

Non-response to Communication Technology Outreach for Beta-agonist Overuse in a Pragmatic Randomized Trial of Patients with Asthma

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INTRODUCTION

Evidence suggests that communication technology applications can improve treatment adherence.¹ However, a recent Cochrane Review concluded insufficient evidence exists to determine the effects of automated communication on managing chronic conditions such as asthma.² Because not all patients are receptive to communication technology interventions, defining factors associated with non-response to electronic outreach can inform tailoring future interventions to increase effectiveness. As part of a pragmatic trial targeting asthma patients with too frequent refills of inhaled beta-agonists (“overfill”),³ the objective of this work was to describe and compare patients who did versus did not respond to a communication technology outreach. A higher asthma medication ratio (AMR), defined as the ratio of asthma controller medications (numerator, e.g., inhaled corticosteroids) to total controller medications plus inhaled beta-agonists (denominator), is associated with better asthma outcomes.⁴ We hypothesized that patients who did not respond to outreach would have a lower AMR than patients who did respond.

METHODS

This work was conducted at Kaiser Permanente Colorado (KPCO), an integrated healthcare system with approximately 600,000 members in the Denver-Boulder area. In KPCO usual care, when a patient refills a beta-agonist more frequently than every 60 days, an asthma care coordinator (ACC) is notified through the electronic health record (EHR) for patient follow-up. Because there are many reasons a patient could overfill (e.g., extra inhaler for gym), knowledge of current asthma

symptoms is important, but unavailable to the ACC until after s/he contacts the patient. The electronic outreach was designed to determine whether the patient currently had symptoms to guide further contact.

The study included members aged ≥ 18 diagnosed with persistent asthma and without chronic obstructive pulmonary disease. Patients were randomized 1:1 to receive a question about symptoms by text/call (call if phone was not text-enabled) or email if they overfilled from 2/9/2017 through 11/8/2017. Patients who responded they had symptoms were contacted by an ACC; patients without symptoms were not contacted. Patients who did not respond were contacted by an ACC if the ACC had not contacted them in the last 90 days and there was EHR evidence of a recent exacerbation (i.e., asthma-related corticosteroid burst, urgent care or emergency department visit, or hospitalization).

We compared responders and non-responders on characteristics, asthma exacerbations, and AMR the year prior to outreach. In univariable comparisons, Chi-square, Fisher’s exact, or the Mann-Whitney test was used. We ran a multi-variable model and selected variables that individually explained $\geq 5\%$ of the full model log-likelihood⁵ for presentation in a smaller, adjusted model estimating Relative Risks (RR) and 95% confidence intervals (95% CI) of non-response. Statistical analyses employed SAS version 9.4 (SAS Institute Inc., Cary, NC).

The KPCO Institutional Review Board approved this study. The requirement for informed consent was waived.

RESULTS

Altogether, 420 of 4953 (8.5%) patients randomized to text ($N=284$)/call ($N=136$) and 398 of 5046 (7.9%) patients randomized to email overfilled a beta-agonist and received outreach. Non-responders had a lower mean AMR ($P=0.019$) (Table 1). Other characteristics associated with non-response included email outreach ($P<0.001$), less than high school education ($P=0.021$), lower family income ($P<0.001$), and missed appointments ($P=0.008$).

Table 1 Characteristics of patients with asthma who did and did not respond to automated electronic beta-agonist overfill outreach

