Toward Optimized Practice

DIAGNOSIS AND MANAGEMENT OF NURSING HOME ACQUIRED PNEUMONIA (NHAP)

Clinical Practice Guideline | March 2015

OBJECTIVE

In caring for residents in long term care facilities (LTCF) Alberta clinicians will:

- Increase the accuracy of clinical diagnosis of NHAP
- Initiate timely treatment for NHAP
- Optimize use of laboratory and diagnostic imaging services in the diagnosis of NHAP
- Optimize use of antibiotics in the treatment of NHAP
- Ensure practices to prevent respiratory infections are in place in the LTCF
- Facilitate teamwork and communication in the evaluation and management of residents with NHAP

TARGET POPULATION

Patients with pneumonia acquired in a LTCF

LTCF is any congregate living environment for older and/or disabled persons that have high personal and professional care needs.

EXCLUSIONS

Hospital acquired pneumonia (HAP) (onset within 14 days of discharge from an acute care facility)

Aspiration pneumonia (See Appendix A)

Pneumonia in patients with cystic fibrosis, tuberculosis or bronchiectasis

RECOMMENDATIONS

- ✓ Ensure the LTCF initiates the Nursing Home Acquired Pneumonia Checklist when NHAP is suspected to facilitate timely and accurate communication of relevant information among the care team.
- ✓ Diagnose NHAP when respiratory rate ≥25 bpm (counted for one full minute) plus any of the following are present:
  - Temperature ≥37.8°C or 1.1°C above baseline
  - New/increased cough or sputum production
  - Pleuritic chest pain
  - New/increased crackles, wheezes or bronchial breath sounds
  - New delirium or decreased level of consciousness
  - Dyspnea
  - Tachycardia
  - New/worsening hypoxemia
- ✓ Ensure treatment for NHAP is consistent with the resident's Goas of Care Designation

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do bugs drugs?

- ✓ Order chest X-ray if available (consider mobile units) for all residents with clinical findings consistent with pneumonia but do not delay treatment pending results of a chest X-ray. Transfer to acute care for a chest X-ray alone is not necessary.
- ✓ Administer antibiotics as soon as possible, i.e., within four to eight hours after the diagnosis of NHAP. If transfer to hospital is required, initiate antibiotics prior to transfer.
- ✓ Select empiric antibiotic therapy for NHAP according to recommendations in Bugs & Drugs[1,2] as microbiologic diagnosis of NHAP has significant limitations
- X DO NOT prescribe antibiotics for viral respiratory infections or for the prevention of NHAP. Inappropriate use of antibiotics leads to adverse patient outcomes and preventable increases in antimicrobial resistance in pathogenic and commensal bacterial flora.
- ✓ Provide oxygen therapy if O_2 saturation is <90%
- ✓ Ensure adequate hydration. Consider Hypodermoclysis if hydration cannot be provided orally.
- ✓ Consider transfer to acute care if any of the following apply:
    - Respiratory rate >40 bpm
    - Pulse >125 bpm
    - Systolic blood pressure <90 mmHg or decreased 20 mmHg below baseline
    - Adequate oxygenation or hydration cannot be achieved at the LTCF
    - Resident is hemodynamically unstable or is deteriorating rapidly
- ✓ Institute measures to prevent viral respiratory tract infections (as these predispose to pneumonia) including:
    - Promote hand hygiene for staff, residents and visitors
    - Provide influenza and pneumococcal vaccination for residents
    - Encourage influenza vaccination for staff
    - Encourage staff/visitors to stay home if sick
    - Support smoking cessation and avoidance of second hand tobacco smoke for residents
    - Promote good oral hygiene for residents

BACKGROUND

INTRODUCTION

Nursing home acquired pneumonia (NHAP) is defined as pneumonia occurring in a resident of a long term care facility (LTCF). NHAP is the second most commonly diagnosed infection in LTCF.[3] The incidence of NHAP is 1-3.2 per 1000 patient days[4] and LTCF residents are six to ten times more likely to acquire pneumonia than older persons residing in the community.[5] Prevalence of NHAP ranges between 0.3 to 4.4% in chronic care facilities,[6,7] accounts for 13-48% of all LTCF infections and is one of the most common causes for transfer to hospital.[5] NHAP is the leading cause of death among LTCF patients[8] with a mortality rate of 5-40%,[4,5] a rate two to threefold higher than for community acquired pneumonia (CAP).

