

# Analysis of Short Course Systemic Glucocorticoid Prescribing in Urgent and Convenient Care Clinics

**Urgent Message:** Across a tristate urgent-care and convenient-care network, systemic steroid use occurred in nearly one-sixth of encounters (15.5%). And 72.5% of those were for likely avoidable indications and 66% for acute respiratory infections. The finding highlights the need to establish systemic steroid metrics to drive stewardship efforts.

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## Abstract

**Background:** The College of Urgent Care Medicine released a position statement advocating for corticosteroid stewardship best practices in 2022, but the extent of avoidable systemic short-course glucocorticoid (SSCG) use in urgent or convenient care clinics is unknown.

**Methods:** Using data from the electronic medical record, a cross-sectional analysis of in-person or video telehealth encounters occurring from July 2022 through June 2023 of patients without chronic steroid use aged 3 months and older from 55 urgent or convenient care clinics across Missouri, Oklahoma, and Arkansas was completed. Variables related to encounter diagnoses, patient age and location, clinic type, medication prescribed, and provider degree were analyzed to inform data on SSCG use rate, the SSCG use rate for acute respiratory infections (ARIs), and the estimated SSCG use that was likely avoidable using a tier-based diagnosis schema, with 95% confidence intervals (CI), p-values, and univariate odds ratios (ORs) reported when appropriate.

**Results:** Of the 586,653 encounters analyzed, 15.5%



involved SSCG use, with adult encounters receiving SSCGs more often than pediatric encounters (adult SSCG rate 18.5% vs pediatric SSCG rate 8.4%, OR 2.47, CI 2.42-2.51,  $p < 0.001$ ). It was estimated that approximately 7 in 10 (72.5%, CI 72.2%-72.8%) encounters utilizing SSCGs were likely avoidable based on diagnostic tier assignment. The diagnoses that SSCGs were most frequently utilized for were pharyngitis (14,164 SSCG encounters, SSCG use rate 12.1%), acute sinusitis (8,697 SSCG encounters, SSCG use rate 36.0%), and acute upper respiratory infections (5,574 SSCG encounters,

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SSCG use rate 23.3%). ARI encounters accounted for 66.0% (CI 65.7-66.3%) of SSCG use and represent 77.7% (CI 77.3-78.0%) of likely avoidable (ie, tier 2 and tier 3) SSCG use. Significant geographic and provider variability was noted.

**Conclusions:** SSCG use was noted in nearly 1 in 6 encounters in a large network of urgent and convenient care clinics from July 2022 through June 2023, often for avoidable indications and ARIs. This highlights the need for monitoring specific SSCG measures to advance corticosteroid stewardship efforts in the urgent and convenient care setting.

## Introduction

While systemic glucocorticoids have numerous evidence-based indications in patients of all ages, they are often used for short courses in clinical scenarios when patient benefit is expected to be minimal or absent. This trend, combined with data from the last decade outlining the potential harms of short courses of systemic corticosteroids, clarifies why steroid stewardship efforts are warranted. Steroids are used with increasing frequency, often when they could be avoided, leading to a risk of avoidable harms beyond well-known risks like hyperglycemia, to include risks such as sepsis and gastrointestinal hemorrhage in adults and children, pneumonia in children, and congestive heart failure, venous thromboembolism and fracture in adults.<sup>1,2</sup>

In August of 2022, the College of Urgent Care Medicine released a position statement advocating for corticosteroid stewardship best practices for adult and pediatric patients in the urgent care setting.<sup>3</sup> However, the fraction of systemic corticosteroid use that is avoidable and therefore amenable to reduction is unknown. To our knowledge, there is no recent analysis of outpatient systemic short-course glucocorticoid (SSCG) use in the COVID-19 era, nor is there an overall estimate of avoidable urgent or convenient care SSCG use that considers adults and pediatrics, all conditions that SSCGs are utilized for, or the fraction of overall SSCG utilization for acute respiratory infections (ARI).

The overarching objective of this study was to establish SSCG baseline use data within a large healthcare system, which could inform how best to enact systemic steroid stewardship efforts in urgent and convenient care clinics. Specifically, we sought to establish a baseline of SSCG use rate overall per 100 encounters, by age and diagnoses, to estimate the rate of potentially avoidable SSCG use per 100 encounters and report the percentage of SSCG use for ARIs. We further examined

SSCG use based on additional patient, prescriber, and clinic variables outlined below, along with a duration analysis to inform the duration definition for SSCG use in this care setting.

## Methods

### Study Design, Data Sources, and Study Population

This was a retrospective cross-sectional analysis of in-person and video-telehealth encounters of patients aged 3 months and older occurring at any of the 47 urgent care and 8 convenient care clinics within a large healthcare system across Missouri, Oklahoma, and Arkansas from July 1, 2022, through June 30, 2023. The data source utilized was the electronic medical record (EMR) of our healthcare system (Epic, Madison, Wisconsin), which is integrated across our hospitals and clinics. Encounters not fulfilling the inclusion criteria (eg, orders only or x-ray imaging) or encounters with missing diagnosis data were not included in the dataset. Additional encounters were excluded if they involved a patient with chronic steroid use, defined as any current or previous prescription within the 365 days prior to the index encounter where a supply of 30 days or more was provided for a systemic glucocorticoid, or if an intraarticular steroid injection was administered without concurrent systemic glucocorticoid use. The Mercy Institutional Review Board reviewed the study protocol and determined it met exemption criteria. This study adheres to the Strengthening the Reporting of Observational Studies in Epidemiology recommendations.

