

Patient knowledge and perception of upper respiratory infections, antibiotic indications and resistance

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Background and Objective: The misuse of antibiotics is not a harmless practice; rather, it can render future antibiotic treatments ineffective. This study looked to determine patient knowledge and perception of upper respiratory infections and indicated treatment.

Methods: The authors developed and administered a questionnaire to 98 patients visiting affiliated family medicine clinical sites. Participants were selected randomly, either while sitting in the waiting room, or after being seen by the clinician.

Results: While more than half the respondents recognized that treatment for colds did not require antibiotics, 70% erroneously indicated that viruses require antibiotic treatment. Additionally, almost 90% of respondents thought that yellow nasal discharge or coughing up yellow mucous requires antibiotic treatment. It was interesting to note that 95% of patients reported satisfaction when advised by their physician that antibiotic treatment wasn't necessary, even if they initially thought they needed antibiotics.

Conclusions: Primary care providers have the greatest opportunity to curb inappropriate antibiotic use by both prescribing appropriately and educating their patients about proper antibiotic use when indicated.

Keywords: antibiotic resistance, antibiotic indications, upper respiratory infection, patient knowledge, patient education

Background

Although the discovery of penicillin has greatly changed the course of modern medicine, its exploitation along with many other antibiotics has resulted in antimicrobial resistance. Despite early warnings of resistance, antibiotic misuse and overuse continues. Beginning in the early 1990's the scientific community warned of the problem of antibiotic resistance as a global hazard. Today, the literature is replete with articles that explain why resistance occurs, the magnitude of the problem, and various solutions and interventions. While studies clearly support that drug resistance has been linked to the overuse of antibiotics including broad-spectrum antibiotics, inappropriate dosing, and antibiotics with unfavorable pharmacodynamics and pharmacokinetics, clinicians often argue that patient expectations have also exacerbated the problem (Britten 1995; Britten and Ukoumunne 1997; Macfarlane et al 1997; Mangione-Smith et al 1999; Hooton and Levy 2001; Scott et al 2001). A decade of extensive research initiatives (Ware 2000; Gonzales et al 2001a), a national Centers for Disease Control and Prevention (CDC) campaign targeting inappropriate consumer usage of antibiotics, specialty college guidelines (Brooks et al 2000; Gonzales et al 2001a; Snow et al 2001; CDC 2007), and increased use of the pneumococcal vaccine are beginning to decrease the burden of overall antibiotic selective pressure (Hooton and Levy 2001; Finkelstein et al 2003). However, antibiotic resistance continues to be detrimental to the delivery of effective healthcare in the United States (Yates 1999; Jacobs et al 2003).

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Nearly 90% of all upper respiratory infections are caused by viruses (Larrabee 2002; Brunton and Pichichero 2006), which do not respond to antibiotic treatment. Nevertheless, antibiotics are widely prescribed for these conditions. This misuse of antibiotics is not a harmless practice. Rather, it “creates a selective pressure for the development of resistant strains of pathogens” (Larrabee 2002), which leads to the ineffectiveness of future antibiotic use. An example has been the extensive over prescribing of the second generation macrolide antibiotics, which experts clearly argue has been the overwhelming cause of macrolide resistance in the past 10 to 15 years (Lonks et al 2002; Moellering et al 2002; Jacobs et al 2003; Doern 2005; Doern et al 2005; Vanderkooi et al 2005). This example has significantly complicated the effective treatment of community-acquired respiratory tract infections such as rhinosinusitis, community acquired pneumonia, otitis media, and acute exacerbation of chronic bronchitis. In fact, roughly 30% of the pneumococcal strains common to all these infections are resistant to penicillins and/or macrolides (Moellering et al 2002; Doern 2005).

