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Educational interventions targeting adolescents with atopic dermatitis

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BOSTON UNIVERSITY
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Thesis

**EDUCATIONAL INTERVENTIONS TARGETING ADOLESCENTS
WITH ATOPIC DERMATITIS**

by

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EDUCATIONAL INTERVENTIONS TARGETING ADOLESCENTS

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BECKY HWANG

ABSTRACT

Background

As a chronic inflammatory skin disorder, atopic dermatitis (AD) often affects people of varying ages and has the potential to affect individuals for years to decades. AD is both a physical and emotional disease, often severely affecting adolescents. Adolescence is a critical period of development when patients suffering with AD must learn to manage their own disease. The associated pruritus and skin barrier defects can be severe and interfere with social and educational opportunities. As adolescents accept the responsibility of managing their own AD, the disease outcome will be directly affected by their actions.

Literature Review Findings

Currently, the first line treatment for majority of patients suffering from AD is centered around topical emollients, topical corticosteroids and avoidance of exacerbating factors. Even with these treatments however, relapses often occur due to improper management of treatment, treatment education, and comorbidities. As a result, relapses often increase patient's psychological stress and dermatologic scarring while decreasing self-confidence; all of which culminate into a decrease in quality of life.

An organized literature review was performed focusing on studies that addressed adjunctive treatment modalities to improve overall disease outcomes in AD patients ages

10-19. Research has indicated the effectiveness of educational interventions for adolescents that aim to teach patients how to better cope with the disease by introducing topical therapy training, support groups, and counseling interventions. These interventions equip the youth with knowledge, motivate them to self-manage their chronic condition, and reinforce healthy behaviors. Because of the success of these interventions, it is important for providers such as physician assistants (PAs) and physicians to learn how to recognize patients' psychological stress and effectively implement education interventions.

Proposed project

The purpose of this study is to create a continuing medical education (CME) presentation-based lecture summarizing the most recent literature regarding educational interventions, which will raise awareness in the medical community. A brief 90-minute course will be offered for CME credits to expand the knowledge base of providers and equip them with resources necessary to encourage age-appropriate behavioral modifications to prevent and minimize relapses.

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LIST OF ABBREVIATIONS

AAD.....	American Academy of Dermatology
AAFP.....	American Academy of Family Practitioners
AAP.....	American Academy of Pediatrics
AAPA.....	American Academy of Physician Assistants
ACCME.....	Accreditation Council for Continuing Medical Education
AD.....	Atopic Dermatitis
BDI.....	Beck Depression Inventory
CME.....	Continuing Medical Education
DLQI.....	Dermatology Life Quality Index
FLG.....	Filaggrin
HPA axis.....	Hypothalamic-Pituitary-Adrenal axis
IAS.....	Interaction Anxiousness Scale
IRB.....	Institutional Review Board
mARS.....	Mobile audience response systems
QoL.....	Quality of Life
PA.....	Physician Assistant
PBC.....	Private Body Consciousness
SCORAD.....	Scoring Atopic Dermatitis
SDPA.....	Society of Dermatology Physician Assistants
SPD.....	Society for Pediatric Dermatology
STAI.....	State Trait Anxiety Index

INTRODUCTION

Background

Atopic dermatitis (AD) is one of the most common chronic inflammatory skin diseases and a major public health problem globally, with a prevalence of 10.7% in US children under 18 years old.¹ In many cases, patients who are diagnosed with atopic dermatitis continue to have persistent disease throughout adulthood. In developed countries, especially Western societies, there seems to be an increase in incidence of atopic dermatitis.² At the same time, there is increasing research to suggest that atopic dermatitis is associated with impaired psychosocial functioning, which can stem from perceived disease severity, pruritus, sleep disturbances, and social distress. The associated pruritus and skin barrier manifestations can be severe and interfere with social and educational opportunities. The current first-line treatment for the majority of patients suffering from AD is centered around topical corticosteroids and avoidance of exacerbating factors. However, there is evidence to suggest that education and psychological coping could improve long term quality of life (QoL) and disease severity.^{3,4} There is currently a lack of training programs for healthcare providers to carry out educational interventions that can improve long-term disease severity and QoL. It is essential for providers to employ educational and psychosocial interventions in order to equip the youth with knowledge, motivate them to self-manage their chronic condition, and reinforce healthy behaviors. This will empower young patients to make informed and responsible decisions about their health.

Statement of the Problem

AD is often accompanied by severe chronic symptoms such as pruritus, sleep disturbance, and psychological stress, which can all have serious effects on a patient's quality of life.⁵ As the incidence of AD in youth has increased, there has been a correlative increase in psychological disease. Dermatological conditions have been shown to be associated with psychological comorbidity. Affected patients can present with behavioral problems mostly rooted in increased emotional dependency, anxiety and sleep disturbances.⁶ Pruritus, a major symptom, can contribute to mood changes and poor sleep quality.⁶ Additionally, when compared to peers of the same age group, those with AD are more susceptible to mental illnesses such as anxiety, depression, conduct disorder and ADHD.^{7,8} The chronically relapsing-remitting course of AD can develop into a long-term economic and psychological burden in patients with persistent disease. Evidence from the literature suggests that good patient-provider rapport is central to effective treatment of AD.

While many studies examine on childhood atopic dermatitis vs. adult AD, there is a lack of research on how AD progresses into adulthood. The 2015 study conducted by Mortz et al. is one of the very few studies to explore this. Persistent disease into adult life is quite common and negatively affects QoL.⁹ Patients with either early onset of disease or associated diseases such as allergic rhinitis and hand eczema are more likely for their AD to persist into adulthood. It is crucial to recognize AD as not only a common and debilitating disease of childhood, but also adulthood.⁹

There is much work to be done in improving interventions and preventing adverse

outcomes in the adolescent population. There is evidence to suggest that education and psychological coping could lessen the severity of AD.¹⁰ Multiple studies have explored alternative methods for healthcare delivery, but there are still many challenges in providing care for this population that needs to be addressed. Providers working closely with adolescents are not frequently exposed to training modalities focusing on teaching strategies. This education-based study will address how informing practitioners on the latest educational techniques and coping interventions can affect the QoL, symptoms, and management of adolescent AD patients.