SSCG use was defined as an outpatient prescription for or an in-clinic administration of a systemic (ie, oral [PO], intravenous [IV], or intramuscular [IM]) glucocorticoid of less than 30 days duration. Duration of SSCGs was determined from data within the medication order; duration data was utilized when available, and amount of medication dispensed combined with directions for use was utilized to determine the duration (when duration data was unavailable). Glucocorticoids prescribed or administered via non-systemic routes, such as inhaled, topical, intranasal, or ophthalmic were excluded.

### Estimating Avoidable Steroid Use

As our healthcare system's EMR does not require links between diagnoses and medication prescriptions, urgent or convenient care visit diagnoses were classified based on the most likely indication for SSCG use in a tiered fashion, modeled after existing antibiotic stewardship methods.<sup>4</sup> Given the clinical versatility of SSCGs, a diagnostic categorization scheme was created that aims to

be both comprehensive and nuanced, based on clinical judgment of the lead author. Only perinatal diagnoses codes were not categorized given age restrictions within our study patient population.

- Tier 1 diagnoses were diagnoses for which SSCGs are often indicated as the expected benefits commonly outweigh the risk of harm in the urgent or convenient care setting: asthma, chronic obstructive pulmonary disease (COPD) or gout exacerbations, autoimmune or rheumatologic conditions, contact dermatitis, etc.
- Tier 2 diagnoses were diagnoses for which SSCGs may be indicated in other care settings (eg, inpatient) or depending on the specific clinical circumstance but are usually avoidable in the urgent or convenient care setting: pneumonia, COVID-19, pharyngitis, etc.
- Tier 3 diagnoses were all other diagnoses for which use of SSCGs were avoidable regardless of care setting, where the risk of harm is expected to outweigh the potential benefit, or the indication is unclear given a lack of supporting evidence of guidance: acute upper respiratory infection, bronchitis, non-radicular low back pain, etc.

In assigning each visit a single diagnosis for tier as-

signment, priority was given to tier 1 diagnoses, then tier 2 diagnoses, then tier 3 diagnoses. If a visit contained multiple diagnoses from a single tier, the first-listed diagnosis was assigned.

#### Acute Respiratory Infection

Independent of the tier-schema-assigned single encounter diagnosis described above, all encounter diagnoses were screened for ARI diagnoses. While the definition of ARI utilized for this study has been previously defined,<sup>5</sup> the subgroupings were modified to fit within the above-described tier schema. Eligible ARI diagnoses included bronchitis, pneumonia, otitis media and other ear complaints, sinusitis, pharyngitis, influenza, COVID-19, croup, cough, laryngitis, and other acute upper or lower respiratory tract infections.

#### Other Variables

Patient age was categorized by National Institutes of Health recommended age groups (3 months-1 year; 1-12 years, 13-17 years, 18-64 years,  $\geq 65$  years)<sup>6</sup> with larger groupings reported to summarize pediatrics (3 months-17 years) and adults (18 years or older). Patient variables analyzed in addition to age included biologic sex, state, and ZIP code. Clinic data was categorized

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**Table 1. Patient, Clinic, Provider, And Diagnostic Characteristics And Association With Use of Systemic Short Course Glucocorticoids**

Characteristic	Total Encounters 586,653	SSCG Use Rate (15.5%)	SSCG Use Rate OR with 95% CI	SSCG Use for Tier 1 (4.3%)	Tier 1 Contribution to SSCG Use Rate OR with 95% CI
<b>Age Group</b>					
18 – 64 Years	336,063	19.0%	Ref	4.7%	Ref
3 Months – 1 Year	6,116	7.4%	0.34 (0.31, 0.38)	2.8%	1.89 (1.56, 2.28)
1 – 12 Years	124,733	8.0%	0.37 (0.36, 0.38)	3.3%	2.09 (2.00, 2.19)
13 – 17 Years	42,719	9.7%	0.46 (0.45, 0.48)	2.9%	1.26 (1.18, 1.35)
65+ Years	77,022	16.5%	0.84 (0.83, 0.86)	4.8%	1.24 (1.19, 1.30)
<b>Sex Group</b>					
Male	234,456	15.3%	Ref	4.6%	Ref
Female	352,135	15.7%	1.03 (1.01, 1.04)	4.1%	0.83 (0.80, 0.85)
<b>Clinic Type</b>					
UC	515,358	15.5%	Ref	4.3%	Ref
CC	71,268	15.4%	0.99 (0.97, 1.01)	4.2%	0.98 (0.94, 1.03)
<b>Provider Type</b>					
Physician	104,245	13.1%	Ref	4.0%	Ref
NP	361,755	16.4%	1.30 (1.28, 1.33)	4.4%	0.84 (0.80, 0.87)
PA	116,190	14.9%	1.17 (1.14, 1.19)	4.1%	0.87 (0.83, 0.92)
<b>Provider Quartile</b>					
Low SSCG Use Quartile	111,601	5.3%	Ref	2.7%	Ref
High SSCG Use Quartile	176,921	25.2%	6.07 (5.90, 6.24)	4.9%	0.22 (0.21, 0.24)
<b>Patient State</b>					
Missouri	319,424	12.9%	Ref	4.3%	Ref
Oklahoma	155,331	19.7%	1.66 (1.63, 1.69)	4.3%	0.55 (0.54, 0.57)
Arkansas	97,112	17.3%	1.41 (1.39, 1.44)	4.2%	0.64 (0.61, 0.66)
Other States	14,786	17.6%	1.45 (1.38, 1.51)	4.9%	0.77 (0.71, 0.84)
<b>ARI Status</b>					
No ARI	320,833	11.7%	Ref	6.1%	Ref
ARI Present	265,820	18.7%	1.75 (1.72, 1.77)	2.8%	0.16 (0.15, 0.16)
Abbreviations: ARI, acute respiratory infection; CC, convenient care; CI, confidence interval; NP, nurse practitioner; OR, odds ratio; PA, physician assistant; Ref, reference category; SSCG, systemic short course glucocorticoid; UC, urgent care					

