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Editorial

Prescription practices in acute pediatric infections and their implications on the worldwide antimicrobial resistance

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1. Introduction

A large proportion of antimicrobial agents are prescribed worldwide for acute respiratory infections, including colds, upper respiratory infections, acute bronchitis, pharyngo-tonsillitis, sinusitis, and acute otitis media [1–9]. Many of these infections are viral in nature, and antimicrobials are of no benefit. However, the widespread and inappropriate utilization of antimicrobials for such viral illnesses is the driving force behind the emergence of infections caused by antimicrobial drug-resistant organisms [10–12]. Antimicrobial drug – resistant strains of community-acquired pathogens, including *Streptococcus pneumoniae, Haemophillus influenzae,* and *Staphylococcus aureus*, have emerged as serious global health threats [13–15]. In the United States the proportion of invasive infections caused by penicillin-nonsusceptible *S. pneumoniae* increased from 1% in 1992 to 27% in 2000 [10]. Multiple drug resistance of *S. pneumoniae* has also escalated in frequency as the proportion of *S. pneumoniae* isolates nonsusceptible to $\geqslant$3 classes of antimicrobial drugs increased from 7% in 1995 to 19% in 2000 [10].

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Numerous studies have shown a consistent and strong association between recent antimicrobial drug use and emergence of infection with a drug-resistant strain of *S. pneumoniae* [16–21]. The worldwide increasing rates of fluoroquinolone use have also been implicated in the emergence of quinolone-resistant *S. pneumoniae* infections [22–25]. The increase in antimicrobial drug – resistant infections has economic as well as medical implications and the annual cost of unnecessary and antimicrobial drug prescribing for acute respiratory infections in the USA has been estimated to be about 726 million US dollars [5].

Numerous studies have demonstrated a strong and consistent linkage between antimicrobial drug use and antimicrobial resistance at both individual and population levels [26–31]. Despite the awareness of this association, the inappropriate and ineffective use of antimicrobial agents for viral respiratory infections is still very common [1,3,17,31–36].

The study by Shiva et al. [37] presented in this issue of the Journal demonstrated that such inappropriate drug use occurs also in the treatment of acute respiratory and gastrointestinal infections in children receiving outpatient care in Tehran. General practitioners prescribed more antibiotics than pediatricians and more of these agents were given in private clinics as compared to public hospitals.

Multiple interventions that were aimed at patients and clinicians have been implemented in the past decade to enhance the appropriate antimicrobial drug use and prevent the emergence of antimicrobial resistance. Numerous studies demonstrated that interventions at the level of the physician, clinic, or community had only a modest effect on prescribing [38–44]. These programs that were focused are helpful in evaluating specific intervention strategies in a relatively controlled setting. However, adoption of new practices may be slow even when the intervention is proven to be effective, and its‘ implementation to larger populations may be limited. In contrast, large-scale programs can reach numerous physicians and the general public in an entire country, state or a large metropolitan area.

Guidelines for the proper selection of antimicrobial infections have been developed in some countries by the different specialty academies, government agencies (i.e. Center of Disease Control in the USA), add hoc committees, and medical centers. However, guidelines in one country may not apply to other countries or continents because of differences in antimicrobial susceptibility, the prevalence of pathogens, the practice of medicine, antimicrobial availability and their cost, and cultural differences. However, in the USA the combined effect of national guidelines for appropriate use of such drugs, increasing attention by the media and professional organizations, and the Centers for Disease Control and Prevention national campaign may have contributed to the observed trend toward declining antimicrobial use. Progress toward decreasing the inappropriate use of antimicrobials is being made in many states, although antimicrobial prescribing rates are still excessive, and use of broad-spectrum antimicrobial drugs is increasing nationally [8,39,45].

Health organizations and professional societies in each country should consider a balanced approach that includes nationwide educational activities with increasing emphasis on local, provider-level interventions and policy development. These activities might include academic detailing by physician opinion leaders, feedback on antimicrobial prescribing performance, effects on local antimicrobial resistance, and economic incentives for careful and appropriate antimicrobial use. These strategies may have the greatest effect if they are implemented as quality improvement initiatives in collaboration with the leadership of health plans and clinic and hospital organizations. Continuous and ongoing assessment of prescribing trends and rates of antimicrobial drug resistance will be required to measure the ultimate results of these efforts. Such an approach will benefit the health care in each nation, reduce antimicrobial resistance, prolonged the effective “life” of antimicrobial, and lead to better success in the treatment of infections.

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