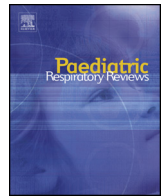




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CME article

The Adolescent with Asthma

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EDUCATIONAL AIMS

- To provide an overview of the physiological and psychosocial developmental factors related to the adolescent with asthma.
- To review incidence and etiology of psychological morbidity and contextual factors related to the adolescent with asthma.
- Describe the current and future approaches to the adolescent with asthma's adherence to treatment and transition into adult care.

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Keywords:

Adolescence
Asthma management
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Transition of care.

SUMMARY

The adolescent with asthma experiences a period of physical and psychosocial changes that affect their health and well-being. Overall, adolescents with asthma are at increased risk for asthma morbidity and death. Increased rates of depression and anxiety, for the adolescent and their caregivers, can lead to non-adherence to their medical regimens, poor symptom control, and poor treatment outcomes. Contextual factors, such as race, ethnicity, and living situation, affect the prevalence, morbidity, and mortality for the adolescent with asthma. These factors also affect the transition process for adolescents entering adult medical care. An overview is presented of how the adolescent with asthma differs and how healthcare providers can promote effective asthma management and better asthma control.

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INTRODUCTION

Asthma is the most common pediatric chronic illness in the United States, affecting an estimated 6.2 million children under the age of 17.¹ Adolescents with asthma are at an increased risk for asthma morbidity and death.² Psychosocially, the adolescent must balance his or her desire for autonomy, family communication and conflict, peer relationships, and academic and vocational demands within the context of illness management. Adolescents with asthma are at greater risk of having at least one anxiety or depressive diagnosis compared to healthy peers³ that may decrease adherence to treatment and ultimately lead to worse medical outcomes.^{4,5}

The goal of asthma management is to achieve the best asthma control with the least amount of medications.⁶ According to the

National Asthma Education Program (NAEP), clinicians seek to achieve asthma control to reduce interference with activities of daily living (ADLs), current impairment, and future risk.⁷ Although effective self-management can improve asthma control and reduce asthma morbidity, adherence to asthma medical regimens often declines during adolescence.⁸ Adolescents may struggle with the responsibility of managing asthma based on the psychological and medical burden related to asthma, and may continue to struggle into adulthood. Limited research has looked specifically at adolescents with asthma and their transition into adulthood.⁹

The purpose of this review is to twofold. First, we aim to provide physicians and other healthcare providers with a summary of clinical and research findings on the developmental aspects of adolescents with asthma (e.g., physiological, psychosocial). Second, we review research related to adolescent psychological functioning, adherence to treatment, and transition into adult care. This review provides an overview of how adolescents with asthma differ from other age groups with asthma, as well as how healthcare providers can best care for an adolescent with asthma and promote effective asthma management and better asthma control.

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Abbreviations: CAM, complementary and alternative medicine.

ADOLESCENT PHYSIOLOGICAL DEVELOPMENT AND ASTHMA

Gender differences

Preadolescent boys have a higher prevalence of wheeze and asthma than girls. In adolescence, however, the onset of wheeze is greater in females than males and asthma is more severe. Prospective studies support the hypothesis of a higher incidence of asthma and wheeze in girls after puberty.¹⁰ Female sex appears to be an independent risk factor for non-allergic asthma at all ages, but particularly during adolescence and young adulthood.¹¹ Supporting these data is the observation that women with early menarche have lower lung function and more asthma in adulthood.¹² In women with asthma, respiratory symptoms change significantly during the menstrual cycle and are most frequent from the midluteal to midfollicular stages, and less common near the time of ovulation. Oral contraceptives appear to have a protective effect and reduce ovulatory cyclic asthma symptoms.¹³

The rate of hospitalization for asthma follows the same pattern as the incidence data, with a change from lower to a higher risk in girls after puberty.¹⁴ Asthma hospitalization rates for boys are higher than for girls between ages 2–12 years, the gender gap in asthma hospitalizations reverses between ages 13–14 years, and rates for girls are significantly higher than boys between 16–18 years of age.¹⁵ The risk of asthma severity and hospitalization is compounded in young women who are smokers.¹⁶