Hypothesis

Providers will acquire adequate understanding of the most up-to-date educational interventions recommended for adolescents as an adjunctive treatment for AD, which will ultimately lead to positive provider-patient relationships.

Objectives and specific aims

The main purpose is to summarize and present the most recent data on education interventions and coping skills to providers in the format of a CME lecture. The goals of the lecture are to provide providers working with adolescents with AD the necessary tools to counsel individuals in the hopes of decreasing the likelihood of developing long-lasting adverse effects on overall QoL and psychological consequences. If the hypothesis is correct, a new adjunct to topical and systemic treatments can be recommended for providers treating with adolescent patients with AD.

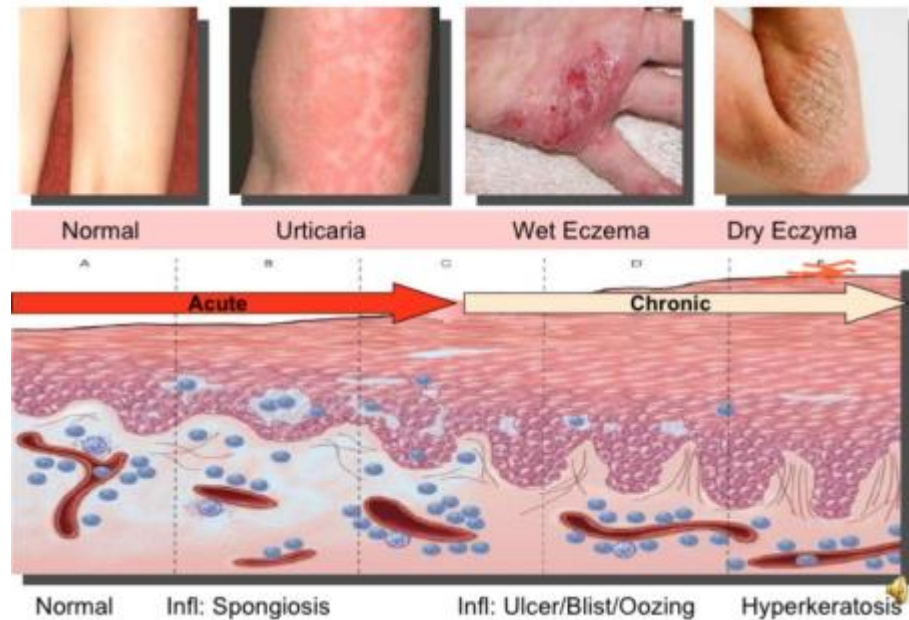
1. Identify education interventions associated with lower Scoring Atopic Dermatitis (SCORAD) score and improved QoL
2. Summarize the current data on educational interventions that will increase compliance with treatment plan
3. Create a CME lecture with a goal of educating providers on the latest literature on educational interventions in improving QoL for adolescents with AD
4. Gauge pre- and post-assessment knowledge and understanding of AD therapy and evaluate the data with a paired t-test

REVIEW OF THE LITERATURE

Overview

Atopic dermatitis (AD), also known as chronic eczema, is a multifactorial chronic inflammatory skin disease, characterized by varying degrees of dry, scaly lesions, pruritus, and accompanying psychological burden. It can start at any age and often presents on uncomfortable areas such as the elbow, knee, and face but can appear all over the body as seen in Figure 1. It is a serious cause of QoL impairment, morbidity, and extremely high healthcare spending. It is thought to be caused by both genetic and environmental components.¹¹ Atopy is the individualized or familial tendency to produce IgE antibodies in response to a low dose of proteins or allergens, which can cause diseases such as atopic dermatitis, asthma and allergic rhinoconjunctivitis.¹² Eczema is often associated with these comorbidities and together are known as the atopic triad.¹³ Clinical, genetic, and experimental studies have suggested that AD can be an antecedent for the development of sensitization resulting in allergic rhinitis and asthma. This highlights the importance of the epidermal barrier in the pathogenesis of these disorders.¹⁴

Figure 1. Varying stages of AD and dermatological changes associated with each.¹⁵



Atopic dermatitis usually manifests in early childhood, often before the age of 5, and affects areas of the face, neck, dorsal surfaces and joint flexural areas.¹⁶ Oftentimes, patients with a childhood onset outgrow the disease and have spontaneous remission before entering adolescence.^{17,18} Although AD is thought to be most common in children, up to 50% of cases can begin in or continue into adulthood. AD lesions can manifest as vesicular or papular lesions. In adolescents and adults, in addition to eczematous lesions, these older individuals often have overlying localized lichenified plaques, especially affecting the hands, the antecubital (Figure 2) and popliteal fossae.

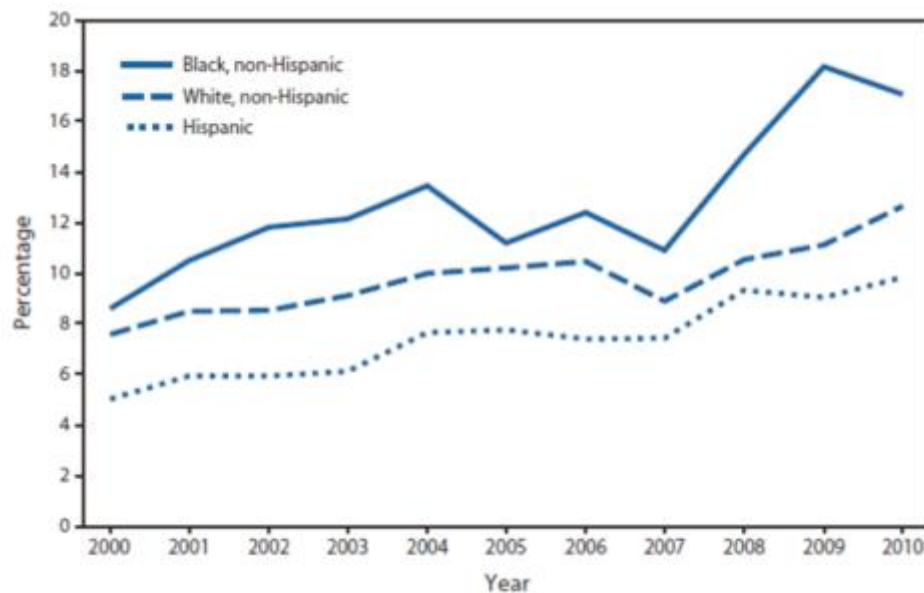
Figure 2. Atopic dermatitis lesions with lichenified plaques affecting the antecubital fossae.¹⁹



