Antibiotics for Colds in Children

Who Are the High Prescribers?

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Objective: To examine physician characteristics associated with being a high prescriber of antibiotics for pediatric upper respiratory tract infections (URIs).

Design and Setting: Analysis of 34,624 episodes of care for URIs in children (younger than 18 years) in the Kentucky Medicaid program from July 1, 1995, to June 30, 1996.

Participants: Primary care physicians with at least 25 episodes of care (n=205). The proportion of patients with URIs receiving antibiotics stratified the sample into low (≤25th percentile) and high (≥75th percentile) antibiotic prescribers.

Main Outcome Measures: Bivariate analyses were computed comparing the high and low prescribers. A logistic regression model was computed for likelihood of being a high prescriber by number of URI episodes, proportion of patients receiving antibiotics that were broad spectrum, years since medical school graduation, physician gender, rural/urban practice, and specialty.

Results: The high prescriber group (n=52) included data from 11,899 episodes of care, with a mean prescribing rate of 80%. The low prescriber group (n=55) included data from 5,396 episodes, with a mean prescribing rate of 16%. High prescribers were significantly more years away from medical school graduation (27 vs 19 years; P=.001) and had managed significantly more URI episodes than low prescribers (229 vs 98; P=.001). In the logistic regression, compared with pediatricians, the odds ratios of being a high prescriber were 409 (95% confidence interval [CI], 29-7276) for family practitioners and 318 (95% CI, 17-6125) for other primary care physicians.

Conclusion: With the rise of antibiotic-resistant bacteria, more focused training regarding treatment of URIs is warranted in residency and in continuing medical education forums.

SUBJECTS AND METHODS

The data used for analysis were paid claims in the Kentucky Medicaid program from July 1, 1995, to June 30, 1996.

EPISODES OF CARE

The episodes of care were for children (younger than 18 years) with URIs. Upper respiratory tract infections were defined by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) under diagnostic code stem 465, “acute upper respiratory tract infections of multiple or unspecified sites,” and code 460, “acute nasopharyngitis/common cold.” All codes under stem 465 (465.0, 465.8, and 465.9) were used to define URIs because physicians may vary the codes used for this condition.11 The ICD-9-CM code 460 was also used to define a generalized URI because the symptom complex designated by the lay term “common cold” represents nonspecific URIs. The selection of a variety of codes to define URI was based on the awareness that different offices include different precoded ICD-9-CM codes on their billing sheets for URI. All encounters with URIs in an outpatient setting were available for analysis. Using the Medicaid claims data, specific episodes of URI were identified. Patients could have more than 1 episode. Each episode begins with a physician claim for outpatient evaluation and management with a primary diagnosis of URI. The Current Procedural Terminology (CPT) codes indicating physician evaluation and management in an outpatient setting are 99201-5 and 99211-5.12 These CPT codes were used only to identify types of services, such as physician visits, not to differentiate diagnoses. All claims on the date of service with the diagnosis of URI are considered to be part of the encounter. Because Kentucky Medicaid drug claims do not have a corresponding diagnosis code, the medications in the URI encounter had to be linked according to the date of service and a physician code that matched the visit that started the episode.

The pharmaceutical treatment was assumed to have been prescribed for treatment of the URI if the date of the drug claim was on the day of or no more than 4 days after the physician visit. We believed this time frame surrounding the physician visit would account for the possible time lag between seeing the physician and filling the prescription. Encounters were excluded if any additional visit (whether inpatient, outpatient, or emergency department) for another condition occurred sometime within the time frame. This provided a window of drug acquisition uncontaminated by other conditions. Furthermore, if another visit for a URI was reported within the time frame, the second visit was eliminated from the data, since this visit was presumed to be part of the initial URI episode.

Drug claims contain the prescribing physician’s identification number. The episodes were further defined by linking the identification number of the physician managing the episode with the identification number on the drug claim. Any drug claims that did not match the physician visit were eliminated. Topical or ophthalmic medications were excluded, as were antifungal, anthelmintic, and antiprotozoan agents.

