

Topics in Long-Term Care

EDITED BY PHILIP W. SMITH, MD

Development of Minimum Criteria for the Initiation of Antibiotics in Residents of Long-Term-Care Facilities: Results of a Consensus Conference

Mark Loeb, MD, MSc; David W. Bentley, MD; Suzanne Bradley, MD; Kent Crossley, MD; Richard Garibaldi, MD; Nelson Gantz, MD; Allison McGeer, MD; Robert R. Muder, MD; Joseph Mylotte, MD; Lindsay E. Nicolle, MD; Brenda Nurse, MD; Shirley Paton, RN; Andrew E. Simor, MD; Philip Smith, MD; Larry Strausbaugh, MD

ABSTRACT

Establishing a clinical diagnosis of infection in residents of long-term-care facilities (LTCFs) is difficult. As a result, deciding when to initiate antibiotics can be particularly challenging. This article describes the establishment of minimum criteria for the initiation of antibiotics in residents of LTCFs. Experts in this area were invited to participate in a consensus conference. Using a modified delphi approach, a questionnaire and selected relevant articles were sent to participants who

were asked to rank individual signs and symptoms with respect to their relative importance. Using the results of the weighting by participants, a modification of the nominal group process was used to achieve consensus. Criteria for initiating antibiotics for skin and soft-tissue infections, respiratory infections, urinary infections, and fever where the focus of infection is unknown were developed (*Infect Control Hosp Epidemiol* 2001; 22:120-124).

Antibiotic use is common in long-term-care facilities (LTCFs). The rate of systemic antibiotic use reported in older adults who reside in these facilities is, in fact, similar to that in acute-care hospitals.¹⁻⁵ The potential for bacterial resistance and adverse side effects warrants that antibiotics be prescribed carefully to individuals in LTCFs.⁶⁻¹⁵ Although bacterial infections are common in this population,^{16,17} between 22% and 89% of antibiotic prescriptions in this population have been described as inappropriate.^{2,3,18,19}

In residents of LTCFs, the clinical decision to initiate antibiotics can be challenging. The fundamental problem is difficulty in establishing a diagnosis of infection. The diag-

nostic accuracy and reproducibility of clinical features of infections that occur in this population, such as pneumonia, are poor.^{20,21} Clinical diagnosis is further impeded by the difficulty in obtaining a history, because many residents are cognitively impaired or have hearing or speech difficulties.¹⁵ Because diagnostic tests often are less easily obtained in the institutionalized elderly, the use of antibiotics frequently is empirical, that is, initiated in the absence of microbiology results or even in the absence of a definitive diagnosis of infection. The empirical use of antibiotics in the long-term-care setting, however, has not been evaluated extensively. Zimmer et al developed mini-

From the Division of Infectious Diseases and Medical Microbiology (Dr. Loeb), McMaster University and Hamilton Civic Hospitals, Hamilton, Ontario, Canada; the Department of Internal Medicine (Dr. Bentley), Saint Louis University School of Medicine; Geriatric Research, Education and Clinical Center, St Louis Veterans Affairs (VA) Medical Center, St Louis, Missouri; VA Medical Center GRECC (Dr. Bradley), Ann Arbor, Michigan; Education Service (Dr. Crossley), VA Medical Center, Minneapolis, Minnesota; Department of Medicine (Dr. Gantz), Polyclinic Medical Center, Harrisburg, Pennsylvania; the Department of Medicine (Dr. Garibaldi), University of Connecticut Health Center, Farmington, Connecticut; the Department of Infection Control (Dr. McGeer), Mount Sinai Hospital and the University of Toronto, Toronto, Ontario, Canada; VA Pittsburgh Healthcare System (Dr. Muder), University of Pittsburgh Medical Center, Pennsylvania; Erie County Medical Center (Dr. Mylotte), Buffalo, New York; the Department of Medicine (Dr. Nicolle), Health Sciences Center, University of Manitoba, Winnipeg, Manitoba, Canada; Hospital for Special Care (Dr. Nurse), New Britain, Connecticut; Laboratory Centre for Disease Prevention and Control (Ms. Paton), Health Canada, Ottawa, Ontario, Canada; Sunnybrook and Women's College Health Sciences Center and the University of Toronto (Dr. Simor) Toronto, Ontario, Canada; University of Nebraska Medical Center (Dr. Smith), Omaha, Nebraska; Portland VA Medical Center (Dr. Strausbaugh), Portland, Oregon.

