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## Special Article

## Nursing Home–Associated Pneumonia, Part I: Diagnosis



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## A B S T R A C T

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Pneumonia is 1 of the 3 most common infections identified in nursing home residents and is associated with the highest mortality of any infection in this setting. In regard to pneumonia in the nursing home setting, practitioners are focused primarily on identifying residents with this infection and choosing a treatment regimen. In this article, the diagnosis of this infection is addressed. Based on published studies and clinical experience, “bedside criteria” for the diagnosis of nursing home–associated pneumonia (NHAP) are proposed that are based primarily on objective respiratory signs and symptoms that can be readily identified by staff. It is also stressed that factors predisposing to aspiration should be identified because there is a risk for aspiration pneumonitis. A previously published decision tool to distinguish between aspiration pneumonia and aspiration pneumonitis is discussed. Because providers are often not present when there is a change in status of a resident, nursing staff are crucial to the diagnosis of NHAP. However, there is variability in staff experience and the ability to obtain and communicate clinical findings to assist providers in making decisions about diagnosis. To deal with this issue, templates have been developed to help staff collect the appropriate information before contacting the provider. The most important diagnostic test in a resident with suspected pneumonia is a chest radiograph. However, studies done more than a decade ago demonstrated considerable variability in radiologists’ interpretation of chest radiographs of residents performed in the nursing home. Radiologic techniques have improved considerably with utilization of digital technology, but there have been no recent studies to determine if interpretation of these radiographs is more consistent. An alternative to radiographs is lung ultrasonography, which has been found to be more accurate than chest radiographs in identifying pneumonia in adults; however, this method has not been studied in the nursing home setting. Host biomarkers such as serum C-reactive protein and procalcitonin levels have been studied in adults with pneumonia to distinguish between bacterial and nonbacterial infection, but there has been limited study in NHAP and the findings are conflicting. Lastly, it is stressed that the provider should carefully document the clinical findings and testing that result in a diagnosis of pneumonia to enhance surveillance for infection as well as antimicrobial stewardship activities.

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Pneumonia is 1 of the 3 most common infections identified in nursing home residents and is associated with the highest mortality of any infection in this setting.<sup>1</sup> There have been multiple reviews of nursing home–associated pneumonia (NHAP) published in the past 2 decades, indicating the importance of this infection for nursing home residents. These reviews have noted problems with the diagnosis of NHAP because of its “atypical presentation,” limited information regarding etiology, and lack of studies of antibiotic treatment to better define the appropriate regimen and duration of treatment.

There has been heightened concern for the possibility of resistant organisms causing NHAP, which may influence treatment approaches both in the hospital and nursing home.<sup>2</sup>

In regard to pneumonia in the nursing home setting, practitioners are focused primarily on 2 factors: identifying residents most likely to have pneumonia, and choosing a treatment regimen. However, clinical criteria that practitioners can use at the bedside for the diagnosis of NHAP have not been standardized, and diagnostic tools to identify the etiology of what appears to be pneumonia that can inform treatment decisions are not readily available. In addition, treatment guidelines that provide recommendations for NHAP as well as many clinical studies of this infection have focused on hospitalized episodes whereas the majority of cases of NHAP are treated in the nursing home.<sup>3</sup>

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Therefore, the focus will be on the management of NHAP in the nursing home setting. In this first article, the diagnosis of NHAP will be addressed. A second article will address the etiology and treatment of NHAP. It should be noted that the information in these reviews will focus on long-term residents in community skilled nursing facilities. This information may not apply to academic skilled nursing facilities or federal facilities providing long-term care that have predominately male residents and may be associated with an academic medical center; these facilities may have access to diagnostic methods and consultation services not available to community skilled nursing facilities.

