

Current Management of Acne Vulgaris: Severity-Based Therapy, Combination Treatment, And Antibiotic Stewardship

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ABSTRACT

Acne vulgaris is a common chronic inflammatory disorder of the pilosebaceous unit that affects adolescents and adults and may lead to scarring, dyspigmentation, psychosocial distress, and reduced quality of life. Contemporary management is based on acne severity, lesion type, distribution, scarring risk, patient age, pregnancy status, treatment history, and psychosocial burden. First-line therapy for mild-to-moderate acne relies on topical treatment, particularly topical retinoids, benzoyl peroxide, and combination regimens. Topical retinoids normalize follicular keratinization and are useful for both active treatment and maintenance. Benzoyl peroxide has antimicrobial and anti-inflammatory effects and reduces the risk of antibiotic resistance when used with topical or oral antibiotics. Moderate-to-severe inflammatory acne often requires escalation to systemic therapy, most commonly oral tetracycline-class antibiotics combined with non-antibiotic topical agents. Antibiotic monotherapy should be avoided. Hormonal therapy, including combined oral contraceptives and spironolactone, is useful in selected female patients, particularly those with persistent, adult-onset, or hormonally influenced acne. Oral isotretinoin remains the most effective treatment for severe nodular, scarring, refractory, or psychosocially burdensome acne. Adjunctive procedures, including chemical peels, lasers, photodynamic therapy, intralesional corticosteroids, and emerging microbiome-based or drug-delivery approaches, may benefit selected patients but are generally less established than standard pharmacologic regimens. This review summarizes current acne management with emphasis on severity-based escalation, combination therapy, maintenance, adherence, and antibiotic stewardship.

KEYWORDS: acne vulgaris; topical retinoids; benzoyl peroxide; oral antibiotics; isotretinoin; hormonal therapy; clascoterone; acne scars; antibiotic stewardship.

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INTRODUCTION

Acne vulgaris is one of the most frequent dermatologic conditions worldwide. It is a chronic inflammatory disease of the pilosebaceous unit characterized by comedones, papules, pustules, nodules, cysts, post-inflammatory hyperpigmentation, and scarring. Although acne is most common during adolescence, it may persist into adulthood or present for the first time in adult patients.

The pathogenesis of acne is multifactorial and includes increased sebum production, follicular hyperkeratinization, colonization by *Cutibacterium acnes*, inflammation, androgenic signaling, genetic predisposition, and

environmental factors. Treatment must therefore target multiple pathogenic mechanisms rather than rely on a single drug class [1,2].

Modern acne management is severity based. Mild comedonal or inflammatory acne is usually managed with topical therapy. Moderate inflammatory acne often requires topical combination therapy and, when necessary, oral antibiotics for limited durations. Severe nodular, scarring, refractory, or psychologically burdensome acne should be treated more aggressively, often with oral isotretinoin [1–3].

A central principle of current management is avoidance of antibiotic monotherapy. Combination regimens improve

efficacy, target multiple mechanisms, and help reduce antimicrobial resistance [1,4].

METHODS

This narrative review was developed from the uploaded literature synthesis on current management of acne vulgaris. The evidence included clinical guidelines, narrative reviews, systematic reviews, network meta-analyses, consensus recommendations, and recent updates on topical, systemic, hormonal, procedural, and emerging therapies.

References are numbered according to their first appearance in the manuscript.

Clinical Assessment

Initial evaluation should determine acne severity, lesion morphology, distribution, duration, previous treatments, adherence, adverse effects, scarring, dyspigmentation, and psychosocial impact.

Clinically relevant lesion types include:

Open and closed comedones

Inflammatory papules

Pustules

Nodules

Cysts

Sinus tracts

Atrophic scars

Hypertrophic or keloidal scars

Post-inflammatory erythema or hyperpigmentation

Severity is commonly classified as mild, moderate, or severe.

Mild acne is usually comedonal or limited inflammatory disease. Moderate acne includes more widespread papules and pustules. Severe acne includes nodules, cysts, extensive inflammatory lesions, scarring, or marked psychosocial impairment.

Assessment should also identify special circumstances such as pregnancy, lactation, preadolescent acne, adult female acne, endocrine features, polycystic ovary syndrome, medication-induced acne, occupational exposure, or acne fulminans.

General Treatment Principles

The goals of acne treatment are to:

Reduce active lesions.

Prevent scarring.

Improve quality of life.

Minimize post-inflammatory hyperpigmentation.

Reduce recurrence.

Avoid unnecessary antibiotic exposure.

