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 ORIGINAL ARTICLE

NECASA I: A Practical Algorithm Integrating Skincare Into the Management of Acne Patients in the Nordic European Countries

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ABSTRACT

Background: Acne vulgaris is a multifactorial dermatosis primary of the face and trunk. Erythema, pruritus, and xerosis are frequent adverse effects of first-line acne treatment and, if not appropriately counseled and managed, can exacerbate, leading to regimen nonadherence and poor outcomes.

Methods: A panel of 6 dermatologists (5 from the Nordic European Countries and one from the UK) employed a modified Delphi method and reached a consensus on a practical acne treatment and maintenance algorithm integrating skincare based on the best available evidence, and the panels' clinical experience, and opinions.

Results: The Nordic European Countries Acne Skincare Algorithm (NECASA) recommends integrating skincare and nonprescription acne treatment into acne regimens, addressing the relative lack of standardized guidance on their use as mono or adjunctives to acne treatment. The algorithm uses stratification by acne subtype and discusses management approaches per type of acne (comedonal, papulopustular, and nodulocystic acne), severity (mild to moderate and severe), and maintenance treatment. Skincare monotherapy may reduce acne lesions and maintain clearance in patients with mild acne. Adjunctive skincare may enhance the efficacy and improve tolerability of acne treatment, reduce pigmentary alterations, and improve skin barrier function.

Conclusions: The NECASA algorithm may serve as a roadmap for integrating skincare in managing acne patients and tailoring acne treatment to improve adherence and tolerance to treatment and patient outcomes.

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INTRODUCTION

Acne vulgaris is a multifactorial, chronic, relapsing dermatosis primary of the face and trunk. It is most commonly observed in adolescents and young adults and frequently results in significant social, psychological, and physical consequences. Its prevalence rates are estimated to range from 35% to over 90% among adolescents.[1] The natural course of this disease can commence as early as ages 7 to 12 (preadolescent acne) and, in many patients, fails to resolve until the third decade of an individual's life.[2-4] As well as persisting for several decades, acne can develop for the first time during adulthood; this post-adolescent persistent or last-onset acne predominantly affects females.[2,3,5]

The primary clinical lesions seen in acne, ranging from open and closed comedones to papules, pustules, and large nodulocystic lesions, carry material physical and psychosocial morbidity, as do the clinical sequelae, which commonly arise from acne and include persistent erythema, acne-induced hyperpigmentation (PIH)/pigment alteration (PIPA) and scar formation. These sequelae correlate with the duration of acne, highlighting the necessity to initiate timely and effective treatment.[2,5-10] Some evidence suggests that certain racial and ethnic groups may experience variations in the severity, prevalence, and sequelae of acne, with patients with skin of color being more likely to develop PIPA.[1,11]

Acne Pathogenesis and the Role of the Skin Barrier and Microbiome

Acne pathogenesis has long been tied to 4 key components: hyper-/dysseborrhea, microcomedone formation, *C. acnes* colonization, and inflammation.[1] Studies have found that individuals with acne have increased transepidermal water loss (TEWL) and skin barrier dysfunction.[12] Individuals with acne have been found to have larger sebaceous glands with increased sebum excretion with an altered milieu, decreased free sphingosine and total ceramides, dilution of linoleic acid, alterations in free fatty acids, and increased squalene concentration, all contributing to subclinical inflammation.[13,14] A study of Japanese males ages 14 to 26 with mild to moderate facial acne found that compared with their age- and sex-matched controls, they had not only elevated sebum secretion and lipid content, decreased free sphingosine and total ceramides but also increased TEWL.[15] These findings correlated and worsened with acne severity compared with control and even the mild acne cohort.[15] Studies have also found that males and females with acne have increased skin pH (mean 5.09 ± 0.39 vs 6.35 ± 1.3, $P<0.001$).[16] These changes may alter epidermal barrier function, altering which flora (ie, cutaneous microbiome) survive or thrive.[12]

