Completed

Nudge *Personalized Patient Data and Behavioral Nudges to Improve Adherence to Chronic Cardiovascular Medications*

- Patient-level randomized pragmatic trial comparing the effects of digital interventions (text messages and chat bot) on **medication adherence** in patients with chronic cardiovascular conditions
- 3 health systems

Nudge

JAMA | Original Investigation

Personalized Patient Data and Behavioral Nudges to Improve Adherence to Chronic Cardiovascular Medications
A Randomized Pragmatic Trial

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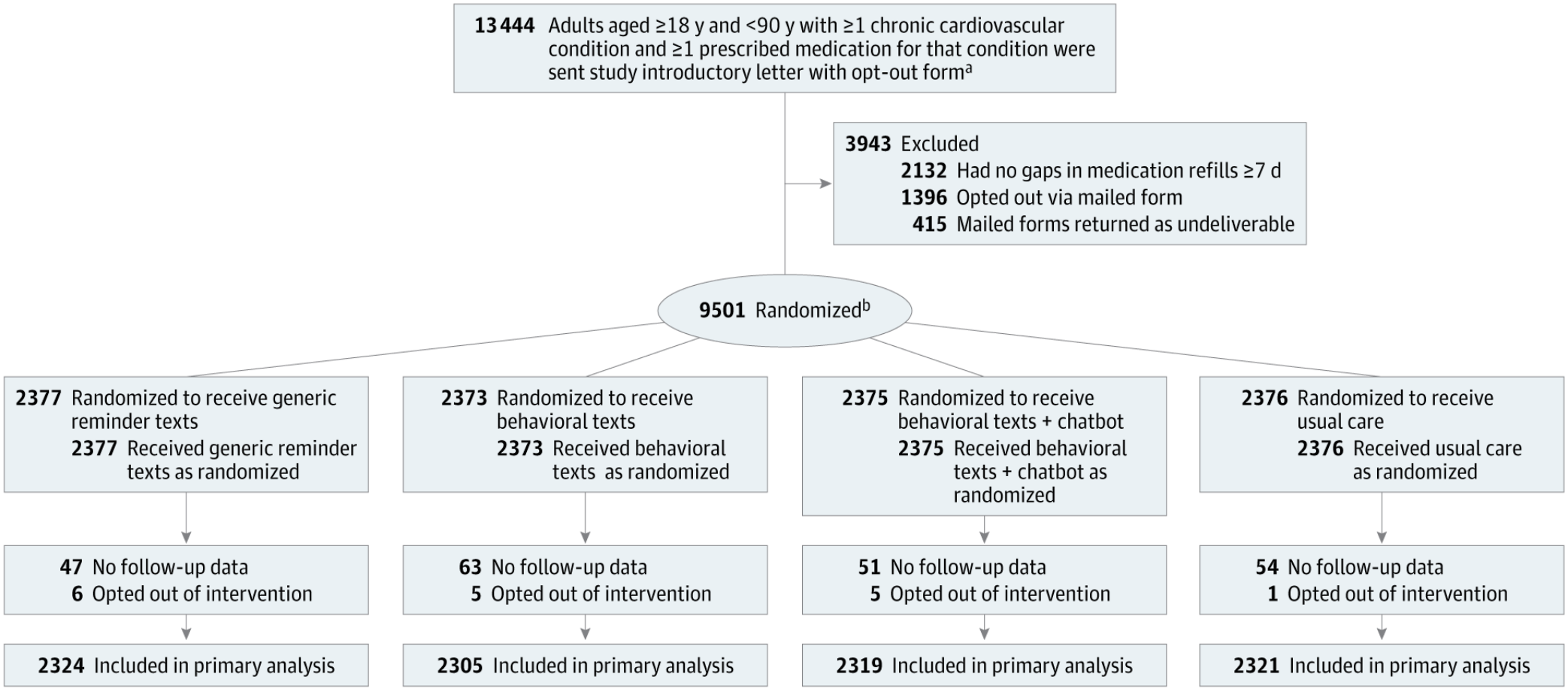
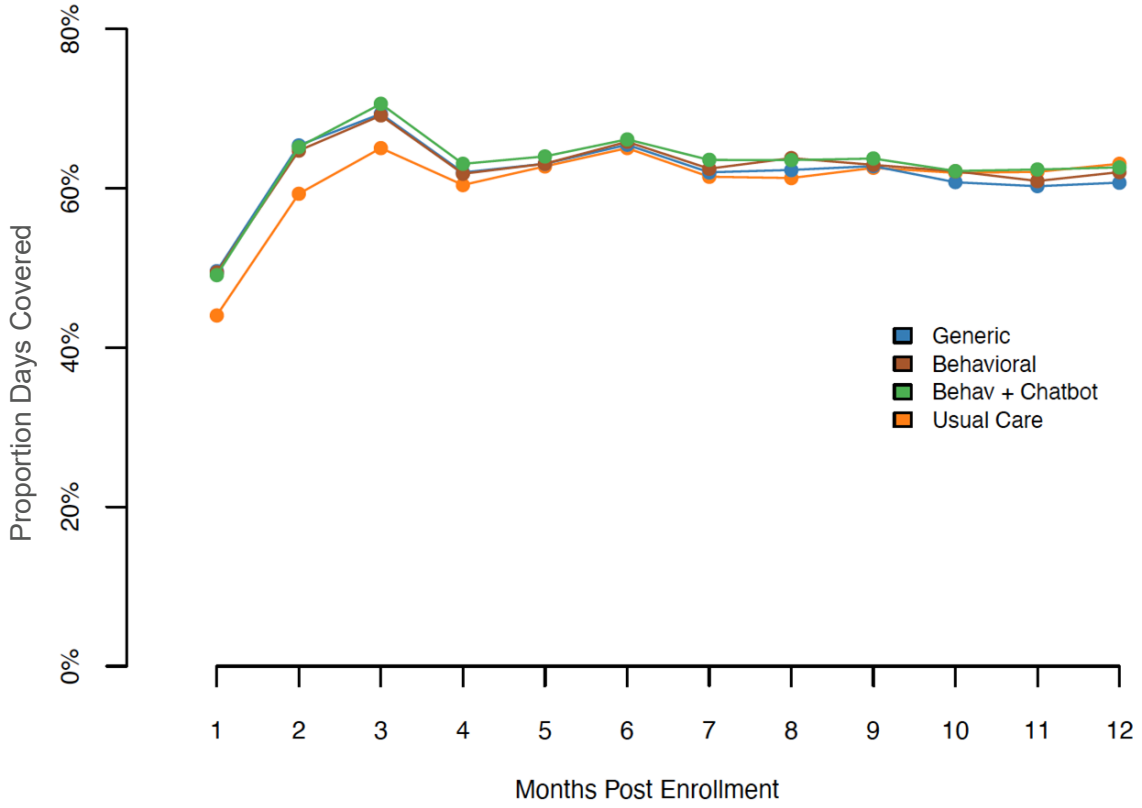
From: **Personalized Patient Data and Behavioral Nudges to Improve Adherence to Chronic Cardiovascular Medications: A Randomized Pragmatic Trial**

