Prescribing practices and attitudes toward giving children antibiotics

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abstract

OBJECTIVE To investigate whether overprescribing is common in treatment of pediatric upper respiratory infections and to examine factors that influence prescribing antibiotics for children.

DESIGN A random, stratified sample of practising family physicians was surveyed with a mailed questionnaire. Initial nonresponders were mailed a second questionnaire.

SETTING British Columbia.

PARTICIPANTS A total of 608 general and family physicians. Response rate was 64%; 392/612 surveys were completed.

MAIN OUTCOME MEASURES Physicians' self-reported prescribing practices and knowledge of and attitudes toward using antibiotics for children's upper respiratory tract infections.

RESULTS Relative to treatment guidelines developed for the study, most physicians responded appropriately to the cough (94%) and lobar pneumonia (99.1%) vignettes. More than half the physicians (56.5%) reported they would immediately prescribe antibiotics for tympanic membrane dysfunction, and 79.4% indicated they would prescribe antibiotics for pharyngitis without obtaining a laboratory culture. Approximately 25% of physicians in the study did not believe that prior antibiotic use increased personal risk for acquiring drug-resistant infection, and 23.1% did not believe that antibiotic use was an important factor in promoting resistance in their communities.

CONCLUSION Education in current treatment of pediatric upper respiratory tract illnesses and antimicrobial drug resistance is required. The high response to the questionnaire (64%) and the many requests from physicians to receive the project's educational materials (45%) indicate a high level of interest in this subject.

résumé

OBJECTIF Procéder à une enquête pour savoir si la prescription excessive est courante dans le traitement des infections pédiatriques des voies respiratoires supérieures et examiner les facteurs influençant la prescription d'antibiotiques pour les enfants.

CONCEPTION Un échantillon aléatoire stratifié de médecins de famille en pratique a fait l'objet d'un sondage au moyen d'un questionnaire envoyé par la poste. Les personnes n'ayant pas répondu initialement ont reçu à nouveau le questionnaire par la poste.

CONTEXTE La Colombie-Britannique.

PARTICIPANTS Un total de 608 omnipraticiens et médecins de famille. Le taux de réponse s'élevait à 64%; 392/612 questionnaires ont été complétés.

PRINCIPALES MESURES DES RÉSULTATS Les habitudes d'ordonnance, les connaissances et les attitudes concernant le recours aux antibiotiques pour les infections des voies respiratoires supérieures chez les enfants qu'ont signalées les médecins eux-mêmes.

RÉSULTATS En fonction des lignes directrices de traitement établies aux fins de l'étude, la plupart des médecins ont répondu correctement aux vignettes sur la toux (94%) et sur la pneumonie lobaire (99,1%). Plus de la moitié des médecins (56,5%) ont indiqué qu'ils prescriraient immédiatement des antibiotiques pour une dysfonction de la membrane tympanique et 79,4% ont répondu qu'ils prescriraient des antibiotiques pour une pharyngite sans avoir obtenu les résultats d'une culture en laboratoire. Environ 25% des médecins qui ont participé à l'étude ne croyaient pas qu'une utilisation préalable d'antibiotiques augmentait le risque personnel de contracter une infection résistante aux médicaments et 23,1% ne croyaient pas que le recours aux antibiotiques était un facteur important dans la propagation de la résistance dans leurs communautés.

CONCLUSION Il est nécessaire de dispenser de l'éducation sur le traitement actuel des maladies des voies respiratoires supérieures chez l'enfant et la résistance aux antimicrobiens. Le taux élevé de réponse au questionnaire (64%) et les nombreuses demandes de la part des médecins de recevoir les documents éducatifs du projet (45%) témoignent d'un fort intérêt pour ce sujet.

This article has been peer reviewed.

Cet article a fait l'objet d'une évaluation externe.

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RESEARCH

Prescribing practices and attitudes toward giving children antibiotics

Traditionally, Canadians have enjoyed relatively low and stable rates of antimicrobial drug resistance. More recently, reports demonstrating Canada's escalating rate of antimicrobial drug resistance[1,2] and widespread media coverage of resistant "super-bugs" have raised both public awareness of and professional concern about this growing problem.