Acne and the Skin Microbiome

A healthy skin microbiome has a balanced diversity; however, with its high sebum content, the follicular microbiome has an overwhelming majority of *Cutibacterium acnes* (*C. acnes*), with over 90% of an abundant follicular bacterial population.[12,17,18] *C. acnes* colonization is a mainstay of acne pathogenesis.[19-21] Studies demonstrated a significantly expanded *C. acnes* population during puberty corresponding with increased sebum production,[22-24] that contracts near the fifth decade of life,[25-27] approximately the time wherein acne has a decrease in incidence and prevalence. In acne-affected skin, the quantity and the quality of *C. acnes* are significant. Individuals with acne had more homogenous *C. acnes* phylotypes with an overabundance of phylotype IA1. The severity of acne on the back was associated with the loss of diversity of *C. acnes* phylotype, with a major predominance of phylotype IA1.[12,28,29]

While uncertain which manifests first, the epidermal barrier dysfunction or the dysbiosis, it is clear both are present in acne and contribute to its pathogenesis. Expert opinions have suggested proper management of these deficits may improve acne severity as mono treatment or in conjunction with prescription regimens.[12,30]

Acne Management Paradigms

Management of acne has traditionally focused on prescription topical and oral medications targeting the four accepted tenets of acne pathophysiology (eg, hyper-/dysseborrhea microcomedone formation, colonization with *C. acnes*, and inflammation).[31-33] However, as our understanding of acne as a dermatosis involving an altered epidermal barrier function and microbiome homeostasis has evolved, so too has the recommended acne regimen to include nonprescription acne products and skincare as adjunctive and monotherapy.[12,30,34-37] While expert opinion has highlighted the importance of skin care in managing acne, these recommendations have not consistently been discussed in guidelines or algorithms.

This manuscript provides a Nordic European Countries Acne Skincare Algorithm (NECASA) that may serve as a roadmap for integrating skincare in managing acne patients in the Nordic European countries. The NECASA recommendations on acne treatment, maintenance, and integrated skincare support dermatologists and other Health Care Professionals (HCPs) caring for patients with acne in the Nordic European countries to improve patient outcomes.

MATERIALS AND METHODS

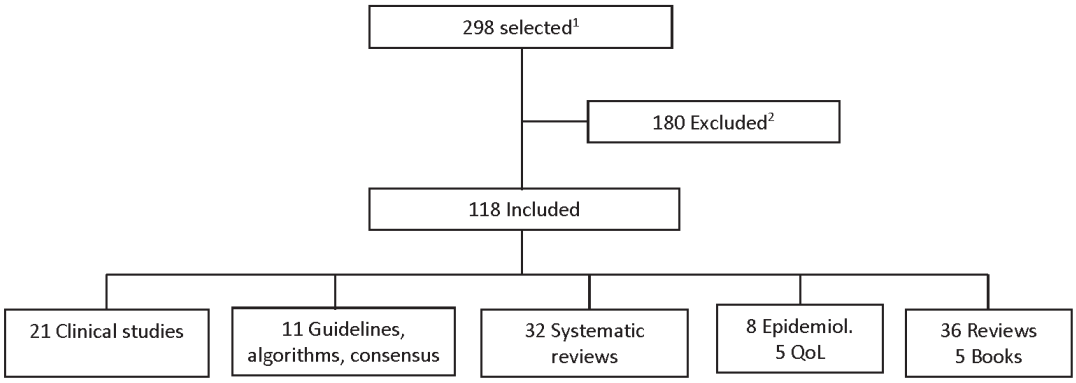
A panel of 6 Nordic European countries (NECASA panel) dermatologists who treat acne patients gathered for a meeting on October 13, 2023, in Berlin during the European Academy of Dermatology Congress. The group reviewed the results of a structured literature review utilizing a modified Delphi process.[38,39] They developed an algorithm for prescription and nonprescription acne treatment and skincare using cleansers and moisturizers for acne patients, drawing from their clinical knowledge and experience.

