

Supplemental Online Content

Agarwal AK, Southwick L, Gonzales RE, et al. Digital engagement strategy and health care worker mental health: a randomized clinical trial. *JAMA Netw Open*. 2024;7(5):e2410994. doi:10.1001/jamanetworkopen.2024.10994

eFigure 1. Monthly Automated Text Messages Associated With Mental Health and Penn Cobalt Resources And Mental Health Assessments (e.g., PHQ-9 and GAD-7) Appointment Triage Text Messages and Roles

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eTable 1. GLM Model on Complete Cases: 6-Month GAD-7

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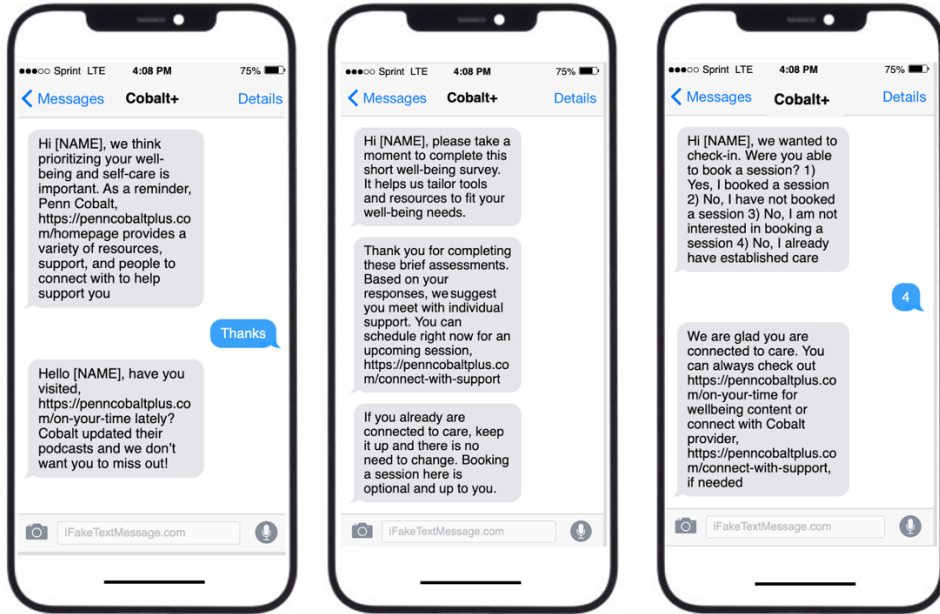
eTable 4. WHO-5 Comparison With Observed Data

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This supplemental material has been provided by the authors to give readers additional information about their work.

eFigure 1. Monthly automated text messages related to mental health and Penn Cobalt resources and mental health assessments (e.g., PHQ-9 and GAD-7) appointment triage text messages.



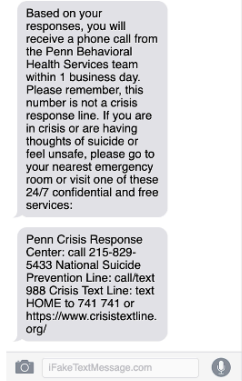
eFigure 2. Mental health assessments (e.g., PHQ-9 and GAD-7) appointment triage messaging

