

Refill Reminder Preference and Inhaled Corticosteroid Adherence Among Patients with Asthma

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ABSTRACT

Context: Refill reminders can help patients improve adherence to inhaled corticosteroid (ICS) therapy. However, little is known about patient preferences for reminder type or whether patients who express a preference differ from patients who do not.

Objectives: To describe patient preferences for ICS prescription refill reminder type and to compare baseline ICS therapy adherence, measured as proportion of days covered (PDC) 1 year before initiating preference-based reminders, between patients who did and did not express a preference.

Design: This substudy within a randomized multi-intervention study was conducted at Kaiser Permanente Colorado. Adults with asthma randomized to intervention were offered the opportunity to choose text, telephone, or email reminders. Patients who did and did not provide a preference were compared by baseline characteristics using log-binomial models.

Main Outcome Measure(s): The primary outcomes were reminder preference and type.

Results: A total of 1497 of 4545 patients (32.9%) expressed a preference; 789 (52.7%) chose text. The adjusted relative risk (aRR) of not providing a preference increased with decreasing PDC (PDC of 0.50 to < 0.80: aRR, 1.14; 95% confidence interval [CI], 1.04-1.25; PDC < 0.5: aRR, 1.76; 95% CI, 1.59-1.95) compared with patients with a PDC of 0.80 or greater.

Conclusion: Among patients who expressed a preference, text reminders were preferred. Patients who expressed a preference had higher baseline adherence. Further research is needed to determine whether expressing a preference for a refill reminder type is itself associated with adherence. Given that offering the opportunity to choose a reminder type only engaged a subset of patients, further work is needed to understand how best to leverage technology-enabled communication outreach to help patients optimize adherence.

they receive.⁹ Furthermore, little is known about whether or how patients who express a preference for a specific modality of adherence reminder differ from patients who do not express a preference.

The BreatheWell study is a pragmatic randomized clinical trial designed to test the effectiveness of multiple technology-enabled communication interventions. In the BreatheWell study, ambulatory patients with asthma were initially randomized into 3 groups: text or automated telephone call (intervention), email (intervention), or usual care. Each patient then received any of 3 applicable interventions. The interventions targeted the subsets of patients who 1) smoked (smoking intervention completed in 2017), 2) filled inhaled short-acting β -agonists (asthma relievers) prescriptions too frequently (β -agonist overfill intervention, completed in February 2018),¹⁴ and/or 3) required refills of ICS prescriptions (asthma controllers; ICS prescription refill reminder preference intervention began in October 2018). Patients remained in their initially randomized group for the smoking and β -agonist prescription overfill interventions, which were completed before the start of the ICS intervention. For the ICS intervention, patients who had been initially randomized to either of the 2 intervention groups were combined into 1 intervention group and were offered the opportunity to choose a preferred modality of receiving ICS prescription refill reminders (ie, they could choose a reminder type that differed from their initially randomized group).

The ICS prescription refill reminder preference intervention is ongoing. When completed, the results will aid in answering questions about whether being able to choose a refill reminder type is associated with ICS therapy adherence. In addition, developing and implementing the ICS intervention provided the opportunity to better understand characteristics of patients who did or did not respond when given the opportunity to express a preference. Patients initially randomized to the usual care group were not offered

INTRODUCTION

Health care professionals continue to seek evidence about how to help patients optimize adherence to medications for chronic conditions, such as asthma.¹⁻⁸ Technology-enabled communications using text, email, or automated call are useful for sending patients many types of health care reminders,⁹⁻¹² and some evidence suggests that technology-enabled communication reminders can improve adherence to inhaled corticosteroid (ICS) therapy among patients with asthma.^{9,13} However, little is known about the preferences of patients with asthma for the modality (ie, type) of technology-enabled communication adherence reminders

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the opportunity to provide a preference and therefore were not included in this study. The objectives of this study were to answer the following questions as a BreatheWell sub-study. Among patients offered the opportunity to provide a preference for the type of ICS prescription refill reminders they receive, 1) what proportion expressed a preference and what modality of reminder did they prefer and 2) did patients who provided a preference have different baseline ICS therapy adherence than patients who did not provide a preference? For the second question, we hypothesized that patients who provided a preference would have higher ICS therapy adherence during the year before the ICS prescription refill reminder intervention compared with patients who did not provide a preference.

