

## Promoting Appropriate Antibiotic Use: Teaching Doctors, Teaching Patients

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### Abstract

Antibiotic resistance is a major public health threat that requires an organized, comprehensive approach to overcome. Many studies have shown that integrating education programs for clinicians, medical office staff, patients, and targeted audiences such as day care providers make the biggest difference in community-wide antibiotic use. We describe such an integrated approach between our state's public health programs and our developing curriculum for primary care residents based at the academic health center. Patients receive education directly from both the state programs and their clinicians during office visits for upper respiratory infections. Physicians learn principles of appropriate antibiotic use, how best to educate patients about this important health topic, and how to address patients' concerns about their illnesses.

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### Introduction

Antibiotic resistance is recognized as a major public health threat worldwide, but especially in developed countries where antibiotics are widely available. As early as 1998, the Institute of Medicine published a report on Antibiotic Resistance (Harrison & Lederberg, ed. 1998) that detailed the extensive long-term ramifications of antibiotic use. Among these long term ramifications are the growing number of bacteria that are resistant to one or more of the 100 or so available antibiotics. To compound the problem, there have recently been far fewer new antibiotics entering the market. In 2002, 89 new drugs came to the market and none were antibiotics (IDSA, 2004). Exact costs of the burden of antibiotic resistant bacteria are not known, but considering reports that over 70 percent of bacteria that cause hospital infections are resistant to at least one antibiotic, the monetary cost and human costs are staggering.

In response to the growing threat of antibiotic-resistant bacteria in the community, the U.S. Centers for Disease Control and Prevention (CDC) has established a national antibiotic resistance education initiative. Get Smart: Know

When Antibiotics Work coordinates and supports educational programs that simultaneously target clinicians, patients and the public. These programs are based in the philosophy that both clinicians and consumers play pivotal roles in the complex interactions that lead to inappropriate antibiotic prescribing and use (Weissman & Besser, 2004). In 2002, the Oregon Department of Human Services founded the Oregon Alliance Working for Antibiotic Resistance Education (AWARE), one of 27 state and local education programs funded through a cooperative agreement with the CDC. Oregon AWARE is a coalition of more than 40 partners that promotes clinician and consumer education about appropriate antibiotic use. The coalition's patient education efforts complement clinician education programs by targeting health consumers at many points along the behavioral continuum of antibiotic use.

In addition to public health based community education programs, CDC recognized the need for improved clinician education on antibiotic use, since in the United States antibiotics are primarily prescribed by a physician or other licensed clinician. To address this need, CDC

granted money to the University of California – San Diego (UCSD) in 1999 to develop a judicious antibiotic use curriculum for medical students. This curriculum includes formal didactic sessions on principles of antibiotic resistance, drug choice, infection control and other pertinent topics, as well as small group exercises that allow learners to practice patient education skills such as negotiating with patients about the need for antibiotics and educating them about how to use antibiotics properly when they are indicated.

While the medical student curriculum was broad-based, the CDC also recognized that 80% of antibiotics are prescribed in the outpatient setting, many of these for common respiratory infections. Thus, in follow-up to the UCSD project, the CDC called for proposals to adapt this curriculum for use by primary care residents (physicians doing graduate medical education in family medicine, internal medicine, and pediatrics). The CDC awarded this grant to our team at Oregon Health & Science University, recognizing our ability to integrate the residency curriculum with the medical student curriculum (OHSU was a beta-test site for the UCSD curriculum and now hosts the Web-based components of that curriculum) and Oregon AWARE's established program of educational activities.

Oregon AWARE's public health awareness strategies aim to reduce inappropriate antibiotic use behaviors among consumers by providing the general population of well adults with information about the growing threat of antibiotic resistance and the importance of appropriate use of antibiotics. The coalition's four main consumer messages are: 1) don't take antibiotics to treat viral illnesses like colds or the flu, 2) unnecessary use increases the risk of developing resistant infections, 3) when antibiotics are prescribed, take every dose even if symptoms improve, and 4) never share antibiotics, take leftovers, or take them without a prescription. The Oregon AWARE coalition has created a number of materials to reinforce these basic messages. They are available in bulk for a nominal fee, or as free PDF downloads at

<http://www.healthoregon.org/antibiotics/pubs.cfm>.

