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 ORIGINAL ARTICLE

The Many Faces of Pediatric Acne: A Practical Algorithm for Treatment, Maintenance Therapy, and Skincare Recommendations for Pediatric Acne Patients

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ABSTRACT

Background: Pediatric acne is a common, complex, multifactorial inflammatory skin disease with various expressions in childhood that can be categorized by age, severity, and pubertal status.

Methods: The Faces of Pediatric Acne Project (FoPAP) aims to improve patient outcomes. The FoPAP group developed an algorithm that follows a consensus paper and a clinical case series on pediatric acne by applying the selected literature and drawing from the clinical knowledge and experience of each group member.

Results: The algorithm addresses neonatal, infantile, mid-childhood, preadolescent, and adolescent acne and starts with education on acne, general measures for prevention, treatment, maintenance, and ongoing skin care. Evaluation of pediatric acne requires a directed medical history and physical examination. For mid-childhood acne patients, a workup is warranted, and endocrine-associated abnormalities necessitate referral to a pediatric dermatologist. The second section of the algorithm identifies the type of pediatric acne, followed by the third section on acne treatment using a prescription or nonprescription treatment and skincare options. After successfully controlling the disease, maintenance treatment with topical agents and skincare using gentle cleansers and moisturizers containing lipids such as ceramides is important.

Conclusions: The pediatric acne algorithm offers a comprehensive approach to treating and maintaining pediatric acne. In addition, it may support healthcare providers to bring more attention to pediatric acne patients and improve outcomes.

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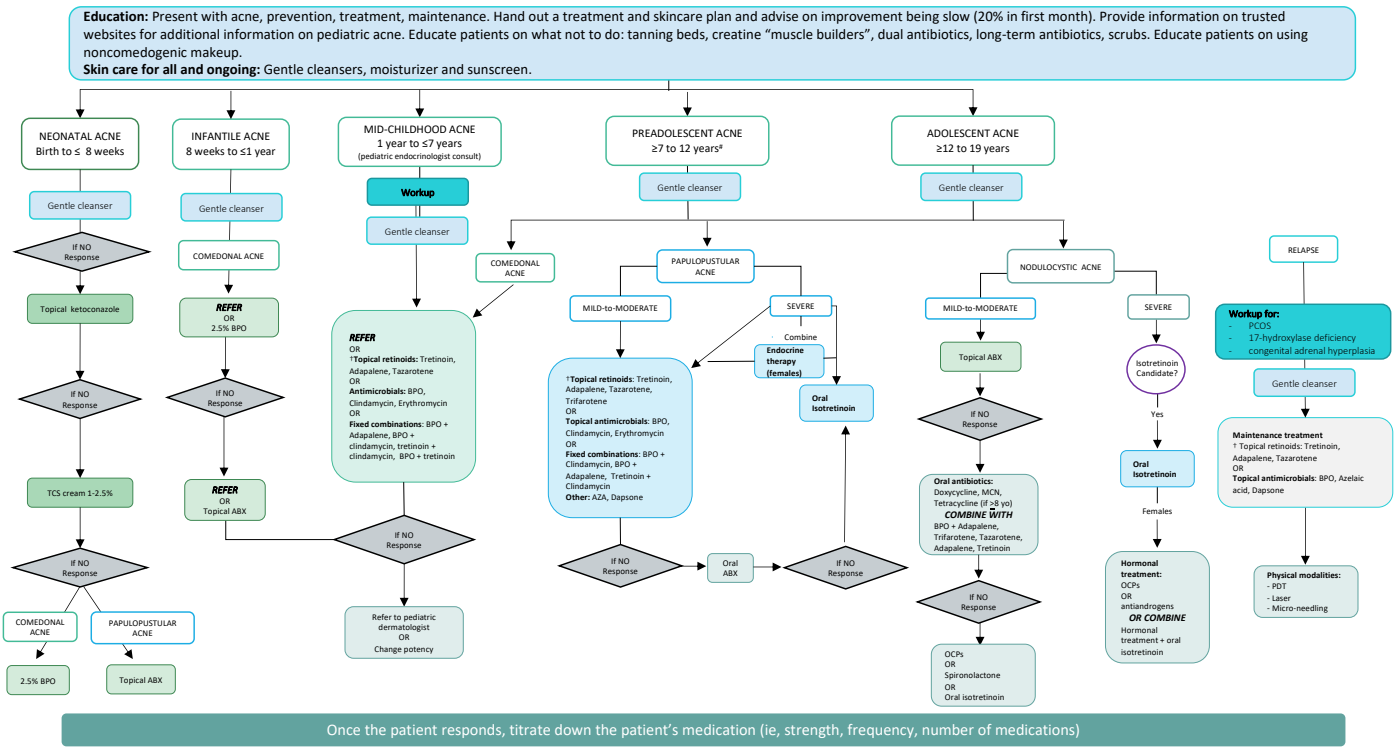
INTRODUCTION