### Use of Surveillance Definitions to Identify Residents With Pneumonia

Surveillance definitions for infection in nursing home residents have been available for about 3 decades and have been recently updated.<sup>4</sup> However, surveillance definitions should not be used to identify infection in individual residents for the purpose of determining the need for antimicrobial therapy. This point has been clearly made in the article describing the updated surveillance definitions<sup>4</sup> as well as by the Healthcare Infection Control Practices Advisory Committee (HICPAC).<sup>5</sup> The following statement is taken from the HICPAC article: “Another important concept that is underappreciated by many clinicians is the distinction between HAI [healthcare-associated infection] surveillance definitions and clinical diagnoses. Clinical diagnoses are based, in part, on the subjective judgment of clinicians and are used to guide treatment of individual patients. Surveillance definitions are used to assess a facility’s HAI burden and the need for and effect of prevention efforts. Of note, HAI surveillance definitions are *not* intended for clinical diagnosis or to guide patient treatment.”

### “Bedside” Criteria to Identify Residents With Pneumonia

The approach to identifying residents with pneumonia should focus on symptoms and signs related to the respiratory tract, including examination of the lungs. Having stated that, it has been noted in numerous publications that the presentation of pneumonia in the nursing home resident is frequently “atypical,” making diagnosis difficult. However, studies of NHAP that have noted an atypical presentation frequently involved hospitalized residents.<sup>6,7</sup> It may be difficult to obtain an accurate history from an ill nursing home resident in the hospital setting, and information from the nursing home may not be complete regarding the history prior to hospital transfer. In the nursing home setting, the clinician has the opportunity to obtain information directly from staff about the status of a resident, but this comes with a caveat (see “Roadblocks to the Diagnosis” section). When the clinician is present in the facility, this allows for direct collection of pertinent history as well as examination. Given the

difficulty of obtaining an accurate history from cognitively impaired residents, the focus should be on objective measurements that focus on the respiratory tract. Unfortunately, consensus regarding the criteria for the diagnosis of NHAP remains elusive.<sup>8</sup>

Despite the lack of agreement on diagnostic criteria for NHAP, there is evidence that focusing on respiratory signs and symptoms may be a useful approach for the practicing clinician. In a prospective study of 60 nursing home residents, 21 (35%) developed pneumonia, 19 (90%) of whom had a respiratory rate >25 per minute that had a sensitivity of 90% and specificity of 95% for the diagnosis of pneumonia.<sup>9</sup> In a study of 2334 nursing home residents in 36 nursing homes in Missouri between 1995 and 1998 with signs and symptoms of lower respiratory tract infection, the goal was to define clinical findings associated with radiographic pneumonia.<sup>10</sup> Of the 2334 episodes, 45% had radiographic evidence consistent with pneumonia (12% probable and 35% definite). Multivariate analysis identified 8 independent predictors of pneumonia on chest radiograph; of these 8, 3 were respiratory signs: respiratory rate  $\geq 30$  breaths per minute, crackles on lung examination, and absence of wheezing. Wheezing, especially in someone with no history of this problem, in the presence of other lower respiratory tract symptoms, is more often associated with viral infection, for example, respiratory syncytial virus infection.<sup>11</sup>

The correlation of an elevated respiratory rate with pneumonia in nursing home residents suggested that pulse oximetry might also be helpful in the diagnosis of this infection. In residents with suspected acute infection, an oxygen saturation <94% had a sensitivity for pneumonia of 80%, specificity of 91%, and positive predictive value of 95%; a decrease in saturation of >3% from baseline had a sensitivity for pneumonia of 73%, specificity of 100%, and positive predictive value of 100%.<sup>12</sup> However, there has been limited information about the use of pulse oximetry in nursing home residents suspected to have pneumonia. In a study of 1702 episodes of presumed lower respiratory tract infection in 21 long-term care facilities in Canada, pulse oximetry was used in only 28.5%.<sup>13</sup>

Because the diagnosis of infection in nursing home residents can be difficult, minimum criteria for starting antibiotic therapy were developed for various types of infection, including lower respiratory tract infection, using a modified Delphi method.<sup>14</sup> Depending on the level of temperature, which was divided into 3 categories, the criteria varied as to what would constitute minimal criteria for starting antimicrobial therapy (Table 1). What is common to all 3 fever categories is an elevated respiratory rate and cough.

