

Promoting Adherence to Inhaled Corticosteroid Therapy in Patients with Asthma

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Abstract

- **Objective:** To review factors associated with adherence to inhaled corticosteroid (ICS) therapy among patients with asthma and the recent advances in promoting medication adherence and improved asthma outcomes.
- **Methods:** Review of the scientific literature.
- **Results:** Although daily ICS therapy is first-line controller therapy for persistent asthma management, nonadherence is common and compromises asthma treatment outcomes. Disparities in asthma outcomes may be explained by ICS adherence, which is disproportionately low in low-income and ethnic minority patients. Adherence to ICS therapy is influenced by a complex interaction of treatment-, clinician-, and patient-level factors. Clinicians can play a critical role in educating patients and their family members about the importance of adherence to prescribed treatment.
- **Conclusion:** Improvement of adherence to ICS therapy requires multidisciplinary approaches involving physicians, nurses, respiratory therapists, pharmacists, and other health care professionals.

Asthma is a significant public health problem, affecting 17.5 million adults and 7.1 million children in the United States [1]. The goal of asthma care is asthma control [2]. National and international guidelines recommend the use of inhaled corticosteroid steroids (ICS) as first-line daily controller therapy for children, adolescents, and adults with persistent asthma [2,3]. Although daily ICS therapy is effective and integral to asthma self-management [2], patient adherence to ICS therapy is poor [4]. The average ICS adherence rates for asthma patients (the percentage of time the medication is taken as prescribed) is often less than 50% for children [5] and adults [6]. Unfortunately, medication nonadherence is a common problem across all segments of patients with asthma, including low-income and ethnic minority children, who are disproportionately affected by asthma morbidity [7].

Medication nonadherence contributes to asthma morbidity among children [8] and adults [6]. Patient behaviors, such as nonadherence and inappropriate inhaler technique, account

for approximately half of patients with poor asthma control [9]. Dose-response relationships have been found between the controller adherence and treatment outcomes [6,10]. Nonadherence to daily ICS regimen is not only detrimental to individual treatment outcomes but also contributes to the excessive societal health care costs, because nonadherence can lead to asthma exacerbations, which increase the need for emergency department utilization and hospitalization. When nonadherent patients continuously present with treatment-unresponsive asthma symptoms, physicians may order additional tests to rule out other diagnoses and step up the medication regimen, believing that a more aggressive medication regimen is necessary to achieve asthma control [11].

To alleviate negative consequences associated with medication nonadherence, health care professionals need to recognize the factors underlying ICS nonadherence and apply strategies to improve adherence. We reviewed treatment-, clinician-, and patient-level factors associated with nonadherence to ICS therapy and recent advances in the randomized controlled trials (RCTs) on adherence promotion interventions, with a goal of offering an evidence base for clinical decision making.

Factors Associated with Nonadherence

Treatment-Related Factors

Asthma is a chronic illness that disproportionately affects low-income and ethnic minority children and adults [12]. Thus, high treatment cost is one of the major contributors to nonadherence [13]. Patients may skip daily ICS doses in an attempt to stretch out their medication and to reduce financial burden.

Another treatment-related barrier is a patient's perceived need of ICS medications. When patients experience fewer asthma symptoms, they tend to use fewer doses of their controller medicines without understanding that their controller medicine adherence keeps their symptoms under control [14,15]. More complex medication routines are also associated

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with nonadherence [16], as patients may misunderstand [17] or improperly use ICS [18]. Patients also report forgetting to take or refill prescriptions in a timely manner [19].

Patients' beliefs about their medication influence the pattern of use. Patients' confidence in their current ICS medication regimen depends upon their previous experience with the medication. Prior negative experiences with medications may result in skepticism of a new medication's ability to control asthma symptoms, which could also lead to nonadherence [20]. For instance, if patients expect immediate symptom relief from using ICS, they may lose confidence in the helpfulness of ICS medications. Poor inhaler technique may also compromise the effectiveness of these medications, leading patients to conclude they are ineffective [21].