Acne vulgaris (acne) is a multifactorial skin disease with a prolonged course of acute outbreaks, relapses, and recurrences with significant social, psychological, and physical consequences.[1-6] The presentation of pediatric acne depends on age (neonatal, infantile, mid-childhood, preadolescent, and adolescent), severity (mild, moderate, severe), type (eg, comedonal, papules, pustules, nodular), and other characteristics (eg, oily skin).[5-8] Discoloration, such as post-inflammatory hyperpigmentation (PIH) and scar formation, may occur in some patients, making it necessary to initiate timely and effective treatment.[9,10]

Triggered by a pattern of innate inflammation, pediatric acne may manifest underlying pathology.[5,6] Workup, when necessary, is based on age and physical findings, including morphology and distribution of acne lesions and age-related physical conditions.[5,6,10]

The pathogenesis of acne is thought to be similar at all ages, including pediatric acne.[5,6,10-18] However, treatment and maintenance may differ due to the state of skin maturity and concerns about the safety and efficacy of various therapies in young age groups.[5,6,10-18]

FIGURE 1. Algorithm for pediatric acne.



Atopic dermatitis (AD), Skin of color (SOC), Topical corticosteroid (TCS), Phosphodiesterase (PDE), topical calcineurin inhibitors (TCI), Janus kinase (JAK)

Status of the Project

The Faces of Pediatric Acne Project (FoPAP) aims to improve outcomes for pediatric patients with acne by giving it more attention from healthcare providers who treat children. The FoPAP group (advisors) developed practical clinical tools for pediatric acne treatment and maintenance to support healthcare providers in achieving better outcomes for their pediatric acne patients.

The advisors published a consensus paper on neonatal through preadolescent acne.[6] This publication was followed by a paper that defined various expressions of pediatric acne to help educate and tailor nonprescription acne treatment and skin care using cleansers and moisturizers as mono or adjuncts to prescription treatment.[10,18] The advisors then shared their clinical experience with a pediatric acne patient case series publication that described treatments and maintenance approaches, including skin care, to address the knowledge gap in prescription and nonprescription acne treatments and skincare products for pediatric acne.[10,18] The current pediatric acne algorithm offers a comprehensive approach to treating and maintaining pediatric acne and includes recommendations on prescription medications, nonprescription acne treatment products, and skin care.

MATERIALS AND METHODS

The algorithm serves pediatric dermatologists, pediatricians, and other healthcare professionals caring for pediatric acne patients.

Role of the Panel

The advisors (pediatric dermatologists, dermatologists, and pediatricians) have extensive experience and knowledge in treating pediatric acne patients and convened a meeting on August 13, 2022. First, they reviewed and discussed the literature on prescription and nonprescription acne treatment and skin care using cleansers and moisturizers for pediatric acne patients. The advisors then developed an algorithm applying the selected literature and drawing from the clinical knowledge and experience of each group member.

