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Antibiotic Prescription Fills for Acute Conjunctivitis among Enrollees in a Large United States Managed Care Network

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Purpose: Antibiotics are seldom necessary to treat acute conjunctivitis. We assessed how frequently patients with newly diagnosed acute conjunctivitis fill prescriptions for topical antibiotics and factors associated with antibiotic prescription fills.

Design: Retrospective, observational cohort study.

Participants: A total of 340 372 enrollees in a large nationwide United States managed care network with newly diagnosed acute conjunctivitis, from 2001 through 2014.

Methods: We identified all enrollees newly diagnosed with acute conjunctivitis, calculating the proportion filling 1 or more topical antibiotic prescription within 14 days of initial diagnosis. Multivariate logistic regression assessed sociodemographic, medical, and other factors associated with antibiotic prescription fills for acute conjunctivitis. Geographic variation in prescription fills also was studied.

Main Outcome Measures: Odds ratios (ORs) with 95% confidence intervals (CIs) for filling an antibiotic prescription for acute conjunctivitis.

Results: Among 340 372 enrollees with acute conjunctivitis, 198 462 (58%) filled $\geq$1 topical antibiotic prescriptions; 38 774 filled prescriptions for antibiotic–corticosteroid combination products. Compared with whites, blacks (OR, 0.89; 95% CI, 0.86–0.92) and Latinos (OR, 0.83; 95% CI, 0.81–0.86) had lower odds of filling antibiotic prescriptions. More affluent and educated enrollees had higher odds of filling antibiotic prescriptions compared with those with lesser affluence and education ($P < 0.01$ for all). Compared with persons initially diagnosed with acute conjunctivitis by ophthalmologists, enrollees had considerably higher odds of antibiotic prescription fills if first diagnosed by an optometrist (OR, 1.26; 95% CI, 1.21–1.31), urgent care physician (OR, 3.29; 95% CI, 3.17–3.41), internist (OR, 2.79; 95% CI, 2.69–2.90), pediatrician (OR, 2.27; 95% CI, 2.13–2.43), or family practitioner (OR, 2.46; 95% CI, 2.37–2.55). Antibiotic prescription fills did not differ for persons with versus without risk factors for development of serious infections, such as contact lens wearers ($P = 0.21$) or patients with human immunodeficiency virus infection or AIDS ($P = 0.60$).

Conclusions: Nearly 60% of enrollees in this managed care network filled antibiotic prescriptions for acute conjunctivitis, and 1 of every 5 antibiotic users filled prescriptions for antibiotic–corticosteroids, which are contraindicated for acute conjunctivitis. These potentially harmful practices may prolong infection duration, may promote antibiotic resistance, and increase costs. Filling antibiotic prescriptions seems to be driven more by sociodemographic factors and type of provider diagnosing the enrollee than by medical indication. *Ophthalmology 2017;■:1–9 © 2017 by the American Academy of Ophthalmology*

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Acute conjunctivitis is one of the most common ocular conditions encountered in general medical practice, affecting 6 million persons in the United States each year.[1] Approximately one half of all eye-related diagnoses seen in primary care offices[2] and nearly one third of all emergency department visits for ocular problems are for conjunctivitis.[3] Unlike other common ocular conditions, such as refractive error or cataract, most cases of acute conjunctivitis are diagnosed and managed by non–eye-care providers rather than by ophthalmologists and optometrists.

Accurate differentiation among viral, bacterial, allergic, and other causes of acute conjunctivitis can be challenging because all these causes can show similar clinical features. However, because acute conjunctivitis is often self-limiting, most patients with this condition do not require topical antibiotic therapy.[3] It is estimated that more than 60% of patients with acute conjunctivitis have adenovirus or other viral infections[4,5] that do not respond to antibiotics.[3] Allergic conjunctivitis is also quite common and does not respond to antibiotics. Bacterial infections account for a much smaller proportion of acute conjunctivitis cases. These cases are usually mild and self-limiting, often resolving within 7 to 14 days without antibiotic therapy.[6] Although topical antibiotics may hasten resolution of symptoms among persons with bacterial conjunctivitis,[6] this benefit must be weighed against the risk of ocular surface toxicity,[3]

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antibiotic resistance,[7,8] and the cost associated with their use.[1] Topical corticosteroids are contraindicated in most cases of acute conjunctivitis because they can prolong adenoviral infections, can worsen underlying ocular herpes simplex virus infections, and if taken for prolonged periods, can increase the risk of cataract and glaucoma.[3]

In the United States, researchers have determined that nearly one third of outpatient antibiotic prescriptions for common viral or mild bacterial conditions, such as sinusitis, influenza, and pharyngitis, are unnecessary or inappropriate, representing an opportunity to improve patient safety and conserve health care resources.[9] Like these other conditions, acute conjunctivitis is also very common and seldom requires antibiotics. In 2013, as part of the nationwide Choosing Wisely initiative to reduce wasteful or unnecessary medical testing and treatment, the American Academy of Ophthalmology recommended avoiding antibiotic prescriptions for viral conjunctivitis and deferring immediate antibiotic therapy when the cause of conjunctivitis is unknown.[10] To our knowledge, no prior study has assessed antibiotic use for acute conjunctivitis among a large, diverse segment of the United States population. We assessed filled prescriptions for topical antibiotics for acute conjunctivitis among enrollees in a large United States managed care network, identified factors associated with filled prescriptions for antibiotics for this condition, and explored how this practice varies among communities throughout the country.