The Antibiotic Resistance Education Project, initiated by the University of British Columbia's (UBC's) Department of Pediatrics, in partnership with the UBC Department of Family Practice and the UBC Institute of Health Promotion Research, aims to minimize the spread and effect of community-based antimicrobial drug resistance. To this end, an educational program for family physicians and parents of preschool children has been implemented. To guide the design of educational materials, family physicians were surveyed to investigate whether overprescribing is common in treatment of children's upper respiratory tract infections and to examine factors that influence antibiotic prescribing for children. This paper reports findings from the survey.

Antimicrobial drug resistance is most often associated with hospitalized populations. Recent evidence, however, suggests that drug resistance will increasingly influence the day-to-day practice of family physicians in community settings. The greatest effect of antibiotic resistance for community-based physicians pertains to rising rates of resistance of *Streptococcus pneumoniae*, the leading bacterial cause of otitis media, meningitis, and pneumonia in children.

Increasing prevalence of *S pneumoniae* resistant to penicillin (still the drug of choice for these conditions) will make successful treatment increasingly complicated, expensive, and uncertain.[3] Furthermore, recent antibiotic use is a risk factor for invasive infection with penicillin-nonsusceptible pneumococci.[4-6] Because colonized children can transmit pneumococci to other children,[6] the presence of strains of *S pneumoniae* resistant to many drugs is of particular concern for children in group care settings where respiratory pathogens are easily transmitted.

Several factors have been shown to promote development of antimicrobial drug resistance; among the most important are medical misuse of antibiotics (ie, prescribing antibiotics for unwarranted indications and for inappropriate durations, and prescribing broad-spectrum antibiotics when more selective agents would suffice) and widespread use of antibiotics in agriculture.[7] Our project is restricted to antibiotic use in humans.

Canada has one of the highest rates of antibiotic use in the industrialized world—twice the per capita rate in the United States.[8] Antimicrobial drug use is highest among children; rate of use in children younger than 15 years is three times higher than for any other age group.[9] Because a large proportion of the antibiotics given to children are for upper respiratory conditions that do not warrant antimicrobial therapy,[9-15] reducing inappropriate antibiotic use in this area should slow growth of antimicrobial drug resistance.

Many non-clinical factors influence physicians' prescribing practices,[15-17] but parental pressure and fear of losing patients are commonly cited by physicians as factors in their decisions whether or not to prescribe antibiotics.[18-22] The literature, however, suggests that patients' satisfaction with office visits is associated with the perceived quality of the patient-physician interaction and not with provision of prescriptions.[19-21]

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METHODS

Questionnaire development

An instrument previously developed by the United States Centers for Disease Control and Prevention (CDC) was reviewed by an expert panel comprising pediatric infectious disease specialists, pediatricians, and family physicians to ensure that items were relevant to BC physicians. The expert panel then developed questions for the BC survey based on recent evidence surrounding treatment of pediatric upper respiratory illnesses (**Table 1**). The questionnaire included seven case studies examining physicians' prescribing habits (**Table 2**), six items with a Likert-type scale measuring attitudes and beliefs surrounding antimicrobial drug resistance and prescribing, and seven items collecting demographic information about respondents. The instrument was pilot-tested

Table 1. Treatment guidelines for pediatric upper respiratory illnesses: *Developed by the Antibiotic Resistance Education Project and endorsed by the Canadian Paediatric Society.*

ACUTE OTITIS MEDIA
The high spontaneous recovery rate of acute otitis media (AOM) might warrant watchful waiting for 48 to 72 hours before initiating antibiotic therapy for children older than 2 years if appropriate follow up can be assured.
Persistent middle ear effusion following therapy for AOM is to be expected and does not require treatment.
Antimicrobial therapy for AOM should be initiated when middle ear effusion, ear pain, fever, and irritability have not improved after 48 to 72 hours.
For AOM requiring antimicrobial therapy, a 10-day course of amoxicillin remains the treatment of choice for children younger than 2 years. For older children, a 5-day course appears equally effective.
NONSPECIFIC UPPER RESPIRATORY INFECTIONS (COMMON COLD)
Antimicrobial agents should not be given for nonspecific upper respiratory symptoms.
Purulent rhinitis (thick, opaque, or discolored nasal discharge) frequently accompanies common colds. It is not an indication for antimicrobial treatment unless it persists for more than 14 days along with other symptoms, such as fever, facial or dental pain, or facial swelling.
COUGH ILLNESS OR BRONCHITIS
Regardless of duration, cough illness or bronchitis in children rarely warrants antimicrobial treatment.
ACUTE SINUSITIS
Thick purulent or discolored nasal discharge, in the absence of other symptoms, does not indicate bacterial infection.
Diagnosis of bacterial sinusitis requires either prolonged nonspecific upper respiratory symptoms or presence of more severe upper respiratory symptoms.
Antimicrobial treatment of acute sinusitis with 7 to 10 days of amoxicillin is still successful for initial treatment of acute uncomplicated sinusitis in most children.
PHARYNGITIS
Most cases of pharyngitis are not bacterial and will not benefit from antibiotic therapy.
Diagnosis of group A streptococcal pharyngitis should be made using a laboratory test (throat culture or antigen test).
Antimicrobial therapy should not be given to children with pharyngitis if they do not have diagnosed Group A streptococcal or other bacterial infection.
If laboratory results indicate streptococcal infection, a 10-day course of oral penicillin remains the treatment of choice.