Literature Review

A structured literature search used keywords related to pediatric acne treatment and maintenance. Prior to the meeting, literature was culled on current best practices in pediatric acne, addressing prescription and nonprescription acne products and skin care as monotherapy, adjunctive, and maintenance treatment. Searches were performed on PubMed and Google Scholar on July 5th and 6th, 2022, by a dermatologist and a physician/

scientist. Selected articles included guidelines, consensus papers, reviews describing current best practices in pediatric acne treatment using acne products and skin care, and clinical research studies published in English from 2010 to June 2022. Search terms used: *Pediatric acne vulgaris AND pathogenesis OR quality of life OR pediatric acne guidelines OR algorithms OR consensus recommendations OR prescription treatment OR nonprescription treatment OR skincare OR retinoids OR benzoyl peroxide OR isotretinoin OR hormonal treatment OR adherence to treatment OR bacterial resistance OR efficacy, safety, tolerability, skin irritation, handling, comfort.*

The results of the searches were evaluated independently by two reviewers. Based on reviewer consensus, each treatment within the publications was assigned an alphanumeric level of evidence (1 to 4 and A to C), using pre-established criteria by the American Academy of Dermatology.[19] Initially, 57 articles were identified, and after excluding 19 duplications and poor-quality papers, 38 articles remained, of which only 14 were of sufficient quality to grade. The selected publications comprised 7 guidelines, algorithms, consensus papers, 22 clinical studies (15 randomized controlled trials), and 9 reviews. Notably, there were no publications specifically on nonprescription pediatric acne treatment and skin care.

Development of the Algorithm

The project used a modified Delphi process, which comprised preparing the project, conducting the literature review, and preparing a draft algorithm.[20,21] The advisors convened a meeting to discuss the literature review results and the draft algorithm. During the workshop portion of the meeting, each of the three groups discussed and modified the draft algorithm. The advisors then presented the three versions to the group to fine-tune the algorithm and reach a consensus. An online process was then used to review the manuscript with the algorithm for publication.

The Algorithm

The algorithm addresses neonatal, infantile, mid-childhood, preadolescent, and adolescent acne (Figure 1). The first section addresses education on the presentation of acne, prevention, treatment, maintenance, and ongoing skin care.

The second section identifies the type of acne followed by the treatment approach according to acne presentation using a prescription, nonprescription treatment, and skincare options.

Education on Acne

Age-appropriate education on a child's acne type should be provided to patients and parents with measures on prevention and avoiding risk factors, treatment, and maintenance.[6,10] The education should include why the treatment was chosen, the expected outcome, and duration.[6,10] In addition, a treatment and skincare plan should be handed out during the visit, as should information about trusted websites where patients and parents can find additional information.[6,10] Children with acne and their parents may hold common misconceptions about acne that need tackling before treatment begins, such as poor hygiene. Educating about the central role of inflammation in acne and measures to reduce inflammation is essential, such as how over-vigorous washing may irritate the skin, enhance inflammation, and exacerbate acne.[5,6] Educating patients and parents on realistic treatment outcomes may support treatment adherence.[6,10] The physician should inform the patients and parents that a slight improvement of the acne may be expected in the first month of treatment, followed by about 20% improvement per month after that. After successfully controlling the disease, the use of maintenance treatment with topical agents and skincare products incorporating gentle cleansers and moisturizers is essential.[5,6,10]

Skin Care With Gentle Cleansers and Moisturizers

Skincare products should be suitable for pediatric acne-prone and oily skin.[5,6,10,12-18] The cleansers and moisturizers are non-comedogenic and complement acne treatments with benefits such as gentle cleansing, hydrating, and promoting a healthy skin barrier.[6,10,15-18,22] Daily use of fragrance-free, non-irritating, and non-comedogenic cleansers, moisturizers, and sunscreen may reduce xerosis, erythema, and photosensitivity resulting from topical or oral acne treatments.[5,6,10,15-18,22] Using the appropriate skincare products will help to minimize irritation and inflammation.[5,6,10,15-18,22] Cleansers and moisturizers, such as those containing ceramides, promote a healthy skin barrier, reducing inflammation and irritation that may result from topical or systemic treatments.[10,14,16-18] The skincare regimen should be included in the acne prevention, treatment, and maintenance care regimen and should be ongoing even after treatment with prescription and other nonprescription products are discontinued.[5,6,10]

Diagnosis

The type of acne according to age used in the pediatric acne algorithm comprises neonatal acne: birth to ≤ 8 weeks; infantile acne: 8 weeks to ≤1 year; mid-childhood acne: 1 year to <7 years; preadolescent acne: ≥7 to 12 years; adolescent acne: ≥12 to 19 years or after menarche for girls.[5,6,10] Other systems consider three different groups of acne patients: preadolescent (≥7 to 12 years), adolescent (≥12-25 years), and post-adolescent patients (≥25 years), which were deemed too broad and not practical for the algorithm.[7,8]

Effective evaluation of children with acne requires a directed medical history and physical examination.[5,6,10,22] The medical history should include the age of acne onset, disease duration, growth parameters, and age of onset for any early signs of virilization.[5,6,10] The physical examination should include height,

FIGURE 2. Infant with facial acne.