Characteristic*	Responded N=407	Did not respond N=411	P value†
Asthma medication ratio (AMR), mean (SD)	0.46 (0.28)	0.42 (0.27)	0.02
Beta-agonist overfill outreach type, %			<0.001
Email	40.0	57.2	
Text/call (if phone was not text-enabled)	60.0	42.8	
Age in years, mean (SD)	49.2 (15.2)	48.0 (16.0)	0.33
Female, N (%)	233 (57.2)	249 (60.6)	0.36
Race, %			0.36
Asian	2.9	2.2	
African American	5.4	7.3	
American Indian/Alaskan	0.7	0.7	
Native			
White	73.0	66.7	
Other	5.7	7.3	
Unknown	12.3	15.8	
Hispanic ethnicity, % yes	13.5	18.5	0.05
Body mass index (BMI) in kg/m ² , %			0.47
<18.5	1.0	0.7	
18.5–24.9	17.9	20.4	
25–29.9	34.9	29.2	
30–34.5	22.1	23.6	
35–39.5	11.3	14.1	
≥40	12.8	11.7	
Tobacco use, %			0.71
Current smoker	9.1	10.7	
Former smoker	32.9	31.4	
Never smoker	57.5	56.9	
Elixhauser comorbidity score ⁽⁶⁾ , mean (SD)	5.4 (9.3)	6.3 (9.8)	0.17
Less than high school education, % in census block	9.4	10.7	0.02
Family income, median \$ (5th, 95th %ile)	85,421 (42,083, 135,054)	78,554 (39,099, 128,494)	<0.001
Total number of ambulatory visits per patient, mean (SD)	5.9 (7.8)	5.4 (6.3)	0.97
Ambulatory appointments missed, % of patients			0.01
None	69.5	61.3	
1	18.4	19.0	
≥2	12.0	19.7	
Total number of asthma-related after-hour visits, emergency department visits, and/or hospitalizations per patient, mean (SD)	0.1 (0.3)	0.1 (0.4)	0.66
Beta-agonist canisters dispensed, mean (SD)	5.1 (4.0)	5.5 (4.8)	0.12
Short-acting corticosteroid inhalers dispensed, mean (SD)	6.2 (5.7)	5.5 (5.3)	0.15
Oral/injectable corticosteroid bursts, % with ≥1	17.4	20.9	0.22

*Unless specified, characteristics were determined for the 12 months prior to outreach

†Chi-square or Fisher's exact test for dichotomous variables, Mann-Whitney test for continuous variables

In adjusted analysis, non-response was associated with email outreach (RR 1.41, 95% CI 1.22, 1.61) and ≥2 missed appointments (RR 1.28, 95% CI 1.09, 1.51) (Table 2). RR indicated lower AMR and lower family income were associated with non-response, although both 95% CI included 1.00 (Table 2).

Table 2 Relative Risks of not responding to an automated electronic beta-agonist overfill outreach among patients with asthma

Characteristic	Unadjusted Relative Risk (95% CI)	Adjusted Relative Risk (95% CI)*
Higher asthma medication ratio†	0.92 (0.86, 0.99)	0.93 (0.87, 1.00)
Beta-agonist outreach type (reference—text/phone)	1.41 (1.23, 1.62)	1.40 (1.22, 1.61)
Hispanic ethnicity (reference—no/unknown)	1.19 (1.01, 1.40)	1.15 (0.97, 1.36)
Less than high school education (reference—high school or higher education)	1.71 (0.96, 3.04)	0.89 (0.43, 1.85)
Higher median family income	0.89 (0.83, 0.96)	0.91 (0.83, 1.00)
Ambulatory appointments missed (reference—none)		
1 missed appointment	1.08 (0.90, 1.30)	1.08 (0.91, 1.29)
2 or more missed appointments	1.32 (1.13, 1.55)	1.28 (1.09, 1.51)

*Includes 812 (of 818) patients because 6 patients had missing data for ≥1 characteristic(s)

†Relative risk estimated for increment of ~1 standard deviation (0.3 for AMR; \$30,000 for income)

DISCUSSION

In this evaluation of non-response to communication technology outreach among adults with asthma, non-response was higher among patients who had lower AMR. In other words, patients who did not respond to outreach used relatively less asthma controller medications or relatively more asthma reliever medications than patients who responded. An implication of this finding is that non-responders have higher likelihood of worse asthma outcomes.⁴ Non-response was also higher among patients who received email outreach compared to text/call, missed ≥2 ambulatory appointments a year, had less than high school education, or had lower income. When these characteristics were all considered, the AMR findings were not conclusive; further work is needed to define relationships between adherence and response to communication technology outreach. This profile of non-responders suggests that further tailoring of communication technology outreach is necessary to engage some patients, for instance patients who miss ambulatory appointments.

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Compliance with Ethical Standards:

Prior Presentations: None.

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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