SHEA Position Paper

Antimicrobial Use in Long-Term–Care Facilities

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ABSTRACT

There is intense antimicrobial use in long-term–care facilities (LTCF), and studies repeatedly document that much of this use is inappropriate. The current crisis in antimicrobial resistance, which encompasses the LTCF, heightens concerns of antimicrobial use. Attempts to improve antimicrobial use in the LTCF are complicated by characteristics of the patient population, limited availability of diagnostic tests, and virtual absence of relevant clinical trials. This article recommends approaches to management of common LTCF infections and proposes minimal standards for an antimicrobial review program. In developing these recommendations, the article acknowledges the unique aspects of provision of care in the LTCF (*Infect Control Hosp Epidemiol* 1996;17:119-128).

INTRODUCTION

This position paper outlines the concerns regarding and adverse consequences of inappropriate antimicrobial use in long-term–care facilities (LTCFs) and recommends approaches to promote the rational use and to limit the potential adverse effects of antimicrobials in this high-risk setting.

STATEMENT OF THE PROBLEM

Intensive Use of Antibiotics in LTCFs

Antimicrobials are among the most frequently prescribed pharmaceutical agents in LTCFs, accounting for approximately 40% of all systemic drugs prescribed.[1,2] The point prevalence of systemic antibiotic use in LTCFs is approximately 8%,[3,4] with a likelihood of 50% to 70% that a resident will receive at least one course of a systemic antimicrobial agent during a 1-year period.[3,5] In addition, topical antimicrobial drugs also are prescribed frequently in LTCFs, although the extent of use of these agents has been less well studied.[5]

Inappropriate Use of Antibiotics in LTCFs

A substantial proportion of the antimicrobial use in LTCFs is considered inappropriate. Recent reports indicate that 25% to 75% of systemic antimicrobials[3,4,6-9] and up to 60% of topical antimicrobials[8] are prescribed inappropriately. Although inappropriateness of antimicrobial use is a problem in all settings,[10] the intensity of antimicrobial use and the additional concerns noted below warrant careful attention toward improving prescribing practices in LTCFs.

Adverse Consequences of Inappropriate Antimicrobial Use

Because infections occur frequently in LTCFs,[11-14] residents often are exposed to antimicrobial agents. These agents carry with them a risk of adverse consequences even when they are prescribed optimally. Elderly nursing home (NH) residents are at increased risk of drug-related adverse effects by virtue of the physiologic effects of aging on kidney and liver functions, the presence of comorbid

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medical illnesses, and the concurrent use of other drugs to treat these diseases. Probably the most important adverse outcome of inappropriate antimicrobial use in LTCFs is the promotion of antimicrobial resistance in this high-risk population and the increased opportunities for transmission of resistant organisms to other patients in the LTCF.[15] *Antimicrobial resistance in LTCFs is considered more fully in the companion position paper developed by the Long-Term–Care Subcommittee.*

Because residents of LTCFs frequently are treated with multiple drugs,[1,5] the addition of antimicrobials increases the potential for harmful drug interactions in addition to the adverse drug effects directly associated with the antimicrobials prescribed. In addition, the increased use of antimicrobials contributes substantially to costs. Excess costs associated with inappropriate antimicrobial use cannot be sustained in the current climate of cost containment and rationing of resources.

Problems in Optimizing Use of Antibiotics in LTCFs

There are many difficulties in promoting the optimal use of antimicrobials in LTCFs. First, the clinical diagnosis of infection frequently is imprecise. Hearing and cognition often are impaired in residents of LTCFs, and symptoms may not be expressed or interpreted correctly. Chronic comorbid clinical conditions may obscure the signs or symptoms of infection. Infectious illnesses may not present with classic clinical findings.[16] The febrile response may be relatively impaired, and there is an increased frequency of afebrile infection.[17] Alternatively, fever with no clearly identified source is frequent.[11-14] Illness may present with vague systemic symptoms such as confusion, diminished appetite, or low-grade fever rather than localizing findings. Clinical criteria for the diagnosis of infections have been identified primarily for younger populations with limited comorbidities, and their validity in the LTCF population, in most cases, has not been assessed.[18] This uncertainty in clinical diagnosis contributes to inappropriate use of empiric antimicrobials.