Until recently, the lack of dose counters and some medications with 25-day supplies added to the difficulty in patients knowing when to get refills, often leading to days or weeks of no therapy. This unintentional adherence issue may lead to a loss of confidence in the efficacy of ICS and intentional nonadherence. Common explanations for intentional nonadherence are the concerns about side effects [18], poor taste [22], fear of dependence [13], and fear that the prolonged use of the medication will make them immune to it [23]. Also, some patients fear that ICS medications will weaken their immune systems [23]. For pediatric patients, although ICS via nebulizer would seem to be easy to use, it could set up another barrier to adherence due to the extra maintenance and time needed to complete a daily treatment [24].

Clinician-Related Factors

An important factor in ICS adherence is the physician-patient partnership. Poor rapport and miscommunication between a physician and the patient is associated with nonadherence to ICS treatment [25]. Indeed, patients are more likely to be nonadherent when their physicians fail to elicit and address their barriers to adherence and treatment [26]. A working alliance is a collaborative partnership distinguished by patient trust in their physician and agreement on treatment expectations and goals [27]. It is associated with treatment adherence among patients with chronic illnesses, including asthma, cancer, HIV/AIDS, diabetes, and hypertension [27]. Continuity of care may also affect adherence [28]. Patient adherence tends to be undermined if patients are treated by different clinicians frequently offering contradictory advice with each office visit [29].

Patient-Related Factors

Several demographic factors indicate who is at risk for nonadherence to ICS therapy. Patients with lower socioeconomic status and educational levels are more likely to be nonadherent [30,31]. Risk for ICS nonadherence increases with age [32]. The role of gender in ICS adherence has been

less clear, with some studies showing lower adherence among females [31] and others demonstrating no gender differences [18].

As a result of interactions among environmental, socioeconomic, and cultural influences, ethnic minority children and adults are disproportionately affected by asthma morbidity, prevalence, and severity compared with non-Hispanic white counterparts [33]. For instance, urban minority children have significantly lower ICS adherence compared with non-Hispanic white children (35% vs. 62%) after controlling for socioeconomic status [34]. This disparity is partially explained by living in a disadvantaged neighborhood, which disproportionately affects inner-city African American patients [30]. Indeed, exposure to community violence is associated with increased asthma symptoms. Those exposed to community violence may experience greater distress and perceive little control over their illness [30]. As a result, they may become nonadherent [35], because preventing asthma attacks may not be a top priority when their immediate concern is ensuring their own safety. The mechanism of this association warrants further research. Negative beliefs about medications are more commonly held among ethnic minority patients, which may also explain the ethnic disparities in the rates of ICS adherence [33,36]. Even when socioeconomic status is controlled for, African-American patients tend to be less adherent to ICS therapy than their non-Hispanic white counterparts [31].

Lack of health literacy may also present barriers to medication adherence as patients navigate complex health care systems. Inadequate health literacy is common among low-income and ethnic minority patients [37]. Patients with low health literacy are at risk for poor asthma control due to their lack of asthma self-management knowledge and skills [38,39]. Non-native speakers of English are at risk for low health literacy. In a study of Medicare enrollees, 53.9% and 33.9% of Spanish- and English-speaking patients had suboptimal health literacy [40]. Limited English proficiency among Spanish-speaking patients is associated with lower adherence, lower asthma control, poorer quality of life, more worry about side effects and addiction, and lower self-efficacy in managing asthma [41].

Patient and family characteristics are strongly associated with medication adherence. Low motivation [42], lack of self-efficacy in asthma self-management [43], suboptimal quality of life [44], and living in a single-parent household are all associated with nonadherence [45]. Particularly, patients' motivation to adhere to a medication regimen is the most important predictor of medication adherence [42]. Psychological distress, such as depression or anxiety, is associated with nonadherence [46,47]. Maternal depressive symptoms are also

strongly related to nonadherence [48] and poor asthma morbidity among children [49]. Mothers with depressive symptoms tend to report lower confidence in their child's medication efficacy, more instances of forgetting to give the medication to their child, and an inability to control asthma symptoms [48].

