PATIENT SAFETY MOVEMENT

First, Do No Harm. ZERO by 2030

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## How To Use This Guide

This AEBP provides evidence-based actions and resources for executives, leaders, clinicians, and performance improvement specialists. This document is intended to be used as a guide for healthcare organizations to examine their own workflows, identify practice gaps, and implement improvements. In it, you'll find:

**Best Practice Summary:** A high level summary of evidence-based, clinical best practices.

**Executive Summary:** Executives should understand the breadth of the problem and its clinical and financial implications.

**Leadership Checklist:** This section is for senior leaders to understand common patient safety problems and their implications related to Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP). Most preventable medical harm occurs due to system defects rather than individual mistakes. Leaders can use this checklist to assess whether best practices are being followed and whether action is needed in their organization around NV-HAP.

**Clinical Workflow:** This section includes more specific information about NV-HAP prevention across the continuum of care. Leaders should include the people doing the work in improving the work. This section outlines what should be happening on the frontline. Clinicians can use this section to inform leaders whether there are gaps and variations in current processes. This is presented as an infographic that can be used for display in a clinical area.

**Education for Patients and Family Members:** This section outlines what frontline healthcare professionals should be teaching patients and family members about NV-HAP. Clinicians can inform leaders whether there are gaps and variations in the current educational processes.

**Performance Improvement Plan:** If it has been determined that there are gaps in current practice, this section can be used by organizational teams to guide them through an improvement project.

**What We Know About Non-Ventilator Hospital-Acquired Pneumonia:** This section provides additional detailed information about NV-HAP.

**Resources:** This section includes helpful links to free resources from other groups working to improve patient safety.

**Endnotes:** This section includes helpful links to free resources from other groups working to improve patient safety.

**Citation:** Patient Safety Movement Foundation. (2022). Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP) Actionable Patient Safety Solutions. Retrieved from https://patientsafetymovement.org/community/apss/

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## Best Practice Summary

### Outpatient Prevention

- ☐ Emphasize the importance of oral care and proper oral hygiene in both the inpatient and outpatient settings.
- ☐ Provide patients, particularly vulnerable patients, with the equipment necessary for oral care.

### Upon Admission

- ☐ Employ evidence-based bundles, such as the I-COUGH bundle.
- ☐ Assess the risk for NV-HAP in each patient, including history of chronic acute respiratory illnesses, thoracic surgery, or underlying comorbidities.

### Routine Care

- ☐ Perform appropriate diagnostics if NV-HAP is suspected (e.g., chest x-ray, sputum culture, blood cultures etc).
- ☐ Ensure that the patient and their family understand what NV-HAP is and how to identify early signs and symptoms.
- ☐ Demonstrate appropriate prevention techniques, such as head of bed elevation, for patients and family members.
- ☐ Communicate NV-HAP diagnosis or risk to the patient, family members, and receiving provider.

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# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Executive Summary

### The Problem

It has been shown that hospital-acquired pneumonia can be decreased by 70% through inexpensive, easily integrated preventive measures such as oral care, respiratory exercises, and mobility (Baker & Quinn, 2018) and yet hospital-acquired pneumonia is still the #1 hospital-acquired infection (HAI), with non-ventilator hospital-acquired pneumonia (NV-HAP) representing over 60% of cases (Magill, O'Leary, & Janell, 2018). The risk of NV-HAP is not exclusive to those typically susceptible and instead, those who are young and traditionally healthy are also at risk, thereby increasing the pool of at-risk patients significantly to approximately 35 million in the US annually (Baker & Quinn 2018; Magill et al., 2014).

### The Cost

Preventing even 100 cases of NV-HAP is estimated to save $400 million, 700-900 hospital days, and the lives of 20-30 patients (Quinn, et al. 2013). Pneumonia is the number one most prevalent HAI, with 60% of pneumonia cases not associated with a ventilator (Magill, et al. 2014). The mortality for NV-HAP hovers around 13-30%, far exceeding other HAI mortality rates (Micek, Chew, Hampton, & Kollef, 2016). Cost of care for patients with NVHAP is estimated to be between $28,000-$40,000 (Giuliano, Baker & Quinn, 2018). Centers for Medicare and Medicaid Services (CMS) began reporting 30 day mortality measures for pneumonia to increase hospital transparency (CMS, 2020).

