

Actionable Patient Safety Solutions (APSS): **Non-Ventilator Hospital-Acquired Pneumonia (NV-HAP)**

How to use this guide

This guide gives actions and resources for creating and sustaining safe practices for NV-HAP. In it, you'll find:

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Patient Safety
MOVEMENT

Executive Summary

The Problem

Hospital-acquired pneumonia is the #1 hospital-acquired infection (HAI), with non-ventilator hospital-acquired pneumonia (NV-HAP) representing over 60% of cases ([Magill, O'Leary, & Janell, 2018](#)). 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](#)). 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](#)).

The Cost

The risk of NV-HAP is not exclusive to typical high-risk patients 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 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 NV-HAP 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. These organizations have focused on **implementing an NV-HAP prevention “bundle” with routine prophylaxis efforts for every patient.**

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. Hospitals who make a formal commitment to improve NV-HAP and share their success on the PSMF website have access to an additional level of consulting services.

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. Note trends in areas with high incidence and prevalence. Routinely reassess outcomes.
- If NV-HAP rates indicate room for improvement, 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.
- If a PI plan is put in place, 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 and order sets.
- 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.

Clinical Workflow Infographic

ADMISSION

- **Assess the risk for NV-HAP.** Patients with a history of chronic or acute respiratory illness, thoracic surgery, or underlying co-morbidities, as well as elderly or immunosuppressed patients, are at greatest risk. Assess risk for aspiration, nutritional deficiency, and presence of feeding tube.
- Clarify patient and family wishes and document advance directive status.
- **Determine baseline and prepare.** SaO₂, RR, O₂ settings, lung sounds, as applicable
- Complete appropriate diagnostics: CXR, ABG, etc
- Ensure patient rooms are sanitized prior to admission and routinely thereafter to reduce microbial colony count

ED

OR

L&D

DIRECT ADMIT

ROUTINE CARE

Prevention

- Encourage deep breathing and coughing exercises
- Encourage incentive spirometry
- Monitor pulse oximetry
- Routinely assess respiration
- Perform meticulous hand hygiene
- Routinely sanitize patient room to reduce colony count of patient room to reduce colony count
- Change rooms if extended length of stay
- Perform routine oral care to reduce microbe colonization
- Encourage mobility as much as possible to expand lung capacity
- Keep head of bed elevated after drinking or eating
- Implement aspiration precautions as appropriate
- Ensure adequate hydration
- Ensure adequate sleep

Treatment: In the case that patient still acquires pneumonia, the following diagnostics should be used to confirm before initiating the therapies below

- Diagnostics
 - o Chest x-ray
 - o Sputum culture
 - o Arterial blood gases
 - o Blood cultures
 - o Bronchoscopy
- Therapies
 - o Oxygen
 - o Nebulizer therapy
 - o Fever reducing medications
 - o Antibiotics

DISCHARGE

- **Ensure the family is well-prepared**
 - o Discuss information about common post-pneumonia symptoms.
 - o Provide instructions on breathing exercises and methods to mitigate disrupted sleeping and eating patterns. Have a thorough conversation about when to seek help if symptoms worsen.
 - o Teach patients and family members how to use oxygen and nebulizer therapies, if applicable.
 - o Teach patients and families how to monitor themselves, if monitoring at home is needed.
- Coordinate post-discharge needs: skilled nursing facility, rehabilitation facility or home health needs

Performance Improvement Plan

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

- **Gather the right project team.** Be 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.

Complete this Lean Improvement Activity: Conduct a [SIPOC](#) analysis to understand 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.



RECOMMENDED NV-HAP IMPROVEMENT TEAM

- | | |
|---|--|
| <ul style="list-style-type: none">• Nurses• Respiratory therapists• Physicians• Physical and occupational therapists• Environmental service staff• Engineering staff• Dietary staff | <ul style="list-style-type: none">• Infection control specialists• Clinical educators• Information technologists• Patient/family members• Pulmonologists• Admitting and registration staff• Quality and safety specialists |
|---|--|

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

- **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 are needed to improve patient outcomes.

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.