NHAP was first described in 1978, but there are very few well-designed evaluations of clinical pathways or antibiotic therapy recommendations in this patient population.[9,10] Loeb and colleagues in Ontario demonstrated that the use of a NHAP clinical pathway reduced the number of transfers to hospital and had comparable clinical outcomes to a 'usual' treatment group.[11] In the absence of randomized controlled trial data for empiric drug therapy, many clinicians have extrapolated findings from CAP clinical pathways and guidelines.[12] Yet there is little, if any, evidence to support use of CAP guidelines in the nursing home patient population primarily due to advanced age and disease complexity in the risk stratification process. Although there are few guidelines that provide definitive prescribing direction for LTCF residents with NHAP, the following key elements should be considered as they will impact the prevention, assessment, diagnosis and management of NHAP in this setting.

PREVENTION

Limit the spread of respiratory tract infections as many predispose to pneumonia. Promote hand hygiene and infection prevention and control precautions with peers, LTCF staff, residents and visitors. Handwashing is the best way to stop the spread of infections as 80% of common infections can be spread by the hands.

Provide pneumococcal and annual influenza vaccines for residents in LTCF (See AHS guidance here: http://www.albertahealthservices.ca/2824.asp).

Recommend that all LTCF staff receive an annual influenza vaccination. Staff should stay home if they develop influenza-like symptoms.

Help residents to stop smoking and to avoid exposure to environmental tobacco smoke. Smoking is the strongest independent risk factor for invasive pneumococcal disease in adults.[13]

Ensure residents have good oral hygiene.[14]

DECISION-MAKING

With the high prevalence of dementia in LTCFs, advance care planning with a signed Goals of Care Designation is important to guide health care decisions. A person's Goals of Care Designation is usually determined by matching their values, beliefs and care wishes with expert clinical advice regarding appropriate medical care that can serve those preferences. Many residents and families may not want life supporting or life prolonging therapies; conservative treatment and management options are often preferred. Understanding the resident's preferences regarding health care wishes can better prepare designated decision makers and family members for in-the-moment decision making, especially for NHAP which is a leading cause of death in LTCF.[4]

RISK FACTORS

Increasing age, poor functional status, dementia, co-morbid conditions, male gender, swallowing difficulty, inability to take oral medications, and inadequate oral care have been identified as risk factors for the development of NHAP.[5,14,15] In addition, medications such as anti-psychotics, anti-cholinergics, H2 receptor blockers and proton pump inhibitors have also been linked to a higher risk of pneumonia.[5,16] Risk factors contributing to death from NHAP include aspiration, bed-fast state,

cerebrovascular accident, difficulty with oropharyngeal secretions, dysphagia, feeding tube, and sedative hypnotic use.[5,17]

ETIOLOGY

The microbiological demographics in LTCF are not well understood and vary between facilities. *Streptococcus pneumoniae* is recognized as the most common pathogen causing NHAP. One prospective study found a prevalence of infection with *S. pneumoniae* in 55% of patients transferred to hospital with NHAP.[18]

The etiology of NHAP more closely resembles CAP than HAP. The most common pathogens for NHAP are *S. pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus*. Less common pathogens in NHAP are *Chlamydophilia pneumoniae* and, rarely in Alberta, *Legionella pneumophila*. Gram-negative organisms (*Enterobacteriaceae spp*) may be pathogens in elderly patients, especially if they have decreased functional status, are institutionalized, or have multiple co-morbid illnesses. Severe NHAP is more likely to be due to *S. aureus*, including MRSA, *P. aeruginosa*, or *Enterobacteriaceae*.