Antibiotics classified as narrow spectrum were first-line drugs (penicillin, ampicillin, amoxicillin, erythromycin,

ever, little is known about the characteristics of physicians who are likely to prescribe antibiotics for URIs in children. Therefore, our purpose is to examine physician characteristics associated with prescribing antibiotics for pediatric URIs.

RESULTS

Two hundred five physicians were included in the analysis, accounting for 34,624 episodes of care. The high prescriber group included 52 physicians and data from 11,899 episodes of care, with a mean antibiotic prescribing rate for URIs of 80%. The low prescriber group included 55 physicians and data from 5396 episodes of care, with a mean antibiotic prescribing rate for URIs of 16%. Tables 1 and 2 compare both groups according to practice and background characteristics.

The results of the logistic regression indicated that after controlling for the other entered variables, pediatricians were significantly less likely to be high prescribers than physicians of other specialties. The odds ratios of being a high prescriber compared with the reference group of pediatricians were 409 (95% confidence interval [CI], 29-7276) for family practitioners and 318 (95% CI, 17-6125) for other primary care physicians. In the logistic regression, more time since graduation (P=.001), more episodes of URIs (P=.001), and a lower proportion of episodes treated with antibiotics that were broad spectrum (P=.002) were significantly more likely to predict high prescribers. Physician gender (P=.31) and rural or urban practice (P=.18) were not statistically significant predictors of being a high prescriber.

COMMENT

High prescribers of antibiotics for URIs in children have several distinguishing characteristics. They are likely to be specialists other than pediatricians and farther from medical school training and to have more patient encounters for URIs, and they are more likely to prescribe a narrow-spectrum antibiotic. These results point to several meaningful implications.

First, the results have significant implications regarding training and knowledge base. The focus of the study was on appropriate treatment of pediatric URIs, a condition with little evidence to support the use of antibiotics. Pediatricians were significantly more likely than other specialists to be low prescribers. Whereas pediatricians focus on the medical treatment of children, family physicians are trained to treat children and adults. This suggests that the training of family physicians may require specific focus on the commonly encountered problem of respiratory tract infections in children. Although many parents expect antibiotics to be prescribed for their child’s respiratory tract infection,19 most are simply seeking clarification of symptoms without a specific expectation for antibiotics.10 On the other hand, data suggest that adults are more likely than children to receive an-
trimethoprim-sulfamethoxazole, first-generation cephalosporins, tetracycline, and doxycycline). Broad-spectrum drugs designed for use with suspected resistant organisms included second- and third-generation cephalosporins, fluoroquinolones, and macrolides other than erythromycin. This classification has been described in previous investigations of respiratory disease.13,14

SUBJECTS

Primary care physicians were included in the study if they had treated at least 75 episodes of pediatric respiratory tract infections (eg, otitis media, sinusitis, URI, purulent rhinitis, and pharyngitis) and at least 25 URI episodes in the year of the study. This inclusion criteria focused the study on individuals who arguably had at least some experience managing the condition. In addition, they had to be in private or hospital-based practice. Pediatricians, family physicians, and other primary care physicians were included. Other primary care physicians were defined for this study as physicians whose specialty was not identified as otolaryngology (eg, general practice and general internal medicine) in the Medical Licensure Board database, but who met the other inclusion criteria for pediatric URI episodes.

The physicians’ antibiotic-prescribing practices were profiled after computing episodes of care for URIs. The proportion of URI episodes treated with antibiotics was used to divide the sample of physicians into low and high antibiotic prescribers. In an effort to have an adequate distinction between them, high prescribers were defined as being at or above the 75th percentile and the low prescribers were defined as being at or below the 25th percentile in proportion of URI episodes treated with antibiotics.

Characteristics of the physicians were obtained from the Kentucky Board of Medical Licensure’s 1996 database. Self-reported physician variables included in the database were specialty; year of birth, which was recoded to age in 1996; year of graduation from medical school, which was recoded to years since graduation in 1996; gender; type of degree (doctor of medicine vs doctor of osteopathy); and county of practice, which was classified as urban if the individual lived in a county in a metropolitan statistical area and as rural if the county was located outside a metropolitan statistical area.