Literature Review

Before the meeting, literature was culled on current best practices in acne in the Nordic European Countries, addressing prescription and nonprescription acne products and skincare as monotherapy, adjunctive, and maintenance treatment. Search terms used for the structured literature search comprised: *Acne AND treatment OR maintenance OR OTC treatment OR skincare as monotherapy and adjunct OR cleansers OR moisturizers OR skincare efficacy OR safety OR tolerability OR skin irritation using treatment or skincare.* Searches were performed on PubMed and Google Scholar on August 30, 2023, by reviewing titles and abstracts and then full articles. Selected articles included guidelines, consensus papers, reviews, and clinical research studies published in English from 2010 to August 30, 2023. Publications other than English and that did not address skincare were excluded. The results of the searches were evaluated independently by two reviewers (AA and PB).[40] References from selected publications were manually reviewed for additional resources.

Initially, 298 articles were identified, and after excluding 180 that were not associated with nonprescription acne products or skincare products and duplications, 118 articles remained. These publications comprised eleven guidelines, algorithms,

FIGURE 1. Structured literature search results.



Selected after filtering for English language, 2010-present, humans[1]
Excluded: Duplications, not including skincare[2]
Epidemiology (Epidemiol), Quality of life (QoL)

consensus papers, 21 clinical studies (15 randomized controlled trials), 32 systematic reviews, 36 reviews, 5 books, 5 quality of life studies, and eight epidemiology studies (Figure 1).

Algorithm Development

The practical algorithm focused on integrating skincare into acne management and maintenance treatment. Based on the literature search results and their in-field practice, the NECASA panel worked in small groups to implement and revise the initial algorithm skeleton proposed by AA and PB. The NECASA panel reconvened into a plenary group to reach a consensus through blinded reiterations. Reviewing, editing, customizing the final algorithm, obtaining consensus, and discussing and reviewing the manuscript took place online.

RESULTS

The Algorithm

The NECASA algorithm (Figure 2) recommends integrating skincare and nonprescription acne treatment into acne regimens, addressing the relative lack of standardized guidance on their use as mono or adjunctives to acne management. The algorithm is stratified by acne subtype and discusses approaches per type of acne (comedonal, papulopustular, and nodulocystic acne), severity (mild to moderate and severe), and maintenance management. Each branch point begins with the fundamental that all acne regimens benefit from incorporating skincare, including a physiologic pH cleanser, moisturizer with lipids or humectants, and an SPF 50+ sunscreen to minimize acne PIPA. The type of cleanser and moisturizer should be adapted according to the individual patient's needs.