### The Solution

Many healthcare organizations have successfully implemented and sustained improvements and reduced death from NV-HAP. This document provides a blueprint that outlines the actionable steps your organization should take to successfully reduce NV-HAP and summarizes the available evidence-based practice protocols. This document is revised annually and is always available free of charge on our website.

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Leadership Checklist

On a monthly basis, or more frequently if a problem exists, the executive team should review all healthcare associated infection trends. Use this checklist as a guide to determine whether current evidence-based guidelines are being followed in your organization:

- ☐ Measure and report NV-HAP incidence monthly (NV-HAP cases/1000 patient days). Note trends in areas with high incidence and prevalence. Routinely reassess outcomes.
- ☐ Initiate a PI (performance improvement) project. If a problem is not indicated, routinely reassess to identify gaps, and ensure integrity of the data collected.
- ☐ Ensure frontline involvement in NV-HAP improvement activities. Maintain their engagement and remove barriers to progress. For example, show alignment in improved oral care and decreased NV-HAP.
- ☐ Measure the associated process outcomes.
- ☐ Ensure that NV-HAP protocols are embedded into clinical workflows, whether electronic or paper.
- ☐ Ensure there are enough staff to effectively manage necessary preventive care.
- ☐ Ensure adequate training and documentation of NV-HAP competencies and skills.
- ☐ Eliminate barriers to making rapid changes to documentation templates.
- ☐ Debrief on a regular basis to solicit team feedback about barriers to sustained compliance. Adjust the plan quickly and nimbly as needed.
- ☐ Hold staff accountable for providing the standard of care and reward success.
- ☐ Ensure that leaders have a simple process to oversee NV-HAP improvement work while also considering how it aligns with other initiatives across the organization.
- ☐ Raise awareness for the implications of NV-HAP and how to prevent it by engaging stakeholders within the community as a preventive measure. For example, engage dentists and dental students in prevention efforts through improved oral care.

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# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Clinical Workflow

### 1. OUTPATIENT ROUTINE CARE AND DENTAL VISITS

- Emphasize the importance of oral care in preventing NV-HAP. Ensure the patient has proper oral care equipment (e.g., toothbrush). If not, supply it for them.

### 2. ADMISSION

- Assess the risk for NV-HAP. Patients with a history of a chronic or acute respiratory illness, thoracic surgery, or underlying comorbidities, the elderly, and those who are immunosuppressed are at highest risk.
- Assess risk for aspiration, nutritional deficiency, and presence of a feeding tube.
- Clarify patient and family wishes and document advance directive status.
- Obtain baseline data (e.g., SaO2, respiratory rate, O2 settings, lung sounds, etc).
- Complete appropriate diagnostics (e.g., CXR, ABG, etc).
- Ensure patient rooms are sanitized prior to admission and routinely thereafter to reduce microbial colony count.
- Understand the patient's oral care habits at home.

### 3. ROUTINE CARE: PREVENTION

- Use I-COUGH bundle or similar, which includes:
  - Incentive spirometry
  - Coughing and deep breathing

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

- Oral care (brushing teeth and using mouthwash twice daily)
- Understanding (patient and family education)
- Getting out of bed at least three times daily
- Head-of-bed elevation

- Use pulse oximetry.
- Perform meticulous hand hygiene.
- Identify swallowing disorders.
- Perform routine sanitation of the patient room to reduce colony count.
- Change rooms if extended length of stay.
- Implement aspiration precautions as appropriate.
- Ensure adequate hydration and sleep.

