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Beyond the Watch List: Antibiotic Prescribing for Adult Upper Respiratory Tract Infections in an Emergency Department in Bahrain

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Abstract

Introduction: Upper respiratory tract infections (URTIs) are among the most common presentations to emergency departments (EDs) worldwide, and antibiotic prescribing for adult URTIs remains common despite their predominantly viral, self-limiting course. This pattern of antibiotic prescribing contributes to antimicrobial resistance and avoidable adverse effects, and no prior study has characterized adult antibiotic prescribing for URTIs anywhere in Bahrain, including within Bahrain's Royal Medical Services (RMS)/Bahrain Defence Force Military Hospital system. This study evaluated the frequency, WHO Access, Watch, Reserve (AWaRe) classification, and clinical correlates of antibiotic prescribing for adult URTI visits at a tertiary military hospital in Bahrain.

Methods: We conducted a retrospective cross-sectional review of electronic medical records (EMRs) for adult patients (age ⩾14 years) diagnosed with a URTI in the ED of the RMS Military Hospital, Bahrain, between 1 July and 31 December 2025. Data extracted included demographics, triage acuity, diagnosis code, antibiotic prescription and agent, respiratory swab testing and result, and ED revisit within two weeks. Antibiotic agents were classified using the WHO AWaRe framework. Associations with antibiotic prescribing were assessed using chi-square tests and multivariable logistic regression.

Results: Of 452 adult URTI visits, 121 (26.8%; 95% confidence interval (CI) 22.9-31.0%) resulted in an antibiotic prescription. Watch-category agents accounted for 69/120 agent mentions (57.5%), exceeding Access-category use (51/120, 42.5%); Augmentin (amoxicillin-clavulanate) and azithromycin were the most frequently prescribed agents. A respiratory swab was performed in only 55/449 visits (12.2%); among the 29 patients with a positive viral result, seven (24.1%) nonetheless received an antibiotic. On multivariable logistic regression, each additional decade of age was independently associated with 29% higher odds of antibiotic prescribing (odds ratio (OR) 1.29, 95% CI 1.14-1.45, p<0.001); sex, triage acuity, and swab testing were not independently associated. Prescribing varied markedly by month, from 12.4% in November to 55.9% in December (p<0.001). Patients who revisited the ED within two weeks of the index visit had a higher index-visit prescribing rate than those who did not (39.2% vs. 25.4%), a non-significant trend (p=0.055).

Conclusions: Approximately one in four adult URTI visits to this ED resulted in an antibiotic prescription, with a disproportionate share of Watch-category agents relative to first-line Access-category options. These findings provide the first adult-specific baseline data for this institution and suggest candidate antimicrobial stewardship targets, in particular, reducing reliance on Watch-category agents and evaluating whether point-of-care viral testing could support diagnosis-driven prescribing decisions.

Categories: Emergency Medicine, Quality Improvement, Infectious Disease
Keywords: antibiotic prescribing, antimicrobial stewardship, bahrain, emergency department, upper respiratory tract infection, who aware classification

Introduction

Upper respiratory tract infections (URTIs) are among the most frequent reasons for presentation to emergency departments (EDs) globally [1].

The overwhelming majority are caused by viral pathogens and are self-limiting, yet antibiotics continue to be prescribed at rates that substantially exceed what would be expected if treatment were strictly guided by etiology [1-5]. This pattern of overprescribing is a recognized driver of antimicrobial resistance, unnecessary healthcare expenditure, and avoidable adverse drug reactions, and has made URTI management a focal point for antimicrobial stewardship programs internationally [6,7].

EDs present particular challenges for stewardship efforts. High patient volumes, diagnostic uncertainty at

the point of care, limited access to rapid microbiological testing, and time pressure on treating clinicians all contribute to a prescribing environment in which empiric antibiotic use for undifferentiated respiratory symptoms is common [1,7]. Beyond the immediate risk of resistance selection, unnecessary antibiotic exposure has also been linked to increased likelihood of future healthcare reattendance for similar complaints, suggesting that inappropriate prescribing may not only fail to benefit patients but could paradoxically increase downstream utilization [8].

