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NASAL DECONGESTANTS IN COMPETITIVE ATHLETES: A NARRATIVE REVIEW

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Abstract
Background. Athletes often use nasal decongestants for rhinitis- or infection-related obstruction, but rapid relief must be balanced against systemic stimulation, rebound congestion, and anti-doping risk.
Aim. To assess efficacy, performance effects, safety, rhinitis medicamentosa, and anti-doping implications of oral and topical decongestants in competitive athletes.
Material and methods. PubMed/MEDLINE, reference lists, clinical guidance, and official WADA and regulatory documents were searched through 2 July 2026. Relevant evidence was synthesized narratively.
Results. Topical imidazolines provide rapid short-term relief. Therapeutic pseudoephedrine doses usually do not improve performance; higher doses show inconsistent benefits and greater stimulant exposure. Oral phenylephrine lacks convincing efficacy at recommended doses. Mean cardiovascular effects of pseudoephedrine are small, but individual risk depends on comorbidity, co-medication, exercise, and environment. Prolonged topical use may cause tachyphylaxis, rebound congestion, and rhinitis medicamentosa. Under the 2026 WADA List, pseudoephedrine is prohibited in competition above 150 micrograms/mL in urine, whereas specified topical imidazolines are permitted by nasal administration.
Conclusions. Decongestants should be used briefly for a defined indication, with ingredient verification, cardiovascular screening, a stop date for topical products, and competition-specific anti-doping planning.

Key words: nasal decongestants; pseudoephedrine; competitive athletes; rhinitis medicamentosa; cardiovascular safety; anti-doping

1. Introduction

Upper-airway complaints occur frequently in physically active people, yet the medicines used for rapid nasal relief have received less attention than therapies directed at the lower respiratory tract. During a single season, a competitive athlete may experience allergic or non-allergic rhinitis, an acute viral infection, exercise-associated rhinorrhea, pool-related irritation, or symptoms provoked by cold air (Surda et al. 2017; McIntosh et al. 2021). The practical consequences may include poorer nocturnal rest, uncomfortable breathing, missed or modified sessions, and additional difficulty during travel and competition. Widespread over-the-counter availability also encourages athletes to choose an oral tablet or nasal spray before the cause and expected duration of obstruction have been established (McIntosh et al. 2021; Price et al. 2022).

The attraction of these medicines is understandable. Topical alpha-adrenergic agonists can open the nasal airway within minutes, and oral pseudoephedrine can reduce mucosal swelling without requiring correct spray technique (McIntosh et al. 2021; Price et al. 2022). An athlete who wakes with a blocked nose before an important race may therefore perceive a decongestant as a practical solution rather than a pharmacological exposure. This apparently simple decision is complicated by three features specific to sport. First, systemic sympathomimetic effects occur in a setting that may already include high heart rate, environmental heat, dehydration, anxiety, caffeine, or stimulant-containing supplements (Salerno et al. 2005; Roberts et al. 2023). Second, repeated topical use can produce decreasing response and worsening congestion (Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026). Third, pseudoephedrine is regulated in competition under the World Anti-Doping Agency Prohibited List (World Anti-Doping Agency 2026).

A further problem is the difference between relief of disease-related limitation and direct enhancement of performance. An athlete with severe congestion may perform better after effective symptom control because normal function has been restored. This is not equivalent to demonstrating that a decongestant is an ergogenic aid in a healthy, asymptomatic athlete (Trinh et al. 2015; McIntosh et al. 2021). Trials of pseudoephedrine have used different doses, exercise models, feeding states, and sampling times, producing apparently conflicting results (Trinh et al. 2015; Gheorghiev et al. 2018). Most therapeutic-dose studies are negative, whereas isolated studies

using higher doses have reported benefits in short or high-intensity tasks (Gillies et al. 1996; Hodges et al. 2006; Pritchard-Peschek et al. 2010).

Topical preparations create a different trade-off. Xylometazoline and oxymetazoline produce strong local vasoconstriction with limited systemic exposure when correctly used, and specified imidazoline derivatives administered by nasal routes are not prohibited by WADA (Eccles et al. 2008; Stinson and Sadofsky 2025a; World Anti-Doping Agency 2026). However, easy access and rapid relief encourage repetitive use. In April 2026, the United Kingdom Medicines and Healthcare products Regulatory Agency strengthened advice to limit xylometazoline and oxymetazoline to no more than five consecutive days because prolonged use increases the risk of rebound congestion, rhinitis medicamentosa, and tachyphylaxis (Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026). This update is directly relevant to athletes who may use sprays throughout an allergy season or repeatedly before training (Medicines and Healthcare products Regulatory Agency 2026).

The clinical challenge is therefore not to classify decongestants as uniformly safe or unsafe. It is to identify when short-term use is justified, which formulation is most appropriate, how comorbidity and exercise environment modify risk, and how treatment can be planned without creating dependence or an anti-doping violation (Dykewicz et al. 2020; McIntosh et al. 2021; World Anti-Doping Agency 2026). This narrative review integrates rhinology, exercise pharmacology, cardiovascular safety, and anti-doping regulation to provide a practical framework for clinicians and competitive athletes (Dykewicz et al. 2020; McIntosh et al. 2021; World Anti-Doping Agency 2026).

Review objective

The objective of this narrative review was to summarize and critically discuss current evidence on oral and topical nasal decongestants in competitive athletes, with particular attention to therapeutic efficacy, possible effects on exercise performance, cardiovascular and cerebrovascular safety, rhinitis medicamentosa, anti-doping regulations, and practical medication selection.

Key review questions

1. **What clinical situations justify the use of an oral or topical nasal decongestant in a competitive athlete?**
2. **Do pseudoephedrine or topical imidazoline decongestants improve exercise performance beyond relief of nasal symptoms?**
3. **How do dose, formulation, comorbidity, co-ingested stimulants, and environmental stress modify cardiovascular or cerebrovascular risk?**
4. **How can rebound congestion, tachyphylaxis, and rhinitis medicamentosa be prevented and managed?**
5. **How should athletes and clinicians interpret the 2026 WADA rules for pseudoephedrine and topical imidazoline derivatives?**

2. Methods of the narrative review

2.1. Review design and rationale

This article was designed as a narrative review because the clinical question spans several evidence domains that are not readily reduced to a single intervention-outcome comparison: rhinology, exercise pharmacology, cardiovascular and neurological safety, medication overuse, and anti-doping regulation. The review was prepared with attention to the quality domains described by the SANRA framework, including explanation of the topic's importance, a clear objective, transparent literature searching, appropriate referencing, explicit scientific reasoning, and presentation of clinically relevant outcomes (Baethge et al. 2019).

2.2. Search strategy and eligibility principles

A structured search of PubMed/MEDLINE was conducted and updated through 2 July 2026. Search concepts included combinations of nasal decongestant, pseudoephedrine, phenylephrine, xylometazoline, oxymetazoline, imidazoline, athlete, exercise, performance, blood pressure, heart rate, rhinitis medicamentosa, rebound congestion, tachyphylaxis, pharmacokinetics, urine concentration, doping, and WADA. Reference lists of relevant reviews, position papers, and primary studies were screened manually. Official documents from the World Anti-Doping Agency, European Medicines Agency, Medicines and Healthcare products Regulatory Agency, and U.S. Food and Drug Administration were included when they provided current regulatory or safety information. The search description was reported to improve transparency in accordance with SANRA principles (Baethge et al. 2019).

Eligible sources were English-language human studies, systematic reviews, meta-analyses, clinical guidelines, consensus or position statements, and official regulatory documents addressing at least one prespecified domain: short-term therapeutic efficacy, exercise performance, cardiovascular or neurological safety, pharmacokinetics and urinary elimination, topical-decongestant overuse, or anti-doping status. Athlete-specific controlled trials and pharmacokinetic studies were prioritized for performance and doping questions. High-quality rhinitis guidance

and systematic reviews were prioritized for efficacy and clinical management. Non-human studies, illicit stimulant use unrelated to treatment of nasal symptoms, ophthalmic preparations, and sources without direct relevance to the review questions were excluded from the main synthesis. Case reports were not used to estimate incidence, although regulatory assessments of rare safety signals were considered.

No publication-date restriction was imposed because several pivotal exercise and rhinitis-medicamentosa studies are older. The search was not intended to meet the exhaustive standard of a systematic review, no protocol was registered, and record selection was not performed independently in duplicate. These design choices were stated explicitly to avoid implying PRISMA-level completeness.

2.3. Evidence extraction and qualitative synthesis

Information was extracted into the following domains: active ingredient and formulation, dose, participant characteristics, symptom indication, exercise model, performance outcome, hemodynamic response, urinary concentration, duration of exposure, evidence of rebound or tachyphylaxis, regulatory status, and practical clinical implications. Evidence was synthesized qualitatively and interpreted according to source type. Official regulatory documents and major clinical guidance were used for current rules and safety advice; systematic reviews and meta-analyses were used to summarize overall effects; controlled trials were used to illustrate dose- and protocol-specific findings; and observational studies were used to contextualize uncommon adverse outcomes. This source hierarchy also addresses the SANRA expectation that narrative reviews distinguish levels of evidence and present clinically relevant endpoint data (Baethge et al. 2019).

Formal risk-of-bias scoring, duplicate data extraction, statistical pooling, and hypothesis testing were not performed.

Numerical findings were reported only when they clarified the magnitude or heterogeneity of an effect. Recommendations were framed as clinical interpretations of the available evidence rather than as graded guidelines, and inferential statements were identified with cautious language where direct athlete-specific evidence was limited.

3. Evidence synthesis

3.1. Why competitive athletes use nasal decongestants

The demand for rapid decongestion in sport is created by a combination of symptom burden and time pressure. Allergic rhinitis may fluctuate with pollen exposure, travel, and outdoor competition. Swimmers are exposed to chlorine by-products, winter athletes inhale large volumes of cold dry air, and endurance athletes may experience exercise-induced rhinorrhea or congestion without classic allergy (Surda et al. 2017; Hox et al. 2021). Viral respiratory infections add episodic obstruction during training blocks. Because athletes often plan around fixed competition dates, a medicine that acts within minutes may appear more attractive than a controller therapy that requires regular use (Hox et al. 2021; McIntosh et al. 2021).