## 3. ROUTINE CARE: TREATMENT

Perform appropriate diagnostics as early as possible. These may include:

- Chest x-ray
- Sputum culture
- Arterial blood gasses
- Blood cultures
- Bronchoscopy

Intervene with appropriate therapies as early as possible. These may include:

- Oxygen
- Nebulizer therapy
- Fever reducing medications
- Antibiotics

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## 4. DISCHARGE

- Engage with patients and family members around education needed for prevention at home. Ensure patients and family members understand what NV-HAP is, how to recognize signs and symptoms, and when to call a doctor. Assess patient and family member literacy levels around NV-HAP. See "Healthcare Literacy" APSS for more information.
- Ensure patients understand their personal risk for recurrent pneumonia. Encourage patients to continue I-COUGH bundle at home. Upon repeat NV-HAP, consider the possibility for secondary infections based on antibiotic use.
- Demonstrate aspiration prevention techniques, especially upon eating, for patients and family members. Emphasize the importance of continued oral care upon discharge. Demonstrate proper use of an incentive spirometer.
- Set up discharge follow up within approximately seven days post-discharge. Upon follow up, inquire about signs and symptoms of pneumonia, such as fever, cough, etc. Upon follow up, assess mobility performance and barriers. Encourage patient to continue mobility exercises as tolerated and encourage them to contact their doctor about increasing mobility performance.
- Coordinate post-discharge needs, whether the patient is going to a skilled nursing facility, rehabilitation facility, or home health services. Ensure patient and family members have contact with dentistry and that the dentist understands patient history of NV-HAP within the hospital. Coordinate with outpatient rehabilitation facilities based on patient needs. See "Care Coordination" AEBP for more information.

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Education for Patients and Family Members

The outline below illustrates all of the information that should be conveyed to the patient and family member by someone on the care team in a consistent and understandable manner.

**Prevention:** Patients and family members should understand how to prevent pneumonia both before and within the hospital:

- **Hand hygiene**- Hand hygiene is an effective measure to prevent many types of healthcare-associated infections, including pneumonia. See Hand Hygiene AEBP for more information for improving clinician, patient, and visitor hand hygiene.
- **Oral care**- Proper oral care, such as toothbrushing, removes bacteria from the mouth that could be inhaled into the lungs. Patients can begin practicing prevention of HAIs even before their visit by developing a routine around oral care.
- **Prevention of aspiration**- Explain what aspiration is and that eating in an upright position and sitting in an upright position after meals can prevent aspiration. Ensure patients and family members are eating and chewing slowly.
- **Moving**- Non-ventilator associated pneumonia is associated with a lack of movement while in the hospital. Movement is essential to reduce secretions in the lungs. Patients should ask their care team about mobility care plans.

Example resource: Patient Education Material to Prevent Pneumonia Through Oral Care from the VHA

**Treatment:** Healthcare workers should ensure that patients and family members are aware if they acquired pneumonia in the hospital. Information that should be communicated to the patient and the family in this situation includes basic information about the condition, treatment options, and monitoring of their loved one for worsening symptoms (Institute for Quality and Efficiency in Health Care, 2018).

- Maintain the inclusive discussion with the patient and family member. When assisting with oral care, explain that this will remove bacteria in the mouth that can cause pneumonia. When administering medications, explain what the medication is, why they are taking it, and how it will help. Active discussion with the patient will cultivate trust and a better patient experience (Goss, 2009).

**Discharge:** Clinicians should communicate to patients what to expect upon discharge, including:

- Information about common post-pneumonia symptoms
- Instructions on breathing exercises
- Methods to mitigate disrupted sleeping and eating patterns

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

- When to seek help if symptoms worsen (Icahn School of Medicine, 2020)
- If oxygen therapy is needed and if so, how to complete
- If monitoring at home is needed and if so, how to complete
- If nebulizer therapy is needed at home and if so, how to complete
- Signs and symptoms of sepsis (Early Detection and Treatment of Sepsis AEBP) and very clear action items to seek care while compromising as little time as possible (e.g., don't go to urgent care if sepsis is suspected).

Clinicians need to ensure the patient is well informed of their care plan post-discharge and that they are well-equipped to uphold the care plan based on their circumstances, priorities, and abilities.

**Questions family members should ask** (Dartmouth-Hitchcock, 2020)

- "Are you going to raise the head of the bed while [patient] is on the ventilator?"
- "How are we going to prevent stomach ulcers?"
- "How long will [patient] be on a ventilator?"
- "What will you do to prevent blood clots?"
- "When can [patient] try breathing on their own?"
- "How often is this device cleaned?"
- "How often is [patient]'s mouth cleaned?
- What are my next steps after discharge?