VAP PROCESSES TO CONSIDER ASSESSING

- | | |
|---|---|
| <ul style="list-style-type: none">• Hand hygiene• Intubation protocols• Environmental cleaning• Mobility• Incentive spirometry• Breathing exercises• Equipment disinfection | <ul style="list-style-type: none">• Oral care• Patient positioning• Peptic ulcer (PU) prevention protocol• Deep vein thrombosis (DVT) prophylaxis• Patient and family education• 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

- **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.

The action plan should include 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



TYPICAL GAPS IDENTIFIED IN NV-HAP

- | | |
|---|---|
| <ul style="list-style-type: none"> • Lack of accountability • Little organizational focus on NV-HAP prevention • Lack of leadership oversight • 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 | <ul style="list-style-type: none"> • Staffing needs • Emergent patient needs • Difficulty in performing oral care effectively • Lack of adequate supplies • Environmental cleaning • Prevention protocols not woven into care team routine • Stationary patients with inability for activity |
|---|---|

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

- **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.

[Read this paper](#) from the Institute for Healthcare Improvement to understand how small local steps can integrate into larger, system changes



NV-HAP COMPARATIVE OUTCOMES

- | | |
|--|---|
| <ul style="list-style-type: none"> • Hand hygiene compliance • ICU LOS • Oral care compliance | <ul style="list-style-type: none"> • Mobility performance • Improved spirometry |
|--|---|

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

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 HAls in a given year ([Eber, et al. 2010](#)). Despite the prominence of VAP within the literature, over 60% of these pneumonia-related HAls were classified as NV-HAP and NV-HAP is associated with a higher financial loss for hospitals ([Giuliano, Baker & Quinn, 2018](#)).

Incidence and Epidemiology

Patients begin showing symptoms of NV-HAP at least 48 hours after hospital admission ([CDC, 2013](#); [Baker, Quinn, Munro, & Giuliano, n.d.](#)). Many 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 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. 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 HAls, 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 HAls ([Magill, et al. 2014](#)). Finally, an estimated 35 million US 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 ([Micek, Chew, Hampton, & Kollef, 2016](#)).



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 four 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 population. 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](#)).

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 oxygen levels which may damage other organs such as the kidneys, brains, or heart.

- **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.

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](#))



Table provided by [Davis & Finley, 2012](#)

Table 1. Pennsylvania Nosocomial Pneumonia and Related Deaths

Year	No. of NV-HAP Cases	No. of NV-HAP Deaths	% of NV-HAP Cases Contributing to Death	No. of VAP Cases	No. of VAP Deaths	% of VAP Cases Contributing to Death
2009	1,976	363	18.4 (95% CI: 16.5 to 20.3)	922	163	17.7 (95% CI: 15.0 to 20.5)
2010	1,848	366	19.8 (95% CI: 17.8 to 21.8)	737	144	19.5 (95% CI: 16.3 to 22.7)
2011	1,773	315	17.8 (95% CI: 15.8 to 19.7)	640	127	19.8 (95% CI: 16.4 to 23.3)
Total	5,597	1,044	18.7 (95% CI: 17.5 to 19.8)	2,299	434	18.9 (95% CI: 17.1 to 20.7)

Note: NV-HAP refers to nonventilator-hospital-acquired pneumonia and VAP refers to ventilator-associated pneumonia.

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](#)).

Table provided by [Davis & Finley, 2012](#)

Table 2. Estimated Costs of NV-HAP and VAP Cases

Year	No. of NV-HAP Cases	Cost for NV-HAP Cases	No. of VAP Cases	Cost for VAP Cases
2009	1,976	\$55,343,808	922	\$34,521,524
2010	1,848	\$51,758,784	737	\$27,594,754
2011	1,773	\$49,658,184	640	\$23,962,880
Total	5,597	\$156,760,776	2,299	\$86,079,158

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](#)).

National and International Standards

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](#)).

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
- 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).