Interventions to Improve Medication Adherence and Asthma Outcomes

Changing health behaviors is challenging and difficult to maintain. Identifying nonadherence does not equate to successfully addressing the problem itself [9]. Indeed, even multiple asthma education sessions are not enough to enhance medication adherence for some patients. Maintaining improved adherence over time poses additional challenges [50]. Furthermore, despite the advances in adherence studies, heterogeneity in the conceptualization, measurement, and reporting of adherence across RCTs makes it difficult to integrate findings [51,52]. Many findings are compromised by the reliance on self-reported adherence that often exaggerate adherence [4,52]. It is only recently that some of the RCTs have begun to incorporate objective measures of medication adherence, such as the use of electronic medication monitors and pharmacy refill records [53]. Although these measures have limitations, including the lack of ability to evaluate inhaler techniques and the dosage timing, they provide objective adherence information that is not obtainable through self report.

Effective long-term promotion of adherence and clinical outcomes requires multidisciplinary coordination [4,9,11,54], involving physicians, nurses, respiratory therapists, pharmacists, and other health care professionals. Thus, the most promising interventions often combine multiple strategies, including patient counseling, reminders, reinforcement, and an asthma action plan (AAP) [4].

Treatment-Level Interventions

Complexity of treatment regimen affects patient adherence [5]. Therefore, reducing medication regimen complexity has been beneficial for boosting adherence. Studies have shown higher adherence with a once-daily oral regimen compared with twice-daily inhaled therapy [6,55]. The use of an audiovisual reminder function on the inhaler may improve ICS adherence among adults and adolescents with asthma [56]. AAPs may help reduce the burden of a complex medication regimen through instructions for daily medications, environmental controls, and for recognizing and treating acute symptoms [2]. To date, effectiveness of AAP as a sole intervention in improving adherence and clinical outcomes remains undetermined [57]. A clearly written AAP may be an effective adjunct to asthma self-management education and regular review [57].

Clinician-Level Interventions

Providing multifaceted asthma self-management education is an important component of asthma care in the NHLBI guideline [2]. Asthma self-management education can improve clinical outcomes, particularly decreasing emergency room visits and hospitalizations for both adults [58] and children [59]. Self-management education in outpatient clinics also provides an opportunity to enhance medication adherence when combined with behavioral strategies reinforced on a regular basis [60]. For example, among adults with moderate/severe asthma, a 30-minute session of tailored asthma education consisting of how to self-monitor symptoms, inhaler technique training, and creating an individualized AAP that was reinforced at 2-week intervals was more effective in improving ICS adherence and asthma control than usual care with self-monitoring of symptoms alone [61]. These strategies require relatively modest time investment and resources.

Asthma guidelines encourage clinicians to develop treatment goals in partnership with their patients [2]. A recent study used a 3-group design to examine the efficacy of a shared decision making (SDM) approach relative to clinician decision making (CDM) and usual care for patients with poorly controlled asthma [10]. In SDM, a nonphysician asthma care manager collaborated with the patient to negotiate the AAP, which elicited and addressed patient barriers to adherence, treatment preferences, and goals using a motivational interviewing technique [62]. In CDM, a clinician independently determined the treatment plans and goals. Patients who received the SDM intervention had better adherence to controller medications (as measured by refill records) and better outcomes (ie, better asthma-related quality of life, asthma-related provider visits, and pulmonary function and lower frequency of asthma-related medical visits and rescue inhaler use) than did the CDM and usual care groups [10]. Another study examined whether providing information to clinicians on patient adherence via pharmacy refill records would improve ICS adherence; it found that only when the clinicians were interested enough to view the adherence information did the patient's ICS adherence improve [63]. These findings and findings from other smaller studies [64–66] suggest the utility of incorporating adherence feedback into clinical practice.