Limited use of laboratory and radiologic tests also contributes to less than optimal use of antimicrobials. Many LTCFs do not have on-site laboratory or radiological facilities. Thus, "standard" diagnostic tests frequently are not obtained.[3,4,8,9] Obtaining appropriate specimens for microbiologic studies also may be problematic. Residents with productive coughs may not be able to cooperate to expectorate sputa; clean-catch, midstream urine specimens may be impossible to obtain from incontinent residents. When culture data are available, they may be difficult to interpret. For instance, many elderly residents of LTCFs have oropharyngeal colonization with aerobic gram-negative bacilli.[19,20] When sputum specimens are obtained, they frequently are contaminated with these organisms, complicating the identification of the causative agent of pneumonia. For more disabled residents in LTCFs, the prevalence of bacteriuria is over 30%[21] even in noncatheterized patients. In catheterized patients, the prevalence of bacteriuria approaches 100%.[22] Therefore, a positive urine culture is of limited value in identifying whether fever or other symptoms are due to urinary infection.

The patient mix among LTCFs is heterogenous, ranging from "healthy" elderly in some NHs to debilitated, chronically ill patients in others. The population of many NHs now includes more acutely and subacutely ill patients who, in the past, may have been treated in hospitals. Many LTCFs now offer intravenous antibiotics, making it possible for physicians to prescribe the array of broad-spectrum agents available for hospitalized patients. This may promote the induction of antibiotic-resistant infections in LTCFs.

Finally, a substantial problem in providing guidelines for the optimal use of antimicrobials in LTCFs is the absence of relevant comparative clinical trials to define the most effective management of residents with probable or documented infections. The difficulties in clinical and microbiological diagnosis complicate the performance of these trials. Restrictive entry criteria, such as requiring a sputum specimen, limit the generalizability of studies.

Thus, recommendations regarding the use of antimicrobials in LTCFs are limited because they are based on clinical criteria targeted for less complexly ill younger populations, drug selection must be made with limited assistance from diagnostic tests, and virtually no data are available from relevant clinical trials to define optimal treatment regimens.

Antibiotics and Comfort Care

The use of antimicrobials in infected elderly, institutionalized patients is a potentially life-sustaining therapy. It is accepted that, for selected patients in LTCFs, it is ethically appropriate not to offer therapy with antimicrobials.[23] Subjective criteria have been proposed to assist physicians in making decisions with respect to nontreatment of life-threatening infections.[24,25] In addition, some hospitals and NHs currently have policies that address the ethical issues of antibiotic use for patients with life-threatening infections.

TABLE
Quality Standards for Infectious Diseases (Modified From Reference 27)

Strength of Recommendation	
Category	Definition
A	Good evidence to support a recommendation for use
B	Moderate evidence to support a recommendation for use
C	Poor evidence to support a recommendation for or against use
Quality of Evidence	
Grade	Evidence
I	At least one properly randomized, controlled trial
II	At least one well-designed clinical trial without randomization from: • Cohort or case-controlled analytic studies • Multiple time series studies • Dramatic results in uncontrolled experiments
III	Opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees

PROMOTING OPTIMAL ANTIMICROBIAL USE IN LTCFs

Definitive recommendations for antimicrobial use in LTCFs based on scientific evidence are lacking. Thus, the subsequent sections of this position paper outline the opinions of the working group to promote the rational use of antimicrobial therapy in LTCFs. First, guidelines are offered for appropriate empirical management, including choice of antimicrobials for infectious syndromes that are common in LTCFs. Second, recommendations for the structure and content of an antimicrobial utilization review program are proposed. Institutions may wish to use these recommendations as a framework to develop antimicrobial programs appropriate for their own facility.

EMPIRIC ANTIMICROBIAL THERAPY

Background

The LTCF clinician frequently must initiate therapy with empiric antibiotics in the absence of cultures or while awaiting culture results.[26] This section provides recommendations for empiric antibiotic therapy for the most frequent types of infections in NH residents: upper and lower respiratory tract infections, urinary tract infections, skin and soft-tissue infections, diarrhea, and fever of unknown origin. The discussion for each clinical syndrome includes a brief description of clinical issues, most frequent bacterial pathogens, appropriate pretreatment studies, and choices for empiric antibiotic therapy.