Best Strategies for Prevention

- Oral care
 - Special needs patients, such as those with dementia or autism, may require a dental care expert to assist with proper oral care. However, no patient should be excluded from proper oral care.
- Incentive spirometry
- Respiratory exercises
- Mobility
- Hand hygiene
- Vaccinations
- Kinetic beds ([CDC, 1997](#))

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% did not receive incentive spirometry
- 67.4% did not undergo cough and deep breathing exercises
- 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., 2014](#); [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.
 - 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

The VA established a national Hospital-acquired Pneumonia Prevention by Engaging Nurses (HAPPEN) program. The HAPPEN toolkit is available for download [here](#)



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](#)
- [Clinical practice guidelines for hospital-acquired pneumonia and ventilator-associated pneumonia in adults](#)
- [AHRO: Early mobility guidelines](#)
- [CDC: Advisory Committee on Immunization Practices](#)
- [American Journal of Infection Control: NV-HAP Prevention Implementation Guide](#)

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 in the hospital:
 - **Hand hygiene:** Hand hygiene is an effective measure to prevent many types of healthcare-associated infections, including pneumonia
 - **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.
 - **Visitation:** Family member should prevent visitation of a patient upon experiencing flu-like symptoms
 - **Prevention of aspiration:** Aspiration is when a person accidentally inhales fluid or food into their lungs, which can cause pneumonia. An upright bed position during and after meals can decrease the likelihood of aspiration
 - **Moving:** Often, non-ventilator associated pneumonia is associated with a lack of movement while in the hospital. This movement is important because it reduces secretions in the lungs. The nursing team has plans for mobility programs, walking, or other exercises
- **Treatment:** Healthcare workers should ensure that family members are aware if the patient 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 for worsening symptoms ([Institute for Quality and Efficiency in Health Care, 2018](#))

Resources for Patients and Family Members

- [Material to Prevent Pneumonia Through Oral Care from the VHA](#)
- [PatientAider® Infections section](#)



Questions family members should ask ([Dartmouth-Hitchcock, 2020](#))



- “Are you going to raise the head of the bed?”
- “How are we going to prevent stomach ulcers?”
- “What will you do to prevent blood clots?”
- “How often is this device cleaned?”
- “How often is [patient]’s mouth cleaned?”

- Although this resources includes patient education information for healthcare workers regarding community-acquired pneumonia, the language and techniques outlined are applicable to patient education methods for NV-HAP ([Patient education: Pneumonia in adults](#))
- 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
 - 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

Measuring outcomes

When considering outcomes measures to monitor success of NV-HAP quality improvement projects, four key factors are helpful to consider:

1. Measure pre-post process measures selected by the implementation committee. For example, type and frequency of oral care and type of mobility.
2. Clearly define cases of NV-HAP. General administrative data (ICD-10) and the CDC definition (included in the HAPPI toolkit) can be used. However, hospitals may set their own definition and data extraction systems provided the definition is consistently applied in pre/post data collection.

3. Collect the pre-post incidence of NV-HAP, patient sociodemographics, units of NV-HAP occurrence, fiscal impact, and discharge disposition as a minimum data set. Hospitals may want to collect more details to guide further interventions.
4. Compare the process implementation data with the outcome data (incidence of 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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References