	Mild PHQ9<10 AND GAD7 < 10	Moderate PHQ9>10 and <19 AND GAD7 >10 and <19	Severe PHQ9 >19 OR GAD7 >19	SI PHQ9, Q9 > 0
	<ul style="list-style-type: none"> • Thank you for completing these brief assessments. Your responses suggest that meeting with 1:1 support could be helpful. There are sessions open today and later this week, URL • If you already are connected to care, keep it up and there is no need to change. Booking a session here is optional and up to you. 	<ul style="list-style-type: none"> • Thank you for completing these brief assessments. Based on your responses, we suggest you meet with individual support. You can schedule right now for an upcoming session, URL • If you already are connected to care, keep it up and there is no need to change. Booking a session here is optional and up to you. 	<ul style="list-style-type: none"> • Thank you for completing the brief assessments. Based on your responses, you need individual support. You can schedule right now for an upcoming session, URL. Please remember to sign into Cobalt to see their offerings. • If you are in crisis or having thoughts of suicide or feel unsafe, reply with "A" for 24/7 confidential and free crisis services. • [If A] Please go to your nearest emergency room or visit one of these 24/7 confidential and free services: <ul style="list-style-type: none"> • Penn Crisis Response Center: call 215-829-5433 • National Suicide Prevention Line: call 988 • Crisis Text Line: text HOME to 741 741 or https://www.crisistextline.org 	<ul style="list-style-type: none"> • Hello PARTICIPANT_FIRSTNAME, thank you for completing these brief assessments. Based on your responses, you will receive a phone call from the Penn Behavioral Health Services team within 1 business day. • Please remember, this number is not a crisis response line. If you in crisis or are having thoughts of suicide or feel unsafe, please go to your nearest emergency room or visit one of these 24/7 confidential and free services: <ul style="list-style-type: none"> • Penn Crisis Response Center: call 215-829-5433 • National Suicide Prevention Line: call 988 • Crisis Text Line: text HOME to 741 741 or https://www.crisistextline.org/
Two Days Later	<p>Hi [NAME], we wanted to check-in. Were you able to book a session?</p> <p>A. Yes, I booked a session</p> <ul style="list-style-type: none"> • [If A] Glad to hear <p>B. No, I have not booked a session</p> <ul style="list-style-type: none"> • [If B] You can schedule right now for an upcoming appointment, URL. Please remember to sign into Cobalt to see their offerings. Need help booking an appointment? If yes, text Y. <p>C. No, I am not interested in booking a session</p> <ul style="list-style-type: none"> • [If C] Not a problem. Could you tell us why not? <p>D. No, I already have established care</p> <ul style="list-style-type: none"> • [If D] We are glad you are connected to care. You can always check out URL for wellbeing content or connect with Cobalt provider, URL, if needed. Please remember to sign into Cobalt to see their offerings. 			<p>Hi [NAME], we wanted to check in. Were you able to speak to someone from the Penn Behavioral Health Services team / EAP?</p> <p>A. Yes</p> <p>B. No</p>

eFigure 3. Safety and Suicidality

Participant Facing

Participant expresses SI and immediately receives resources



After 72 hours, all participants receive a follow-up text message and tailored resources based on their response

Answers Yes

Hi [NAME], we wanted to check in. Were you able to speak to someone from the Penn Behavioral Health Services team / EAP?

Yes

Great glad to hear

Answers No

Hi [NAME], we wanted to check in. Were you able to speak to someone from the Penn Behavioral Health Services team / EAP?

No

Okay, thanks for letting us know.

This is not a crisis response line. If you are in crisis or are having thoughts of suicide or feel unsafe, please go to your nearest emergency room or visit one of these 24/7 confidential and free services - Penn Crisis Response Center: call 215-829-5433 - National Suicide Prevention Line: call 1-800-273-8255 - Crisis Text Line: text HOME to 741 741 or https://www.crisistextline.org/

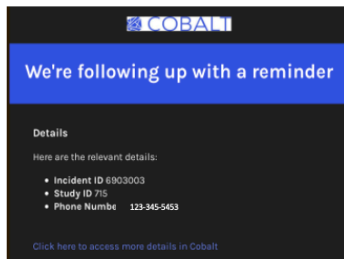
No Response

Based on your responses, you will receive a phone call from the Penn Behavioral Health Services team within 1 business day. Please remember, this number is not a crisis response line. If you are in crisis or are having thoughts of suicide or feel unsafe, please go to your nearest emergency room or visit one of these 24/7 confidential and free services:

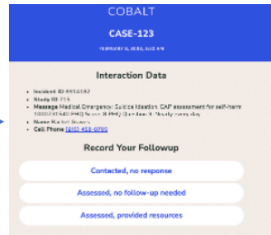
Penn Crisis Response Center: call 215-829-5433 National Suicide Prevention Line: call/text 988 Crisis Text Line: text HOME to 741 741 or https://www.crisistextline.org/

Employee Assistance Provider (EAP) Internal Workflow

1). EAP receives email alert



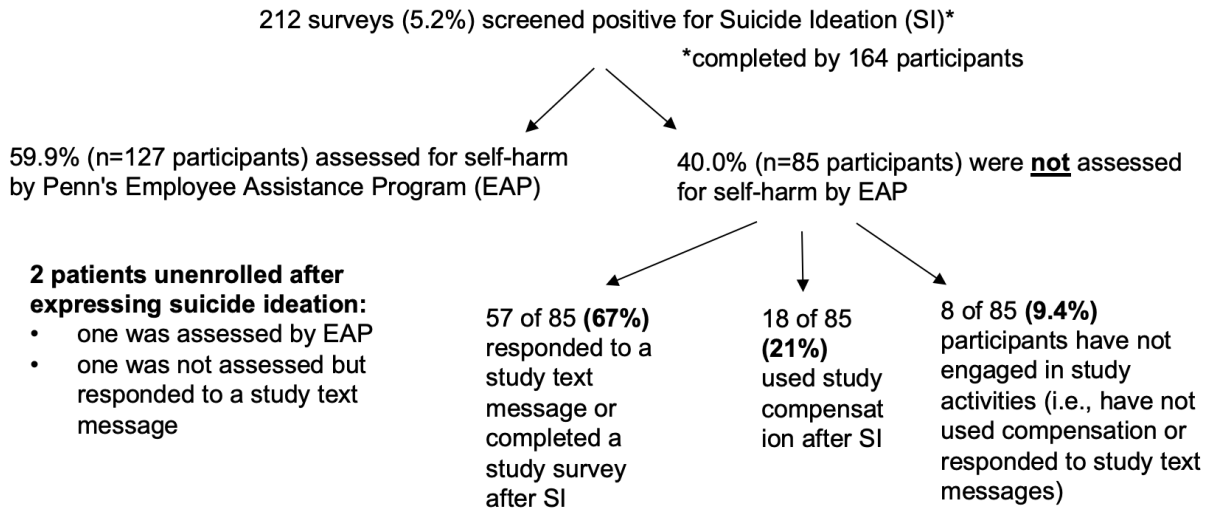
2). EAP providers logs into Penn Cobalt platform for user information to conduct safety assessment and records action taken



If user is "Contacted, no response" EAP receives email alert until user is contacted.

At most 3 emails in 72 hours

eFigure4. Safety and Suicidality findings



eTable 1. GLM model on complete cases: 6-month GAD-7

Variables	β (95% CI)	P value
Arm assignment	-0.67 (-1.13, -0.16)	0.01
Baseline GAD-7 score	0.60 (0.55, 0.65)	<.0001
Age	-0.01 (-0.03, 0.01)	0.29
Female	0.44 (-0.24, 1.13)	0.20
<u>Race-Ethnicity</u>		
Asian	-0.34 (-1.24, 0.55)	0.45
Black	0.17 (-0.41, 0.76)	0.56
Other	-0.06 (-1.38, 1.25)	0.92
White	0	.
Hispanic	0.48 (-0.64, 1.60)	0.40
Married or with partner	0.08 (-0.43, 0.59)	0.76