Implementing asthma education into primary care practice can be challenging due to time constraints [2]. Furthermore, some high-risk children do not have a consistent health care provider. Thus, recent studies have directly targeted children in schools. School-based asthma self-management education programs are effective in improving knowledge of asthma, self-efficacy, self-management behaviors, and self-reported adherence, although their effects on quality of life, school absences, and asthma symptoms have been inconsistent [59]. Schools also provide an opportunity to help students establish

regular chronic illness management. By ensuring ICS adherence, once-daily directly observed therapy [26] administered at school has been shown to improve asthma control [67–69]. For school-aged children, a partnership between health care providers and schools may be beneficial for improving adherence and clinical outcomes.

Patient-Level Interventions

Many adherence interventions addressing patient-related factors focused on low-income, urban minority children because of their disproportionately high asthma morbidity and mortality. Because younger children rely on their primary caregivers for their medication regimen [70], many interventions were delivered through home visits by an asthma educator or family coordinator. Most of the effective interventions for children were multidisciplinary and combined medical, educational, and behavioral strategies. For instance, Bonner and colleagues [71] demonstrated the effectiveness of a home-based, individually tailored asthma education program that used asthma diaries and peak flow measures coupled with physician training on the use of these educational tools. A stepped AAP and allergy-testing feedback for environmental control were also incorporated and compared with usual care [71]. This multilayer intervention resulted in improved asthma knowledge, self-efficacy, and anti-inflammatory adherence, and decreased asthma symptoms and activity limitations. Unfortunately, the long-term effects of these resource-intensive interventions on adherence and clinical outcomes have been inconsistent [9,54], with many reporting only modest, short-term improvement [72,73]. These challenges may in part derive from the aforementioned socioeconomic and environmental stressors experienced by urban, low-income minority families. Self-management education tailored to the patients' health literacy levels may be more promising [39].

Conclusions and Recommendations

Daily ICS therapy is a first-line controller therapy for asthma self-management. Despite its effectiveness, nonadherence to ICS therapy is common, which results in compromised treatment outcomes and excess health care costs. Clinicians play a critical role in educating patients about the importance of adherence to prescribed treatment. We have identified a number of factors contributing to ICS nonadherence and discussed recent advances in adherence promotion strategies.

Several recommendations can be made for clinical practice, particularly for asthma self-management education. Tailored asthma education using individualized information including an AAP and feedback is effective [60,61,74]. Ongoing assessment and monitoring of medication adherence with regular follow-up using a case management approach

may be useful [75,76] if the adherence information is used for patient feedback [63]. Discussion of when to step up or down the medications may also give the patient confidence that they are receiving individualized attention with their treatment plan. In addition, having patients bring in their medications to each clinic visit and reviewing inhaler technique may help reduce the impact of communication barriers.

For adherence measurement, the use of objective measures (eg, pharmacy refill records, electronic medication monitoring) is recommended, because patients tend to overreport adherence [52]. Education is not effective unless the patient is motivated to change his or her own behavior [5]. Eliciting and addressing the patients' unique barriers to medication adherence, their concerns about medication, and their motivation and readiness to change is recommended [22,30]. A brief motivational interviewing [62] technique appears to be a promising strategy to address these motivational issues [5,10,77].

Finally, coordinating multiple components of the health care system is necessary to improve adherence and clinical outcomes [11]. For instance, psychological problems such as depression and anxiety disorders are common among asthma patients and their primary caregivers, and may present significant barriers to adherence. Clinicians could consider administering screenings for mental health problems [49] and provide mental health referrals if needed [76]. Although collaborative efforts to improve adherence may be costly in the short run, the long-term cost savings gained by improved adherence can exceed the cost of adherence promotion [11]. This makes adherence promotion a worthy "investment" in managing asthma outcomes.

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