Obesity and smoking

Obesity and overweight is increasing globally and is particularly problematic for adolescent girls. Obesity is also associated with asthma and the severity of asthma.¹⁷ Both asthma and obesity are independently and synergistically associated with systemic inflammation¹⁸ and obesity is associated with metabolic syndrome including type 2 diabetes mellitus and cardiovascular disease.¹⁹

In the United States, approximately 1.4 million children younger than 18 years start smoking each year and up to 90% of adult smokers began during adolescence. Two thirds of regular smokers became regular, daily smokers before they reached 19 years of age. Adolescents report symptoms of tobacco dependence early in the smoking process, even before becoming daily smokers. The prevalence of tobacco use is higher among teenagers and young adults than among older adult populations.²⁰ Current smoking is significantly associated with symptoms of asthma, such as having recent wheezing and recent exercise-induced wheezing, especially for adolescents who are not atopic.²¹ Paradoxically, adolescents with asthma who smoke are at increased risk of nicotine dependence compared to those without asthma and the greater the symptom severity the more rapidly dependence develops.²²

Environmental tobacco smoke also increases the frequency and severity of asthma. This exposure can occur in the home and when exposed to friends or classmates who are smokers. In Scotland, passage of smoke-free legislation in 2006 was associated with a subsequent reduction in the rate of respiratory disease in populations other than those with occupational exposure to environmental tobacco smoke, including school age children and adolescents.²³

Exercise asthma and asthma misdiagnosis

Asthma is both under diagnosed and increasingly, over diagnosed. The misdiagnosis of asthma is especially common in young people presenting with exercise-related symptoms or cough²⁴ and in those who are obese.²⁵ Adolescents with exercise

induced dyspnea are far more likely to have normal or physiologic exercise limitation than to have asthma.²⁴

Non-asthmatic wheeze (called “undiagnosed wheeze” by the investigators) accounted for 22% of wheezing at 18 years in the Isle of Wight cohort study. This was primarily associated with adolescent-onset and had similar symptom frequency and severity to diagnosed asthma. Those with non-asthmatic wheeze had normal pulmonary function test results, little or no bronchial hyperresponsiveness, and were less frequently atopic than those with asthma. The authors concluded that non-asthmatic wheeze is relatively common during adolescence, differs from diagnosed asthma and has strong associations with smoking and paracetamol (acetaminophen) use.²⁶

ADOLESCENT PSYCHOSOCIAL DEVELOPMENT AND ASTHMA

Psychosocial development for all adolescents involves dynamic changes in cognitive functioning, family and peer relationships, and school and vocational achievement. During adolescence, there are global improvements in reasoning and information processing with specific gains in abstract, multidimensional, planned and hypothetical thinking.²⁷ As such, asthma-related fears may become more emotional and cognitively sophisticated during adolescence.²⁸ For example, adolescents can more fully understand the limitations that asthma imposes and how this diagnosis challenges their autonomy and independence.

Identity formation and development are core psychosocial tasks of adolescence.²⁹ The adolescent’s exploration and formation of their identity – in both their normative and medical worlds – may affect relationships with family and peers and adherence to treatment regimens.² Providers are encouraged to build rapport with the adolescent and interact with them without parents present to facilitate their trust in the medical environment and understand their individual experiences.⁶

Family factors

Parents and families often assume much of the responsibility for child and adolescent asthma care. Family routines and effective problem solving within families can promote better adherence to asthma treatment regimens.³⁰ Family emotional climate has been found to affect asthma severity, triggering asthma symptoms when the emotional climate is dysfunctional.³¹ Family functioning has also been associated with patient/provider relationships and treatment adherence in families with an adolescent with severe asthma.³² Adolescents whose parents had higher ratings of self-esteem were described by physicians as being able to better form alliances with physicians. Interestingly, physicians reported better alliances with parents who reported worse overall family functioning, suggesting that physicians may be more likely to intervene with families identified as having inadequate parental involvement.³² Consistent with NHLBI guidelines highlighting the importance of patient/provider partnership in effective asthma management,³³ family functioning may be associated with positive asthma outcomes in adolescents through strong alliances between families and providers.