Maintain long-term disease control.

Patients should be counseled that most acne treatments require several weeks before visible improvement. Topical therapies often require 6–8 weeks for meaningful response and up to 12 weeks for full assessment [5].

Adherence is essential. Common causes of treatment failure include irritation, unrealistic expectations, excessive application, poor moisturizer use, early discontinuation, and

complicated regimens. A simple regimen with clear instructions improves persistence.

Skin Care and Counseling

Basic skin care supports pharmacologic treatment and reduces irritation. Patients should use gentle cleansers, non-comedogenic moisturizers, and broad-spectrum sunscreen. Overwashing, abrasive scrubs, alcohol-based toners, and manipulation of lesions should be discouraged.

Important counseling points include:

Apply topical medications to the entire acne-prone area, not only visible lesions.

Start irritating agents gradually when needed.

Use moisturizer to improve tolerance.

Avoid picking or squeezing lesions.

Continue maintenance therapy after improvement.

Avoid antibiotic monotherapy.

Discuss pregnancy safety before prescribing retinoids, tetracyclines, or hormonal therapies.

Topical Retinoids

Topical retinoids are foundational treatments for acne. They normalize follicular desquamation, reduce comedone formation, have anti-inflammatory effects, and prevent new lesions.

Common topical retinoids include:

Tretinoin

Adapalene

Tazarotene

Trifarotene

Topical retinoids are particularly useful for comedonal acne but also benefit inflammatory acne when combined with benzoyl peroxide or other agents. They are also central to maintenance therapy after improvement.

Adverse effects include dryness, erythema, peeling, burning, and photosensitivity-like irritation. These effects can be reduced by gradual introduction, use of moisturizer, lower concentration formulations, and application of a pea-sized amount at night.

Topical retinoids should generally be avoided during pregnancy.

Benzoyl Peroxide

Benzoyl peroxide is a first-line topical therapy with antimicrobial, anti-inflammatory, and mild comedolytic properties. It reduces *C. acnes* without causing bacterial resistance.

Its most important role is in combination therapy. Benzoyl peroxide should be used with topical or oral antibiotics to reduce the emergence of resistant organisms [1,4].

Adverse effects include dryness, irritation, peeling, and bleaching of clothing or towels. Lower concentrations may improve tolerability while maintaining efficacy.

Benzoyl peroxide may be used as:

Monotherapy in mild inflammatory acne

Combination therapy with topical retinoids

Combination therapy with topical clindamycin

Adjunctive therapy with oral antibiotics

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Maintenance therapy after systemic treatment

Topical Antibiotics

Topical antibiotics, most commonly clindamycin, reduce inflammatory lesions by targeting *C. acnes* and inflammation. However, they should not be used alone because of antibiotic resistance.

Topical antibiotics should be combined with benzoyl peroxide and usually limited to patients with inflammatory acne. Long-term continuous use should be avoided when possible.

Erythromycin is used less frequently because of resistance concerns.

Azelaic Acid and Other Topical Agents

Azelaic acid has comedolytic, anti-inflammatory, antimicrobial, and pigment-modulating effects. It is useful in patients with acne and post-inflammatory hyperpigmentation and may be better tolerated than some retinoids.

Salicylic acid may help comedonal acne through keratolytic effects, although evidence is generally less robust than for retinoids and benzoyl peroxide.

Dapsone gel may be useful for inflammatory acne, particularly in selected female patients, but is not usually considered first-line for all patients.

Clascoterone

Clascoterone is a topical androgen receptor inhibitor. It targets androgen signaling within the pilosebaceous unit and offers a non-systemic antiandrogen option.

It may be useful in both male and female patients with acne, particularly when hormonal influence is suspected or systemic hormonal therapy is not desired. Its long-term position in treatment algorithms continues to evolve [6].

Combination Topical Therapy

Combination therapy is preferred because acne pathogenesis is multifactorial. A topical retinoid plus benzoyl peroxide is one of the most effective topical strategies for mild-to-moderate acne.

A network meta-analysis of randomized trials found that retinoid plus benzoyl peroxide was among the most effective topical pharmacologic options for mild-to-moderate acne [7].

Common combinations include:

Topical retinoid + benzoyl peroxide

Benzoyl peroxide + topical clindamycin

Topical retinoid + topical antibiotic + benzoyl peroxide

Fixed-dose combination products

Fixed combinations may improve adherence by simplifying treatment.

Oral Antibiotics

Oral antibiotics are indicated for moderate-to-severe inflammatory acne, widespread truncal acne, or acne that has not responded adequately to topical therapy.

