CONTEMPORARY SUBJECT

Experience With a Clinical Decision Support System in Community Pharmacies to Recommend Narrow-Spectrum Antimicrobials, Nonantimicrobial Prescriptions, and OTC Products to Decrease Broad-Spectrum Antimicrobial Use

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ABSTRACT

BACKGROUND: Overuse of antibiotics increases the incidence of bacterial resistance and contributes avoidable costs to the health care system.

OBJECTIVE: To determine the feasibility of a protocol-driven community pharmacy intervention that was designed to decrease broad-spectrum antimicrobial (BSA) use in patients with upper respiratory tract infections.

METHODS: The intervention involved pharmacists who conducted guided interviews regarding patient symptoms in a cohort of patients with BSA prescription visiting 2 rural community pharmacies during peak respiratory illness season. A clinical decision support system was provided to aid in pharmacist diagnosis and assist in determining if the BSA therapy was appropriate. Upon patient consent, pharmacists attempted to contact primary care providers (PCPs) to confirm the diagnosis and recommend appropriate alternative therapy.

RESULTS: There were 192 subjects with prescriptions for BSAs and symptoms of respiratory tract infection. Only 3% of the patients who were approached declined to discuss their symptoms and treatment with the pharmacist. A mean of 3 minutes was required to collect symptom and treatment information from the patients. However, when patients were asked if the pharmacist could contact their PCP to recommend alternative therapy, only 7% (n = 4) of patients agreed to the intervention. The PCPs who were contacted by pharmacists were receptive to altering the BSA to first-line antimicrobial therapy such as amoxicillin or doxycycline.

CONCLUSION: Despite a description of the importance of the intervention, more than 90% of patients prescribed a BSA declined to permit the community pharmacist to contact the prescriber to discuss first-line therapeutic alternatives. This experience in a pilot study to explore the feasibility of pharmacist intervention at the point of dispensing of a BSA made clear that a successful community pharmacy intervention to reduce BSA use would require an alternative method, perhaps via a collaborative practice protocol that does not require patient consent to make the drug substitution to first-line antibiotic therapy.

KEYWORDS: Community pharmacy, Antimicrobial resistance, Computerized decision support, Bioinformatics

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The excessive use of antimicrobials fosters the development of antimicrobial resistance. For more than 2 decades, hospital-based pharmacists have been involved in activities designed to reduce excessive antimicrobial use and improve antimicrobial use practices. Common pharmacist activities include intravenous to oral conversion programs, streamlining broad-spectrum antimicrobial (BSA) therapy, participation in multidisciplinary antimicrobial use teams, and formulation of antimicrobial use policies.[1] Many of these interventions have been demonstrated to improve inpatient antimicrobial utilization.[2-3]

The majority of antimicrobial consumption occurs, however, in the outpatient setting, with more limited opportunity for direct pharmacist intervention. Estimates published by the Centers for Disease Control and Prevention suggest that half of the courses of antimicrobial drugs in community populations are prescribed for unjustified reasons, with approximately three fourths of outpatient antimicrobial use directed toward upper upper respiratory infections (URIs).[4,5]

The majority of these prescriptions are brought to community pharmacies, where hundreds of thousands of antimicrobial prescriptions are dispensed every day during face-to-face encounters with patients or their caregivers. During these encounters, pharmacists have an opportunity to use their specialized knowledge of antimicrobials and over-the-counter

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FIGURE 1 Lower Respiratory Infection—Adult