into either urgent or convenient care clinics. Ordering provider data was analyzed by provider type (physician, nurse practitioner, or physician assistant), SSCG use quartile among providers with at least 100 encounters, and a selected analysis of the 35 providers with 100 or more encounters who had the highest overall SSCG use rates reported by what percentage of their total use included use in ARI encounters to provide detail on variability of ordering provider use patterns. SSCG variables included systemic glucocorticoid utilized, route of administration, and prescription duration.

### Statistical Methods

Statistical analyses were performed using R (version 4.4.0) and Python. The overall, tier-based, and ARI-related diagnostic mean rates of SSCG per 100 patient encounters were calculated and analyzed based on the

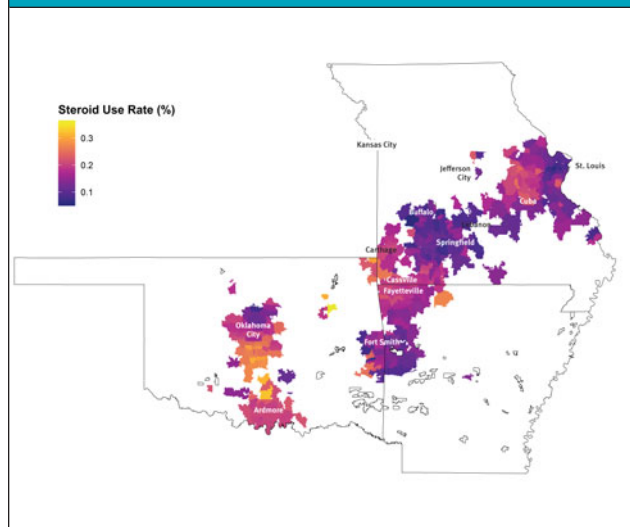
above pre-specified variables (age, gender, etc.). Except for the prespecified ARI group and its subgroupings of diagnoses, diagnoses were grouped based on the individual categorizations outlined in the tiering schema. Descriptive statistics, including proportions and means, were used to summarize encounter characteristics and SSCG utilization across tiers 1 through 3 and ARI diagnoses. For inferential analyses, univariate logistic regression was used to estimate odds ratios (ORs) between groups, along with corresponding 95% confidence intervals (CIs) and p-values to determine statistical significance. When 95% CIs are presented without accompanying p-values, they were calculated using the Wilson score interval. Subgroup analyses were conducted to examine variations in SSCG use across patient age groups, provider types (physicians, nurse practitioners, and physician assistants), clinical settings (urgent vs convenient

care), gender (male vs female), and patient states (Missouri, Oklahoma, and Arkansas). Missing data were not handled using complete case analysis; records were included in each analysis if complete data was available for the variables used in that specific model.

## Results

There were 616,551 urgent or convenient care encounters involving 419,870 patients. A total of 29,898 encounters from 15,619 patients were excluded, all due to chronic steroid use, leaving 586,653 encounters (87.9% occurring in the urgent care setting) from 404,251 eligible patients (mean age 34 years; female 60.0%). Analysis shows 20.1% of patients received SSCGs from an urgent or convenient care encounter during the study period, which equaled a SSCG encounter rate of 15.6%. SSCG use rates were similar in urgent and convenient care clinics (convenient care OR 0.99, CI 0.97-1.01,  $p=0.198$ ). Prednisone was the most

**Figure 1. Analysis of Steroid Use Rates by Patients' Location, Across Missouri, Oklahoma, and Arkansas**



**Table 2. Top 6 Diagnoses With Highest SSCG Use Counts Within Each Age Group**

Age Group	Diagnosis	SSCG Use Counts	Number of Encounters	SSCG Use (%)
3 months - 1 year	Cough	53	317	16.7%
	Acute URI	52	764	6.8%
	Wheezing	43	92	46.7%
	General Symptoms and Signs	28	438	6.4%
	AOM	26	1241	2.1%
	Rash	24	140	17.1%
1 – 12 years	Acute Pharyngitis	1536	38421	4.0%
	Croup	911	1002	90.9%
	Acute URI	801	6584	12.2%
	Asthma	742	1054	70.4%
	Wheezing	602	941	64.0%
	Cough	566	3309	17.1%
13-17 years	Acute Pharyngitis	1066	12755	8.4%
	Acute sinusitis	287	965	29.7%
	Asthma	262	378	69.3%
	Acute URI	234	1448	16.2%
	Cough	143	735	19.5%
	Rash	143	297	48.2%
18 – 64 years	Acute Pharyngitis	10626	60775	17.5%
	Acute Sinusitis	6891	17935	38.4%
	Bronchitis and Other Acute LRI	3824	6312	60.6%
	Acute URI	3724	12419	30.0%
	Unspecified Sinusitis	3087	6715	46.0%
	Cough	2445	7398	33.1%
≥65 years	Acute Sinusitis	1250	4024	31.1%
	Bronchitis and Other Acute LRI	1066	2223	48.0%
	Acute Pharyngitis	919	5120	18.0%
	Acute URI	763	2732	27.9%
	Cough	697	2473	28.2%
	Unspecified Sinusitis	676	1677	40.3%