on a convenience sample of 10 family physicians, and wording in the questionnaire was slightly modified according to feedback.

Sample selection

A random sample of 608 family physicians and general practitioners (17% of all physicians in the province) was generated through the provincial physician database maintained by the BC College of Physicians and Surgeons. The sample was stratified to include all geographic regions of the province and all population densities (urban, light urban, and rural). Nonpractising physicians, retired physicians, and those not treating children were excluded from the study.

Protocol

The questionnaire and a personalized cover letter were mailed to physicians with instructions to return the completed questionnaire by fax or mail in a prestamped envelope included in the package. Nonresponders received a second mailing 3 weeks after the first mailing. No further follow up was attempted. Questionnaires were anonymous but coded to allow tracking. Participants had the option of identifying themselves in order to receive

Table 2. Questionnaire case scenarios

CASE 1
A 9-month-old, previously healthy child has fever of 38.5°C and rhinorrhea and is pulling at his right ear. The tympanic membrane is slightly pink and retracted and has decreased mobility. No air-fluid level is seen. Would you prescribe antibiotics?
CASE 2
A 3-year-old girl presents with a 7-day history of low-grade fever and deep cough. On examination, she is irritable and has a normal respiratory rate, clear lungs, and a cough. She is afebrile. Would you prescribe antibiotics?
CASE 3
A 30-month-old child is seen with a 5-day history of bilateral greenish nasal discharge, low-grade fever, and intermittent cough. Examination results are unremarkable except for the purulent nasal drainage. Would you prescribe antibiotics?
CASE 4
A 5-year-old boy is seen with a 3-day history of cough, spiking fevers to 39.5°C, and tachypnea. He is miserable and unwell but not toxic. On examination, he has decreased air entry with dullness on percussion over the right upper lung field. Would you prescribe antibiotics?
CASE 5
How often do you prescribe antibiotics to prevent secondary bacterial infection in children with viral upper respiratory infections?
CASE 6
How often do you treat children *presumptively* (without culture) with a full course of antibiotics for probably Group A streptococcus infection when fever and exudative pharyngitis are present?
CASE 7
After how many days of illness would you begin antibiotics for a 4-year-old child with a daytime cough and bilateral purulent nasal discharge?

an educational package on antimicrobial drug resistance.

Data from the questionnaires were analyzed with the Statistical Package for the Social Sciences (SPSS) for Windows (version 6.0). Ethical approval for the study was obtained from the UBC Behavioural Sciences Screening Committee.

RESULTS

A total of 392 surveys were returned for a 64% response rate; 28 questionnaires were excluded based on the exclusion criteria described above. The remaining 364 respondents included physicians from all BC geographic regions. Sex distribution appeared representative of BC's general practitioners (**Table 3**).

Table 3. Characteristics of study physicians: *N = 364.*

VARIABLE	N (%)
Sex*	
• Male	246 (72.8)
• Female	92 (27.2)
Years in practice	
• 10 or less	88 (24.8)
• More than 10	267 (75.2)
College of Family Physicians of Canada certification	
• Yes	143 (40.2)
• No	213 (59.8)
Geographic stratum	
• Heavy urban	123 (34.5)
• Light urban	131 (36.7)
• Rural	103 (28.9)
Average no. of patients seen weekly	
• Less than 100	97 (28.0)
• 100-150	62 (46.8)
• More than 150	87 (25.1)
Type of practice	
• Solo	97 (27.8)
• Group	213 (61.0)
• Walk-in clinic	39 (11.2)

**Sex distribution of BC general practitioners in the year of survey distribution (1997) was 70.6% male and 29.4% female.*

Table 4 shows results from case studies measuring self-reported prescribing behaviours. In relation to the treatment principles listed in **Table 1**, an overwhelming majority of physicians responded appropriately to the cough and lobar pneumonia vignettes (cases 2 and 4). In contrast, more than half the physicians (56.5%) responded inappropriately that they would prescribe antibiotics for tympanic membrane dysfunction (case 1), and 79.4% indicated they would prescribe antibiotics for pharyngitis without obtaining a throat culture (case 6).