METHODS

Setting, Patients, and Eliciting Preference

This work was conducted at Kaiser Permanente Colorado (KPCO), an integrated health care system that had approximately 600,000 members in the Denver-Boulder metropolitan area in 2018. Patients were included in the BreatheWell study cohort if they were current KPCO members as of January 2017, were age 18 years or older (no upper age limit), and had persistent asthma (on the basis of a coded asthma diagnosis and an ICS prescription order within the previous year). Patients diagnosed with chronic obstructive pulmonary disease were excluded as were patients who died or disenrolled. The study cohort was refreshed in June 2018 (just before eliciting preference for the ICS prescription refill reminder preference intervention). The KPCO Institutional Review Board approved this study and waived the informed consent requirement.

Before the start of the ICS prescription refill preference intervention, in KPCO routine health care operations, all patients with asthma younger than age 65 years taking ICSs (ie, regardless of whether they were in the BreatheWell study cohort) received English or Spanish ICS prescription refill reminders by text or automated call when they were due (reminder sent 5-11 days before the refill due date) or overdue (reminder sent 30 days after refill due date) for an ICS prescription refill.¹ Patients did not choose the refill reminder type they received through routine health care operations; rather they received a text if their telephone was text enabled or an automated call if their telephone was not text enabled. Routine health care operations refill reminders were sent using the KPCO automated interactive voice response (IVR) system. In this IVR system, text messages are prioritized for text-enabled telephones, but patients can request not to receive texts. This IVR system has been used in multiple population-based interventions, including several that were subsequently incorporated into usual health care operations.^{8,15-17} This IVR system is also being

used for the BreatheWell ICS prescription refill reminder preference intervention.

For the ICS prescription refill preference intervention, all patients who had been initially randomized to either of the BreatheWell study intervention groups and who were taking ICSs were invited to choose whether they preferred to receive ICS prescription refill reminders by automated telephone call, text message, or email (see below). Patients who indicated a preference received ICS prescription refill reminders via that mode beginning with their first ICS prescription refill due after October 3, 2018. Patients of all ages who did not provide a preference received ICS prescription refill reminders as per routine health care operations detailed above. Patients originally randomized to the BreatheWell study usual care group were not invited to choose a modality of receiving ICS prescription refill reminders and are not included in this report.

To elicit a preference for type of ICS prescription refill reminders, patients were contacted by at least 2 of the following methods: mail, automated telephone call, and/or email. Contacts were continued until patients provided a preference or until they had been contacted at least 3 and no more than 5 times between June and August 2018. In these contacts, patients were directed to a website where they entered their names and dates of birth into an encrypted system to confirm that they were part of the BreatheWell study cohort. Once patients were verified as being in the study cohort, they could complete an online Research Electronic Data Capture (REDCap, Vanderbilt University, Nashville, TN) survey. The survey requested that participants indicate a preference for the modality by which they would receive ICS prescription refill reminders and provide the contact information they wanted used for reminders. Patients could select only 1 mode of refill reminder. As part of the contacts, patients were provided information about how to reach the BreatheWell study team if they had questions, to provide their preference (as an alternative to completing the online survey), or to opt out of participating in the intervention.

Data Sources

Patient demographic, administrative, utilization, and clinical data were extracted from the KPCO Virtual Data Warehouse (VDW). The VDW content areas used included demographics, enrollment, encounters, diagnoses, utilization, death, census, pharmacy, language preference, socioeconomic status, and benefits. The VDW data tables are linked by a common, unique patient identifier that differs from the patient's health record number. The crosswalk between the VDW unique patient identifier and the patient's health record number is maintained in a separate table. Patient email and telephone contact

