Inhaler reminders improve adherence with controller treatment in primary care patients with asthma

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Background: Poor adherence contributes to uncontrolled asthma. Pragmatic adherence interventions for primary care settings are lacking.

Objective: To test the effectiveness of 2 brief general practitioner (GP)-delivered interventions for improving adherence and asthma control.

Methods: In a 6-month cluster randomized 2 × 2 factorial controlled trial, with GP as unit of cluster, we compared inhaler reminders and feedback (IRF) and/or personalized adherence discussions (PADs) with active usual care alone; all GPs received action plan and inhaler technique training. GPs enrolled patients prescribed combination controller inhalers, with suboptimal Asthma Control Test (ACT) scores (ACT score ≤19). Inhaler monitors recorded fluticasone propionate/salmeterol adherence (covertly for non-IRF groups) and, in IRF groups, provided twice-daily reminders for missed doses, and adherence feedback. PAD GPs received communication training regarding adherence. Outcomes collected every 2 months included ACT scores (primary outcome) and severe exacerbations. Intention-to-treat mixed-model analysis incorporated cluster effect and repeated measures.

Results: A total of 43 GPs enrolled 143 patients with moderate-severe asthma (mean age, 40.3 ± 15.2 years; ACT score, 14.6 ± 3.8; fluticasone propionate dose, 718 ± 470 μg). Over 6 months, adherence was significantly higher in the IRF group than in non-IRF groups (73% ± 26% vs 46% ± 28% of prescribed daily doses; $P < .0001$), but not between PAD and non-PAD groups. Asthma control improved overall (mean change in ACT score, 4.5 ± 4.9; $P < .0001$), with no significant difference among groups ($P = .14$). Severe exacerbations were experienced by 11% of the patients in IRF groups and 28% of the patients in non-IRF groups ($P = .013$; after adjustment for exacerbation history; $P = .06$).

Conclusions: Inhaler reminders offer an effective strategy for improving adherence in primary care compared with a behavioral intervention or usual care, although this may not be reflected in differences in day-to-day asthma control. (J Allergy Clin Immunol 2014;134:1260-8.)

Key words: *Medication adherence, treatment effectiveness, intervention studies, antiasthmatic agents, asthma, ambulatory monitoring, health communication*

In asthma, adherence with inhaled controller medications, particularly inhaled corticosteroid (ICS)-containing medications, is important for achieving good asthma control, yet many studies report suboptimal adherence rates.[1] Poor adherence contributes to mortality and morbidity, including uncontrolled symptoms, impaired quality of life, exacerbations, and urgent health care

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Abbreviations used
ACT: Asthma Control Test
GP: General practitioner
ICS: Inhaled corticosteroid
IRF: Inhaler reminders and feedback
LABA: Long-acting β2-agonist
PAD: Personalized adherence discussion
T: Timepoint in months (eg, T2: Timepoint 2 months)
UC: Active usual care

utilization.[2-4] Without interruptions in ICS use, asthma-related hospitalizations could be reduced by 60%.[2]

General practitioners (GPs) identify poor adherence as 1 of the top 3 barriers to the delivery of effective asthma care.[5] Asthma guidelines recommend that GPs should assess and correct adherence at every visit[6,7] but provide few practical interventions. Furthermore, most published adherence interventions are too complex to be feasible for primary care, and some studies are nonrandomized or report no asthma outcomes.[8]

Models such as the Information-Motivation-Behavioral skills model theorize that health-related information, motivation, and behavioral skills are effective determinants of the extent to which a health behavior such as medication-taking will be performed.[9] Barriers to adherence may be "intentional" (eg, doubts or concerns about treatment effectiveness or side effects) and/or "unintentional" (eg, due to forgetting/chaotic lifestyles),[10] but no practical interventions have been developed to address these in primary asthma care.