Various innovative interventions targeting both patients and physicians have been utilized to address this growing concern. CDC (2007) have initiated a “Get Smart” national campaign, which, 1) informs patients about the differences between viral and bacterial infections, 2) advises patients not to take an antibiotic for a viral illness, 3) asks patients not to pressure clinicians for antibiotic therapy, and 4) cautions patients not to use antibiotics prescribed for another person or use antibiotics left over from a previous illness. Investigators have taken this campaign one step further. Through utilization of the CDC campaign brochure, Pontes and colleagues (2005) have identified an educational intervention that increases consumers’ preference for physicians who chose not to prescribe antibiotics unnecessarily for simple upper respiratory tract infections. Study participants rated doctors more favorably when antibiotics were not prescribed for acute viral infections when they understood the differences between bacterial and viral illnesses and why inappropriate prescribing is harmful. Such a study demonstrated how a relatively simple educational intervention could drastically change patients’ beliefs about antibiotic indications and resistance. Other investigators (Gonzales et al 1999, 2001b, 2004, 2005; Yates 1999; Brooks et al 2000; Bauchner et al 2001; Snow et al 2001; Trepka et al 2001; Larrabee 2002; Harris et al 2003; Taylor et al 2003; Brown and Nathwani 2005) have delineated possible solutions to this problem that include development of specific medical specialty treatment guidelines and algorithms, restricted use of antibiotics, antibiotic

cycling, educational videos and pamphlets, and interactive computerized educational programs. Nevertheless, despite a modest decline in overall antibiotic use, patients continue to engage in antibiotic misuse, and clinicians continue to prescribe indiscriminately (Mangione-Smith et al 1999). Interventions that have shown some success have largely failed to transfer over into daily clinical practice. Continued research must be performed addressing the multifactorial etiology of this problem that involves patients, clinicians, health insurance organizations, and pharmaceutical companies. At a minimum, continued attempts at curbing the problem of antibiotic resistance will rely on patient and clinician education and specifically understanding and addressing patient preferences.

Several studies (Britten 1995; Britten and Ukoumunne 1997; Macfarlane et al 1997; Mangione-Smith et al 1999; Hooton and Levy 2001; Scott et al 2001) have examined the correlation between patient expectation of antibiotic prescriptions and practitioner prescribing behaviors, suggesting that perceived expectations were more likely to influence the decision to prescribe medication. A cause for antibiotic overuse is when patients expect or clinicians perceive that patients expect antibiotic treatment for acute infection, whether viral or bacterial.

Methodology

This university Institutional Review Board (IRB)-approved study was undertaken to determine the perception and knowledge of patients regarding antibiotic use in a family medicine practice. The investigators developed and administered the approved questionnaire (see Table 1) to 100 individuals in three family medicine practices located in southern New Jersey. These clinical offices were chosen due to their patient population demographics. By having patients from these three offices participate in the study, the authors expected to include representation from a varied cultural and socioeconomic patient population group.

The only exclusion criterion for participation was age, which needed to be greater than 18. The questionnaire was administered to patients visiting university affiliated family medicine clinical sites located in southern New Jersey. Front desk personnel asked patients when they first registering or after their clinician had seen them, if they would like to participate in this study on a voluntary basis. A study coordinator completed the informed consent process with the participants and sat with them while they completed the questionnaire. An introductory paragraph on the questionnaire

Table I Survey questions

How many times in the last year have you been on an antibiotic for treatment of a respiratory infection?
 _____ times

When you get a respiratory infection, how many days do you usually wait before you seek treatment from a healthcare provider?
 _____ days

Do you think that an antibiotic is necessary when you have a respiratory infection for a period of over 5 days?
 Yes _____ No _____

When prescribed an antibiotic for a respiratory infection, do you take it for the number of days that your doctor prescribes for you?
 Yes _____ No _____

If not, what is the main reason you do not? (ie, side effects? forget?)

When given an antibiotic for a respiratory infection, to take for 5 days, I finish taking all of the medication.
 Yes _____ No _____

When given an antibiotic for a respiratory infection, to take for 10 days, I finish taking all of the medication.
 Yes _____ No _____

I stop taking antibiotics when I start feeling better.
 Yes _____ No _____

Do you think that some antibiotics for a respiratory infection, work better for you?
 Yes _____ No _____

Have you ever requested a specific antibiotic by name for a respiratory infection?
 Yes _____ No _____

If so, which one?