Atopic dermatitis affects genders equally and is one of the most commonly diagnosed dermatological disorders in adolescents. According to the 2003 National Survey of Children's Health, the incidence of atopic dermatitis is around 1 in 5 children, with a prevalence varying between 8.7 – 18.1% across states. After analyzing the national survey, Shaw et al. stated an odds ratio of 1.67 for correlative relationships between AD and factors such as metropolitan living, black race, higher education level, and dry climates.¹ Other correlations include black race, higher education level, and dry climates. In comparison, atopic dermatitis affects 15-20% of children and 1-3% of adults worldwide.¹⁸ The incidence of atopic dermatitis is increasing; during past decades in several industrialized nations, the incidence has increased up to 3 times. Living in developed countries and metropolitan regions seems to be a risk factor for AD. Although the prevalence of AD is higher in developed countries and metropolitan regions, efforts to

identify specific environmental causes have been inconclusive.¹⁸ From 2000 to 2010, the prevalence of people younger than 17 years old with eczema has increased. According to the National Health Interview Survey, the CDC stated that prevalence of eczema or skin allergies has increased. Figure 3 shows that the prevalence across racial groups has increased from “8.6% to 17.1% among non-Hispanic black children, from 5.0% to 9.9% among Hispanic children, and from 7.6% to 12.6% among non-Hispanic white children.”²⁰

Figure 3. Prevalence of AD or skin allergies across racial groups according to the CDC.²⁰



Risk factors for disease

A heritable component has been recognized in the development of AD but does not follow typical Mendelian inheritance patterns and is thought to have a polygenic mode of inheritance. The most consistent risk factors for AD are family history and loss of function mutations of the FLG gene. Nearly 70% of AD patients have a family history of atopy.^{21,22} Chances of developing AD are 2-3 times higher in those with one atopic parent and 3-5 times higher if both parents have atopic syndromes.^{23,24} Flohr and Yeo suggests that limiting early childhood exposure to infectious agents, endotoxins, and animals can increase susceptibility to allergic diseases.²⁵

Other risk factors include food sensitization, allergies, environmental factors, and microbial exposure. The most common food allergens associated with atopic dermatitis include cow's milk, hen's egg, and peanuts. It is thought that allergens can therefore be an exacerbating trigger for AD flare-ups.²⁶ Environmental factors such as low outdoor temperature, urban settings, fast-food, delayed weaning, obesity, pollution, small families, widespread use of antibiotics, immunizations, and tobacco smoke are all associated with an increased risk for AD, while UV light exposure, fresh fruits, fish, and breastfeeding have been shown to be protective factors.¹⁸

Pathophysiology

There are three hypotheses proposed to account for the pathophysiology of the disease. The first is an immunological hypothesis that proposes strong contributions to atopic dermatitis results from dysregulation of adaptive and innate immune defense leading to

an amplified IgE-mediated, systemic Th2 response.²² There is evidence to suggest that CD4+ T cells tend to follow predominately Th2 differentiation, which causes increased production of interleukins and IgE antibody.²⁷

The second is a skin barrier hypothesis that proposes a loss of function gene mutation causing an impaired skin barrier leading to dry skin, fissuring, and a greater risk of eczema. Due to strong familial trends, investigators have tried to identify genes responsible for atopy. The strongest documented genetic association for AD is mutation of the filaggrin (FLG) gene, which is normally responsible in maintaining an intact and hydrated skin barrier.²⁸ Atopic dermatitis affects 42% of all mutation carriers. FLG is normally responsible for an important epidermal protein expressed on the outer layers of the epidermis that help bind keratinocytes together.²⁹

Lastly, the hygiene hypothesis states that excessive attention to hygiene, changes in eating habits, widespread use of antibiotics and immunization as seen with urban living will increase the risk of developing AD. The study conducted by Kramer et. al. supports this hypothesis as they found that AD prevalence was higher for children from small families (up to 3 people) and who attended a nursery at a later age compared to an earlier age.³⁰ This study supports the idea that if the human immune system is exposed to infections and foreign antigens at an earlier age, then there would be greater protection against atopy. Another example that supports the hygiene hypothesis showed that communities that strongly limited use of antibiotics and immunizations had a lower prevalence of AD.³¹ However, results from some studies do not support the hygiene

hypothesis. For example, studies by Zutavern et al. and Purvis et al. did not show any correlation between AD and the size of a family.^{32,33}

Understanding psychological and emotional needs are crucial to treating patients holistically.³⁴ Successful management in more than one-third of dermatology patients takes into account associated psychological factors.³⁵ Psychodermatology is a rapidly evolving field that examines the relationship between mind and skin. It focuses on the intricate interactions between the neuroendocrine, immune and cutaneous systems.³⁶ This interplay is particularly applicable to atopic dermatitis, where patients can stress over its potentially lifelong or relapsing-remitting course.³⁷