Table 5 shows that 48.4% of study physicians thought they would reduce their antibiotic prescribing if parents did not pressure them for prescriptions; almost all physicians (93.5%) believed that educating parents would curb expectations for antibiotics. Conversely, a substantial number of physicians

Table 4. Self-reported antibiotic prescribing practices in management of pediatric upper respiratory tract illnesses: *N = 364.*

RESPONSE*	CORRECT (%)	INCORRECT (%)
Case 1. Tympanic membrane dysfunction	43.5	56.5
Case 2. Cough	94.0	6.0
Case 3. Upper respiratory tract infection	72.9	27.1
Case 4. Lobar pneumonia	99.1	0.9
Case 5. Prevention of secondary infection	82.0	18.0
Case 6. Treating pharyngitis without culture	19.6	79.4
Case 7. Days before treating dry cough	24.5	75.5

**Correct responses were determined by an expert panel of pediatric infectious disease specialists, pediatricians, and family physicians and based on treatment principles developed for the project and endorsed by the Canadian Paediatric Society (*Table 1*).*

Table 5. Beliefs surrounding antibiotic resistance and prescribing: *N = 364.*

BELIEF	DISAGREE (%)	UNCERTAIN (%)	AGREE (%)
Would reduce prescribing if parents did not pressure for prescriptions	40.4	11.2	48.4
Giving parents advice reduces expectation for antibiotics	0.3	6.2	93.5
Prior antibiotic use increases personal risk of developing resistance	16.4	11.7	71.8
Antibiotic use is a notable factor in my community	11.7	11.4	77.0

(40.4%) thought that absence of parental pressure would not cause them to decrease their prescribing.

Physicians reported that previous clinical experience, educational articles, practice guidelines, and medical journal articles were most influential on their prescribing practices (**Table 6**). Parents' expectations and cost of medications had less influence on prescribing.

Table 6. Factors influencing antibiotic prescribing: *N = 364.*

FACTOR	% REPORTING
Previous clinical experience	88.6
CME articles	77.2
Practice guidelines	66.9
Journal articles	61.4
Specialist advice	46.7
Discussion with colleagues	39.4
Parents' expectations	33.3
Cost of medication	30.3
Liability concerns	15.8
Concerns about losing patients	5.0
Pharmaceutical detailing	1.9

None of the demographic variables examined in the questionnaire (sex, years in practice, College of Family Physicians of Canada certification, number of patients treated weekly, and type of practice) appeared to be related to physicians' prescribing practices.

DISCUSSION

Antibiotics were appropriately used in the cough and lobar pneumonia case studies with 94% and 99.1% of physicians, respectively, responding correctly. Responses to the remaining cases had greater variability and suggested physicians need education in this area. More than half (56.5%) the study physicians would prescribe antibiotics immediately for tympanic membrane dysfunction without effusion despite current treatment guidelines that indicate this condition does not require antibiotic therapy. Furthermore, 79.4% would prescribe antibiotics for pharyngitis without obtaining a throat culture. This practice is not supported by current recommendations of the Canadian Paediatric Society and the American Pediatric Society and, since up to 90% of cases of pharyngitis are not due to Group A streptococcus, would result in unnecessary overuse of antibiotics. Clinical diagnosis of streptococcal pharyngitis is notoriously unreliable,

and many cases that display all the "classic" symptoms are misdiagnosed.[23,24] While limited access to testing laboratories might play a role in rural physicians' use of antibiotics for pharyngitis, the data demonstrated no relationship between geographic location and prescribing. Therefore, it is likely that most physicians would benefit from further education on this subject.

The tendency to overuse antibiotics in treatment of other pediatric upper respiratory tract infections, such as cough, otitis media with effusion, pharyngitis, the common cold, and rhinitis, might, in part, be related to the difficulty of diagnosing these infections. Clinical criteria for differentiating these conditions as viral or bacterial and self-limiting or treatable are not definitive.