Peer factors

Successful peer interactions during adolescence affect identity formation, self-image, psychological adjustment, and adherence to treatment.^{34,35} Feelings of embarrassment about asthma have been linked to not carrying an inhaler or being less likely to use asthma medications in front of peers. Adolescents may also choose not to use medications for fear of being “interrogated” about their medications in front of others.³⁶ However, adolescents who report

feeling in control of their asthma symptoms may feel less embarrassed about their illness, may be more likely to discuss asthma with peers, and ultimately experience better self-management behaviors. Healthcare providers are in a position to support adolescents in their sense of control over asthma, engage adolescents in discussions about peer support, and how they handle their asthma at school.

School and vocational achievement factors

School success is important for an adolescent's social and emotional functioning, future vocational attainment, insurance status, and financial independence.³⁴ Asthma is the leading medical cause of school absences in the United States, with an estimated 4 million children missing approximately 12.8 million school days each year.^{37,38} A recent national longitudinal study found that adolescents with mild to moderate asthma were not significantly different from their healthy peers in high school graduation rates, employment status, or receiving disability services.³⁹ However, those with severe asthma have significantly lower educational attainment and future employment than those with mild to moderate asthma.⁴⁰ A city-wide after-school program provided a one-time, 2.5 hour workshop to a population of minority families with 77% of children on Medicaid. Asthma symptoms were reduced to less than once per week on average, hospital days decreased from 11% to 2%, emergency room visits decreased from 35% to 4%, and school days missed decreased from 48% to 20%. Although this program was administered to students in grades K-6, it appears to be a model that could be tailored to adolescents with asthma as well.⁴¹

PSYCHOLOGICAL ASPECTS OF THE ADOLESCENT WITH ASTHMA

Since many mental health disorders emerge during adolescence, it is important to understand the impact of psychological functioning for the adolescent diagnosed with asthma. Adolescents with asthma are at increased risk of comorbid anxiety and/or depression,³ which can be associated with poor symptom control, increased healthcare use, reduced quality of life, non-adherence to medications, poor treatment outcomes and a higher prevalence of death.^{4,42}

Anxiety: Approximately one third of adolescents diagnosed with asthma may suffer from an anxiety or panic disorder.⁴³ Adolescents with asthma have increased rates of agoraphobia compared to healthy controls and community-based populations (7.5% vs. 3.4% vs. 0.50%, respectively;⁴⁴). Social anxiety disorder is also more prevalent for adolescents with asthma, perhaps due to their fear of negative peer evaluation and increased discomfort in social settings.⁴⁵ Studies have identified being Caucasian, female, a smoker, living with a single parent, more parent-externalizing behaviors, and a more recent diagnosis of asthma as possible risk factors for anxiety disorders for adolescents with asthma.^{5,42,44} Whereas the prevalence of anxiety in this population appears related to behavioral and socioeconomic factors, several studies have indicated that anxiety may not be related to asthma severity.⁴⁵

Depression: Between 20%–50% of adolescents diagnosed with asthma report significant depressive symptoms.³⁴ A meta-analysis reported a depression prevalence rate of 27%, which is more than twice that of adolescents without asthma.⁴² Depressive symptoms, both within this population and in the general adolescent population, appear especially related to other behavioral co-morbidities, such as risk-taking behaviors, smoking and substance abuse.^{3,5} Increased rates of negative mood for both adolescents with asthma and their parents were significantly associated with increased asthma symptom reporting and

school absences.⁵ This may indicate that the emotional state of the child and/or parent influences the accurate reporting of symptoms, where the more distressed they are the more symptoms they report. The result may be increased office visits, hospital/ED visits, and school absences even in the state of relatively mild asthma symptoms.⁵

Parent/Caregiver psychological health

Families of adolescents with severe asthma report higher rates of psychological disturbances.⁴⁶ Higher rates of parent psychological difficulties have not been found for children/adolescents with mild to moderate asthma.⁴⁷ Other research has indicated that parental stress and depression at baseline increase a child's inflammatory profile over a six-month period, which is seen in both a healthy cohort and children with asthma.⁴⁸ Thus, the healthcare provider should consider how physical and psychological functioning interacts with one another for the adolescent with asthma.