Methods

Data Source

The Clinformatics DataMart database (OptumInsight, Eden Prairie, MN) contains de-identified records of all beneficiaries in a large nationwide managed care network. We had access to data for all enrollees with any form of eye care from January 1, 2001, through December 31, 2014. This subset comprises enrollees who had 1 or more International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9-CM) codes for any eye-related diagnosis (360−379.9), Current Procedural Terminology codes for any eye-related visits, and diagnostic or therapeutic procedures (65091−68899 or 92002−92499) during their time in the plan. We had access to enrollees' medical claims, including ICD-9-CM codes for all ocular and nonocular conditions. The Clinformatics DataMart database also contains sociodemographic information (age, sex, race, annual income, education level) of each enrollee. For every clinical encounter, the type of health care provider who cared for the enrollee also was captured. In addition, the database contains details about all outpatient medication prescriptions filled, including the date the prescription was filled and the type and quantity of medication. All enrollees were fully enrolled in the pharmacy plan during their entire medical plan enrollment. This database has been used to study patients with other ocular diseases.[11,12] The University of Michigan Institutional Review Board approved this study, which uses de-identified data.

Eligibility Criteria

Eligible enrollees were those who had been diagnosed with acute conjunctivitis based on the following ICD-9-CM codes: 372.00, 372.30, or 077.3. We also required all eligible persons to be enrolled continuously in the managed care plan for at least 4 years before and 90 days after the initial acute conjunctivitis diagnosis. Because appropriate management of first-time episodes of acute conjunctivitis often differs markedly from management of recurrent, chronic, noninfectious, hospital-associated, or postoperative conjunctivitis, we excluded enrollees with any prior diagnosis of chronic conjunctivitis (ICD-9-CM code 372.1), inpatient hospitalization at the time of the initial acute conjunctivitis diagnosis, or records of intraocular surgery within 90 days of the initial acute conjunctivitis diagnosis. We also excluded enrollees with any previous diagnosis of acute conjunctivitis in the 4 years before their initial acute conjunctivitis diagnosis to help exclude persons with recurrent or chronic conjunctivitis.

Outcomes

The primary outcome of interest was the proportion of persons with newly diagnosed acute conjunctivitis who filled prescriptions for topical antibiotics within 14 days of their initial diagnosis. We did not consider oral, intravenous, or other routes of antibiotic administration, because these routes of administration are used rarely to treat conjunctivitis and are likely capturing antibiotic use for other infections. We examined all major classes of topical ophthalmic antibiotics including fluoroquinolones, macrolides, aminoglycosides, sulfonamides, bacitracin, and polymyxins (Table 1). We also examined filled prescriptions for antibiotic−corticosteroid combination products. Some enrollees filled prescriptions for multiple antibiotic classes during the 14-day period of interest. In addition, we calculated the proportion of enrollees filling prescriptions for any of these classes of antibiotics stratified by the type of health care provider who made the initial conjunctivitis diagnosis: ophthalmologist, optometrist, internal medicine physician, family practice physician, pediatrician, urgent care physician, or unspecified health care provider.

Statistical Analysis

Data analyses were performed using SAS software version 9.4 (SAS, Inc, Cary, NC). Characteristics of the study population were summarized using means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Differences in continuous variables were assessed using the 2-sample t test. Differences in categorical variables were assessed using the chi-square test. Results with $P < 0.05$ were considered statistically significant.

Factors Associated with Filling Prescriptions for Antibiotics for Acute Conjunctivitis. Multivariable logistic regression was used to assess factors associated with filling 1 or more prescriptions for topical antibiotics for acute conjunctivitis. In the model, the dependent variable was 1 or more antibiotic prescription fills within 14 days of the enrollee's initial acute conjunctivitis diagnosis. Covariates of interest included age at the time of acute conjunctivitis diagnosis; sex; race or ethnicity; annual income; education level; presence of comorbid diabetes mellitus (DM), human immunodeficiency virus (HIV), or AIDS; contact lens use; calendar year of initial acute conjunctivitis diagnosis; and the type of health care provider who first diagnosed the acute conjunctivitis. Enrollees were categorized as not having DM, having DM without any record of end-organ damage from this condition, or having DM with evidence of end-organ damage such as diabetic nephropathy, neuropathy, or retinopathy.

Geographic Variation in Prescription Fills of Topical Antibiotics for Acute Conjunctivitis. To evaluate geographic variation in topical antibiotic prescription fills for acute conjunctivitis, we divided the United States into 306 hospital referral regions (HRRs) according to established methods developed by investigators at Dartmouth University.[13] Briefly, HRRs represent regional health