ANALYSIS

Bivariate analyses (Student t test and χ² test) were computed comparing the high and low prescribers (Table 1 and Table 2). A forced inclusion logistic regression model was computed to examine the independent effect of the predictor variables: number of URI episodes, proportion of episodes treated with antibiotics that were broad spectrum, years since medical school graduation, physician gender, rural or urban practice, and 2 dummy variables representing specialty (family practice or other), with pediatrics as the reference category. Age was not entered into the model because of the collinearity with years since graduation. Type of degree was not entered because only 3 individuals in the analysis were not doctors of medicine, thereby providing too few doctors of osteopathy.

<table>
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<tr>
<th>Table 1. Characteristics of Low and High Prescribers*</th>
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<td>Prescribing Group</td>
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<tr>
<td>Characteristic</td>
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*URI indicates upper respiratory tract infection. Prescribing groups are described in the “Subjects” subsection of the “Subjects and Methods” section.

tiotics but not the specific use of narrow-spectrum agents. Thus, education regarding the likely causes of pediatric URIs and the use of narrow-spectrum agents may be necessary.

Our study has several limitations. First, although the data should represent practice patterns for pediatric URIs,
the data are based on claims filed to a single state’s Medicaid system. Practices may vary by state and payer. No objective validation of the diagnoses could be made from the available data. Symptoms of nonspecific URIs may overlap with URIs localized to a particular anatomic region (eg, sinusitis), thereby leading to possible diagnostic misclassification, particularly with preprinted billing forms. Although the diagnosis could not be objectively evaluated, treatment decisions were made based on the physician’s belief in what the physician thought was wrong with the patient. The most accurate data available about the physician’s impression are the diagnosis codes submitted to Medicaid.

Second, because the drug claims contained no diagnosis code, we had to make assumptions about antibiotic prescriptions filled in a specified time frame and linked to the diagnosing physician. In addition, we assumed that the medications filled within 4 days of the visit were related to the condition for which the physician billed and were not prescribed at an earlier date or for an unrelated condition that was diagnosed but not submitted as the reason for the visit. However, in past studies of URIs in the Kentucky Medicaid program, more than 90% of the patients who received antibiotics filled the prescriptions on the same day as the physician visit, thereby strengthening the assumed link between the visit and the prescription. Furthermore, in our study, each visit managed by a specific physician was linked with only the drugs prescribed by that physician.

Third, the filled antibiotic could be a treatment regimen not for the URI but for a secondary bacterial infection. At least for coded secondary diagnoses, this does not seem to fully explain the high rate of antibiotic prescribing. In a cross-sectional sample of Kentucky Medicaid claims from July 1, 1993, to June 30, 1994, fewer than 2% of encounters for the common cold had a secondary diagnosis of acute sinusitis or otitis media. Fewer than 6% of the total outpatient office visits for URIs with prescriptions for antibiotics had a secondary diagnosis of acute sinusitis or otitis media.

In summary, with the rise of antibiotic-resistant bacteria and the call for more judicious use of antibiotics, an identification of characteristics of physicians whose practices correspond with current evidence in treating pediatric URIs is particularly important. More focused training regarding treatment of URIs may be warranted in residency and continuing medical education forums. Training must target whether to prescribe antibiotics and what kind.

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### Table 2. Relation of Physician Specialty to Prescribing Practice

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<th>Prescribing Group*</th>
<th>No. (%) of Physicians</th>
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<tr>
<td></td>
<td>Pediatricians (n=31)</td>
</tr>
<tr>
<td>% High prescriber</td>
<td>4 (13)</td>
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<tr>
<td>% Low prescriber</td>
<td>27 (87)</td>
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</tbody>
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* Described in the “Subjects” subsection of the “Subjects and Methods” section. Differences between groups were significant (P<.001).
† Includes other primary care physicians.

### REFERENCES