Existing research

Slattery et. al found that adolescents with AD had greater prevalence of anxiety disorders, such as depression and anxiety, when compared to the community.³⁸ Stress is one of the many negative psychosocial impacts that atopic dermatitis has on adolescents. Studies have shown that stress exacerbates atopic dermatitis by inducing eosinophil, Th2, and IgE proliferation.¹⁶ In addition, both stress and atopic dermatitis occurring in childhood causes sensitization of the hypothalamic-pituitary-adrenal axis (HPA axis) increases the susceptibility to both in adulthood. By this rationale, if children with AD can control their AD and stress in childhood, then they will be less sensitive to stress when they are older. Psychotherapy, relaxation therapy, hypnosis, massage, and acupuncture are just a few of the many therapeutic approaches to reducing stress, relieve anxiety, and to change

behavioral patterns such as responses to itching and frustration that are common in AD patients.¹⁶

Sang Oh et al. evaluated the psychological traits of 34 adolescents afflicted with AD aged 13-41 with the following psychologically-based questionnaires: Beck Depression Inventory (BDI), State Trait Anxiety Index (STAI), Interaction anxiousness Scale (IAS), private body consciousness (PBC) and the Dermatology Life Quality Index (DLQI). Research found a significant relationship between the parameters of the questionnaires and DLQI as well as an increase in all parameters of the given questionnaires.³⁹ Between the clinical factors, anxiety was found to be correlated to pruritus. Psychotherapy that can help decrease anxiety should be considered in patients with AD that do not respond to itch management by anti-histamines alone.

A study by Brenninkmeijer et al. of 165 patients aged 18-30 whose AD began during childhood highlighted the significant association between disease severity and negative impact on QoL with significant burden on QoL in 48.7% of patients ($R=0.518, P<0.001$).⁴⁰ The major issues expressed were the desire to receive more understandable information about the disease, empathy from the provider, group interactions, and the need for psychological comfort. In addition, adolescent patients with moderate to severe AD exhibited notable hindrance in forming healthy social bonds, leading to having fewer friends and minimizing their output in group settings when compared to their healthy peers or those with mild AD. Patients in high school reported intense itching (90%), embarrassment of skin appearance (70%), intimate interaction avoidance (49.1%), abstinence of sports related activities (43.2%), sleep disruption

(69.2%), fatigue (60.2%) and physical aggravation of skin lesions associated with stress (74.1%).⁶

A correlation between severity of clinically significant symptoms and lesions and stress has been found. Saunes et al. conducted a study on Norwegian adolescents revealed a positive association between intensity of clinical attributes and amplification of psychological stress ($p < 0.05$).⁴¹ Specifically, females were found to be more impacted by psychological stress than males; however, the relationship between AD and psychological stress was more closely related in adolescent males than females. In particular, the psychological burden was most prevalent in patients ages 17-19 years old.⁴¹ It may be important to utilize screening tools to recognize these older individuals who are in distress.

There is recent evidence to suggest that educational interventions for both children and their caregivers may benefit from structured education provided by multidisciplinary teams.⁴² Atopic dermatitis in children significantly affects QoL by interfering with normal development, education, and play.⁴³ Educational and counseling interventions can play an integral role in improving quality of life in childhood and adolescence AD. Education and counseling not only play an important role for the patients who are suffering from atopic dermatitis, but is equally essential for the patient's family. As Lee and Oh mentioned, the more knowledge about AD that parents receive, the more motivated they are to treat it.⁴³ Current interventions vary in their target population. Some interventions focus on integrated family education, some focus only on the affected child, and others focus only on counseling and educating the parents. The

variability in the types of intervention also vary greatly, including individual face-to-face educational sessions, web-based consultations, lectures, group discussions, practice scenarios, personal experience sessions, and structured activities. From allergists and dermatologists to psychologists and dieticians, educators of the interventions differ in their disciplines, but have all shown to be effective in counseling, educating, and motivating AD patients and family in self-managing the disease. Although the details of each intervention for AD are wide-ranging, most studies have shown that educational and counseling interventions are effective in improving the QoL in children and adolescents with AD.

Interventions that lead to better outcomes can be simple and effective. For example, an intervention by Beattie and Lewis-Jones showed that merely demonstrating the application of topical therapies improve the outcome of treatment adherence⁴⁴. Reasons for poor adherence to therapy include fear of side effects, under-prescribing, failure to renew medications, lack of time, refusal of therapy, and lack of knowledge of therapy. In Beattie and Lewis-Jones' intervention, only 41% of patients who used topical corticosteroids were aware of its potency while a substantial number of patients also did not receive adequate information and training in the usage of topical therapies. By recommending the clear labelling of potency on topical corticosteroids and educating patients on how and when to use the medication, treatment adherence improved. With improved treatment adherence, better overall outcomes can be expected.

Interventions that target patients suffering from AD are conducted by educators from variable disciplines. However, it has been shown that a good educator-patient

relationship is the strongest predictor of adherence to treatment and strengthened self-efficacy.⁴⁵ Many studies have shown positive results from nurse educators. Patients reported faster access to treatment, increased knowledge of their condition, effective rapport without feeling rushed.^{46,47} These results indicate the types of educators that families and patients prefer for their educational and counseling interventions: educators that are available, knowledgeable, well-trained, and personable.

The format of the intervention also plays a role in its effectiveness. Although individualized educational interventions have been shown to decrease AD severity and increase QoL, group interventions seem to be more effective.⁴⁸⁻⁵⁰ Group interventions provide longer, more detailed sessions in addition to stimulating a sense of camaraderie by allowing families to share their stories, experiences, and questions. This way, families can learn what others do to help with the management of AD. Furthermore, some interventions take group interventions one step further by narrowing the group to comparable age ranges to help narrow the group's focus. Futamara et al. conducted a two-day parental education program on childhood AD and compared results from a control group, who received conventional treatment alone, with results from a group receiving both conventional treatment and the parental education program. The study showed that group discussions helped to alleviate anxiety about AD. Results indicated that the experimental group had a much lower SCORAD score than the control group. The SCORAD determines severity of AD. According to the SCORAD index AD is defined as mild if <25, moderate 25-50, and severe if the score >50.⁵¹ In addition to the

lowered SCORAD score, the group receiving the educational program also received a better sleeplessness symptom score and corticosteroid anxiety score.