Etiology of psychological problems

Globally, the chronic and daily implications of treating one's asthma may contribute to anxiety or depressive symptoms and these same symptoms may exacerbate the symptoms of asthma.³⁴ For example, the unpredictable and chronic experience of asthma may lead to adolescents' anxious thoughts that provoke somatic and emotional symptoms of anxiety or panic, especially if coupled with acute medical interventions or hospitalizations. Likewise, shortness of breath – a central symptom of panic attacks – may lead to hyperventilation that potentially aggravates asthmatic bronchoconstriction.³ Conversely, limited sensitivity to resistive respiratory loads was found to increase the likelihood of near-fatal asthma attacks.⁴⁹ Therefore, the accurate perception of subjective vs. objective asthma symptoms is important for the adolescent with asthma.⁵⁰

Bender⁴ outlined relationships among depression, nonadherence, and asthma control. One pathway of this model indicated that poor asthma control may cause distress that leads to depressive symptoms. Another pathway considered that depression may lead to either nonadherence or increased chronic inflammation resulting in poor asthma control, thereby setting a pattern of poor emotional and physical functioning.⁴ The prevalence of smoking and other substance abusing behaviors for adolescents with asthma points to a self-medication hypothesis, where self-soothing behaviors may be an attempt of the individual to treat their distress and achieve emotional stability.⁵¹ Adolescence appears to be the best time to assess and treat such negative coping behaviors since the individual with asthma is experiencing heightened cognitive and emotional reactions to their disease with little practice or skills to address them in a healthy manner.

Assessment and Intervention

Annual screening of psychological status and family functioning are recommended to identify patients and families at-risk. Effective screening for mental health disorders has been implemented in pediatric asthma,⁴⁴ cancer,⁵² cystic fibrosis,⁵³ and primary care.⁵⁴ Screening and psychological support appear more feasible when offered within the medical setting as part of an interdisciplinary team.⁵⁵ The Psychosocial Assessment Tool (PAT 2.0;⁵²) is an example of a validated screener that assesses family functioning and adjustment to pediatric chronic illness that could indicate targeted follow up and/or referral to a mental health provider.⁵⁶

CONTEXTUAL INFLUENCES ON THE ADOLESCENT WITH ASTHMA

Pediatric asthma disparities exist, with racial and ethnic minority children having greater asthma prevalence, morbidity, and mortality than non-Hispanic white children.⁵⁷ Asthma disparities are thought to be determined from multiple factors, including access to the health care system, patient beliefs and expectations, provider beliefs, and the environment within which the child lives.⁵⁸ Parental beliefs related to the need for asthma medications have been associated with medication adherence in non-Hispanic white and Latino families, both in mainland US and Island Puerto Rico.⁵⁹ Cultural beliefs have been associated with the underuse of daily preventative medications for asthma in African American and Latino families⁶⁰ and to greater use of alternative medications in Latino families.⁶¹ As racial and ethnic minority children often live in urban settings, it is difficult to disentangle the effects of socio-economic status from race/ethnicity. In cystic fibrosis, socio-economic status has been consistently identified as a predictor of outcomes because of its association with environmental tobacco smoke exposure and disease management skills rather than barriers related to healthcare access or differences in prescribed care.⁶²

Studies that focused specifically on adolescents with asthma found that up to 80% of adolescents use complementary and alternative medicine (CAM; e.g., prayer, relaxation) to manage their asthma symptoms.⁶³ Although CAM practices are used across ethnic groups, African American and Latino adults often report higher rates of CAM than non-Hispanic whites.⁶⁴ CAM use becomes problematic when used in lieu of conventional medical treatments; poor asthma control has been linked to CAM use in children.⁶⁵ Predictors of CAM have consistently included being African American, older age, more asthma symptoms, and perceived efficacy of CAM.^{66,67} In a study of African American adolescents with asthma, 71% reported using CAM in the past month for symptom management, and more frequent asthma symptoms were associated with the use of prayer.⁶⁸ However, adolescents were least likely to report the use of prayer or guided imagery for symptom management to their providers.