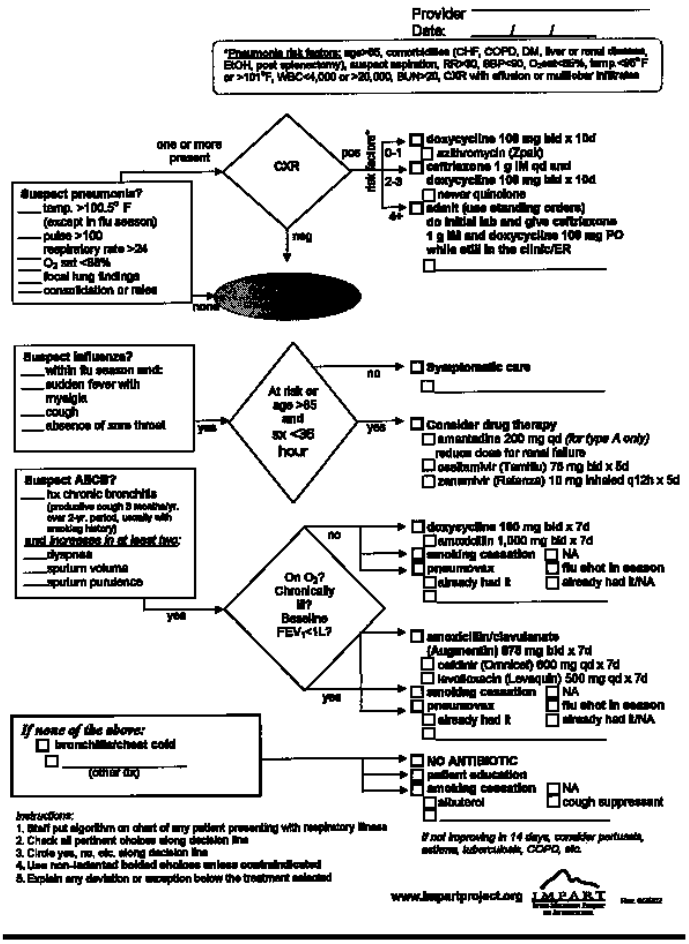
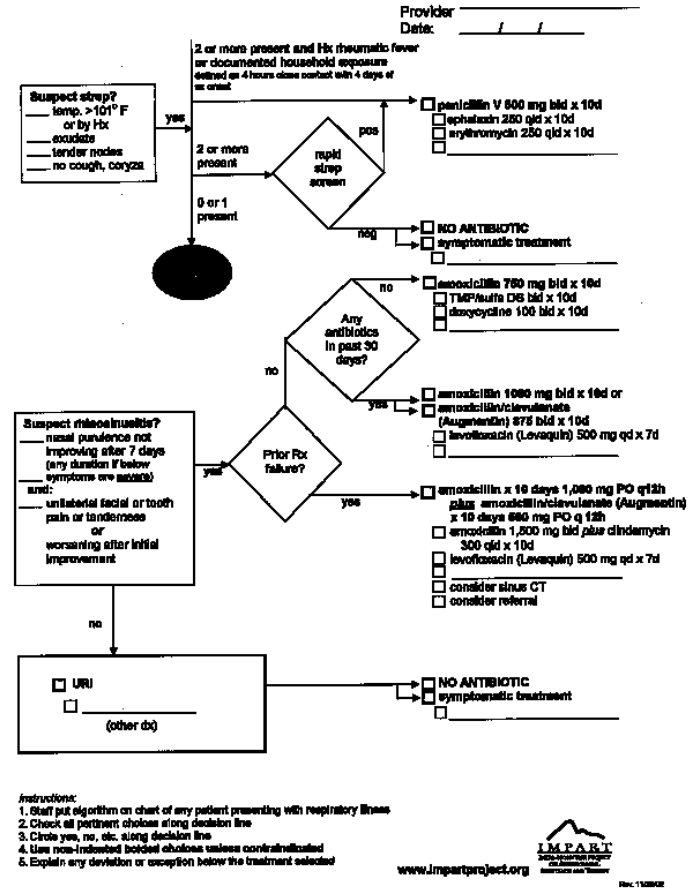


FIGURE 2 Upper Respiratory Infection—Adult



(OTC) medications for symptomatic treatments of URI. In addition, community pharmacists are frequently required to interact with primary care providers (PCPs) or their office staff via telephone during the processing and distribution of prescription medications. As community pharmacists interface with both antimicrobial consumers and antimicrobial prescribers, the potential exists for impacting inappropriate antimicrobial use in community pharmacies. However, there are limited published studies regarding the ability of community pharmacists to impact the utilization of outpatient antimicrobial therapy.

This study was a pilot project undertaken as part of the Intermountain Project on Antimicrobial Resistance and Therapy (IMPART). A full description of IMPART has recently been published.[6] Briefly, IMPART was a 12-community randomized trial in which 2 different strategies to enhance appropriate use of antimicrobials for acute URI were compared. One study arm received a community-directed intervention alone, and the other arm received the community-directed intervention plus a clinical decision support system (CDSS) via handheld computer (personal digital assistant [PDA]) for management of acute respiratory infection. The community-directed intervention focused on providing consumers with information on antimicrobial resistance and appropriate antimicrobial use. The CDSS was developed for PCP use at the time of an office visit, assisting in making diagnostic and therapeutic decisions for patients with acute URIs (Figures 1 and 2; CDSS PDA version available for download at http://www.int.med.utah.edu/impart/).

The IMPART provider-based CDSS was modified to a pharmacist version, which included the informed-consent screens, patient-specific data screens, and pharmacy-specific data screens in addition to the CDSS diagnostic and treatment algorithms.