Compensation by oral breathing does not eliminate the functional consequences of nasal blockage. Congestion may interfere with nocturnal rest, promote oral and pharyngeal dryness, and make breathing feel more laborious even when overall ventilation remains adequate (Hox et al. 2021; McIntosh et al. 2021). In an athlete whose usual capacity has been reduced by rhinitis or an acute respiratory illness, successful decongestion may help recover baseline functioning rather than create a new physiological advantage. Such benefit is most plausible during sleep, prolonged low-to-moderate exercise, or exposure to air that is cold, dry, polluted, or otherwise irritating (Hox et al. 2021; McIntosh et al. 2021). This distinction reconciles useful symptom relief with the generally negative evidence for a direct ergogenic action in healthy participants (Trinh et al. 2015; Gheorghiev et al. 2018; McIntosh et al. 2021).

Self-treatment is common because decongestants are often sold as single agents and as components of multi-symptom cold remedies. Combination products may contain pseudoephedrine or phenylephrine together with paracetamol, ibuprofen, antihistamines, dextromethorphan, or caffeine (Price et al. 2022). Product names and formulations may differ between countries. An athlete may therefore focus on the brand or the symptom printed on the package and fail to recognize a prohibited stimulant, duplicated analgesic, or sedating antihistamine (Price et al. 2022; World Anti-Doping Agency 2026). Ingredient-level review is essential in competitive sport (Price et al. 2022; World Anti-Doping Agency 2026).

Persistent or mainly unilateral blockage, facial pain, recurrent epistaxis, loss of smell, or failure of appropriate anti-inflammatory treatment should prompt reconsideration of the initial indication. Repeated sympathomimetic dosing will not correct fixed narrowing, chronic rhinosinusitis, nasal valve dysfunction, turbinate disease, or congestion caused by medication overuse (Dykewicz et al. 2020; McIntosh et al. 2021). Temporary improvement can conceal the underlying disorder and postpone definitive assessment. In sports medicine, the first decision should therefore concern the likely cause and time course of symptoms, not which rescue product to prescribe (Dykewicz et al. 2020; McIntosh et al. 2021).

3.2. Pharmacology and formulation-specific effects

Nasal congestion reflects vascular engorgement, increased mucosal blood volume, tissue edema, secretions, and structural factors. Sympathomimetic decongestants reduce the vascular component by activating adrenergic pathways and constricting capacitance vessels in the nasal mucosa (Dykewicz et al. 2020; Stinson and Sadofsky

2025a). The clinical response depends on receptor profile, route, dose, tissue exposure, and the contribution of nonvascular disease. No decongestant corrects allergy, infection, polyposis, septal deviation, or chronic inflammation itself (Dykewicz et al. 2020; Stinson and Sadofsky 2025a).

Pseudoephedrine is an orally administered sympathomimetic with mixed direct and indirect adrenergic effects. It promotes vasoconstriction and may increase heart rate, blood pressure, alertness, and tremor (Salerno et al. 2005; Stinson and Sadofsky 2025a). Oral administration provides systemic exposure and can treat bilateral congestion without reliance on spray technique, but it also exposes cardiovascular and central nervous systems. Immediate-release preparations produce higher peaks than sustained-release products and show a clearer dose-response for blood pressure (Salerno et al. 2005; Barroso et al. 2012). Renal excretion and urinary pH contribute to pharmacokinetic variability, which is relevant to both safety and doping control.

Oral phenylephrine is a predominantly alpha-1 agonist, but extensive first-pass metabolism limits systemic bioavailability. A systematic review found insufficient evidence that the commonly marketed 10 mg oral dose provides clinically meaningful congestion relief (Hatton et al. 2007). In November 2024, the U.S. Food and Drug Administration proposed removing oral phenylephrine as an active ingredient in over-the-counter monograph products for nasal congestion after concluding that the available data did not support efficacy at recommended oral doses; the proposal concerned oral, not intranasal, phenylephrine and was based on effectiveness rather than a new safety signal (U.S. Food and Drug Administration 2024). Athletes should therefore not treat oral phenylephrine as a reliably effective substitute selected only because pseudoephedrine is regulated (Hatton et al. 2007; U.S. Food and Drug Administration 2024).

Topical imidazoline derivatives such as xylometazoline, oxymetazoline, and naphazoline act directly on nasal mucosal vessels. Their onset is rapid and the decongestant effect can last many hours. Controlled studies have demonstrated improved nasal conductance and symptom relief with xylometazoline in common cold, while oxymetazoline 0.05% can provide relief for approximately 12 hours (Eccles et al. 2008; Druce et al. 2018). Correct local use generally produces less systemic exposure than an oral sympathomimetic, although systemic adverse effects remain possible with excessive dosing, mucosal injury, ingestion, pediatric exposure, or susceptible patients (Stinson and Sadofsky 2025a).

Route does not eliminate the need to examine the full product. Some nasal preparations combine a vasoconstrictor with ipratropium or dexpanthenol, while oral cold products may contain several active substances (Eccles et al. 2010; Price et al. 2022). The same athlete may also take caffeine, a pre-workout supplement, an attention-deficit medication, or another sympathomimetic (Salerno et al. 2005; Price et al. 2022). Pharmacological burden is cumulative even when each product is individually available without prescription. The safest selection is the narrowest formulation that treats the dominant symptom for the shortest required duration (Dykewicz et al. 2020; Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026).

Table 1. Formulation-specific clinical and anti-doping considerations for common nasal decongestants

Agent and route	Therapeutic role and evidence	Principal risks	WADA 2026 status	Practical note
Pseudoephedrine, oral	Systemic short-term relief; therapeutic-dose performance benefit is generally absent or inconsistent.	Blood-pressure and heart-rate increase, insomnia, tremor; rare severe neurological events; variable urinary elimination.	Prohibited in competition when urine concentration exceeds 150 micrograms/mL.	Use only when clinically indicated; avoid intentional high-dose use; plan from the start of the in-competition period.
Phenylephrine, oral	Recommended OTC oral doses lack convincing decongestant efficacy.	Adrenergic adverse effects remain possible despite uncertain benefit.	Verify current ingredient status and all components of combination products.	Not a dependable clinical substitute for pseudoephedrine solely on regulatory grounds.

Xylometazoline / oxymetazoline, nasal	Rapid, strong local relief; useful as brief rescue therapy.	Rebound congestion, tachyphylaxis, rhinitis medicamentosa; systemic effects with excess exposure or susceptibility.	Specified imidazoline derivatives used by the nasal route are not prohibited.	Use the lowest effective dose for no more than 5 consecutive days; do not combine with another sympathomimetic decongestant.
Naphazoline and other specified imidazolines, nasal	Local decongestion; evidence and labeling vary by product and country.	Overuse and systemic toxicity remain possible; combination ingredients may alter risk.	Specified local imidazoline derivatives are not prohibited by the 2026 List.	Verify the exact active ingredient, route, dose, and national product instructions.

Sources: (Hatton et al. 2007; European Medicines Agency 2024; U.S. Food and Drug Administration 2024; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026).

3.3. Therapeutic efficacy and its limits

Evidence supports a modest short-term role for decongestants in acute nasal congestion. The Cochrane review of decongestant monotherapy for common cold found a small benefit in subjective congestion in adults, but the evidence base was limited and did not justify prolonged treatment (Deckx et al. 2016). Topical agents usually produce a more immediate and perceptible opening of the nasal airway than oral agents. This rapid response is useful as a temporary bridge, but it can also create a strong behavioral preference that encourages overuse (Eccles et al. 2008; Deckx et al. 2016; Druce et al. 2018).

The most appropriate background therapy depends on diagnosis. In allergic rhinitis, regular intranasal corticosteroids are preferred for persistent congestion, and intranasal or oral antihistamines can be selected according to the symptom profile (Dykewicz et al. 2020). Saline irrigation, allergen reduction, and correct spray technique improve treatment quality without adrenergic stimulation (Dykewicz et al. 2020; Hox et al. 2021). Contemporary rhinitis guidance permits limited short-term decongestant use in selected severe cases, but does not position it as first-line long-term therapy (Dykewicz et al. 2020). An athlete who repeatedly needs a vasoconstrictor probably requires reassessment of diagnosis, adherence, technique, exposure, or anatomy (Dykewicz et al. 2020; McIntosh et al. 2021).

In viral illness, decongestion may improve comfort but does not shorten the infection or make strenuous competition medically appropriate (Deckx et al. 2016). Symptoms such as fever, chest pain, marked fatigue, lower-airway involvement, or systemic illness should not be masked to permit participation (Deckx et al. 2016; Price et al. 2022). A clear nose is not evidence of physiological recovery. Similar caution applies to acute bacterial rhinosinusitis or severe sinus pain, where repeated decongestant use can distract from the need for clinical assessment (Deckx et al. 2016; Price et al. 2022).

Topical agents may have a role when a short period of severe obstruction prevents delivery of an intranasal corticosteroid or when rhinorrhea and congestion require a carefully selected combination approach (Eccles et al. 2010). Some studies and systematic reviews suggest that combining oxymetazoline with an intranasal corticosteroid can improve congestion without clearly producing rebound during controlled treatment (Thongngarm et al. 2016; Neighbors et al. 2022). These findings should not be generalized to unsupervised continuous use. Combination treatment is a targeted strategy for selected patients, not permission to maintain indefinite daily vasoconstrictor exposure (Thongngarm et al. 2016; Neighbors et al. 2022).

The therapeutic endpoint in sport should be functional recovery rather than a sensation of maximal patency. Excessive pursuit of an 'open nose' can lead athletes to dose more frequently than indicated, particularly when normal cyclical changes in nasal resistance are interpreted as recurrence of disease (Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026). Clinicians should set expectations: some variation in airflow is physiological, and complete elimination of all congestion is not necessary for safe exercise (Dykewicz et al. 2020; Stinson and Sadofsky 2025b).

3.4. Pseudoephedrine and exercise performance

Pseudoephedrine has attracted sports-science interest because it combines decongestant action with stimulant properties and is chemically related to other sympathomimetics (Trinh et al. 2015; Gheorghiev et al. 2018). The central question is dose. Standard therapeutic exposure may relieve symptoms without creating a meaningful performance effect, while higher doses can produce greater plasma concentrations, heart-rate responses, and

possible central stimulation (Trinh et al. 2015; Gheorghiev et al. 2018). The literature is heterogeneous and should not be summarized by a single positive or negative trial (Trinh et al. 2015; Gheorghiev et al. 2018).

One of the most informative therapeutic-dose studies evaluated 120 mg pseudoephedrine before a one-hour high-intensity cycling trial. Performance and isometric muscle function did not improve, although exercise altered plasma and urinary drug concentrations (Gillies et al. 1996). Other controlled studies using therapeutic or near-therapeutic dosing have also failed to show consistent changes in endurance time, perceived exertion, or strength (Gillies et al. 1996; Trinh et al. 2015; Gheorghiev et al. 2018). This supports the view that ordinary symptom-directed dosing is not reliably ergogenic (Trinh et al. 2015; Gheorghiev et al. 2018).

