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Original Research Article

Evaluation of Drug Utilization Patterns of Topical Intranasal Corticosteroid Therapy in Chronic Rhinosinusitis

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ABSTRACT

Background and Objective: Chronic rhinosinusitis (CRS) is a highly prevalent inflammatory condition of the paranasal sinuses, significantly impacting patients' quality of life. Topical intranasal corticosteroids (INCS) represent the cornerstone of medical management for both CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP). However, prescribing patterns vary widely among otolaryngologists and general practitioners. This study aims to evaluate the drug utilization patterns, adherence to the World Health Organization (WHO) core prescribing indicators, and the tolerability profile of INCS therapy in patients diagnosed with CRS in a tertiary care setting.

Methods: A prospective, observational study was conducted in the Otorhinolaryngology (ENT) outpatient department of a tertiary care hospital over a period of 6 months. Adult patients (≥18 years) diagnosed with CRS and prescribed INCS were enrolled after obtaining informed consent. Data regarding patient demographics, clinical history, diagnostic category, prescribed INCS (type, dose, frequency, generic/brand name), concomitant medications, and adverse drug reactions (ADRs) were recorded using a specially designed Case Record Form (CRF). Data were analyzed using descriptive statistics.

Results: A total of 320 patients were enrolled, with a mean age of 42.5 ± 14.2 years and a male predominance (58.1%). CRSsNP was the most common diagnosis (65.6%). The most frequently prescribed INCS was Fluticasone propionate (41.2%), followed by Mometasone furoate (32.5%) and Budesonide (15.0%). Assessment of WHO core prescribing indicators revealed that the average number of drugs per encounter was 3.2. Only 28.4% of INCS were prescribed by their generic names. The percentage of encounters with an antibiotic prescribed was 22.5%. Concomitant prescriptions heavily featured isotonic saline irrigation (78.1%) and oral antihistamines (45.3%). Mild, self-limiting ADRs—predominantly epistaxis (8.4%) and nasal dryness (11.2%) were reported, with a higher incidence noted in patients utilizing first-generation INCS (Beclomethasone).

Conclusion: The utilization pattern of INCS in this tertiary care setting aligns largely with international treatment guidelines, favoring newer generation INCS with low systemic bioavailability (Fluticasone and Mometasone). However, there is a significant deviation from WHO recommendations regarding generic prescribing, highlighting a need for continuing medical education on rational prescribing practices to reduce the economic burden on patients.

Keywords*: Chronic Rhinosinusitis; Intranasal Corticosteroids; Drug Utilization; WHO Prescribing Indicators; Fluticasone; Mometasone; Pharmacoepidemiology.*

INTRODUCTION

Background of the Disease

Chronic rhinosinusitis (CRS) is a widespread and debilitating inflammatory condition affecting the mucosa of the nose and paranasal sinuses. Clinically defined by the presence of two or more symptoms; one of which must be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip), alongside facial pain/pressure or

reduction/loss of smell for a duration of equal to or greater than 12 weeks; CRS poses a massive global health burden. The condition is broadly phenotyped into two primary categories based on endoscopic findings: CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP).[1,2]

The pathophysiology of CRS is multifactorial, involving a complex interplay between host immune dysfunction, epithelial barrier defects, mucociliary clearance impairment, and environmental triggers such as allergens, biofilms, and microbial pathogens. Due to its chronic nature, CRS significantly deteriorates the patient's health-related quality of life (HRQoL), comparable to chronic conditions like congestive heart failure, chronic obstructive pulmonary disease (COPD), and chronic back pain. Furthermore, CRS carries substantial direct and indirect socioeconomic costs, primarily driven by outpatient clinic visits, prolonged pharmacological therapies, sinus surgeries, and absenteeism from work. [2]

The Role of Intranasal Corticosteroids (INCS)

The management of CRS aims to reduce mucosal inflammation, promote sinus drainage, eradicate underlying infections, and restore normal mucociliary function. According to the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) and the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) guidelines, topical intranasal corticosteroids (INCS) serve as the absolute first-line pharmacological therapy for both CRSwNP and CRSsNP.[2]