Predisposing factors for multi-drug resistant NHAP pathogens are severe pneumonia, antibiotic therapy in prior three to six months, hospitalization in last 90 days, and poor functional status (ADL <12).[14]

Anaerobes are generally less important pathogens in NHAP. Although elderly residents in LTCF have a higher incidence of aspiration, the role of anaerobes in this setting remains controversial. Anaerobic coverage is not recommended in NHAP unless there is observed aspiration in residents with poor oral hygiene, severe periodontal disease, or putrid sputum; or evidence of necrotizing pneumonia or lung abscess.[19]

Influenza, parainfluenza, and respiratory syncytial virus are important causes of lower respiratory infections in LTCF residents and can predispose to bacterial pneumonia.[5] In one study, more than 50% of NHAP cases were due to viral infection, often leading to hospitalization compared with 30% viral etiology for CAP.[20]

PATHOPHYSIOLOGY

In as many as 50% of cases, a viral infection precedes the development of pneumonia and likely plays a role in the pathogenesis of pneumonia.[5] Viruses may inhibit important host defenses, including ciliary activity, neutrophil function, and other lung defense mechanisms. Cigarette smoke compromises mucociliary function and macrophage activity. Alcohol impairs the cough reflex, increases oropharyngeal colonization with Gram-negative bacilli, and may inhibit immune mechanisms.

DIFFERENTIAL DIAGNOSIS

The most common causes of diagnostic confusion in this population are non-infectious cardiac and pulmonary disorders and viral respiratory tract infections, most commonly acute viral bronchitis and influenza. Congestive heart failure (CHF) is a common disorder resembling NHAP. An exacerbation of pre-existing CHF may result in shortness of breath for the resident and thus resemble the presentation of NHAP. CHF may also co-exist with NHAP.

Tuberculosis (TB) should always be considered given that there is a 10 to 30 times increased incidence of TB in LTCF residents. These residents account for 20% of all TB cases in older people.[21,22] It is important to be aware of TB admission screening findings such as evidence for prior TB on chest X-ray.

Chest radiographs are the best way to diagnose NHAP. Patients with NHAP have segmental or lobar distribution of infiltrates on chest X-rays. Patients with CHF will demonstrate vascular redistribution to the upper lobes, usually accompanied by cardiomegaly. Previous chest X-rays may reveal interstitial lung disease that can be confused with the appearance of NHAP.

Pleural effusions can also complicate the diagnostic process. Bacterial pneumonias, particularly due to *S. pneumoniae* and *H. influenzae*, may be accompanied by pleural effusion. Pleural effusions without associated infiltrates are not due to pneumonia.

A fever of ≥37.8°C or 1.1°C above baseline accompanied by pulmonary symptoms and a productive cough suggests NHAP. The febrile response in the elderly is often blunted or may be suppressed by analgesic medications. Thus, temperature should always be compared with baseline when assessing the resident for fever.

Respiratory rate ≥25 bpm is the best clinical indicator of NHAP.[23-26] A respiratory rate <25 bpm has a high negative predictive value for NHAP suggesting viral etiology.

DIAGNOSIS

In LTCF, diagnosis of NHAP must often be made on clinical grounds alone. Although a new or progressive infiltrate seen on chest X-ray plus clinical signs consistent with pneumonia (new onset fever with temperature ≥37.8°C or 1.1°C above baseline, leukocytosis, purulent sputum, hypoxia[27] is the gold standard for the diagnosis of NHAP, diagnosis and initiation of therapy should not be delayed pending results of an x-ray. Symptoms of NHAP most commonly include tachypnea, fever, chills, dyspnea, pleuritic chest pain, and cough.[28] The physical examination should assess for the signs and symptoms cluster for NHAP: respiratory rate, temperature, heart rate, oxygen saturation level, auscultation of the respiratory system and assessment of level of consciousness (see Table 1) as well as blood pressure and level of hydration. The resident's history and co-morbidities should also be taken into account when making a diagnosis of NHAP.

Diagnosis is often based on nursing assessment and clinical information received from the LTCF rather than examination of the resident by the physician. The NHAP Checklist is a tool to be initiated at the LTCF to ensure all relevant diagnostic information is collected and communicated to the physician. Ensuring use of the checklist will assist with timely and accurate diagnosis of NHAP.