Hollar and colleagues<sup>8</sup> used literature review and the Delphi method to attempt to reach consensus among geriatricians and pulmonologists on the diagnosis of NHAP. After defining characteristics commonly used in studies to identify pneumonia in nursing home residents, the expert panel was not able to reach consensus on either the characteristics or the number of characteristics required to make a

**Table 1**  
Minimum Criteria for Initiating Antibiotic Therapy for Suspected Lower Respiratory Infection (Bronchitis or Pneumonia) in Nursing Home Residents<sup>14</sup>

Temperature Level	Minimum Criteria for Initiating Therapy
>102°F (>38.9°C) >100°F (>37.9°C) [or a 2.4°F (1.5°C) increase above baseline temperature] but <102°F (<38.9°C)	At least 1 of the following: respiratory rate >25/min, or productive cough. Presence of a cough and at least 1 of the following: 1. pulse >100, 2. delirium, 3. rigors (shaking chills), or 4. respiratory rate >25/min.
Afebrile residents known to have COPD Afebrile without COPD	New or increased cough with purulent sputum production New cough with purulent sputum production and either of the following: respiratory rate >25/min or delirium.
In the setting of a new infiltrate on a chest radiograph thought to represent pneumonia	Respiratory rate >25/min, a productive cough, or fever [temperature >37.9°C (100°F) or 1.5°C (2.4°F) increase above baseline temperature].

COPD, chronic obstructive pulmonary disease.

**Table 2**  
Proposed “Bedside” Criteria for the Diagnosis of Pneumonia in Nursing Home Residents

Main criteria
2 or more of the following:
1. Cough
2. Shortness of breath
3. Respiratory rate > 25/min
4. Oxygen saturation < 94% on room air or decrease of > 3% from baseline saturation
5. Abnormal chest examination findings [provider or nurse]
Secondary criteria
With or without:
1. Fever [ $>99^{\circ}\text{F}$ ( $>37.2^{\circ}\text{C}$ )]
2. Change in mental status, or
3. Change in functional status
Are there risk factors for aspiration?
1. Stroke
2. Dysphagia of any cause
3. Parkinson's disease
4. Feeding tube
5. Excess sedation
If the main criteria are met, chest radiograph should be obtained.

diagnosis of NHAP. However, 57% of the expert panel agreed that fever, shortness of breath, decline in functional status, increased respiratory rate, and abnormal chest examination findings were important characteristics and that at least 2 or 3 of these characteristics should be present to make a diagnosis of NHAP.

Based on the studies detailed above, proposed “bedside” criteria for suspected pneumonia in nursing home residents are listed in Table 2. The main criteria are designed such that each element is objective and should be readily available to nursing staff. The exception is the examination of the chest, which may be problematic for nursing staff to perform and communicate accurately (see the section “Roadblocks to Diagnosis”). Nonspecific findings such as a change in mental status or functional status are not considered part of the main criteria because of the subjectivity involved in assessing these changes. Fever is not included in the main criteria because there has been an ongoing debate about the appropriate cutoff temperature for fever in the nursing home population as well as the concern that residents may not be febrile in the presence of bacterial infection.<sup>15–18</sup> In addition, the provider is reminded to determine if risk factors for aspiration are present, and the duration of symptoms prior to evaluation. The latter factors may assist in making the distinction between aspiration pneumonia and aspiration pneumonitis, which have different treatment approaches that will be discussed in the next section. If the main criteria are met, a chest radiograph is recommended.

