Role of Infectious Diseases Consultants in Management of Antimicrobial Use in Hospitals

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(See the editorial commentary by McGowen on pages 939–42)

The Infectious Diseases Society of America Emerging Infections Network (EIN) surveyed its members to characterize antimicrobial restriction policies in their hospitals and the involvement of infectious diseases consultants in this process. Of the 502 respondents (73%), 250 (50%) indicated that their hospital pharmacies would not dispense certain antimicrobials without approval of infectious diseases consultants. Moreover, 89% agreed that infectious diseases consultants need to be directly involved in the approval process. At hospitals with control policies, commonly restricted agents included lipid formulations of amphotericin B, carbapenems, fluoroquinolones, piperacillin-tazobactam, and vancomycin. Only 46 EIN members (18%) reported remuneration of infectious diseases consultants for participation in the approval process. Pediatric infectious diseases consultants were more likely to practice in hospitals with restriction policies than were adult infectious diseases consultants (64% vs. 45%; \( P < .001 \)). Similarly, teaching hospitals were more likely to have antimicrobial-control policies than were nonteaching facilities (60% vs. 17%; \( P < .001 \)).

In some hospitals, the pharmacy will not dispense certain antimicrobial agents without the approval of a physician trained in infectious diseases. This practice reduces both the use and the costs of these agents [1–3]. In several studies, this practice and other methods used to restrict antimicrobial use have decreased the incidence of certain drug-resistant organisms in health care settings [2, 4–6]. Despite these observations, it is not known how many hospitals require approval by infectious diseases consultants for the release of certain antimicrobial agents. Accordingly, the Infectious Diseases Society of America (IDSA) Emerging Infections Network (EIN) surveyed its membership about approval policies in their hospitals. The survey also solicited attitudes and information about the approval processes and related issues, such as drug targets and reimbursement for participation.

METHODS

The IDSA EIN is a provider-based sentinel network that was established in 1995 through a Cooperative Agreement Program award from the Centers for Disease Control and Prevention (CDC) to the IDSA [7]. It comprises volunteers who belong to either the IDSA or the Pediatric Infectious Diseases Society (PIDS) and practice adult and/or pediatric infectious diseases in the United States and other countries. Because >98% of
EIN members practice in the United States, only information from these respondents was used in this analysis.

During March 1999, the IDSA EIN distributed a 2-page introduction and a 1-page questionnaire via facsimile to all 690 EIN members. Members who did not respond received a second facsimile and reminder 2 weeks after the original query was sent. The survey inquired about members’ attitudes regarding the relationship between antimicrobial resistance and use, the role of infectious diseases consultants in hospital approval processes, and the likelihood of antagonizing other colleagues by involving infectious diseases consultants in the approval process. It also asked about the use of such approval processes in their primary inpatient workplaces. Members who worked in hospitals requiring infectious diseases approval for certain agents were asked about remuneration and drugs targeted for approval. Members who did not work in hospitals requiring infectious diseases approval for release of any antibiotic were questioned about their support for an approval process, their willingness to participate, and ideal agents to restrict.

Responses from members practicing in university and non-university teaching hospitals were similar; accordingly, the data were combined and compared with responses from members practicing in nonteaching hospitals. χ² Analysis was used to test differences in frequencies for statistical significance.

RESULTS

Characteristics of respondents. Overall, 502 (73%) of the 690 surveyed EIN members responded. Of these respondents, 116 (23%) indicated that they work with pediatric patients exclusively, and 341 (68%) indicated that they work with adult patients exclusively (table 1). Response rates were similar for both groups. In addition, 197 respondents (39%) described their principal inpatient setting as a university teaching hospital, 187 (37%) described it as a nonteaching hospital, 109 (22%) described it as a nonteaching hospital, and 9 (2%) did not specify the nature of their primary inpatient workplace.

