61 (0.49)	0.617‡‡	0.46 (0.50)	0.48 (0.50)	0.689‡‡
Did you discuss depression with PCP?, *mean (SD)* **	0.52 (0.50)	0.44 (0.50)	0.179‡‡	0.41 (0.50)	0.52 (0.50)	0.169‡‡
Have you seen other doctors? *mean (SD)* **	0.53 (0.52)	0.58 (0.50)	0.291‡‡	0.52 (0.51)	0.53 (0.51)	0.832‡‡

Footnotes for Tables 3

* PHQ-9. Patient Health Questionnaire-9 is a nine item scale. A score of ≥10 indicates moderate depressive symptoms.[16]

† Q-LES-Q-SF. Quality of Life Enjoyment and Satisfaction Questionnaire Short Form is a 16 item scale indicating the degree of enjoyment and satisfaction experienced by subjects in various areas of daily functioning. The reported score is the sum of the question responses rescaled to 100. Higher scores indicate higher enjoyment and satisfaction.[21]

‡ GAD-7. Generalized Anxiety Disorder 7 is a 7 item scale. A score of 10-14 indicates possible clinically significant generalized anxiety and ≥15 indicates that treatment is probably warranted. [23]

§ PAM-13. Patient Activation Measure 13 is a 13 item scale indicating the degree of patients' willingness and ability to take independent actions to manage their health and care. Raw scores converted to range from 0–100 with ≤47.0 not believing activation important; 47.1–55.1 indicating a lack of knowledge and confidence to take action; 55.2–67.0 beginning to take action; and ≥67.1 taking action. [22]

** Question shortened in the table. Full survey questions available.[14]

†† Independent t-test

‡‡ Chi-squared

Supplemental Table 4. Baseline Characteristics by Recruitment Site

Characteristic	BMC (n = 653)		Mt. Auburn (n = 56)		p-value
Women, n (%)	431	66	36	64.3	0.909
Mean age, (SD)	51	13.5	58.1	15.5	0.001
Race, n (%)					
White non-Hispanic	196	30	45	80.4	p < 0.001
Black non-Hispanic	304	46.6	3	5.4	p < 0.001
Hispanic	121	18.5	5	8.9	0.115
Other race	89	13.6	5	8.9	p < 0.001
Income, n (%)					
< $10,000	84	12.9	4	7.1	0.301
$10,000 - $19,999	125	19.1	6	10.7	0.168
$20,000 - $49,999	102	15.6	5	8.9	0.251
>= $50,000	56	8.6	21	37.5	p < 0.001
No personal income	49	7.5	0	0	0.064
Refused	89	13.6	15	26.8	0.013
Did not know	146	22.4	5	8.9	0.029
Education, n (%)					
Less than high school	29	4.4	1	1.8	0.548
Some high school	87	13.3	0	0	0.007
High School Graduate or GED	248	38	10	17.9	0.004
Some college	199	30.5	16	28.6	0.884
4-year college graduate or higher	89	13.6	29	51.8	p < 0.001
Health Literacy, n (%)†					
Grade 3 or below	3	0.5	0	0	1
Grade 4 to 6	20	3.1	0	0	0.364
Grade 7 to 8	101	15.5	1	1.8	0.009
Grade 9 or above	388	59.4	40	71.4	0.105
Employment, n (%)					
Full-time	122	18.7	14	25	0.329
Part-time	57	8.7	8	14.3	0.254
Home-maker	9	1.4	1	1.8	1
Student	7	1.1	0	0	0.941
Retired	94	14.4	20	35.7	p < 0.001
Disabled	231	35.4	8	14.3	0.002
Unemployed	114	17.5	4	7.1	0.072
Other‡	18	2.8	1	1.8	1
Homeless in past 6 months	52	8	0	0	NA
Mean PHQ-9, (SD) ††	15	4.3	14	3.2	0.001
Major depressive disorder ‡‡	202	30.9	4	7.1	0.127
Q-LES-Q-SF score**, mean (SD)	46	15.8	48	16.7	0.309
Marital Status, n (%)					