A German study conducted by Staab et al. performed an educational intervention among three age groups, 3 months to 7 years, 8 to 12 years, and 13 to 18 years.⁵⁰ The program comprised of a two-hour group training once weekly for six weeks. The 3 months to 7-year group received parental education while the 8 to 12-year group attended separate education sessions. The 13 to 18-year group attended individual sessions tailored to their needs based off medical, nutritional and psychological issues. Results indicated that the age-specific educational program had significantly better scores for severity of eczema, subjective severity, and effect on parents' QoL as seen in Table 1 ($p < 0.05$).

Advantages of this study include narrow age groups, allowing Staab et al. to compare the differences between the age groups and usage of a control group, as improvements were also seen in the absence of parental or patient education. Another aspect of the study that is laudable is the 40-hour training workshop for educators. The program was only offered at institutions with national certification for the education of children and adolescents with AD. One limitation to this study is that only patients with moderate to severe eczema were included. It would be interesting to be how the same intervention affects patients with mild eczema as well.

Table 1. Comparisons of disease severity for AD between the intervention and control groups by Staab et al.⁵⁰

Study: Staab <i>et al.</i> , 2006 ⁸⁷		Change in disease severity score from baseline to 12 months (covariance analysis), mean (95% CI) ^a		
Age group: 3 months to 7 years	Measure	Intervention (n = 274)	Control (n = 244)	Difference between groups
	SCORAD: total severity score	-17.5 (-19.6 to -15.3)	-12.2 (-14.3 to -10.1)	-5.2 (-8.2 to -2.2), <i>p</i> -value = 0.0002
	SCORAD: objective severity score	-13.0 (-14.8 to -11.2)	-8.7 (-10.5 to -7.0)	-4.2 (-6.8 to -1.7), <i>p</i> -value = 0.0009
	'Skin Detective' subjective severity score	-3.3 (-3.9 to -2.8)	-2.2 (-2.7 to -1.6)	-1.1 (-1.9 to -0.3), <i>p</i> -value < 0.001
Age group: 8–12 years	Measure	Intervention (n = 102)	Control (n = 83)	Difference between groups
	SCORAD: total severity score	-16.0 (-20.0 to -12.0)	-7.8 (-11.4 to -4.3)	-8.2 (-13.6 to -2.8), <i>p</i> -value = 0.003
	SCORAD: objective severity score	-12.3 (-15.6 to -8.9)	-5.6 (-8.7 to -2.5)	-6.7 (-11.2 to -2.1), <i>p</i> -value = 0.005
	'Skin Detective' subjective severity score	-3.7 (-4.6 to -2.7)	-1.6 (-2.5 to -0.7)	-2.1 (-3.4 to -0.8), <i>p</i> -value < 0.001
Age group: 13–18 years	Measure	Intervention (n = 70)	Control (n = 50)	Difference between groups
	SCORAD: total severity score	-19.7 (-23.7 to -15.7)	-5.2 (-10.5 to 0.1)	-14.5 (-21.2 to -7.9), <i>p</i> -value < 0.0001
	SCORAD: objective severity score	-15.0 (-18.4 to -11.6)	-5.1 (-9.5 to -0.6)	-9.9 (-15.5 to -4.3), <i>p</i> -value < 0.0001
	'Skin Detective' subjective severity score	-3.1 (-4.1 to -2.2)	-1.0 (-2.1 to 0.1)	-2.1 (-3.5 to -0.7), <i>p</i> -value < 0.0002

One study performed by Karppinen et al. assessed the effect of empowering heliotherapy on clinical outcome and quality of life for AD patients. Heliotherapy is treatment by exposure to sunlight. After two weeks of empowered heliotherapy consisting of group discussions, exercise practices, and heliotherapy, the SCORAD score for AD patients improved significantly, from 30.6 to 11.1 ($p < 0.001$).⁵² Moreover, the

study was also done with psoriasis patients and results in QoL seemed to be more profound for AD patients. However, the two groups should not be directly compared due to the limited sample size. Although the results from the study showed important benefits of empowering heliotherapy, the experiment population only consisted of females. Females, as Uttjek et al. mentions, have been shown to have better topical treatment compliance than males.⁵³ Therefore, the results of this study may be biased. Nevertheless, the intervention showed positive effects on AD symptoms and QoL by group discussions, lifestyle modifications, and treatment routines such as regular heliotherapy.

Many interventions are aimed toward educating the parents to improve child behavior problems, self-efficacy, QoL, treatment competence, and symptom severity. An intervention like the one performed by Morawska et al. educated parents of 2 to 10-year-old children with atopic dermatitis using two 2-hour group discussions based on Triple P (Positive Parenting Program).⁵⁴ Triple P is a family support system to prevent and treat behavioral problems in children and adolescents. The intervention group underwent didactic instruction, video modelling, active skills training, and homework assignments to educate the parents on AD, managing the illness, minimizing AD-associated stress, and ensuring optimal treatment implementation. Results indicated improved parents' self-efficacy, fewer eczema-related child behavior problems, improved management of eczema, better quality of life for the parents but not the child, reduced symptom severity, and no change in parental treatment compliance ($p < 0.001$).

Similarly, Pustisek et al. focused on understanding the significance of structured parental educational interventions on childhood AD by designing a short-term structured educational program for the parents of AD children ranging from ages 3 months to 7 years. The results were like other intervention studies, where participants of the intervention had a much lower SCORAD score, with decreased pruritus ($p = 0.000$), sleep disturbance ($p = 0.001$), perceived stress ($p = 0.024$), and anxiety ($p = 0.42$) than those of the control group.⁵⁵ This study maintained small groups for their group sessions, ranging from 5 to 8 participants, to provide a better environment for focused communication. Moreover, Pustisek et al. thought that two 2-hour sessions would be the best format, as more people would be able to fit it in to their schedules, and is less expensive and easier to organize than longer sessions.