In the primary IMPART study, the scope of pharmacist participation was limited to the display of consumer educational materials in community pharmacies and the involvement of some pharmacists in formal and informal presentations to com-

munity groups. This pilot study was designed to determine the feasibility of using a community pharmacist to (a) collect clinically meaningful information about indications for antimicrobial use from patients who are bringing an antibiotic prescription to be filled and (b) intercept inappropriate prescriptions through a process of patient consent and communication with the ordering clinician to decrease BSA use in URI.

Methods

The pharmacy pilot project took place in Twin Falls, Idaho, a rural community with a population of approximately 35,000. Twin Falls is served by 15 community pharmacies, including 5 independently owned pharmacies. Twin Falls was randomized as an "intervention" community in IMPART, and approximately 50% of the PCPs participated in the PCP-based CDSS during the study period.

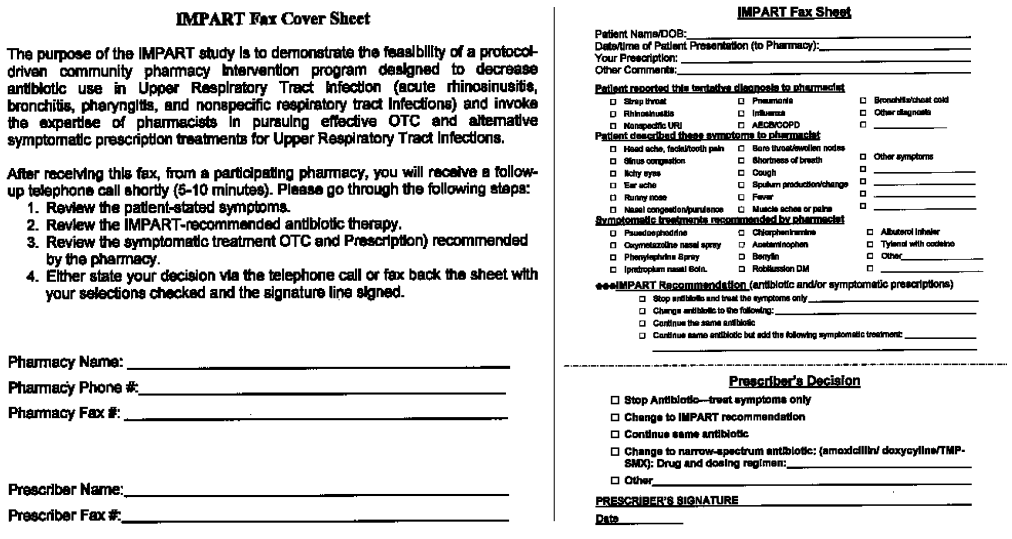
In November 2002, an educational seminar was conducted to recruit community pharmacy sites to participate in the study. Two independent community pharmacies agreed to participate. Study approval was obtained from the University of Utah, Human Subjects Committee. Pharmacists read a prepared statement to eligible patients, who then provided verbal consent for participation.

The study hypothesis was that a community pharmacy-based intervention program could decrease the dispensing of BSA therapies by 20% to 35% compared with baseline. This reduction would occur through substitution of narrow-spectrum antimicrobials for sinusitis or pharyngitis or by eliminating antimicrobial therapy for acute bronchitis or nonspecific URI.

The study was a cohort design and was conducted over 2 winter seasons in 2 phases: a control phase and an intervention phase. During the study time frame, pharmacists screened all patients presenting with BSA prescriptions for study participation. BSAs were defined as advanced-generation macrolides (azithromycin, clarithromycin), respiratory tract fluoroquinolones (levofloxacin, gatifloxacin, moxifloxacin), advanced-generation cephalosporins (cefuroxime, cefprozil, cefdinir, cefixime, cefpodoxime, ceftibutin, loracarbef), and amoxicillin/clavulanate. Pharmacists were instructed to ask patients for the PCP's presumed diagnosis for prescribing the antimicrobial agent. The selection criteria to participate in the study included patients who received the antimicrobial prescription for one of the targeted URI diagnoses or described symptoms consistent with a targeted URI. Targeted URIs included acute bronchitis, acute sinusitis, nonspecific URI, pharyngitis, and "other." The "other" category included diagnoses such as influenza or acute exacerbation of chronic bronchitis. Once an eligible patient was identified, the pharmacist was to (1) obtain verbal consent, (2) assess and record the patient's symptoms, and (3) compare the prescribed treatment with CDSS recommendations. The CDSS and data collection software were loaded onto a PDA. During the control phase of the study, the pharmacists were instructed not to contact the antimicrobial prescriber to recommend a therapeutic intervention outside of their historical scope of practice (i.e., drug interactions, allergies, etc.) or recommend further symptomatic therapies unless a patient requested advice on OTC product selection.