For intentional poor adherence, providing health professionals with communication training, for example, in empathic, nonconfrontational motivational interviewing techniques, can modify patients' beliefs and attitudes, leading to improved health behaviors[11-13] and medication adherence.[14,15] For unintentional poor adherence in chronic diseases due to forgetting, reminder packaging (eg, blister packaging for tablets) improves adherence by establishing medication-taking routines.[16,17] Interactive adherence reminders for inhaled medications are more technically complex, but reliable devices are now available.[18,19] Only 1 study of such devices has been reported in asthma, demonstrating higher adherence (93% vs 74%) in patients receiving reminders; the high adherence in the control group may reflect the controlled research environment and free medications.[20]

However, the effectiveness of such strategies in asthma has not been tested in real-life community settings. We designed 2 brief primary care interventions: (1) inhaler reminders with GP feedback and (2) personalized GP-patient discussions about adherence. Both incorporated the 3 components of the Information-Motivation-Behavioral skills model, with the goal of targeting intentional and unintentional barriers to medication adherence in asthma. The aim of this study was to measure the effect of these interventions, separately and together and compared with active usual care (UC), on adherence with combination ICS/long-acting β2-agonist (LABA) medications and asthma control in people with poorly controlled moderate-severe asthma.

METHODS

Study design

We conducted a 6-month pragmatic cluster 2 × 2 factorial parallel-group randomized controlled trial in general practices in Greater Sydney, Australia, during the period 2010 to 2013. GPs were randomized to either the active group or the control group for each intervention and trained to deliver the intervention(s) with patients from their practice. The interventions (detailed later) were as follows: personalized audiovisual inhaler reminders and feedback (IRF) and brief personalized adherence discussions (PADs). All GPs received brief training in UC including one-off checking and teaching inhaler technique and writing asthma action plans. The interventions were compared separately and together, and with UC alone.

To maximize relevance to clinical practice, prescribing was according to the GP's clinical judgment, only 2 study visits were required (1 for enrollment and initial delivery of the intervention to the patient and 1 for follow-up), and most outcome data were collected by telephone by study staff (T0, T2, T4, and T6 months). For more details of methods, see this article's Online Repository at www.jacionline.org.

Medications and inhaler monitoring

The GP gave each patient a SmartTrack device (Nexus6, Auckland, New Zealand; Fig 1) that clipped onto their ICS/LABA inhaler and asked 3 onscreen questions about asthma control each month. After the device was activated during the T0 call, it recorded the date/time of all actuations and uploaded the data each month to a secure Web site. Device reliability and accuracy have been reported.[18] For IRF groups, GPs and patients were shown how to customize ringtones/reminder times and view the medication feedback online. Patients also received 1 albuterol pressurized metered dose inhaler, 1 month's supply of fluticasone propionate/salmeterol pressurized metered dose inhaler (Seretide, GlaxoSmithKline, Boronia, Australia) at their GP-prescribed dose, and a miniWright Digital peak expiratory flow/FEV_1 meter.

Randomization, blinding, and allocation concealment

Randomization of GPs was by computer-generated random code, with a minimization algorithm to ensure balance of GP locations by socioeconomic area,[21] previous asthma/chronic obstructive pulmonary disease management training in the past 12 months, and GPs speaking a second language other than English. After randomization, GP allocation concealment was maintained until during the training workshop. As with any behavioral intervention, blinding of GPs and patients to their own intervention(s) was not possible, but the other interventions were not described, and to aid blinding, GPs in each group received UC training. To avoid bias, and with ethics approval, GPs in the UC and PAD-only groups, and their patients, were not advised about the SmartTrack recording function until study end, when all patients received a debriefing statement and were offered a confidential copy of their adherence record.

Recruitment and training of GPs

GPs were recruited through 4 general practice organizational divisions in Sydney. Inclusion criteria were access to computer and e-mail, and not currently participating in another adherence-promoting study. To minimize cross-contamination between intervention groups, only 1 GP from a practice could participate. Each randomized GP received his or her respective training modules (Table I) in a half-day workshop before enrolling patients. At workshop end, GPs recorded their rating of the usefulness of the study interventions on a visual analog scale ranging from 0 to 100 (0 = not at all useful, 100 = extremely useful). GPs were reimbursed $100 per patient enrolled.

Patient recruitment

Eligible participants were patients aged 14 to 65 years, with suboptimal asthma control (Asthma Control Test [ACT] score ≤19),[22] and prescribed twice-daily ICS/LABA for 1 month or more. Exclusion criteria were asthma exacerbation (defined by oral corticosteroid use, emergency department visit, or hospitalization) in the last month, use of budesonide/formoterol as maintenance and reliever therapy, major respiratory disease (eg, chronic obstructive pulmonary disease), serious uncontrolled medical conditions,