A breastfeeding six-week-old male patient with mild comedonal acne.

weight, types, locations of acne, and signs of puberty (body odor, axillary and pubic hair, breast buds, enlarged phallus, testis, or clitoris).[5,6,10] A workup may be indicated for patients with other signs of virilization.[5,6,10] A hand and wrist X-ray for bone age is a simple, practical initial examination.[5,6,10]

A referral to a pediatric endocrinologist and a workup is warranted for mid-childhood acne (ages 1 to < 7 years), which is very uncommon, and patients need a referral, especially if displaying secondary sexual characteristics.[5,6,10] Physicians should collect a history of the patient's diet and consider any potential contributing factors related to acne (eg, milk consumption).[22]

Neonatal and Infantile Acne

Neonatal acne occurring at 0 to 8 weeks of life is estimated to affect 20% of newborns, more frequently boys than girls, and usually presents small erythematous papules and pustules on the face, rarely with comedones (Figure 2).[5,6,10,22] Neonatal acne is mostly self-limited, benign, and typically resolves over a few months without scarring.[5,6,10] Eruptions due to infections need to be excluded, such as bacterial folliculitis, secondary syphilis, herpes simplex virus, and varicella-zoster virus.[5,11,12] Other conditions to be excluded comprise transient neonatal pustular melanosis, erythema toxicum neonatorum, eosinophilic pustular folliculitis, sebaceous gland hyperplasia, and congenital adrenal hyperplasia.[5,6,10-12] Neonatal cephalic pustulosis due to colonization of Malassezia yeasts present monomorphic red papules or pustules on the face and neck without comedones.[5,6,10-12] Maternal medications may also cause neonatal or infantile eruptions and should be checked; for instance, lithium, phenytoin, and corticosteroids.[5,6,10-12]

When, in rare cases, significant neonatal acne presents with signs of sexual precocity, virilization, or growth abnormalities, an underlying endocrinologic disease, tumor, or other gonadal/ovarian pathology needs to be ruled out by a pediatric endocrinologist.[5,6,10] Most cases benefit from skincare products, such as those containing ceramides, and off-label topical therapies, which may be considered for more complicated neonatal and infantile acne cases.[5,6,10,12,13,18,22]

TABLE 1.

Prescription Pediatric Acne Treatment				
Type	**Topical**	**Age Indication**	**Oral***	**Age Indication**
Retinoid	Tretinoin	N/A	Isotretinoin	N/A
Antibiotic	Erythromycin Clindamycin	N/A	N/A	N/A
Anti-inflammatory	Dapsone	N/A	N/A	N/A
Androgen receptor inhibitor	Clascoterone 1%	N/A	N/A	N/A
Fixed combination BPO + Antibiotic	BPO + Erythromycin BPO + Clindamycin	N/A	N/A	N/A
Fixed combination BPO + Retinoid	BPO +Tretinoin	N/A	N/A	N/A
Fixed combination Retinoid + Antibiotic	Tretinoin + Clindamycin	N/A	N/A	N/A

*Pediatric use
Drugs@FDA: FDA Approved Drug Products http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm
^Sarecycline, FDA approved in October 2018 for non-nodular moderate-to-severe acne, is a new tetracycline class, narrow antibacterial spectrum oral antibiotic.
Modified with permission from Schachner et al.[6]

FIGURE 3. Mid-childhood acne.

Facial acne in a 6-year-old girl presenting with comedones, papules, and pustules.

FIGURE 4. Preadolescent acne.

Mild comedonal acne in an 8-year-old girl.