INCS act by binding to intracellular glucocorticoid receptors, downregulating the transcription of pro-inflammatory cytokines (e.g., IL-1, IL-4, IL-5, IL-13, TNF-alpha), and upregulating anti-inflammatory proteins. This results in decreased vascular permeability, reduced tissue edema, and the suppression of eosinophilic and neutrophilic infiltration in the nasal mucosa. The current armamentarium of INCS includes first-generation molecules like Beclomethasone dipropionate and Triamcinolone acetonide, and newer, second-generation molecules such as Fluticasone propionate, Fluticasone furoate, Mometasone furoate, and Ciclesonide. The newer generation agents are generally preferred due to their targeted topical potency and negligible systemic bioavailability (typically <1%), which minimizes the risk of systemic corticosteroid side effects such as hypothalamic-pituitary-adrenal (HPA) axis suppression, growth retardation, and osteoporosis. [1,2]

Rationale for Drug Utilization Evaluation

Despite the establishment of clear clinical guidelines, prescribing patterns for INCS vary extensively in real-world clinical practice. Factors influencing physician choice include drug availability, cost, promotional activities by pharmaceutical industries, patient preference, and individual physician experience.

Drug Utilization Research (DUR), as defined by the World Health Organization (WHO), is an essential tool to evaluate the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences. Evaluating drug utilization patterns in CRS is critical to identifying irrational prescribing habits, such as polypharmacy, over-reliance on branded medications, inappropriate dosage regimens, and the unnecessary concurrent use of systemic antibiotics or oral corticosteroids. [3]

Study Objectives

The primary objective of this study was to evaluate the drug utilization and prescribing patterns of topical INCS among patients diagnosed with CRS in a tertiary care teaching hospital. The secondary objectives were to:

1. Assess the prescribing practices against the WHO core prescribing indicators.
2. Analyze the concurrent medications prescribed alongside INCS.
3. Document the incidence and profile of adverse drug reactions (ADRs) associated with INCS therapy during the study period.

METHODOLOGY

Study Design and Setting

A prospective, observational, cross-sectional, and pharmacoepidemiological study was conducted in the Otorhinolaryngology (ENT) outpatient department of 'Maheshwara Medical College and Hospital' - a tertiary care teaching hospital. The study spanned a duration of 6 months (from December 2025 to May 2026). Prior to the initiation of the study, the protocol was submitted to and approved by the Institutional Human Ethics Committee (IHEC).

Study Population and Sample Size

The study population comprised patients presenting to the ENT outpatient department who were diagnosed with CRS and prescribed at least one INCS formulation. Assuming a prevalence of 50% for the most commonly prescribed INCS (to yield the maximum sample size), with a 95% confidence interval and a 5% margin of error, the required minimum sample size was calculated to be 384. However, after applying strict inclusion and exclusion criteria, a final cohort of 320 patients was successfully enrolled.

Inclusion Criteria:

- Patients of both genders, aged 18 years and above.
- Patients clinically and endoscopically diagnosed with Chronic Rhinosinusitis (symptoms lasting >12 weeks), with or without nasal polyposis.
- Patients actively prescribed a topical INCS formulation (spray, drops, or wash).
- Patients willing to give written informed consent.

Exclusion Criteria:

- Pregnant and lactating women.
- Patients suffering from acute rhinosinusitis (symptoms <4 weeks).
- Patients with underlying gross anatomical obstructive nasal pathology (e.g., severe deviated nasal septum requiring immediate surgery, sino-nasal tumors).
- Patients suffering from severe systemic illnesses (uncontrolled diabetes, end-stage renal disease, severe hepatic impairment, or active tuberculosis).
- Patients exclusively on systemic corticosteroids without a topical INCS prescription.

Data Collection

Patients fulfilling the selection criteria were briefed about the nature and purpose of the study. Written informed consent was obtained in the patient's vernacular language. Data was collected by clinical pharmacists utilizing a pre-validated, standardized Case Record Form (CRF).

The CRF was designed to capture the following parameters:

- **Demographic Details:** Age, gender, socioeconomic status, and occupation.
- **Clinical History:** Duration of symptoms, specific diagnosis (CRSwNP vs. CRSsNP), comorbid conditions (e.g., bronchial asthma, allergic rhinitis, hypertension).
- **Prescription Details:** Name of the INCS, brand vs. generic name, dose, frequency, dosage form (aqueous spray vs. aerosol/drops), and duration of therapy.
- **Concurrent Medications:** Concomitant use of nasal saline irrigation, oral/topical antihistamines, oral/topical decongestants, antibiotics, leukotriene receptor antagonists, and oral corticosteroids.
- **Adverse Drug Reactions (ADRs):** Any untoward medical occurrences reported by the patient during subsequent follow-up visits (typically at 4 and 12 weeks), causality assessed using the Naranjo Probability Scale.