Patients with symptoms of the common cold require treatment with antibiotics	Do not agree	Slightly agree	Moderately agree	Strongly agree	Completely agree
Patients who cough up yellow or greenish mucous require antibiotics	Do not agree	Slightly agree	Moderately agree	Strongly agree	Completely agree
Patients who have yellow or greenish nasal discharge from the nose require antibiotics	Do not agree	Slightly agree	Moderately agree	Strongly agree	Completely agree
Respiratory infections caused by viruses require treatment with antibiotics	Do not agree	Slightly agree	Moderately agree	Strongly agree	Completely agree
Many antibiotics today do not work as well as they used to in the past	Do not agree	Slightly agree	Moderately agree	Strongly agree	Completely agree

advised patients about the current definition of respiratory infections as defined by the National Institutes of Health (NIH 2006). Participants were offered help with completing the questionnaire, including reading the questions to them and filling in the answers. The office physicians were blinded to their patients' study participation.

Results

One hundred surveys were completed, two of which were eliminated from the study results as the participants did not meet the age criteria. The breach of protocol to include the two underage participants was reported to the IRB. Table 2 below provides further demographic descriptions of the study participants.

Table 3 contains a frequency distribution analysis of eight questions that provided significant information for the authors. From these results, it is clear that study participants do not have an understanding of the differences between viral and bacterial etiologies of respiratory tract infections, with a

significant number of participants believing that antibiotics are indicated for viral infections. Additionally the presence of yellow mucous alone created a greater perception among participants that antibiotics were indicated. This may well be the result of clinician over emphasis on this symptom guiding antibiotic prescribing rather than published treatment guidelines (Hooton and Levy 2001). Discouragingly, only half of the respondents encountered a clinician that would not prescribe an antibiotic even though the patient felt it was necessary. This again validates clinician's beliefs regarding patient expectations and its subsequent effect of antibiotic overuse (Britten 1995; Britten and Ukoumunne 1997; Macfarlane et al 1997; Mangione-Smith et al 1999; Hooton and Levy 2001; Scott et al 2001). Despite lack of knowledge regarding appropriate antibiotic prescribing, ninety-five percent of participants are satisfied with their clinician when told an antibiotic is not needed, clearly contradicting the perceptions that many clinicians have regarding their patients. Interestingly, a large majority of

Table 2 Participant demographics (n = 98)

Gender	Average age	Education completed	Ethnicity	Prescription plan
Males – 35	45	H.S/Grammar 62	Black 20	Yes – 85
Females – 63	49	College/Post-grad. 36	Hispanic 6	No – 13
			Caucasian 65	
			Asian 7	

participants wanted to be further educated on the topic of antibiotic resistance.

There were no significant differences in patient responses based on gender, education, ethnic group or prescription plan.

Discussion

Our study demonstrates just how little patients truly understand about upper respiratory tract infections, antibiotic indication, and its ramifications for misuse. With the morbidity and mortality associated with resistant bacteria, particularly streptococcus pneumonia, physicians need to educate patients not only on preventative measures (such as immunoprophylaxis), but also on avoidance of antibiotic misuse unless there is strong evidence for bacterial infection. Before this can occur however, clinicians themselves must avoid the common misperception that patients expect antibiotic treatment even when not indicated. If the medical community is to succeed at curbing the problem of antibiotic resistance, current research suggests that patient education is the key.

The authors recognize the small sample size and the geographical limitations of this study, however, a number of studies have recognized the importance of looking at local communities and health practices when planning new health policies or interventions (Mayster et al 1990; Hubbell

1991). The results of such community-oriented research might provide additional information not evident in national research studies, such as was shown in our study where patients trust their physician and are satisfied when told antibiotic treatment is not indicated and their preference for being educated by their physicians about specific antibiotic treatment options.