Educational and coping mechanism interventions seem to have positive effects for adults with AD as well. Ehlers et al. and Evers et al. both reported improvements in skin severity, reduced pruritus, and better management of AD after a multidisciplinary intervention utilizing educational sessions and cognitive-behavioral therapy.^{56,57} Some interventions, however, showed no difference between control groups and intervention groups. For example, Boston et al. developed a 12-week group-based program for adults with AD consisting of biweekly 2-hour sessions that include teaching topics such as skin disease, healthy lifestyle, stress management techniques, and medical feedback. After analyzing the results using variables such as disease severity, quality of life, symptoms, costs, and cost-effectiveness, the intervention group did not show any differences from

the control group at follow-up ($p < 0.05$).⁵⁸ The results however, could be attributable to the small sample size of 50 patients.

Overall, these multidisciplinary interventions often have many similarities in their structure and format, leading to similar results. Most of these interventions include educating the parents and patients on the disease and its management, incorporating group-sessions, and sometimes psychological and behavioral interventions. These interventions are structured in a way that often allows the patient and family to be equipped with the knowledge needed to better manage AD, with the result of a better QoL. By learning about the pathophysiology, course, and triggers of the disease, the patient and family will be able to understand AD progression and avoid elements that may exacerbate the disease. By learning about treatment techniques and discussing the facts and myths of treatment side effects, patient concerns may be alleviated and treatment compliance may increase. Lastly, by utilizing group sessions, patients can share their personal experiences and concerns with the group to integrate knowledge such as tips, techniques, advantages and disadvantages of certain treatment methods.

The first step is to recognize the obstacles to successful disease management. To treat the whole individual, providers must pay more attention to understated contributors such as emotional strains and long-standing scratching habits. There is a need for providers to integrate educational and coping skills programs for effective disease management in affected youth. Implementations will likely significantly improve self-perceived health, improve compliance, and reduce long-term psychological impact of disease.

Studies that assess the pertinence of psychological impact on pathogenesis of AD are needed. Furthermore, dermatological providers must aim to understand psychological features of adolescents with AD. They must also become knowledgeable about the required treatment techniques in order to help patients control stressful states. The clinical features of AD are very well characterized; however, there are factors that predispose adolescents to persistence of disease. The disconcerting symptoms of AD in adolescences can become a vicious cycle with exacerbation of both the psychological and physical features of the condition.

METHODS

Study design

A curriculum on educational interventions for adolescents with AD will be designed for practitioners (including but not limited to physician assistants (PAs), physicians, and other health care providers). The aim will be to educate practitioners on the most up-to-date knowledge on counseling and educational interventions specific to reducing and preventing AD associated comorbidities. The lecture will be conferred at nationally accredited continuing medical education (CME) conferences will facilitate gaining of new knowledge and skills to advocate for the ongoing improvement of adolescent patient care. The curriculum will be submitted for CME accreditation and offered for 1.5 category 1 CME credits.

Study population and sampling

The presentation-based curriculum will be presented at national medical conferences offered to providers specializing in pediatrics, family medicine and dermatology, or those with a special interest in educational interventions. Based on an effect of 15% increase in scores from the pre-assessment to the post-assessment, an alpha level of 0.05 and a beta level of 0.80, the target sample size would be a minimum of 56 participants. If we presume that approximately 40 attendees attend each national conference. Therefore, the program must be offered at a minimum of 2 national conferences in order to attain our goal sample size.

The target conferences are those offered through American Academy of Dermatology (AAD), American Academy of Physician Assistants (AAPA), Society of Dermatology Physician Assistants (SDPA), Society for Pediatric Dermatology (SPD), American Academy of Family Practitioners (AAFP) and AAP (American Academy of Pediatrics). All medical health providers working in pediatrics or dermatology will be invited to the 90-minute presentation on incorporating education and psychosocial interventions into AD therapy.

Curriculum

The content of the lecture will be a general overview of the most current research on the recommendations for educational interventions for adolescents with AD. The design will be in the structure of a PowerPoint presentation accompanied by multiple image-based slides. Curriculum will be developed by dermatology experts actively involved in AD clinical research and education. The target learning audience is providers working frequently with the adolescent population who could be afflicted by AD. The first live didactic session is a 90-minute slide presentation entitled “Educational interventions in Adolescents with Atopic Dermatitis”. The framework of the lecture will be centered around the learning objectives which will serve as a guide for key takeaway points.

Responses to the pre-test and post-test portion comprised of 10 questions will be completed by attendants through mobile audience response systems (mARS). The advantage of mARS is that other data points can be documented anonymously including text responses. There will be three sections to the supplementary short answer portion

which will be sent out as an electronic survey via email subsequent to the conference. For the first, the attendees will create a short provider-patient dialogue to educate patients on stress management. For the second, participants will identify potential barriers to implementing changes to their practice such as time constraints, issues with administrative advocacy insurance claims, or lack of professional standards. The last short answer will address any changes they would hope for in future presentations.

Table 2. CME Learning Objectives

1. Understand the scope of current treatment options for adolescents with AD
2. Apply current data from clinical trials for educational interventions and individualization of treatment
3. Recognize importance of timely initiation of educational interventions including improvements in patient comprehension, group therapy, structured teaching of treatment, and coaching coping strategies
4. Identify when to implement strategies for overcoming barriers to access to care and patient therapy adherence
5. Explain interdisciplinary team and collaborative care approaches that can improve patient outcomes
6. Design treatment plans that align with individualized patient and family goals
7. Devise a provider-patient dialogue to educate patients on disease pathogenesis, proper treatment techniques, stress management, and adherence in AD care.