Positive findings have generally appeared with higher doses or specific exercise tasks, although high-dose studies have also reported cardiorespiratory changes without uniform improvement across outcomes (Gill et al. 2000). Hodges et al. reported improved 1500 m running after approximately 2.5 mg/kg pseudoephedrine, while Pritchard-Peschek et al. observed improved cycling time-trial performance after a 180 mg dose in a small sample of trained men (Hodges et al. 2006; Pritchard-Peschek et al. 2010). These studies are important because they show biological plausibility, but their sample sizes were small and the results have not been uniformly reproduced across protocols or sexes (Gill et al. 2000; Trinh et al. 2015; Gheorghiev et al. 2018).

A later dose-response study in trained cyclists compared 2.3 and 2.8 mg/kg with placebo and found no improvement in a roughly 30-minute cycling time trial. Plasma concentrations varied widely between participants, despite body-mass-adjusted dosing (Pritchard-Peschek et al. 2014). Female collegiate runners also did not improve 800 m performance after pseudoephedrine (Berry and Wagner 2012). These findings emphasize that high exposure does not guarantee a performance effect and that individual pharmacokinetics complicate prediction (Trinh et al. 2015; Gheorghiev et al. 2018).

Individual trials also differed in stimulant co-exposure, exercise duration, and the timing of drug administration (Chester et al. 2003). The 2018 meta-analysis by Gheorghiev et al. concluded that pseudoephedrine increased heart rate but did not produce a consistent effect on time-trial performance, perceived exertion, or metabolic markers. Subgroup patterns suggested that larger doses and shorter exercise may be more likely to show an effect, but the overall magnitude was small and uncertainty remained high (Gheorghiev et al. 2018). An earlier systematic review reached a similar conclusion: therapeutic doses were largely ineffective as ergogenic aids, while evidence at supratherapeutic doses was limited and inconsistent (Trinh et al. 2015).

The clinical state of the participant is crucial when interpreting performance data. Most controlled exercise studies tested healthy volunteers without meaningful nasal obstruction (Trinh et al. 2015; Gheorghiev et al. 2018). Results from these cohorts cannot be transferred directly to an athlete whose sleep, comfort, or usual training capacity has deteriorated because of acute illness or rhinitis. In that setting, treatment may permit a return toward the athlete's ordinary level without producing a true stimulant advantage (Trinh et al. 2015; Gheorghiev et al. 2018; McIntosh et al. 2021). At the same time, feeling less congested can obscure ongoing systemic illness and encourage premature exercise, so symptom relief should not be treated as evidence that recovery is complete (McIntosh et al. 2021; Price et al. 2022).

The practical conclusion is that pseudoephedrine should not be selected for the purpose of performance enhancement (Trinh et al. 2015; Gheorghiev et al. 2018). Evidence for a meaningful direct benefit is weak, dose-dependent, and inconsistent, while the consequences of pursuing higher exposure include cardiovascular stimulation and a greater probability of exceeding the anti-doping urinary threshold (Trinh et al. 2015; Gheorghiev et al. 2018; World Anti-Doping Agency 2026). The risk-benefit balance becomes particularly unfavorable when an asymptomatic athlete uses the drug as a pre-race stimulant (Gheorghiev et al. 2018; World Anti-Doping Agency 2026).

3.4.1. Dose, sex, and exercise-model heterogeneity

Dose is not a sufficient explanation for the divergent performance findings. Fixed doses create different exposure per kilogram, whereas body-mass-adjusted dosing still produces substantial interindividual variation in plasma concentration (Barroso et al. 2012; Pritchard-Peschek et al. 2014). In the dose-response cycling study, higher administered doses increased plasma pseudoephedrine concentrations but did not improve the approximately 30-minute time trial, and concentrations varied widely between participants (Pritchard-Peschek et al. 2014). Doping-control studies likewise show that urine concentration cannot be inferred reliably from dose alone because absorption, renal elimination, urinary pH, repeated administration, and sampling time all contribute to variability (Chester et al. 2004; Barroso et al. 2012).

Sex representation is another limitation. Most pseudoephedrine exercise experiments enrolled small groups of trained men (Trinh et al. 2015; Gheorghiev et al. 2018). The study in female collegiate runners found no improvement in 800-m performance after 2.5 mg/kg, but one negative trial cannot establish that sex has no modifying effect (Berry and Wagner 2012). Hormonal status, body composition, renal handling, and differences in event physiology remain insufficiently studied. Current systematic reviews therefore support caution when generalizing male-dominated data to all competitive athletes (Trinh et al. 2015; Gheorghiev et al. 2018).

The exercise model also matters. Positive results have been reported in a 1500-m run and in a very small cycling time trial after relatively high exposure, whereas prolonged cycling, endurance running, and several strength or

repeated-effort protocols have been negative or inconsistent (Gillies et al. 1996; Hodges et al. 2006; Pritchard-Peschek et al. 2010). These tasks differ in duration, pacing freedom, central drive, contribution of anaerobic metabolism, and sensitivity to small changes in arousal (Gill et al. 2000; Chester et al. 2003). A benefit observed in one tightly defined protocol should therefore not be presented as a general effect across endurance, team, strength, and precision sports (Trinh et al. 2015; Gheorghiev et al. 2018).

Taken together, the evidence is more compatible with a small, context-dependent stimulant effect at higher exposure than with a dependable ergogenic response (Trinh et al. 2015; Gheorghiev et al. 2018). The uncertainty is clinically important: escalating the dose to reproduce a positive laboratory result increases sympathomimetic exposure and the probability of an adverse analytical finding, while the expected performance gain remains uncertain (Gheorghiev et al. 2018; World Anti-Doping Agency 2026). For therapeutic decision-making, symptom control at the lowest effective dose is a more defensible endpoint than attempting to reproduce a high-dose experimental protocol (Trinh et al. 2015; Gheorghiev et al. 2018; World Anti-Doping Agency 2026).

3.5. Cardiovascular, cerebrovascular, and exercise-related safety

Oral pseudoephedrine increases sympathetic tone and peripheral vasoconstriction (Salerno et al. 2005). In a meta-analysis of randomized trials in adults, the mean increase in systolic blood pressure was approximately 1 mmHg and the mean increase in heart rate was approximately 3 beats per minute, with no significant average effect on diastolic pressure. Immediate-release formulations, higher doses, and shorter exposure were associated with larger responses (Salerno et al. 2005). These average values are reassuring for many healthy adults but should not be misinterpreted as a guarantee of safety for every athlete (Salerno et al. 2005).

Exercise changes the context in which the drug acts. During intense effort, heart rate, catecholamines, cardiac output, skin blood flow, and thermoregulatory demand are already elevated. Heat, dehydration, altitude, anxiety, sleep loss, and intercurrent illness may narrow physiological reserve (Roberts et al. 2023). Co-ingestion of caffeine, energy drinks, pre-workout stimulants, beta-agonists, attention-deficit medications, or another decongestant may further increase adrenergic load. Trials designed to measure average resting blood pressure are not powered to exclude rare arrhythmia, ischemia, or severe hypertensive responses under these combined conditions (Salerno et al. 2005; Grimaldi-Bensouda et al. 2021). Population-level observational evidence has not demonstrated a simple large increase in myocardial infarction or stroke after decongestant exposure, but it cannot exclude risk in susceptible individuals or unusual exercise settings (Grimaldi-Bensouda et al. 2021).

The European Medicines Agency completed a safety review after reports of posterior reversible encephalopathy syndrome and reversible cerebral vasoconstriction syndrome. In 2024, it confirmed that pseudoephedrine-containing medicines must not be used in patients with severe or uncontrolled hypertension or severe acute or chronic kidney disease or renal failure. Patients should stop the medicine and seek urgent care for sudden severe or thunderclap headache, nausea, vomiting, confusion, seizures, or visual disturbance (European Medicines Agency 2024). These events are rare, but the warning is relevant because headache and nausea during competition may otherwise be attributed to heat or exertion (Roberts et al. 2023; European Medicines Agency 2024).

Renal function has particular relevance to athletes. Pseudoephedrine is substantially eliminated through the kidneys, and reduced clearance can increase exposure (Chester et al. 2004; Barroso et al. 2012). Acute kidney stress can occur during prolonged endurance events, especially with heat illness, dehydration, rhabdomyolysis, or non-steroidal anti-inflammatory drug use (Roberts et al. 2023). A healthy athlete with transient exercise-associated renal impairment is not equivalent to a patient with severe chronic kidney disease, but the overlap reinforces the need to avoid unnecessary dosing during physiologically stressful events (Chester et al. 2004; Barroso et al. 2012; European Medicines Agency 2024).

Topical imidazolines usually create less systemic exposure, yet excessive use can still cause palpitations, blood-pressure changes, headache, or central effects. Risk may rise with overuse, swallowing, damaged mucosa, use in children, or simultaneous oral sympathomimetics (Stinson and Sadofsky 2025a; Medicines and Healthcare products Regulatory Agency 2026). The 2026 MHRA communication specifically advises against combining xylometazoline or oxymetazoline with other oral or nasal sympathomimetic decongestants (Medicines and Healthcare products Regulatory Agency 2026). Athletes should not stack an oral cold remedy with a nasal spray simply because the routes differ (Medicines and Healthcare products Regulatory Agency 2026).

Pre-participation questions should include hypertension, congenital or acquired heart disease, arrhythmia, syncope, kidney disease, hyperthyroidism, glaucoma, and current stimulant medication. A history of palpitations or exertional chest symptoms warrants particular caution (Salerno et al. 2005; European Medicines Agency 2024). The absence of diagnosed disease does not justify supratherapeutic use. When treatment is necessary, the lowest effective dose and shortest duration should be used, and first exposure should not occur immediately before a major competition where adverse effects cannot be assessed safely (Salerno et al. 2005; European Medicines Agency 2024; Medicines and Healthcare products Regulatory Agency 2026).

Medication can also affect perceived readiness. Mild stimulation may reduce fatigue or increase alertness without improving physiological capacity. This can alter pacing and encourage an athlete to sustain intensity despite illness, sleep deprivation, or heat strain (Gheorghiev et al. 2018; Roberts et al. 2023). Safety assessment must therefore consider behavior as well as blood pressure. A drug that makes an unwell athlete feel more capable can

indirectly increase risk even when its average hemodynamic effect is small (Gheorghiev et al. 2018; Price et al. 2022).