During the intervention phase, pharmacists were instructed to screen and obtain consent from subjects in a similar manner as in the control phase. However, during the intervention phase, if a discrepancy was noted between the prescribed treatment and the CDSS recommendation, pharmacists were instructed to contact the PCP. The pharmacist completed a worksheet on each patient and sent it via fax to the PCP (Figure 3). The worksheet contained a summary of the patient's self-reported symptoms, the PCP-prescribed medications, and the CDSS recommendations. The pharmacist initiated a telephone call to the PCP within 5 to 10 minutes to discuss the findings and recommendations. Finally, pharmacists were instructed to rec-

FIGURE 3 Impart CDSS Support Findings & Pharmacy Recommendation Fax Sheet



IMPART Fax Cover Sheet

The purpose of the IMPART study is to demonstrate the feasibility of a protocol-driven community pharmacy intervention program designed to decrease antibiotic use in Upper Respiratory Tract Infection (acute rhinosinusitis, bronchitis, pharyngitis, and nonspecific respiratory tract infections) and invoke the expertise of pharmacists in pursuing effective OTC and alternative symptomatic prescription treatments for Upper Respiratory Tract Infections.

After receiving this fax, from a participating pharmacy, you will receive a follow-up telephone call shortly (5-10 minutes). Please go through the following steps:

1. Review the patient-stated symptoms.
2. Review the IMPART-recommended antibiotic therapy.
3. Review the symptomatic treatment OTC and Prescription) recommended by the pharmacy.
4. Either state your decision via the telephone call or fax back the sheet with your selections checked and the signature line signed.

Pharmacy Name: _____

Pharmacy Phone #: _____

Pharmacy Fax #: _____

Prescriber Name: _____

Prescriber Fax #: _____

IMPART Fax Sheet

Patient Name/DOB: _____

Date/time of Patient Presentation (to Pharmacy): _____

Your Prescription: _____

Other Comments: _____

Patient reported this tentative diagnosis to pharmacist

☐ Strep throat ☐ Pneumonia ☐ Bronchitis/chest cold
☐ Rhinosinusitis ☐ Influenza ☐ Other diagnosis
☐ Nonspecific URI ☐ AECB/COPD ☐ _____

Patient described these symptoms to pharmacist

☐ Head ache, facial/tooth pain ☐ Sore throat/swollen nodes ☐ Other symptoms
☐ Sinus congestion ☐ Shortness of breath ☐ _____
☐ Itchy eyes ☐ Cough ☐ _____
☐ Ear ache ☐ Sputum production/change ☐ _____
☐ Runny nose ☐ Fever ☐ _____
☐ Nasal congestion/purulence ☐ Muscle aches or pains

Symptomatic treatments recommended by pharmacist

☐ Pseudoephedrine ☐ Chlorpheniramine ☐ Albuterol inhaler
☐ Oxymetazoline nasal spray ☐ Acetaminophen ☐ Tylenol with codeine
☐ Phenylephrine Spray ☐ Benylin ☐ Other _____
☐ Ipratropium nasal Soln. ☐ Robitussin DM ☐ _____

IMPART Recommendation (antibiotic and/or symptomatic prescriptions)

☐ Stop antibiotic and treat the symptoms only _____
☐ Change antibiotic to the following: _____
☐ Continue the same antibiotic
☐ Continue same antibiotic but add the following symptomatic treatment: _____