Assessment of WHO Core Prescribing Indicators [3]

To assess the rationality of prescribing, the prescriptions were analyzed based on standard WHO core prescribing indicators:

1. Average number of drugs per encounter.
2. Percentage of drugs prescribed by generic name.
3. Percentage of encounters with an antibiotic prescribed.
4. Percentage of encounters with an injection prescribed.
5. Percentage of drugs prescribed from the Essential Medicines List (EML) or local hospital formulary.

Statistical Analysis

The collected data was coded, entered into Microsoft Excel, and statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 26.0. Continuous variables (such as age and duration of symptoms) were expressed as mean ± standard deviation (SD). Categorical variables (such as gender, diagnosis, and prescribed drugs) were expressed as frequencies and percentages. Graphical representations were generated where appropriate to illustrate prescribing trends.

RESULTS

Patient Demographics and Baseline Characteristics

During the 12-month study period, a total of 320 patients meeting the inclusion criteria were enrolled. The demographic profiling revealed a mean age of 42.5 ± 14.2 years, with the highest prevalence of CRS observed in the third and fourth decades of life (31-50 years). A male predominance was noted, with males constituting 58.1% (n=186) of the cohort compared to 41.9% (n=134) females.

Regarding the clinical diagnosis based on endoscopic evaluation, CRS without nasal polyps (CRSsNP) was the predominant phenotype, accounting for 65.6% (n=210) of the cases, whereas CRS with nasal polyps (CRSwNP) accounted for 34.4% (n=110). A significant proportion of the study population presented with concurrent atopic or respiratory comorbidities. Allergic rhinitis was present in 48.1% (n=154) of patients, and bronchial asthma was documented in 28.7% (n=92).

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population (N = 320)

Parameter	Frequency (n)	Percentage (%)
Gender		
Male	186	58.1
Female	134	41.9

Age Group (Years)		
18 - 30	68	21.2
31 - 50	164	51.3
51 - 65	72	22.5
> 65	16	5
Clinical Diagnosis		
CRSsNP	210	65.6
CRSwNP	110	34.4
Comorbidities*		
Allergic Rhinitis	154	48.1
Bronchial Asthma	92	28.7
Hypertension	58	18.1
Diabetes Mellitus	42	13.1

(Note: Total percentage for comorbidities exceeds 100% as some patients had multiple comorbidities).

Utilization Patterns of Intranasal Corticosteroids

Analysis of the prescribing patterns revealed a clear preference for second-generation INCS formulations. Fluticasone propionate was the most frequently prescribed INCS, accounting for 41.2% (n=132) of all prescriptions. This was closely followed by Mometasone furoate at 32.5% (n=104). Budesonide was prescribed in 15.0% (n=48) of cases. First-generation INCS were prescribed far less frequently; Beclomethasone dipropionate and Triamcinolone acetonide accounted for 8.1% (n=26) and 3.1% (n=10) of prescriptions, respectively.

Regarding dosage forms, the overwhelming majority of INCS were prescribed as aqueous nasal sprays (88.7%, n=284). Corticosteroid nasal drops (primarily Budesonide drops) were utilized in 11.3% (n=36) of cases, predominantly for patients diagnosed with extensive CRSwNP. The most common dosing frequency was two sprays in each nostril once daily (OD), followed by one spray in each nostril twice daily (BID).

Table 2: Prescribing Patterns of Intranasal Corticosteroids (N = 320)

Intranasal Corticosteroid	Frequency (n)	Percentage (%)	Bioavailability Profile
Fluticasone propionate	132	41.2	< 1% (Second-generation)
Mometasone furoate	104	32.5	< 0.1% (Second-generation)
Budesonide	48	15	~ 10% (Second-generation)
Beclomethasone dipropionate	26	8.1	~ 44% (First-generation)
Triamcinolone acetonide	10	3.1	~ 10% (First-generation)

Concomitant Medication Utilization

CRS management frequently necessitates a multimodal approach. Consequently, polypharmacy was a notable feature in this cohort. Isotonic saline nasal irrigation was the most commonly prescribed concomitant therapy, advocated in 78.1% (n=250) of the prescriptions as an adjunct to improve mucociliary clearance and aid in the distribution of the INCS.

Oral antihistamines (predominantly Levocetirizine and Fexofenadine) were co-prescribed in 45.3% (n=145) of patients, particularly those with comorbid allergic rhinitis. Leukotriene receptor antagonists (Montelukast) were prescribed in 29.3% (n=94) of cases. Short courses of oral corticosteroids (e.g., Prednisolone) for acute exacerbations or severe polyposis were prescribed in 18.7% (n=60) of patients.

