

Things We Do for No Reason™: Routine Coverage of Anaerobes in Aspiration Pneumonia

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Inspired by the ABIM Foundation's Choosing Wisely® campaign, the "Things We Do for No Reason™" (TWDFNR) series reviews practices that have become common parts of hospital care but may provide little value to our patients. Practices reviewed in the TWDFNR series do not represent "black and white" conclusions or clinical practice standards but are meant as a starting place for research and active discussions among hospitalists and patients. We invite you to be part of that discussion.

CLINICAL SCENARIO

An 88-year-old woman with a history of dementia presents to the emergency room with new-onset dyspnea following 2 days of a self-limited gastrointestinal illness associated with nausea, vomiting, and diarrhea. After noting a new supplemental oxygen requirement of 4 L and a temperature of 38.6 °C, the hospitalist's exam finds an edentulous patient with bibasilar lung crackles and a nontender abdomen. Taking into account her elevated white blood cell count and chest radiograph with right greater than left bibasilar opacities, the admitting hospitalist diagnoses aspiration pneumonia (AP) and specifically selects an antibiotic regimen with anaerobic coverage.

BACKGROUND

Aspiration, the inhalation of oropharyngeal or gastric materials into the lung, takes one of the following three forms: (1) "microaspiration," wherein a small number of virulent organisms from oropharynx gains entry into the alveoli, (2) "macroaspiration," wherein a large volume of typically less virulent organisms gains entry into the airways, or (3) a combination of the two. Hospitalists may struggle to distinguish unwitnessed macroaspiration causing AP from other typical causes of pneumonia, such as community-acquired pneumonia (CAP) or hospital-acquired pneumonia (HAP).¹ A hospitalist should suspect macroaspiration—the most common cause of AP—in patients with risk factors such as dysphagia, diminished cough reflex or impaired swallowing, and infiltrates in the dependent bronchopulmonary segments, or of course, in cases of witnessed aspiration.²

Moreover, hospitalists must differentiate AP, an infectious entity, from aspiration pneumonitis, a noninfectious entity caused by macroaspiration of mostly sterile gastric content. Aspiration pneumonitis presents with acute lung injury within hours of an aspiration event, whereas AP entails a gradual onset of symptoms and signs of pneumonia.² Although aspiration pneumonitis can present dramatically with hypoxemia and pulmonary edema and may evolve into AP, patients do not initially benefit from empiric antibiotics.¹

WHY YOU MIGHT THINK SPECIFIC ANAEROBIC COVERAGE IS ESSENTIAL

In the 1970s, several studies of patients who were presumed to have AP because of risk factors for macroaspiration, such as alcohol use disorder, illicit drug use, and seizure disorder, identified anaerobes as major etiologic pathogens. These studies reported the presence of putrid sputum and obtained samples through invasive methods (eg, transtracheal aspirates, thoracentesis, and blood cultures).^{3,4} Many of the patients studied had radiographic findings of pleuropulmonary disease. For example, in the study by Bartlett et al, 70% of patients had radiographic evidence of abscess or pulmonary necrosis. These findings led to the assumption that anaerobes play a significant role in all cases of aspiration-related pulmonary syndromes. Because anaerobic bacteria live in the gingival sulcus, with an especially high burden in dental plaques, their role as a potential pathogen in AP may seem logical.⁵ Given the backdrop of those concerns, Kioka et al found that providers treated 90% of presumed AP patients in the intensive care unit with antibiotics that have anaerobic activity despite only 30% meeting the criteria for anaerobic coverage.⁶

WHY ANAEROBIC COVERAGE IS NOT ROUTINELY NECESSARY

In contrast to the population of patients with AP described from the 1970s, we now diagnose AP more frequently in nursing home residents, the elderly with cognitive impairment, and those with tube feed dependence, dysphagia, or gastrointestinal motility disorders.¹ Concurrent with this change in the epidemiology of AP, we have witnessed a shift in recovered bacteria from anaerobes to aerobes in recent studies.^{7,8} In an intensive care unit study from 1999, respiratory tract organisms of patients with suspected aspiration mirrored those of patients with CAP or HAP.⁹ In a systematic review of eight observational studies that included studies from 1993 to 2014 and involved elderly patients with uncomplicated AP, only two