SIGNS & SYMPTOMS CLUSTER FOR NHAP
If chest X-ray is not available, **tachypnea** and at least **one** additional sign or symptom should be present to make a diagnosis of probable NHAP

• Tachypnea
  ○ Most important clinical predictive factor
  ○ Respiratory rate ≥25 bpm is associated with increased morbidity and mortality
  ○ Respiratory rate >40 bpm may be an indication for transfer to hospital
  ○ An elevated respiratory rate has a high sensitivity and specificity for the diagnosis of pneumonia
  ○ Respiratory rate <25 bpm has a high negative predictive value for NHAP
  Note: respiratory rate must be counted for a full minute

AND at least one of the following:
• Fever
  ○ Temperature of ≥37.8°C or 1.1°C above baseline is both a sensitive and specific predictor of infection (positive predictive value of 55% in nursing home residents)
  ○ Elderly patients may have lower basal body temperatures so always compare temperature to baseline. A temperature 1.1°C greater than baseline indicates fever
  ○ Residents who are taking antipyretics will have lower baseline temperatures
  Note: rigors are an important marker for bacteremia
• Cough
  ○ New productive cough is an important clinical symptom for NHAP.
  ○ Unproductive cough is common in this patient population and is not a specific symptom for NHAP.
• Pleuritic chest pain
  ○ Pleuritic chest pain may be present but is not a specific sign of pneumonia and is also a sign to watch for pulmonary embolus.
• Crackles, wheezes or bronchial breath sounds
  ○ New or increased
• New onset delirium and/or decreased level of consciousness, increased confusion
  ○ Sensitive but not specific for pneumonia
• Dyspnea
• Tachycardia
• New or worsening hypoxemia

Table 1: Signs and Symptoms Cluster for NHAP

CLINICAL ASSESSMENT

Due to increasing age, symptoms of infection may not be as apparent and physical signs of infection may be diminished in many LTCF residents. Fever may be less commonly observed whereas delirium and confusion may be more common in this population.[29] Delirium or acute confusion is found in 44.5% of elderly patients with pneumonia.[30]

Tachypnea is the only physical sign for which a predictive value for NHAP can be calculated for LTCF residents. Normal respiratory rate in the elderly is 16 to 25 bpm.[23] A respiratory rate of more than 25 bpm has a sensitivity of 90% and a specificity of 95% for the diagnosis of pneumonia.[26]

A single temperature of 38.3°C has a sensitivity of only 40% for predicting infection. Lowering the threshold to 37.8°C increases the sensitivity to 70% while maintaining specificity at 90%.[29] A temperature of 37.8°C or greater is both a sensitive and specific predictor of infection (positive predictive value of 55% in nursing home residents).[29] However, basal body temperature in the frail elderly is often lower than 37°C.[31] An increase of 1.1°C over baseline may be a better temperature criterion in the elderly.[29] Regular vital signs are an essential component of initial and continuing assessment of all residents with NHAP.

Oxygen saturation (O2) should be assessed by pulse oximetry if respiratory rate (RR) ≥25 bpm. Hypoxemia is an important indicator of acute severity and short term mortality in CAP and NHAP.[27,29]

INVESTIGATIONS

The diagnosis in the LTCF may often be based on clinical assessment alone. Ideally, and as available or appropriate, the diagnosis of pneumonia should be supported with chest X-ray, complete blood count and differential, arterial blood gases if indicated by pulse oximetry, blood cultures and sputum cultures as well as nasopharyngeal cultures during viral respiratory infection season or during outbreaks. There is value in performing these tests, if possible, even after diagnosis of NHAP and treatment has been initiated. Many of these tests may only be available if the resident is admitted to hospital.

CHEST X-RAY

Chest X-ray (CXR) is the gold standard for diagnosis of NHAP. If available, CXR should be performed on all residents with clinical findings consistent with pneumonia. Evidence of acute pneumonia, i.e. new infiltrate, is present in 75-90% of CXR performed on LTCF residents with clinical evidence of NHAP.[29] CXR can also identify co-morbid lung or cardiovascular disease. Additionally the severity of the illness may be judged by the extent of lung involvement on CXR. Mobile CXR is becoming increasingly available so that many LTCF can obtain CXR for residents with signs and symptoms of NHAP.

