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# Economic Burden of Adult Pharyngitis: The Payer's Perspective

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## ABSTRACT

**Objectives:** Although not recommended by practice guidelines, physicians frequently prescribe an antibiotic for adults with viral pharyngitis. The financial burden of this practice, from the payer's perspective, has not been previously evaluated. The purpose of this study was to estimate those expenditures.

**Methods:** A cost-of-illness study was performed to estimate annual expenditures of pharyngitis management from the payer's perspective. National Ambulatory Care Survey data were used to represent current patterns of ambulatory care visits and antibiotic prescriptions for adult pharyngitis. Direct and antibiotic resistance costs were summed to estimate total expenditures for pharyngitis management. Resistance costs were calculated using a model linking the effect of antibiotic consumption to the cost consequences of resistant *Streptococcus pneumoniae* infection. Sensitivity analyses compared cost outcomes of current practice, adherence to pharyngitis management guidelines from the Infectious Diseases Society of America (IDSA), and nonantibiotic treatment.

**Results:** In the base-case analysis, reflecting current practice patterns, total expenditures were $1.2 billion with antibiotic resistance contributing 36% ($426 million). IDSA guideline adherence decreased costs to $559 million with resistance accounting for 6.8% ($37.9 million). Guideline adherence plus reducing office visits by 30% decreased costs to $372 million, with only 1.4% ($5.3 million) due to resistance. Additional cost-savings of $88 million were realized by using a nonantibiotic treatment strategy.

**Conclusions:** Current practice imposed a substantial economic burden on the payer, while guideline adherence resulted in cost reductions, especially in terms of resistance, emphasizing that antibiotic prescribing habits have broad economic consequences. Relevant stakeholders, payers, physicians, and other health-care providers should revisit efforts to encourage adherence to pharyngitis guidelines to reduce health-care costs.

*Keywords:* adults, antibiotic resistance, cost-of-illness analysis, pharyngitis.

## Introduction

More than 11 million patients annually with acute pharyngitis seek medical attention in the ambulatory care setting [1]. Like other upper respiratory infections (URI) in adults, pharyngitis is caused by a virus in 80% to 90% of cases [2]. Group A streptococci (GAS) is the only bacterial etiology of pharyngitis for which antibiotic treatment, usually with penicillin, is routinely recommended [2]. Accordingly, only 10% to 20% of adult patients should receive treatment with a recommended antibiotic. In contrast, ambulatory care physicians provided an antibiotic prescription from 47% to 73% of adults with pharyngitis [3–5]. Many were for nonrecommended, newer, and more expensive agents [4,5]. Excessive antibiotic use can contribute to the development of antibiotic resistance leading to the use of more expensive drugs and more costly outcomes from infections with resistant bacteria [6–8]. Annual expenditures related to antibiotic resistance in the United States were estimated to be at least $5 billion [9]. One study indicated that more than $1.1 billion was spent annually on unnecessary antibiotic prescriptions for adults with URI [10].

To help combat the overuse of antibiotics for URI, practice guidelines for adult pharyngitis have been circulated. The American College of Physicians recommends clinical indicators to identify adults with a high probability of GAS pharyngitis [11], while those from the Infectious Diseases Society of America (IDSA) are more stringent, because antibiotic treatment is recommended only for patients with clinical features of GAS pharyngitis plus a positive rapid antigen detection test (RADT) [12]. Nonetheless, 66% of physicians in a health-care plan failed to adhere to either one of these guidelines [3].

The cost consequences to the health-care payer of pharyngitis management are not known. A database examination of nearly 14,000 insured employees in 1997 found that acute pharyngitis cost the employer $30 million in health-care benefits, with outpatient expenditures estimated at $628 per beneficiary.

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Nevertheless, the authors did not mention whether a practice guideline was used to aid management decisions. In addition, they reported costs in broad categories without providing detailed information about the distribution of diagnostic and therapeutic expenditures [13]. Therefore, we undertook a cost-of-illness (COI) study to determine the payer's cost of pharyngitis management incurred by: 1) current practice patterns; 2) adherence to IDSA guidelines; and 3) no antibiotic treatment. A COI study measures the economic burden of a disease and highlights areas to target cost reductions [14–16].