Prescriber's Decision

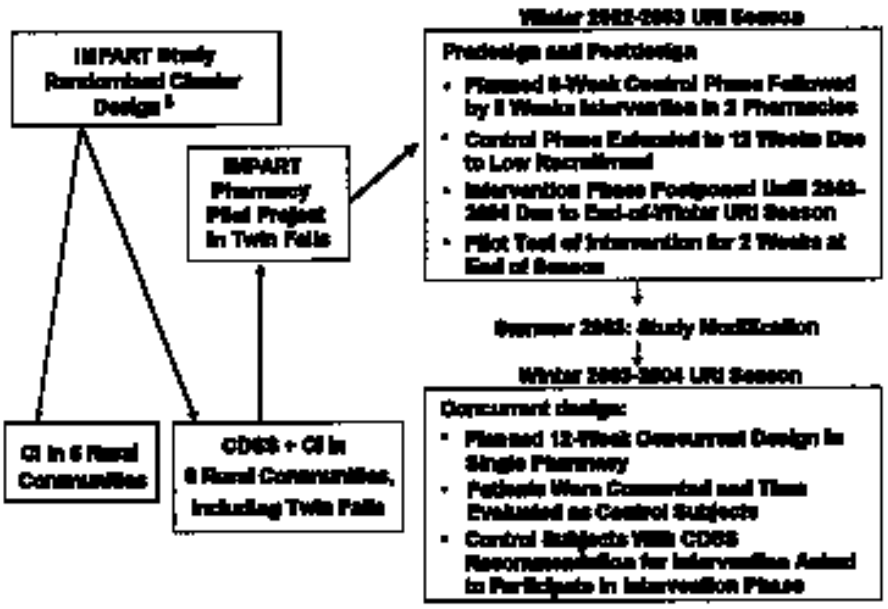
☐ Stop Antibiotic—treat symptoms only
☐ Change to IMPART recommendation
☐ Continue same antibiotic
☐ Change to narrow-spectrum antibiotic: (amoxicillin/ doxycyline/TMP-SMX): Drug and dosing regimen: _____
☐ Other _____

PRESCRIBER'S SIGNATURE _____

Date _____

CDSS = clinical decision support system; IMPART = Intermountain Project on Antimicrobial Resistance and Therapy; OTC = over the counter.

FIGURE 4 IMPART and Pharmacy Pilot Study Design



CDSS = clinical decision support system; IMPART = Intermountain Project on Antimicrobial Resistance and Therapy; URI = upper respiratory infection.

ommend to patients, where appropriate, OTC therapies based on self-reported symptoms irrespective of whether antimicrobial therapy was dispensed. In cases where a PCP failed to respond within 20 minutes of pharmacist initiation, the broad-spectrum prescription was filled as prescribed; however, the pharmacist still recommended appropriate symptomatic therapy and counseled the patient on antimicrobial use for URI.

Additional data collected included the recommended interventions (antimicrobial, nonantimicrobial, OTC), pharmacist time, PCP acceptance of the recommendations, and patient opinion data regarding the pharmacy intervention. Follow-up data collection documented any return for subsequent antimicrobial prescriptions, antimicrobial refills, related nonantimicrobial prescription therapies within 30 days of the initial prescription or intervention, and antimicrobial cost. Pharmacies also completed a questionnaire that included general store information such as the prescription volume, antimicrobial prescription volume and makeup, and OTC sales. Pharmacies were reimbursed $5.00 per control case, $17.50 per intervention attempt, and $2.50 for each patient-specific outcomes data extraction.

The pharmacy-based pilot project design and its relationship to the IMPART study is summarized in Figure 4. During the 2002-2003 winter URI season, an 8-week control phase was to be followed by an 8-week intervention phase. Because of the lower than anticipated number of patients presenting with prescriptions for BSAs, the control phase was extended to 12 weeks. The control phase extension resulted in delaying the initiation of the intervention phase until after the peak of the winter URI season. A decision was made to delay the intervention phase until 2003-2004. However, researchers conducted a 2-week pilot of the intervention phase of the study at the conclusion of the 2002-2003 winter URI season. Based on responses from patients when asked to participate in antimicrobial-directed intervention, a protocol modification was made prior to the 2003-2004 winter URI season. In the revised protocol, a 2-step consent process was utilized. Subjects who consented and participated in the control phase and had an antimicrobial prescription that was divergent from the CDSS recommendation were then asked to participate in the intervention. In addition, patients were asked to complete a questionnaire regarding their perceptions about antimicrobials, OTC, and URI.