On the other hand, greater frequency of praying has been associated with better quality of life in a sample of African American adolescents with asthma.⁶⁹ Findings regarding CAM use in adolescents suggest several factors relevant for healthcare providers working with this population (see [Box 1](#)). Providers should recognize the frequency of CAM use across adolescents with asthma, particularly those from African American or Latino backgrounds, as well as the belief among many adolescents that CAM use alone is efficacious. Healthcare providers must actively engage adolescents in conversations about CAM use, as adolescents are not likely to disclose such information. Healthcare providers should recognize the importance of CAM use for

adolescents, but also strive to ensure that the adolescent understands the importance of using CAM in conjunction with a medically based treatment.

ADHERENCE AND THE ADOLESCENT WITH ASTHMA

Effective asthma control and positive medical outcomes depend, in large part, on the adolescent and family's adherence to their medical regimen.⁸ Adherence in pediatric chronic illness has been defined as the extent to which a person's behavior coincides with medical or health advice.⁷⁰ Across all ages, adherence to medical advice is now understood to be a complex cluster of associated behaviors rather than a single factor.⁷¹

Consequences of poor adherence for adolescents with asthma include poor asthma control and greater asthma morbidity.^{72,73}

In addition, poorly controlled asthma diminishes child and adolescent health-related quality of life and is responsible for increased school absences, emergency room visits, office visits, and inpatient care at a cost of more than one billion dollars per year.⁷⁴ Adolescents use preventive asthma medication less than children and adults with asthma.⁷⁵

Measuring adherence

A variety of approaches have attempted to measure adherence in pediatric asthma, including drug assays, observations, electronic monitors, pill counts, provider estimates, and patient/parental reports.⁸ [Table 1](#) outlines the assets and liabilities to each approach to measuring adherence. The presence of symptoms, use of quick relief medication, and patient-reported outcomes may be the most clinically significant components of adherence to monitor as opposed to outcomes such as lung function, sputum eosinophils, and exhaled nitric oxide.⁶ Examples of patient-reported outcomes include quality of life, asthma exacerbations, impact on daily activities, and psychological factors that may impact symptom expression and perceived severity.^{6,76}

Barriers to adherence

Barriers to adherence for adolescents include negative attitudes about healthcare providers,⁷⁷ reluctance to take medications in the presence of peers, and denial of the consequences of nonadherence.⁷⁸ Adolescent patients diagnosed with asthma reported frequent barriers to adherence, including: treatment and daily activities interfering with each other, forgetfulness, psychosocial difficulties, and wanting to appear normal to their peers. Parents of adolescents reported forgetfulness, dislike taste of medication, oppositional behavior, and treatment and daily activities interfering with each other as frequent barriers.⁷⁹

Misinformation about asthma medications and incorrect assumptions (e.g., "outgrowing asthma") have also been found to contribute to nonadherence.⁸⁰ As noted earlier, adolescent depressive symptoms and risk taking behaviors (e.g., smoking, drinking alcohol) have been identified as factors that can contribute to adolescent nonadherence. Adolescents who engage in risk taking behavior may have a general disregard for health consequences, which includes medication adherence, and may be further compounded by adolescent depression.⁴

Poor aerosol device compliance and contrivance may contribute to lower rates of adherence among adolescents.⁸¹ Even if a patient is aware of how to use a device correctly, they may demonstrate contrivance, purposely using a device incorrectly (e.g., without a holding chamber). For an adolescent, contrivance may stem from finding the proper use of an inhaler inconvenient or socially unacceptable. In addition to educating adolescents on how to use an inhaler, healthcare providers should also strive to have the

Box 1. Conversations regarding CAM use.

- What concerns or worries you about taking your asthma medications? (prompts: long-term effects, side effects, beliefs in necessity)
- How useful do you think your asthma medications are in decreasing your asthma symptoms?
- Sometimes when adolescents have asthma symptoms, they may use prayer, relaxation techniques, massage or rub, or take herbal remedies or change what they eat or drink to make their symptoms go away. What sorts of things do you use to treat your asthma?
- Tell me about a time when you used one of these other treatments, like prayer, instead of taking your inhaler.