Perceived pressure from parents was identified by physicians as a major factor in antibiotic prescribing in this survey. Results from parent focus groups conducted as part of this study, however, suggested that most parents did not expect antibiotics when they visited their doctors and, in fact, suggested the opposite (unpublished data). These findings confirm findings from other studies that have suggested that physicians are often inaccurate in their perceptions of parental expectations of antibiotics.[25] It is possible that the pressure perceived by physicians is not an expectation for antibiotics but rather an expectation for a physician to provide some form of intervention. In some cases, an effective intervention might be an adequate explanation for not prescribing antibiotics, such as was demonstrated in the study by Barden et al,[19] or provision of suggestions for follow up and symptomatic care of the child.

Interestingly, 40.4% of physicians thought their prescribing would decrease in the absence of parental pressure. It is unclear from this study, however, whether this response indicates that these physicians did not feel pressure from parents to prescribe or that these physicians will be less likely to change prescribing behaviours in light of current treatment recommendations.

Approximately 25% of physicians in this study did not believe that prior antibiotic use increased patients' personal risk for acquiring drug-resistant microbes, and 23.1% did not think that antibiotic use was a significant factor in promoting resistance in their communities. This finding suggests a more general need for education on the principles of antimicrobial drug resistance. Numerous recent studies have demonstrated that previous antibiotic use is a risk factor for acquiring drug-resistant microbes.[4-6]

Editor's key points

- This survey of British Columbia physicians indicated that more than 90% of the 392 respondents would decide appropriately whether or not to prescribe antibiotics for cough and pneumonia case studies.
- Despite official recommendations, more than half the doctors would prescribe antibiotics for tympanic membrane dysfunction; and almost 80% would prescribe antibiotics for infants suffering from pharyngitis without obtaining a throat culture beforehand.
- A quarter of respondents did not believe prior antibiotic use increased drug resistance.

Points de repère du rédacteur

- Cette enquête postale auprès de 392 médecins de la Colombie-Britannique indique que la plupart des répondants décideraient de façon appropriée de prescrire ou non un antibiotique dans les cas de pneumonie lobaire et de toux chez l'enfant.
- À l'encontre des recommandations officielles, plus de la moitié des médecins prescriraient des antibiotiques dans les cas de dysfonction tubaire; de plus, près de 80% prescriraient un antibiotique aux enfants souffrant de pharyngite sans avoir obtenu de prélèvement pharyngé au préalable.
- Il est important de sensibiliser davantage les médecins aux risques que représente la résistance bactérienne.

Limitations

Limitations of this study include the fact that physician prescribing is a complex behaviour influenced by many factors that cannot be easily captured through responses to written case studies. Thus, the strikingly high baseline knowledge for the bronchitis and lobar pneumonia cases could reflect the greater clinical detail provided in these scenarios. In addition, use of the terms "correct" and "incorrect" for physicians' responses is in relation to the prescribing guidelines developed by the Antibiotic Resistance Education Project. While these guidelines emerged from a thorough literature review and subsequently received the official endorsement of the Canadian Paediatric Society, they were not, at the time of this survey, extensively circulated among BC physicians. The objective of this survey was to collect baseline information on the knowledge and attitudes of BC physicians that

would ultimately inform the development of an educational intervention.

Implications for practice

This study accomplished two objectives. It obtained locally specific data on the self-reported prescribing patterns of BC family physicians. Findings from the questionnaire suggest that curbing inappropriate prescribing will require a multifaceted approach and require general physician and public education in current treatment principles for pediatric upper respiratory tract illnesses and in antimicrobial drug resistance.

The rather high response rate to the questionnaire (64% after one follow up) and the number of physicians who wished to receive the educational materials (approximately 45% of the responding sample) indicate that BC family physicians are interested in this subject. Currently, the Antibiotic Resistance Education Project is conducting an evaluation of the packages sent to participants. Packages containing posters, patient brochures, a self-care or symptomatic care prescription pad, and a review article outlining current treatment guidelines for pediatric upper respiratory illnesses were mailed to all family physicians and pediatricians in the province. An evaluation of the effect of the intervention is under way, including an examination of provincial trends in antibiotic prescribing practices.

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Contributors

Ms Katzenstein *coordinated the project.* **Drs Frankish**, **Herbert**, **Chambers** *and* **Speert** *contributed to the design and analysis of the survey and participated in development of the manuscript.*

Competing interests

None declared.

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