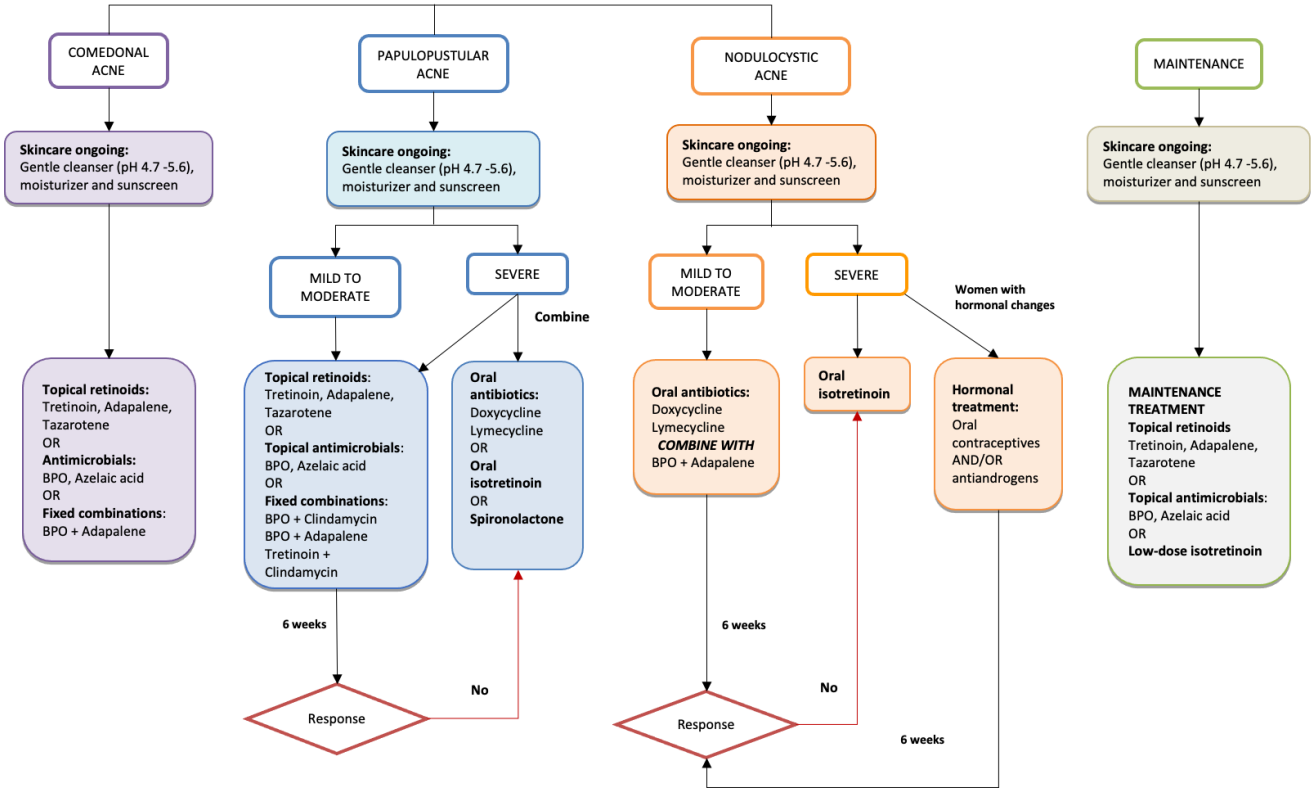
Comedonal Acne

Comedonal acne is often best medically managed with agents that can penetrate the pilosebaceous unit and regulate keratinocyte turnover, including topical retinoids (eg, adapalene, tazarotene, tretinoin, trifarotene) as well as benzoyl peroxide (BPO).[33] Additionally, agents such as salicylic acid and azelaic acid, with comedolytic activity, can be incorporated as an additional wash or leave-on product.[32,35,41-44] While often considered a mild form of acne, more severe, diffuse forms of comedonal acne may require isotretinoin.[33] See papulopustular and nodulocystic acne for related skincare recommendations.

Papulopustular and Nodulocystic Acne

Papulopustular or nodulocystic lesions are best managed with a combination of modulators of keratinocyte adhesion as well as anti-inflammatory and even anti-androgenic agents. In addition to previously discussed agents, topical (eg, clindamycin) and oral (eg, doxycycline) antibiotics can manage *C. acnes* abundance and minimize inflammation.[33] The panel agreed that topical and oral antibiotic treatment should always be administrated in combination with topical BPO or topical retinoids to minimize the risk of antibiotic resistance. Skincare products promoting microbiome homeostasis, such as moisturizers and probiotic cleansers, may supplement skin flora after destruction by antimicrobials.[43,45-47] Nodulocystic lesions, especially peri-orally or along the jawline in adult female patients, may have a hormonal component and require anti-androgens such as spironolactone, oral contraceptive pills, which may also mitigate hyper-/dysseborrhea.[33] In the most severe cases or for acne patients with severe acne-related scarring, isotretinoin provides the best evidence for long-term management and outcomes.[48] Moisturizers are key to ensuring patients can tolerate a several-month and potentially year-long regimen due to the high chance of xeroses such as retinoid-related dermatitis, xerophthalmia, and cheilitis.[48] Patients who have graduated from isotretinoin may relapse and require maintenance, including skincare.[48] In addition to skincare, the authors recommend nonprescription

FIGURE 2. NECASA Practical algorithm integrating skincare into acne management.



options, including azelaic acid and salicylic acid, provide evidence-based choices that are readily accessible to patients without access to dermatology or to tide them over until they can be evaluated by a dermatologist and restarted on a topical and potentially systemic regimen.[33]

Integrating Skincare in Acne Treatment and Maintenance

Role of Skincare in Acne Management

Skin barrier dysfunction is a well-documented adverse effect of topical and systemic agents for acne management that results in increased transepidermal TEWL and is often perceived by patients as a combination of stinging, burning, tingling, pruritus, and xerosis.[47,49,50] Topical treatment options may affect the cutaneous microbiome directly through antimicrobial action or indirectly through creating an inhospitable ecosystem.[12] Multiple randomized, placebo/vehicle-controlled trials have shown these prescription regimens to be efficacious at materially improving acne severity.[33] However, the authors note that adverse effects related to this type of treatment can negatively impact patient quality of life (QoL) and treatment adherence, especially early on when establishing rapport with a dermatologist.