Mid-childhood Acne

A referral to a pediatric endocrinologist and a workup is warranted for mid-childhood acne (ages 1 to < 7 years) (Figure 3).[5,6,10] Depending on the type and severity of acne, recommendations include topical retinoids (tretinoin, adapalene, and tazarotene) or topical antimicrobials (benzoyl peroxide [BPO], clindamycin, or erythromycin) (Table 1).[5,6,10] Fixed combinations of topical treatments (BPO + adapalene, BPO + clindamycin, tretinoin + clindamycin or BPO + tretinoin) may also be used. Nonprescription antimicrobials may be suitable for these patients, and in all cases, skincare products with gentle cleansers and moisturizers is ongoing (Table 2).[5,6,10]

Preadolescent Acne

Preadolescent acne has become more common and may occur in children aged 7 to 12 years or for females up to menarche.[5,6,23-26] Few epidemiological studies have been conducted on this population.[25,26] Patients with preadolescent acne may experience psychological stress due to unfavorable perceived appearance changes, increased social impairment, and even mental health problems.[3,4,25,26]

Preadolescent acne often presents as comedones, covering the central forehead or the central part of the face, eg, the brow, nose, lips, and even ears (Figure 4).[25,26] Early diagnosis and prompt initiation of treatment may prevent emotional stress and possible sequelae such as post-inflammatory hyperpigmentation (PIH) and scarring.[27-29] Treatment options for comedonal acne include topical retinoids (tretinoin, adapalene, and tazarotene) or topical antimicrobials (BPO, clindamycin, or erythromycin).[5,6,10] Nonprescription antimicrobials may be recommended if applicable for these patients.[5,6,10-12] Fixed combinations of topical treatments (BPO + adapalene, BPO + clindamycin, tretinoin + clindamycin, or BPO + tretinoin) may also be used. These treatment options may irritate the skin or cause dryness.*6,10,14-18* Therefore, treatment should always be combined with skincare products containing lipids like ceramides to help manage barrier disruption commonly associated with acne and related prescription treatment.[6,10,14-18] If the patient does not respond to treatment, referral to a pediatric dermatologist is indicated for further assessment and treatment recommendations.[5,6,10]

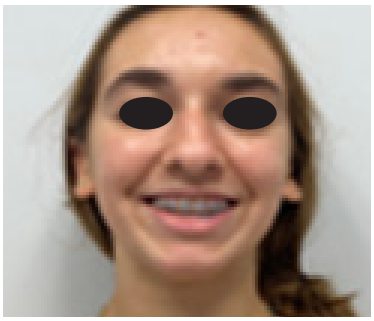
Adolescent Acne

Adolescent acne occurs in individuals aged 12 to 19 years or after menarche for girls and puts a significant burden on the quality of life of these patients.[30-35] Adolescent acne patients may be susceptible to opinions expressed in social media about their condition and develop unrealistic notions about their appearance.[33] Severe mental health conditions such as anxiety, suicide attempts, and body dysmorphic disorders have been reported in acne patients.[34,35]

TABLE 2.

Nonprescription Pediatric Acne Topical Treatments		
Type	**Formulation**	**Activity/Effect**
Benzoyl peroxide	2.5%, 5%, 10%	Antibacterial, mild sebostatic, mild keratolytic
Salicylic acid	0.5%, 2%	keratolytic
Sulfur	3%-8%	It helps absorb excess sebum
Sodium sulfacetamide	10%	Antibacterial
Resorcinol	2%	Antibacterial, mild keratolytic
Niacinamide	2%, 4%, 5%, 10%	Anti-inflammatory, antimicrobial, reduced sebum, helps skin tone evening
Glycolic acid	7%, 12%, 10%, 15%, 20%	Exfoliation

FIGURE 5. Adolescent acne.



Comedonal acne in a 13-year-old girl.

FIGURE 6. Adolescent acne.

Nodular cystic acne in a 14-year-old male.