Participant Roles

Role	Control (%)	Intervention (%)	Total (%)
Nurses	210 (50)	206 (50)	416 (33)
Physicians & Advance Practice Providers	85 (49)	89 (51)	174 (14)
Technicians (lab, pharmacy, radiology)	71 (47)	80 (53)	151 (12)
Registration Staff	54 (44)	68 (56)	122 (10)
Hospital and Outpatient Support (unit clerk, patient coordinator)	58 (50)	58 (50)	116 (9)
Clinical Research	38 (47)	43 (53)	81 (6)
Food and Environmental Services	33 (55)	27 (45)	60 (5)
Medical Assistants	22 (51)	21 (49)	43 (3)
Therapists (occupational, physical, speech, respiratory, nutritionist)	23 (52)	21 (48)	44 (3)
Social Work and Behavioral Health	13 (43)	17 (57)	30 (2)
Pharmacists	26 (68)	12 (32)	38 (3)
Total	633	644	1,275

eTable 2. Anxiety and Depression Comparison with Imputed Data
Paired t-test & arm comparison for GAD7, using imputed data

	Control	Intervention	Total	Difference	P Value
# of participants	633	642	1275		
GAD7_bl, mean (std)	5.79 (4.77)	6.03 (4.88)	5.91 (4.83)	0.24 (-0.29,0.77)	0.3723
6-month					
GAD7_6m, mean (std)	5.57 (5.34)	5.07 (4.97)	5.32 (5.40)	-0.50 (-1.04, 0.04)	0.0686
6-month change, mean (std)	-0.22 (4.71)	-0.96 (4.65)	-0.59 (4.96)	-0.74 (-1.23, -0.26)	0.0027
6-month change, 95% CI	(-0.59, 0.15)	(-1.32, -0.60)	(-0.87, -0.32)		
Paired t-test P-value	0.2418	<.0001	<.0001		
9-month					
GAD7_9m, mean (std)	4.95 (4.81)	4.32 (4.74)	4.63 (4.69)	-0.62 (-1.16, -0.08)	0.0237
9-month change, mean (std)	-0.85 (4.71)	-1.71 (4.48)	-1.28 (4.51)	-0.86 (-1.38, -0.34)	0.0012
9-month change, 95% CI	(-1.21, -0.48)	(-2.06, -1.36)	(-1.53, -1.03)		
Paired t-test P-value	<.0001	<.0001	<.0001		

Paired t-test & arm comparison for PHQ9, using imputed data

	Control	Intervention	Total	Difference	P Value
# of participants	633	642	1275		
PHQ9_bl, mean (std)	5.71 (4.74)	5.92 (5.19)	5.81 (4.97)	0.21 (-0.34, 0.76)	0.4514
6-month					
PHQ9_6m, mean (std)	5.40 (5.36)	4.81 (5.56)	5.10 (5.22)	-0.60 (-1.23, 0.04)	0.0649
6-month change, mean (std)	-0.31 (4.84)	-1.11 (5.54)	-0.71 (4.96)	-0.81 (-1.41, -0.20)	0.01
6-month change, 95% CI	(-0.69, 0.07)	(-1.55, -0.68)	(-0.99, -0.44)		
Paired t-test P-value	0.1137	<.0001	<.0001		
9-month					
PHQ9_9m, mean (std)	5.02 (4.88)	4.28 (5.04)	4.64 (4.91)	-0.74(-1.29, -0.19)	0.0086
9-month change, mean (std)	-0.69 (4.42)	-1.64 (4.77)	-1.17 (4.55)	-0.95(-1.46, -0.44)	0.0003
9-month change, 95% CI	(-1.04, -0.35)	(-2.01, -1.27)	(-1.42, -0.92)		
Paired t-test P-value	<.0001	<.0001	<.0001		