An empiric antimicrobial should be active against the most likely pathogens and should be able to achieve the desired therapeutic concentration at the suspected site of infection. Thus, it is important to evaluate the patient thoroughly to identify the source of infection and to select drugs and routes of administration appropriate for the clinical problem.[6] The use of empiric antibiotics does not eliminate the need to establish a specific diagnosis and to identify the causative etiologic agent whenever possible. Drug toxicity, costs, and the induction of resistance are more likely to be clinically significant issues when the duration of empiric therapy exceeds 3 to 4 days.[15]

The extent to which laboratory assessment is obtained will vary among institutions. In LTCFs, culture results may not be available or may be delayed for 2 to 4 days. Where possible, rapid diagnostic methods, which may be performed on site and which have been documented to be useful for the nursing home population, should be encouraged. If cultures are available, the results often are difficult to interpret, due in part to the poor quality of the culture specimen submitted. When culture and sensitivity tests are available, the empiric antibiotic(s) should be reassessed. The choice for definitive antibiotic treatment should have as narrow a spectrum as possible, should achieve therapeutic concentrations at the site of infection, should be well tolerated, should have low toxicity, and should be the least expensive therapeutic option.

The choice of a specific empiric antimicrobial is

influenced by the severity of the patient's illness, the nature of underlying diseases, prior exposures to antibiotics, prior infections with resistant organisms, and history of drug allergies. The environment of the NH also can influence the choice of empiric antibiotics. Institutions frequently have specific patterns of antibiotic resistance that are unique to their setting or patient population. Thus, the recommendations for empiric or definitive antimicrobial therapy that are suggested in this position paper should not be considered as defining drugs of choice or even as defining optimal treatment in all institutions; they should be used as broad guidelines by the clinicians in LTCFs who must integrate epidemiologic, clinical, and available laboratory data to provide the best possible care for the patient. Consistent with the previous discussion of the lack of useful therapeutic studies in this population, all recommendations for assessment or empiric therapy for specific infections would be considered category BIII, using the modified Infectious Diseases Society of America Quality Standards for Infectious Diseases[27] (Table).

Upper Respiratory Tract Infection

Etiology. The most frequent infections of the upper respiratory tract are the common cold, pharyngitis, and sinus infections. Upper respiratory infections in NH patients usually are caused by viral pathogens; however, the β-hemolytic group A streptococcus is an occasional cause of pharyngitis in the elderly. *Streptococcus pneumoniae* and *Hemophilus influenzae* are the most common causes of bacterial sinusitis. Prolonged, recurrent sinus infections frequently are associated with other organisms, including gram-negative bacilli and anaerobic bacteria.

Patient assessment. The minimal workup of a patient with pharyngitis should include visualization of the throat and obtaining a pharyngeal swab for a diagnostic test for group A streptococcus. For patients with earache, an otoscopic examination should be performed. Bacterial sinusitis should be considered in patients with fever, nasal discharge, and facial pain or headache. Generally, no additional diagnostic or microbiological workup is needed. However, refractory cases that do not respond to initial empiric therapy may require sinus X rays or computerized tomographic (CT) examination of the sinuses or mastoids. Rarely, surgical aspiration of middle-ear fluid or an occluded sinus may be needed to identify a definitive causative agent.

Empiric therapy. Empiric therapy for pharyngitis seldom is necessary; penicillin should be prescribed only if a throat culture or a reliable streptococcal screening test documents the presence of group A streptococci. For acute sinusitis, antibiotics such as trimethoprim-sulfamethoxazole, amoxicillin, cefuroxime axetil, or a macrolide antibiotic such as clarithromycin or azithromycin are appropriate for empiric therapy. Amoxicillin-clavulanic acid should be reserved for patients who respond poorly to previous treatment with more narrow-spectrum antibiotics. Quinolones rarely are indicated for infections at these sites.