JAMA. 2025;333(1):49-59. doi:10.1001/jama.2024.21739

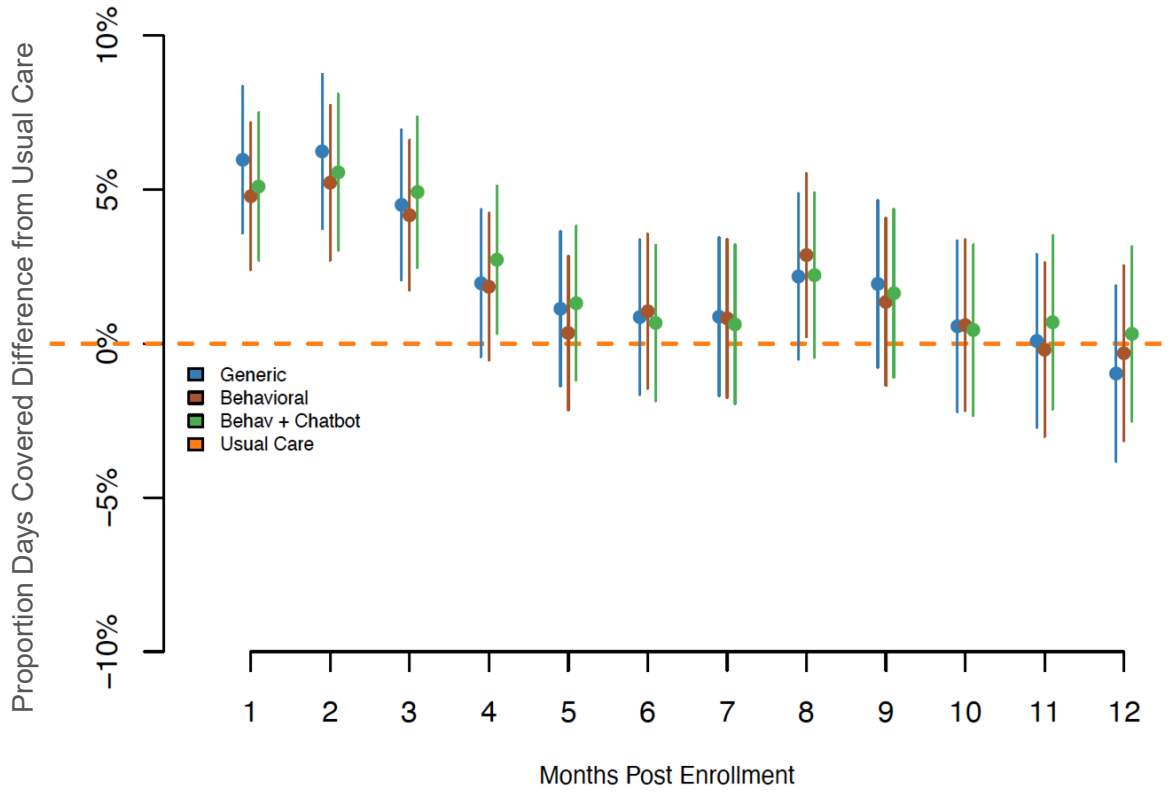


MAIN STUDY FINDINGS

Monthly proportion days covered stratified by treatment group



Adjusted difference in proportion days covered from Usual Care stratified by follow-up month



Primary Outcome: PDC at 12-months

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Table 2. Differences in Mean Proportion of Days Covered From Usual Care

Primary analysis outcome	Unadjusted proportion of days covered, %[a]				Adjusted absolute difference (from usual care) in percentage points of the proportion of days covered[b]					
	Generic reminder text (n = 2324)	Behavioral nudge text (n = 2305)	Behavioral nudge text + chatbot (n = 2319)	Usual care (n = 2321)	Generic reminder text		Behavioral nudge text		Behavioral nudge text + chatbot	
					Difference (95% CI)	*P* value	Difference (95% CI)	*P* value	Difference (95% CI)	*P* value
3 Mo	61.4	61.1	61.6	56.2	5.6 (3.4-7.8)	<.001[c]	4.8 (2.5-7.0)	<.001[c]	5.2 (3.0-7.4)	<.001[c]
12 Mo	62.0	62.3	63.0	60.6	2.2 (0.3-4.2)	.02	2.0 (0.1-3.9)	.04	2.3 (0.4-4.2)	.02

[a] Analyses adjusted for health care system, number of medications gapping at baseline. Patients active taking multiple study medications had all combinations of follow-up days for all baseline medications counted in the denominator and days that medications were filled counted in the numerator.

[b] Analyses adjusted for health care system, number of medications gapping at baseline, treatment group, follow-up month, patient demographics including age, gender, race, ethnicity, insurance status, marital status as well as comorbidity variables including hypertension, hyperlipidemia, coronary artery disease, diabetes, atrial fibrillation, chronic heart failure, chronic kidney disease, cerebrovascular disease, prior myocardial infarction, prior revascularization, depression, posttraumatic stress disorder, and substance abuse.

[c] Indicates significant result with adjusted level of significance (.05/3).

Table 3. Mean Difference in Median Gap Lengths in Days From Usual Care

Secondary analysis	Gap length, median (IQR), d				Mean difference (from usual care) in medians					
	Generic reminder text (n = 2324)	Behavioral nudge text (n = 2305)	Behavioral nudge text + chatbot (n = 2319)	Usual care (n = 2321)	Generic reminder text		Behavioral nudge text		Behavioral nudge text + chatbot	
					Difference (95% CI)	*P* value	Difference (95% CI)	*P* value	Difference (95% CI)	*P* value
Initial gap[a]	9 (1-55)	9 (1-62)	10 (1-59)	15 (1-85)	5 (3-7)	<.001[b]	5 (3-7)	<.001[b]	5 (3-7)	<.001[b]
All subsequent gap(s)[c]	16 (6-56)	17 (6-59)	15 (6-56)	20 (8-58)	4 (1-6)	.01[b]	3 (0-6)	.06	4 (2-7)	.01[b]

[a] Refers to gaps in analysis.

[b] Indicates significant result with adjusted level of significance (.05/3).

[c] All gaps following the initial enrollment gap were tracked individually and assessed time from the start of the gap to a fill. Subsequent gaps exclude the initial gap.