The treatment options for comedonal acne are similar to those recommended for preadolescent acne (Figure 5). For mild-to-moderate papulopustular acne, topical retinoids (tretinoin, adapalene, tazarotene, and trifarotene) or topical antimicrobials (BPO), clindamycin, or erythromycin are prescribed.[5,6,10,14,18,22] Further options comprise fixed combination treatments (BPO + adapalene, BPO + clindamycin, tretinoin + clindamycin) or azelaic acid or topical dapsone.[5,6,10,14,18,22] All treatments should be combined with skin care, including gentle cleansers and moisturizers, to promote a healthy skin barrier and reduce the side effects of prescription treatments.[6,10,14-18]

Oral antibiotics are required for severe papulopustular acne.[5,10,14,18,22] If patients do not respond to the treatment, oral isotretinoin or endocrine therapy (for females) may be given and can be combined with topical therapy.[5,10,14,18,22,36,37]

For patients with mild-to-moderate nodulocystic acne, topical or oral antibiotics should be prescribed.[5,10,14,18,22] If the patient is not responding to oral antibiotics (doxycycline, minocycline, or tetracycline), additional topical treatment (BPO + adapalene, tazarotene, trifarotene, adapalene, or tretinoin) is required. If the therapy is unsuccessful, oral contraceptives (females) or oral isotretinoin may be added to topical treatment.[5,10,14,18,22]

Clascoterone cream 1%, an androgen receptor inhibitor, is indicated for the topical treatment of acne in males and females 12 years of age and older.

Patients with severe nodulocystic acne should be assessed for the suitability of oral isotretinoin (Figure 6). Female patients may receive oral contraceptives or antiandrogens, which can be combined with oral tretinoin.[5,10,14,18,22,36] Physicians should consider the psychosocial aspects of acne (eg, depression, mood effects of drugs such as oral contraceptives and isotretinoin) and physical aspects such as xerosis.[31,35]

Once patients respond to therapy, titrate the medication down (ie, strength, frequency, number of medications).

Acne sequelae such as discoloring and scaring are more common in acne presenting with inflammatory lesions, especially in patients with richly pigmented skin.[28,27] Although the mechanism is unclear, PIH may be due to inflammation-inducing excessive melanin production or irregular pigment dispersion.[28,27] In a study of 1942 acne patients with richly pigmented skin, 43% had acne-related scarring, which, in 99% of cases, originated from inflammatory acne lesions.[28] Early and effective acne treatment with topical adapalene combined with BPO can reduce the risk of future scars.[9,14,30-32]

The clinician should inform the patient and parents about acne-related sequelae such as PIH and scarring to avoid risk factors and promote adherence to treatment and maintenance therapy. The physician should explain that less washing and avoiding topical alcohol, abrasive scrubs, and rubbing the skin may prevent irritation and, thus, inflammation.[6,10,18]

Relapse

Workup may be needed for polycystic ovary syndrome (PCOS), 17-hydroxylase deficiency, or congenital adrenal hyperplasia in patients with moderate-to-severe acne who relapse frequently.[5,6] Patients should be referred to a pediatric dermatologist if the endocrinologic management is not effectively controlling acne.[5,6,10,18]

Maintenance Treatment

Acne maintenance therapy may comprise topical retinoids (tretinoin, adapalene, tazarotene), topical antimicrobials (BPO), topical azelaic acid, or dapsone.[5,6,10,14,18,22] For maintenance, physical modalities such as photodynamic therapy (PDT) with red light or intense pulsed light, laser, or micro-needling may also be recommended.[38]

LIMITATIONS

Our searches found no specific clinical publications on nonprescription pediatric acne treatment and skin care; therefore, we based recommendations on clinical experience and the opinions of panelists.

CONCLUSION

Pediatric acne can be categorized by age and pubertal status and deserves more attention from healthcare providers who treat children. It is important to educate patients regarding differential diagnosis, treatment, and maintenance, as well as skin care as monotherapy or as an adjunct to prescription treatment. The presented algorithm for pediatric acne treatment and maintenance approaches using prescription and nonprescription acne products and skin care is a practical tool that supports clinicians in improving outcomes for pediatric patients with acne.

Nonprescription acne treatment and skincare products containing lipids such as ceramides play an important role in monotherapy, adjunctive, and maintenance treatment, although further research on their role in pediatric acne is recommended.

DISCLOSURES

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