### **The Case for a Combined Educational Approach**

Public education about safe antibiotic use is critical because decreasing inappropriate antibiotic prescribing through clinician education is not the only factor in the appropriate use equation. Unfortunately, surveys have shown that many consumers have misconceptions about the types of illnesses that can be effectively treated with antibiotics (Dowler, Thomas, & Saddler, 2003; Vanden Eng, Marcus, Hadler, Imhoff, Vugia, Cieslak, Zell, Deneen, McCombs, Zansky, Hawkins, & Besser, 2003). The same studies show that many consumers are also unaware of the dangers associated with inappropriate use of antibiotic medications. Although clinicians serve as gatekeepers for consumers who obtain their antibiotics by legal means in the U.S., patients play an important role in the interactions that lead to prescription. The advent of medical consumerism and the expansion of direct-to-consumer marketing of pharmaceuticals in the U.S., among other factors, have placed patients in a role of unprecedented power in the realm of health-related decision making (Roter & Hall, 1992).

Antibiotics are also obtainable through means other than prescription. Available over the counter in Mexico and many other countries, antibiotics can make their way to U.S. consumers across the border, through the mail, at swap meets and in local import shops (Calva, Ceron, Bjalil, & Holbrook, 1993; Casner & Guerra, 1992; Sola & Saddler, 2003). Regardless of how antibiotics are obtained, consumer behaviors determine the eventual pattern of antibiotic use. Many of these behaviors may contribute to the development of resistant organisms; examples include not completing the entire course of therapy, sharing the antibiotics between family members, and hoarding leftover medication for future use.

Fortunately, controlled interventions that included components of both clinician and patient education have demonstrated significant

decreases in prescribing rates for adult and pediatric upper respiratory infections (Finkelstein, Davis, & Dowell, 2001; Gonzales, Steiner, Lum, & Barrett, 1999; Welschen, Kuyenhoven, Hoes, & Verheij, 2004). Trials that expanded educational efforts to the community have also shown efficacy in reducing both the inappropriate prescribing of antibiotics and resistant pneumococcal carriage rates in the general public (Belongia, Sullivan, Chyou, Madagame, Reed & Schwartz, 2001; Hennessy, Petersen, Bruden, Parkinson, Hurlburt, Getty, Schwartz & Butler, 2002; Perz, Craig, Coffey, Jorgensen, Mitchel, Hall, Schaffner, & Griffin, 2002).

Public education about judicious use may also provide a degree of moral support for prescribing clinicians. Promotion of realistic expectations among consumers may reduce the likelihood of confrontational patient/clinician encounters regarding the prescription of antibiotics. In one study, pediatricians suggested that parental education would be the most important means of reducing inappropriate antibiotic use (Bauchner, Pelton, & Klein, 1999). In a focus group of physicians, Barden, Dowell, Schwartz and Lackey (1998) noted that unrealistic patient expectations were the single most important cause of inappropriate prescribing.

Thus, the combined goals of the OHSU "Teaching Primary Care Residents Judicious Antibiotic Use" project and the Oregon AWARE program include extensive training for clinicians on how to use patient education materials effectively, how to understand the patient's true agenda accurately, and how to negotiate with and educate patients about when and how to use antibiotics appropriately.

#### **The Resident Curriculum on Judicious Use**

To accomplish this goal, our team is developing a curriculum for primary care residents to

improve both understanding of judicious antibiotic use and how to educate patients about this important public health issue. The curriculum is evidence-based, using sources such as the joint American Academy of Pediatrics/American Academy of Family Physicians guidelines on diagnosis and treatment of otitis media (AAFP/AAO-HNS/AAP, 2004) as the basis for the information presented. We encouraged the faculty in each residency program to complete the curriculum by offering continuing medical education (CME) credit as well. This helps improve the likelihood that the residents will get consistent messages from both the curriculum and their faculty preceptors.

Residents often work in remote locations or on schedules that do not permit them to attend formal didactic conferences. To address this problem, the curriculum is almost entirely Web-based, which allows asynchronous learning at times and locations convenient to the residents. The Web-based components include 11 short didactic segments in Microsoft PowerPoint® format with voice/text narration and photo/video images (Table 1); outpatient clinical case scenarios that mirror the clinical encounter for residents to work through and apply knowledge and skills learned in the didactic sessions (Table 2); reference materials; and links to outside resources.