**Resources for families**

- PatientAider ® Infections section

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Performance Improvement Plan

Follow this checklist if the leadership team has determined that a performance improvement project is necessary:

☐ **Gather the right project team.** Bee sure to involve the right people on the team. You'll want two teams: an oversight team that is broad in scope, has 10-15 members, and includes the executive sponsor to validate outcomes, remove barriers, and facilitate spread. The actual project team consists of 5-7 representatives who are most impacted by the process. Whether a discipline should be on the advisory team or the project team depends upon the needs of the organization. Patients and family members should be involved in all improvement projects, as there are many ways they can contribute to safer care.

### RECOMMENDED NV-HAP IMPROVEMENT TEAM

- Nurses
- Respiratory therapists
- Physicians (Pulmonologists, surgeons, primary care providers, etc)
- Physical and occupational therapists
- Speech language therapist
- Dentists and dental representatives
- Supply chain experts
- Nursing home staff
- Home health staff
- Patient experience experts (ex. Experience of eating food)
- Equity/diversity officer (ex. Access to dentistry)
- Palliative care experts
- Environmental service staff
- Engineering staff
- Dietary staff
- Infection control specialists
- Clinical educators
- Information technology
- Patient/family members

Table 1: Understanding the necessary disciplines for a non-ventilator hospital-acquired pneumonia project improvement team

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

**Complete this Lean Improvement Activity:**

Conduct a SIPOC analysisto understand the current state and scope of the problem. A SIPOC is a lean improvement tool that helps leaders to carefully consider everyone who may be touched by a process, and therefore, should have input on future process design.

☐ **Understand what is currently happening and why.** Reviewing objective data and trends is a good place to start to understand the current state, and teams should spend a good amount of time analyzing data (and validating the sources), but the most important action here is to go to the point of care and observe. Even if team members work in the area daily, examining existing processes from every angle is generally an eye-opening experience. The team should ask questions of the frontline during the observations that allow them to understand each step in the process and identify the people, supplies, or other resources needed to improve patient outcomes.

## NV-HAP PROCESSES TO CONSIDER ASSESSING

- Hand hygiene
- Intubation protocols
- Environmental cleaning
- Mobility
- Incentive spirometry
- Breathing exercises
- Equipment disinfection
- Frequent and routine oral care
- Patient positioning
- Peptic ulcer (PU) prevention protocol
- NG Tube placement
- Swallow screens for ability to swallow (e.g., those with potential stroke)
- Deep vein thrombosis (DVT) prophylaxis
- Patient and family education
- Adjustments in diet with anticipated risk factors
- Assessment of comorbidities and use of organizational comorbidity assessment tool
- Vaccinations: CDC: Advisory Committee on Immunization Practices

Table 2: Consider assessing these processes to understand where the barriers contributing to non-ventilator hospital-acquired pneumonia may be in your organization

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

☐ **Prioritize the gaps to be addressed and develop an action plan.** Consider the cost effectiveness, time, potential outcomes, and realistic possibilities of each gap identified. Determine which are a priority for the organization to focus on. Be sure that the advisory team supports moving forward with the project plan so they can continue to remove barriers. Design an experiment to be trialed in one small area for a short period of time and create an action plan for implementation.

**Be sure the plan includes the following:**

- Assess the ability of the culture to change and adopt appropriate strategies
- Revise policies and procedures
- Redesign forms and electronic record pages
- Clarify patient and family education sources and content
- Create a plan for changing documentation forms and systems
- Develop the communication plan
- Design the education plan
- Clarify how and when people will be held accountable

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## TYPICAL GAPS IDENTIFIED IN NV-HAP