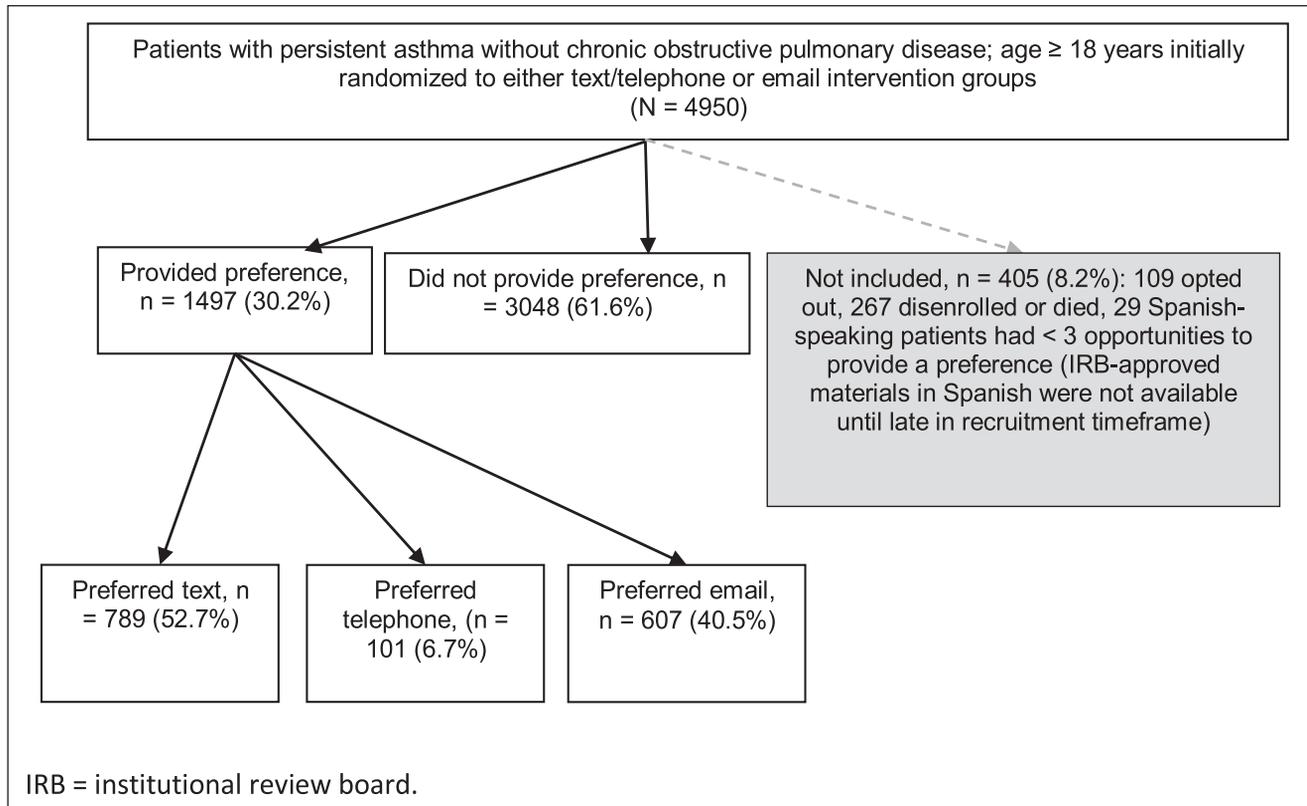


Figure 1. BreatheWell study intervention patients and preference for inhaled corticosteroid prescription refill reminders. Not included, $n = 405$ (8.2%): 109 opted out, 267 disenrolled or died, 29 Spanish-speaking patients had < 3 opportunities to provide a preference (IRB-approved materials in Spanish were not available until late in recruitment timeframe).

information was extracted from the electronic health record as well as the preference survey.

Statistical Analysis

Baseline characteristics of patients in the analytic cohort were examined using descriptive statistics. These characteristics included age, sex, race/ethnicity, socioeconomic status (educational level and income), insurance plan type, and enrollment history. In addition, for the year before the start of the ICS prescription refill reminder intervention (October 3, 2017, to October 2, 2018), the number of clinic appointments missed, adherence as the proportion of days covered (PDC),¹⁸ and asthma exacerbations were determined. Asthma exacerbations were defined as oral corticosteroid bursts and asthma-related urgent care visits, Emergency Department visits, and hospitalizations. Patients who provided a preference were compared with those who did not on baseline characteristics, asthma exacerbations, and the PDC the year before the intervention. In univariable comparisons, the χ^2 , t -test, or Wilcoxon rank-sum test was used to estimate the significance of comparisons between those who provided a preference and those

who did not. For patients who chose 1 of the 3 reminder modes, the χ^2 test, analysis of variance, or Kruskal-Wallis test was used for comparisons.

Relative risks (RRs) and 95% confidence intervals (CIs) for the binary outcome of not providing a preference for refill reminder type were estimated using log-binomial models (ie, binomial distribution with a log link function).¹⁹ Univariate RRs were estimated and a multivariable model of adjusted RR (aRR) was prepared to explore strengths of associations when all variables were modeled together. Characteristics in the multivariable model included age, sex, race/ethnicity, percentage of census block with less than a high school education, family income, insurance plan type, asthma exacerbations in the prior year, missed clinic appointments in the prior year, and ICS PDC. Statistical analyses used SAS Studio software, release 3.7 (Enterprise Edition) (SAS Institute Inc, Cary, NC).