Table 3. CME Question topics

1. Defining atopic dermatitis (AD)
2. Pathophysiology of AD
3. Current available treatment options for AD
4. Comorbidities associated with chronic AD
5. Psychological coping strategies
6. Structure of educational interventions for adolescents with AD
7. Effectiveness of educational interventions on lowering SCORAD and improving QoL
8. Effect of group therapy on adolescents with AD
9. Creating successful provider-patient dialogues
10. Provider confidence in integrating education and counseling of adolescent patients with AD into their clinical practice

Curriculum Assessment

While the CME learning objectives will highlight the key points, the primary evaluation of how efficacious the curriculum is will be determined through the pre- and post- test data. The pre-test will be completed via mARS serve to identify baseline knowledge prior to the lecture. Immediately following the PowerPoint lecture, the post-test questionnaire will be administered through mARS by all health care professionals in attendance.

Study variables and measures

Each audience member will perform both pre- and post- lecture assessments to determine success and impact of educational session. The supplemental short answer portion where participants create a brief provider-patient dialogue will be for educational purposes only and will not be graded. Pre- and post- activity questions to measure baseline and immediate changes in declarative knowledge (Moore's level 3A). The pre- and post- tests will be identical and be comprised of 10 questions answered through mobile audience response systems (mARS). Each attendee will be encouraged to bring their own web/html capable device. Devices may be leased upon entry for those who do not own compatible devices. The hope is that the post-lecture data will show a minimum of 15% increase in scores and a minimum score of 80%. A target 80% score correlates with answering 8 out of 10 questions correctly on the post-test. The questions will be comprised of topics covered in the learning objectives listed in Table 2.

Recruitment

All participants included in the study will have attended the 90-minute lecture offered at certified CME conferences. Ideally, the attendees will be health care providers who specialize in dermatology and/or pediatrics or have a special interest in educational interventions in adolescents. The certified 1.5 CME credit course can be placed towards their requirements by their state. Additionally, this CME course is a great opportunity for attendees to learn more regarding recently developed areas specific to education in pediatric dermatology. After specific conferences are scheduled the presentation will be

publicized on national organization webpage and the CME webpage. Handouts and information will be distributed at selected academic medical centers, an email marketing campaign, as well as social media accounts associated with upcoming national medical conferences. Advertisements will include title, time and date of each presentations, names of speakers, brief overview of presentation agenda. To be included in the study, each attendee must also sign consent forms giving permission for their participation in the educational program.

Data collection

All audience data will be collected through mARS and through an additional electronic survey which are both useful instruments to assess audience comprehension. By utilizing this system, the audience can not only answer multiple choice questions but also submit text responses for open-ended questions. It also allows the educator to receive instantaneous anonymous responses demonstrating the learners understanding of topics. All pre-test data will be recorded prior to formal commencement of the lecture. Post-test data will be acquired at the end of the presentation.

Other data elements collected from the conference include: anonymized attendee evaluations of the CME lecture, audience demographics, and short answer responses. Attendee evaluations of the course will be based on a five point Likert scale in the six domains listed below in Table 4 on delivery, content and practical value. Evaluations of the CME will be to evaluate aspects of overall course and how well it contributed to

educational value. Audience demographics will also be documented at the end of the lecture.

Table 4. Evaluation of Continuing Medical Education

1. Pre-course registration
2. Quality of course information
3. Delivery of CME presentation
4. Overall organization of lecture
5. Relevance to clinical practice
6. Opportunity for engagement

Table 5. Five point Likert scale

1=Poor
2= Fair
3=Neutral
4= Good
5=Excellent

Table 6. Audience Demographics Survey

<p>1. Which of the following best describes your primary professional credential?</p> <ul style="list-style-type: none">a) Physician Assistantb) Physician (MD, DO)c) Nurse Practitionerd) Nursee) Other (OT, PT, PhD, PharmD)
<p>2. Which of the following best describes your age group?</p> <ul style="list-style-type: none">a) Under 30 yearsb) 30 to 40 yearsc) 40 to 50 yearsd) 50 to 60 yeare) Over 65 years
<p>3. Which best describes your clinical practice environment?</p> <ul style="list-style-type: none">a) Communityb) Hospitalc) Academic Medical centerd) Outpatient practicee) Other (Industry, Lab)
<p>4. Which of the following describes your primary area of practice?</p> <ul style="list-style-type: none">a) Pediatricsb) Dermatologyc) Primary Cared) Mental Healthe) Other

Data analysis

At the end of one calendar year, all the data will be entered into Microsoft Excel-based study report form and an analysis will be performed using IBM SPSS. Paired t-test will be used to evaluate and summarize the pre- and post- CME mean test scores for outcomes related to knowledge and competence (Moore's framework levels 3 and 4 respectively). Chi-square tests or t-tests will be conducted to compare demographic characteristics of physician assistants, physicians, and other providers.

Timeline and resources

Prior to launching the presentation, the lecture must be first accredited by the Accreditation Council for Continuing Medical Education (ACCME) as well as the American Academy of Physician Assistants (AAPA). Accreditation is essential for confirming that the presentation is up to standard and can be used by practitioners in their incorporation of new knowledge to better care. First time applicants applying for initial accreditation through the ACCME can take approximately twelve to eighteen months. The goal will be to achieve provisional accreditation for a two-year term. Applications for AAPA Category 1 CME credit submitted for live conference which must be submitted at least 21 days prior to activity start date, thereby allowing 3 weeks for review by the AAPA Review Panel. Once approved the AAPA CME Accreditation will be valid for one calendar year. The plan will be to submit all applications by January 2017 with expected approval from both accrediting bodies by September 2018. Anticipated

completion of data collection will be September 2019. Presenting faculty will disclose limitations of data and potential conflicts of interest, if any.

The goal is to offer this lecture at many wide-ranging medical conferences in the United States throughout the year. As soon as accreditation is received, we will begin to offer the lecture at national conferences offered to various health care providers. Offering to lecture to mid-level practitioners and physicians will allow for more extensive outreach and strengthen statistical analyses.

Institutional Review Board

The study protocol will be sent for Institutional Review Board (IRB) exemption for educational studies of Boston Medical Center and Boston University Medical Campus IRB under the 45 CFR 46.101 (b) criteria.