- Lack of a granular, easily understood process
- Inconsistent communication of NV-HAP prevention updates
- Inconsistent education of new protocols
- Complex work environment with many distractions
- New or visiting staff members
- Staffing needs
- Inadequate nutrition and noncompliance with prescribed diets (e.g., nectar-thick diets)
- Failure to appreciate a patient condition which may lead to NV-HAP (e.g., silent aspirators, knowledge of aspiration but noncompliance with treatment)
- Emergent patient needs
- Difficulty in performing oral care effectively
- Lack of adequate supplies (e.g., tooth-brushes, lip balm, items for dry mouth, mouth swabs, etc.)
- Little care coordination between outpatient and inpatient settings
- Prevention protocols not woven into care team routine
- Stationary patients with inability for activity
- Lack of accountability
- Little organizational focus on NV-HAP prevention
- Lack of leadership oversight

Table 3: By identifying the gaps in non-ventilator hospital-acquired pneumonia prevention compliance, organizations can tailor their project improvement efforts more effectively

Create a process map once the workflows are well understood that illustrates each step and the best practice gaps the team has identified (IHI, 2015). Brainstorm with the advisory team to understand why the gaps exist, using whichever root cause analysis tool your organization is accustomed to (IHI, 2019). Review the map with the advisory team and invite the frontline to validate accuracy.

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

☐ **Evaluate outcomes, celebrate wins, and adjust the plan when necessary.** Measure both process and outcome metrics. Outcome metrics include the rates outlined in the leadership checklist. Process metrics will depend upon the workflow you are trying to improve and are generally expressed in terms of compliance with workflow changes. Compare your outcomes against other related metrics your organization is tracking.

Routinely review all metrics and trends with both the advisory and project teams and discuss what is going well and what is not. Identify barriers to completion of action plans, and adjust the plan if necessary. Once you have the desired outcomes in the trial area, consider spreading to other areas (IHI, 2006).

It is important to be nimble and move quickly to keep team momentum going, and so that people can see the results of their labor. At the same time, don't move so quickly that you don't consider the larger, organizational ramifications of a change in your plan. Be sure to have a good understanding of the other, similar improvement projects that are taking place so that your efforts are not duplicated or inefficient.

## NV-HAP METRICS TO CONSIDER ASSESSING

Process metrics:

- Frequency of bundle audit
- Frequency of educational/competency assessment
- How does information from audits get communicated, to whom, and what are the next steps thereafter
- Hand hygiene compliance
- Oral care compliance
- Mobility performance
- Improved spirometry performance

Comparative outcomes:

- ICU LOS
- Escalation of care
- Readmissions
- Mortality

Table 4: Consider evaluating related metrics to better understand non-ventilator hospital-acquired pneumonia presence and contributing factors

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## What We Know About Non-Ventilator Hospital-Acquired Pneumonia

### Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

Both ventilator and non-ventilator hospital-acquired pneumonia are common types of hospital acquired infections globally. Results suggest that the combination of NV-HAP and VAP account for 21.8% of HAIs in a given year (Eber, et al. 2010). Despite the prominence of VAP within the literature, over 60% of these pneumonia-related HAIs were classified as NV-HAP and NV-HAP is associated with a higher financial loss for hospitals (Giuliano, Baker & Quinn, 2018).

### Populations at Risk

While the following populations are most susceptible to NV-HAP, relatively healthy or young individuals are also at risk (Quinn, Baker, Cohen, Stewart, & Lima, 2013). An at-risk exclusive approach to intervention would place those without traditional risk factors in a compromised position (Quinn, et al. 2013). Those who are most at risk include the very young and very old, those who have been intubated, those who are immunocompromised and those with:

- ICU treatment
- Low body mass index (BMI)
- Signs of malnourishment
- Acid-blocking medications or nervous system depressants
- Severe illness
- Underlying chronic lung disorders
- Low body temperature
- Comorbidities (CDC, 2003; Giuliano, Baker & Quinn, 2018; Sopena & Sabria, 2005)

### Incidence and Epidemiology

Most hospital-acquired pneumonia cases are acquired from poor oral care. The microbiome of the oral cavity contains 200 billion oral microbes and over 700 different species (Baker, Quinn, Munro, & Giuliano, n.d.).