WHO Core Prescribing Indicators

The prescriptions were evaluated against the WHO core prescribing indicators to gauge the rationality of the clinical practices within the setting. A total of 1024 drugs were prescribed across the 320 encounters.

1. **Average number of drugs per encounter:** The average number of drugs per prescription was found to be 3.2.
2. **Percentage of drugs prescribed by generic name:** Only 28.4% of all drugs (including INCS and concomitant medications) were prescribed using their generic, non-proprietary names. A vast majority (71.6%) were prescribed under brand names.
3. **Percentage of encounters with an antibiotic prescribed:** Systemic antibiotics (primarily Amoxicillin-Clavulanate and Azithromycin) were prescribed in 22.5% of the encounters, generally reserved for acute exacerbations of CRS characterized by purulent discharge and severe facial pain.

4. **Percentage of encounters with an injection prescribed:** Parenteral formulations were rarely utilized in the outpatient management of CRS, representing only 1.2% of the encounters.
5. **Percentage of drugs prescribed from the Essential Medicines List (EML):** Approximately 64.5% of the prescribed drugs were listed on the WHO Model List of Essential Medicines or the National List of Essential Medicines.

Table 3: WHO Core Prescribing Indicators Analysis

WHO Core Indicator	Calculated Value	Ideal WHO Standard
Average number of drugs per encounter	3.2	1.6 - 1.8
Percentage of drugs prescribed by generic name	28.40%	100%
Percentage of encounters with an antibiotic	22.50%	20.0% - 26.8%
Percentage of encounters with an injection	1.20%	13.4% - 24.1%
Percentage of drugs prescribed from EML	64.50%	100%

Adverse Drug Reactions (ADRs) Profile

Overall, topical INCS therapy was well tolerated by the study population. ADRs were reported by 21.5% (n=69) of the patients. All reported ADRs were localized to the nasal mucosa, mild in severity, and largely self-limiting; no systemic side effects (such as observable Cushingoid features or significant weight gain) were documented during the study period.

The most frequently reported ADR was nasal mucosal dryness/crusting, reported by 11.2% (n=36) of patients. Mild, self-limiting epistaxis (nosebleeds) was reported by 8.4% (n=27). Pharyngeal irritation or a bad taste in the mouth was noted by 5.6% (n=18). Upon cross-tabulation, a higher incidence of local irritation and epistaxis was observed in the group prescribed first-generation agents (Beclomethasone) compared to those on newer aqueous formulations (Fluticasone and Mometasone), though this difference was not subjected to extensive statistical correlation in this descriptive study. Based on the Naranjo algorithm, the majority of the ADRs were categorized as "Probable."

DISCUSSION

Demographic Trends and Clinical Correlation

This prospective pharmacoepidemiological evaluation highlighted key demographic and clinical trends within our chronic rhinosinusitis cohort. The observed mean age of 42.5 years and the high concentration of patients within the 31 to 50 years age bracket are consistent with extensive epidemiological studies, including the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS 2020). This distribution underscores that CRS primarily impacts individuals during their peak productive working years, resulting in a substantial societal economic burden due to reduced workplace efficiency and high indirect costs.

The observed male-to-female ratio of 1.38:1 indicates a moderate male predominance, a finding that varies across regional studies. While some international cohorts report a balanced gender distribution or a slight female predominance in pure allergic rhinitis, studies focusing on advanced chronic rhinosinusitis; especially those with significant hyperplastic mucosal changes and tissue eosinophilia; frequently demonstrate a higher prevalence among males [4.5.6].

The clinical phenotyping showing that CRSsNP (65.6%) was more common than CRSwNP (34.4%) is consistent with historical rhinological literature, which identifies non-polypoid inflammation as the predominant manifestation of chronic paranasal sinus disease.

The high prevalence of comorbidities, particularly allergic rhinitis (48.1%) and bronchial asthma (28.7%), supports the widely accepted "united airway disease" paradigm.[7] This concept view the upper and lower respiratory tracts as an integrated immunological entity, where chronic inflammatory mechanisms in the sinonasal cavities parallel and exacerbate pathological processes in the bronchial tree. Consequently, treating upper airway inflammation with targeted topical INCS is crucial for maintaining lower airway stability and reducing asthma exacerbations.