Lower Respiratory Tract Infection

Etiology. S pneumoniae remains the most common bacterial etiology of pneumonia in elderly LTCF patients.[28-30] However, in this population, a broad array of other bacterial and nonbacterial pathogens also may cause pneumonia.[31] Gram-negative bacilli frequently are grown in culture from patients previously treated with antibiotics or from residents in NHs where intense antibiotic use occurs,[32] but these organisms are relatively infrequent causes of pneumonia. Patients with preexisting, chronic lung disease are at risk for infection with *H influenzae*; those with diseases that predispose to aspiration frequently have mixed aerobic and anaerobic pulmonary infections.[31] Anaerobic infection occurs most commonly in patients with dental caries and infrequently in edentulous patients.

Patients with bacterial pneumonia usually have productive coughs, although some patients are unable to expectorate respiratory secretions. Patients with dry hacking coughs may be infected with atypical pathogens including *Legionella pneumophila, Mycoplasma pneumoniae,* or *Chlamydia pneumoniae.* These infections, however, are relatively uncommon in LTCF patients.[31]

Patient assessment and investigation. Many NH patients have preexisting underlying lung diseases, making it difficult to distinguish chronic symptoms from acute lower respiratory infection. The diagnosis of pneumonia frequently is made on the basis of new onset of fever with new or increased cough and new or changed sputum production, without the benefit of chest X-ray confirmation.[18] Dyspnea and new wheezing or rales are potentially useful physical signs.

The minimum workup of patients suspected of having pneumonia should include auscultation of the lungs. Patients without classic pulmonary findings of bacterial pneumonia on physical examination may have bacterial bronchitis or infection with an atypical agent. Ideally, the evaluation of patients with suspected pneumonia should include a chest radiograph obtained before or immediately after empiric therapy has been started. Efforts should be made to obtain a sputum specimen for Gram stain and culture from patients with suspected pneumonia. This frequently is impossible, however, due to patient dehydration or

inability to cooperate. If a sputum specimen is obtained, the quality of the specimen, determined by the presence of large numbers of polymorphonuclear leukocytes and relative paucity of epithelial cells, should be assessed before culture.[33] The Gram stain is useful to identify the pneumococcus, as this organism may not be isolated in culture because of inability to survive refrigeration and transportation to the laboratory. Sputum tests to identify unusual pathogens such as *Legionella* or *Mycoplasma* should be obtained only in highly selected cases. Laboratory tests for specific viral etiologies rarely are indicated, but may be useful in outbreak situations where a diagnosis would assist in development of optimal infection control strategies. Blood cultures usually are not indicated, but should be obtained from patients ill enough to warrant hospitalization. In this situation, they may be positive in up to 20% of cases.

Empiric therapy. There are several appropriate antimicrobial options for the empiric therapy of pneumonia in LTCF patients.[34] Trimethoprim-sulfamethoxazole, amoxicillin, cefuroxime axetil, or a macrolide such as erythromycin, clarithromycin, or azithromycin generally are considered to be appropriate agents. The impact of increasing incidence of penicillin resistance among pneumococci and ampicillin resistance in *H influenzae* and other respiratory pathogens requires further assessment for the NH population. Clindamycin should be considered for patients with suspected anaerobic pneumonia following aspiration and may be combined with trimethoprim-sulfamethoxazole if mixed aerobic-anaerobic infection is considered. Amoxicillin-clavulanic acid also may be appropriate in this situation. Intramuscular ceftriaxone may be used in patients who require parenteral therapy.[35] Quinolones, broad-spectrum cephalosporins or penicillins, and aminoglycoside antibiotics should not be prescribed as agents of first choice for empiric therapy of pneumonia in NH patients.