RESULTS

The final analytic cohort included 4545 patients (Figure 1), including 1497 patients (32.9%) who provided a preference

Table 1. Characteristics of patients who did and did not provide a preference for the modality of receiving inhaled corticosteroid prescription refill reminders^a

Characteristic	Offered preference, N = 4545		p value ^b
	Provided preference, n = 1497 (32.9%)	Did not provide preference, n = 3048 (67.1%)	
Age, mean (SD), y	57.5 (15.3)	48.9 (17.1)	< 0.001
Preference by age group, y			
< 65, n = 3394 (74.7%)	935 (62.5)	2459 (80.7)	< 0.001
> 65, n = 1151 (25.3%)	562 (37.5)	589 (19.3)	
Sex			
Female	1019 (68.0)	1812 (59.4)	< 0.001
Race/ethnicity			
Hispanic	163 (10.9)	530 (17.4)	< 0.001
Non-Hispanic white	1180 (78.8)	2064 (67.7)	
Non-Hispanic black	55 (3.7)	201 (6.6)	
Asian	38 (2.5)	72 (2.4)	
Other or unknown	61 (4.1)	181 (5.9)	
Education level			
Less than high school education, mean (SD), % of census block	7.2 (8.6)	9.2 (10.5)	< 0.001
Family income (per census block)			
< \$50,000	143 (9.6)	453 (14.9)	< 0.001
\$50,000-\$100,000	819 (54.7)	1,690 (55.4)	
> \$100,000	535 (35.7)	905 (29.7)	
Insurance plan type			
Traditional HMO	723 (48.3)	1,179 (38.7)	< 0.001
Deductible HMO	550 (36.7)	1,226 (40.2)	
High deductible	130 (8.7)	311 (10.2)	
Medicaid	48 (3.2)	245 (8.0)	
Other	46 (3.1)	87 (2.9)	
Missed appointments in prior year			
≥ 1 Missed appointment(s)	501 (33.5)	1103 (36.2)	< 0.001
No missed appointments	957 (63.9)	1772 (58.1)	
No scheduled appointments	39 (2.6)	173 (5.7)	
ICS PDC ^{d,e}			
Mean (SD)	0.66 (0.26)	0.52 (0.28)	< 0.001
< 50%	434 (29.9)	1450 (51.5)	< 0.001
50%- < 80%	459 (31.6)	758 (26.9)	
≥ 80%	558 (38.5)	607 (21.6)	
Asthma exacerbations, mean (SD) ^{c,d}	0.33 (0.75)	0.31 (0.81)	0.189

^a Data are presented as number (percentage) of patients unless otherwise indicated.

^b The χ^2 , t-test, or Wilcoxon rank sum test

^c Includes asthma-related urgent care visits, Emergency Department visits and hospitalizations, or corticosteroid bursts.

^d Year before intervention.

^e n = 4266 for PDC (excludes 30 persons enrolled at < 6 months and 249 with no ICS days' supply in prior year).

HMO = health maintenance organization; ICS = inhaled corticosteroid; PDC = proportion of days covered; SD = standard deviation.

and 3048 patients (67.1%) who did not (Table 1). By age group, 562 of 1151 patients (48.8%) age 65 years or older provided a preference, whereas 935 of 3394 patients (27.5%) younger than age 65 years provided a preference. Patients who provided a preference differed from those who did not in most measured characteristics (Table 1).

For example, they were older ($p < 0.001$) and had higher family income ($p < 0.001$). However, patients who provided a preference were like patients who did not provide a preference in asthma exacerbations (mean [standard deviation {SD}], 0.33 [0.75] vs 0.31 [0.81]; $p = 0.189$).