The introduction of the WHO Access, Watch, Reserve (AWaRe) classification has provided a practical framework for evaluating not only whether an antibiotic was prescribed, but whether the agent selected was an appropriate first-line (Access) choice or a broader-spectrum (Watch) agent whose use should be reserved for specific indications [9,10]. Applying this framework to ED-level prescribing data allows stewardship efforts to move beyond a binary yes/no prescribing metric toward a more actionable picture of agent-class distribution.

Despite a substantial international literature describing URTI antibiotic prescribing patterns and their determinants [1-5,7,11], Bahrain-specific data remain limited and dated. A single prior study characterized antibiotic prescribing for pediatric URTI at this same institution using 2005-2006 data [12], and a separate study described all-cause (not URTI-specific) antibiotic prescribing among adult patients of all diagnoses in the emergency room of a different, secondary-care hospital in Bahrain using a one-month sample from 2014 [13]. To our knowledge, no prior study, at this institution or elsewhere in Bahrain, has specifically characterized antibiotic prescribing for adult URTI visits, and this is the first study of any kind to examine adult antibiotic prescribing within the Royal Medical Services (RMS)/Bahrain Defence Force Military Hospital system, whose only prior local publication on this topic was limited to a pediatric population [12]. No prior Bahraini study, at this or any other institution, has applied the WHO AWaRe framework to URTI prescribing.

This study was undertaken to establish contemporary, URTI-specific baseline data on the frequency, AWaRe agent-class distribution, and clinical correlates of antibiotic prescribing for adult ED patients at a tertiary military hospital in Bahrain, with the aim of identifying concrete, locally relevant targets for antimicrobial stewardship intervention.

Materials And Methods

Study design and setting

This was a retrospective, cross-sectional observational study based on electronic medical record (EMR) review, conducted in the Emergency Medicine Department of the RMS Military Hospital, Kingdom of Bahrain. Chart review and data extraction were conducted retrospectively, after Institutional Review Board approval, and covered the six-month period from 1 July to 31 December 2025. The study was approved by the institutional review board of the RMS Military Hospital (approval number RMS-MH/IRB/2026-1160, approved April 2026), and given its retrospective design with no direct patient or physician contact, a waiver of informed consent was granted.

Study population

All adult patients (age ⩾14 years) presenting to the ED and assigned a discharge diagnosis consistent with a URTI (International Classification of Diseases, 10th revision (ICD-10) [14] codes J06.9, J39.9, J39.8, J06.8, J39, J06.0, B33.8, or B34.2) between 1 July and 31 December 2025 were eligible for inclusion. The unit of analysis was the ED visit (encounter) rather than the patient: 452 visits were made by 421 unique patients, of whom 27 had more than one visit (23 with two visits and four with three visits). A revisit was defined as a return to the ED within two weeks of an index visit. An age of 14 years was used as the lower cutoff for adult status because it corresponds to the standard threshold separating pediatric from adult ED intake at RMS Military Hospital. To test whether this choice influenced the findings, the analyses were repeated in a sensitivity analysis restricted to patients aged ⩾18 years. Patients with a diagnosis of pneumonia or other lower respiratory tract infection, an exacerbation of chronic lung disease (e.g., chronic obstructive pulmonary disease or asthma), or a condition in which antibiotics are routinely indicated (e.g., known immunocompromised status) were excluded a priori by restricting the diagnosis codes above to upper, non-complicated respiratory presentations.

Data collection

Data were extracted from the hospital EMR and included patient age, sex, nationality, triage acuity level, disease description and ICD-10 code, ED disposition/outcome, antibiotic prescription status and agent name, performance and result of a throat/nasal swab (where obtained), and documented ED revisit within two weeks of the index visit. The EMR did not record the clinical indication for respiratory swab testing, which was at the treating physician's discretion. Revisit status was taken from the documented field, and four patients recorded as admitted after the index visit were counted as revisits. Swab status was missing for three visits; all 55 visits with a swab had a documented result (29 positive and 26 negative), so no swab results were missing. No patient identifiers were retained in the analysis dataset.