Urinary Tract Infection

Urinary tract infections are the most commonly diagnosed and treated infections in residents of LTCFs.[4,9,36] Many treatment courses actually are given, inappropriately, for asymptomatic bacteriuria.[37] More than 30% of noncatheterized residents in LTCFs and almost all chronically catheterized patients have asymptomatic bacteriuria.[21,22,37] Inappropriate treatment of asymptomatic bacteriuria exposes the patient to the risk of adverse drug effects and induces the development of subsequent colonization or infection with increasingly resistant organisms.[38,39]

Etiology. The most likely cause of urinary infection in both catheterized and noncatheterized NH residents is *Escherichia coli.*[22,37] Other members of the *Enterobacteriaceae* such as *Proteus* species, *Klebsiella* species, *Providencia* species, or *Enterobacter* species, as well as enterococci and *Pseudomonas aeruginosa*, frequently are isolated, usually from patients previously treated with antibiotics.[22,28,36,37] In men with recurrent urinary infection, bacterial prostatitis is a likely source. Chronically catheterized patients have polymicrobial bacteriuria with a variety of organisms that change spontaneously regardless of antibiotic pressure.[22]

Patient assessment and investigation. The minimal workup of patients with signs and symptoms suggestive of urinary tract infection should include a urinalysis and urine culture; urine cultures should not be collected from asymptomatic patients. A clean-catch or midstream urine specimen should be obtained. This often is difficult in poorly cooperative NH residents. Straight catheterization may be needed to obtain a satisfactory specimen. Patients with indwelling urethral catheters should have urine obtained by aspiration of the catheter tubing lumen; specimens should not be collected from the drainage bag. Urine specimens may be obtained from external (condom) catheters in men if controlled, standardized collection methods that limit contamination are used.[40,41] All urine specimens should be refrigerated prior to and during transport to the microbiology laboratory to prevent overgrowth of contaminating organisms. Ideally, blood cultures should be obtained from patients with rigors or with temperatures greater than 102°F or less than 96°F. Positive blood cultures may identify a specific etiologic pathogen for patients with polymicrobic bacteriuria.[28]

Empiric therapy. Results of previous urine cultures and sensitivity tests should be reviewed to identify patterns of possible antibiotic resistance that might guide the choice of empiric therapy. The usual choice of empiric therapy for symptomatic urinary tract infection is trimethoprim-sulfamethoxazole. Quinolone antibiotics are excellent drugs when infection with antibiotic-resistant gram-negative bacilli is anticipated; amoxicillin is the drug of choice for enterococcal infections. Initial parenteral therapy with a single daily dose of an aminoglycoside may be appropriate for some patients. Most symptomatic lower urinary infections in the NH are treated with 3- to 7-day courses of antibiotics[21]; 10 to 14 days of therapy may be appropriate for patients with signs or symptoms suggestive of pyelonephritis. Chronic prostatic infections sometimes require 2 or more weeks of therapy. A limited number of antibiotics, including trimethoprim-sulfamethoxazole and the quinolones, are able to penetrate into the prostate gland.

Skin and Soft-Tissue Infection

Two major types of skin and soft-tissue infection occur frequently in NH residents: infected pressure ulcers and cellulitis.

Etiology. The bacteriology of infected pressure ulcers invariably is polymicrobial. The most common isolates are *Staphylococcus aureus* and enteric bacteria such as *Proteus* species and *E coli*. Occasionally, anaerobic bacteria and *P aeruginosa* are recovered from these infected sites.[28,42] This same array of organisms can be isolated as surface contaminants from noninfected pressure ulcers. The most common bacterial causes of cellulitis are streptococci, particularly groups A and B β-hemolytic streptococci, and *S aureus*. These organisms are the most frequent pathogens recovered in blood cultures from patients with cellulitis.[28,42] Occasionally, gram-negative bacilli will cause superficial soft-tissue infections or cellulitis in NH patients.

Patient assessment and investigation. Determining whether an ulcer is infected or colonized is problematic because sites of skin breakdown often are coated with exudative material and colonized with bacteria. Swabs of exudate for culture are not helpful in diagnosing the presence of infection; they generally reveal multiple bacterial species. The diagnosis of infection of a pressure ulcer requires clinical judgment.[18]

In the lower extremities, it sometimes is difficult to distinguish bacterial cellulitis from stasis changes or other diseases of the venous or arterial circulation or severe edematous states. The diagnosis of a superficial cellulitis rarely is confirmed by culture.