Additionally, adult learners tend to have preferred learning styles (primarily visual, auditory, or kinesthetic), thus curricula targeted at adults must include all three styles of presentation. The Web-based components address the needs of visual and auditory learners well, but do not have a kinesthetic component. Therefore, the curriculum will also include hands-on practice of relevant clinical skills such as pneumatic otoscopy (critical for accurate diagnosis of otitis media), and effective patient communication skills.

Table 1  
Didactic Segments

Didactic Area	Content
Background	History & trends of antibiotic resistance, how resistance develops, role of antibiotic use
Drug choice	Basic pharmacological principles, broad vs. narrow-spectrum antibiotics, using an antibiogram to guide drug choice
Patient education	What patients really want, how to determine the true agenda, educating and negotiating with patients about appropriate antibiotic use
Disease-specific segments (all cover Presentation, Diagnosis, Etiology, Treatment)	Acute Bronchitis, Pharyngitis, Acute Otitis Media, Sinusitis, Adult Community-Acquired Pneumonia (CAP), Pediatric CAP, Adult Urinary Tract Infection (UTI), Pediatric UTI

Table 2  
Case Index

No.	Patient	Age/Sex	Symptoms	Key Teaching Points
1	Rich	6 yrs. / male	Rhinorrhea with Coughing	<ul style="list-style-type: none"> <li>• Differentiating viral URI from sinusitis in a child</li> </ul>
2	Beverly	26 mo. / female	Fever and Irritability	<ul style="list-style-type: none"> <li>• Assessing severity of illness</li> <li>• Managing treatment failure</li> </ul>
3	Maria	12 yrs. / female	Sore Throat	<ul style="list-style-type: none"> <li>• Differentiating viral vs. bacterial pharyngitis</li> </ul>
4	John	18 mo. / male	Fever and Rhinorrhea	<ul style="list-style-type: none"> <li>• Parental reassurance</li> <li>• Symptomatic therapy of viral illness</li> </ul>
5	Jonathon	2.5 yrs. / male	Rhinorrhea and Coughing	<ul style="list-style-type: none"> <li>• Reassurance &amp; symptom control</li> </ul>
6	Jill	6 mo. / female	Fever with Fussiness	<ul style="list-style-type: none"> <li>• Diagnosis in the presence of nonspecific findings</li> </ul>
7	Ruth	34 yrs. / female	Respiratory Symptoms with Headaches	<ul style="list-style-type: none"> <li>• Differentiating viral URI from sinusitis in an adult</li> </ul>
8	Steve	24 yrs. / male	Respiratory Symptoms with Myalgia	<ul style="list-style-type: none"> <li>• Educating a peer</li> </ul>
9	James	32 yrs. / male	Respiratory Symptoms with Coughing	<ul style="list-style-type: none"> <li>• Negotiating about antibiotic use</li> </ul>
10	Sheila	28 yrs. / female	Respiratory Symptoms with Coughing	<ul style="list-style-type: none"> <li>• Differentiating cough illness</li> <li>• Pneumonia severity</li> </ul>
11	Charles	64 yrs. / male	Respiratory Symptoms with Coughing	<ul style="list-style-type: none"> <li>• Pneumonia in the presence of comorbidities</li> </ul>
12	Sara	30 yrs. / female	Dysuria	<ul style="list-style-type: none"> <li>• Importance of complete history</li> </ul>

First, the didactic section on patient education describes common patient understandings of when and how to use antibiotics; addresses misconceptions about what patients with

respiratory infections really expect from their office visit; explains the advantages and disadvantages of various forms of patient education; and illustrates crucial communication

skills that can help clinicians educate their patients about antibiotic use. Second, the online cases include some scenarios in which antibiotics are not indicated. Those cases include questions about how to negotiate with the patient about not prescribing antibiotics. Third, one conference session for the residents focuses on negotiation and patient education.