Antibiotic classification

Antibiotic agents were mapped to their WHO AWaRe category according to the 2021 WHO AWaRe classification update [10]. Agents recorded with non-standard spelling or brand names in the source data were mapped to a single canonical generic or brand name prior to classification (e.g., "Zinnat" to cefuroxime; combination entries for amoxicillin and clavulanic acid to Augmentin). Because detailed clinical data, such as Centor/McIsaac scores, symptom duration, or streptococcal testing, were not available in the structured EMR fields, this study characterizes antibiotic agent selection against the WHO AWaRe framework rather than the clinical appropriateness of individual prescribing decisions. One prescription was recorded as "yes" without an agent name; the 121 prescriptions therefore correspond to 120 antibiotic agent mentions, and agent-level percentages use 120 as the denominator.

Statistical analysis

Descriptive statistics were used to summarize patient characteristics and prescribing patterns; continuous variables are presented as mean ± standard deviation (SD) or median (interquartile range, IQR) as appropriate, and categorical variables as frequency (percentage). The 95% confidence interval (CI) for the primary outcome (proportion of visits with an antibiotic prescription) was calculated using the Wilson score method. Bivariate associations between antibiotic prescribing and candidate factors (sex, age group, triage acuity, swab testing, nationality, and ED revisit within two weeks) were assessed using the chi-square test. A multivariable logistic regression model was fitted with antibiotic prescription (yes/no) as the outcome and age (per 10-year increment), sex, swab testing, and triage acuity (urgent, levels 2-3, versus standard/non-urgent, levels 4-5) as covariates; results are reported as adjusted odds ratios (ORs) with 95% CIs. Covariates were prespecified on clinical grounds and EMR availability (age, sex, swab testing, and triage acuity) rather than selected by significance testing; nationality and revisit were not entered, the latter because it occurs after the prescribing decision. Model fit and discrimination were assessed using McFadden's pseudo-R^2, the area under the receiver operating characteristic curve (AUC), and the Hosmer-Lemeshow test. Comorbidities were not available in the structured EMR fields. Because diagnosis code and calendar month were available, prescribing was compared by diagnosis code (J06.9 versus all other codes) and by month using the chi-square test, and the multivariable model was repeated with each added as a sensitivity analysis. Missing data were handled by complete-case analysis. Denominators vary slightly across analyses because of missing data on individual fields: 452 visits had complete diagnosis and prescribing data; 449 had a documented swab-testing status (three missing) and complete data on all logistic regression covariates; and 444 had a documented revisit-within-two-weeks status (eight missing). A two-sided p-value <0.05 was considered statistically significant. Analyses were performed using Python (version 3.12, Python Software Foundation, Wilmington, DE; pandas, NumPy, and SciPy libraries).

Results

Study population

During the six-month study period, 452 adult ED visits met the inclusion criteria. The monthly distribution of cases is shown in Table *1*. Baseline characteristics of the cohort, including the breakdown of ICD-10 diagnosis codes, are summarized in Table *2*. The mean age was 38.8 ± 18.1 years (range 14-98 years), and the sex distribution was near-even (50.2% female). The great majority of visits (359/452, 79.4%) carried a diagnosis of acute URTI, unspecified (ICD-10 J06.9).

Month	Adult URTI presentations, n
July 2025	53
August 2025	41
September 2025	70
October 2025	131
November 2025	89
December 2025	68
Total	452

TABLE 1: Monthly distribution of adult upper respiratory tract infection (URTI) presentations included in the study (n = 452)

Characteristic	Value
Age, years-mean ± SD	38.8 ± 18.1
Age, years-median (IQR)	34 (25–51)
Age range	14–98
Female sex, n (%)	227 (50.2)
Male sex, n (%)	225 (49.8)
Bahraini nationality, n (%)	365 (80.8)
Non-Bahraini nationality, n (%)	87 (19.2)
Triage level 2–3 (urgent), n (%)	83 (18.4)
Triage level 4 (standard), n (%)	290 (64.2)
Triage level 5 (non-urgent), n (%)	79 (17.5)
Throat/nasal swab performed, n/N (%)	55/449 (12.2)
J06.9 (acute upper respiratory infection, unspecified), n (%)	359 (79.4)
J39.9 (disease of upper respiratory tract, unspecified), n (%)	50 (11.1)
J39.8 (other specified diseases of upper respiratory tract), n (%)	16 (3.5)
B34.2 (coronavirus infection, unspecified site), n (%)	8 (1.8)
J06.0 (acute laryngopharyngitis), n (%)	6 (1.3)
J39 (other diseases of upper respiratory tract), n (%)	6 (1.3)
J06.8 (other acute upper respiratory infections of multiple sites), n (%)	4 (0.9)
B33.8 (other specified viral diseases), n (%)	3 (0.7)

TABLE 2: Baseline characteristics of the study group

Primary outcome: frequency of antibiotic prescribing

An antibiotic was prescribed in 121 of 452 visits (26.8%, 95% CI 22.9-31.0%). The remaining 331 visits (73.2%) were managed without an antibiotic.