The workup of a patient with a suspected skin or soft-tissue infection must include a careful examination of the area to identify signs of local inflammation such as erythema, warmth, tenderness, and swelling. The area around pressure ulcers should be palpated to identify crepitus, a clue to a deep subcutaneous-tissue infection. Cultures of purulent material should be obtained for both aerobic and anaerobic bacteria. In patients with systemic symptoms in which a definitive bacterial diagnosis is needed, needle aspiration of purulent material from a deep decubitus ulcer infection may be helpful. Needle aspiration from the leading edge generally is not helpful when cellulitis alone is present. Radiological studies should be obtained to identify gas or bone involvement. Blood cultures should be drawn from patients with fever, rigors, acute confusion, or other clinical presentations that suggest sepsis.

Empiric antimicrobials. Therapy for infected pressure ulcers must be broad-spectrum to cover both aerobic gram-positive and gram-negative bacilli and anaerobic pathogens. Amoxicillin-clavulanic acid as a single agent meets these criteria. Other possibly effective antimicrobial combinations include trimethoprim-sulfamethoxazole or a quinolone such as ciprofloxacin or ofloxacin for gram-negative organisms, together with metronidazole or clindamycin for anaerobic coverage. In treating infected pressure ulcers, definitive therapy must include aggressive debridement or drainage of the wound infection, as well as antibiotics. This may require hospitalization.

The usual agents selected to treat cellulitis are dicloxacillin or cephalexin, although many other drugs such as trimethoprim-sulfamethoxazole, amoxicillin-clavulanic acid, erythromycin, or clindamycin also may be used.

Diarrhea

Etiology. Occasional episodes of diarrhea are common in NH patients. Most of these episodes are noninfectious, being due to food intolerance, drug therapy, or other gastrointestinal pathology.[43] Outbreaks of infectious diarrhea in NH residents may be caused by viral agents, foodborne enterotoxigenic pathogens, such as *S aureus*, *Clostridium perfringens,* or *Bacillus cereus*, or invasive pathogens, such as *Salmonella* species, *Shigella* species, *Campylobacter jejuni,* or *E coli O157*. NH residents who are being treated or who recently have been treated with antibiotics also are at increased risk for *Clostridium difficile*-associated diarrhea.[44]

Patient assessment and investigation. Establishing the diagnosis of infectious diarrhea in an NH patient is difficult and costly.[18] An infectious agent should be suspected when a patient develops an acute change from usual bowel habits. Depending on the pathogen, fever may or may not be present. Patients with severe symptoms, such as fever, abdominal cramps, or bloody diarrhea, should have stool cultures sent for identification of invasive enteric pathogens, and blood cultures should be obtained. Patients who develop diarrhea during or within 4 weeks after receiving antibiotics should have stool specimens sent for identification of *C difficile* toxin. Generally, no specific workup is needed for the afebrile patient with new-onset diarrhea without major clinical alterations; observation and appropriate hydration are sufficient.

Empiric therapy. Most patients have self-limited episodes of diarrhea, and empiric therapy is not warranted. Appropriate oral replacement of fluid and electrolytes is the mainstay of treatment in these patients.[43] Nonetheless, if symptoms are severe, the patient appears toxic, and infection with *Salmonella* species or *Shigella* species is a concern, agents such as trimethoprim-sulfamethoxazole or a quinolone antibiotic should be prescribed. In these patients, antimotil-

ity agents may be hazardous. If *C difficile* colitis is identified by toxin assay, metronidazole should be used for definitive treatment; oral vancomycin should not be used as a first-line agent for this illness because of the expense and the possibility of selecting for vancomycin-resistant enterococci in intestinal flora.

Fever of Unknown Origin

Fever without obvious cause is a common occurrence among NH residents. This observation reflects the difficulties in establishing the specific etiology of febrile illnesses in elderly NH patients. Strictly speaking, the diagnosis of fever of unknown origin (FUO) is restricted to patients with fever of greater than 101°F for 3 weeks or longer that is undiagnosed after a thorough review of the clinical record, repeated physical examinations, and usual laboratory tests to identify focal infections.