Characteristic	ICS prescription refill reminder preference type			p value ^b
	Text, n = 789 (52.7%)	Email, n = 607 (40.6%)	Telephone, n = 101 (6.8%)	
Age, mean (SD), y	53.5 (14.5)	60.4 (15.0)	71.2 (11.5)	< 0.001
Preference by age group, y				
< 65 (n = 935 [62.5%])	596 (75.5)	316 (52.1)	23 (22.8)	< 0.001
≥ 65 (n = 562 [37.5%])	193 (24.5)	291 (47.9)	78 (77.2)	
Sex				
Female	563 (71.4)	386 (63.6)	70 (69.3)	0.008
Race/ethnicity				
Hispanic	115 (14.6)	40 (6.6)	- ^c	< 0.001
Non-Hispanic white	586 (74.3)	516 (85.0)		
Non-Hispanic black	36 (4.6)	15 (2.5)		
Asian	16 (2.0)	17 (2.8)		
Other or unknown	36 (4.6)	19 (3.1)		
Education level				
Less than high school education mean (SD), % of census block	7.6 (9.1)	6.5 (7.8)	8.6 (9.4)	0.26
Family income (per census block)				
< \$50,000	81 (10.3)	53 (8.7)	9 (8.9)	0.17
\$50,000-\$100,000	432 (54.8)	322 (53.1)	65 (64.4)	
> \$100,000	276 (35.0)	232 (38.2)	27 (26.7)	
Insurance plan type				
HMO	341 (43.2)	313 (51.6)	- ^c	<0.001
Deductible HMO	312 (39.5)	215 (35.4)		
High deductible	75 (9.5)	51 (8.4)		
Medicaid	36 (4.6)	10 (1.7)		
Other	25 (3.2)	18 (3.0)		
Missed appointments in prior year				
≥1 Missed appointment(s)	286 (36.3)	179 (29.5)	- ^c	0.08
No missed appointments	480 (60.3)	414 (68.2)		
No scheduled appointments	23 (2.9)	14 (2.3)		
ICS PDC ^{e,f}				
Mean (SD)	0.66 (0.26)	0.66 (0.27)	0.63 (0.28)	0.54
< 50%	218 (28.5)	178 (30.4)	38 (38.4)	0.31
50%- < 80%	246 (32.1)	188 (32.1)	25 (25.3)	
≥ 80%	302 (39.4)	220 (37.5)	36 (36.4)	
Asthma exacerbations, mean (SD) ^d	0.33 (0.72)	0.29 (0.74)	0.47 (0.97)	0.11

^a Data are presented as number (percentage) of patients unless otherwise indicated.

^b The χ^2 , analysis of variance, or Kruskal-Wallis test.

^c Actual numbers not given for entries with fewer than 6 patients to maintain Health Insurance Portability and Accountability Act compliance.

^d Includes asthma-related urgent care visits, Emergency Department visits and hospitalization, or corticosteroid bursts.

^e Year before intervention.

^f n = 1451 for PDC (excludes 9 persons enrolled at < 6 months and 37 with no ICS days' supply in prior year).

HMO = health maintenance organization; ICS = inhaled corticosteroid; PDC = proportion of days covered; SD = standard deviation.

A total of 789 patients (52.7%) who provided a preference requested text reminders (Figure 1; Table 2); 596 (75.5%) of those who preferred text were younger than age 65 years (Table 2). Other than age, across patients who preferred a specific reminder type, there were far fewer differences in measured characteristics

(Table 2) across patients who preferred text vs email vs telephone reminders than between patients who did vs did not express a preference.

The PDC the year before the intervention was higher in patients who provided a preference than in those who did not (mean [SD], 0.66 [0.26] vs 0.52 [0.28]; p < 0.001)

Table 3. Relative risks of not providing a preference for the modality of receiving ICS prescription refill reminders among patients with asthma

Characteristic	Unadjusted relative risk, n = 4545 (95% CI)	Adjusted relative risk n = 4212 (95% CI) ^a
Age (per 10 years)	0.91 (0.90-0.92)	0.87 (0.85-0.89)
Sex		
Female, reference	1.13 (1.08-1.17)	1.19 (1.10-1.30)
Race/ethnicity (reference: non-Hispanic white)		
Hispanic	1.20 (1.14-1.26)	1.20 (1.04-1.39)
Non-Hispanic black	1.23 (1.15-1.32)	1.30 (1.01-1.67)
Asian	1.03 (0.90-1.18)	0.99 (0.79-1.25)
Other or unknown	1.18 (1.09-1.27)	1.21 (0.99-1.49)
Education		
Less than high school education (per 10% increment), % of census block	1.06 (1.05-1.08)	1.08 (1.02-1.15)
Family income (reference: > \$100,000)		
< \$50,000	1.21 (1.14-1.28)	0.98 (0.81-1.18)
\$50,000-\$100,000	1.07 (1.02-1.12)	1.03 (0.95-1.12)
Insurance plan type (reference: HMO)		
Deductible HMO	1.11 (1.06-1.17)	0.99 (0.91-1.09)
High deductible	1.14 (1.06-1.22)	0.96 (0.82-1.12)
Medicaid	1.35 (1.27-1.43)	1.53 (1.16-2.01)
Other	1.06 (0.93-1.20)	0.87 (0.69-1.10)
Missed appointments in prior year (reference: none)		
≥ 1	1.06 (1.01-1.11)	1.08 (0.99-1.17)
No scheduled appointments	1.26 (1.17-1.35)	1.54 (1.15-2.06)
ICS PDC in prior year (reference: ≥ 0.80)		
0.50- < 0.80	1.20 (1.14-1.28) ^b	1.14 (1.04-1.25)
< 0.50	1.48 (1.39-1.45)	1.76 (1.59-1.95)
Asthma exacerbations in prior year (reference: none)	0.97 (0.92-1.02)	0.97 (0.89-1.06)

^a Adjusted for all characteristics listed. Excludes 30 persons enrolled at < 6 months and 303 persons with no asthma prescription dispensings in the prior year or no ICS days' supply in the prior year.