Antibiotic agents and WHO AWaRe classification

Among the 121 prescriptions, 120 antibiotic agent mentions were recorded (Table *3*), because one prescription had no agent name documented. Augmentin (amoxicillin-clavulanate) was the most frequently prescribed agent (47/120, 39.2%), followed by azithromycin (37/120, 30.8%). By AWaRe category, Watch-group agents accounted for 69/120 mentions (57.5%) and Access-group agents for 51/120 (42.5%; Figure *1*); no Reserve-group agents were used.

Agent	Mentions, n (%)	AWaRe category
Augmentin (amoxicillin-clavulanate)	47 (39.2)	Access
Azithromycin	37 (30.8)	Watch
Cefuroxime	14 (11.7)	Watch
Rocephin (ceftriaxone)	7 (5.8)	Watch
Moxifloxacin	5 (4.2)	Watch
Amoxicillin	4 (3.3)	Access
Clarithromycin	3 (2.5)	Watch
Ciprofloxacin	2 (1.7)	Watch
Cefixime	1 (0.8)	Watch

TABLE 3: Antibiotic agents prescribed and WHO Access, Watch, Reserve (AWaRe) classification (121 prescriptions, 120 agent-mentions)



FIGURE 1: Proportional distribution of antibiotic agent mentions by WHO Access, Watch, Reserve (AWaRe) category (Access vs. Watch; n = 120)

Diagnostic testing and potentially discordant prescribing

A throat/nasal swab was collected in 55/449 visits with data available (12.2%). Of the swabs collected, 26 returned a negative result, and 29 returned a positive viral result (influenza A/B or COVID-19). Among these virologically confirmed cases, seven (24.1%) nonetheless received an antibiotic prescription. Because detailed clinical information, examination findings, symptom duration, or streptococcal testing was not available, we could not determine whether these prescriptions were clinically inappropriate; we describe this instead as potentially discordant prescribing, consistent with diagnostic uncertainty as a proximate driver of empiric antibiotic use in time-pressured ED settings.

Factors associated with antibiotic prescribing

On bivariate analysis (Table *4*, Figure *2*), age group was significantly associated with antibiotic prescribing (p=0.001), rising from 19.1% in patients aged 14-30 years to 38.3% in those aged ⩾51 years. Sex, triage acuity, swab testing, and nationality were not significantly associated with prescribing. ED revisit within two weeks (n=444 with documented status) showed a non-significant trend toward higher index-visit prescribing (39.2% among revisits vs. 25.4% among non-revisits, p=0.055).

Factor	Group	Antibiotic prescribed, n	Total, n	Rate, %	Chi-square (χ^2)	df	p-value
Sex	Female	61	227	26.9	0.00	1	1.000
Sex	Male	60	225	26.7	0.00	1	1.000
Age group	14–30 years	35	183	19.1	13.22	2	0.001
Age group	31–50 years	42	154	27.3	13.22	2	0.001
Age group	≥51 years	44	115	38.3	13.22	2	0.001
Triage level	2–3 (urgent)	23	83	27.7	0.37	2	0.832
Triage level	4 (standard)	79	290	27.2	0.37	2	0.832
Triage level	5 (non-urgent)	19	79	24.1	0.37	2	0.832
Swab performed	Yes	18	55	32.7	0.75	1	0.385
Swab performed	No	103	394	26.1	0.75	1	0.385
Nationality	Bahraini	99	365	27.1	0.05	1	0.832
Nationality	Non-Bahraini	22	87	25.3	0.05	1	0.832
Revisit within two weeks	Yes	20	51	39.2	3.67	1	0.055
Revisit within two weeks	No	100	393	25.4	3.67	1	0.055