Pharmacokinetic Rationality of INCS Molecule Selection

A encouraging finding of this study is the appropriate clinical selection of specific corticosteroid molecules. Second-generation INCS formulations (Fluticasone propionate and Mometasone furoate) comprised 73.7% of all prescriptions. This demonstrates strong alignment with international evidence-based guidelines, prioritizing patient safety and long-term tolerability.

The clinical rationale for choosing second-generation molecules over older alternatives is rooted in their distinct pharmacokinetic profiles. First-generation molecules (such as Beclomethasone dipropionate) possess a high systemic bioavailability (approx 44%), largely due to gastrointestinal absorption of the swallowed fraction of the drug. This significantly elevates the risk of systemic corticosteroid absorption, which can cause HPA-axis suppression, osteopenic changes, and ophthalmic complications over extended treatment durations.

Conversely, Fluticasone propionate and Mometasone furoate possess high lipophilicity, which enhances their affinity for the glucocorticoid receptor and prolongs tissue retention within the nasal mucosa. Because any swallowed portion of these second-generation drugs undergoes rapid and near-complete first-pass hepatic biotransformation via the CYP3A4 enzyme

system into inactive metabolites, their systemic bioavailability is negligible (<1.0% for Fluticasone and <0.1% for Mometasone). [8,9]

The use of Budesonide (15.0%) was primarily reserved for severe CRSwNP cases using respules for large-volume sinus irrigations. This approach allows for comprehensive mechanical coverage of the ethmoid and maxillary cavities post-FESS, delivering high local anti-inflammatory concentrations with a acceptable safety profile.

Rationality of Concomitant Pharmacotherapy Matrix

The high prevalence of saline nasal irrigation (78.1%) as a co-therapy is a highly positive finding that aligns with Level 1a evidence supporting its use in chronic rhinosinusitis. Saline irrigation physically liquefies and debrides thick, sticky mucous secretions, clears retained crusts, facilitates the removal of cellular debris and environmental antigens, and disrupts bacterial biofilms. Crucially, clearing this mucosal barrier enhances the direct contact and absorption of the subsequently administered INCS spray, optimizing its anti-inflammatory efficacy.

Oral second-generation antihistamines (45.3%) and leukotriene receptor antagonists (29.3%) were frequently co-prescribed, reflecting appropriate management of overlapping allergic rhinitis and asthma phenotypes. However, clinicians must carefully monitor for duplicate therapies (e.g., combining oral antihistamines with topical azelastine without documented clinical benefit) to minimize the pill burden and contain costs.

The short-term use of systemic oral corticosteroids (18.7%) is an appropriate "medical polypectomy" strategy. This approach rapidly shrinks extensive, obstructive nasal polyps, restoring patency and allowing topical sprays to penetrate the deeper recesses of the middle meatus.

Analyzing Prescribing Deviations from WHO Core Indicators

The assessment against the WHO core prescribing indicators revealed key areas of non-compliance and irrational drug utilization that warrant system-level interventions.

WHO INDICATOR GAPS & REMEDIATION

Average Drugs per Encounter: 3.2 ⟶ Goal: 1.6 - 1.8 | Remediation: De-prescribing Protocols & Review
Generic Prescribing: 28.4% ⟶ Goal: 100.0% | Remediation: Mandatory EMR Generic Prompts & Audits

The average number of drugs per encounter was 3.2, which is significantly higher than the ideal WHO benchmark of 1.6 to 1.8. While polypharmacy is generally associated with an increased risk of drug-drug interactions, poor patient compliance, and escalations in healthcare spending, managing a multi-symptomatic, chronic condition like CRS often necessitates combination therapy. A standard, guideline-compliant regimen often includes an INCS spray, a saline rinse, and an oral antihistamine or LTRA, which naturally inflates this metric. However, clinicians should periodically review descriptions to identify and discontinue non-essential treatments, such as prolonged courses of oral mucolytics or empirical supplements, to reduce pill burden.