### Aspiration Pneumonia vs Aspiration Pneumonitis

The reader is referred to several useful reviews of aspiration pneumonia and aspiration pneumonitis.<sup>19–24</sup> In the older adult nursing home resident, aspiration pneumonia and aspiration pneumonitis share a common mechanism: macro-aspiration an event defined as aspiration of a large volume of oropharyngeal or gastric contents and a common predisposing factor—dysphagia of varying causes.<sup>22</sup> What distinguishes these entities is the characteristics of the aspirated material. The term *aspiration pneumonia* refers to a subgroup of bacterial pneumonia in which acute infection develops following aspiration of a large volume of oropharyngeal contents or gastrointestinal contents with a pH > 2.5 containing a high bacterial load and failure of lung host defense mechanisms to clear bacteria.<sup>22</sup> Aspiration pneumonitis is defined as macro-aspiration of gastrointestinal contents, including acid, bile, or food particles in variable proportions with sudden respiratory

decompensation (hypoxemia, elevated respiratory rate, abnormal lung examination and radiograph findings, and often fever and leukocytosis).<sup>21</sup> To produce a chemical pneumonitis in the lung, it has been estimated from animal studies that the pH of the aspirated material should be <2.5; this is a sterile aspiration in contrast to that with aspiration pneumonia.<sup>22</sup> An important distinction to keep in mind is that the presentation of aspiration pneumonia may progress gradually over hours to a few days, whereas aspiration pneumonitis tends to present as an abrupt change in respiratory status related to the acute aspiration event.<sup>22</sup>

Physicians have difficulty making the distinction between aspiration pneumonia and aspiration pneumonitis because factors predisposing to aspiration are the same for both entities and the aspiration event may be unwitnessed, making the diagnosis difficult unless careful history is obtained.<sup>19,21,22</sup> In a study of nursing home residents, definitions for witnessed and unwitnessed aspiration events in this population were developed.<sup>25</sup> This study emphasized the importance of an underlying swallowing abnormality as the basis for the aspiration event in nursing home residents. This was corroborated in a prospective study of nursing home residents with aspiration pneumonia admitted to the hospital, 72% of whom had dysphagia secondary to neurologic disease.<sup>26</sup>

A retrospective study of 195 residents with suspected pneumonia admitted to an inpatient geriatrics unit was performed with the goal of developing a decision tool to assist clinicians in identifying aspiration pneumonia and pneumonitis.<sup>27</sup> Episodes were stratified into 3 clinical categories based on definitions developed a priori using the definitions of an aspiration event by Pick et al<sup>25</sup>: aspiration pneumonitis [n = 86 (44%)], infectious pneumonia [n = 43 (22%)], and an aspiration event without an infiltrate [n = 66 (34%)]. Based on the findings in the retrospective study<sup>27</sup> and concepts found in the review by Marik,<sup>19</sup> a decision tool or algorithm was developed to distinguish between pneumonia, aspiration pneumonia, and aspiration pneumonitis (Figure 1). It should be emphasized that in the algorithm, the main factor distinguishing aspiration pneumonia from aspiration pneumonitis is the duration of symptoms before evaluation. If symptoms are present for less than 24 hours after an aspiration event, pneumonitis is the diagnosis and no antimicrobial therapy is necessary.<sup>19,21,23,24</sup> If symptoms are present for more than 24 hours or is undetermined, the concern is that bacterial infection may be present, and antimicrobial therapy is recommended. Antibiotic treatment regimens to consider (oral or parenteral) will be discussed in part II of this review.