Address reprint requests to Mark Loeb, MD, MSc, Hamilton Health Sciences Corp, Henderson General Hospital Site, 711 Concession St, Hamilton, ON L8V 1C3, Canada.

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imum criteria for empirical antibiotic use, based on Centers for Disease Control and Prevention surveillance definitions of infection.¹⁸ In their survey, they reported that 62% of residents in skilled nursing homes receiving systemic antibiotics met minimum criteria. Using the same criteria, Montgomery et al found that 57% of courses of antimicrobials met minimum criteria for initiating an antibiotic.²

A consensus conference to formulate minimum criteria for initiating antibiotics was held by members of the Society for Healthcare Epidemiology of America (SHEA) with expertise in the area of infections in residents of LTCFs on March 5, 2000, in Atlanta, Georgia. Guidelines for the use of specific antibiotics were not discussed; such information is provided in the SHEA Long-Term-Care Committee position paper, "Antibiotic Use in Long-Term Care Facilities."¹⁵

The criteria proposed in this document should not be confused with surveillance definitions of infections in LTCFs²² or minimum diagnostic criteria for infection in long-term care. Surveillance definitions of infection were developed to help standardize infection control surveillance, whereas criteria for minimum diagnostic testing refer to diagnostic strategies alone and not minimum criteria for initiating antibiotics empirically. Furthermore, the criteria listed below are not meant to indicate that antibiotics should be initiated in all residents if the signs or symptoms are present (eg, residents for whom care is limited to comfort-only measures). Rather, these clinical findings should be present prior to initiating antibiotics.

Establishing criteria that, at a minimum, should be present before initiating antibiotics is a potentially important strategy for optimizing antibiotic use. If integrated into clinical practice, such criteria may lead to a substantial reduction in the inappropriate use of antibiotics. Unfortunately, relatively few data exist to establish the validity of clinical features that can serve as triggers for the empirical use of antibiotics. Most of the evidence is derived from indirect observational studies or is based on expert opinion. However, given the enormous public health concern about antibiotic resistance, it was felt by the participants of this consensus conference that the establishment of such criteria was both necessary and timely. Prospective evaluation of these criteria should be seen as an important priority for those who conduct infectious diseases research in LTCFs.

METHODS

Members of SHEA with expertise in the area of infections in residents of LTCFs (including infectious disease physicians, geriatricians, microbiologists, and epidemiologists) were invited to participate in the consensus conference. Members of this group actively care for residents in LTCFs. Prior to the meeting, a questionnaire and selected relevant articles were sent to the participants, who were asked to rank individual signs and symptoms of infection (derived from frequently used surveillance definitions for LTCF-acquired infections) with respect to their relative importance in the decision to initiate antibiotics.²² A modified Delphi approach was used, whereby participants were asked to reconsider the weights they assigned to signs and symptoms

in light of the group results to achieve consensus on the weighting of variables (two iterations were performed).²³

A 1-day consensus conference then was conducted; 9 of the 12 committee members took part in the consensus conference. Using the results of the weighting by participants, a modification of the nominal group process was used to achieve consensus.²³ Disagreements were resolved through discussion until complete consensus was achieved among the participants.

For the purposes of this document, the term *long-term-care facility* refers to community-based, free standing nursing homes, semi-skilled nursing homes, Veterans Affairs facilities, and chronic-care hospitals.

RESULTS

Skin and Soft-Tissue Infections

In developing these criteria, consideration was given to situations in which there is intact skin, as well as when there is loss of skin integrity, such as with skin ulcers, percutaneous gastrostomy or jejunostomy sites, pressure sores, and tracheostomy sites.

Minimum criteria for initiating antibiotic therapy for a suspected skin or soft-tissue infection in a resident of an LTCF include either new or increasing purulent drainage at a wound, skin, or soft-tissue site; or at least two of the following: (1) fever (temperature $>37.9^{\circ}\text{C}$ [100°F] or an increase of 1.5°C [2.4°F] above baseline temperatures taken at any site); or (2) redness, (3) tenderness, (4) warmth, or (5) swelling that was new or increasing at the affected site.