Etiology. The causes of FUO in NH residents are similar to those in the general population. Infections (36%); cancer, especially lymphomas (24%); connective-tissue diseases, especially giant-cell arteritis (26%); and drug reactions are frequent causes of FUO in the elderly.[45] Infectious causes of FUO in the elderly include intraabdominal abscesses, infective endocarditis, and disseminated tuberculosis, as well as less common diagnoses.

Assessment and investigation. The minimal workup of a patient with FUO should include repeated histories and physical examinations, complete blood-cell count and differential, erythrocyte sedimentation rate, and urinalysis. A stool specimen may be obtained to test for occult blood if anemia is present. The chemistry profile should include liver function tests. Blood cultures, chest X ray, and an intermediate-strength intradermal tuberculin skin test with anergy skin testing should be obtained. If a diagnosis is not suggested by these tests, further workup should be considered. This may require hospitalization for imaging studies, including CT scans or nuclear medicine surveys. Biopsy of the bone marrow, liver, lymph node, or temporal artery may be needed to establish a definitive diagnosis.

Empiric therapy. Empiric therapy of a patient with FUO should be avoided. Every effort should be made to establish a definitive diagnosis. Antibiotics and other empiric drugs should not be administered until a specific etiologic cause is identified for the fever.

ANTIMICROBIAL UTILIZATION REVIEW

Background

Infection control programs have become a standard measure for quality improvement in LTCFs. Surveillance and control activities are the major foci of these programs. Antibiotic utilization fits logically within the purview of the infection control program. While infection control programs traditionally have advocated education, isolation techniques, and handwashing to control nosocomial infections, they now are beginning to address problems of antibiotic use. There is little precedent, however, to guide the LTCF in developing standards for an antimicrobial utilization review program or to evaluate the program's efficacy in improving patient care or controlling the spread of infections.

Inferences may be drawn from reports of hospital-based antimicrobial control programs. Guidelines from the Infectious Diseases Society of America outline several steps to limit antibiotic overuse in the hospital, including antibiotic order forms, automatic stop orders, limited antimicrobial susceptibility reporting, the development of antimicrobial use criteria, regulation of promotional efforts by pharmaceutical representatives, and specific monitors of antimicrobial use.[46] They suggest that a multidisciplinary team carry out these efforts. A number of studies from acute-care hospitals have noted some benefit from implementation of an antibiotic order form,[47] individual continuing education,[48] and a computerized antibiotic consultant.[49] Many of these programs are labor-intensive and expensive and may be applicable only in selected university teaching hospitals. Moreover, there are few data confirming the long-term value of such interventions. In fact, a number of studies suggest that some measures, such as formulary restriction,[50] a physician prescribing handbook,[51] providing peer comparative data to physicians,[52] and physician education on antibiotics in general,[53] are either ineffective or of limited, short-term benefit. Enforced compliance with institutional antibiotic prescribing guidelines is more effective than voluntary compliance in decreasing antibiotic use.[54]

The extent to which such measures are either possible or effective in the LTCF has not been assessed. Few antibiotic utilization standards are available, especially standards applicable to the LTCF. However, criteria developed by Delphi methods for use of drugs have been attempted for LTCF residents.[55] In developing an antimicrobial utilization review program for an LTCF, the limitations of resources and absence of reports that evaluate effectiveness of different components must be acknowledged. With this in mind, the committee recommends basic standards of antibiotic review for all LTCFs, with further suggestions for expanded programs for selected facilities with special concerns, interest, and resources.

RECOMMENDATIONS

(1) *Infection control programs in LTCFs should be encouraged to include a component of antimicrobial utilization review (category BIII).*

Comment: The purpose of this activity should be to promote the rational use of antimicrobial agents and, potentially, to limit the extent of antibiotic-resistant pathogens in the LTCF. The process of antimicrobial utilization review falls most appropriately into the domain of the infection control program; inappropriate antibiotic prescribing practices have an impact on the success or failure of infection control efforts. This program, however, must be multidisciplinary, with input and cooperation from the infection control practitioner, the medical director, nursing staff, practicing physicians, and the pharmacy.