Nonprescription treatment, including skincare, may be an option for individuals with mild acne who cannot start prescription treatments.[50] It may also be an option for individuals who have completed the course of isotretinoin and require a regimen for maintenance or a bridge to restarting topical therapies if they relapsed and require consultation with a dermatologist.

Skincare and Nonprescription Products for Mild Acne

Epidermal barrier dysfunction and microbiome dysbiosis have been associated with acne pathogenesis and severity.[12] Several studies have assessed the role of skin care, nonprescription medicated agents, and sunscreen in treating mild acne.

Acne-affected skin has an increased TEWL and altered pH[15,16]; therefore, cleansers and moisturizers should have a physiologic pH (ie, pH 4-6), promoting a healthy epidermal barrier function that may improve acne severity.51-54 Adding agents such as niacinamide may mitigate inflammation via sebo-suppressive effects[55,56] and interleukin-8 modulation.[57-59] Cleansers and moisturizers that comprise probiotic topical agents (eg, thermal spring water) may mitigate microbiome dysbiosis.[12,60-62]

TABLE 1.

Regular Use of Skincare Monotherapy and Adjunctive to Prescription Acne Treatment	
Skincare monotherapy for mild acne compared to a placebo or similar products	**Regular use of skincare adjunctive to prescription treatment compared to treatment alone or combined with a placebo**
1. Improve overall treatment outcome	1. Improve local tolerance of treatments, reducing irritation or AEs
Improves acne severity*	May improve local tolerance to topical and systemic therapies with a high irritation potential*
2. Reduce the number of lesions	2. Reduce sebum and improve skin barrier function
May reduce acne lesions*	May reduce skin oiliness, improve skin hydration, and decrease TEWL*
3. Good local tolerance improving treatment adherence	3. Improve treatment adherence, patient satisfaction, and patient QoL
Good tolerability and should be recommended to improve adherence to treatment*	Improves tolerance and adherence to prescription treatment (oral/topical retinoids)**
4. Reduce sebum	4. Improve treatment efficacy
Aims to reduce skin oiliness*	Integrating moisturizers containing skin care in acne treatment regimes may result in improved clinical outcomes*
5. Maintain treatment outcome	5. Help reduce the occurrence of PIH and PIPA
May be helpful as maintenance and may be recommended to minimize the occurrence of new lesions following prescription drug therapy**	Topical retinoid treatment should be the first line to control acne, PIH, and PIPA. Adjunctive skincare may prevent and treat PIH and PIPA combined with daily sun protection.*

Modified with permission.[72]
*low-moderate quality of evidence, recommendation aligned with clinical experience and expert opinion. **Low-moderate quality of evidence. Adverse events (AEs), Transepidermal water loss (TEWL), Post-inflammatory hyperpigmentation (PIH), Post-inflammatory pigmentary alteration (PIPA)
Note: Recommended skincare has acne-targeting ingredients

Other nonprescription agents have demonstrated benefits for mild acne management. While a staple of most acne guidelines, BPO effectively reduces inflammatory and non-inflammatory lesions in mild and moderate facial acne.[33] It has been shown to help minimize the risk of antimicrobial resistance when paired with other topical and systemic agents with antibiotic activity. However, BPO can also worsen TEWL, resulting in xerosis, irritation, burning, and stinging.[63] Reducing the potency or frequency of these agents and using adjunctive skincare with gentle cleansers and moisturizers may improve adverse effects.[64]

Azelaic acid is a dicarboxylic acid naturally occurring in cutaneous fungi, namely *Malassezia furfur*. Studies have demonstrated that topical preparations of azelaic acid have comedolytic in addition to antimicrobial activity.[65] It may also improve PIPA and may be doubly beneficial in individuals with skin of color.[66]

Alpha- (eg, glycolic) and beta- (eg, salicylic) hydroxy acids have been formulated as creams, lotions, and washes and work to promote chemical exfoliation, and for the lipophilic beta-hydroxy acids, penetrate the pilosebaceous unit thereby acting as a comedolytic. These agents may be utilized as monotherapy for comedonal acne and safely paired with other nonprescription and prescription topical agents (eg, retinoids) to promote the efficacy of acne and acne scar treatment regimens. At least one randomized controlled trial has demonstrated that 0.5% salicylic acid is significantly more effective than the control in reducing open comedones and inflammatory lesions within 12 weeks.