The algorithm was evaluated prospectively in 170 episodes of suspected pneumonia admitted to the same inpatient geriatrics unit in which the tool was developed.<sup>28</sup> Research nurses applied the algorithm to the 170 episodes that resulted in stratification into 4 clinical groups: pneumonia, 25%; aspiration event with an infiltrate and symptoms of <24 hours' duration, 28%; aspiration event with an infiltrate and symptoms of >24 hours duration, 12%; and an aspiration event with negative chest radiograph (regardless of duration of symptoms), 35%. These designations were not made available to physicians responsible for the care of residents. There was no significant difference in presenting signs and symptoms or admission vital signs, mean percentage oxygen saturation, mean total white blood cell count, or mean C-reactive protein serum level among the 4 clinical groups. Blood cultures were positive in 4 episodes classified as pneumonia and 1 classified as aspiration event with infiltrate and symptoms >24 hours. However, urine pneumococcal antigen was positive in 4 (13.8%) of 29 classified as aspiration pneumonitis of <24 hours and 1 (3.2%) of 31 classified as an aspiration event only. Assuming that a positive urinary pneumococcal antigen indicates acute infection, the algorithm misclassified these 5 episodes as noninfectious. There was no significant difference in hospital mortality between the 4 clinical groups.

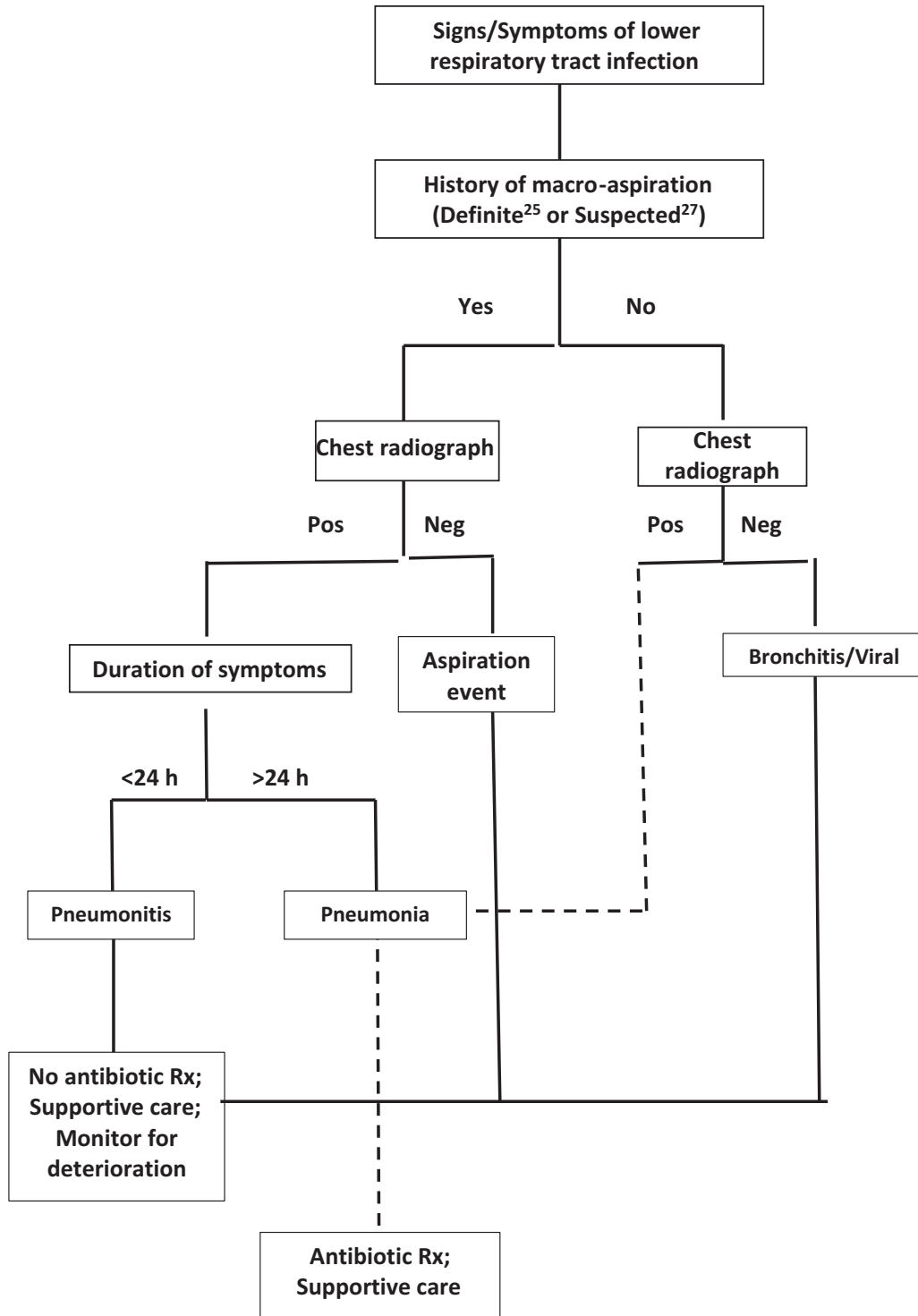


Fig. 1. Algorithm for the diagnosis and management of residents with suspected pneumonia in the nursing home. Antibiotic treatment may be parenteral or oral initially. Supportive care includes intravenous or subcutaneous fluids, oxygen supplementation, and antipyretics. Residents need to be monitored carefully for response to management with or without antibiotic treatment. This figure is modified from one that was previously published.<sup>27</sup> Neg, negative; Pos, positive; Rx, treatment.

The findings of these 2 studies<sup>27,28</sup> suggested that a substantial proportion of residents with a diagnosis of pneumonia admitted to the hospital may not have bacterial infection and do not require antimicrobial therapy. Unfortunately, there has been no independent validation of the decision tool. However, there is circumstantial evidence to support the observations of these studies, which will be discussed in more detail in part II of this review.<sup>29,30</sup>