Table 1

Assets and liabilities of adherence measures. (Reprinted with permission from ref. [8].)

Measure	Assets	Liabilities
Assays	Verify drug ingestion Adjust drug levels Quantifiable	Pharmacokinetic variations Short-term measure Invasive and expensive
Observation	Direct measure of non-medication regimens Repeated measurements Necessary to functional assessment	Obtrusive and reactive Clinically impractical Difficult to obtain representative samples
Electronic monitors	Precision (reveals dosing and dosing interval data) Continuous and long-term assessments Helps identify drug reactions	Does not measure consumption Reactive Mechanical failures

adolescent demonstrate the proper technique for them and discuss barriers that may prevent them from using the device correctly.

Adolescent adherence interventions

Several comprehensive reviews of adherence interventions in pediatric asthma have been published.^{82,83} A peer led asthma self-management program has been described as well received by adolescents,⁸⁴ suggesting that adolescents may be more willing to learn from leaders that are perceived as similar to them. Healthcare providers may wish to support peer leaders in asthma education programs.

Adherence interventions for adolescents with asthma have also used technology, including text messaging, the Internet, and social media outlets.⁸⁵ One pilot study found improvements in asthma symptoms at one month and three month follow-up in an intervention group that received tailored text messages (e.g., “take your meds”).⁸⁶ An Internet-based self-management program was also found to improve asthma-related quality of life and asthma control in adolescents, although this effect was not seen after 12 months.⁸⁷

Intervention studies in adherence demonstrate the importance of focusing on the adolescent’s beliefs related to health behavior change. In an intervention with inner-city, African American adolescents with asthma, a motivational interviewing intervention increased adolescent motivation and readiness to adhere to treatment; improvements in adherence to medication were not found.⁸⁸ A parent-youth teamwork intervention was found to improve adherence in youth between the ages of 9 and 15 years of age as compared to asthma education and standard of care groups.⁸⁹ The teamwork intervention provided parents and youth with techniques for addressing conflicts related to the shared responsibility of asthma care and a standardized scheduling system for parent supervision of medication use. This schedule allowed parents to gradually reduce their involvement in the youth’s daily medication use as appropriate. Discussions should focus on how the parent and adolescents can share responsibility, including a schedule for gradually reducing parental involvement in the adolescent’s daily asthma care. A structured plan may reduce parent-adolescent conflict over asthma care at home (see Box 2).

TRANSITION OF CARE INTO ADULT SERVICES

The transition of adolescents to adult services is essential due to the increased survival of chronically ill children into adulthood. Transition is defined as “a purposeful, planned process that addresses the medical, psychosocial, and educational/vocational needs of adolescents and young adults with chronic physical and medical conditions as they move from child-centered to adult-oriented healthcare systems”.⁹⁰ A consensus statement by the American Academy of Pediatrics recommends that programs be

Box 2. Recommendations regarding adolescent adherence.

- Assess for risk taking behaviors, depressive symptoms, and family functioning.
- Discuss the adolescent’s beliefs about taking medications as prescribed. What positive outcomes would the adolescent experience when taking medications as prescribed (i.e. decreased interference with daily activities).
- Emphasize the importance of using an inhaler correctly and have the adolescent demonstrate his or her technique.
- Consider the role of the adolescent’s peers in their everyday asthma care – are there ways to positively involve the adolescent’s friends?
- Assess whether the adolescent is hesitant to use the inhaler in front of peers or during social activities.
- Emphasize the importance of the parent and adolescent working together as a team in the adolescent’s asthma management.
- Help the parent and adolescent formulate a plan that gradually allows the adolescent to assume more responsibility in his or her asthma care.

available to *all young people* with special health care needs to address their health care, work environment, and independent living skills.⁹¹

Common barriers to a successful transition of adolescents to adult services include limited time to foster self-care skills, tools to assess readiness to transition, a lack of clinical attention to the transition process, and few guidelines for desirable self-management skills.^{92,93} For young adults with asthma, financial barriers to their needed medical care and prescription medications can be difficult.⁹⁴ Surveyed youth with special health care needs suggest that preparation and a clear termination of pediatric services are important for successful transition to adult services.⁹³ Young adults with mild/moderate asthma may transition well to adult asthma clinics; however the few studies with large populations of young adults with moderate to severe asthma have shown lower rates of educational attainment and employment.³⁹