^b n = 4266 for PDC (excludes 30 persons enrolled at < 6 months and 249 with no ICS days' supply in the prior year).

HMO = health maintenance organization; ICS = inhaled corticosteroid; PDC = proportion of days covered.

(Table 1). Across patients who preferred a specific reminder type, the PDC did not differ by preferred type of reminder (mean [SD], 0.66 [0.26] text, 0.66 [0.27] email, and 0.63 [0.28] telephone; $p = 0.54$) (Table 2).

The aRR of not providing a preference increased with decreasing PDC. Compared with patients with a PDC of 0.80 or greater, patients with a PDC of 0.50 to less than 0.80 had an aRR of 1.14 (95% CI, 1.04-1.25), and patients with a PDC less than 0.5 had an aRR of 1.76 (95% CI, 1.59-1.95) (Table 3). Two additional characteristics were associated with a moderate increase in aRR: having no scheduled clinic appointments in the prior year (aRR, 1.54; 95% CI, 1.15-2.06) and having Medicaid (aRR, 1.53; 95% CI, 1.16-2.01). As indicated in Table 3, several characteristics were associated with small increases in the aRR of not providing a preference. Increasing age was associated with a protective effect against not providing a preference (aRR, 0.87; 95% CI, 0.85-0.89).

DISCUSSION

In this evaluation of preferences of patients with asthma for the type of technology-enabled communication for ICS therapy adherence reminders they received, when offered the opportunity to choose a reminder type, only one-third of patients expressed a preference, and among those who provided a preference, more than half selected text messaging. Patients who provided a preference differed from those who did not in numerous ways, such as being older, having higher income, and more often being white. Importantly, we also found that patients who provided a preference had higher ICS therapy adherence the year before the ICS prescription refill reminder preference-based intervention than patients who did not provide a preference. Finally, we found that patients with the lowest ICS therapy adherence the year before the intervention had a 76% increase in the aRR of not providing a preference for ICS prescription refill reminder type, and patients who had no

scheduled clinic appointments in the prior year or who had Medicaid insurance had 54% and 53% increases, respectively, in the aRR of not providing a preference.

Across patients who expressed a preference, except for text reminders being preferred by younger patients, few characteristics differed on the basis of refill reminder type preferred. The PDC the year before initiating the ICS prescription refill reminder preference-based intervention did not differ across patients who preferred text, email, or telephone.

One factor that possibly contributed to the low proportion of patients who chose the type of ICS prescription refill reminders they preferred was that, in routine health care operations at KPCO, patients younger than age 65 years were already receiving ICS refill reminders by text or automated call. Although patients did not get to choose the type of refill reminders they received as part of routine health care operations, they could have been satisfied with these reminders and therefore did not feel it necessary to explicitly state a preference when asked to do so before the preference-based intervention. This theory is supported by our finding that 74.7% of patients were younger than age 65 years but accounted for 80.7% of patients who did not provide a preference (Table 1). We only surmise this, however, because our study did not examine the satisfaction of patients with refill reminders provided through routine health care operations.

Among patients who expressed a preference, more than half preferred to receive reminders by text. Our finding is consistent with at least 1 recent study that found that patients prefer text messaging for health-related reminders.²⁰ A difference in preferred prescription refill reminder type by age was noted. Although individuals age 65 years and older accounted for 37.5% of patients who provided a preference, they accounted for only 24.5% of patients who preferred text and 77.2% of the patients who preferred telephone call (Table 2). This finding is consistent with a study of cancer screening reminders that found younger individuals more commonly requested text or email reminders.²¹

A strength of this study is its large sample of demographically and socioeconomically diverse adults with persistent asthma. Our data sources were comprehensive and robust, with few missing data elements (eg, < 3% with unknown race/ethnicity) and contact information for essentially all patients in the cohort. Few patients opted out, maintaining the representativeness of the study sample.

As with any study, this work has limitations. It was not designed to assess preferences for reminder content, timing, or number. A high proportion of patients in this study were privately insured. It is unknown whether health care systems that serve predominantly publicly insured patients would have similar findings, particularly given that having Medicaid insurance was associated with not providing a

preference. Finally, our health care system already had a nonpreference-based prescription refill reminder system in place for ICSs for patients younger than age 65 years; it is feasible that findings might differ in a patient population naïve to automated prescription refill reminders.