COMPLETE BLOOD COUNT (CBC)

CBC with differential is recommended for all residents. In the elderly, the total white blood count (WBC) and neutrophils showing a left shift are one of the best indicators of bacterial infection.[32]

Arterial Blood Gases

If O_2 saturation is less than 90% or the patient has COPD, arterial blood gas should be drawn on room air or on baseline O_2 if the patient is receiving chronic oxygen.

Blood Cultures

For residents admitted to hospital with suspected NHAP, blood cultures should be drawn prior to starting antibiotics. However, treatment should not be delayed while waiting for tests or results. Obtaining a blood culture within 24 hours of presentation has been associated with improved 30 day survival in patients with CAP [33] but has not been studied in NHAP.

Sputum Cultures

Collection of sputum for Gram stain and culture is recommended if the resident has a productive cough. However, most sputum samples taken from LTCF residents are of poor quality due to poor expectoration and an inability to provide an adequate sample.[29] There is no value in sending poor quality specimens, i.e., salivary samples or samples obtained with poor expectoration, as these will be rejected by the laboratory. For cultures of properly collected sputum samples special attention should be given to the results of the Gram stain, especially if intracellular organisms are seen.

Nasopharyngeal Cultures

Swabbing for collection and culture of nasopharyngeal secretions is recommended to exclude a viral infection especially during viral respiratory infection season and during outbreaks.

Serology and Invasive Testing

Serology is not routinely recommended. Legionella urinary antigen testing is not recommended routinely unless Legionella spp is known to be a local pathogen.

Routine use of invasive testing (e.g., bronchoscopy, bronchoalveolar lavage) is not recommended.

The presence of recurrent pneumonia should trigger investigating immune system disorders, structural abnormalities and/or antibiotic resistance.

Management

Treatment decisions should be consistent with the resident's Goals of Care Designation. Management recommendations include:

- *Oxygen therapy*
    - Oxygen therapy is indicated for hypoxemia, i.e., O_2 saturation <90%.[34] If oximetry is not available consider initiating oxygen at 2 litres/minute.

      Note: COPD baseline oxygenation may be lower and therefore must be individually assessed
- *Hydration*[35]

- Hydration of patients with NHAP is essential. Many patients with pneumonia are dehydrated due to increased insensible water loss. One litre of fluids in a 24 hour period is required to replace insensible losses under most circumstances. Fluid requirement for older persons without cardiac or renal failure is 30mL/kg/day in addition to estimated fluid deficit.

  Note: Consider hypodermoclysis if adequate hydration cannot be achieved orally.

- Antibiotic Therapy (refer to Bugs & Drugs[1,2])
  - Antibiotics should be given as soon as possible after the diagnosis of pneumonia is made as delays are associated with increased morbidity and mortality.[27,36-38] Studies indicate that outcomes for elderly patients are improved if antibiotics are initiated within four to eight hours of diagnosis.[39]

> **PRACTICE POINT**
>
> *Administer antibiotics as soon as possible if signs and symptoms of NHAP are present. Delay in treatment is associated with significant increases in patient morbidity and mortality.*

Most patients with NHAP can be managed with oral antibiotics.[40,41] The choice of empiric therapy is based on the likely microorganism(s), severity of illness, allergies, recent treatment failure and ability to swallow. Empiric therapy of NHAP should always cover *S. pneumoniae*. In the setting of pulmonary disease, empiric therapy for intracellular pathogens such as *Mycoplasma pneumoniae* and *C. pneumoniae* should also be provided. Refer to Bugs & Drugs[1,2] for antibiotics for NHAP. Monotherapy is not recommended in severe pneumonia. The appropriate use of antibiotics in LTCF, as in all other settings, mitigates the development of antimicrobial resistance and collateral damage such as *Clostridium difficile* infection.