(a) *The antimicrobial review program should monitor antibiotics that are prescribed in the LTCF (category BIII).*

Comment: Surveillance data should be reviewed on a regular basis—monthly, quarterly, or semiannually—depending on the size of the institution and quantity of antibiotics prescribed. The program should list the specific types of antibiotics used in the LTCF and should record the number of doses or days of treatment, as well as costs. Whenever possible, these data should be linked with surveillance data of infections caused by resistant pathogens. This information should be reviewed by the infection control committee and forwarded to prescribing physicians.

(b) *The antimicrobial review program should develop and promote programs to optimize judicious antibiotic use (category BIII).*

Comment: This would include ensuring that information regarding the use of antibiotics for symptomatic infections is included in the patient's medical records as part of the treatment plan. Whenever possible, the use of antibiotics, particularly broad-spectrum antibiotics, should be minimized.

(c) *Guidelines should be developed for the use of antimicrobials for patients for whom comfort measures only are being provided (category BIII).*

(2) *In selected LTCFs, a more intensive antimicrobial utilization review program may be developed, including review of antibiotic appropriateness (no categorization).*

Comment: Such a program may be warranted because of an identified or potential problem in antimicrobial use, because of concerns with antibiotic resistance in the facility, or where there is a special research interest to improve antibiotic use. The audit program in these LTCFs should be focused on the collection and review of data that are relevant to antimicrobial use in the context of the goals or needs of the institution. Components of this program may include a review of antibiotic prescribing practices, evaluation of the appropriateness of drug prescriptions, more intense surveillance of antibiotic resistance, or the identification of adverse effects of antimicrobial drugs. The purpose of these audits includes measurement of the extent to which antimicrobial use meets accepted practice standards, identification of patterns of use that may affect patient outcome adversely, documentation of costs of care, and collection of information to link antimicrobial use and bacterial antimicrobial resistance patterns in the institution.

Specific guidelines should be developed to define the information to be collected, the methods of analysis and dissemination of that data, and the circumstances under which interventions might be undertaken. Criteria for appropriateness should be developed based on this paper and other published guidelines,[4,56,] reviews, or clinical studies. The input of clinicians is mandatory to ensure that the program is clinically relevant and accepted in the LTCF. A selection of topics for audit should be based on resource utilization and the frequency of observed inconsistencies in practice. Reviews should include consideration of topical, as well as systemic, antimicrobial agents.

LTCFs that implement intensive programs should report their findings to both the infection control committee and the medical staff. Where a high rate of inappropriate use is identified, a plan to improve use should be developed. Although several mechanisms to improve antibiotic use have been reported, none has been critically evaluated in the LTCF setting. These methods include physician education, the development of a restricted LTCF formulary, antibiotic prescribing guidelines, feedback to individual physicians of monitored data, or recommendations for mandatory infectious disease consultation. Restrictive programs may be warranted when serious problems have been identified, such as outbreaks of antibiotic-resistant infections or consistent misuse of antimicrobial agents. Any intervention program should include a component of assessment to document its impact with regard to efficacy and cost.

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Meningococcal Carriage Linked to Campus Bar

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Following a 15-month Group C meningococcal outbreak at a university campus in central Illinois, investigators studied the risk factors for oropharyngeal carriage in students. Almost 10% of students sampled at the student health center (86 of 976) were found to be carriers of meningococci; however, fewer than 2% of the 86 were found to have Group C. Risk factors associated with carriage included age under 23 years, male gender, no recent antibiotic use, alcohol ingestion of 21 or more drinks within the past week, not receiving allergy shots, and patronage of several local bars. Immunization with meningococcal vaccine, past use of rifampicin, and cigarette smoking were not statistically associated with carriage. The group reporting the heaviest alcohol consumption had approximately four times greater odds of meningococcal carriage than those who abstained from drinking.

Working in the bar was found to be an even greater risk factor than being a student patron, with a dose response effect; that is, the more bar exposure a student had, the more likely the student would be a carrier.

This analysis suggests that during meningococcal outbreaks on college campuses, epidemiologists and physicians should counsel students to reduce their alcohol intake, especially binge drinking, and not to frequent the local campus bars.

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