

Background

- Respiratory tract diagnoses (RTDs) are the most common indication for ambulatory antibiotic prescriptions, up to 50% of which are estimated to be inappropriate.^{1,2}
- Seasonal variations in antibiotic prescribing for RTDs have been identified, with increased rates of prescribing in the winter months relative to the summer months^{3,4}; however, the characteristics and appropriateness of these variations have not been well described.
- Previously, it has been shown that individual providers' rates of prescribing for all RTDs and for tier 3 RTDs¹ are correlated with overall inappropriateness of prescribing (Table 1).³
- Certain provider demographics have also been associated with inappropriate prescribing, specifically APP, family medicine specialty, fewer years in practice, nonteaching practice, and nonurban practice.³

Table 1. Tiers of diagnostic codes describing antibiotic appropriateness.¹

Diagnostic category	Example diagnoses
Tier 1 – Antibiotics almost always indicated	Bacterial pneumonia, streptococcal pharyngitis, respiratory tract abscess
Tier 2 – Antibiotics may be indicated	Pharyngitis, sinusitis, suppurative otitis media, COPD or bronchiectasis with exacerbation
Tier 3 – Antibiotics not indicated	Asthma, bronchitis, viral respiratory infections, non-suppurative otitis media, non-specific respiratory symptoms

Objectives

- To describe seasonal variations in diagnosis and prescribing patterns
- To determine whether there is an association between provider characteristics and seasonal prescribing patterns.
- To determine whether seasonal changes in prescribing are associated with inappropriate prescribing

Methods

- From 7/1/2016-6/30/2017, antibiotic prescribing was analyzed for 31 primary care practices comparing winter (October-March) and summer (April-September) months.
- ICD-10 codes for RTDs were described as tier 1, 2, or 3 based on whether antibiotics are almost always, sometimes, or almost never indicated, respectively.
- Twenty visits from each of 60 providers were randomly selected and manually reviewed to determine a gold standard of antibiotic appropriateness in order to characterize the appropriateness of seasonal variations in prescribing.
- Associations between season and diagnostic tier, season and appropriateness, and individual provider seasonal changes in antibiotic prescribing and provider characteristics were determined (Tables 2-7)

Results

Table 2. Summary of total RTD visits with or without antibiotic by season.

	No antibiotic (%)	Antibiotic (%)	Total
Winter	30,532 (60)	20,558 (40)	51,090
Summer	26,809 (70)	11,728 (30)	38,537
Total	57,341	32,286	89,627

- There was a **lower proportion of visits with tier 3 diagnoses in winter months** (68% vs 74%, $p < 0.01$), but a **greater proportion of tier 2 diagnoses** (29% vs 23%, $p < 0.01$).
- There were **greater proportions of visits in which an antibiotic was prescribed** for both tier 2 (80% vs 74%, $p < 0.01$) and tier 3 diagnoses (23% vs 16%, $p < 0.01$) **in winter months**.

Table 3. Proportion of inappropriate prescribing by season.

	Number Appropriate	Number Inappropriate	% Inappropriate
Summer	230	370	62%
Winter	166	234	72%
Total	396	804	67%

Inappropriate antibiotics were prescribed more frequently in the winter months compared to the summer months: 72% vs 62%, $p < 0.01$

Table 4. Proportion of diagnoses made seasonally.

	Summer (%)	Winter (%)	P-value
Tier 1	2	2	0.48
Tier 2	23	29	<0.01
Tier 3	74	68	<0.01

Table 5. Proportion of prescribing for each diagnostic tier seasonally.

	Summer (%)	Winter (%)	P-value
Tier 1	44	46	0.43
Tier 2	74	80	<0.01
Tier 3	16	23	<0.01

Table 6. Association of selected metrics with inappropriate prescribing.

Variable	β -coefficient	p-value	R ²
% prescribing for tier 3 RTDs	0.78	<0.01	0.31
% prescribing for all RTDs	0.54	<0.01	0.28
Seasonal prescribing variance (% prescribing winter - % prescribing summer)	1.32	<0.01	0.11

- Seasonal variation in percent prescribing was correlated with inappropriate prescribing**, though less so than previously described metrics.

Table 7. Provider demographics and seasonal variation in prescribing rates (*associated with greater inappropriate prescribing)

	N (%)	Mean seasonal increase in % prescribing	P-value
Provider role			
Physician	139 (76)	6.5	0.50
APP*	43 (24)	5.8	
Provider gender			
Male	72 (40)	6.4	0.92
Female	110 (60)	6.3	
Provider specialty			
IM	105 (58)	5.1	<0.01
FM*	77 (42)	8.2	
Board certification			
Before 1997	89 (49)	6.9	0.28
After 1997	93 (51)	5.9	
Teaching status			
Teaching	61 (34)	2.9	<0.01
Nonteaching*	121 (66)	8.1	
Practice setting			
Urban	95 (52)	3.9	<0.01
Nonurban*	87 (48)	9.1	

- Certain **provider characteristics** were associated with **increased rates of prescribing in the winter months**.

Conclusions

- Although there was a greater proportion of tier 2 diagnoses made in winter months, winter months were associated with greater inappropriate prescribing relative to summer months.
- Seasonal variation in prescribing did not outperform prior metrics (prescribing for tier 3 RTDs and all RTDs) of inappropriateness of prescribing.
- Further investigation is needed to understand the drivers for seasonal variations in RTDs and antibiotic prescribing.

References

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