Primary care providers need to take advantage of this opportunity, reflect on both their own prescribing habits and beliefs, and on their patients' health care preferences and thereby improve patient education regarding antibiotic resistance. Furthermore, academic institutions should place strong emphasis on patient education in their medical curricula, training all future physicians to effectively counsel their patients regarding necessary and/or unnecessary treatment.

References

- Bauchner H, Osganian S, Smith K, et al. 2001. Improving parent knowledge about antibiotics: a video intervention. *Pediatrics*, 108:845–50.
- Britten N. 1995. Patients' demands for prescriptions in primary care. *BMJ*, 310:1084–5.
- Britten N, Ukoumunne O. 1997. The influence of patients' hopes of receiving a prescription on doctors' perceptions and the decision to prescribe: a questionnaire survey. *BMJ*, 315:1506–10.
- Brooks I, Gooch WM III, Jenkins SG, et al. 2000. Medical management of acute bacterial sinusitis. Recommendations of a clinical advisory committee on pediatric and adult sinusitis. *Ann Otol Rhinol Laryngol Supp*, 182:2–20.
- Brown EM, Nathwan I D. 2005. Antibiotic cycling or rotation: a systematic review of the evidence of efficacy. *J Antimicrob Chemother*, 55:6–9.
- Brunton S, Pichichero M. 2006. Considerations in the use of antibiotics for streptococcal pharyngitis. *J Fam Pract*, (Suppl)S9–16.
- [CDC] Centers of Disease Control and Prevention. 2007. Get Smart: Know when antibiotics work campaign information [online]. Accessed on October 24, 2007. URL: http://www.cdc.gov/drugresistance/community/campaign_info.htm.
- Doern GV. 2005. Antimicrobial resistance with bacterial causes of community-acquired respiratory tract infections in the United States. *Treat Respir Med*, 4(Suppl 1):1–4.
- Doern GV, Richter SS, Miller A, et al. 2005. Antimicrobial resistance among *Streptococcus pneumoniae* in the United States: have we begun to turn the corner on resistance to certain antimicrobial classes? *Clin Infect Dis*, 41:139–48.
- Finkelstein JA, Stille C, Nordin J, et al. 2003. Reduction in antibiotic use among US children, 1996–2000. *Pediatrics*, 112:620–7.
- Gonzales R, Bartlett JG, Besser RE, et al. 2001a. Principles of appropriate antibiotic use for treatment of acute respiratory tract infections in adults: background, specific aims, and methods. *Ann Intern Med*, 134:479–86.

Table 3 Survey results

Question	Do not agree	Agree
Colds require antibiotic treatment	55%	45%
Viruses require antibiotic treatment	30%	70%
Yellow nasal mucous requires antibiotic treatment	14%	86%
Coughing up yellow mucous requires antibiotic treatment	8%	92%
My doctor does not give me antibiotics even when I think I need them	42%	58%
I am satisfied when my doctor tells me I don't need an antibiotic	5%	95%
Has a doctor ever discussed antibiotic resistance with you?	32%	68%
Should antibiotic resistance be discussed with you?	12%	88%