General perspective of respondents. Of the 502 respondents, 467 (93%) agreed that inappropriate use of antimicrobial agents is the most important factor contributing to the burgeoning problem of antimicrobial resistance in US hospitals. Approximately the same percentage of pediatric (96%) and adult (93%) infectious diseases consultants agreed with this statement. Furthermore, 447 (89%) of the respondents agreed that infectious diseases consultants need to be directly involved in the approval process for use of selected antimicrobial agents prescribed for individual patients in their hospital settings. However, 224 (45%) judged that infectious diseases consultants’ participation in the approval process would antagonize colleagues in other specialties and would possibly lead to a loss of income from decreased requests for consultation. Of interest, 57% of infectious diseases consultants who practiced in nonteaching facilities agreed that the approval process would antagonize colleagues, compared with 42% of respondents who practiced in teaching facilities ($P = .007$). In addition, 135 (60%) of 224 respondents concerned about negative ramifications of the approval process practice in institutions where approval is not required.

Practice in respondent hospitals. Of the 502 respondents, 250 (50%) reported that approval by infectious diseases consultants is required for their pharmacy to dispense certain antimicrobial agents in their primary inpatient workplace (table 1). The frequency of hospitals requiring approval, as reported by EIN members, varied somewhat by hospital setting, type of practice, and region. For example, 232 (60%) of 384 members practicing in teaching facilities reported that infectious diseases approval is required for certain antimicrobial agents, whereas only 18 (17%) of 109 respondents in nonteaching hospitals reported requirements for infectious diseases approval ($P < .001$).

![Table 1. Number of Emerging Infections Network member hospitals requiring approval by an infectious diseases consultant to dispense certain antimicrobial agents.](image-url)

<table>
<thead>
<tr>
<th>Type of Hospital</th>
<th>Pediatric Patients</th>
<th>Adult Patients</th>
<th>Both Adult and Pediatric Patients</th>
<th>Unspecified</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>74/113</td>
<td>138/241</td>
<td>18/25</td>
<td>2/5</td>
<td>232/384</td>
</tr>
<tr>
<td>University</td>
<td>55/78</td>
<td>75/104</td>
<td>8/12</td>
<td>1/3</td>
<td>139/197</td>
</tr>
<tr>
<td>Nonuniversity</td>
<td>19/35</td>
<td>63/137</td>
<td>10/13</td>
<td>1/2</td>
<td>93/187</td>
</tr>
<tr>
<td>Nonteaching</td>
<td>0/2</td>
<td>16/94</td>
<td>2/12</td>
<td>0/1</td>
<td>18/109</td>
</tr>
<tr>
<td>Unspecified</td>
<td>0/1</td>
<td>0/6</td>
<td>0/1</td>
<td>0/1</td>
<td>0/9</td>
</tr>
<tr>
<td>Total</td>
<td>74/116</td>
<td>154/341</td>
<td>20/38</td>
<td>2/7</td>
<td>250/502</td>
</tr>
</tbody>
</table>

NOTE. Data are no. of respondents who reported that their hospital required approval by an infectious diseases consultant to dispense certain antimicrobial agents/no. of respondents.
In terms of practice type, 74 (64%) of 116 pediatric infectious diseases consultants and 154 (45%) of 341 adult infectious diseases consultants reported requirements for infectious diseases approval in their hospitals ($P < .001$). In addition, 68% of EIN members practicing in the New England and mid-Atlantic regions worked in hospitals that required approval by infectious diseases consultants for release of some antimicrobial agents. In the other 7 regions of the United States delineated by the CDC, the percentage of respondents working in hospitals that require approval ranged from 23% in the West–North Central region to 55% in the Mountain region.

Of the 252 EIN respondents practicing in hospitals without infectious diseases approval processes, 145 (58%) thought that their facility should adopt such policies and indicated willingness to participate for some portion of the year. When stratified by practice type, 102 (55%) of 187 adult medicine practitioners, 29 (69%) of 42 pediatric medicine practitioners, and 12 (67%) of 18 members who practice with both populations agreed with the adoption of such a policy and would be willing to participate. Similarly, in this subgroup, 87 (57%) of 152 members in teaching hospitals and 54 (59%) of 91 members in nonteaching hospitals favored approval programs.

**Target antimicrobial agents for restriction by approval policies.** Of the 250 infectious diseases consultants who practice in hospitals with approval processes, agents targeted include: lipid formulations of amphotericin B, carbapenems, fluoroquinolones, piperacillin/tazobactam, and vancomycin (table 2). Respondents working in institutions without infectious diseases approval policies identified a similar range of antimicrobial agents for potential restriction (table 2).