During the first 48 hours of hospitalization, especially in the absence of regular oral care, changes occur in an individual's oral microbiota that are associated with pneumonia-causing organisms. These pathogens colonize in the dental plaque and if the patient aspirates, the pathogens can relocate into the lungs. Dysphagia is the most important risk factor for

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

aspiration-related pneumonia, especially in elderly and acute stroke patients. It is estimated that 43–54% of stroke patients with dysphagia aspirate and 37% will later develop pneumonia (Passaro, Harbarth, & Landelle, 2016).

Pneumonia occurs when bacteria move from proximal sites, such as the oral microbiota, into the lung and ignite an inflammatory response. Researchers have found a critical relationship between oral microflora and NV-HAP. While NV-HAP can be associated with multiple types of organisms, it is primarily caused by bacteria and viral organisms. For example, bacteria found in patients with NV-HAP have been matched with specific flora found in the oral cavity (Di Pasquale, Aliberti, Mantero, Bianchini, & Blasi, 2016).

Recognition of this relationship between the oral microbes and NV-HAP has prompted efforts that target removal of oral biofilm as one of the most common methods of prevention (Scannapieco & Shay, 2014).

Furthermore, the stomach may also be a factor contributing to bacteria that can lead to subsequent infection. In healthy persons, a majority of bacteria that reaches the stomach will not survive; however, in patients whose stomach pH increases from the normal levels to pH of greater than or equal to 4, microorganisms can survive, grow, and multiply inside of the stomach (CDC, 1997).

## Clinical Implications

In a comparison among the most prevalent HAIs, pneumonia was ranked number one in prevalence, with the majority of cases not associated with a ventilator (Magill, et al. 2014). The mortality rate ranges from 13%-30% (Micek, Chew, Hampton, & Kollef, 2016), far exceeding other hospital-acquired infections' mortality rates (Davis & Finley, 2012). Incidence is between 2.12 per 100 patients (Quinn, Baker, Cohen, Stewart, & Lima, 2013) and accounts for 21.8% of all HAIs (Magill, et al. 2014). Finally, an estimated 35 million U.S. patients are at risk of contracting NV-HAP annually (Baker & Quinn 2018; Magill et al., 2014).

Patients who develop NV-HAP are over 8 times more likely to die than their equally matched controls who do not develop NV-HAP. 18.8% of patients with NV-HAP will require a transfer to the ICU (Mitchell, et al. 2019). NV-HAP is associated with a longer length of stay ranging from four to almost 16 days (Micek, Chew, Hampton, & Kollef, 2016). The average length of stay is up to 4 times longer than patients without NV-HAP (Micek et al. 2016).

Younger patients constitute half of all hospital-acquired pneumonia cases, most of which originate outside of the ICU. Hospital-acquired pneumonia has long been associated with the elderly and intensive care units (ICU). However, new results suggest that NV-HAP occurs across more hospital units than previously anticipated, thereby placing all patients, young included, at risk for developing NV-HAP (Baker & Quinn, 2018).

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

Pneumonia can be tangentially related to additional complications, including sepsis. 50% of sepsis cases begin with pneumonia (Angus, 2013). Patients who experience NV-HAP are at risk for low oxygens levels which may damage other organs such as the kidneys, brains, or heart. See "Early Detection and Treatment of Sepsis" AEBP for more information.

- **Compared to VAP:** Although US hospitals are required to monitor VAP, there are no such requirements in place to monitor for NV-HAP (Quinn, Baker, Cohen, Stewart, & Lima, 2013). However, a three year comparison between NV-HAP and VAP clinical implications revealed that the total number of NV-HAP cases was 5,597 with 1,044 leading to death, while the total number of VAP cases was 2,299 with 434 leading to death. Although the percent of cases contributing to death is approximately 19% for both NV-HAP and VAP, there are significantly more NV-HAP cases in a given year.

## Financial and Organizational Implications

Cost of care for patients with NV-HAP is estimated to be between $28,000-$40,000 (Giuliano, Baker & Quinn, 2018).

- **Compared to VAP:** Although many studies have suggested that the mortality rates between NV-HAP and VAP are relatively similar (Magill, et al. 2014), a 3-year study of HAP in Pennsylvania from 2009-2011 found that NV-HAP affects more people than VAP (5,597 vs 2,299), has a comparable mortality rate (18.7% vs 18.9%), and has higher total costs ($156 million vs $86 million), respectively (Davis & Finley, 2012).