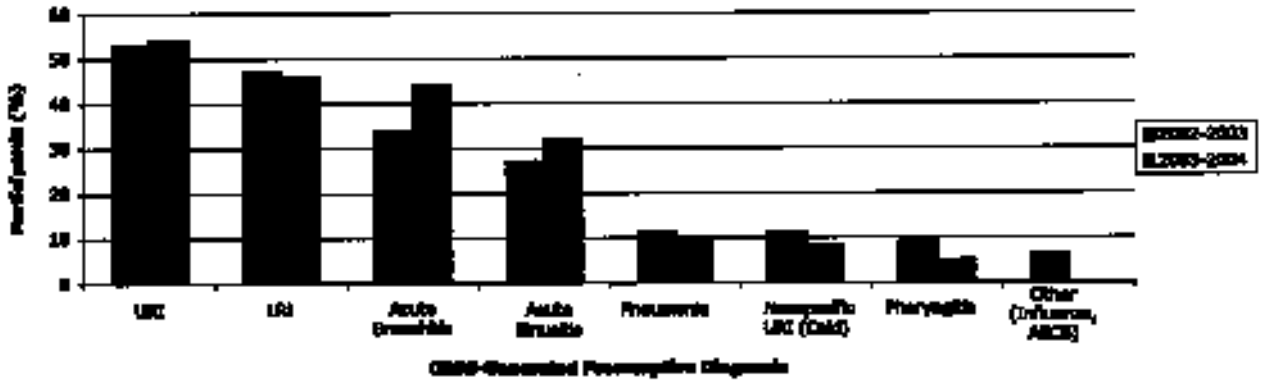
Impact of the project would measure average antimicrobial costs per patient in the control versus intervention phase and the number of times providers accepted the pharmacists' antimicrobial recommendation in the intervention phase.

Results

For both winter seasons combined, 192 subjects participated. During the 2002-2003 winter season, 133 participants were obtained from 2 community pharmacies. During the 2003-2004 winter season, one pharmacy declined to participate for reasons unrelated to the study. The remaining pharmacy obtained an additional 59 participants. Based on pharmacy dispensing records, approximately 20% of all patients presenting with BSA prescriptions for any indication were approached to participate in the study. Only 6 (3%) patients declined to participate in the control phase of the study in 2002-2003. After informed consent was obtained, data collection and generation of the CDSS treatment recommendation was completed in an average of 3 minutes.

A summary of the pharmacist-collected, CDSS-generated URI classification and diagnosis is summarized in Figure 5. BSA, by class dispensed to participants, was macrolides (57%), fluoroquinolones (21%), amoxicillin/clavulanate (19%), and

FIGURE 5 *Percentage of Participants by Classification and Diagnosis According to the Pharmacist-Generated IMPART CDSS*



AECB = acute exacerbation of chronic bronchitis; CDSS = clinical decision support system; IMPART = Intermountain Project on Antimicrobial Resistance and Therapy; LRI = lower respiratory infection; URI = upper respiratory infection.

cephalosporins (3%). The average (±SD) pharmacy profit from a BSA prescription was $9.15 ($3.94) per patient. The average BSA cost per patient allowed by third-party payers was $58.61 ($26.12 [$73.00 ($33.17) average wholesale price]). In addition, participants purchased a mean of 0.68 products per encounter.

During the 2003-2004 winter season, only 4 (7%) of the 59 eligible subjects consented to the interventional phase of the study. The most common reason for declining intervention, as recorded by the pharmacist from a pull-down PDA menu, was "patient insisted on antimicrobial"; however, 4 patients (7%) "resented the interference" by the pharmacist. Patients who agreed to participate in the intervention phase had prescriptions for macrolides or fluoroquinolones and a CDSS-generated diagnosis of sinusitis or pharyngitis. In 3 of the 4 cases, the PCP was contacted within the 20-minute time frame. In 1 case, the prescriber did not return the call. Two of the 3 PCPs contacted accepted the recommendation. In both cases, a narrow-spectrum, inexpensive, antimicrobial was substituted. These patients reported positive encounters, citing that they were "happy to save money." None of the patients who participated in the intervention returned for a second course of antimicrobials.

A total of 24 (41%) of the 59 participants in year 2 completed the patient-directed questionnaire, which contained questions regarding respondents' attitudes about antimicrobial use, OTC products, and respiratory illnesses. The majority of respondents (75%) were aware of the problem of antimicrobial resistance and that antimicrobials were ineffective at treating colds or flu (Table 1). In addition, 75% of respondents stated that they "always" or "sometimes" asked their PCP why antimicrobials were prescribed. A large proportion of respondents (>90%) reported that they self-medicated with OTC products, and most (60%-75%) reported that they had a general knowledge of which products to use. However, only 29% said their PCP recommended symptomatic treatments. Finally, almost all respondents (>90%) stated that they wanted to learn more about self-care of URI.

Discussion

This study attempted to determine the feasibility of a protocol-driven community pharmacy intervention program to decrease inappropriate BSA use in the treatment of URI. Notable findings are that it is feasible for a community pharmacist to collect clinically meaningful information about indications for antimicrobial use from patients, with the vast majority of patients being willing to discuss their illness and treatment with a pharmacist. Pharmacists were able to work patient data collection, tentative diagnosis, and a preliminary assessment of treatment appropriateness into their workflow; it required an average of 3 minutes.