Married	127	19.4	24	42.9	0.001
Divorced	133	20.4	8	14.3	0.226
Separated	46	7	1	1.8	0.012
Widowed	50	7.7	5	8.9	0.751
Single w/o partner	176	27	15	26.8	0.979
Single with partner	124	19	3	5.4	p < 0.001
CAGE score, mean (SD)	2	42.8	NA	NA	NA
DAST-10 score, mean (SD)	3	9.8	0	NA	NA
GAD-7 score, mean (SD)	11	5.6	8	5.0	p < 0.001
History of Clinical Depression	403	61.7	34	60.7	0.874
Medication for Depression	239	36.6	24	42.9	0.492
Previous Medication for Depression	277	42.4	28	50	0.669
Relaxation					
Chiropractor	56	8.6	6	10.7	0.628
Acupuncture	31	4.7	1	1.8	0.134
Massage	60	9.2	8	14.3	0.302
Deep Breathing	244	37.4	32	57.1	0.004
Meditation	158	24.2	24	42.9	0.009
Yoga	51	7.8	9	16.1	0.111
Diet/Nutrition to Improve Mood	155	23.7	16	28.6	0.419
Exercise	296	45.3	30	53.6	0.264
Book About Depression	66	10.1	6	10.7	0.412
Support Group	68	10.4	11	19.6	0.396
Prayer	447	68.5	28	50	0.008
Other Relaxation	284	43.5	37	66.1	0.002
PAM-13 score, mean (SD)	42	56.3	41	45.5	0.282
Q-LES-Q-SF score**, mean (SD)	45	15.8	48	16.7	0.185

* Not all column percentages sum to 100% when missing values are present.

† Health literacy categories correspond to total REALM scores of grade 3 or below (REALM score, 0 –18), grade 4 to 6 (REALM score, 19 – 44), grade 7 to 8 (REALM score, 45–60), and grade 9 or above (REALM score, 61–66). (ref – same as in the manuscript)

‡ The most common responses under "other" are not working due to a leave of absence, due to recent release from prison, due to medical leave, due to depression, due to medical reasons, and due to unspecified reasons.

** Q-LES-Q-SF = Quality of Life Enjoyment and Satisfaction Questionnaire. The reported score is the sum of the question responses rescaled (to 100).

†† PHQ-9 = PHQ-9 = Patient Health Questionnaire-9 (ref – same as in the manuscript)

‡‡ Determined by clinical interview by licensed mental health counselor

Supplemental Table 5. ITT Results using MANOVA test

	30 days		
	control	intervention	p-value
Q-LES-Q-SF, *mean (SD)* †	51.94 (20.14)	52.35 (19.59)	0.570
PHQ-9, *mean (SD)* *	10.56 (6.36)	10.00 (6.23)	0.307
PAM-13, *mean (SD)* §	36.30 (13.76)	37.63 (14.30)	0.930
GAD-7, *mean (SD)* ‡	8.58 (6.22)	8.69 (6.35)	0.474

Supplemental Table 6. Complier Average Treatment Effects for Primary Outcomes at 30 and 90 Days

Compliance	Outcome	Coefficient	Std. Error	P-Value
Continuous Compliance				
	Readmissions, 30 days	0.05	0.16	0.742
	Readmissions, 90 days	0.09	0.06	0.108
	Reutilizations, 30 days	0.18	0.11	0.096
	Reutilizations, 90 days	0.07	0.04	0.071
Binary Compliance, >= 1 Dose				
	Readmissions, 30 days	0.12	0.38	0.742
	Readmissions, 90 days	0.47	0.29	0.105
	Reutilizations, 30 days	0.42	0.25	0.093
	Reutilizations, 90 days	0.37	0.2	0.068

Complier average treatment effects were calculated by instrumenting for treatment compliance with treatment assignment and using two-stage regression, with an OLS model for the first stage and a Poisson for the second stage. "Continuous compliance" uses a continuous measure of dosage, from zero doses up to 12 doses. "Binary Compliance" defines compliance as receiving at least one dose of the intervention.