### Roadblocks to the Diagnosis of Pneumonia in Nursing Home Residents

A major problem in the nursing home setting is that the clinician is often not present when there is a change in status of a resident. Consequently, the clinician must rely on nursing staff to evaluate the resident and communicate their findings, usually by phone. The main

limitation of this process is the variability in the experience and clinical ability of staff to collect the appropriate information in order for the clinician to make an accurate diagnosis and management decision, and there may be a covering physician who has no prior knowledge of the resident. These limitations have been recognized and, as a result, templates to assist nursing staff in collecting the appropriate information before calling the provider have been developed.<sup>31,32</sup> These templates are available online and are free to download. The extent to which these templates or similar approaches have been adopted by nursing homes is not known, but if not, the recommendation would be to seriously consider their utilization. The need for accurate assessment by nursing staff of a resident suspected to have pneumonia emphasizes that staff is key to the diagnosis and management of this infection in the nursing home setting.

## Diagnostic Tests in Residents With Suspected Pneumonia

### Chest Radiography

The most important diagnostic test in a resident with suspected pneumonia is a chest radiograph. However, there are limitations regarding radiographs of the chest in the nursing home setting. The radiography is done using the anterior-posterior view, and it may be difficult to position a resident properly and a resident may not be able to cooperate in holding the proper position. In addition, variation in interpretation of the chest radiograph by radiologists has been reported in studies of NHAP done over a decade ago.<sup>33,34</sup> There has been significant improvement in portable radiography capability with the availability of lightweight equipment and digital technology that allows the technician to review the film onsite to assess the quality of the film and repeat if necessary. The examination is available online to be read by a remote radiologist with results available in a timely fashion. In addition, the provider may have the ability to review the film online on the website of the company performing the radiography. This allows the provider to compare the clinical findings to the radiologic findings.