Abbreviations: LRI, lower respiratory infection; SSCG, systemic short course glucocorticoid; URI, upper respiratory infection



**Table 3. SSCG Usage Rates and Distribution Across Diagnostic Tiers**

Tier	SSCG Use Encounters	Total Encounters	Percentage of Encounters with SSCG Use (%)	Contribution to Overall SSCG Use (%)
1	25,065	53,413	46.9%	27.5%
2	29,678	200,383	14.8%	32.6%
3	36,283	332,857	10.9%	39.9%

Abbreviation: SSCG, systemic short course glucocorticoid

common SSCG utilized, followed by methylprednisolone, dexamethasone, and triamcinolone (58.8%, 25.5%, 13.0%, and 2.7%), respectively. PO administration was the most common route utilized (79.6% PO, 20.3% IM, 0.03% IV). Among adults, SSCG course median duration was 7 days, with a 5-10 day interquartile range. Extended courses beyond 14 days were uncommon, occurring in only 2.9% of total SSCGs ordered. SSCG use varied significantly by age groupings: 8.4% of pediatric (age 3 months through 17 years) encounters vs 18.5% of adult (age 18 years or greater) encounters utilized SSCGs (adult vs pediatric OR 2.47, CI 2.42 - 2.51,  $p < 0.001$ ). Variations noted within each age grouping are summarized in **Table 1** with the highest SSCG use rate noted in adults aged 18-64 years (19.0%) and the lowest SSCG use rate noted in patients aged 3 months through 1 year (SSCG use rate 7.4%, OR 0.34, CI 0.31-0.38,  $p < 0.001$ ). Compared with male patients, female patients were slightly more likely to receive SSCGs (OR 1.03, CI 1.01-1.04,  $p < 0.001$ ).

### Geographic Variability

We found significant geographic variability. When analyzing data by state, Oklahoma residents' encounters

were 53% more likely (OR 1.66, CI 1.63-1.69,  $p < 0.001$ ) to involve SSCGs than Missouri residents' encounters. Intrastate geographic variations in SSCG use were more pronounced when analyzed by patient ZIP code (**Figure 1**). When comparing the highest and lowest SSCG use rates within a state by patient ZIP code, we found a nearly fourfold higher odds variation of SSCG use within Arkansas (OR 3.73, 95% CI 1.80–7.69,  $p < 0.001$ ), and greater than sevenfold higher odds variation within Missouri (OR 7.58, 95% CI, 2.3–25.0,  $p < 0.001$ ) and Oklahoma (OR 7.87, 95% CI 2.14–28.90,  $p = 0.002$ ).

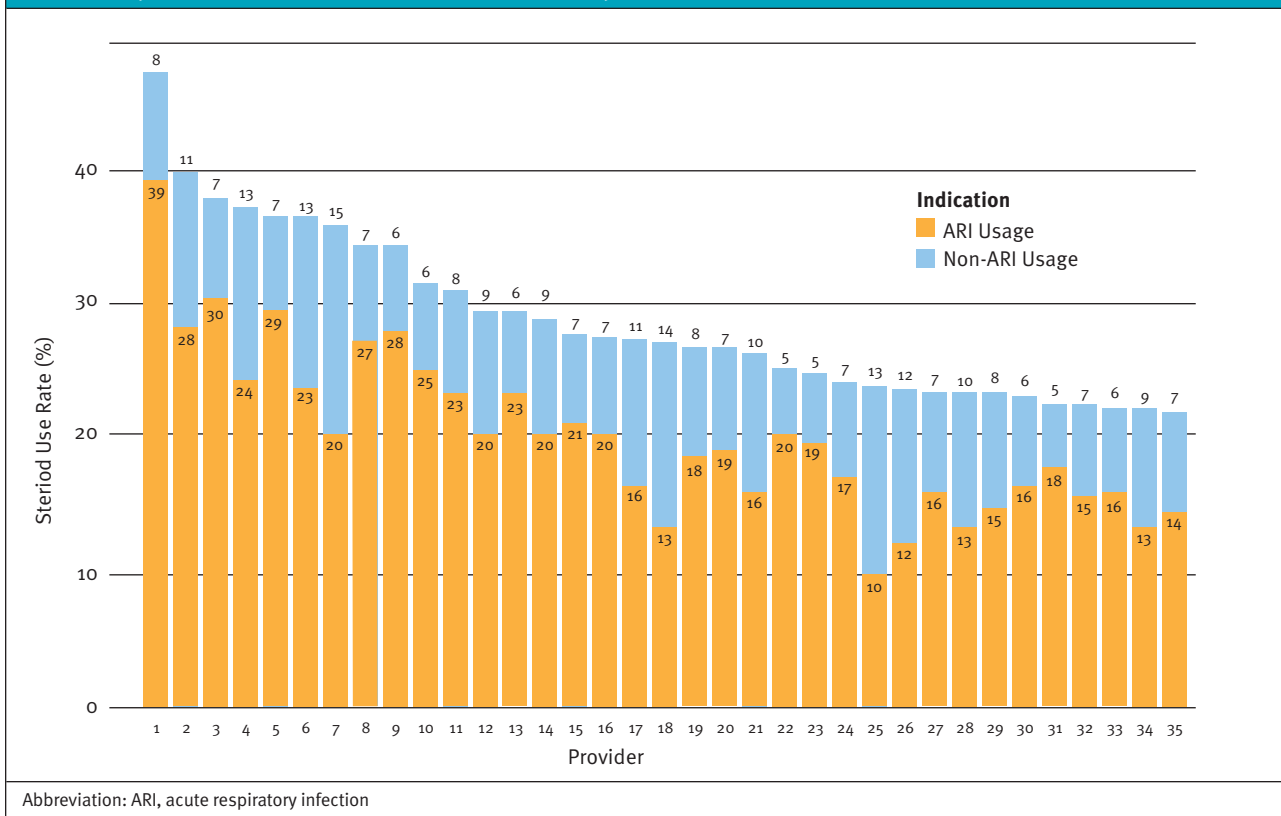
### Steroid Use Rate by Diagnoses and Tier