TABLE 4: Bivariate associations between candidate factors and antibiotic prescribing

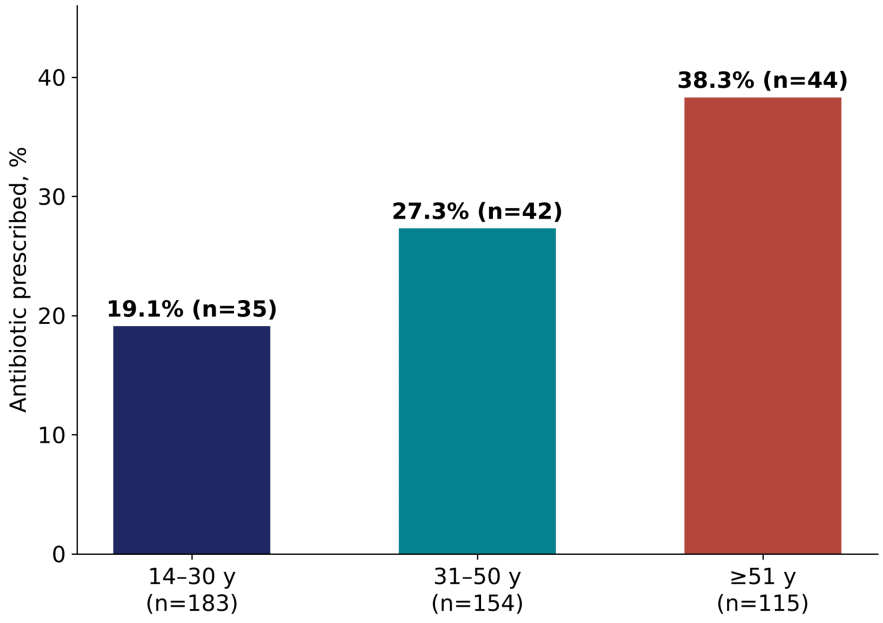

FIGURE 2: Antibiotic prescribing rate by age group (chi-square (χ^2) = 13.22, df = 2, p = 0.001)

On multivariable logistic regression (n=449; Table *5*, Figure *3*), age remained the only variable independently associated with antibiotic prescribing after adjustment: each additional decade of age was associated with 29% higher odds of receiving an antibiotic (OR 1.29, 95% CI 1.14-1.45, $p < 0.001$). Sex, swab testing, and triage acuity were not independently associated with prescribing. Model fit was modest (McFadden pseudo-$R^2 = 0.036$), indicating that the measured covariates explain only a limited proportion of the variability in prescribing decisions; unmeasured clinical factors, including illness severity not captured by triage level,

likely account for most of the remaining variation. In a sensitivity analysis excluding the 33 patients (7.3%) aged 14-17 years, 116 of 419 visits (27.7%, 95% CI 23.6-32.2%) resulted in an antibiotic prescription, and in the multivariable model (n=416) age remained the only independent factor (OR 1.29 per decade, 95% CI 1.13-1.46, p<0.001), with estimates for sex, swab testing, and triage acuity essentially unchanged. Prescribing did not differ significantly between visits coded J06.9 (99/359, 27.6%) and all other codes (22/93, 23.7%; p=0.447); by individual code, the proportion prescribed an antibiotic was 26.0% for J39.9 (13/50), 18.8% for J39.8 (3/16), 33.3% for J06.0 (2/6), 66.7% for J39 (4/6), and 0% for B34.2 (0/8), J06.8 (0/4), and B33.8 (0/3), and adding diagnosis code to the model did not alter the findings (age OR 1.30, 95% CI 1.15-1.47; J06.9 OR 1.42, 95% CI 0.82-2.46). Restricting the analysis to each patient's first visit (n=421), 112 patients (26.6%) received an antibiotic, similar to the all-visit estimate. Prescribing varied significantly by month ($\chi^2 = 42.08$, df = 5, p<0.001): 14/53 (26.4%) in July, 6/41 (14.6%) in August, 19/70 (27.1%) in September, 33/131 (25.2%) in October, 11/89 (12.4%) in November, and 38/68 (55.9%) in December. After adjustment for month, age remained independently associated with prescribing (OR 1.31 per decade, 95% CI 1.15-1.49), swab testing remained non-significant (OR 1.40, 95% CI 0.72-2.73), and model discrimination improved (area under the curve (AUC) 0.73; McFadden pseudo-$R^2 = 0.113$).