A recent study evaluated the influence of chest radiograph reports on antibiotic treatment in 226 residents with signs and symptoms suggesting pneumonia.<sup>35</sup> Fifty-two percent of the radiographs were read by a radiologist as a low likelihood of pneumonia, 30% stated pneumonia was present or highly likely, and 18% were ambiguous regarding presence of pneumonia or infiltrate. Providers treated residents with ambiguous reports with antibiotics at the same rate (71%) as those with a positive report (78%); 40% with reports with a low likelihood of pneumonia were treated with antibiotics. The authors concluded that because providers did not consistently use chest radiograph findings to guide therapy, the emphasis should be on respiratory signs and symptoms to make a diagnosis of pneumonia and treatment decisions, with less emphasis on chest radiograph findings. In another study, it was found that providers in nursing homes stopped antibiotic therapy in residents with suspected pneumonia who had a negative chest radiograph.<sup>36</sup>

In summary, although there are limitations to performing and interpreting chest radiographs in nursing home residents, studies of interpretation of chest radiographs in residents using the latest technology are needed. In the meantime, a chest radiograph is strongly recommended in a resident suspected of having pneumonia based on clinical findings for verification of the diagnosis, which has importance not only for infection surveillance but also for antibiotic stewardship activities.

### Lung Ultrasonography

As noted in the previous section, chest radiography is presently considered the main diagnostic tool to identify pneumonia in nursing

residents. However, the variability in interpretation of chest radiographs in nursing home residents is a major concern as mentioned above. As a result of this variability as well as the difficulty in performing chest radiographs in certain patients, children, for example, in the intensive care unit and in the emergency department, lung ultrasonography has been studied as an alternative to identify pneumonia in adults.<sup>37</sup>

Multiple studies have demonstrated the superiority of ultrasonography over chest radiography in the diagnosis of pneumonia in adults.<sup>38</sup> A study of older patients admitted to a geriatric inpatient unit in Italy with acute respiratory symptoms found that lung ultrasonography was significantly more accurate than chest radiograph in identifying pneumonia based only on clinical criteria; interobserver agreement for ultrasound was high ( $k = 0.90$ ).<sup>39</sup>

As far as can be determined, there is no published information about the use of lung ultrasonography in the diagnosis of NHAP in the nursing home. There are no major technical limitations of lung ultrasonography since portable units are available.<sup>40</sup> A limitation of lung ultrasonography is the experience of the person performing the examination. Clearly, studies of lung ultrasonography in the nursing home setting for the diagnosis of pneumonia are warranted.

### Other Laboratory Tests to Consider

When pneumonia is suspected in a nursing home resident, there may be consideration for obtaining other laboratory tests such as sputum and blood cultures, total white blood cell count with differential, and measurement of electrolyte and creatinine serum levels. Before ordering any of these tests, clinicians need to consider if there will be a reasonably high diagnostic yield (eg, from sputum or blood cultures), risk to the resident from obtaining a test, cost of the test, and, most importantly, impact of test results on management.<sup>41</sup>

In terms of cultures, there is no evidence that sputum or blood cultures have a role in managing suspected pneumonia in the nursing home setting. Obtaining sputum cultures from nursing home residents is difficult at best, and the results are usually not useful. The yield from blood cultures done in the nursing home for any suspected infection is also low.<sup>42</sup> In addition, trying to obtain cultures from residents may delay therapy as well as inflict discomfort in attempting to obtain a culture.

In a study of 221 older patients (ages 70–99 years) presenting to an emergency department, it was found that a total white blood cell count of  $>14,000$  cells/mm<sup>3</sup> had a likelihood ratio of 3.7 for bacterial infection; if the percentage of neutrophils was  $>90\%$  regardless of the total white blood cell count, the likelihood ratio was 7.5; and if the percentage “band forms” was  $>6\%$ , the likelihood ratio was 4.7.<sup>43</sup> There have been no recent studies to corroborate these findings. The decision to obtain a complete blood count and basic metabolic panel in a resident with suspected pneumonia should be individualized and based on the clinician’s assessment of the resident’s clinical status.