CONCLUSION

Discussion

Education is critical to the management of all diseases. Current literature suggests that educational interventions provided by multidisciplinary teams are effective for adolescents with atopic dermatitis. Better disease control at an early age can equip patients with the knowledge and tools they need to adhere to treatment regimens and prevent future physical and psychological complications. Research also suggests that a strong provider-patient relationship may be the most important prognosticator of adherence to treatment and self-sufficiency.

By reaching out to the medical community with a CME curriculum on educational interventions for atopic dermatitis, there is the potential to affect a wide population of patients. The design of the proposed CME-accredited lecture makes it an enticing motivator for attendees to earn CME credit and ensures reliable attendance while learning about optimizing therapy. The curriculum will be applicable to physician assistants, nurse practitioners, and physicians working in pediatrics, family practice, and dermatology fields who will encounter many patients afflicted by this lifelong skin condition. Additionally, the curriculum aims to inspire providers to express greater interest in patient advocacy and teaching. Providers attending the conferences are subsequently more likely to be involved in passing on their new skillset and educational techniques. The curriculum will have the greatest chance of success if providers with a fundamental understanding of pediatrics and dermatology genuinely aspire to learn about educational techniques. If the educational session is successful, the lecture can be adapted to atopic

dermatitis patients of all ages. To verify whether the learning objectives are met, both a pre- and post-lecture assessment will be administered. One potential limitation of this study is that our statistical analysis may not reach significance if we cannot recruit the target sample size population of 56 attendance. However, it should not be difficult to meet the target sample size by presenting at more than one national conference for multiple organizations.

Summary

AD is one of the most common chronic inflammatory skin diseases and a major public health concern globally. In many instances, those who are diagnosed with AD continue to have persistent disease and symptoms throughout their adult life. Given the potentially lifelong course with no cure, there is a need for adjunctive patient-focused treatments. Current research indicates that educational interventions are effective in creating a positive impact on QoL, reducing psychological sequelae and disease severity, and motivating AD patients to adhere to treatment regimens. In particular, practitioners should be aware that poor coping and long-established scratching can play a major role in the exacerbation of symptoms. Designing a curriculum to teach providers how to recognize patient knowledge deficiencies and approach psychological suffering is essential to create better outcomes. Poor tactics and poor communication skills when addressing discouraged patients can sometimes amplify negative outcomes. It is necessary to provide health specialists with the proper tools to carry out interventions aimed at improving knowledge, improving AD disease management, and problem

solving skills. Teaching interventions can also include lecture material on psychological management targeting self-efficacy and coping mechanisms. Effective completion of the curriculum will give providers relevant instructive and clinically-based training for a specific age population, allowing them to be better equipped to care for adolescents with atopic dermatitis.

Adolescence is comprised of formative years of development that are critical in influencing perceptions about atopic dermatitis and therapeutic plans for self care. Equipping and empowering providers to take action and practice age-appropriate initiatives will enhance their expertise in responding to their adolescent AD patients. The curriculum, as an added benefit, will improve and build a healthy patient-provider relationship. By conducting this research, more medical professionals will practice a holistic approach to managing AD. This CME course will act as a foundation to build a comprehensive and effective therapy for young teens with AD. This study aims to confirm that educational lectures are imperative in continuing medical education and furthering clinical expertise.

Clinical and/or public health significance

It is important to address AD because the physical symptoms of painful, dry, itchy skin can lead to poor sleep, lower QoL, emotional distress and affect activities of daily living. This research aims to show that providers who have taken the curriculum will be confident in managing and approaching adolescent patients. If the aims are fulfilled, then it is expected that the curriculum will become a meaningful component of future CME

conferences. This study data has the potential of influencing academic medical centers to emphasize education interventions when educating trainees early on in their careers. Offering this curriculum at annual CME conferences will allow practitioners nationwide to treat their AD patients by using the most effective combination of therapies to minimize the impact of disease.

LIST OF JOURNAL ABBREVIATIONS

Acta Derm Venereol	Acta Dermato-Venereologica
Allergy Asthma Immunol Res	Allergy, Asthma & Immunology Research
Ann Allergy Asthma Immunol	Annals of Allergy, Asthma & Immunology
Ann Nutr Metab	Annals of Nutrition and Metabolism
Arch Dermatol Res	Archives of Dermatological Research
Arch Dis Child	Archives of Disease in Childhood
Asian Nurs Res	Asian Nursing Research
Australas J Dermatol	Australasian Journal of Dermatology
Behav Res Ther	Behavior Research and Therapy
BMJ	BMJ: British Medical Journal
Br J Dermatol	British Journal of Dermatology
Clin Exp Allergy	Clinical and Experimental Allergy
Clin Exp Dermatol	Clinical and Experimental Dermatology
Cochrane database Syst Rev	The Cochrane Database of Systematic Reviews
Community Pract	Journal of Community Practice
Curr Probl Dermatol	Current Problems in Dermatology
Health Technol Assess	Health Technology Assessment
J Allergy Clin Immunol	Journal of Allergy and Clinical Immunology

J Am Acad Dermatol	Journal of the American Academy of Dermatology
J Consult Clin Psychol	Journal of Consulting and Clinical Psychology
J Eur Acad Dermatol Venereol	Journal of the European Academy of Dermatology and Venereology
J Invest Dermatol	Journal of Investigative Dermatology
Lancet	The Lancet
N Engl J Med	The New England Journal of Medicine
Nat Genet	Nature Genetics
Pediatr Allergy Immunol	Pediatric Allergy and Immunology
Pediatr Dermatol	Pediatric Dermatology
Postep dermatologii i Alergol	Advances in Dermatology and Allergology
Prim Care Companion J Clin Psychiatry	Primary Care Companion to The Journal of Clinical Psychiatry
Semin Cutan Med Surg	Seminars in Cutaneous Medicine and Surgery

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CURRICULUM VITAE