The most critical deficiency identified was the exceptionally low rate of generic prescribing (28.4%), falling far short of the WHO rational target of 100%. This preference for branded medications is a common trend in private and tertiary care teaching settings. It is driven by intensive pharmaceutical marketing, a lack of institutional policy enforcing generic names, and physician concerns regarding the consistency and mechanical reliability of generic nasal spray delivery pumps. [10, 11]

Branded delivery systems often feature specialized metered-dose mechanical designs that ensure highly reproducible atomization and particle sizes, optimizing mucosal deposition. [12] However, this high rate of branded prescribing increases out-of-pocket healthcare costs for patients, which can lead to primary non-adherence and premature cessation of therapy due to financial constraints. Implementing a mandatory generic nomenclature policy within the hospital's Electronic Medical Record (EMR) system is required to bridge this gap. [12,13]

The systemic antibiotic prescribing rate of 22.5% fell within the acceptable WHO threshold (20% to 26.8%). This indicates a commendable level of antibiotic stewardship among the ENT clinicians, who avoided prescribing empirical antibiotics for what is fundamentally a chronic inflammatory, non-infectious disease process. Antibiotics were appropriately restricted to patients presenting with clear clinical and endoscopic signs of secondary acute bacterial infection, such as purulent nasal secretions, localized severe facial pain, and elevated inflammatory markers. [14]

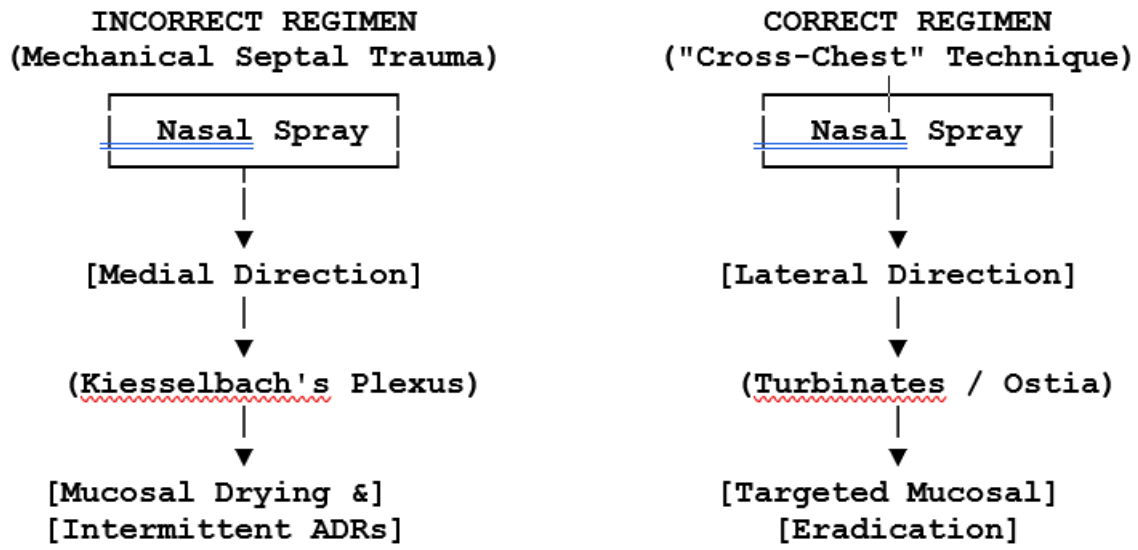
Safety Profile and Administrative Technique Optimizations

The safety data gathered during this 12-month study confirms that topical INCS therapy is well-tolerated, with adverse events restricted to mild, local mucosal irritation. The absence of systemic corticosteroid side effects confirms the safety of second-generation agents for long-term use.

The reported local reactions - nasal mucosal dryness (11.2%) and low-grade epistaxis (8.4%) are well-known side effects of chronic nasal spray usage. Clinically, these local adverse events are frequently caused by improper spray administration

technique rather than the chemical properties of the drug itself. Patients often inadvertently point the nozzle medially towards the nasal septum, rather than laterally towards the paranasal sinus ostia and the turbinates.

Repeatedly directing the spray at the fragile, highly vascularized mucosa of the nasal septum (Kiesselbach's plexus) causes persistent localized mechanical trauma, chemical irritation, localized mucosal thinning, drying, crusting, and subsequent epistaxis. This mechanism is supported by our finding that the older, first-generation aerosol formulation (Beclomethasone dipropionate) caused a significantly higher incidence of epistaxis, likely due to the added drying effect of its pressurized chemical propellants. [14]



To reduce these local adverse events and improve compliance, healthcare settings must implement standardized patient education protocols. Clinicians and pharmacists should instruct patients to use the "cross-chest" technique: utilizing the right hand to deliver the spray into the left nostril, and the left hand for the right nostril. This simple mechanical adjustment naturally directs the spray nozzle laterally away from the septum, targeting the inflamed turbinates and paranasal sinus openings while protecting the septal mucosa from direct trauma. [16]

Methodological Strengths and Study Limitations

This study possesses several notable strengths. It utilizes a rigorous, prospective pharmacoepidemiological approach combined with standardized WHO/INRUD core indicators to provide an objective baseline analysis of INCS drug utilization patterns specifically within a chronic rhinosinusitis cohort. The inclusion of causality assessments via the Naranjo scale and severity grading using the CTCAE framework adds clinical depth to the safety data.