The top 3 diagnoses with 100 or more encounters associated with the highest SSCG use rates were croup (SSCG use rate 90.3%), contact dermatitis (SSCG use rate 80.4%), and anaphylaxis or allergic reaction diagnoses (ie, adverse events not elsewhere classified, SSCG use rate 76.2%), all of which are tier 1 diagnoses. However, when ranking the top 3 diagnoses by total SSCG use encounters, SSCGs were most frequently utilized for likely avoidable (tier 2 or 3) indications involving ARIs: pharyngitis (tier 2, 14,164 SSCG encounters, use rate 12.1%), acute sinusitis (tier 2, 8,697 SSCG encounters,

**Table 4. Summary of ARI Diagnostic Subgroups With Greater Than 100 Encounters**

Tier	ARI Subgroup	SSCG Use Counts	Number of Encounters	SSCG Use Rate (%)
1	Croup	1003	1111	90.3%
1	Other Respiratory Disorders	386	1188	32.5%
2	Pharyngitis & Tonsillitis	14805	121139	12.2%
2	Acute Sinusitis	8697	24159	36.0%
2	Pneumonia	442	1819	24.3%
2	Covid-19	406	28034	1.5%
3	Nonspecific Upper Respiratory Infection	5574	23947	23.3%
3	Acute Bronchitis	5453	9473	57.6%
3	Cough	3904	14232	27.4%
3	Otitis Media	2114	27577	7.7%
3	Other Respiratory Diagnosis	316	3759	8.4%
3	Laryngitis	244	375	65.1%
3	Influenza	238	5392	4.4%
3	Unspecified Acute Lower Respiratory Infection	132	424	31.1%

Abbreviations: ARI, acute respiratory infection; SSCG, systemic short course glucocorticoid

**Figure 2. Systemic Short Course Glucocorticoid Use by Providers: ARI vs non-ARI**

use rate 36.0%), and acute upper respiratory infections (tier 3, 5,574 SSCG encounters, use rate 23.3%). Common indications for SSCGs varied by age grouping, as summarized in **Table 2**.

SSCG use rates and distribution across diagnostic tiers are summarized in **Table 3**. As expected, tier 1 encounters had the highest SSCG use rate (46.9%, CI 46.5%-47.4%). However, it only accounted for 27.5% of overall SSCG use, suggesting more than 7 in 10 (72.5%, CI 72.2%-72.8%) encounters utilizing SSCGs were likely avoidable (tier 2 32.6%, CI 32.3%-32.9% and tier 3 39.9%, CI 39.5%-40.2%).