Comment: Participants agreed that the presence of erythema alone is not adequate as a minimum criterion for initiating antibiotics. The importance of laboratory confirmation when documenting pus from a site (ie, presence of leukocytes and organisms on a Gram stain of the purulent material) was emphasized by some participants, but was not considered essential to initiating antibiotics. Specific issues relevant to this diagnosis were also discussed: (1) herpes zoster is viral and therefore does not require antibacterial agents, but can pose diagnostic difficulty; (2) deeper infections, such as olecranon bursitis, may present with similar signs or symptoms as skin or soft-tissue infections; (3) underlying osteomyelitis needs to be considered when managing a resident with an infected diabetic or decubitus ulcer; (4) surgical consultation and hospitalization are mandatory for certain soft-tissue infections (eg, necrotizing fasciitis or gas gangrene); (5) these minimum criteria do not apply to residents with burns; (6) thromboembolic disease should be considered when a resident presents with an erythematous or swollen leg (both infection and deep vein thrombosis can potentially be present); and (7) gout is a condition that can at times be mistaken for cellulitis.

Respiratory Infections

Minimum criteria for initiating antibiotic therapy for suspected lower respiratory tract infection (bronchitis or pneumonia) were developed for the febrile and the afebrile resident.

1. If the resident is febrile with a temperature $>38.9^{\circ}\text{C}$ [102°F],²⁴ minimum criteria for initiating antibiotics for a suspected lower respiratory infection include at least one of the following: respiratory rate >25 breaths per minute or productive cough.

2. If the resident has a temperature $>37.9^{\circ}\text{C}$ [100°F] (or a 1.5°C [2.4°F] increase above baseline temperature) but $\leq 38.9^{\circ}\text{C}$ [102°F], minimum criteria for initiating antibiotics include the presence of a cough and at least one of the following: (1) pulse >100 ; (2) delirium; (3) rigors (shaking chills); or (4) respiratory rate >25 . In this document, delirium refers to the definition of delirium in the *Diagnostic and Statistic Manual of Mental Disorder*, 4th edition²⁵; that is, disturbance of consciousness with reduced ability to focus, shift, or sustain attention; change in cognition (such as memory deficit, disorientation) or development of a perceptual disturbance not better accounted for by dementia; and development of symptoms over a short period of time, with a tendency to fluctuate during the day.

3. For afebrile residents known to have chronic obstructive pulmonary disorder (COPD), classified as high-risk because of age >65 ,²⁶ minimum criteria for initiating antibiotics for a suspected respiratory infection include a new or increased cough with purulent sputum production.

4. For afebrile residents who do not have chronic obstructive pulmonary disease (COPD), minimum criteria for initiating antibiotics include a new cough with purulent sputum production and at least one of the following: respiratory rate >25 breaths per minute or delirium.

Comment: It was noted that, in the setting of a new infiltrate on a chest radiograph thought to represent pneumonia, any one of the following symptoms or signs would constitute appropriate minimum criteria for initiating antibiotics: a respiratory rate >25 breaths per minute, a productive cough, or fever (temperature $>37.9^{\circ}\text{C}$ [100°F] or 1.5°C [2.4°F] increase above baseline temperature). Conditions that should not prompt empirical antibiotics include cough in residents who have a temperature $\leq 38.9^{\circ}\text{C}$ [102°F] although this temperature threshold is arbitrary, the group agreed that high fever is more likely to be associated with bacterial infection in the absence of a respiratory outbreak) and a nonproductive cough in a resident without COPD, for up to 24 hours after large-volume aspiration. The likelihood of lower respiratory tract infection is low, and clinical characteristics in this setting are compatible with chemical pneumonitis. It was agreed that obtaining a complete cell count with differential and a chest radiograph was reasonable for residents with fever, cough, and any one or more of the following: pulse >100 , worsening mental status, or rigors.