The second question, that of the feasibility of a community pharmacist to intercept inappropriate prescriptions through a process of patient consent and communication with the ordering clinician to decrease BSA use in URI, went largely untested because the majority of eligible patients were unwilling to provide informed consent for the intervention. Most patients who refused to participate were insistent about receiving an antimicrobial, but the reasoning behind the insistence, or whether a different narrow-spectrum antimicrobial might be acceptable, could not be determined. Few patients resented the pharmacy interference. Very limited data from completed intervention cases suggested that providers in this rural environment were accessible within the 20-minute time frame and were

TABLE 1 *Results of a Patient-Directed Questionnaire Regarding Attitudes About Antimicrobials, OTC Products, and URI—% of Respondents**

Question	Yes	No	Don't Know	
Have you read, seen, or heard about the growing problems of antimicrobial resistance?	62.5	12.5	25.0	
Do you generally believe antimicrobials are needed to treat colds or the flu?	25.0	75.0	–	
When you go to the doctor with the cold or flu, does your doctor ever recommend treating your symptoms with OTC medications?	25.0	25.0	50.0	
When you have a cold or the flu, do you treat yourself with OTC medications?	87.5	12.5	–	
If you do not use OTC medications for treating the cold and flu, is it because you are confused by all of the different products?	8.3	16.7	75	
	Strongly Agree	**Somewhat Agree**	**Somewhat Disagree**	**Strongly Disagree**
When my doctor prescribes an antimicrobial, I ask questions about why it is needed.	25.0	54.2	12.5	8.3
If I do not receive an antimicrobial prescription for an infection from my doctor, I will go to another provider.	8.3	12.5	33.3	68.4
I know which OTC medications to take to treat a cough.	12.5	62.5	20.8	4.2
I know which OTC medications to take to treat a runny nose.	16.7	54.2	20.8	8.3
I know which OTC medications to take to treat a fever.	45.8	33.3	12.5	8.4
I would like to learn more about self-treatment of cold and flu symptoms instead of taking antimicrobials and going to the doctor.	25.0	62.5	8.3	4.2

** 24 patient responses to community pharmacy survey in winter season 2003-2004. OTC=over the counter; URI=upper respiratory infection.*

amenable to the CDSS-based recommendations.

One strength of this study is its novel attempt to use community pharmacists to intervene at the point of dispensing to reduce BSA use. We were unable to identify any other published studies that systematically attempted to use community-based pharmacists to perform this task. The concept is somewhat analogous to antimicrobial-related functions such as streamlining or antimicrobial de-escalation performed by inpatient pharmacists on a daily basis.[1,7]

A second strength of the study is that we recruited community-based pharmacy practitioners to perform the intervention under the normal working conditions of a busy community pharmacy. Other than training the pharmacists on the protocol and data collection process, the primary investigators were not involved in the data collection or intervention.

The data collection software was constructed in such a manner that pharmacists were required to sequentially complete the data collection fields before proceeding, thus resulting in standardized adherence to the protocol and integrity of the data collected. In addition, the IMPART CDSS provided a standardized and validated system of diagnostic and treatment pathways.

Finally, pharmacies were offered reimbursement for their services. In an inpatient environment, there is a clear incentive for the institution to minimize drug expenditures when pharmacists successfully perform streamlining and de-escalation. In a community pharmacy environment, a financial penalty is incurred when a prescription is not dispensed.

While studies have demonstrated that pharmacists can positively impact unnecessary antimicrobial use in hospitals and ambulatory care, we could not identify any published PCP-targeted intervention programs where community pharmacists attempted to decrease unnecessary BSA use by patient interview, focusing on URI symptoms.[6,8] Several studies have looked at the role of community pharmacists in providing consumer information about antimicrobial resistance as part of a multifaceted approach, and a national survey of community pharmacists examined factors that would influence their ability to participate in patient-oriented antimicrobial educational programs.[9] In this survey, pharmacists perceived barriers such as time constraints, a lack of educational materials, and fear of harming relationships with physicians. Though limited, our data do not support those assumptions, as patient-specific data relative to their URI could be collected in a timely manner, and physicians were responsive to pharmacist's queries.

Other literature suggests that pharmacists do impact community prescribing patterns through their interaction with PCPs, noting that pharmacists consistently, if infrequently, contact PCPs to initiate, discontinue, or change therapy on a patient's behalf.[10] Other reasons commonly cited for contacting PCPs include correcting problems or helping patients save money. This rationale is of interest due to the significant out-of-pocket costs faced by many patients. BSAs are expensive compared with narrow-spectrum antimicrobials or OTC medications, and are frequently unnecessary. In addition, the most

commonly cited patient satisfaction comment in our study was related to saving the patient money. Finally, the reluctance of patients to agree to the intervention to minimize antimicrobial use is somewhat consistent with PCP opinions that patient demands are a major consideration when prescribing antimicrobials.[11,12] Interestingly, our patient questionnaire findings regarding their demand for antimicrobials did not support that perception.