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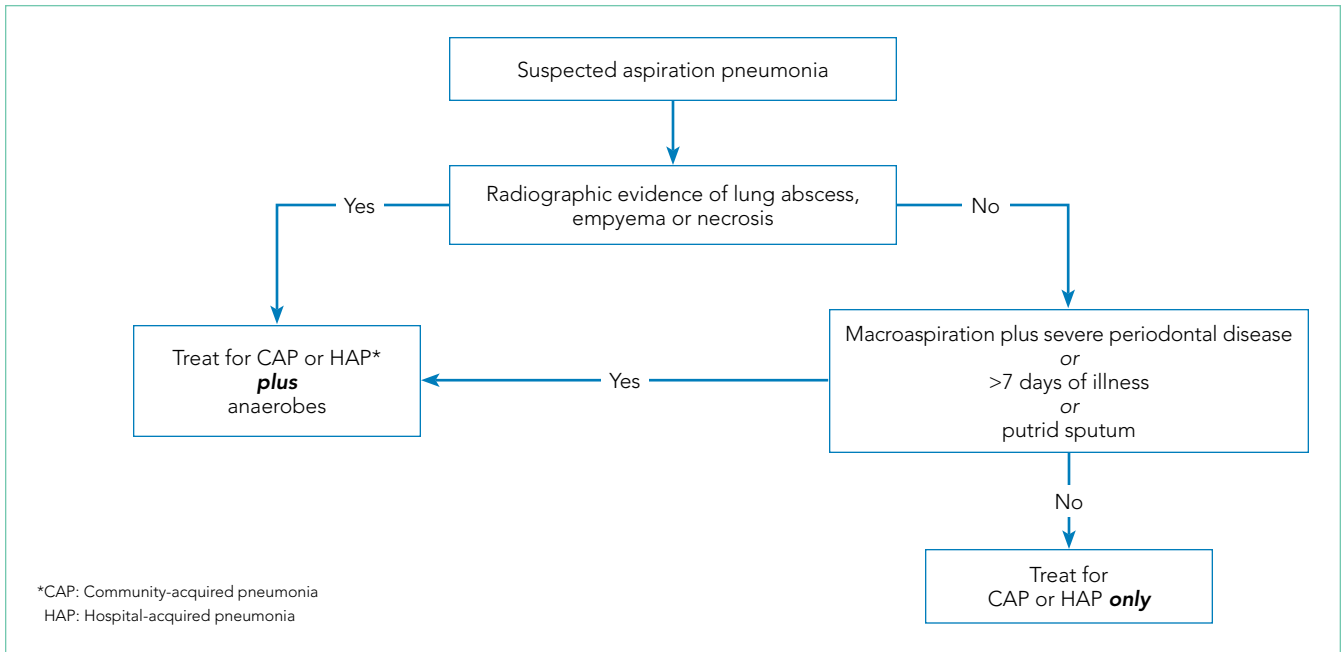


FIG. Algorithm for Antibiotic Selection in Suspected Aspiration Pneumonia. Antibiotic selection for suspected aspiration pneumonia is based on clinical findings plus risk factors and radiographic findings.

out of eight studies demonstrated the presence of anaerobes in respiratory cultures. Even in those two studies, anaerobic bacteria frequently coexisted with aerobes. The majority of organisms in all eight studies consisted of aerobic gram-positives, gram-negatives, or both.¹⁰

A study by El-Solh et al most frequently isolated pathogenic aerobic gram-negative bacteria (49% of cases), followed by anaerobic bacteria (16%), among institutionalized elderly patients with severe AP diagnosed by clinical features. In that same study, most anaerobes coexisted with aerobic gram-negative bacteria, and the clinical illness promptly resolved in the absence of specific anaerobic coverage.¹¹ AP can be successfully treated without anaerobic coverage due to a variety of factors: the insignificant role of anaerobes in the pathogenesis of uncomplicated AP, lower severity of illness in the absence of abscesses or pulmonary necrosis (uncomplicated), and altered local redox-potential from the elimination of aerobic pathogens, which effectively also treats anaerobes.¹ Moreover, anaerobes possess generally less virulence in comparison with aerobes. AP from these organisms typically requires risk for excessive oral growth (eg, periodontal disease) and macroaspiration of a large number of organisms.⁵

There are also potential harms associated with the unnecessary treatment of anaerobic bacteria. Since anaerobes account for the majority of the bacteria present in the bowel, targeting anaerobes can result in gut dysbiosis.¹ Moreover, a prospective study showed an increase in the incidence of vancomycin-resistant enterococci and antibiotic-resistant gram-negative bacteria associated with the empiric use of antibiotics with anaerobic activity.¹² Finally, a systematic review detailed the high incidence of *Clostridioides difficile* infections among patients receiving clindamycin and carbapenems.¹³