Variable	Odds ratio	95% CI	p-value
Age (per 10-year increase)	1.29	1.14-1.45	<0.001
Male sex (ref: female)	1.15	0.75-1.77	0.528
Swab performed (ref: no)	1.37	0.74-2.56	0.320
Urgent triage, level 2-3 (ref: level 4-5)	0.75	0.42-1.34	0.336

TABLE 5: Multivariable logistic regression for antibiotic prescribing (n = 449)

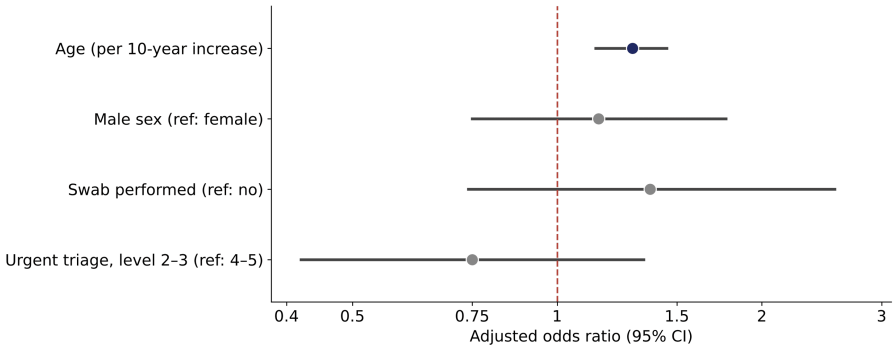

FIGURE 3: Forest plot of adjusted odds ratios (ORs) for antibiotic prescribing from the multivariable logistic regression model (n = 449). Dashed line indicates OR = 1 (no association)

Discussion

In this six-month retrospective cohort of 452 adult ED visits for URTI at a tertiary military hospital in Bahrain, just over a quarter of visits (26.8%) resulted in an antibiotic prescription, despite the predominantly viral and self-limiting nature of the condition. This finding is broadly consistent with international literature describing frequent antibiotic use for URTIs in emergency and ambulatory settings, where the disconnect between typically viral etiology and prescribing behavior has been repeatedly documented [1-5,7]. The present study extends this literature by providing, to our knowledge, the first characterization of adult antibiotic prescribing of any kind within the RMS/Bahrain Defence Force Military Hospital system, whose only prior local publication on this topic examined a pediatric population at the same institution nearly two decades ago [12], and, more broadly, the first Bahraini data specifically characterizing adult URTI antibiotic prescribing, building on a separate Bahraini study of all-cause adult prescribing at a different, secondary-care hospital [13]. It is also the first application of the WHO AWaRe framework to URTI prescribing in Bahrain, characterizing not only how often antibiotics were prescribed but also which agents were selected.

Comparing the two studies conducted at this institution nearly two decades apart offers a tentative signal of

a shifting prescribing pattern rather than a direct comparison: Senok et al. reported amoxicillin as the most frequently prescribed agent for pediatric URTI in 2005-2006 [12], whereas Watch-category agents, chiefly azithromycin, now account for the majority of antibiotic mentions in the present adult cohort, with Augmentin remaining the single most-used individual agent. Because the two studies differ in both patient age group and two decades of interval, this comparison cannot establish a true within-institution trend, but it is directionally consistent with the broader international drift toward Watch-category prescribing described elsewhere [9,10] and suggests that local antimicrobial stewardship efforts at this institution may benefit from renewed attention to agent selection, not only prescribing frequency.

The AWaRe distribution observed here is a notable stewardship finding in its own right. Watch-category agents, principally azithromycin, cefuroxime, and ceftriaxone, accounted for more than half of all antibiotic mentions (57.5%), exceeding the use of first-line Access-category agents such as amoxicillin. This pattern echoes findings from other health systems applying the AWaRe framework to respiratory infection prescribing, where Watch-category agents are frequently over-represented relative to WHO's global target of at least 60% Access-category use across total antibiotic consumption [9,10]. Because Watch-category agents carry a comparatively higher resistance-selection potential, this imbalance represents a candidate target: promoting first-line Access agents (where an antibiotic is indicated at all) over broader-spectrum Watch alternatives for uncomplicated URTI.