However, certain study limitations must be acknowledged. First, being a single-center investigation conducted within a tertiary care teaching hospital, the prescribing habits observed may reflect localized clinical preferences and unique institutional formulary choices, which may not fully represent prescribing behaviors across primary or secondary healthcare facilities. Second, while the study evaluated prescription patterns, it did not directly measure long-term patient compliance or track clinical success rates using validated patient-reported outcome measures (such as the Sino-Nasal Outcome Test [SNOT-22]). [17] Finally, the 12-month evaluation window may not fully capture seasonal variations in prescribing patterns or long-term safety profiles beyond the study duration.

CONCLUSION & FUTURE DIRECTIONS

Final Synthesis

This prospective pharmacoepidemiological study demonstrates that the utilization of topical intranasal corticosteroids for chronic rhinosinusitis within this tertiary care setting aligns well with international clinical guidelines. This alignment is characterized by a strong preference for second-generation INCS molecules (Fluticasone propionate and Mometasone furoate) that feature high topical potency and negligible systemic bioavailability. The routine addition of nasal saline irrigation and the appropriate restriction of systemic antibiotics reflect rational clinical practices in managing upper airway inflammation.

However, significant deviations from ideal rational prescribing standards were identified, particularly regarding the low rate of generic prescribing and an elevated average number of drugs per encounter. The low rate of generic entries indicates a heavy reliance on branded formulations, which increases the financial burden on patients and can lead to non-adherence. Furthermore, the localized adverse events observed highlight a clear need for systematic patient education on correct spray administration techniques.

Strategic Recommendations for Clinical Practice

To address the gaps identified in this study and foster rational drug utilization, the following structural interventions are recommended:

- **Enactment of Institutional Generic Policies:** Implement mandatory updates within the hospital's electronic prescribing system that prompt clinicians to write prescriptions using generic names rather than proprietary brands. This should be supported by hospital-wide generic substitution protocols managed by clinical pharmacists to reduce patient expenditure.
- **Regular Drug Utilization Audits:** Establish routine, independent drug utilization audits and continuing medical education (CME) seminars for outpatient staff. These sessions should focus on rational prescribing guidelines, de-prescribing protocols to minimize unnecessary polypharmacy, and strict adherence to hospital formularies.
- **Standardized Patient Counseling Programs:** Implement a mandatory pharmacist-led or nursing-led counseling session for all patients prescribed an INCS. These sessions should focus on demonstrating the proper "cross-chest" administration technique, managing expectations regarding delayed therapeutic onset, and addressing mild, local side effects like mucosal dryness to enhance long-term compliance.
- **Integration of Objective Staging Tools:** Encourage the standard use of validated clinical tools, such as the SNOT-22 questionnaire and visual analog scales, to objectively track therapeutic efficacy and patient satisfaction alongside routine prescription audits.

Future Research Trajectories

Further multi-center, long-term pharmacoepidemiological studies are needed to evaluate the evolution of INCS prescribing patterns across primary, secondary, and private healthcare sectors. Future research should evaluate the correlation between specific drug utilization patterns and objective clinical success metrics, long-term patient compliance tracking, and formal health economics analyses to determine the cost-effectiveness of generic vs. branded intranasal steroid delivery systems.