3.5.1. Environmental and pharmacological risk modifiers

The safety of a sympathomimetic cannot be separated from the conditions in which it is taken. A labeled dose used at rest by a well-hydrated healthy adult is not equivalent to the same exposure immediately before maximal exercise in heat, after sleep loss, or during systemic illness (Salerno et al. 2005; Roberts et al. 2023; European Medicines Agency 2024). The mean hemodynamic changes reported in trials are small, but higher doses and immediate-release formulations produce larger responses, and regulatory warnings identify severe hypertension and severe renal disease as important risk states (Salerno et al. 2005; European Medicines Agency 2024).

Heat, dehydration, and prolonged exercise deserve particular caution because medication-related headache, palpitations, nausea, dizziness, or agitation may overlap with early exertional heat illness and other competition-related emergencies (Roberts et al. 2023; European Medicines Agency 2024). Direct controlled evidence quantifying a pseudoephedrine-by-heat interaction is sparse; the combined risk should therefore be described as biologically plausible and clinically concerning rather than proven (Jolley et al. 2014; Gheorghiev et al. 2018). The principal practical problems are diagnostic and behavioral: stimulation may encourage continued effort, while overlapping symptoms may delay recognition and cooling or other emergency treatment (Gheorghiev et al. 2018; Roberts et al. 2023). Conservative avoidance is reasonable when an athlete is already physiologically stressed or cannot be monitored appropriately (Roberts et al. 2023; European Medicines Agency 2024).

Co-exposure should be assessed at ingredient level. The MHRA advises against combining xylometazoline or oxymetazoline with another oral or nasal sympathomimetic decongestant (Medicines and Healthcare products Regulatory Agency 2026). Caffeine, energy products, prescribed stimulants, and beta-agonists have different indications and are not interchangeable, but their presence may complicate interpretation of tremor, tachycardia, anxiety, or sleep disturbance (Salerno et al. 2005). Exercise studies have not adequately quantified all of these combinations; absence of interaction data is therefore not evidence that stacking is harmless (Salerno et al. 2005; Gheorghiev et al. 2018; Medicines and Healthcare products Regulatory Agency 2026).

A new decongestant should not be trialed for the first time immediately before a major event. When short-term treatment is clinically justified, the athlete should assess tolerability during a low-risk period and avoid exceeding labeled dose or frequency (Dykewicz et al. 2020; Medicines and Healthcare products Regulatory Agency 2026). This is especially important for athletes with previous palpitations, marked blood-pressure responses, migraine-like neurological symptoms, or dependence on multiple cold products (Salerno et al. 2005; European Medicines Agency 2024). The plan should specify the indication, stop date, permitted alternatives, and symptoms that require discontinuation or urgent review (Dykewicz et al. 2020; Price et al. 2022; European Medicines Agency 2024).

3.6. Rhinitis medicamentosa, rebound congestion, and tachyphylaxis

Rhinitis medicamentosa is a drug-induced form of nasal obstruction associated with prolonged or excessive topical vasoconstrictor use. The clinical cycle begins when congestion returns as the drug effect wears off (Fowler et al. 2019; Zucker et al. 2019; Stinson and Sadofsky 2025b). The user interprets this as persistence of the original disorder, shortens the dosing interval, and obtains temporary relief. Repeated exposure is followed by reduced responsiveness, more severe baseline obstruction, and increasing psychological reliance on the spray (Zucker et al. 2019; Stinson and Sadofsky 2025b). Athletes may be particularly vulnerable because dosing becomes linked to sleep, training, travel, and competition routines (Fowler et al. 2019; Stinson and Sadofsky 2025b).

The pathophysiology is incompletely defined and probably varies by agent, dose, and duration. Proposed mechanisms include adrenergic receptor desensitization, reduced endogenous norepinephrine response, reactive vasodilation, mucosal ischemia, edema, epithelial injury, and structural remodeling (Graf 1997; Stinson and Sadofsky 2025b). Tachyphylaxis describes the rapid reduction in pharmacological response, whereas rebound congestion is the worsening that appears after the effect has worn off. Rhinitis medicamentosa generally refers to a more persistent clinical syndrome with chronic obstruction and mucosal changes (Zucker et al. 2019; Stinson and Sadofsky 2025b).

The exact duration that produces clinically significant rebound has been debated, and recent evidence reviews continue to emphasize uncertainty around onset when modern topical agents are used exactly as directed (Hagen et al. 2026). Small controlled studies in healthy volunteers have not always demonstrated rebound after several weeks of oxymetazoline, and some corticosteroid-decongestant combination trials have not shown clear medication-induced congestion (Watanabe et al. 2003; Neighbors et al. 2022). These findings indicate that the phenomenon is not inevitable after a fixed number of doses in every user. They do not remove the population-level risk of prolonged unsupervised use, especially in people with underlying rhinitis who repeatedly escalate treatment (Stinson and Sadofsky 2025b; Hagen et al. 2026).

Regulatory advice is intentionally conservative. In April 2026, the MHRA limited recommended continuous use of xylometazoline and oxymetazoline to a maximum of five days, advised patients not to exceed the labeled dose or dosing interval, and recommended reassessment when symptoms persist or worsen (Medicines and Healthcare products Regulatory Agency 2026). It also noted that early recognition and treatment usually permit recovery, although severe cases may produce lasting mucosal or structural changes (Medicines and Healthcare products

Regulatory Agency 2026). This five-day rule is a practical safety boundary for sport even though individual research findings are heterogeneous (Hagen et al. 2026; Medicines and Healthcare products Regulatory Agency 2026).

Prevention requires explicit instructions at the first prescription or purchase. The athlete should know the maximum consecutive duration, understand that more frequent dosing can worsen the problem, and have a plan for the underlying rhinitis (Zucker et al. 2019; Medicines and Healthcare products Regulatory Agency 2026). A topical decongestant should not be renewed automatically for each training session. Recording the start date on the bottle or medication plan is a simple behavioral intervention (Medicines and Healthcare products Regulatory Agency 2026). If symptoms are expected to last more than a few days, controller therapy should begin early enough to reduce reliance on rapid vasoconstriction (Zucker et al. 2019; Dykewicz et al. 2020).

Management begins with recognition and withdrawal of the offending agent. Some patients can stop immediately, while others with severe dependence may tolerate gradual reduction better, for example by reducing frequency or treating one nostril at a time (Zucker et al. 2019; Yang et al. 2025). Intranasal corticosteroids are commonly used to ease withdrawal and treat underlying inflammation (Hallén et al. 1997; Zucker et al. 2019). A randomized trial found fluticasone more effective and faster than placebo during withdrawal, although the overall evidence base remains limited and no single conservative or surgical algorithm has been established (Hallén et al. 1997; Zucker et al. 2019; Yang et al. 2025). Saline irrigation, education, and follow-up are useful, and persistent severe obstruction warrants ENT assessment (Zucker et al. 2019; Yang et al. 2025).

A return-to-use decision should be cautious. Re-exposure after recovery may recreate the cycle, particularly when the underlying allergic or structural cause remains untreated (Zucker et al. 2019; Yang et al. 2025). For an athlete with previous rhinitis medicamentosa, future topical vasoconstrictor use should be exceptional, time-limited, and supervised. The goal is not merely to stop the spray but to replace the function it served with a sustainable treatment plan (Zucker et al. 2019; Yang et al. 2025).

3.7. Anti-doping implications

Anti-doping risk is determined by the active substance, route, timing, urinary concentration, and current rules rather than by whether a product was purchased over the counter. Under the 2026 WADA Prohibited List, pseudoephedrine is prohibited in competition when its concentration in urine exceeds 150 micrograms/mL (World Anti-Doping Agency 2026). The rule is a concentration threshold, not a simple prohibition of every therapeutic dose. Nevertheless, individual variability makes the relationship between a tablet and a later urine result imperfect (Barroso et al. 2012; World Anti-Doping Agency 2026).

WADA medical guidance advises athletes to stop pseudoephedrine-containing pills at least 24 hours before the in-competition period (World Anti-Doping Agency 2021a). This interval is a risk-reduction recommendation, not a guarantee that every athlete will be below the threshold (Chester et al. 2004; Barroso et al. 2012; World Anti-Doping Agency 2021a). Formulation, dose, repeated administration, renal function, urinary pH, and individual pharmacokinetics influence elimination; multiple dosing can prolong the period of anti-doping concern (Chester et al. 2004; Barroso et al. 2012). Extended-release products and repeated dosing require particular caution.

Pharmacokinetic studies explain why rigid prediction is difficult. Exercise can alter plasma concentration and urinary excretion, and some individuals approach or exceed relevant concentrations after therapeutic exposure (Gillies et al. 1996; Barroso et al. 2012). Hydration alone does not reliably predict urinary pseudoephedrine concentration, so deliberately drinking excessive fluid is neither a dependable anti-doping strategy nor medically safe (Jolley et al. 2014). The correct strategy is advance planning and avoidance of pseudoephedrine close to competition when suitable alternatives exist (Chester et al. 2004; Barroso et al. 2012; Jolley et al. 2014).

The 2026 List specifies that imidazoline derivatives used by dermatological, nasal, ophthalmic, or otic routes, including naphazoline, oxymetazoline, and xylometazoline, are not prohibited (World Anti-Doping Agency 2026). This makes a correctly used topical imidazoline a potentially useful short-term alternative from an anti-doping perspective. Medical safety limits still apply, and the exemption for the imidazoline ingredient does not legalize another prohibited component in a combination product (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026).

Strict liability means that athletes are responsible for substances found in their samples. A prescription, pharmacy purchase, or lack of intent does not automatically prevent an anti-doping rule violation (World Anti-Doping Agency 2021b). Athletes should verify the exact active ingredients and current status through an official national anti-doping medication database or Global DRO where available (World Anti-Doping Agency 2021b; World Anti-Doping Agency 2026). They should retain packaging, prescription records, dose, and timing. Team physicians should document why treatment was used and discuss whether a Therapeutic Use Exemption may be required when a prohibited systemic medicine is medically necessary (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2021b).

Travel adds complexity. The same brand can contain different ingredients in different countries, and a familiar product name may change from pseudoephedrine to phenylephrine or include additional stimulants (Price et al. 2022; World Anti-Doping Agency 2026). Athletes should not rely on photographs, brand recognition, or advice

intended for the general public. The package should be checked each time, and the verification should be repeated when the WADA List changes annually (World Anti-Doping Agency 2026).