Common options include:

Doxycycline

Minocycline

Sarecycline

Other tetracycline-class agents

Doxycycline is widely recommended because of efficacy, availability, and familiarity [1,3].

Oral antibiotics should always be combined with topical non-antibiotic therapy, ideally benzoyl peroxide and a topical retinoid. They should be used for the shortest effective duration, commonly reassessing after 3–4 months.

Oral antibiotic monotherapy should be avoided. Maintenance after antibiotic discontinuation should rely on topical retinoids, benzoyl peroxide, or other non-antibiotic regimens. Adverse effects of tetracyclines include gastrointestinal upset, photosensitivity, esophagitis, dizziness, pigmentation changes, and rare severe reactions. Tetracyclines are contraindicated during pregnancy and in young children.

Hormonal Therapy

Hormonal therapy is an important option in female patients, especially those with:

Adult female acne

Premenstrual flares

Jawline or lower-face distribution

Persistent acne despite topical therapy

Hyperandrogenic features

Polycystic ovary syndrome

Need for contraception

Desire to avoid prolonged antibiotics

Combined Oral Contraceptives

Combined oral contraceptives reduce androgen-mediated sebum production and can improve inflammatory and comedonal acne. They are appropriate for selected patients after assessment of contraindications.

Contraindications may include thromboembolic disease, certain migraine patterns, smoking over age 35, uncontrolled hypertension, breast cancer, and pregnancy.

Spirolactone

Spirolactone is an androgen receptor antagonist and aldosterone antagonist used off-label for acne in many settings. It is particularly useful for persistent adult female acne.

Potential adverse effects include menstrual irregularity, breast tenderness, dizziness, diuresis, and hyperkalemia in selected risk groups. Pregnancy should be avoided because of potential antiandrogenic effects on the fetus.

Hormonal therapies are not immediate treatments; improvement usually requires several months [5,6].

Oral Isotretinoin

Oral isotretinoin is the most effective treatment for severe acne. It targets multiple pathogenic factors by reducing sebaceous gland activity, decreasing sebum production, normalizing follicular keratinization, reducing *C. acnes*, and exerting anti-inflammatory effects.

Indications include:

Severe nodular acne

Conglobate acne

Scarring acne

Acne with major psychosocial burden

Moderate acne refractory to standard therapy

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Frequent relapse after antibiotics

Acne causing significant functional or emotional impairment

Isotretinoin requires careful monitoring because of adverse effects and teratogenicity. Pregnancy prevention is mandatory for patients who can become pregnant.

Common adverse effects include cheilitis, xerosis, dry eyes, epistaxis, photosensitivity, musculoskeletal symptoms, and laboratory abnormalities. Monitoring practices vary, but baseline and follow-up assessment of pregnancy status, lipids, and liver enzymes are commonly used.

Psychiatric symptoms and inflammatory bowel disease associations remain controversial, but clinicians should screen for mood symptoms and counsel patients appropriately.

Acne in Pregnancy

Pregnancy significantly limits acne treatment options. Topical retinoids, oral isotretinoin, tetracyclines, and many hormonal therapies should be avoided.

Potentially safer options may include:

Gentle skin care

Benzoyl peroxide in limited use

Azelaic acid

Certain topical antibiotics when appropriate

Procedural options in selected cases

Treatment should be individualized and coordinated with obstetric care when systemic therapy is considered.

Procedural Therapies

Procedural treatments may be used as adjuncts or alternatives in selected patients. They are generally less supported by evidence than standard pharmacologic therapy but can be useful in specific contexts.

Options include:

Comedone extraction

Chemical peels

Intralesional corticosteroids for inflamed nodules

Photodynamic therapy

Lasers and light-based treatments

Microneedling or resurfacing for scars after acne control

Intralesional corticosteroids can rapidly reduce painful inflammatory nodules and may help prevent scarring.

Procedural treatment for acne scars should usually be delayed until active acne is controlled.

Maintenance Therapy

Acne commonly relapses if treatment is stopped prematurely. Maintenance therapy is therefore important after successful induction treatment.

Topical retinoids are preferred for maintenance because they prevent microcomedone formation. Benzoyl peroxide may be added for patients with inflammatory relapse risk.

Antibiotics should not be used as long-term maintenance therapy. After discontinuing oral antibiotics, patients should continue non-antibiotic topical treatment.

Antibiotic Stewardship

Antibiotic resistance is a major concern in acne management.