Individual agent selection can also be viewed against clinical guidance for uncomplicated URTI. Current guidance advises against antibiotics for the common cold and for most acute rhinosinusitis, reserving them for persistent or severe presentations, and recommends antibiotics for pharyngitis only when group A streptococcal infection is confirmed, with penicillin or amoxicillin as first-line agents [15,16]. Against this background, the most frequently prescribed agent, amoxicillin-clavulanate (39.2% of agent mentions), is a broader-spectrum combination than first-line guidance suggests, whereas plain amoxicillin accounted for only 3.3%. Azithromycin, the second most common agent (30.8%), is positioned as an alternative for penicillin-allergic patients with streptococcal pharyngitis rather than as a first-line option [16], and cephalosporins, fluoroquinolones, and macrolides together make up most of the remaining Watch-category use. The WHO AWaRe antibiotic book likewise frames Access-category agents as the first choice for common community infections and restricts Watch-category agents to more specific indications [17]. Because symptom, examination, and streptococcal testing data were unavailable, we cannot identify which individual prescriptions departed from this guidance; these comparisons describe agent selection rather than clinical appropriateness.

Diagnostic testing was infrequent in this cohort, with a respiratory swab performed in only 12.2% of visits. Among the minority who were tested and returned a positive viral result, roughly one in four still received an antibiotic, a marker of potentially discordant prescribing given the confirmed viral etiology, though the absence of detailed clinical data means true clinical inappropriateness cannot be established with certainty. This finding aligns with the broader observation that diagnostic uncertainty, rather than confirmed bacterial infection, is often the proximate driver of empiric antibiotic use for URTI in time-pressured ED settings [1,7]. Rapid point-of-care viral testing may therefore be worth evaluating as a lever for reducing unnecessary prescribing by giving clinicians more concrete information to act on at the point of the prescribing decision; however, a positive viral result does not exclude bacterial coinfection, the indications for swab testing in this cohort are unknown, and any benefit should be established prospectively.

Age was the only factor independently associated with antibiotic prescribing on multivariable analysis, with each additional decade of age associated with 29% higher odds of receiving an antibiotic. This is consistent with prior work suggesting that clinicians may weigh a patient's age as a proxy for perceived risk of bacterial superinfection or clinical deterioration more heavily than objective clinical findings when making prescribing decisions for respiratory complaints [1,7]. Notably, a large nationwide cohort study found that antibiotic prescribing for acute URTI in older adults was itself associated with a subsequently higher likelihood of a pneumonia diagnosis, a pattern the authors attributed to diagnostic uncertainty at the index visit rather than a protective effect of the antibiotic [11]; this raises the possibility that some of the age-related prescribing gradient observed here reflects similar diagnostic uncertainty in older patients rather than confirmed bacterial risk, and it is also possible that age itself is a proxy for unmeasured illness severity or comorbidity burden that triage level did not adequately capture. Sex, triage acuity, and swab testing were not independently associated with prescribing, suggesting that acuity at presentation was not the primary driver of the decision to prescribe in this cohort. The modest pseudo-R^2 of the regression model indicates that unmeasured clinical factors, examination findings, symptom duration, and patient expectation likely play a larger role and were not captured in this dataset.

The non-significant trend toward higher antibiotic prescribing at the index visit among patients who revisited the ED within two weeks (39.2% vs. 25.4%, p=0.055) should be described as a trend rather than an established association; it merits cautious interpretation and should be regarded as hypothesis-generating rather than a basis for firm recommendations. It is plausible that antibiotic-treated patients experienced perceived or actual non-response prompting a return visit; it is equally plausible that patients whose presentations already appeared more severe or diagnostically ambiguous were both more likely to be prescribed an antibiotic and more likely to return regardless of treatment. A prior systematic review and meta-analysis has examined the relationship between antibiotic prescribing for respiratory tract infection

and future reattendance, generally supporting the biological plausibility of an association in this direction [8]. This finding did not reach conventional statistical significance and warrants a focused chart review of the subset of revisit patients, including the small number who required subsequent admission, before any practice change is considered on this basis.