Future studies should consider 2 major findings of the present study. First, many aspects of the study appeared to work as designed, and additional study may be warranted. Patients were willing to discuss their illness and treatment with the pharmacist, and pharmacists were able to incorporate this process into their workflow. Also, the limited intervention data suggested that PCPs may be amenable to this type of intervention. To truly test this design, future intervention programs should consider partially masking the patient from the pharmacist-physician interaction. For example, a patient might be informed that the pharmacist was going to contact the PCP to clarify a prescription prior to dispensing.

Other suggestions include using streamlined methods of protocol development, for example, focusing on a specific disease such as acute sinusitis. Sinusitis is a diagnosis for which there are relatively standard and accepted diagnostic patient symptom criteria and treatment guidelines, and narrowing BSA therapy in patients with acute sinusitis symptoms and without recent antimicrobial exposure appears relatively straightforward. Alternatively, subsequent studies might focus on the role of the pharmacist in optimizing symptomatic therapy with OTC or nonantimicrobial prescription alternatives since these therapies are likely to provide better relief than antimicrobials.[6,13] Collaborative practice protocols involving pharmacists have been utilized successfully to manage acute conditions such as cough, colds, fever, diarrhea, and head lice in pediatric patients.[14] Lastly, the observation suggesting reluctance by the patient to have pharmacists perform this type of intervention on their behalf should be confirmed through patient survey or interventional study. If these results are confirmed, subsequent interventions should target interventional strategies prior to antimicrobial dispensing.

Limitations

There were several limitations and difficulties associated with the present study. First, we were only able to recruit independent pharmacies to participate in the study. The owners of these stores provided and directed a significant portion of the pharmacy services rendered and were motivated to participate in this study. In addition, the pharmacists working in these stores were clinically oriented, though not all had utilized a PDA prior to the study. It is difficult to determine if similar findings might be generalized to other types of community pharmacies or pharmacists. Second, the study was conducted in a population that was already receiving both the community-directed educational intervention as well as the PCP-directed CDSS intervention as part of the larger IMPART study. Previous studies have demonstrated that CDSS utilization in primary care can decrease BSA use.[6,15]

It is possible that PCPs in the present study were more selective in determining which patients received BSA therapy, thereby reducing the number of potential subjects available for intervention, or were more likely to respond to pharmacist-initiated intervention. It is also possible that patients were more aware of appropriate antimicrobial use due to the community-targeted intervention, which may have impacted their willingness to discuss their antimicrobial therapy with the pharmacist. However, it is impossible to determine the impact of the larger IMPART study on the implementation or results of the pharmacy-directed study, particularly with the lack of willingness by patients to participate in the intervention, which was the major limitation of the study. We had anticipated some potential resistance to the pharmacy intervention from the PCP, but the patient resistance to the intervention was unanticipated.

Finally, it seemed that the informed-consent process contributed to the difficulty in completing the intervention. In clinical practice, pharmacists frequently contact PCPs prior to processing prescriptions without explaining the specific reasoning to the patient or obtaining patient consent. This is particularly true with inpatient pharmacy antimicrobial-based intervention programs. The informed consent protocol was somewhat rigid and required the pharmacist to instruct the patient that (1) an additional 20 minutes might be required to process their prescription, (2) they might not receive an antimicrobial, or (3) they might receive a different antimicrobial than originally prescribed. This language may have contributed to patient unwillingness to participate in the intervention.

Conclusion

This pilot study suggested that a pharmacist collaborative practice agreement with prescribers of BSAs may be necessary to permit the substitution of first-line therapy when BSAs are prescribed.

DISCLOSURES

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Author Karl J. Madaras-Kelly served as principal author of the study. Study concept and design were contributed by Madaras-Kelly, with substantial input from Samore and author Elizabeth Lyon Hannah and input from Kim Bateman. Data collection was primarily the work of Madaras-Kelly, with a substantial contribution from Hannah and input from the coauthors; data interpretation was primarily the work of Madaras-Kelly, with substantial contributions from Hannah and Bateman and input from Samore. Writing of the manuscript and its revision were primarily the work of Madaras-Kelly and Hannah, with input from Samore.

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