CONCLUSION

The unique physiological and psychosocial changes that occur during adolescence make this a clinically important time to intervene with the patient and family. Anxiety and depression are common for the adolescent and family with asthma and directly affect their ability to adhere to their medical regimen. The shift of adolescents taking more responsibility of their asthma care presents many challenges for consistent adherence to their medical care, symptom management, and strong treatment outcomes. Much work needs to be done to understand how

adolescents with asthma can better adhere to their medical treatment. Contextual factors and the transition to adult care further complicate all of these concerns. Therefore, future studies and clinical attention need to understand that the adolescent with asthma is a unique population that neither childhood nor adult medical approaches will effectively manage.

RESEARCH DIRECTIONS

- Effective interventions for adolescent smoking and obesity that can directly improve adolescent asthma care.
- Understanding hormonal and pubertal influences on asthma morbidity, especially as this relates to non-allergic wheeze.
- Determining genetic and epigenetic/environmental influences on asthma severity (and conversely, asthma improvement) during adolescence and young adulthood.
- Developing effective screening and intervention procedures for psychological disturbances in the adolescent with asthma.
- Developing adherence interventions that effectively target the proportion of direct support vs. independence that adolescents need in achieving good asthma control.
- Developing effective transition programs for adolescents and young adults that can be widely implemented.

CME SECTION

You can receive 1 CME credit by successfully answering these questions online.

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MULTIPLE CHOICE QUESTIONS

1. Which of the following statements about asthma and sex is incorrect:
 - A. Asthma prevalence and hospitalization is more common in adolescent girls than boys
 - B. Obesity has a greater physiologic effect on women with asthma than men
 - C. Early onset of puberty may influence asthma severity in young women
 - D. Both asthma and obesity are inflammatory diseases
 - E. There are some data that suggest that young people with asthma who start smoking, become
 - F. addicted to tobacco more rapidly than non-asthmatic peers

Obesity and overweight is particularly problematic in adolescents. Obesity is associated with both asthma and the severity of asthma. Asthma and obesity are independently and synergistically associated with systemic inflammation. Although the physiologic effects of obesity including poor asthma control are no greater in young women than men, the risk of a obese girl being misdiagnosed as having asthma in the presence of dyspnea (but absence of flow limitation or bronchial hyperresponsiveness) is greater than in similarly obese boys and men.

2. Disease severity is a clinically important factor to consider when treating the adolescent with asthma. Which of the following factors is *least* affected by disease severity?

- A. Educational outcomes
 - B. Prevalence of anxiety
 - C. Adherence to treatment regimen
 - D. Vocational outcomes
 - E. Transition to adult care
3. Which of the following is an example of the best clinical practice approach when discussing adherence with the adolescent with asthma?
 - A. Be clear about what behaviors are expected of them and when.
 - B. Discuss with them what it must be like to be an adolescent with asthma in their school or family and the role they would like to play in their own care.
 - C. Outline a plan with the adolescent about how their parent will become consistently more involved and take more responsibility of their treatment if they are not able.
 - D. Calmly address the negative physical and medical events that may happen if they do not take their medications as prescribed.
 - E. Explain to them that your wish for their increased independence in their care is because once they turn 18 they will be “all alone” and have to manage their care at that time.
 4. Asthma disparities in adolescents likely stem from the interaction of all of the following factors *except*:
 - A. Cultural beliefs about asthma and medication use
 - B. Provider attitudes and beliefs toward patients
 - C. Use of alternative treatments
 - D. Higher rates of asthma morbidity
 - E. Health care system differences (e.g., insurance coverage)
 5. Which of the following recommendations for the effective transition to adult care is least important?
 - A. Address financial and insurance barriers.
 - B. Focus on the severity of asthma symptoms.
 - C. Clear communication on the termination of pediatric services.
 - D. Successful transition to higher education.
 - E. Time to prepare and educate the patient for the transition.

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