Supplemental Table 7. Readmission & Reutilization Rates by Each Additional Session

30-day Readmission & Reutilization Rates by # Sessions

# of Sessions	control	1	2	3	4
N	343	61	99	52	45
Readmit. Rate	0.10	0.20	0.11	0.06	0.00
IRR (95% CI)		2.04 (1.01 , 3.85)	1.15 (0.56 , 2.21)	0.6 (0.14 , 1.67)	0 (NA , NA)
Reutil. Rate	0.24	0.48	0.31	0.25	0.16
IRR (95% CI)		1.99 (1.28 , 3)	1.31 (0.85 , 1.96)	1.05 (0.56 , 1.81)	0.65 (0.27 , 1.31)

90-day Readmission & Reutilization Rates by Dosage

# of Sessions	control	1	2	3	4	5	6	7	8	9	10	11
N	333	44	27	23	36	26	22	24	20	17	14	9
Readmit. Rate	0.21	0.36	0.19	0.57	0.33	0.54	0.14	0.17	0.1	0.06	0.14	0
IRR (95% CI)		1.71 (0.96 , 2.85)	0.87 (0.3 , 1.94)	2.65 (1.4 , 4.62)	1.56 (0.81 , 2.77)	2.53 (1.37 , 4.34)	0.64 (0.16 , 1.71)	0.78 (0.24 , 1.88)	0.47 (0.08 , 1.49)	0.28 (0.02 , 1.24)	0.67 (0.11 , 2.13)	0 (0 , 0)
Reutil. Rate	0.57	1	0.74	1	0.75	1.08	0.68	0.54	0.25	0.47	0.36	0.22
IRR (95% CI)		1.76 (1.25 , 2.42)	1.31 (0.8 , 2.02)	1.76 (1.11 , 2.66)	1.32 (0.86 , 1.94)	1.9 (1.25 , 2.77)	1.2 (0.68 , 1.96)	0.95 (0.52 , 1.61)	0.44 (0.16 , 0.96)	0.83 (0.37 , 1.57)	0.63 (0.22 , 1.37)	0.39 (0.06 , 1.22)

Supplemental Table 8. As-Treated Analysis - Secondary Outcomes by Number of Sessions of RED-DIntervention

30-Day Secondary Outcomes by # Sessions

| | \[Dependent variable:\] | | | |
| | PHQ-9 | GAD-7 | Q-LES-Q-SF | PAM-13 |
	(1)	(2)	(3)	(4)
# of Sessions	−1.043***	−0.646	2.105*	−0.002
	(0.392)	(0.441)	(1.154)	(0.369)
Age	−0.030	−0.080**	−0.331***	−0.116***
	(0.036)	(0.039)	(0.107)	(0.035)
Gender	−1.715*	−1.238	5.416*	0.443
	(1.033)	(1.164)	(3.052)	(1.008)
MDD	5.194***	5.377***	−15.530***	−1.141
	(0.951)	(1.080)	(2.813)	(0.913)
Observations	141	116	136	133
Adjusted R^2	0.225	0.206	0.227	0.057

Note: *p<0.1; **p<0.05; ***p<0.01

90-Day Secondary Outcomes by # Sessions

| | \[Dependent variable:\] | | | |
| | PHQ-9 | GAD-7 | Q-LES-Q-SF | PAM-13 |
	(1)	(2)	(3)	(4)
# of Sessions	−0.257	−0.067	0.949*	0.310*
	(0.160)	(0.199)	(0.551)	(0.157)
Age	−0.057	−0.064	−0.115	−0.098**
	(0.039)	(0.048)	(0.134)	(0.038)
Gender	0.310	−1.548	0.084	−0.387
	(1.037)	(1.239)	(3.552)	(1.010)
MDD	5.843***	3.889***	−16.344***	−1.024
	(0.961)	(1.171)	(3.291)	(0.940)
Observations	135	105	132	133
Adjusted R^2	0.234	0.108	0.160	0.050

Note: *p<0.1; **p<0.05; ***p<0.01

Tables show coefficients, standard errors, and p-value thresholds for OLS regressions of 30- and 90-day secondary outcomes (PHQ-9, GAD-7, Q-LES-Q-SF, PAM-13) on the number of RED-D sessions completed, controlling forthose variables found to differ across subjects with low versus

high number of sessions (age, gender, and major depressive disorder).