In view of the low proportion of patients who expressed a preference (less than half of patients whether age < 65 or ≥ 65 years), an important finding of this study is that further work is needed to understand how best to leverage technology-enabled communication outreach tools to help patients optimize adherence to ICS therapy. The proportion of patients in our study who did not express a preference for an ICS prescription refill reminder type suggests that offering the opportunity to choose a reminder type only engages a subset of patients. The fact that the subset of patients who expressed a preference had higher baseline ICS adherence potentially suggests that technology-enabled communication outreach may be perceived as more important by patients who are already focused on optimizing their asthma drug therapy management. Nonetheless, additional studies can help determine how and when to best use technology-enabled communication when reaching out to patients who are less engaged. Although we believe the results of our ongoing BreatheWell study that ICS prescription refill reminder preference intervention will shed light on whether preference-based technology-enabled communication outreach is effective in optimizing ICS therapy adherence compared with usual care, opportunities will remain to study how best to engage the many patients with suboptimal ICS adherence who do not express a preference for a specific type of refill reminder. Opportunities also exist to examine patient satisfaction with specific types of technology-enabled interventions and with timing and content of reminders.

CONCLUSION

Text messaging was preferred by more than half of patients who expressed a preference for a specific type of technology-enabled ICS prescription refill reminder; however, two-thirds of patients did not express a preference. Given that offering the opportunity to choose a reminder type only engaged a subset of patients, a key message for health care professionals is that further work is needed to understand how best to leverage technology-enabled communication outreach tools to help patients optimize adherence. Patients who chose a prescription refill reminder type had higher baseline ICS therapy adherence than patients who did not choose a reminder type, regardless of whether they chose text, email, or telephone call reminders, suggesting they were already more engaged in optimizing adherence to their asthma therapy than patients who did not choose a reminder type. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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Authors' Contributions

Raebel led study design, participated in data analysis and interpretation, and led manuscript preparation. Shetterly participated in study design, participated in data analysis and interpretation, and reviewed and edited the manuscript. Goodrich participated in study design, led data collection, participated in data analysis and interpretation, and reviewed and edited the manuscript. Anderson participated in data collection, data interpretation, and reviewed and edited the manuscript. Bender participated in study design, data interpretation, and reviewed and edited the manuscript. Wagner participated in study design, data interpretation, and reviewed and edited the manuscript.