Prescribing also varied markedly by calendar month, with the lowest rates in August and November (14.6% and 12.4%) and a peak in December (55.9%). The data do not allow us to determine the cause. Plausible explanations include seasonal differences in case mix, changes in the clinicians on duty, or changes in documentation or testing practice, but these could not be tested. The association between age and prescribing was unchanged after adjustment for month, indicating that it was not driven by this variation. A single six-month window cannot describe a full annual cycle, and prospective multi-season data would be needed to understand seasonal effects on prescribing.

These findings suggest several candidate stewardship interventions, consistent with quality-improvement approaches reported to reduce URI-associated antibiotic prescribing among primary care providers elsewhere [6], although their effectiveness in this setting remains to be tested. First, reinforcing first-line Access-category agent selection when an antibiotic is genuinely indicated could help address the current predominance of Watch-category agents. Second, point-of-care viral diagnostic capacity in the ED could be evaluated as a means of reducing empiric prescribing under diagnostic uncertainty, given the low current testing rate, bearing in mind that a positive viral result does not exclude bacterial coinfection. Third, targeted clinician feedback or audit-and-feedback interventions focused on prescribing in older adult patients may be warranted, given that this was the group with the most pronounced prescribing gradient, while recognizing that this gradient may partly reflect unmeasured illness severity rather than age itself. Finally, a focused chart review of the antibiotic-treated patients who revisited within two weeks would help clarify whether these cases represent treatment failure, alternative diagnosis, or unrelated reattendance, before this hypothesis-generating signal is used to justify any specific practice change.

Limitations

This study has several limitations. First, its retrospective, single-center design relied on structured EMR fields and could not capture the clinical reasoning underlying individual prescribing decisions, such as examination findings, symptom duration, comorbidities, or patient request; age may in particular be confounded by unmeasured illness severity that triage level did not adequately capture. Second, the low rate of microbiological testing (12.2%) limits the precision of the potentially discordant-prescribing estimate and means the true rate of such prescribing is estimated with wide uncertainty given the small denominator (7/29). Indications for swab testing were also not documented, and a positive viral result does not exclude bacterial coinfection. Third, 27 patients accounted for 31 repeat visits during the study period; because each visit was analyzed as an independent encounter, consistent with standard practice for ED prescribing audits, these patients contributed more than one record to the dataset, and the logistic regression does not account for this within-patient clustering, which may modestly underestimate standard errors. Fourth, denominators varied slightly across analyses because of missing data on individual fields (swab status, revisit status), as detailed in the Methods section. Fifth, no correction for multiple comparisons was applied across the bivariate tests reported in Table *4* and the monthly comparison, so the possibility of a false-positive finding cannot be excluded. Finally, as a retrospective, single-center study conducted at a military hospital over a six-month period (July to December) that does not cover a full annual cycle and in which prescribing varied markedly by month, findings may not be fully generalizable to civilian or primary care settings within Bahrain. Inclusion of patients aged 14 to 17 years (7.3% of the cohort) followed the institutional adult threshold, and the main findings were materially unchanged when they were excluded.

Conclusions

This retrospective cohort study found that antibiotic prescribing for adult URTIs in this Bahrain ED setting remains common despite the predominantly viral, self-limiting nature of the condition, with a disproportionate share of broader-spectrum Watch-category agents relative to first-line Access-category options. Older patient age was independently associated with a higher likelihood of antibiotic prescribing, whereas triage acuity and diagnostic testing were not, and diagnostic swab testing was infrequently performed.

These findings represent the first local baseline data on antibiotic prescribing for adult URTI at this institution and within the Bahraini military hospital system more broadly. They suggest candidate targets for antimicrobial stewardship, whose effectiveness remains to be tested, including antibiotic agent selection, evaluation of expanded diagnostic testing capacity, and closer attention to prescribing behavior in older adults, alongside a clear need for further work to disentangle patient age from unmeasured illness severity as a driver of prescribing decisions.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the

work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Royal Medical Services Institutional Review Board (IRB) issued approval (RMS-MH/IRB/ 2026-1160). **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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