### Acute Respiratory Infections

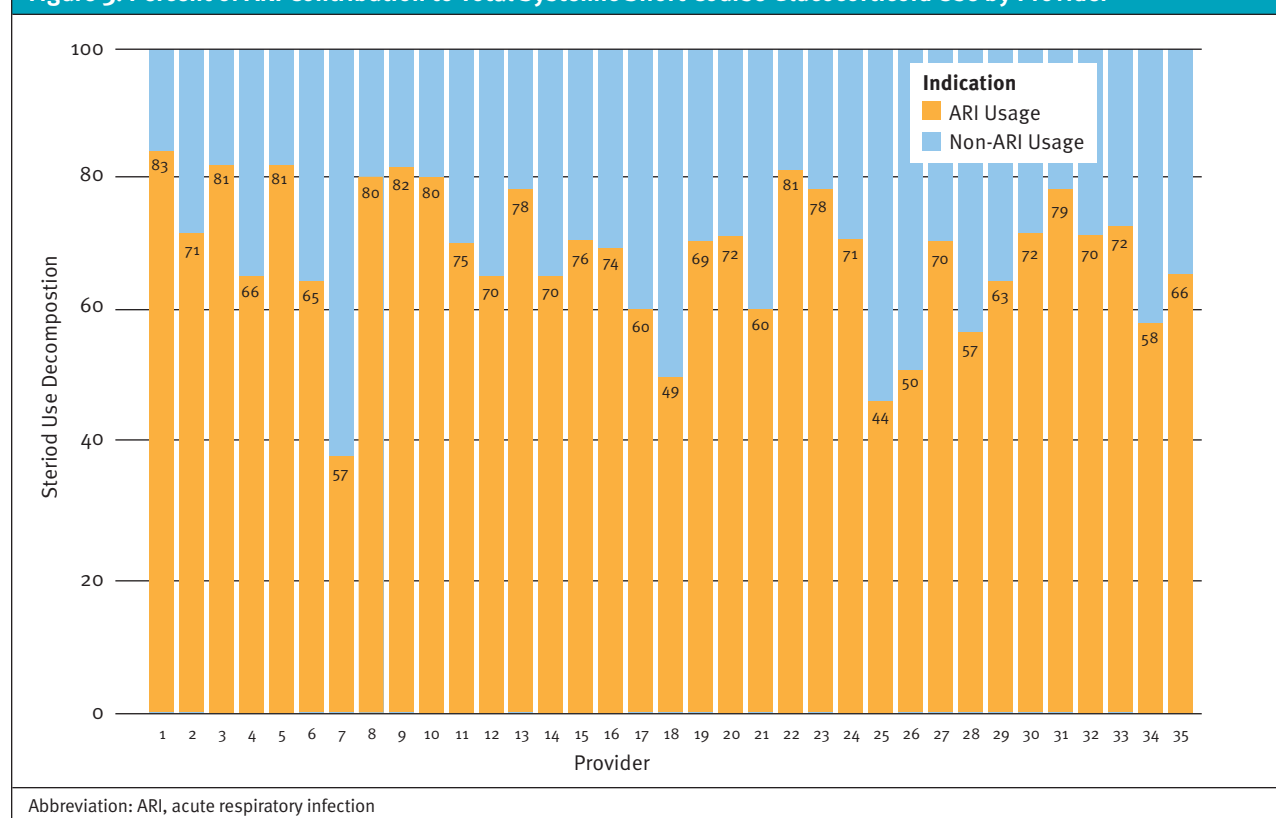
ARI encounters were treated with SSCGs 18.7% of the time vs 11.7% for non-ARI encounters (OR 1.75, CI 1.72-1.77,  $p < 0.001$ ). As shown in **Table 1**, only 2.75 percentage points of the total 18.7% SSCG use for ARI encounters were for tier 1 indications, compared to 6.1 percentage points of the total 11.7% SSCG use for non-ARI encounters. The odds ratio for tier 1 contribution to total steroid use in ARI encounters was 0.16 (CI 0.15-0.16,  $p < 0.001$ ), indicating that SSCG use in ARI en-

counters was more likely to be avoidable. ARI encounters accounted for 66.0% (CI 65.7-66.3%) of SSCG use and represent 77.7% (CI 77.3-78.0%) of all non-tier 1 SSCG use (tier 2 89.1% [CI 88.7-89.4%] and tier 3 68.3% [CI 67.9-68.8%]).

SSCG rates by tier assigned diagnoses for croup, pharyngitis, sinusitis, and URIs were previously discussed. As noted in **Table 4**, the SSCG use rates for many ARI diagnoses from tier 2 or 3 neared or exceeded 25%. Laryngitis and bronchitis were treated with SSCGs more than half of the time (laryngitis rate 65.1%, CI 60.1-69.7% and bronchitis rate 57.6%, CI 56.6-58.6%), while other lower acute respiratory infections, cough, and pneumonia, received SSCGs 31.1% (CI 26.9-35.7%), 27.4% (CI 26.7-28.2%), and 24.3% (CI 22.4-26.3%), respectively. Conversely, only other respiratory diagnoses, (rate 8.4%, CI 7.6 - 9.3%), otitis media (rate 7.7%, CI 7.4 - 8.0%), influenza (rate 4.4%, CI 3.9-5.0%), and COVID-19 (rate 1.5%, CI 1.3-1.6%) had SSCG use rates below 10%.

### Provider Analysis

Compared to physicians, nurse practitioners (NPs) had

**Figure 3. Percent of ARI Contribution to Total Systemic Short Course Glucocorticoid Use by Provider**

30% higher odds (OR 1.30, CI 1.28–1.33,  $p<0.001$ ) and physician assistants (PAs) 17% higher odds (OR 1.17, CI 1.14–1.19,  $p<0.001$ ) to utilize SSCGs. This trend was also observed in SSCG use rates for ARI encounters, which were 15.2%, 19.1% (OR 1.32, CI 1.28–1.36,  $p<0.001$ ), and 19.7% (OR 1.37, CI 1.33–1.40,  $p<0.001$ ) for physicians, PAs, and NPs, respectively. Tier analysis revealed that tier 1 use contributed a larger percentage of overall SSCG use for physicians than their advanced practice provider (APP) colleagues. Tier 1 SSCG use was 30.5%, 27.7% (OR 0.87, CI 0.83–0.92,  $p<0.001$ ), and 26.8% (OR 0.84, CI 0.80–0.87,  $p<0.001$ ) for physicians, PAs and NPs, respectively.

After excluding providers with fewer than 100 encounters, comparing providers in the upper vs lower quartile of SSCG use rates revealed striking differences. Odds that an encounter involving providers in the highest quartile of SSCG use were 6 times higher that SSCG would be used than their peers in the lowest quartile (25.2% vs 5.3% OR 6.07, CI 5.90–6.24,  $p<0.001$ ). Providers in the highest SSCG use quartile accounted for 30.4% of the total encounter volume within the study yet were responsible for nearly half (49.3%, CI 49.0–

49.6%) of the SSCG use. Tier analysis shows that tier 1 use accounted for more than half (52.0%) of the overall SSCG use among providers in the lowest SSCG use quartile vs only 19.4% (OR 0.22, CI 0.21–0.24,  $p<0.001$ ) of the SSCGs in the highest use quartile. Analysis of individual providers with at least 100 encounters revealed the highest SSCG use rate noted was 46.4%. Additionally, 21 of the 277 providers with 100 or more encounters had SSCG use rates exceeding 25%. Among the 35 providers with the highest SSCG use rates, the proportion of SSCG use associated with ARI encounters ranged from 44.2–83.3% (Figure 2,3).