### Biomarkers

The hypothesis underlying the study of host biomarkers in patients with fever or evidence of infection is that the level of a biomarker in blood or other body fluids such as cerebrospinal fluid, along with other factors, would allow the clinician to make the distinction between bacterial and nonbacterial infection. This would result in more appropriate antimicrobial therapy, thereby lessening the risk of antimicrobial resistance and adverse events such as an allergic reaction and *Clostridium difficile* infection. Based on this hypothesis, more than 100 host-related biomarkers have been studied either alone or in combination to determine their utility in predicting the presence of bacterial infection.<sup>44</sup> In terms of identifying bacterial pneumonia, the main focus has been on procalcitonin (PCT) in patients with

community-acquired pneumonia.<sup>45</sup> In addition to diagnosis, biomarkers such as PCT have been utilized to assist in determining duration of therapy and prognosis of pneumonia.<sup>45</sup>

There has been limited evaluation of biomarkers in nursing home residents with pneumonia. In a study assessing an algorithm for distinguishing aspiration pneumonia and aspiration pneumonitis in nursing home residents, there was no significant difference in mean serum C-reactive protein (CRP) levels between residents with an algorithm diagnosis of aspiration pneumonia, aspiration pneumonitis, or bacterial pneumonia.<sup>28</sup> In a study of intubated patients admitted to an intensive care unit with a diagnosis of an aspiration syndrome, of which half were nursing home residents, there was no difference in median serum PCT levels between those with a positive bronchoalveolar lavage bacterial culture (pneumonia) compared to those with a negative bronchoalveolar lavage culture (aspiration pneumonitis).<sup>46</sup> In a study of 87 nursing home residents with a diagnosis of pneumonia admitted to the hospital, 58 were diagnosed with bacterial pneumonia based on clinical and microbiological criteria and 29 with noninfectious diagnoses.<sup>47</sup> Mean CRP and PCT levels on admission were significantly higher in those with a diagnosis of pneumonia. For CRP, using a cutoff of 8.05 mg/dL, the positive predictive value of this cutoff for pneumonia was 88% and negative predictive value 67%. For PCT at a cutoff of 0.475 ng/mL, the positive predictive value for pneumonia was 87% and negative predictive value was 68%. As far as can be determined, these are the only studies of CRP or PCT in the nursing home population. Based on this limited information with conflicting information, the role of CRP or PCT levels in the diagnosis of bacterial pneumonia in nursing home residents remains unclear. In addition, it is uncertain that CRP or PCT determinations would be available to clinicians in the nursing home in a timely fashion to assist in making a decision about initiating antimicrobial therapy. A point-of-care PCT test kit is available, but the cost-effectiveness and feasibility of using this test in the nursing home needs to be evaluated before recommending its use in this setting.<sup>48</sup>

### Documentation of the “Thought Process”

With increasing focus on quality of care in the nursing home setting, accurate documentation of clinical findings and rationale for a specific diagnosis and management approach has become increasingly important. This is especially true when there is a change in status of a resident. Accurate documentation in the medical record by the clinician of the presence of infection of any type impacts not only medical care but also infection surveillance and antimicrobial stewardship activities. The increasing availability of electronic medical records assists in the documentation process even if the clinician is not present in the facility or is being covered by another clinician. The importance of documentation cannot be overstated and allows the clinician to clearly affirm what he or she is thinking regarding the diagnosis and management based on the documented findings.

### Conclusions and Implications

The diagnosis of pneumonia in the nursing home setting should be made based on objective findings focused on the respiratory tract using criteria such as found in Table 2. In a situation in which aspiration is an issue, consideration needs to be given for distinguishing between pneumonia and pneumonitis; a decision tool for that purpose has been proposed but not validated. In terms of diagnostic tests, the chest radiograph is the most important test but interpretation of the radiograph may be an issue. Lung ultrasonography needs to be studied in nursing home residents as either an adjunct or in place of a chest radiograph to verify the presence of an infiltrate consistent with pneumonia. The role of host biomarkers such as PCT requires more study before it can be recommended for use in the nursing home

setting. Documentation of the findings resulting in a diagnosis of pneumonia is an important component of monitoring quality of care.

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