**Remuneration.** Only 46 (18%) of 250 EIN respondents who work in hospitals with restriction policies reported that infectious diseases consultants receive direct remuneration for their participation. Of these 46 respondents, 8 engage in pediatric practice and 32 engage in adult practice. Of interest, 40 (17%) of 232 respondents practicing in teaching facilities and 6 (33%) of 18 respondents practicing in nonteaching facilities report compensation of infectious diseases consultants for their role in the restriction process. Remuneration derived from general hospital funds for 24 of these members and from pharmacy savings for 6 other members. The remaining 16 members did not specify the source of their remuneration. Several respondents reported indirect benefits, such as funding for fellowship positions, increased consultation requests, and leverage in salary negotiations.

**DISCUSSION**

Almost all respondents agreed that inappropriate use of antibiotics is the most important factor contributing to increased antibiotic resistance. This opinion undoubtedly reflects a growing body of literature that demonstrates a relationship between antibiotic use and resistance [8–13]. For example, Seppälä et al. [14] and Arason et al. [15] have demonstrated that reduced antimicrobial use can lead to a decrease in the frequency of antimicrobial-resistant organisms. In these 2 large community-based studies done in Iceland and Finland, respectively, decreased use of penicillin and erythromycin resulted in marked reductions of the rates of penicillin-resistant pneumococci and erythromycin-resistant *Streptococcus pyogenes*. Similarly, when White et al. [16] instituted a restrictive antibiotic policy in their hospital, the frequency of multidrug-resistant *Acinetobacter* species decreased significantly.

Nearly all respondents agreed that infectious diseases consultants should be directly involved in the approval process of selected antimicrobial agents. This judgment may derive from their perception that physicians overuse antimicrobial agents. Numerous studies have demonstrated that these drugs are often used inappropriately and excessively. For example, Murthy [17] found that 25%–50% of antibiotic prescriptions were inappropriate because incorrect choices were made with regard to drug, dose, or duration. Moreover, policies that reduce the use of certain antibiotics effectively diminish the frequency of antibiotic-resistant organisms. In his review of the literature, Gould [5] provided a rationale for antibiotic restriction programs aimed at reducing overuse of antibiotics demonstrating that they often prove to be effective in decreasing drug-resistant organisms. Accordingly, efforts to improve antimicrobial use...
practices have considerable appeal to those interested in combating antimicrobial resistance [18].

Gómez et al. [19] have emphasized the clinical value of combining microbiologic information with the input of infectious diseases consultants. In their study, this combination yielded not only more appropriate empirical and directed therapy but also improved clinical outcomes. Likewise, in their review of the literature, John and Fishman [3] found ample evidence that interventions by infectious diseases consultants improve use and reduce costs of antimicrobial agents. Furthermore, Sáez-Llrens et al. [20] described similar findings in Panama when an antibiotic restriction policy involving infectious diseases consultants led to significant reductions in antimicrobial use, costs, and resistance patterns. The improved use observed in these studies suggests that involvement of infectious diseases consultants in the selection of antimicrobial agents will lead to decreased resistance.

Our survey examined the role that infectious diseases consultants play in this effort to improve or restrict antimicrobial use. The percentage of respondents whose hospitals utilize infectious diseases consultants in an approval process ranged from 17% in nonteaching hospitals, to 50% in nonuniversity teaching hospitals, to 71% in university teaching hospitals. These latter percentages approximate the figure reported by Klapp and Ramphall [21] in their 1983 summary of 108 teaching hospitals. The higher percentages for university teaching hospitals may reflect participation of infectious diseases fellows in the approval process. Notwithstanding, 29% of respondents in university teaching hospitals report a lack of approval programs involving infectious diseases staff.