### Discussion

This study describes SSCG use during urgent care and convenient care visits in a large healthcare system from July 2022 through June 2023. This is the first study to focus on SSCG use in the urgent or convenient care setting or to describe SSCG use since the COVID-19 pandemic. Overall, nearly 1 in 6 (15.5%) of these visits were associated with SSCG use, with higher rates seen in adult vs pediatric age groups and slightly higher rates seen in female vs male patients. The majority were



likely avoidable based on tier-assigned (tier 2 or tier 3) diagnostic indication. Widespread, increasing SSCG use for avoidable indications has been suggested in several previous publications from locations throughout the world.<sup>1-2,7-8</sup> In a U.S. nationwide study of steroid use in acute respiratory tract infections (ARTIs) from 2007 through 2016, the systemic steroid use rate increased from 10.5% to 16.3%, with urgent care clinics identified as the care setting with the highest use rate.<sup>9</sup> While that study also noted a higher steroid use rate for ARTIs in urgent care vs walk-in retail clinics, we did not note a similar difference in urgent vs convenient care clinics' overall SSCG use within our healthcare system. This may be due to differences in walk-in retail clinics (where care may be driven by standing treatment protocols) vs convenient care clinics in our healthcare system—which primarily differ from our urgent care clinics by a lack of on-site x-ray.

In our analysis, children received SSCGs less than half as often as adults. This relative reduction in SSCG use for pediatric patients appeared roughly consistent for ARI and non-ARI encounters. Furthermore, when SSCGs were utilized for pediatric patients, they were more commonly used for tier 1 indications—a trend that was stronger in our younger age brackets relative to adolescents (**Table 1**). This differs from previous literature where use rates were similar between adult and pediatric patients.<sup>1-2</sup> The etiology for this difference is unknown. It may be that acute care providers are more cautious to utilize SSCGs in younger children unless indicated given concerns pediatric adverse effects.<sup>10, 11</sup> The reasons behind the differential SSCG use rate warrant further exploration, as it may inform how to best tailor provider education on corticosteroid stewardship efforts.

We utilized a tier schema for SSCG use similar to existing tier categorizations for antibiotic use; however, the expected and appropriate use rates by tier are significantly different given key distinctions. First, we note that the determination of whether a SSCG is avoidable for both tier 1 and tier 2 indications may rely on severity of presentation not captured in diagnosis data more so than antibiotic tier categorizations. As an example, for tier 1 antibiotic indications (eg, non-viral pneumonia, pertussis, urinary tract infection, syphilis), the expected antibiotic use rate would approach 100%,<sup>4</sup> whereas the SSCG use rates for tier 1 encounters (46.9% overall, 54.8% and 30.7% for providers in the highest and lowest SSCG use quartiles, respectively) was much lower. This highlights that, although tier 1 SSCG use was likely appropriate for these indications, it does not necessarily

*“The data suggests that educational interventions for medication stewardship may be more impactful if specific content is tailored to APPs.”*

mean that all tier 1 SSCG use was unavoidable. This assumption likely results in underestimation of avoidable SSCG use for certain tier 1 indications such as contact dermatitis, which may be amenable to topical rather than systemic therapy, or acute gout exacerbation, which can also be treated with non-steroidal anti-inflammatory drugs (NSAIDs) or colchicine. Second, we utilized a simplified approach relative to existing 3-tier antibiotic schema: tier 1 SSCG use was deemed likely appropriate, whereas tier 2 or 3 SSCG use was likely avoidable. While it is true that a small percentage of the tier 2 SSCG use may have been appropriate on a case-by-case basis (eg, severe pharyngitis), most tier 2 SSCG use observed was likely avoidable in the urgent or convenient care setting. This assumption means that the estimated inappropriate antibiotic use rates for tier 2 antibiotic indications such as sinusitis, pharyngitis, and acute otitis media would be much lower than the expected avoidable SSCG use for tier 2 SSCG indications in the urgent or convenient care setting.

Regarding the optimal definition for SSCG use, our study utilized a duration of less than 30 days, as variable durations from 14-30 days have been noted in the literature.<sup>1,2,8,12</sup> Our data indicates that a duration of 14 or fewer days captures greater than 97% of SSCG use in urgent or convenient care clinics within our healthcare system. Though this data may be useful for future research, healthcare systems or clinics interested in implementing corticosteroid stewardship efforts would need to recognize that inclusion of any steroid duration cap within the definition of a potential corticosteroid stewardship metric may inadvertently lead to longer steroid courses than indicated.

The variable practice patterns we observed in our geographic and provider analyses, which were similar to a previously published nationwide analysis on systemic steroid use for ARTIs in the United States from 2007 through 2016,<sup>9</sup> suggest that patient expectations and local culture likely play a role in noted regional differences, as does provider training. Similar to previous

studies, urgent or convenient care visits among patients living in Oklahoma were 53% more likely to have SSCGs utilized vs visits in Missouri, with more pronounced local geographic differences noted on intra-state patient ZIP code analysis.