Parenteral (IM) therapy should be considered if patient is unable to swallow or absorb oral medication. If IM therapy cannot be initiated promptly, consider transfer to hospital. If hospitalization is indicated, the resident should receive a dose of antibiotic prior to transfer.[5]

When a viral etiology of NHAP is confirmed and there is low suspicion of a secondary bacterial infection, antibiotic therapy should be discontinued. For influenza, an antiviral should instead be given, ideally within two days of symptom onset for the most benefit.

HOSPITALIZATION

Hospitalization rates for NHAP range from 15 to 46% and are nearly 30 times higher than for CAP.[5]

If consistent with the resident's Goals of Care Designation, referral to acute care should be considered for residents with NHAP in any of the following circumstances:[41]

Note: These criteria are provided as a guide only and are not intended to replace clinical judgement

- Respiratory distress (e.g., respiratory rate over 40)
- Tachycardia (pulse over 125 bpm)
- Pulse oximetry <92%

- CHF
- Systolic BP less than 90mmHg
- Signs of impending hemodynamic instability
- Signs of respiratory failure
- Reduced level of consciousness
- Clinical judgement of the attending physician
- Level of acuity that cannot be managed at the facility
- Limited capacity to support the illness at the facility, e.g. oxygen not available

PRACTICE POINT

For residents being transferred to hospital, administer a dose of antibiotics prior to transfer.

Continuing Management

In the LTCF setting, successful management of NHAP includes reassessing patients daily including monitoring and documentation of vital signs. The entire care team should be involved (physicians, nurses, pharmacists, dieticians, healthcare aides, occupational therapy and physiotherapy staff) to monitor medical status, food and fluid intake, response to antibiotics and physical and mental status.

The NHAP Checklist should continue to be used to document any changes in medical status and possible recommendation for transfer to acute care. The checklist will facilitate communication among the care team at the LTCF and between the LTCF and the physician.

The entire medication profile should be reviewed during recovery from NHAP as the need for psychoactive medication may also change. Rehabilitation (occupational therapy and/or physiotherapy) and nutritional programs should be initiated if appropriate. Hospitalization of this population often hastens functional decline. Recovery is often prolonged in the elderly and may take up to several months.

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SUGGESTED CITATION

Toward Optimized Practice (TOP) Working Group for Nursing Home Acquired Pneumonia (NHAP). 2015 March. Diagnosis and management of nursing home acquired pneumonia: clinical practice guideline. Edmonton, AB: Toward Optimized Practice.

For more information see www.topalbertadoctors.org

GUIDELINE COMMITTEE

The committee consisted of representatives from continuing care, family medicine, infectious disease, medical microbiology, pharmacy and public health.

September 2002
Reviewed 2008
Major Revision March 2015

APPENDIX A

ASPIRATION PNEUMONIA[1,2]

Definitions:

Aspiration pneumonitis: chemical injury caused by the inhalation of gastric contents, resulting in inflammatory reaction.

No antibiotic therapy recommended in aspiration pneumonitis

Aspiration pneumonia: development of radiographically evident infiltrate following the aspiration of colonized oropharyngeal material

Risk Factors for Aspiration Pneumonia

- Decreased level of consciousness
- Dysphagia
- Anatomic abnormality of the upper GI tract
- Mechanical interference of the GI tract (ET/NG tubes)

Clinical Picture

- Usually older patient with above risk factors
- Infiltrates in dependent lung segments, especially RLL
- Episode of aspiration often not witnessed
- May progress to abscess/empyema within 1-2 weeks

Etiology

- Role of anaerobes is controversial
- Gram stain may be helpful in diagnosis and decision to use anti-anaerobic therapy
- Choice of antibiotic dependent on clinical situation
- Cefuroxime has good activity against most oral anaerobes

Prevention

- Bedside swallowing assessment and modified barium swallow if indicated
- Staff education to identify residents at risk or with dysphagia
- Ensure appropriate diet and liquid consistency
- Address positioning issues e.g., hyper-extended neck
- Ensure upright position with meals and tube feeds
- Routine dental evaluations and oral hygiene especially in patients with xerostomia
- Treatment of xerostomia