Why are approval processes involving infectious diseases consultants underused? One impediment may be the time and effort required to maintain such an approval program. For example, Woodward et al. [1] found that their program required 24 h per month of an infectious diseases fellow’s time, 76 h per month from the pharmacy, and 10 h per month combined from the infectious diseases faculty. At institutions without fellows, this load would fall on hospital staff members who are volunteers from the IDSA and PIDS, may not be a representative sample of infectious diseases consultants in the United States. Nevertheless, the respondents to this survey practiced in 49 of 50 states and served in a variety of hospital settings. It is possible that survey data include responses from >1 individual practicing in the same inpatient facility. This seems unlikely, because many EIN members have indicated that a designated individual responds for their group. It is also possible that antimicrobial management practices have changed since this survey was issued in March 1999. This, too, seems unlikely for several reasons (e.g., continued cost cutting in health care facilities, contraction of inpatient services, absence of a national initiative to establish restriction programs, and absence of data from controlled studies to validate utility of this approach). Finally, this study does not include information about logistical details that make restriction programs work, such as fellow involvement in university hospitals. We hope to

The lack of compensation, therefore, is a second noteworthy barrier to participation by infectious diseases consultants in hospital approval programs. In our survey, only 18% of respondents received direct remuneration for their efforts. They indicated that their compensation derived from general hospital funds or pharmacy savings. Although numerous studies have demonstrated significant cost savings achieved through restriction programs [1, 3], it appears that few hospitals have acted on this finding. Hospital administrators may hesitate to remunerate infectious diseases consultants for their antibiotic management activities without either guarantees or estimates of pharmacy savings.

The results of our survey suggest a third barrier: the possible collegial downside to restricting choice of specific antimicrobials. On the basis of our study, it appears that infectious diseases consultants fear that their role in the approval process will antagonize colleagues in other specialties. It is difficult to estimate the validity of this concern. In their study involving several teaching institutions, Woodward et al. [1] detected no increase in inappropriate prescription of antimicrobials to avoid contact with the infectious diseases service. In fact, “the requests for use of restricted or controlled antibiotics frequently developed into useful teaching sessions about actual clinical problems” [1, p. 822]. Several EIN members also remarked on this aspect of approval programs. Whether this finding would hold true in a nonteaching setting is unknown.

Despite these barriers to use of infectious diseases consultants in approval processes, there is considerable consensus about which drugs to target. In general, EIN respondents agreed that the ideal antimicrobials to target for restriction are newer broad-spectrum agents, such as carbapenems, fluoroquinolones, and piperacillin-tazobactam, and the newer antifungals. These targets are similar to ones identified by several authors who have emphasized the need to control newer, more expensive, broad-spectrum agents with activity worth conserving [4, 5]. The EIN members who do not currently participate in an approval program proposed the same antibiotic classes as targets for restriction. Of note, this survey was distributed before the release of linezolid. With the emergence of vancomycin-resistant Staphylococcus aureus [22], one can speculate that most infectious diseases consultants would add this drug to their approval list, hoping to prolong its utility.

We acknowledge several limitations in our survey data. EIN members, who are volunteers from the IDSA and PIDS, may not be a representative sample of infectious diseases consultants in the United States. Nevertheless, the respondents to this survey practiced in 49 of 50 states and served in a variety of hospital settings. It is possible that survey data include responses from >1 individual practicing in the same inpatient facility. This seems unlikely, because many EIN members have indicated that a designated individual responds for their group. It is also possible that antimicrobial management practices have changed since this survey was issued in March 1999. This, too, seems unlikely for several reasons (e.g., continued cost cutting in health care facilities, contraction of inpatient services, absence of a national initiative to establish restriction programs, and absence of data from controlled studies to validate utility of this approach). Finally, this study does not include information about logistical details that make restriction programs work, such as fellow involvement in university hospitals. We hope to
address these issues and outcomes of restriction programs in a future EIN survey.

In summary, most infectious diseases consultants who responded to our survey favor policies that make use of certain antimicrobial agents contingent upon approval by infectious diseases consultants; however, only one-half practice in hospitals that have such policies, and few receive direct remuneration for their efforts. Such policies are used less commonly in nonteaching hospitals and also outside the Northeast and mid-Atlantic regions. Expanding the use of this practice to combat antimicrobial resistance will require efforts both to enhance incentives for infectious diseases consultants and to introduce this practice into nonteaching hospitals.

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References