- Gonzales R, Corbett KK, Leeman-Castillo BA, et al. 2005. The "minimizing antibiotic resistance in Colorado" project: impact of patient education in improving antibiotic use in private office practices. *Health Serv Res*, 40:101–16.
- Gonzales R, Malone DC, Maselli JH, et al. 2001b. Excessive antibiotic use for acute respiratory infections in the United States. *Clin Infect Dis*, 33:757–62.
- Gonzales R, Sauaia A, Corbett KK, et al. 2004. Antibiotic treatment of acute respiratory tract infections in the elderly: effect of a multidimensional educational intervention. *J Am Geriatr Soc*, 52:39–45.
- Gonzales R, Steiner JF, Lum A, et al. 1999. Decreasing antibiotic use in ambulatory practice: impact of a multidimensional intervention on the treatment of uncomplicated acute bronchitis in adults. *JAMA*, 281:1512–19.
- Harris RH, Mackenzie TD, Leeman-Castillo B, et al. 2003. Optimizing antibiotic prescribing for acute respiratory tract infections in an urban urgent care clinic. *J Gen Intern Med*, 18:326–34.
- Hooton TM, Levy SB. 2001. Antimicrobial resistance: a plan of action for community practice. *Am Fam Phys*, 63:1087–98.
- Hubbell FA, Waitzkin H, Mishra SI, et al. 1991. Access to medical care for documented and undocumented Latinos in a southern California county. *West J Med*, 154:414–18.
- Jacobs MR, Felmingham D, Appelbaum PC, et al; The Alexander Project. 2003. The Alexander Project 1998–2000: susceptibility of pathogens isolated from community-acquired respiratory tract infection to commonly used antimicrobial agents. *J Antimicrob Chemother*, 52:229–46.
- Larrabee T. 2002. Prescribing practices that promote antibiotic resistance: strategies for change. *J Pediatr Nurs*, 17:126–32.
- Lonks JR, Garau J, Medeiros AA. 2002. Implications of antimicrobial resistance in the empirical treatment of community-acquired respiratory tract infections: the case of macrolides. *J Antimicrob Chemother*, 50(Suppl S2):87–92.
- Macfarlane J, Holmes W, Macfarlane R, et al. 1997. Influence of patients' expectations on antibiotic management of acute lower respiratory tract illness in general practice: questionnaire study. *BMJ*, 315:1211–14.
- Mangione-Smith R, McGlynn EA, Elliott MN, et al. 1999. The relationship between perceived parental expectations and pediatrician antimicrobial prescribing behavior. *Pediatrics*, 103:711–18.
- Mayster V, Waitzkin H, Hubbell FA, et al. 1990. Local advocacy for the medically indigent: Strategies and accomplishments in one county. *JAMA*, 263:262–8.
- Moellering RC Jr, Craig W, Edmond M, et al; Consensus Working Group. 2002. Clinical and public health implications of macrolide-resistant *Streptococcus pneumoniae*. *J Chemother*, 14(Suppl 3):42–56.
- [NIH] National Institutes of Health. 2006. Medical Encyclopedia: Common cold [online]. Accessed on October 24, 2007. URL: <http://www.nlm.nih.gov/medlineplus/ency/article/000678.htm>.
- Pontes MC, Pontes NM. 2005. Debiasing effects of education about appropriate antibiotic use on consumers' preferences for physicians. *Health Care Manage Rev*, 30:9–16.
- Scott JG, Cohen D, Diccio-Bloom B, et al. 2001. Antibiotic use in acute respiratory infections and the ways patients pressure physicians for a prescription [erratum appears in *J Fam Pract*, 2001, 50(12):1077]. *J Fam Pract*, 50:853–8.
- Snow V, Lascher S, Mottur-Pilson C; Joint Expert Panel on Chronic Obstructive Pulmonary Disease of the American College of Chest Physicians and the American College of Physicians-American Society of Internal Medicine. 2001. Evidence base for management of acute exacerbations of chronic obstructive pulmonary disease. *Ann Intern Med*, 134:595–9.
- Taylor JA, Kwan-Gett TS, McMahon EM Jr. 2003. Effectiveness of an educational intervention in modifying parental attitudes about antibiotic usage in children. *Pediatrics*, 111:e548–54.
- Trepka MJ, Belongia EA, Chyou PH, et al. 2001. The effect of a community intervention trial on parental knowledge and awareness of antibiotic resistance and appropriate antibiotic use in children. *Pediatrics*, 107:E6.
- Vanderkooi OG, Low DE, Green K, et al. 2005. Predicting antimicrobial resistance in invasive pneumococcal infections. *Clin Infect Dis*, 40:1288–97.
- Ware J. 2000. Rational use of antibiotics for upper respiratory infections: An evidence-based approach. *Clin Excell Nurs Pract*, 4:151–7.
- Yates RR. 1999. New intervention strategies for reducing antibiotic resistance. *Chest*, 115:24S–27S.