Anti-doping education should also address the temptation to use pseudoephedrine intentionally for a possible stimulant effect (Pokrywka et al. 2009; Trinh et al. 2015; Gheorghiev et al. 2018). The available evidence does not justify this practice, and higher doses increase the likelihood of both adverse effects and a urinary concentration above the threshold (Trinh et al. 2015; Gheorghiev et al. 2018; World Anti-Doping Agency 2026). A performance strategy based on approaching a regulatory limit is clinically and professionally unsound (Pokrywka et al. 2009; World Anti-Doping Agency 2026).

3.7.1. Medication verification and competition planning

Medication planning should work backward from the start of the applicable in-competition period rather than from the scheduled start of the race alone. Under the World Anti-Doping Code, unless an international federation has an approved alternative definition for its sport, the in-competition period generally begins at 11:59 p.m. on the day before the competition in which the athlete is scheduled to participate and continues through the end of that competition and the related sample-collection process (World Anti-Doping Agency 2021b). The athlete should identify the active ingredient, dose, formulation, route, last planned administration, and current status of every component (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). This is particularly important for extended-release tablets and multi-symptom products, in which the visible brand name does not communicate the pharmacokinetic or regulatory profile (World Anti-Doping Agency 2026).

The 24-hour pseudoephedrine discontinuation advice is best understood as a minimum risk-reduction interval. It does not convert a previous dose into a guaranteed negative result (Chester et al. 2004; Barroso et al. 2012; World Anti-Doping Agency 2021a). Repeated dosing, individual renal handling, urinary pH, and sampling time can prolong uncertainty, and published studies demonstrate considerable between-person variation in urinary concentration (Chester et al. 2004; Barroso et al. 2012). Athletes who can use a permitted and clinically appropriate alternative should therefore avoid planning treatment at the edge of the recommended interval (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

Route-specific exceptions require exact reading. The 2026 List states that specified imidazoline derivatives used by nasal and certain other local routes are not prohibited, but this does not apply automatically to every cold product or to every route of administration (World Anti-Doping Agency 2026). A nasal spray may contain additional active ingredients, and the same substance may have a different status when delivered systemically (World Anti-Doping Agency 2026). Verification should be repeated after a product change, international travel, or annual publication of a new Prohibited List (World Anti-Doping Agency 2026).

Documentation should be contemporaneous. The athlete or medical team should record the product, batch or packaging, active ingredients, dose, date, time, clinical indication, and the source used for anti-doping verification (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). When a medically necessary treatment may conflict with the rules, TUE requirements should be assessed in advance rather than after testing. A TUE is a medical-regulatory process, not a substitute for routine ingredient checking or avoidable use of a prohibited stimulant (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2021b).

3.8. A practical management pathway for athletes

The first step is to define the dominant problem. Itching, sneezing, watery rhinorrhea, ocular symptoms, and seasonal exposure suggest allergy (Dykewicz et al. 2020; Price et al. 2022). Purulent discharge, facial pain, fever, or prolonged post-viral symptoms require a different assessment. Sudden obstruction with an upper respiratory infection is usually self-limited (McIntosh et al. 2021; Price et al. 2022). Persistent unilateral symptoms, recurrent bleeding, marked loss of smell, or poor response to anti-inflammatory treatment require structural or ENT evaluation. Decongestant selection should follow this classification (Dykewicz et al. 2020; McIntosh et al. 2021).

For allergic rhinitis, regular intranasal corticosteroid therapy, with or without an antihistamine, should be optimized before a competition period. Correct direction of the spray away from the septum, consistent daily use, and adequate lead-in time are more important than adding repeated rescue medication (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022). Saline irrigation can reduce mucus and allergen burden. Exposure planning may include pollen forecasts, indoor warm-up, showering and changing clothing after outdoor sessions, and treatment of coexisting asthma according to current sport regulations (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022).

For acute severe congestion, a topical imidazoline may be considered for a brief period when there is no contraindication, particularly when competition is not imminent or the product has been verified as permitted. The athlete should receive a firm stop date of no more than five consecutive days under current MHRA advice (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). Combining topical and oral sympathomimetics should be avoided. If congestion continues, the diagnosis should be reviewed rather than the dose increased (Dykewicz et al. 2020; Medicines and Healthcare products Regulatory Agency 2026).

Pseudoephedrine may be considered outside competition when systemic decongestion is clinically appropriate and the athlete has no relevant cardiovascular, renal, or drug-interaction risk (Salerno et al. 2005; European Medicines

Agency 2024). The lowest effective labeled dose should be used for the shortest period. It should not be initiated as a stimulant or as a substitute for sleep (Trinh et al. 2015; Gheorghiev et al. 2018). When competition is approaching, the medication plan should be reviewed early enough to follow anti-doping guidance and allow transition to permitted alternatives (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

Red flags during use include chest pain, marked palpitations, syncope, severe or thunderclap headache, visual disturbance, confusion, seizure, or an unusual hypertensive response. These symptoms require immediate discontinuation and urgent assessment (European Medicines Agency 2024). During hot-weather training or competition, headache, nausea, altered behavior, dizziness, collapse, or confusion must also trigger prompt evaluation for exertional heat illness, hyponatremia, and other acute causes rather than being attributed automatically to medication (Roberts et al. 2023; European Medicines Agency 2024).

For athletes already using a topical spray daily, direct questioning is necessary because many do not consider an over-the-counter nasal product to be a medication. Dependence is suggested by carrying multiple bottles, waking to dose, escalating frequency, or feeling unable to train without the spray (Fowler et al. 2019; Zucker et al. 2019). The management plan should include withdrawal, an intranasal corticosteroid when appropriate, treatment of the original disease, and follow-up. Shame or abrupt criticism can reduce disclosure; a neutral explanation of the rebound cycle is more effective (Zucker et al. 2019; Yang et al. 2025).

Team systems can prevent avoidable problems. A single verified medication list should be available to the athlete, clinician, pharmacist, and support staff (Price et al. 2022; World Anti-Doping Agency 2026). Cold and allergy products should be checked before travel. Athletes should be advised not to share medication (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). Annual pre-season education can cover WADA updates, common combination products, maximum topical duration, and the difference between symptom relief and readiness to compete (World Anti-Doping Agency 2021a; Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026).

3.8.1. Common clinical scenarios

In an athlete with predictable seasonal allergic rhinitis, the optimal intervention begins before the high-exposure period. Regular intranasal corticosteroid treatment, an appropriate antihistamine, correct technique, and environmental measures are more likely to provide stable control than repeated pre-race vasoconstriction (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022). A rescue decongestant may occasionally be useful for severe breakthrough obstruction, but frequent need indicates that the controller plan, adherence, exposure, or diagnosis should be reviewed (Dykewicz et al. 2020; Price et al. 2022).

In an athlete who develops acute viral congestion shortly before competition, the first question is fitness to participate rather than how completely the nose can be opened (Deckx et al. 2016; Price et al. 2022). A brief topical imidazoline course may improve obstruction when there are no contraindications, but it does not shorten the infection or correct systemic illness (Deckx et al. 2016; Medicines and Healthcare products Regulatory Agency 2026). Pseudoephedrine close to the in-competition period adds avoidable regulatory uncertainty, while fever, chest symptoms, marked fatigue, or neurological symptoms should prompt medical reassessment instead of symptom masking (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

In an athlete using xylometazoline or oxymetazoline every day, the likely problem is no longer simple intermittent congestion. Waking to dose, carrying several bottles, increasing frequency, or being unable to sleep or train without the spray should trigger assessment for rhinitis medicamentosa and the underlying disorder (Fowler et al. 2019; Zucker et al. 2019). Withdrawal can be supported by an intranasal corticosteroid, saline, education, and follow-up; severe or persistent obstruction warrants ENT evaluation (Hallén et al. 1997; Zucker et al. 2019; Yang et al. 2025). The athlete should not be advised merely to replace one brand with another topical vasoconstrictor (Zucker et al. 2019; Yang et al. 2025).

During international travel, a familiar product name should not be treated as proof of a familiar formulation. The same brand may contain pseudoephedrine, phenylephrine, an antihistamine, an analgesic, caffeine, or another ingredient depending on the market (Price et al. 2022; World Anti-Doping Agency 2026). The package should be checked at the time of purchase, and team staff should avoid distributing unverified shared cold remedies. This simple system prevents both accidental anti-doping exposure and duplicated or interacting medication (Price et al. 2022; World Anti-Doping Agency 2026).

Table 2. Common clinical scenarios and preferred management priorities

Clinical scenario	Preferred first-line approach	Role of decongestants / what to avoid	Referral or urgent reassessment
Predictable seasonal allergic rhinitis	Begin intranasal corticosteroid early; optimize technique, antihistamine, saline, and exposure control.	Only occasional brief rescue for severe breakthrough obstruction; repeated pre-race use indicates inadequate control.	ENT/allergy review for persistent obstruction, poor response, or diagnostic uncertainty.
Acute viral congestion near competition	Assess overall fitness to participate, hydration, systemic symptoms, and lower-airway involvement.	A verified topical imidazoline may be used briefly when appropriate; avoid pseudoephedrine near the in-competition period when alternatives exist.	Fever, chest symptoms, marked fatigue, syncope, severe headache, or neurological symptoms.
Daily topical-spray use or dose escalation	Explain the rebound cycle; withdraw or taper according to severity; add intranasal corticosteroid and saline when appropriate.	Do not replace one topical vasoconstrictor with another or continue indefinite as-needed dosing.	Persistent severe obstruction, recurrent bleeding, mucosal injury, or inability to discontinue.
Clinical scenario	**Preferred first-line approach**	**Role of decongestants / what to avoid**	**Referral or urgent reassessment**
International travel / unfamiliar product	Verify active ingredient, strength, route, and every combination component before the first dose.	Avoid brand-name assumptions, loose tablets, and unverified shared remedies.	Seek team physician or pharmacist review when ingredient identity or regulatory status is uncertain.

Sources: (Dykewicz et al. 2020; Hox et al. 2021; McIntosh et al. 2021; World Anti-Doping Agency 2021a; Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026).

3.8.2. Diagnostic work-up and monitoring in the athlete

A structured history is the most efficient way to determine whether a decongestant is addressing the actual cause of symptoms. The clinician should record onset, duration, laterality, seasonality, environmental triggers, relationship to exercise, sleep disturbance, loss of smell, facial pain, bleeding, previous trauma, and the response to earlier treatment (Hox et al. 2021; McIntosh et al. 2021). Training venue and sport are relevant because chlorine exposure, cold dry air, pollen, dust, and repeated travel can produce different phenotypes (Surda et al. 2017; Hox et al. 2021). Direct questioning about every oral and nasal product is essential, including frequency, duration, night-time dosing, use immediately before training, and any escalation beyond the label (Hox et al. 2021; McIntosh et al. 2021; Price et al. 2022). Athletes may describe the product by color or brand rather than by active ingredient, and many do not initially regard an over-the-counter spray as medication. The purpose of this history is to distinguish short-lived vascular congestion from allergic, non-allergic, infectious, structural, or medication-induced disease before another sympathomimetic is recommended (Dykewicz et al. 2020; McIntosh et al. 2021; Price et al. 2022).