Physicians often express concern about their skills at negotiating with patients about antibiotic use, and have misconceptions about when patients truly want antibiotics as opposed to simply a more complete understanding of their illness and how to treat it symptomatically (Linder & Singer, 2003; Mangione-Smith, McGlynn, Elliott, Krogstad, & Brook, 1999; Mangione-Smith, McGlynn, Elliott, McDonald, Franz, & Kravitz, 2001; van Duijn, Kuyenhoven, Welschen, den Ouden, Slootweg, & Verheij, 2002). We present information about proven negotiating techniques; effective use of written patient education materials to improve retention and decrease time needed to educate patients; and how to elicit the patient's true agenda for an office visit. We discuss other evidence-based techniques such as delayed prescribing (Arroll, Knealy, & Kerse, 2003) to reduce antibiotic use. We then divide into groups of three to role play clinical scenarios. The observer/timer times the encounter, which should be limited to two minutes, and takes notes on body language, phrasing, and other features of the communication. The patient and physician describe their responses to the encounter, and the observer then reviews the encounter. Practice such as this enhances the residents' confidence in their ability to negotiate with and educate patients as needed.

Our curriculum also includes a wide range of patient education materials, including those prepared by the Oregon Alliance Working for Antibiotic Resistance Education (AWARE) and other reliable public health agencies, and online materials found on both professional (e.g., American Academy of Family Physicians) and lay (e.g., WebMD®) Web sites. We educate about how best to assess the validity of patient education content, and also teach them how to pass this information on to patients, so they can

assess for reliability as well. We also provide patient education materials for all the residency clinics. We make presentations at clinic staff meetings to help nurses, medical assistants, and front office staff be active partners in distributing these materials as part of this health promotion effort. We provide information sheets, algorithms, and advice on self-care for phone triage nurses to use in caring for patients who call in with respiratory complaints.

### **Public Education About Judicious Use**

Although Oregon AWARE's key educational messages closely reflect those of the CDC's national antibiotic resistance awareness campaign, the coalition has relied on locally collected data to hone and target its messages. In 2002, a set of questions measuring consumer knowledge, attitudes and expectations surrounding the use of antibiotics for upper respiratory infections was added to the Oregon Behavioral Risk Factor Surveillance System (BRFSS) telephone survey (Dowler et al., 2003). In addition to determining rates of recent antibiotic use and knowledge of the dangers of antibiotic resistance, we found that persons with lower income and education levels had more misconceptions about when antibiotics were needed, as did persons of non-white race and Hispanic ethnicity. The data have underscored the importance of gearing key messages toward consumers with lower literacy levels.

Stimulated by the BRFSS findings, Oregon AWARE has also used local input to evaluate and redesign its Spanish language educational materials. In 2003, the coalition conducted a series of focus groups with recently immigrated Spanish-speaking women to elucidate culturally mediated beliefs, behaviors and attitudes related to antibiotic use, and to evaluate the effectiveness of existing Spanish materials (Sola et al., 2003). Key findings were that "penicilina" is a more meaningful term than "antibiotico" to recent immigrants, pictures of healthy families on posters and brochures are more appealing than pictures of sick children, and that this audience was not likely to understand technical explanations about viruses and bacteria and which types of illness they cause. The results of this evaluation allowed us to create more

effective, culturally appropriate educational materials for Spanish-speaking patients.

In the absence of a paid public service announcement campaign, the Oregon AWARE coalition has generated media coverage through a number of creative strategies, including a staged media event, press releases, and release of expert editorial opinion pieces to newspapers. We have augmented this effort by placing informational articles in newsletters generated by health plans, parent-teacher organizations, childcare provider groups and school nurses, and by launching a consumer-friendly Web site. These educational efforts encourage consumers to develop realistic expectations about receipt and use of antibiotics before unpleasant symptoms prompt them to seek medical attention.

Posters and brochures in clinic waiting rooms reinforce realistic expectations and encourage patients to ask for the most appropriate symptomatic treatments rather than to simply request antibiotics. A variety of staff, as well as the clinician, may present these materials.

Because antibiotic prescribing rates are particularly high for children aged 0-6 years (McCraig, Besser & Hughes, 2002), Oregon AWARE is now making a special effort to reach the parents of young children with information about appropriate use. Partnerships have been established with childcare provider groups and early childhood education programs. Future educational interventions will aim to reduce the incidence of upper respiratory infections and promote parent and staff awareness of the observation option for otitis media (AAFP/AAO-HNS/AAP, 2004). New child care provider training curricula will emphasize the importance of following standard disinfection procedures and reinforce recommendations regarding frequent, thorough hand washing among children and child care staff.