Most hospitals have performance improvement project plans around CAUTI, with a 13% prevalence and an estimated cost of $1,108, CLABSI, with a 5-10% prevalence and an estimated cost of $33,000, and/or SSI, with a 22% prevalence and an estimated cost of $19,000 (Magill, et al. 2014). However, the potential savings from NV-HAP prevention remain underreported. Studies indicate that prevention of just 100 cases of NV-HAP has the potential to save $4 million, almost 100 hospital days, and 20-30 lives of patients (Quinn, et al. 2013).

According to one case study at Sutter Medical Center, the estimated annual cost of NV-HAP was $4.6 million, 23 patient deaths, and 1035 additional hospital days (Quinn, et al. 2013).

## National and International Standards

**International:** Evidence-based guidelines produced by the British Society for Antimicrobial Chemotherapy synthesized the existing national and international literature regarding prevention, diagnosis and treatment of hospital-acquired pneumonia. The following are among the most prominent guidelines mentioned in the article:

- Prevention of HAP should be included in the education required for induction of new nursing staff

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

- The influenza vaccination should be encouraged in both healthcare workers and in patients. The pneumococcal vaccination should be encouraged in elderly and at-risk populations.
  - CDC: Advisory Committee on Immunization Practices
- Hand hygiene practices should be actively incorporated into guidelines for hospital-acquired pneumonia prevention. Hand hygiene performance audits should be conducted to ensure adherence.
- Equipment, such as nebulizers and bag-valve mask ventilation bags, should be single patient use and should be disinfected thoroughly between every use. Spirometry mouthpieces should be single use only.

The European Respiratory Society compiles the evidence and recommendations of international guidelines on NV-HAP and VAP in their report titled "Summary of the international clinical guidelines for the management of hospital-acquired and ventilator-acquired pneumonia". This summary was compiled with experts from the European Respiratory Society (ERS), the European Society of Intensive Care Medicine (ESICM), the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and the Latin American Society of Thoracic Diseases (ALAT).

**National:** Centers for Medicare and Medicaid Services (CMS) and Hospital Quality Alliance (HQA) began reporting 30 day risk standardized mortality and readmission measures for pneumonia in 2008 (CMS, 2020).

The CDC outlines updated strategies for the prevention of health-care associated bacterial pneumonia, including education and involvement of infection prevention in performance improvement planning, infection and microbiological surveillance, prevention of transmission of microorganisms, and modifying host risk for infection (Tablan, Anderson, Besser, Bridges, & Hajjeh, 2003).

The Infectious Diseases Society of America and the American Thoracic Society compiled guidelines for the management of hospital-acquired and ventilator-associated pneumonia in adults including recommendations for methods to diagnose NV-HAP, treatment, role of inhaled antibiotic therapy, optimization of antibiotic therapy, and antibiotic resistance.

Pneumonia risk can be minimized through preventive measures, however, researchers found basic pneumonia prevention measures were not consistently followed:

- 58.6% of patients diagnosed with NV-HAP did not receive oral care
- 81.8% of patients diagnosed with NV-HAP did not receive incentive spirometry
- 67.4% of patients diagnosed with NV-HAP did not undergo cough and deep breathing exercises

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

- Only 28.7% of patients ambulated at least twice in the 24-hours prior to their pneumonia diagnosis (Baker & Quinn, 2018).

**Case studies:** Prevention of NV-HAP is a patient safety concern that groups have been working on for several years. Provided here, are some representative examples of NV-HAP prevention success:

- Sutter Health System
  - Specialists at Sutter Health launched a study to explore an oral care intervention that would help prevent hospital-acquired pneumonia. Under the leadership of Barbara Quinn CNS, RN, Director of Professional Excellence and Nursing Practice for Sutter Health System, a hospital pneumonia prevention effort was launched.
  - The focus was on oral biofilm removal through oral care.
  - Compared to a 2010-2011 baseline, hospital-acquired pneumonia cases declined by 70% from May 2012 through December 2014 (Baker et al. 2019).
  - Results sustained over a 4-year period saved lives and millions in healthcare expenditures (Quinn et al., 2013; Baker & Quinn, 2018)
- Veterans Health Administration (VHA) (Munro, 2018; Munro & Baker, 2018)
  - VHA manages the care of over 8 million Veterans across 153 medical centers. A team at the Salem VA Medical Center (VAMC) led by Shannon Munro, PhD, NP partnered with the HAPPI research team, examined over 12 years of retrospective and prospective data, and found that an oral care regimen significantly reduces the risk of developing NV-HAP, thus shortening hospital stays, reducing direct health care costs, lowering the need for a higher level of care (e.g. intensive care and discharge to long term care), and saving lives.
  - At the first VA pilot site, the community living center (CLC) units at Salem VAMC, the incidence rate of NV-HAP decreased from 105 cases to 8.3 cases per 1,000 patient days (decreased NV-HAP by 92%) in the first year, yielding an estimated cost avoidance of $1.76 million and 8 lives saved.
  - The population of the CLC units is primarily composed of elderly Veterans with complicated chronic health problems requiring rehabilitation and long-term care. Veterans on the CLC units were 10.7 times less likely to develop NV-HAP with consistent oral care than patients receiving standard nursing care. The Houston VAMC replicated the practice in 2017 and reduced the rate of NV-HAP in the coronary care unit and step-down unit (165 admissions per month) from 11 cases to 0 cases per 1,000 patient days and saved an estimated hospital cost of $480,000 and two patient lives in six months.

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

- These successful outcomes at the original VA pilot sites led to funding from the VHA Diffusion of Excellence Initiative, VHA Quality Enhancement Research Initiative (QUERI), VHA Office of Strategic Integration, and the Veterans Engineering Resource center to support continued expansion efforts as quality improvement. Across all reporting units in 8 VA hospitals in Virginia, North Carolina, and Texas, a predicted 255 cases were avoided as of July 31, 2019. Should we extrapolate the data, there is a cost avoidance estimate of $10.1M and 46 Veteran lives saved. Nationwide VA deployment is underway in 41 VA hospitals including 122 medical-surgical, ICU, CLC, and mental health units
- The VA established a national Hospital-acquired Pneumonia Prevention by Engaging Nurses (HAPPEN) program. The HAPPEN toolkit is available for download by interested hospital systems here

PATIENT SAFETY MOVEMENT
First, Do No Harm. ZERO by 2030

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Resources

- SIPOC Example and Template
- CDC: Guidelines for Prevention of Nosocomial Pneumonia
- European Respiratory Society: Summary of the international clinical guidelines for the management of hospital-acquired and ventilator-acquired pneumonia
- CDC: Vaccines can help prevent pneumonia
- CDC: Disinfection of healthcare equipment
- MedlinePlus: Using an incentive spirometer
- American Hospital Association: I-COUGH Bundle
- ICOUGH: A multidisciplinary strategy to reduce postoperative pulmonary complicationsBoston Medical Center: ICOUGH
- Peer-reviewed article: Clinical practice guidelines for hospital-acquired pneumonia and ventilator-associated pneumonia in adults
- Prevention of hospital-acquired pneumonia in non-ventilated adult patients: a narrative review
- AHRQ: Early mobility guidelines
- CDC: Advisory Committee on Immunization Practices
- American Journal of Infection Control: NV-HAP Prevention Implementation Guide

**For General Improvement:**

- CMS: Hospital Improvement Innovation Networks
- IHI: A Framework for the Spread of Innovation
- The Joint Commission: Leaders Facilitating Change Workshop
- IHI: Quality Improvement Essentials Toolkit
- SIPOC Example and Template for Download
- SIPOC Description and Example

# Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)

## Endnotes

### Conflicts of Interest Disclosure

The Patient Safety Movement Foundation partners with as many stakeholders as possible to focus on how to address patient safety challenges. The recommendations in the APSS are developed by workgroups that may include patient safety experts, healthcare technology professionals, hospital leaders, patient advocates, and medical technology industry volunteers.. Workgroup members are required to disclose any potential conflicts of interest.

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