# Preventing No-shows with Pre-Appointment "Reserved for You" Nudges

Study Protocol with SAP

NCT07829432

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# Study Protocol

## Scientific Background

No-shows are a problem for health systems because they prevent appointment slots from being used by other patients waiting to be seen. Canceling at least 48 hours in advance of the appointment time helps ensure improved access for those patients who are waiting, as well as potentially improving the chances that the canceling patients will eventually be seen (by encouraging rescheduling).

Additionally, prior research suggests that telling patients a vaccine is "reserved for you" increases vaccine uptake (e.g., Milkman et al., 2021). However, it is unclear whether "reserved for you" language also motivates other health behaviors, like attending appointments.

In this study, the team will assess whether reminder messages, both including and not including “reserved for you” language, reduce the rate of no-shows to appointments. An algorithm in Epic attempts to predict which patients are at high risk for no-showing to their appointments, and these patients will be targeted for this initiative.

## Objectives

In the present study, Geisinger sent pre-appointment text messages or MyChart messages to patients predicted to be at high risk for no-showing to their appointment (>50% likely to no-show according to the algorithm). One message version indicated the appointment is "reserved" for the patient; another version was nearly identical but did not include the "reserved" language. A passive control group was not sent messages.

## Design

This initiative is a randomized controlled trial with three study arms. Patients identified as being at high risk for no-showing to their appointment (>50% likely to no-show according to the algorithm) were randomized to either a passive control arm, a message without “reserved” language arm, or a message with “reserved” language arm.

## Methods

The target sample size is 17,376 patients.

All patients in the study were sent standard appointment reminder messages from the system.

Patients were randomized to one of three study arms:

1. Passive Control – Sent standard appointment reminders only
2. Message, Not Reserved – In addition to standard appointment reminders, sent a message encouraging them to reschedule or cancel their appointment if they cannot attend so the slot can be offered to another patient
3. Message, Reserved – In addition to standard appointment reminders, sent a message encouraging them to reschedule or cancel their appointment if they cannot attend so the slot can be offered to another patient AND mentioning that the appointment is reserved for them

Messages were sent 10 days pre-appointment via MyChart or text message based on patient communication preferences.

Patients can be sent messages for multiple appointments as long as they meet enrollment criteria. For the primary analysis, we will include only the first appointment for every unique patient.

**Power Analysis**

With 17,376 patients (approximately 5,792 per arm), we would have 80% power to detect a 2% absolute decrease in no-shows between any two arms, with two-tailed alpha of .05, assuming a 19% baseline rate of no-shows in this patient population.

**Message Modalities**

Outreach in the high-risk group was completed by the Marketing team, using filters for patient contact preferences (MyChart message, text message) and language (English, Spanish) for patients in the outreach group.

**Project Status**

All intervention messages have been sent. The first messages were sent on 9/22/26 and all messages were sent by 10/12/26.

Data collection is ongoing within the health system, and the study team has not yet obtained or analyzed any outcome data from the study.

# Statistical Analysis Plan

## Planned Analyses

***Primary Outcome*:** No-showed to the target appointment occurring 10 days after the message was sent (y/n) [Time Frame: 1 day (10 days following the message date, falling between 9/22/26 and 10/13/26)]

**Question 1:** Can pre-appointment messages decrease no-show rates?

*Analysis 1a (Confirmatory):* We will test the hypothesis that either message version on its own can decrease no-show rates relative to sending no message (passive control). We will estimate the effect of the intervention using an OLS regression with a binary indicator for whether the patient no-showed to the target appointment, and a categorical predictor with three levels (0= passive control [baseline], 1 = not reserved, 2 = reserved).

*Analysis 1b (Confirmatory):* We will test the hypothesis that sending any message can decrease no-show rates compared with sending no message (passive control). We will run a separate OLS regression to test whether the no-show rate varies as a function of a binary predictor variable (0 = passive control [baseline], 1 = either message version).

**Question 2:** Is informing patients that their appointment is “reserved” for them more effective than a reminder without “reserved” language at decreasing the likelihood that they will no-show to that appointment?

*Analysis 2 (Exploratory):* We will test the hypothesis that the “reserved for you” messaging is more effective at decreasing no-show rates than a reminder message about a patient’s upcoming appointment that does not include “reserved” language. We will compare the effect of the reserved message to the not reserved message using an OLS regression with a binary indicator for whether the patient no-showed to the target appointment and a categorical predictor with two levels (0 = not reserved [baseline], 1 = reserved).

***Other Pre-specified Outcomes*:**

We will run the analysis described above on the following additional outcomes:

1. Canceled or rescheduled more than 2 days pre-appointment (y/n) [Time Frame: On the message date or in the 7 subsequent days (8 days total)]

    Whether the patient either canceled or rescheduled more than 2 days pre-appointment

2. Canceled or rescheduled 2 or fewer days pre-appointment (y/n) [Time Frame: In the 2 days pre-appointment or on the appointment date (3 days total)]

    Whether the patient either canceled or rescheduled 2 or fewer days pre-appointment

3. Attended the originally scheduled appointment (y/n) [Time Frame: 1 day (10 days following the message date)]

    Whether or not the patient attended the appointment as originally scheduled

## Analysis notes

The planned analysis aims to examine whether the patient no-shows to an appointment falling 10 days after the reminder message for that appointment is sent, but if the patient has multiple appointments on that day, we will not have data on which appointment the reminder message corresponded to. Therefore, if a patient has multiple appointments on the target date, we will conduct our primary analysis on their first appointment that day. We will follow up with exploratory analyses on all appointments occurring on the target day.

Additionally, patients can be sent messages on multiple days if they meet enrollment criteria more than once. The primary analysis will include only the first appointment date for each patient, but follow-up exploratory analyses may include all appointment dates.

Recent work suggests that OLS regressions are appropriate in randomized experiments with binary outcome variables such as ours (Gomilla, 2021). We will report heteroskedasticity-robust standard errors.

## Additional Exploratory Analyses

1. Age

   Our dataset includes patients as young as 10 months old. Because children's appointments are managed by a parent or guardian until at least age 13, when adolescents have the option to include parents as a proxy to see their communications, we will evaluate whether responsiveness to our intervention varies as a function of age, particularly before age 13 when parents receive communications, between ages 13 and 17 when patients are still minors but can manage their own communications, and adults age 18 and up.

   To test the relation between no-shows and age, we will run an OLS regression including binned age (0-12, 13–17, 18+) as a categorical predictor.

   Finally, we will test for an interaction between age and study arm, as parents of young children, teens, and adults may be differentially receptive to "reserved for you" appointment messaging.

## References

Gomila, R. (2021). Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis. *Journal of Experimental Psychology: General, 150*(4), 700–709. https://doi.org/10.1037/xge0000920

Milkman, K. L., Patel, M. S., Gandhi, L., Graci, H. N., Gromet, D. M., Ho, H., ... & Duckworth, A. L. (2021). A megastudy of text-based nudges encouraging patients to get vaccinated at an upcoming doctor's appointment. *Proceedings of the National Academy of Sciences*, 118(20), e2101165118.