Oregon AWARE also provides direct continuing education for clinicians. The Oregon AWARE medical director and infectious disease consultants have given regular presentations at statewide and local conferences. This group collaborated to produce a self-study, continuing medical education booklet, entitled *Judicious Use of Antibiotics: A Guide for Oregon Clinicians*. The monograph is approved for one hour of continuing education credit for physicians, physician assistants and nurses. It provides a local perspective on the issue of antibiotic resistance, as well as the pharmacokinetic and pharmacodynamic principles that guide rational use of antibiotics. It also outlines consensus-derived treatment guidelines for pediatric and adult cough illness, sinusitis, pharyngitis, and pediatric otitis media. Oregon AWARE mailed the monograph to 6,500 primary care clinicians in 2003. The monograph is also available on the World Wide Web at <http://www.healthoregon.org/cme.pdf>.

#### **Evaluation of Combined Program Impact**

Because behavior change is a long-term phenomenon, it will take several years to evaluate the results of this integrated public/patient/clinician education effort. Our evaluation utilizes multiple components to assess antibiotic use and patient/clinician attitudes about antibiotics from several perspectives. First, the resident curriculum project uses chart abstract data to determine prescribing rates for five common upper respiratory infections before and after implementation of the curriculum. Using Oregon Medicaid claims data, the AWARE program determined crude baseline antibiotic prescribing rates for sinusitis, acute bronchitis, pharyngitis, acute otitis media, and upper respiratory infection (common cold) in 2000. Based on these rates, we are targeting a 40% reduction in prescribing rates, and are abstracting data from charts of patients seen with these diagnoses in the respiratory season (November – March) of the years preceding and following curriculum implementation (Table 3).

Table 3  
 Chart audit sample sizes necessary to determine reduction in antibiotic use.

Diagnosis (ICD 9 code)	Baseline Abx Use (%)*	Sample Size Needed to Assess % Reduction in Antibiotic Use		
		30%	40%	50%
Pharyngitis (462)	50	35% use 182 patients	30% use 103 patients	25% use 65 patients
Sinusitis (461, 473)	80	56% use 66 patients	48% use 40 patients	40% use 27 patients
Bronchitis (466, 490)	70	49% use 94 patients	42% use 55 patients	35% use 36 patients
Acute URI (460, 465)	24	17% use 548 patients	14% use 260 patients	12% use 176 patients
Acute Otitis Media (381, 382)	75	52% use 76 patients	45% use 47 patients	37% use 31 patients

Our abstracted data include diagnosis; presence or absence of specific key diagnostic criteria in the case of sinusitis, otitis media, or pharyngitis; whether an antibiotic was prescribed or not; and if an antibiotic was prescribed, which one (to assess use of narrow- vs. broad- spectrum antibiotics).

Second, future Oregon BRFSS data will provide valuable information about changes in public knowledge about safe antibiotic use and expectations surrounding the receipt of antibiotics to treat upper respiratory infections.

Third, annual analysis of prescribing trends in the Oregon Medicaid fee-for-service population will continue to shed light on clinician prescribing behaviors. This analysis will allow comparisons between prescribing rates in the general community as opposed to those in the residency clinics assessed as part of the curriculum project.

Finally, we hope to analyze trends in two new measures in the Health Plan Employer Data Information Set (HEDIS®) related to appropriate treatment of children with upper respiratory infections and appropriate testing for pediatric pharyngitis.

### Conclusion

Effecting change in antibiotic use requires interventions at multiple levels to all types of health care professionals and to lay audiences. These interventions work best when performed in different settings (e.g., community health talks, education forums for health professionals, or media messages), and through the combined efforts of both public health and medical education organizations. Physicians and other clinicians play a key role in education their patients about the dangers of inappropriate antibiotic use, how and when to use antibiotics appropriately, and how best to care for symptoms caused by viral pathogens. To do this effectively, clinicians must possess good communication skills to use in eliciting the patients' true concerns, in educating patients both directly and through printed or Web-based materials, and in negotiating with patients when antibiotics are not indicated. Given the time constraints common in today's outpatient environment, they must also have easy access to high-quality patient education materials that can reinforce verbal messages and reduce the time needed for direct education.

The programs described in this article provide a wide range of educational opportunities for both clinicians and lay audiences. Many of them are

intended to empower clinicians to educate their patients about this important public health issue. By pursuing these avenues, we expect clinicians

to become much more active in this area of health promotion.

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