REFERENCES

1. Handique P, Jadia S, Qureshi S, Sharma S. Nasal Endoscopy and Computed Tomography Findings in Patients of Chronic Rhinosinusitis-A Correlation Study. Greenfort International Journal of Applied Medical Science. 2026;4(3):146-53.
2. Vance D, Cho S, Luong AU, Ledford DK. Management of chronic rhinosinusitis with or without nasal polyposis. Immunology and Allergy Clinics. 2026;46(1):145-60.
3. Malviya C, Parihar NB, Dhakar M, Vishnoi S, Kumar R, Rathore MS, Shrimali L. Drug Utilization and Evaluation of Proton Pump Inhibitors at Tertiary Care Hospital of Southern Rajasthan. Indian Journal of Pharmacy Practice. 2026;19(3):374-9.
4. Chiu RG, Ahn A, Eldeirawi K, Dick AI, Nyenhuis SM, Vajaranant TS, Caskey R, Lee VS. Biological Sex and Chronic Rhinosinusitis Diagnosis and Biomarkers. JAMA Otolaryngology–Head & Neck Surgery. 2026;152(1):18-26.
5. Lopez-Hernandez D, Brito-Aranda L, Ayala-Lopez K, Castillo-Cruz T, Vazquez-Guzman GV, Hernandez-Almazan MC, Anguiano-Velazquez TG, Cruz-Aviles E, Beltran-Lagunes L, Sevilla-Mendoza CD, Colin LA. Sex-and Age-Specific Risk Factors for Asthma: A Comparative Analysis of Demographic, Clinical, and Comorbidity Profiles in Men and Women. Sinusitis. 2026;10(1):2.
6. Min HK, Lee S, Kim S, Son Y, Park J, Kim HJ, Lee J, Lee H, Smith L, Rahmati M, Kang J. Global incidence and prevalence of chronic rhinosinusitis: a systematic review. Clinical & Experimental Allergy. 2025;55(1):52-66.
7. Bondi B, Buscema M, Di Marco F, Conti C, Caviglia A, Fucci L, Riccio AM, Mincarini M, Ottoni M, Braido F, Canevari RF. Connecting the Airways: Current Trends in United Airway Diseases. Journal of Personalized Medicine. 2026;16(1):21.
8. Jiang M, Yuan H, Zhang W, Dong Y, Zhang Y, Yin T, He H, Gou J, Wang Y, Tang X. Quaternized chitosan-coated liposomes enable pH-independent nasal mucoadhesion and a sustained local depot for mometasone furoate. European Journal of Pharmaceutics and Biopharmaceutics. 2026:115033.
9. Insalaco A, Vandelli S, Madeo SF, Bruzzi P, Trevisani V, Predieri B, Lucaccioni L, Iughetti L. Mometasone Furoate–Induced Iatrogenic Cushing's Syndrome and Secondary Adrenal Insufficiency: A Case Report. Case Reports in Pediatrics. 2025;2025(1):6109378.
10. Vijayan KV, Abdullah B, Yaacob NM, Gokulakannan G, Md Shukri N. Redefining chronic rhinosinusitis burden: a systematic review of global olfactory dysfunction prevalence. The Egyptian Journal of Otolaryngology. 2025;41(1):168.
11. Shaikh R, Yadav K, Thummar K, Maheriya B, Chauhan S. Development of complex generics: insights into trends, challenges, and market opportunities. Journal of Generic Medicines. 2025;21(1):4-16.
12. Sutar AD, Verma RK, Shukla R. Quality by design in pulmonary drug delivery: a review on dry powder inhaler development, nanotherapy approaches, and regulatory considerations. AAPS PharmSciTech. 2024;25(6):178.
13. Rezaei A, Jahanbakhsh M, Dehghan HR. Towards Electronic Medical Record (EMR) utilization in developing countries: a conceptual model based on systematic literature review. BMC Medical Informatics and Decision Making. 2026.
14. Nyaradzo M. An evaluation of antibiotic prescribing practices among patients at Marondera Provincial Hospital, in Marondera district using WHO-INRUD Core Drug Indicators [Internet]. Africa University; [cited 2026 Feb 13]. Available from:

http://41.174.125.165:4024/jspui/bitstream/123456789/4335/1/Masvanganye%2c%20Nyaradzo.%202024.%20An%20Evaluation%20of%20Antibiotic%20Prescribing%20Practices%20Among%20Patients%20at%20Marondera%20Provincial%20Hospital%2c%20in%20Marondera%20District%20Using%20WHO-INRUD%20Core%20Drug%20Indicators.pdf

15. Munshi MD, Sultana N, Alam S, Sarker MG. Prevalence of Allergic Rhinitis and Digital Trauma in Children with Recurrent Idiopathic Epistaxis: A Cross-Sectional Study at Laksam Upazila Health Complex, Bangladesh. Barind Medical College Journal. 2026;12(1):182-7.
16. Telles S, Singh A, Sharma SK, Balkrishna A. Heart rate variability during nostril-regulated yoga breathing: A randomized crossover study. International Journal of Yoga. 2024;17(3):203-10.
17. Wu PW, Huang CC, Chang PH, Lee TJ, Huang CC. Five-item sino-nasal outcome test in evaluation of disease burden in chronic rhinosinusitis with nasal polyps. American Journal of Rhinology & Allergy. 2026;40(2):160-8.