Examination should begin with vital signs and a focused upper-airway assessment. Baseline blood pressure and pulse are particularly useful when an oral sympathomimetic is being considered, when the athlete reports palpitations, or when caffeine, stimulant medication, or pre-workout products are also used (Salerno et al. 2005; European Medicines Agency 2024). Nasal inspection may identify crusting, septal irritation, mucosal edema, obvious septal deviation, discharge, bleeding points, or changes consistent with prolonged topical-decongestant exposure (Dykewicz et al. 2020; McIntosh et al. 2021). Persistent unilateral obstruction, recurrent unilateral

epistaxis, severe facial pain, visible structural abnormality, progressive anosmia, neurological symptoms, or failure of appropriate first-line treatment should lower the threshold for specialist evaluation (Dykewicz et al. 2020; McIntosh et al. 2021). A transient response to vasoconstriction does not exclude structural disease and should not be used as the sole diagnostic test. Conversely, poor response to a decongestant suggests that edema is not the dominant mechanism or that the disease burden exceeds what short-term rescue treatment can reasonably correct (Dykewicz et al. 2020; McIntosh et al. 2021).

Objective assessment can support, but should not replace, the clinical history. Peak nasal inspiratory flow, rhinomanometry, acoustic rhinometry, endoscopy, and validated symptom questionnaires can document obstruction or monitor response when available (Hox et al. 2021; McIntosh et al. 2021). Their results are influenced by technique, the physiological nasal cycle, recent exercise, ambient conditions, and the timing of medication, so a single measurement should be interpreted cautiously (Hox et al. 2021; McIntosh et al. 2021). For athletes whose symptoms are predominantly exercise related, repeating symptom assessment before and after a representative training exposure may be more informative than a resting clinic measurement alone. Endoscopy is especially useful when polyps, chronic rhinosinusitis, structural narrowing, bleeding, or rhinitis medicamentosa are suspected (Hox et al. 2021; McIntosh et al. 2021; Stinson and Sadofsky 2025b). The practical aim is not to prove that the nose is maximally open, but to identify a treatable phenotype and to establish a baseline against which controller therapy, withdrawal of an overused spray, or specialist intervention can be judged (Hox et al. 2021; McIntosh et al. 2021).

Allergy evaluation should be guided by symptoms and exposure rather than performed automatically in every athlete. Seasonal sneezing, itching, watery rhinorrhea, ocular symptoms, and reproducible deterioration during pollen exposure support an allergic mechanism and may justify skin-prick testing or specific IgE assessment (Dykewicz et al. 2020; Price et al. 2022). Aquatic and winter athletes can also develop irritant or mixed rhinitis in which standard allergy tests are negative (Surda et al. 2017; Hox et al. 2021). Coexisting asthma, exercise-induced bronchoconstriction, chronic cough, or exertional dyspnea should be assessed separately because opening the nose will not treat lower-airway disease (Hox et al. 2021; Price et al. 2022). In the opposite direction, persistent nasal inflammation can worsen sleep, mouth breathing, and respiratory comfort, so integrated upper- and lower-airway management is preferable to treating each complaint in isolation. This phenotype-based approach reduces unnecessary vasoconstrictor use and allows intranasal corticosteroids, antihistamines, ipratropium, saline, environmental measures, or specialist care to be selected according to the dominant mechanism (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022).

Medication reconciliation should be completed before any systemic decongestant is prescribed or endorsed. The clinician should ask about prescription stimulants, monoamine oxidase inhibitors, other sympathomimetics, caffeine intake, pre-workout supplements, nicotine, and recent cold remedies (Salerno et al. 2005; European Medicines Agency 2024). Combination products create a particular risk because the athlete may unintentionally duplicate pseudoephedrine, phenylephrine, paracetamol, ibuprofen, or a sedating antihistamine (Salerno et al. 2005; Price et al. 2022). The same review should include cardiovascular disease, hypertension, renal impairment, glaucoma, urinary retention, thyroid disease, previous severe headache, and prior adverse reactions (Salerno et al. 2005; European Medicines Agency 2024). Not every listed condition represents an absolute contraindication in every jurisdiction, but each changes the benefit-risk balance and may justify choosing a local non-adrenergic alternative or obtaining further medical advice. Ingredient verification and safety screening should occur together; a product that is permitted under anti-doping rules can still be clinically inappropriate, while a medically reasonable product can still create regulatory risk near competition (Salerno et al. 2005; European Medicines Agency 2024; World Anti-Doping Agency 2026).

Follow-up should use outcomes that matter to the athlete rather than nasal airflow alone. Relevant endpoints include night-time awakenings, sleep quality, need for rescue medication, ability to complete training, symptom recurrence after the drug wears off, adverse effects, and adherence to controller treatment (Fowler et al. 2019; Zucker et al. 2019). A short planned review is useful after an acute course, especially when the athlete has previously prolonged treatment or is approaching a competition period. Persistent reliance on a decongestant, shortening of the interval between doses, or immediate recurrence after withdrawal should trigger reassessment rather than renewal (Fowler et al. 2019; Zucker et al. 2019; Medicines and Healthcare products Regulatory Agency 2026). For rhinitis medicamentosa, improvement may be gradual and should be judged over weeks, with the athlete warned that early withdrawal discomfort does not mean that the original spray is medically necessary (Zucker et al. 2019; Yang et al. 2025). Monitoring also provides an opportunity to update the anti-doping plan, confirm that the active ingredient has not changed, and document the final dose when pseudoephedrine has been used (Barroso et al. 2012; World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

3.8.3. Special populations and comorbidities

Athletes with known hypertension, arrhythmia, ischemic heart disease, cardiomyopathy, or an exaggerated blood-pressure response to exercise require particular caution with systemic sympathomimetics. The average increases in systolic pressure and heart rate reported in controlled studies are small, but averages do not predict the response of a susceptible individual (Salerno et al. 2005). Immediate-release preparations, higher doses, repeated dosing, anxiety, sleep deprivation, and concurrent stimulants can increase peak adrenergic effects (Salerno et al. 2005;

European Medicines Agency 2024). A history of chest pain, syncope, marked palpitations, or an unexplained hypertensive episode should prompt medical assessment rather than self-treatment. When rapid relief is genuinely required, a short verified topical option or non-adrenergic therapy may offer a more favorable systemic profile, provided local contraindications and the five-day limit are respected (Salerno et al. 2005; Stinson and Sadofsky 2025a; Medicines and Healthcare products Regulatory Agency 2026). The decision should remain diagnosis directed; avoiding pseudoephedrine does not justify indefinite oxymetazoline or xylometazoline use (Salerno et al. 2005; Medicines and Healthcare products Regulatory Agency 2026).

Renal function is relevant because pseudoephedrine is substantially eliminated in urine and urinary concentration is central to anti-doping interpretation. Reduced clearance, repeated dosing, formulation, urinary pH, hydration, and the interval between the last dose and sample collection can alter exposure (Chester et al. 2004; Barroso et al. 2012; Jolley et al. 2014). Published administration studies show wide between-person variability, which is why a fixed discontinuation interval can reduce but not abolish the possibility of exceeding the urinary threshold (Chester et al. 2004; Barroso et al. 2012). Athletes with known kidney disease should not assume that a standard over-the-counter dose behaves identically to that in healthy volunteers. Even in healthy endurance athletes, dehydration strategies should never be used to manipulate elimination because they may increase physiological risk and do not provide a reliable solution (Jolley et al. 2014; Roberts et al. 2023). When competition is close, avoidance of pseudoephedrine and use of a clinically appropriate permitted alternative is more defensible than attempting to predict an individual urinary concentration from dose alone (Barroso et al. 2012; World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

For athletes with allergic rhinitis and asthma, a decongestant is at most an adjunct to the main treatment plan. Durable control usually depends on anti-inflammatory therapy, correct nasal-spray and inhaler technique, and reduction of relevant exposures (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022). Perceived blockage can coexist with exercise-induced bronchoconstriction, dysfunctional breathing, or exercise-induced laryngeal obstruction; repeated use of vasoconstrictors may therefore delay identification of the actual source of exertional symptoms (Hox et al. 2021; Price et al. 2022). Wheeze, cough, chest tightness, or an unexplained fall in exercise capacity warrants appropriate lower-airway assessment rather than additional nasal medication (Hox et al. 2021; Price et al. 2022). Treating nasal disease may improve night-time comfort and reduce habitual mouth breathing, but it should not be assumed to alter bronchial responsiveness. Each medicine should consequently have a defined target symptom and a prespecified measure of benefit, rather than being used as a general solution for every respiratory complaint (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022).

Adolescent and young adult athletes are vulnerable to dosing errors because medicines may be supplied by parents, coaches, teammates, or event staff. Body size, age-specific labeling, contraindications, and national product authorization must be checked rather than extrapolated from adult use (Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026). A young athlete may also be less likely to disclose repeated spray use or stimulant-containing cold remedies if they fear being excluded from competition (Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026). Education should therefore be non-punitive and should explain both the short duration of topical therapy and the need to verify every ingredient. Team travel kits should contain age-appropriate, single-ingredient products with clear written instructions, while unlabelled shared tablets and sprays should be prohibited (Price et al. 2022; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). The 2026 MHRA communication specifically emphasizes dose intervals, maximum duration, and the risk of a cycle of overuse, principles that are directly applicable to supervised youth sport (Medicines and Healthcare products Regulatory Agency 2026).

Endurance athletes competing in heat, humidity, or at altitude require a broader assessment of symptoms that might otherwise be attributed to a decongestant. Tachycardia, headache, dizziness, nausea, sleep disruption, and reduced performance can arise from environmental stress, acute illness, dehydration, altitude exposure, excessive caffeine, or sympathomimetic use (Gheorghiev et al. 2018; Roberts et al. 2023; European Medicines Agency 2024). Combining these factors can make causal interpretation difficult and can increase the chance that a warning symptom is ignored (Gheorghiev et al. 2018; Roberts et al. 2023). Athletes should not take a new systemic decongestant for the first time immediately before a major event, and they should not use it to compensate for inadequate sleep or systemic illness (Salerno et al. 2005; European Medicines Agency 2024). Any medication trial should occur in a low-risk setting with attention to blood pressure, heart rate, subjective stimulation, urinary symptoms, and sleep (Salerno et al. 2005). Severe headache, focal neurological symptoms, visual disturbance, chest pain, or syncope remains a reason for urgent evaluation regardless of the presumed environmental explanation (Roberts et al. 2023; European Medicines Agency 2024).