Strategies to reduce resistance include:

Avoid topical antibiotic monotherapy.

Avoid oral antibiotic monotherapy.

Combine antibiotics with benzoyl peroxide.

Limit oral antibiotic duration.

Reassess response after 3–4 months.

Transition to maintenance therapy with topical retinoids and benzoyl peroxide.

Avoid simultaneous topical and oral antibiotics when unnecessary.

Consider isotretinoin or hormonal therapy when repeated antibiotic courses are needed.

Antibiotic stewardship is now a core component of acne care rather than an optional consideration [1,4].

Management of Acne Scarring and Dyspigmentation

Early effective acne treatment is the best prevention for scarring. Once scars occur, management depends on scar type.

Atrophic scars may be treated with:

Microneedling

Fractional laser

Chemical reconstruction of skin scars

Subcision

Fillers

Ablative resurfacing

Hypertrophic or keloidal scars may require:

Intralesional corticosteroids

Silicone therapy

Laser treatment

Surgical revision in selected cases

Post-inflammatory hyperpigmentation is common in darker skin types and may improve with photoprotection, acne control, azelaic acid, topical retinoids, and pigment-directed therapies.

Emerging Therapies

New and emerging acne therapies aim to improve efficacy, tolerability, adherence, and resistance profiles.

Areas of development include:

Clascoterone and other androgen-targeted therapies

Sarecycline and narrower-spectrum antibiotics

Trifarotene for face and trunk involvement

Microbiome-targeted approaches

Probiotics

Bacteriophage therapy

Nanotechnology-based drug delivery

Anti-inflammatory biologic strategies

Novel laser and energy-based modalities

These approaches are promising, but most remain less established than topical retinoids, benzoyl peroxide, oral antibiotics, hormonal therapy, and isotretinoin [8–10].

Proposed Severity-Based Treatment Algorithm

Mild comedonal acne: topical retinoid; consider benzoyl peroxide or azelaic acid if needed.

Mild inflammatory acne: topical retinoid plus benzoyl peroxide; consider benzoyl peroxide plus topical clindamycin for limited duration.

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Moderate inflammatory acne: topical retinoid plus benzoyl peroxide; add oral doxycycline or another appropriate oral antibiotic when needed.

Moderate acne in female patients with hormonal pattern: consider combined oral contraceptive or spironolactone.

Severe nodular or scarring acne: oral isotretinoin when appropriate.

Refractory acne after adequate standard therapy: reassess adherence, diagnosis, endocrine factors, and consider isotretinoin or hormonal therapy.

Maintenance after improvement: topical retinoid with or without benzoyl peroxide.

Scarring or dyspigmentation: treat active acne first, then consider procedural or pigment-directed therapy.

Pregnancy or pregnancy planning: avoid contraindicated drugs and use pregnancy-compatible options.

DISCUSSION

Current acne management is built around severity-based escalation and combination therapy. For most patients, topical regimens are the starting point, especially topical retinoids and benzoyl peroxide. These agents are effective because they target comedogenesis, inflammation, and bacterial load while also supporting maintenance.

Moderate-to-severe inflammatory acne often requires systemic therapy, but oral antibiotics should be used carefully. Their role is to control inflammatory disease while topical non-antibiotic agents are continued. Prolonged or repeated antibiotic courses should prompt reconsideration of the treatment plan.

Hormonal therapy is particularly useful in selected female patients and may reduce reliance on antibiotics. Isotretinoin remains the most powerful treatment and should not be reserved only for extreme nodular disease when acne is scarring, refractory, or causing substantial psychosocial impairment.

The future of acne therapy will likely include more targeted antiandrogen therapy, improved topical delivery systems, microbiome-based strategies, and personalized regimens. However, the practical core remains simple: treat early, combine mechanisms, avoid antibiotic monotherapy, support adherence, and maintain control after improvement.

CONCLUSION

Acne vulgaris should be managed through a severity-based, patient-centered approach. Topical retinoids and benzoyl peroxide form the foundation of treatment for mild-to-moderate disease. Combination therapy is preferred over monotherapy because it targets multiple pathogenic mechanisms and reduces antibiotic resistance. Oral antibiotics are appropriate for moderate-to-severe inflammatory acne but should be time-limited and combined with non-antibiotic topical therapy. Hormonal therapy is effective in selected female patients, while oral isotretinoin is the treatment of choice for severe, scarring, refractory, or

psychosocially burdensome acne. Long-term success depends on adherence, maintenance therapy, skin-care counseling, and antibiotic stewardship.

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