While small studies have investigated sulfur, sodium sulfacetamide, resorcinol, retinol, tea tree oil, and green tea extract (amongst other agents), there are not sufficiently robust data to determine their efficacy for managing acne.[33,67]

SPF 50+ sunscreen use is a vital part of sun protection, along with sun avoidance measures and wearing a wide-brimmed hat. Various broad-spectrum types of sunscreen are available with different filters that may suit the individual patient's needs. An option is tinted mineral sunscreen that can provide ultraviolet (UV) and visible light protection, especially in individuals with skin of color, to minimize further inflammation and persistence of pigmentary changes related to acne, such as PIH, without inducing unwanted irritation through a potential contact dermatitis.[46,68]

Skincare as Adjunctive Therapy for Moderate-to-Severe Acne

Many prescription topical and systemic agents can exacerbate skin barrier function and potentially disrupt precarious microbial homeostasis.[12] While the long-term implications of antimicrobials on microbiome health post-treatment are not fully elucidated, exacerbation of skin barrier dysfunction can significantly reduce regimen adherence.[64] Combining gentle moisturizers and cleansers developed explicitly for acne patients and tested on the skin type during treatment with topical retinoids, BPO, and isotretinoin has demonstrated no significant change in treatment regimen efficacy while minimizing adverse effects and potentially increasing adherence as a direct result (Table 1).[35]

Integrating Skincare into Practice

A growing body of evidence supports that incorporating skincare into every acne regimen has the potential to improve adherence and outcomes; however, finding the right combination of products is not a one-size-fits-all endeavor.

Quality skincare should include cleansers and moisturizers. Cleansers should be either more acidic or have a near physiologic pH and be based primarily on syndets to preserve the skin's natural lipids.[43,45,46] Moisturizers that comprise lipids, such as ceramides, and humectants (eg, hyaluronic acid, glycerin), and are non-comedogenic, fragrance-free, and have a near physiologic pH minimize the potential irritation and instigation of contact dermatitis.[43,45,46] This is especially important for patients with skin of color who are more prone to develop acne-related dyschromia, such as PIH, PIPA, and scarring.[32,50,68-71]

In selecting skincare, dermatologists must be mindful of patients' preferences, including cultural practices such as using potentially comedogenic agents such as cocoa butter and petrolatum in individuals with skin of color or hair products that may induce pomade acne.[32,50,70]

Another important consideration is financial restraints for patients when they find the right regimen for themselves. Here, dermatologists may be able to assist by providing samples to the patient for trial or handouts with a shortlist of preferred products with price points to minimize choice paralysis.

Limitations

While the data cited here are not limited to any race or ethnicity, the authors sought to provide insight into treatment strategies specifically for patients within the Nordic European countries, which may, therefore, limit the generalizability of recommendations. Furthermore, although the literature returned robust findings, data regarding the use of skincare as monotherapy or adjunctive to prescription acne regimens is heterogeneous, implementing different agents with different endpoints; these findings make drawing accurate, unbiased conclusions difficult across types of skincare products.

CONCLUSION

Acne vulgaris is the most common chronic dermatosis worldwide. Although multiple guidelines from various societies outline prescription regimens to manage acne, skincare and the importance of epidermal barrier function and microbiome homeostasis are often overlooked in improving acne severity and adherence to therapy. While the literature regarding skincare in acne management continues to grow, dermatologists should discuss skincare practices with their patients at every visit to reinforce teaching points and maximize patient experience and outcomes before, during, and after treatment of their acne.

DISCLOSURES

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