Athletes in precision, combat, motor, and skill-dominant sports may be affected by adverse effects that are not captured by endurance time trials. Tremor, agitation, insomnia, impaired fine motor control, urinary difficulty, or rebound obstruction can be performance limiting even when maximal oxygen uptake is unchanged (Gill et al. 2000; Chester et al. 2003; Gheorghiev et al. 2018). Sedating antihistamines contained in combination cold products introduce a different risk, particularly when alertness, reaction time, or safe driving is required (Price et al. 2022). For this reason, the narrowest single-ingredient formulation is preferable and a medicine should not be selected

solely because it produced a subjective sensation of stimulation in another athlete (Gheorghiev et al. 2018; Price et al. 2022). The relevant question is whether the medicine improves the diagnosed symptom without impairing sleep, judgment, coordination, cardiovascular stability, or anti-doping compliance. This individualized risk assessment is more appropriate than treating all sports and all performance outcomes as equivalent (Gheorghiev et al. 2018; Price et al. 2022).

3.9. Medication stewardship in teams and competition settings

Medication stewardship converts individual advice into a repeatable team process. A team formulary should favor single-ingredient products, list the exact active substance and dose, identify the intended indication, and state whether the product is permitted in and out of competition (Price et al. 2022; World Anti-Doping Agency 2026). The list should be reviewed whenever the WADA Prohibited List changes and whenever a manufacturer changes formulation (World Anti-Doping Agency 2026). Products that are visually similar but contain different ingredients should be stored separately. A designated clinician or pharmacist should oversee the formulary, but the athlete remains responsible for what enters the body; education must therefore enable athletes to perform basic ingredient checks themselves (World Anti-Doping Agency 2021b; World Anti-Doping Agency 2026). The system should also state a maximum duration for topical xylometazoline or oxymetazoline and a clear process for reviewing any request to continue beyond that period (Medicines and Healthcare products Regulatory Agency 2026).

Travel creates predictable opportunities for error. Brand names may be reused for different formulations, package information may be unfamiliar, and a product purchased at an airport or hotel may combine a decongestant with an analgesic, antihistamine, cough suppressant, or caffeine (Price et al. 2022; World Anti-Doping Agency 2026). Athletes should photograph the package and ingredient panel, retain receipts or packaging when practical, and seek verification before the first dose rather than retrospectively (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). Team staff should not distribute loose tablets or allow sharing of nasal sprays. A small pre-verified travel kit is safer than relying on local multi-symptom remedies, but it still requires checking expiration dates and the current competition status (Price et al. 2022; World Anti-Doping Agency 2026). When an emergency purchase is unavoidable, the active ingredient, strength, route, dosing schedule, and time of administration should be recorded immediately (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

Pre-competition planning should include a medication review alongside training and travel logistics. Athletes with predictable seasonal rhinitis should begin controller treatment early enough to judge efficacy and technique before the target event (Dykewicz et al. 2020; Hox et al. 2021; Price et al. 2022). Those with recurrent viral-season problems should have a written pathway that distinguishes mild nasal symptoms from systemic illness and specifies when medical assessment is required (Deckx et al. 2016; Price et al. 2022). If pseudoephedrine is medically necessary outside competition, the plan should identify the final permitted dose and provide a margin beyond the minimum recommended discontinuation interval whenever alternatives exist (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). No team protocol should imply that 24 hours guarantees a urinary concentration below 150 micrograms/mL. The interval is a risk-reduction recommendation within a variable pharmacokinetic system, not an individual clearance test (Chester et al. 2004; Barroso et al. 2012; World Anti-Doping Agency 2021a).

Documentation should be sufficient to reconstruct the clinical decision without becoming burdensome. At minimum, the record should include symptoms, indication, active ingredient, formulation, dose, route, date and time, relevant contraindications, the verification source, and advice on duration or discontinuation (World Anti-Doping Agency 2021a; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). For topical products, recording a stop date is more useful than simply writing 'use as needed' (Medicines and Healthcare products Regulatory Agency 2026). For a suspected adverse reaction or anti-doping concern, the original package, batch details, co-administered medicines, hydration status, and timing relative to training or sample collection may become important (Barroso et al. 2012; World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026). Contemporaneous documentation also helps distinguish medically supervised treatment from unsanctioned high-dose use and supports continuity when several clinicians cover the same team (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

Education is most effective when it addresses the behavioral reasons for overuse. Athletes may continue a topical spray because the immediate sensation of airflow is reinforcing, because withdrawal temporarily worsens symptoms, or because they fear that any nasal resistance will reduce performance (Zucker et al. 2019; Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026). Explaining the nasal cycle, the limited ergogenic evidence, and the mechanism of rebound congestion can correct these assumptions (Trinh et al. 2015; Gheorghiev et al. 2018; Stinson and Sadofsky 2025b). Practical messages should be brief: identify the ingredient, use the lowest effective dose, do not combine oral and topical sympathomimetics, set a stop date, seek review if symptoms persist, and recheck status before competition (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). Case-based teaching is preferable to a generic prohibition because it shows how an apparently harmless cold remedy can create a medical problem, a doping problem, or both (Trinh et al. 2015; Gheorghiev et al. 2018; World Anti-Doping Agency 2026).

Shared decision-making is particularly important when symptom relief is likely but the competitive consequences are uncertain. The athlete should understand the expected magnitude and timing of benefit, the absence of reliable performance enhancement at therapeutic doses, the potential adverse effects, permitted alternatives, and the possibility of an individual urinary concentration above the threshold (Barroso et al. 2012; Gheorghiev et al. 2018; World Anti-Doping Agency 2026). A clinician should avoid false reassurance such as 'this dose is always safe' and equally avoid presenting every decongestant exposure as misconduct (Barroso et al. 2012; World Anti-Doping Agency 2026). The balanced message is that legitimate treatment is possible, but it must be individualized, documented, and separated from intentional stimulation. This approach supports disclosure and reduces the likelihood that athletes self-medicate secretly after receiving an overly rigid or dismissive response (Pokrywka et al. 2009; World Anti-Doping Agency 2026).

3.10. Return-to-training and follow-up

Relief of nasal obstruction should not be used as the sole criterion for return to training after an acute respiratory illness. A decongestant can reduce one symptom while fever, generalized fatigue, chest symptoms, dehydration, or lower-airway involvement persists (Deckx et al. 2016; Price et al. 2022). The athlete should be reassessed according to the overall clinical picture and the demands of the planned session. Light activity may be reasonable in a mild self-limited upper-airway illness, but medication should not be used to conceal deterioration or to force high-intensity participation (Deckx et al. 2016; Price et al. 2022). New chest pain, dyspnea disproportionate to nasal symptoms, syncope, neurological symptoms, or a marked fall in performance requires evaluation (Price et al. 2022; Roberts et al. 2023). The practical distinction is between restoring comfort in an otherwise recovering athlete and pharmacologically masking evidence that the athlete is not ready to compete (Deckx et al. 2016; Price et al. 2022).

After withdrawal from an overused topical decongestant, follow-up should be planned rather than left to the athlete to request. Early worsening can undermine adherence, so the expected course and rescue strategy should be explained in advance (Zucker et al. 2019; Yang et al. 2025). Intranasal corticosteroids, saline, treatment of underlying allergic disease, and gradual reduction may be appropriate according to clinical context (Hallén et al. 1997; Zucker et al. 2019; Yang et al. 2025). Some patients improve within days or weeks, while established rhinitis medicamentosa can require a longer recovery and specialist assessment. Persistent severe obstruction, visible mucosal changes, recurrent bleeding, or inability to discontinue the spray justifies ENT review (Zucker et al. 2019; Yang et al. 2025). A successful return to unrestricted training should mean that the athlete can sleep and exercise without repeated vasoconstrictor dosing, not merely that the same dose has been maintained (Zucker et al. 2019; Medicines and Healthcare products Regulatory Agency 2026).

Prevention of another episode requires reconstruction of the circumstances that led to overuse. Possible drivers include undertreated allergy, a viral infection, structural narrowing, incorrect spray technique, travel, or the belief that an athlete must achieve completely unobstructed nasal airflow before performing (Dykewicz et al. 2020; Hox et al. 2021; McIntosh et al. 2021). Controller treatment and exposure measures should be simple enough to follow during ordinary training and travel. Future topical courses should have a written maximum duration, while any pseudoephedrine plan should be aligned with the competition calendar (World Anti-Doping Agency 2021a; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). In recurrent cases, a seasonal record of symptom days, rescue doses, disrupted sleep, and altered sessions can expose patterns missed during a single visit. A durable result is demonstrated by infrequent need for rescue medication and stable daily functioning across sleep, health, and training (Dykewicz et al. 2020; McIntosh et al. 2021; Medicines and Healthcare products Regulatory Agency 2026).

4. Discussion

This review identifies a consistent central principle: nasal decongestants are useful rescue medicines, but they are poor long-term solutions and unreliable performance aids. Their value is greatest when a clearly defined, vascular component of congestion produces short-term functional impairment (Deckx et al. 2016; Gheorghiev et al. 2018; Medicines and Healthcare products Regulatory Agency 2026). Their value declines when the symptom is chronic, structural, primarily inflammatory, or used as a proxy for fatigue and readiness. In competitive athletes, the threshold for careful planning should be lower because exercise stress and anti-doping rules amplify the consequences of casual use (Dykewicz et al. 2020; McIntosh et al. 2021; World Anti-Doping Agency 2026).

Pseudoephedrine illustrates the difference between average evidence and individual decision-making. Meta-analytic data suggest only small mean changes in heart rate and systolic pressure, and performance effects are inconsistent (Salerno et al. 2005; Gheorghiev et al. 2018). A healthy athlete taking a labeled dose may therefore experience little physiological disturbance. However, higher doses, immediate-release formulations, renal impairment, stimulant combinations, and exercise in a hot or dehydrated state may create a less predictable clinical context even though direct interaction trials are limited (Salerno et al. 2005; Roberts et al. 2023; European Medicines Agency 2024). Rare serious cerebrovascular events cannot be estimated from small exercise studies (European Medicines Agency 2024). Clinical decisions should not be based solely on the reassuring average response of young healthy volunteers (Salerno et al. 2005; Gheorghiev et al. 2018; European Medicines Agency 2024).