eTable 3: Well Being Index Comparison with Observed Data

	Control	Intervention	Total	Difference	P Value
# of participants	633	642	1275		
WBI9_bl, mean (std)	2.70 (2.33)	2.72 (2.23)	2.71(2.28)	0.02 (-0.23, 0.27)	0.896
6-month					
# of non-missing records	528	484	1012		
WBI9_bl, mean (std)	2.70 (2.32)	2.64 (2.22)	2.67 (2.27)	-0.06 (-0.34, 0.22)	0.6815
WBI9_6m, mean (std)	2.24 (2.30)	2.05 (2.34)	2.15 (2.32)	-0.19 (-0.48, 0.10)	0.1912
6-month change, mean (std)	-0.46 (2.14)	-0.59 (2.20)	-0.52 (2.17)	-0.13 (-0.40, 0.14)	0.332
6-month change, 95% CI	(-0.64, -0.27)	(-0.79, -0.39)	(-0.65, -0.39)		
Paired t-test P-value	<.0001	<.0001	<.0001		
9-month					
# of non-missing records	498	473	971		
WBI9_bl, mean (std)	2.66 (2.34)	2.66 (2.25)	2.66 (2.29)	0.00 (-0.29, 0.29)	0.9956
WBI9_9m, mean (std)	2.14 (2.26)	1.72 (2.34)	1.94 (2.30)	-0.42 (-0.71, -0.13)	0.0043
9-month change, mean (std)	-0.52 (2.15)	-0.95 (2.43)	-0.73 (2.30)	-0.42 (-0.71, -0.13)	0.0043
9-month change, 95% CI	(-0.71, -0.33)	(-1.16, -0.73)	(-0.87, -0.58)		
Paired t-test P-value	<.0001	<.0001	<.0001		

eTable4: WHO-5 Comparison with Observed Data

	Control	Intervention	Total	Difference	P Value
# of participants	633	642	1275		
WHO5_bl, mean (std)	13.13 (5.33)	13.10 (5.26)	13.12 (5.29)	-0.03 (-0.61, 0.56)	0.9323
6-month					
# of non-missing records	508	461	969		
WHO5_bl, mean (std)	13.08 (5.36)	13.11 (5.24)	13.10 (5.30)	0.03 (-0.63, 0.70)	0.92
WHO5_6m, mean (std)	13.88 (5.23)	14.15 (5.43)	14.01 (5.33)	0.27 (-0.40, 0.95)	0.4246
6-month change, mean (std)	0.80 (4.67)	1.03 (4.61)	0.91 (4.64)	0.24 (-0.35, 0.83)	0.4228
6-month change, 95% CI	(0.39, 1.20)	(0.61, 1.46)	(0.62, 1.20)		
Paired t-test P-value	0.0001	<.0001	<.0001		

eTable 5: Leaps Comparison with Observed Data

	Control	Intervention	Total	Difference	P Value
# of participants	633	642	1275		
LEAPS_bl, mean (std)	4.43 (4.00)	4.51 (4.28)	4.47 (4.14)	0.08 (-0.38, 0.53)	0.7366
6-month					
# of non-missing records	517	473	990		
LEAPS_bl, mean (std)	4.44 (4.01)	4.43 (4.34)	4.44 (4.17)	-0.01 (-0.53, 0.52)	0.983
LEAPS_6m, mean (std)	5.25 (4.08)	4.94 (4.34)	5.10 (4.20)	-0.31 (-0.84, 0.21)	0.2428
6-month change, mean (std)	0.81(4.29)	0.51 (4.64)	0.67 (4.46)	-0.31 (-0.86, 0.25)	0.28
6-month change, 95% CI	(0.44, 1.19)	(0.09, 0.93)	(0.39, 0.95)		
Paired t-test P-value	<.0001	0.0178	<.0001		
9-month					
# of non-missing records	494	467	961		
LEAPS_bl, mean (std)	4.40 (3.94)	4.45 (4.28)	4.43 (4.11)	0.05 (-0.47, 0.57)	0.8535
LEAPS_9m, mean (std)	5.15 (4.30)	4.17 (3.93)	4.67 (4.15)	-0.97 (-1.50, -0.45)	0.0003
9-month change, mean (std)	0.74 (4.62)	-0.28 (4.12)	0.25 (4.41)	-1.02 (-1.58, -0.47)	0.0003
9-month change, 95% CI	(0.33, 1.15)	(-0.65, 0.09)	(-0.03, 0.52)		
Paired t-test P-value	0.0004	0.1416	0.0848		

eTable 6: GEE with AR(1)