WHEN ANAEROBIC COVERAGE IS INDICATED

Despite the predominance of aerobic organisms in the respiratory tract specimens of patients diagnosed with AP in the current era, situations still exist that require treatment of anaerobes. These include necrotizing pneumonia, empyema, or lung abscess.² Additionally, patients with severe periodontal disease may harbor anaerobic bacteria such as *Bacteroides* species, *Peptostreptococcus* species, and *Actinomyces israelii*.⁵ When we suspect macroaspiration leading to AP, patients with severe periodontal disease may benefit from anaerobic coverage. Putrid sputum generation may indicate the presence of anaerobic organisms that produce the characteristic foul odor of short-chain volatile fatty acids observed in patients with lung abscess or empyema.² It often takes about 8 to 14 days after an aspiration event for lung cavitation or empyema to develop.¹⁴ Therefore, a longer duration of illness or putrid sputum production may signal a significant concurrent burden of anaerobes. The 2019 official guidelines of the American Thoracic Society and Infectious Disease Society of America recommend adding anaerobic coverage to CAP only when empyema or lung abscess is suspected (conditional recommendation, very low quality of evidence).¹⁵

WHAT YOU SHOULD DO INSTEAD

When you suspect AP in a patient, categorize it as either community or hospital acquired based on risk factors similar to CAP or HAP. For patients with witnessed macroaspiration or in patients with substantial macroaspiration risk factors, perform a radiologic evaluation and a thorough oral examination to evaluate for poor dentition, gingival disease (marked redness, tendency to bleed, ulceration), and tongue coating. For patients presenting

from the community with suspected AP without complications, treat with the standard therapy (without additional anaerobic coverage) for CAP. Provide empiric anaerobic coverage for complicated AP (eg, lung abscess, necrosis, or empyema) or for macroaspiration in the setting of severe periodontal disease, putrid sputum, or longer duration of illness. Similarly, treat hospital-acquired AP as HAP (Figure).

When prescribing anaerobic coverage of AP, use combination drugs that include a β -lactamase inhibitor (eg, ampicillin-sulbactam), clindamycin (either alone or in combination with β -lactams), or moxifloxacin.¹ Most anaerobes have β -lactamase or cephalosporinase activity, which renders penicillin and cephalosporins ineffective. Despite its potential side effects, such as *C difficile* infection, treating with clindamycin has the benefit of a relatively low cost and its association with lower rates of methicillin-resistant *Staphylococcus aureus* emergence after treatment.¹⁶ Piperacillin-tazobactam and carbapenems also have excellent anaerobic coverage, but we should reserve them for more severe and complicated cases of AP given their extensive antibacterial activity and concern for the emergence of resistance.⁸ Although well known and used for decades for its activity against clinically important anaerobes, avoid metronidazole due to its reduced cure rate in lung abscess caused by microaerophilic streptococci of the oral cavity.¹⁷ Due to a lack of evidence, we do not recommend the use of metronidazole in lung infections.

RECOMMENDATIONS

- Empirically treat most suspected cases of AP with regimens similar to the standard antibiotics for CAP and HAP. In the absence of specific risk factors for anaerobic infections, do not routinely provide anaerobic coverage.
- Provide anaerobic coverage empirically for AP associated with macroaspiration in the setting of severe periodontal disease, putrid sputum, or longer duration of illness.
- Provide anaerobic coverage in AP with evidence of necrotizing pneumonia, empyema, or lung abscess.

CONCLUSION

Current evidence does not support routine anaerobic coverage of AP in the absence of identifiable risk factors for an anaerobic lung infection.

In consideration of the clinical case, importantly, she has no periodontal disease and no evidence for necrotizing pneumonia, empyema, or lung abscess radiographically. For these reasons, select an empiric antibiotic regime that targets CAP organisms predominantly and forgo additional anaerobic coverage.

Do you think this is a low-value practice? Is this truly a “Thing We Do for No Reason™”? Share what you do in your practice and join in the conversation online by retweeting it on Twitter (#TWDFNR) and liking it on Facebook. We invite you to propose ideas for other “Things We Do for No Reason™” topics by emailing TWDFNR@hospitalmedicine.org.

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