The ergogenic literature does not support routine pseudoephedrine use. Some high-dose studies suggest improvement in selected tasks, while several well-controlled studies are negative (Gillies et al. 1996; Hodges et al. 2006; Pritchard-Peschek et al. 2010). The overall evidence is limited by small samples, male predominance, differing exercise duration, and variable timing (Trinh et al. 2015; Gheorghiev et al. 2018). The strongest reproducible finding is an increase in heart rate rather than a consistent improvement in performance (Gheorghiev et al. 2018). From a practical perspective, this means the athlete accepts clearer pharmacological and regulatory risk than performance benefit (Gheorghiev et al. 2018; World Anti-Doping Agency 2026).

Topical imidazolines have a simpler anti-doping status because the specified nasal route is permitted, but their main hazard shifts from systemic stimulation to repeated local exposure (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). The current MHRA limit of five consecutive days provides a practical rule for routine use (Medicines and Healthcare products Regulatory Agency 2026). Controlled studies in which longer treatment did not produce rebound show that rhinitis medicamentosa is not an automatic consequence of crossing that boundary once (Watanabe et al. 2003; Hagen et al. 2026). Regulatory recommendations nevertheless must account for dose escalation, recurrent courses, differences among products, and unsupervised self-treatment in real-world settings (Hagen et al. 2026; Medicines and Healthcare products Regulatory Agency 2026). For competitive athletes, conservative duration limits are reasonable because a rebound episode can disrupt rest, medication planning, and several weeks of preparation (Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026).

A clinically important finding is that many decongestant problems are preventable upstream. When allergic rhinitis is recognized before the season, controller treatment can be started in advance (Dykewicz et al. 2020; Price et al. 2022). When the main symptom is watery rhinorrhea rather than obstruction, an antihistamine or ipratropium may be more rational than vasoconstriction (Dykewicz et al. 2020; Price et al. 2022). When congestion is unilateral or persistent, an anatomical assessment prevents repeated ineffective medication (Dykewicz et al. 2020; McIntosh et al. 2021). Correct diagnosis reduces the perceived need for rescue therapy and thereby lowers both rhinitis medicamentosa and anti-doping risk (Dykewicz et al. 2020; McIntosh et al. 2021; Price et al. 2022).

Phenotype-specific management also extends beyond short-term pharmacological rescue. In IgE-mediated allergic rhinitis, allergen immunotherapy may reduce long-term symptom and medication burden in appropriately selected patients (Pietrucha et al. 2026). In swimmers, chlorine and disinfection by-products can produce an irritant-dominant rhinitis phenotype, making exposure control and anti-inflammatory management more rational than repeated vasoconstriction (Matyja et al. 2025). When the main complaint is exertional breathlessness, noisy inspiration, or rapid recovery after exercise, exercise-induced laryngeal obstruction and other non-nasal mechanisms should be considered before escalating nasal medication (Kasterka et al. 2026).

The review also highlights a communication problem. Athletes may interpret 'not prohibited' as 'safe' and 'over the counter' as 'irrelevant to doping' (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). Neither inference is valid. Xylometazoline can be permitted yet harmful when overused (Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). Pseudoephedrine can be medically legitimate yet prohibited above a urinary threshold in competition. A permitted product can also contain an unrecognized prohibited ingredient (World Anti-Doping Agency 2026). Education must therefore separate three questions: Is the drug clinically indicated? Is it safe for this athlete in this context? Is it permitted at this time and by this route?

Treatment of congestion should not be advertised as a reliable route to better objective performance. Improvements in night-time rest, respiratory comfort, and the ability to complete planned sessions are clinically meaningful even without a measurable ergogenic effect (Hox et al. 2021; McIntosh et al. 2021). Framing a rescue medicine as a performance aid may encourage unnecessary escalation and shift attention away from control of the underlying disorder. The defensible aim is restoration of ordinary health and activity; any improvement in competitive output should be regarded as an individual downstream effect rather than an expected pharmacological outcome (Trinh et al. 2015; Gheorghiev et al. 2018; McIntosh et al. 2021).

Future research should enroll symptomatic athletes and compare diagnosis-directed treatment pathways rather than administering decongestants to healthy volunteers alone. Trials should report sex, sport, dose per kilogram, formulation, feeding state, caffeine use, environmental conditions, sleep, symptom severity, and urinary concentration (Berry and Wagner 2012; Trinh et al. 2015; Gheorghiev et al. 2018). Performance outcomes should include repeated training quality and sleep, not only a single laboratory time trial. Longitudinal studies are also needed to determine how frequently athletes develop rebound congestion and which behavioral patterns predict dependence (Trinh et al. 2015; Gheorghiev et al. 2018; Hagen et al. 2026).

Research on topical decongestants should distinguish transient rebound, tachyphylaxis, and established rhinitis medicamentosa. Definitions and exposure durations vary widely, making apparently conflicting findings difficult to compare (Stinson and Sadofsky 2025b; Hagen et al. 2026). Objective nasal airflow, symptom scores, mucosal examination, and follow-up after withdrawal should be combined. Studies of corticosteroid-assisted withdrawal and one-nostril tapering could provide practical evidence for sports and primary care settings (Zucker et al. 2019; Yang et al. 2025).

Anti-doping pharmacokinetic work should continue to evaluate repeated therapeutic dosing, extended-release formulations, exercise intensity, renal function, urinary pH, and sex (Chester et al. 2004; Barroso et al. 2012; Jolley et al. 2014). The current 24-hour discontinuation advice is useful but cannot remove all individual uncertainty (Chester et al. 2004; Barroso et al. 2012; World Anti-Doping Agency 2021a). More precise data would improve counseling while preserving the integrity of the urinary threshold. Until then, conservative avoidance near competition and use of permitted alternatives remain the most defensible approach (Barroso et al. 2012; World Anti-Doping Agency 2021a; World Anti-Doping Agency 2026).

4.1. Strengths and limitations of the review

A strength of this review is the integration of athlete performance trials with rhinology, cardiovascular safety, rhinitis medicamentosa, and current anti-doping regulation. It distinguishes relief of a disease-related limitation from direct ergogenic action and incorporates the 2026 WADA List, the 2026 MHRA topical-decongestant update, and the 2024 FDA reassessment of oral phenylephrine (U.S. Food and Drug Administration 2024; Medicines and Healthcare products Regulatory Agency 2026; World Anti-Doping Agency 2026). The review objective, search approach, source hierarchy, and limitations were reported with reference to the core quality domains proposed for narrative reviews in SANRA (Gheorghiev et al. 2018; Baethge et al. 2019; McIntosh et al. 2021).

The review is narrative rather than systematic. Only one bibliographic database was searched directly, selection and extraction were not performed independently in duplicate, a protocol was not registered, and formal risk-of-bias assessment and meta-analysis were not undertaken (Baethge et al. 2019). Consequently, relevant studies may have been missed and the synthesis remains vulnerable to selection and interpretation bias. The evidence base is also heterogeneous: many exercise trials contain small samples of healthy men, direct evidence in symptomatic athletes is limited, and rare adverse events cannot be quantified from performance studies (Trinh et al. 2015; Gheorghiev et al. 2018). Guidance on rhinitis medicamentosa relies partly on small trials and expert practice, while national product labels may differ (Zucker et al. 2019; Yang et al. 2025; Hagen et al. 2026). Anti-doping rules are updated annually, so medication status must be rechecked after the review date (World Anti-Doping Agency 2026).

5. Conclusions

Nasal decongestants can provide rapid and clinically useful short-term relief for competitive athletes, but they should be used as diagnosis-directed rescue therapy rather than routine pre-competition aids (Eccles et al. 2008; Deckx et al. 2016; Druce et al. 2018). Topical xylometazoline and oxymetazoline produce strong local decongestion and specified nasal imidazoline use is not prohibited under the 2026 WADA List (Eccles et al. 2008; Stinson and Sadofsky 2025a; World Anti-Doping Agency 2026). Their use should remain brief, with a maximum of five consecutive days under current MHRA advice, because repeated exposure can cause tachyphylaxis, rebound congestion, and rhinitis medicamentosa (Zucker et al. 2019; Stinson and Sadofsky 2025b; Medicines and Healthcare products Regulatory Agency 2026).

Pseudoephedrine has systemic decongestant and stimulant effects (Salerno et al. 2005). Therapeutic doses generally do not improve performance consistently, while higher doses show mixed small benefits and greater cardiovascular and anti-doping risk (Trinh et al. 2015; Gheorghiev et al. 2018). Average increases in systolic blood pressure and heart rate are modest, but individual effects are less predictable with high doses, immediate-release formulations, hypertension, renal disease, stimulant combinations, and physiologically stressful conditions such as heat or dehydration (Salerno et al. 2005; Roberts et al. 2023; European Medicines Agency 2024). Sudden severe headache, neurological symptoms, chest pain, marked palpitations, or syncope require immediate discontinuation and urgent assessment (European Medicines Agency 2024).

Under the 2026 WADA rules, pseudoephedrine is prohibited in competition above a urinary concentration of 150 micrograms/mL (World Anti-Doping Agency 2026). The recommended 24-hour discontinuation interval reduces risk but cannot guarantee a result below the threshold in every athlete (Chester et al. 2004; Barroso et al. 2012; World Anti-Doping Agency 2021a). Ingredient-level verification, documentation, and advance medication planning are therefore essential (World Anti-Doping Agency 2021a; World Anti-Doping Agency 2021b; World Anti-Doping Agency 2026).

The preferred long-term approach is to make rescue decongestion less necessary. This requires timely recognition of allergic and non-allergic rhinitis, appropriate use of intranasal corticosteroids or antihistamines, saline care, modification of relevant exposures, and assessment for fixed anatomical disease when indicated (Dykewicz et al. 2020; McIntosh et al. 2021; Price et al. 2022). Success is better reflected by sustained control of symptoms, undisturbed rest, preserved health, and reliable participation in training than by subjective maximal patency or a perceived stimulant effect (Hox et al. 2021; McIntosh et al. 2021; Price et al. 2022).

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In preparing this work, the authors used OpenAI ChatGPT to support manuscript organization, academic English refinement, grammar correction, consistency of wording, and bibliographic formatting. After using this tool, the authors reviewed, edited, and verified the content and accept full responsibility for the substantive content of the publication. Literature selection, interpretation of findings, assessment of clinical relevance, verification of references, and final conclusions remained under human supervision. No AI tool was used to generate original data, perform statistical analyses, or replace critical appraisal of the cited sources.

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