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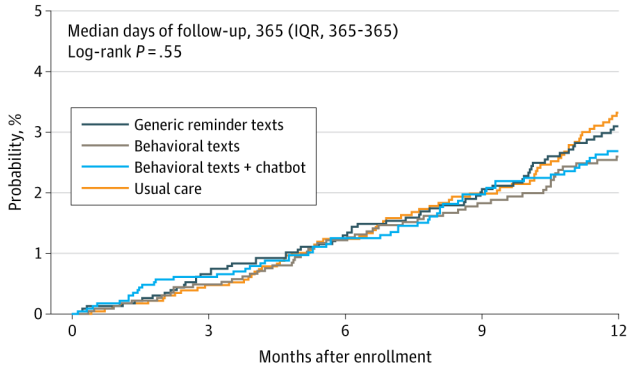
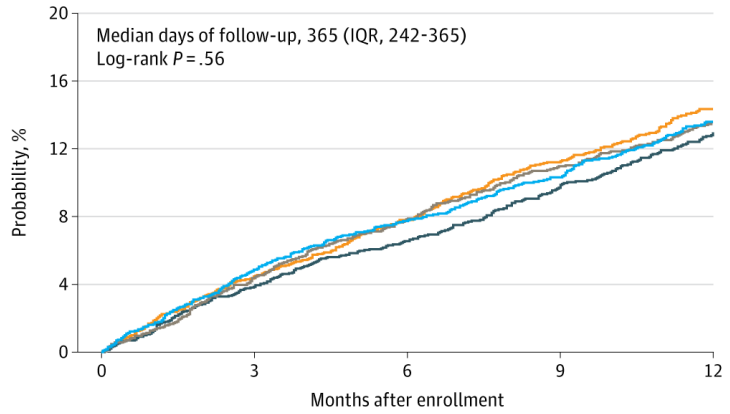
A Death



No. of patients

Generic reminder texts	2324	2249	2067	1811	1771
Behavioral texts	2305	2239	2060	1800	1769
Behavioral texts + chatbot	2319	2252	2064	1800	1766
Usual care	2321	2284	2103	1845	1805

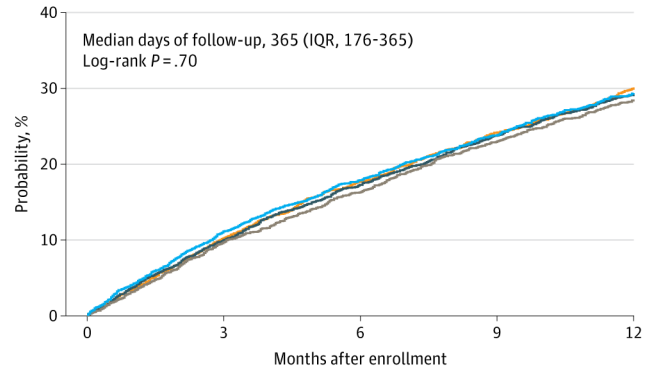
B Hospitalization



No. of patients

Generic reminder texts	2324	2163	1936	1647	1563
Behavioral texts	2305	2147	1914	1618	1551
Behavioral texts + chatbot	2319	2147	1908	1626	1546
Usual care	2321	2184	1946	1657	1576

C Emergency department visits



No. of patients

Generic reminder texts	2324	2023	1717	1405	1281
Behavioral texts	2305	2031	1736	1400	1287
Behavioral texts + chatbot	2319	2007	1696	1380	1262
Usual care	2321	2053	1735	1412	1279

Kaplan-Meier Rates for Secondary Clinical Outcomes Stratified by Treatment Group

CONCLUSIONS

- At 12 months, text message reminders did not improve medication refill adherence
- At 3 months, refill adherence was 5% higher and median length of gaps was shorter by 5 days for all intervention groups compared with usual care (post hoc analysis)
- Limitations
  - Engagement with text messages not known
  - Potential incomplete capture of pharmacy refill data
  - Text messaging system not integrated with healthcare system pharmacy
  - Primary outcome not sensitive to intervention

Lessons Learned

- Opt-out enrollment is feasible and drop out rates lower than expected
  - Enrolled patients historically underrepresented in clinical trials
- Patients generally satisfied with text messages
  - Preferred positive messages; disliked humor and emojis
- Clinical burden for pharmacists were low
  - Questions mainly related to refill logistics and costs
- Making primary outcome more proximal to the intervention delivery
- Patient engagement in the intervention is a challenge and any engagement was associated with improved adherence
- Text messages interventions can be a low cost intervention among a suite of interventions to improve medication adherence
- Health system integration is a challenge but likely to be beneficial

Considerations

- Rapid advances in technology; how to take advantage of these advances in light of the time lag between grant submission to funding?
- How much flexibility to modify/adapt intervention/outcome following UG3 pilot and prior to UH3 launch?

Future of Medication Adherence Research

- Leverage EHR and other data for more personalized interventions
  - Timing/type/intensity of intervention needs to be flexible and adaptable depending on patient context
  - Multi-modal interventions better
  - Just-in-time interventions
- Layered approach to adherence interventions from population wide to more specific patient populations
- Integration of interventions within the EHR
- Integration of interventions within health system infrastructure (e.g., clinical support when needed)