## Methods

### *Definition of Costs*

The current COI study was prevalence-based from the payer's perspective with a time horizon of 1 year. We divided expenditures into direct and resistance costs. Direct costs were those associated with professional services, testing, antibiotic prescriptions, and antibiotic-induced drug rash and anaphylaxis. Resistance costs were those related to hospitalization with community-acquired pneumonia (CAP) caused by *Streptococcus pneumoniae* resistant to beta-lactam or macrolide antibiotics; referred to as drug-resistant *Streptococcus pneumoniae* (DRSP). Total costs were the sum of direct and resistance expenditures.

We used 2006 Medicare reimbursement rates to the authors' institution to represent unit prices for professional services, RADT, drug rash, and anaphylaxis (Table 1). Antibiotic treatment for pharyngitis was divided into recommended and nonrecommended agents. Penicillin and erythromycin were considered recommended antibiotics, while extended spectrum penicillins, cephalosporins, macrolides, and quinolones were considered nonrecommended [5]. The cost for a course of a recommended or nonrecommended antibiotic was determined by multiplying its wholesale price per dose by its suggested duration for GAS pharyngitis [12,17]. We then summed the treatment costs for all the recommended or nonrecommended antibiotics, and divided the result by the respective number of prescriptions for each group to arrive at the average treatment price for a course of a recommended or nonrecommended antibiotic (Table 1).

**Table 1** Unit prices for direct costs

| Category | Unit price ($) |
|---|---|
| Professional services for pharyngitis | 68.00 |
| RADT | 17.00 |
| Recommended antibiotic course | 7.00 |
| Nonrecommended antibiotic course | 30.00 |
| Drug rash | 60.00 |
| Anaphylaxis | 13,922.00 |

RADT, rapid antigen diagnostic test.

### *Characteristics of Cohorts*

We used data from the National Ambulatory Medical Care Survey (NAMCS) to create the characteristics of the NAMCS cohort [5]. The NAMCS is administered by the National Center for Health Statistics (NCHS) and Center for Disease Control and Prevention. Findings are based on a sample of patient visits to nonfederally funded office-based physicians who are primarily engaged in direct patient care. The NAMCS utilizes a multistage probability design which involves three stages in determining selection of patient visits: geographic location, physician specialty, and visits within annual practices of sampled physicians. Since 1989 the survey has been conducted annually. Data collection is completed by the staff at the sampled practices. Each visit is weighted by NCHS to allow extrapolation to national figures. We used summary data from an analysis of NAMCS data which was designed to evaluate antibiotic prescribing for adult pharyngitis visits during the period 1989 to 1999 [5]. In the NAMCS cohort (Table 2), the number of adults with pharyngitis seeking ambulatory care was set at 6.7 million [5]. Also reflecting NAMCS data, 73% (4.9 million) of patients received an antibiotic, with 78% (3.8 million) receiving a nonrecommended agent and 22% (1.1 million) receiving one that was recommended. We estimated that 80% (5.36 million) of 6.7 million patients would receive a RADT [3]. The rates of antibiotic-induced rash and anaphylaxis were set at 3% and 0.1%, respectively [18].

Sensitivity analyses of direct costs were done by varying key characteristics of the NAMCS cohort. In one analysis, we applied the IDSA practice guidelines to the NAMCS population of 6.7 million adults. We called this cohort IDSA-NAMCS (Table 2). In another analysis, we applied the guidelines to a reduced population of 4.7 million adults with pharyngitis, reflecting a 30% reduction in office visits for pharyngitis. We referred to this group as the IDSA-reduced population (IDSA-RP) (Table 2). The percentage of patients receiving a RADT was also varied to reflect adherence to guideline recommendations [3]. Two scenarios of no testing, no antibiotic treatment were also analyzed. The no-testing, no-treatment option applied to the NAMCS population was called NTX-NAMCS and its application to the reduced population of pharyngitis patients was the NTX-RP cohort (Table 2).

### *Calculation of Direct Costs*

The estimated direct cost of each cohort characteristic was calculated as the product of its unit cost (Table 1) and frequency (Table 2). Total annual direct costs were then calculated. The direct expenditure per patient encounter was calculated for the NAMCS and IDSA-NAMCS groups, by dividing their total annual direct costs by their population size. It was not calculated for the reduced population cohorts (IDSA-RP and NTX-