Likewise, our analysis of urgent and convenient care APPs also found a similar provider type trend. In our analysis, APPs had higher SSCG use rates and utilized SSCGs more often for non-tier 1 indications than physicians, a trend that is very similar to available data on systemic steroid use for ARTIs<sup>9</sup> and antibiotic use.<sup>13</sup> It is important to highlight that the differing medication use rates by provider training seen in our study and others<sup>9,13</sup> are expected to have a larger impact in the urgent and convenient care clinics given the typical medical provider staffing ratios utilized in these care settings. In our study, APPs accounted for just over 80% of the total patient encounters. The data suggests that educational interventions for medication stewardship may be more impactful if specific content is tailored to APPs, and that opportunities exist to support APP participation and leadership within medication stewardship programs in this APP-predominant care setting.

While patient age, geographic variability, and provider training may all impact SSCG use, one of the strongest predictors of SSCG overuse appears to be the individual provider's practice pattern. As noted, the highest SSCG rate noted by an individual provider neared SSCG use for nearly half (46.4%) of that provider's 4,561 encounters. Among the 277 providers with at least 100 encounters, the 5 providers with the highest SSCG rates accounted for just over 10% of all the SSCG use noted within our study of over half a million patient encounters. This striking variability in provider practice patterns noted in our study, while not unique to SSCGs,<sup>14</sup> highlights why it is important to monitor SSCG use at the individual provider level, as it allows for SSCG overuse to be appropriately identified and addressed via targeted educational efforts.

A substantial amount of SSCG overuse was driven by use in ARI encounters. With the notable exception of croup in pediatric patients—where a SSCG such as a single dose of dexamethasone is the first line treatment given evidence of reduction in symptoms and the rate of return visits<sup>15</sup>—there is very little evidence supporting the routine use of SSCGs for ARIs, and their use in outpatients is not routinely recommended by clinical guidelines. For pharyngitis, which accounted for 15.5% of SSCGs utilized in our study, data have shown that SSCGs may shorten the duration of this self-limited illness by about 11 hours.<sup>16</sup> Given the limited expected benefit

and inconclusive benefit to harm ratio, most major organizations do not recommend the routine use of SSCGs.<sup>3,17-19</sup> Similarly, minimal benefit of SSCGs in acute sinusitis seen in studies may be attributable to attrition bias or secondary care settings in which the studies were performed.<sup>20</sup> Acute sinusitis clinical practice guidelines (CPG) recommend intranasal corticosteroids rather than SSCGs.<sup>21, 22</sup> For pneumonia and COVID-19, while SSCGs may be indicated for patients with severe illness requiring inpatient level care, they are not indicated for outpatients.<sup>23-29</sup> Moreover, although SSCG use for tier 3 ARIs was common, the research and guidelines available for bronchitis,<sup>30</sup> laryngitis,<sup>31</sup> otitis media,<sup>32</sup> URIs,<sup>33</sup> and influenza<sup>34</sup> recommend against SSCG use.

Our data on SSCG use stratified by tier based diagnostic indication vs SSCG use in ARI encounters may inform future corticosteroid stewardship clinical quality metrics needed to advance steroid stewardship efforts. As an example, for our healthcare system's network of urgent and convenient care clinics, an approach that focused solely on reducing SSCG use in ARIs would identify most opportunities to reduce avoidable steroid use but would have missed more than 1 in 5 (or 14,731 encounters) opportunities for improvement. However, understanding that the level of support will vary by institution and that SSCG use for ARI varies considerably by geographic location, we would recommend collecting baseline data of SSCG use rates overall and for ARI encounters then utilizing that data to implement a corticosteroid stewardship program that excludes tier 1 diagnoses.

### Limitations

Our study has important limitations to consider. First, though our sample size is robust, it is limited to urgent or convenient care clinics located in 3 states and may not be generalizable to other geographic locations, given the known geographic variations.<sup>9</sup> Second, while some may view the limited exclusion criteria as a limitation, we felt that limited exclusions provide a fuller picture of how SSCGs are being used in this setting and controlled against selection bias. Third, our analysis did not consider all covariates that may impact SSCG use or severity of illness data, which could further inform whether the SSCG use was appropriate. A covariate warranting further analysis in future studies is SSCG use in video telehealth vs in-person encounters. Fourth, the lack of a diagnostic indication requirement for all medication orders in our electronic medical record means that, despite our best efforts to infer the diagnostic indication in the tiered fashion described, our analyses

are at risk for misclassification bias and may be limited by a lack of diagnostic specificity. Fifth, the tier schema developed for this study, which, to our knowledge, is a novel approach for SSCG analysis, was created by the lead author rather than a clinical consensus. Sixth, the limitations of our method to estimate the percentage of avoidable SSCG use based on tiered categories discussed previously likely result in offsetting errors in our estimation. Finally, the design of our study did not seek to identify SSCG overuse by other means, namely dose or duration analysis by diagnostic indication, or SSCGs ordered outside of urgent or convenient care encounter types meeting inclusion criteria, which likely results in further underestimation of SSCG overuse.

Despite these limitations, our findings that SSCGs were utilized in 18.5% of adult and 8.4% of pediatric urgent or convenient care encounters from July 2022 through June 2023 in a large healthcare system, and that approximately 7 in 10 of the SSCGs used may have been avoidable, highlight the need to establish specific SSCG measures to advance corticosteroid stewardship efforts in the urgent and convenient care setting. ■

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