Other issues were discussed and agreed to be relevant. The importance of the epidemiological setting (eg, influenza outbreak) in interpreting clinical features is essential. The threshold for antibiotic use during an outbreak of a known viral agent might be lower than when the clinician is faced with an acute sporadic case. Obtaining a complete blood cell count along with a differential should be encouraged if strong consideration is being given to ini-

tiating antibiotics. The presence of leukocytosis ($\geq 14,000$ mm^3), increased band forms ($>6\%$), and fever ($\geq 37.5^{\circ}\text{C}$) had a sensitivity of 94% and specificity of 100% for bacterial infection in older adults in one study.²⁷ Fever and the sudden onset of new pleuritic chest pain are an indication for transfer to hospital for diagnostic testing to rule out a pulmonary embolus. Congestive heart failure must be considered within the differential diagnosis of residents with acute respiratory symptoms and signs. Finally, the use of pulse oxymetry warrants further evaluation in the long-term-care setting.

Urinary Tract Infections

Minimum criteria for initiating antibiotics for an indication of urinary tract infection were considered for residents with no indwelling urinary catheters and for residents with chronic indwelling catheters.

1. For residents who do not have an indwelling catheter, minimum criteria for initiating antibiotics include acute dysuria alone or fever ($>37.9^{\circ}\text{C}$ [100°F] or 1.5°C [2.4°F] increase above baseline temperature) and at least one of the following: new or worsening urgency, frequency, suprapubic pain, gross hematuria, costovertebral angle tenderness, or urinary incontinence.

2. For residents who have a chronic indwelling catheter (either an indwelling Foley catheter or a suprapubic catheter), minimum criteria for initiating antibiotics include the presence of at least one of the following: fever ($>37.9^{\circ}\text{C}$ [100°F] or 1.5°C [2.4°F] increase above baseline temperature), new costovertebral tenderness, rigors (shaking chills) with or without identified cause, or new onset of delirium.

Comment: Other issues relevant to this diagnosis were also discussed. Residents maintained with intermittent catheterization or condom catheters are at lower risk for symptomatic urinary infection than residents with chronic indwelling catheters and should be considered in the same category as residents with no indwelling catheter, with respect to minimum criteria for initiating antibiotics. A urine culture always should be obtained to rule out urinary tract infection.²⁸ In addition, urine cultures will assist in antimicrobial selection with respect to the underlying organism and susceptibilities. Although the clinical course of residents in whom therapy is delayed until laboratory confirmation occurs is unknown, initiating empirical antibiotic therapy may potentially relieve symptoms of acute dysuria. However, for urinary symptoms other than dysuria, such as urgency, frequency, or incontinence, the results of urine culture should be obtained prior to initiating antibiotics. Foul smelling or cloudy urine is not a valid indication for initiating antibiotics. Finally, asymptomatic bacteriuria should not be treated with antibiotics.²⁹⁻³²

Fever Where the Focus of Infection Is Unknown

Minimum criteria for initiating antibiotics when a resident has fever with no obvious focus of infection were discussed by the participants. It was agreed that minimum criteria for initiating antibiotics include the presence of

fever (>37.9°C [100°F] or 1.5°C [2.4°F] increase above baseline) and at least one of the following: new onset of delirium or rigors.

Comment: It was agreed that fever and mental status changes that do not meet the criteria for delirium (eg, reduced functional activities, withdrawal, loss of appetite) need to be investigated, but antibiotics need not be started empirically. It also was agreed that fever alone should be evaluated (eg, history, physical examination, and relevant laboratory tests) without the initiation of a full course of antibiotics. Some participants felt, however, that initiating antibiotics as a diagnostic test may, at times, be useful; that is, if clinical status does not change after 3 to 5 days of antibiotics, then the likelihood of a common bacterial infection is reduced.

COMMENTARY

The intention of this consensus conference was not to formulate complex management strategies (either diagnostic or therapeutic) for residents with infection. The minimum criteria for initiating antibiotics for residents in LTCFs described in this document are not intended to be management guidelines and do not replace clinical judgment when caring for residents who have a possible bacterial infection. Rather, they are meant as a guide to help clinicians decide when to initiate antibiotics empirically. In contrast to the earlier SHEA Long-Term-Care Committee statement on antibiotic use in long-term care,¹⁵ which provided suggestions for empirical agents, this document makes no recommendations with respect to specific agents. The criteria developed were for clinically stable residents. For residents who are hypotensive or who have other evidence of a systemic inflammatory response syndrome, transfer to an acute-care facility (provided that advanced directives do not state otherwise) usually is warranted. The underlying disease state and host status (eg, immunocompromised, febrile neutropenia) need to be considered by clinicians when deciding to use antibiotics.