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References

- Cvietusa PJ, Goodrich GK, Shoup JA, et al. Implementing health care technology research into practice to improve adult asthma management. *J Allergy Clin Immunol Pract* 2019 Mar;7(3):908-14. DOI: <https://doi.org/10.1016/j.jaip.2018.08.029>, PMID: 30201160
- Raebel MA, Shetterly SM, Goodrich GK, et al. Non-response to communication technology outreach for beta-agonist overuse in a pragmatic randomized trial of patients with asthma. *J Gen Intern Med* 2018 Mar;33(6):809-811. DOI: <https://doi.org/10.1007/s11606-018-4395-9>, PMID: 29532303
- Federman AD, O'Connor R, Mindlis I, et al. Effect of a self-management support intervention on asthma outcomes in older adults: The SAMBA study randomized clinical trial. *JAMA Intern Med* 2019 Jun;179(8):1113-21. DOI: <https://doi.org/10.1001/jamainternmed.2019.1201>, PMID: 31180474
- Davis SA, Carpenter D, Lee C, et al. Effect of an asthma question prompt list and video intervention on adolescents' medication adherence 12 months later. *Ann Pharmacother* 2019 Feb;53(7):683-9. DOI: <https://doi.org/10.1177/1060028019831259>, PMID: 30458220
- Kosse RC, Bouvy ML, de Vries TW, Koster ES. Effect of a mHealth intervention on adherence in adolescents with asthma: A randomized controlled trial. *Respir Med* 2019 Mar;149:45-51. DOI: <https://doi.org/10.1016/j.rmed.2019.02.009>, PMID: 30803885
- Gelzer AD, Gao W, Keleti D, et al. Multifaceted interventions improve medication adherence and reduce acute hospitalization rates in Medicaid patients prescribed asthma controllers. *J Asthma* 2019 Feb;56(2):190-199. DOI: <https://doi.org/10.1080/02770903.2018.1439954>, PMID: 29565708
- Bender BG. Technology interventions for nonadherence: New approaches to an old problem. *J Allergy Clin Immunol Pract* 2018 May-Jun;6(3):794-800. DOI: <https://doi.org/10.1016/j.jaip.2017.10.029>, PMID: 29196085
- Bender BG, Cvietusa PJ, Goodrich GK, et al. Pragmatic trial of health care technologies to improve adherence to pediatric asthma treatment: A randomized clinical trial. *JAMA Pediatr* 2015 Apr;169(4):317-23. DOI: <https://doi.org/10.1001/jamapediatrics.2014.3280>, PMID: 25664620
- Jeminiwa R, Hohmann L, Qian J, Garza K, Hansen R, Fox BI. Impact of eHealth on medication adherence among patients with asthma: a systematic review and meta-analysis. *Respir Med* 2019 Mar;149:59-68. DOI: <https://doi.org/10.1016/j.rmed.2019.02.011>, PMID: 30803887
- Greaney ML, Puleo E, Sprunck-Harrild K, et al. Electronic reminders for cancer prevention: Factors associated with preference for automated voice reminders or text messages. *Prev Med* 2012 Aug;55(2):151-4. DOI: <https://doi.org/10.1016/j.ypmed.2012.05.014>, PMID: 22659227
- Steiner JF, Shainline MR, Bishop MC, Xu S. Reducing missed primary care appointments in a learning health system: Two randomized trials and validation of a predictive model. *Med Care* 2016 Jul;54(7):689-696. DOI: <https://doi.org/10.1097/mlr.0000000000000543>, PMID: 27077277
- Khonsari S, Subramanian P, Chinna K, Latif LA, Ling LW, Gholami O. Effect of a reminder system using an automated short message service on medication adherence following acute coronary syndrome. *Eur J Cardiovasc Nurs* 2015 Apr;14(2):170-9. DOI: <https://doi.org/10.1177/1474515114521910>, PMID: 24491349
- Posadzki P, Mastellos N, Ryan R, et al. Automated telephone communication systems for preventive healthcare and management of long-term conditions. *Cochrane Database Syst Rev* 2016;12:CD009921. DOI: <https://doi.org/10.1002/14651858.CD009921.pub2>, PMID: 27960229
- Bender BG, Wagner NM, Shoup JA, et al. Adults with asthma experience no increase in asthma-related exacerbations when digital communication technology tools are employed to offset provider workload: a pragmatic randomized trial. *Med Care* 2019 Dec 30;58(4):352-9. DOI: <https://doi.org/10.1097/MLR.0000000000001265>, PMID: 32197029
- Shoup JA, Madrid C, Koehler C, et al. Effectiveness and cost of influenza vaccine reminders for adults with asthma or chronic obstructive pulmonary disease. *Am J Manag Care* 2015 Jul 1;21(7):e405-13. PMID: 26295268
- Kempe KL, Shetterly SM, France EK, Levin TR. Automated phone and mail population outreach to promote colorectal cancer screening. *Am J Manag Care* 2012 Jul;18(7):370-8. PMID: 22823531
- Raebel MA, Shetterly SM, Bhardwaja B, et al. Technology-enabled outreach to patients taking high-risk medications reduces a quality gap in completion of clinical laboratory testing. *Popul Health Manag* 2020 Feb;23(1):3-11. DOI: <https://doi.org/10.1089/pop.2019.0033>, PMID: 31107176
- Raebel MA, Schmittiel J, Karter AJ, Konieczny JL, Steiner JF. Standardizing terminology and definitions of medication adherence and persistence in research employing electronic databases. *Med Care* 2013 Aug;51(8 Suppl 3):S11-21. DOI: <https://doi.org/10.1097/MLR.0b013e31829b1d2a>, PMID: 23774515
- McNutt LA, Wu C, Xue X, Hafner JP. Estimating the relative risk in cohort studies and clinical trials of common outcomes. *Am J Epidemiol* 2003 May 15;157(10):940-3. DOI: <https://doi.org/10.1093/aje/kwg074>, PMID: 12746247
- Zallman L, Bearse A, West C, Bor D, McCormick D. Patient preferences and access to text messaging for health care reminders in a safety-net setting. *Inform Health Soc Care* 2017 Jan;42(1):32-42. DOI: <https://doi.org/10.3109/17538157.2015.1113177>, PMID: 26864932
- Brandzel SD, Bowles EJA, Wieneke A, et al. Cancer screening reminders: addressing the spectrum of patient preferences. *Perm J* 2017;21:17-051. DOI: <https://doi.org/10.7812/TPP/17-051>, PMID: 29035189.