The anticipated prevalences of the various signs and symptoms in the criteria were not considered when developing the criteria. Most, but not all, participants agreed that criteria should be included even if they were felt to be uncommon. The fact that there may be wide variability in clinical assessment was not considered when developing these criteria. That is, the criteria are based upon the assumption of a valid assessment of symptoms and, in particular, signs. The group recognized that assessment of clinical signs by nursing home staff is an area where standardization is required and emphasized that resources are needed to deal with this issue. As well, it should be noted that nonlocalizing signs, such as a change in mental status, may be quite sensitive indicators for infection despite not being part of the minimum criteria for initiating an antibiotic because of their lack of specificity.

These criteria apply to the systemic use of antibiotics for bacterial infections only. The most common documented bacterial infections in older adults who reside in LTCFs

include respiratory infections, urinary infections, and skin and soft-tissue infections.¹⁶ We therefore addressed these three infections, as well as the situation where there is fever with no obvious site of infection. It should be noted that these criteria did not include other potential infections, such as intravenous catheter-related infections or infections of mucous membranes and conjunctivae. Another specific limitation of this meeting was that the use of topical antibiotics was not addressed. Evidence for widespread use of these agents in LTCFs² and reports of resistance to mupirocin have been well documented.³³ Also, use of antiviral and antifungal agents were not considered. These criteria do not address the issue of prophylactic antibiotics nor do they address the issue of chronic suppressive antibiotics. They are meant specifically to provide guidance to healthcare workers faced with acute symptoms or signs.

It is important to note that the minimum criteria proposed in this document are based largely on expert opinion and, where available, empirical data. Studies to validate these criteria should be conducted. Randomized trials, in which facilities are randomized to either minimum criteria or to usual management, could be conducted to assess whether the minimum criteria can safely reduce antibiotic use.

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Computer Keyboards and Faucet Handles: Reservoirs of Pathogens in the ICU

Gina Pugliese, RN, MS
Martin S. Favero, PhD

Bures and colleagues, believing computer keyboards and faucet handles to be significant reservoirs of nosocomial pathogens in the intensive care unit (ICU), conducted a study to determine if their hypothesis was true. Sterile swab samples were obtained from 10 keyboards and 8 pairs of faucet handles in the medical ICU at Tripler Army Medical Center during a period of 2 months. Methicillin-resistant *Staphylococcus aureus* (MRSA) obtained from the environmental and patient specimens were identified using pulsed-field gel electrophoresis (PFGE).

A total of 144 samples were obtained (80 keyboards and 64 faucet handles), yielding 33 isolates. The colo-

nization rate for keyboards was 24% for all rooms and 26% in occupied rooms. Rates for faucet handles in all rooms and occupied rooms were 11% and 15%, respectively. The environmental isolates and their prevalence were as follows: MRSA, 49%; *Enterococcus*, 18%; *Enterobacter*, 12%; and all other gram-negative rods, 21%.

Fourteen individual patient isolates were recorded: MRSA, 43%; *Enterobacter*, 21%; other gram-negative rods, 36%; and *Enterococcus*, 0%. PFGE identified an indistinguishable strain of MRSA in two patients, on the keyboards and faucet handles in their respective rooms, and on other keyboards throughout the ICU, including the doctors' station.

The authors concluded that the colonization rate for keyboards and faucet handles is greater than that of other well-studied ICU surfaces in rooms with MRSA-

positive patients. The findings suggest an associated pattern of environmental contamination and patient infection not limited to the patient's room. PFGE results have documented an indistinguishable strain of MRSA present as an environmental contaminant on these two fomites and in two patients with clinical infections during the same period. They believe these findings support the hypothesis that these particular surfaces may serve as reservoirs of nosocomial pathogens and vectors for cross-transmission in the ICU setting. New infection control policies and engineering plans were initiated on the basis of these results.

FROM: Bures S, Fishbain JT, Ueyehara CF, Parker JM, Berg BW. Computer keyboards and faucet handles as reservoirs of nosocomial pathogens in the intensive care unit. *Am J Infect Control* 2000;28:465-471.