- Abele-Horn, M., Dauber, A., Bauernfeind, A., Russwurm, W., Seyfarth-Metzger, I., Gleich, P., & Ruckdeschel, G. (1997). Decrease in nosocomial pneumonia in ventilated patients by selective oropharyngeal decontamination (SOD). *Intensive Care Medicine*, 23(2), 187-195. doi: 10.1007/s001340050314
- Angus, D. C., Gandhi, M., Arons, M. M., Gandhi, R. T., & Clinical Research. (2013, November 21). Severe Sepsis and Septic Shock: NEJM. Retrieved from <https://www.nejm.org/doi/full/10.1056/NEJMra120862>
- Baker, D., & Quinn, B. (2018). Hospital Acquired Pneumonia Prevention Initiative-2: Incidence of nonventilator hospital-acquired pneumonia in the United States. *American Journal of Infection Control*, 46(1), 2-7. doi: 10.1016/j.ajic.2017.08.036
- Baker, D., Quinn, B., Munro, S., & Giuliano, K. (n.d.). What is your hospital doing about the #1 hospital-acquired infection? Retrieved from What is your hospital doing about the #1 hospital-acquired infection?
- Bassim, Gibson, & Ward. (2008). Modification of the risk of mortality from pneumonia with oral hygiene care. *J Am Geriatr Soc*, 56(9)
- CDC. (2020). ACIP Vaccine Recommendations and Schedules. Retrieved from <https://www.cdc.gov/vaccines/acip/recommendations.html>
- CDC. (2004). Guidelines for Preventing Health-Care--Associated Pneumonia, 2003. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm>
- CDC. (1997.) Guidelines for Prevention of Nosocomial Pneumonia. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/00045365.htm>
- CMS. (2020). Outcome Measures. Retrieved from <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Outcome-Measures>
- Davis & Finley. (2012). The breadth of hospital-acquired pneumonia: Non-ventilated versus ventilated patients in Pennsylvania. *Pennsylvania Patient Safety Advisory*.
- Davis & Finley. (2018). A Second Breadth: Hospital-Acquired Pneumonia in Pennsylvania, Non Ventilated versus Ventilated Patients. *Pennsylvania Patient Safety Authority*.
- Dartmouth-Hitchcock. (2020). What You Need to Know About Ventilator-Associated Pneumonia (VAP). Retrieved from https://www.dartmouth-hitchcock.org/at-hospital/ventilator-associated_pneumonia.html
- Dibiase, L. M., Weber, D. J., Sickbert-Bennett, E. E., Anderson, D. J., & Rutala, W. A. (2014). The Growing Importance of Non-Device-Associated Healthcare-Associated Infections: A Relative Proportion and Incidence Study at an Academic Medical Center, 2008-2012. *Infection Control & Hospital Epidemiology*, 35(2), 200-202. doi: 10.1086/674847
- Didilescu, A. C., Skaug, N., Marica, C., & Didilescu, C. (2005). Respiratory pathogens in dental plaque of hospitalized patients with chronic lung diseases. *Clinical Oral Investigations*, 9(3), 141-147. doi: 10.1007/s00784-005-0315-6
- Eber, M. R. (2010, February 22). Clinical and Economic Outcomes Attributable to Health Care--Associated Sepsis and Pneumonia. Retrieved from <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/415636>
- Ewan, V. C., Sails, A. D., Walls, A. W. G., Rushton, S., & Newton, J. L. (2015). Dental and Microbiological Risk Factors for Hospital-Acquired Pneumonia in Non-Ventilated Older Patients. *Plos One*, 10(4). doi: 10.1371/journal.pone.0123622
- Giuliano, K. K., Baker, D., & Quinn, B. (2018). The epidemiology of non-ventilator hospital-acquired pneumonia in the United States. *American Journal of Infection Control*, 46(3), 322-327. doi: 10.1016/j.ajic.2017.09.005
- Giuliano, K., Quinn, B., & Baker, D. (2017). Non-Ventilator Hospital-Acquired vs. Pneumonia on Admission in Patients Who Develop Sepsis: Incidence and Cost. *Open Forum Infectious Diseases*, 4(suppl_1). doi: 10.1093/ofid/ofx163.1533
- Gleeson, K., Maxwell, S. L., & Eggli, D. F. (1997). Quantitative Aspiration During Sleep in Normal Subjects. *Chest*, 111(5), 1266-1272. doi: 10.1378/chest.111.5.1266
- Gomes-Filho, I. S., Passos, J. S., & Cruz, S. S. D. (2010). Respiratory disease and the role of oral bacteria. *Journal of Oral Microbiology*, 2(1), 5811. doi: 10.3402/jom.v2i0.5811
- Goss, L. (2009). What you need to know about hospital-acquired pneumonia. *Nursing Management*, 40(9). Retrieved from https://www.nursingcenter.com/journalarticle?Article_ID=940641&Journal_ID=54013&Issue_ID=940640
- HAP, VAP, or HCAP Suspect. (n.d.). Retrieved from https://openi.nlm.nih.gov/imgs/512/308/2447611/PMC2447611_cc6877-1.png
- Heo, S. M., Haase, E. M., Lesse, A. J., Gill, S. R., & Scannapieco, F. A. (2008). Genetic Relationships between Respiratory Pathogens Isolated from Dental Plaque and Bronchoalveolar Lavage Fluid from Patients in the Intensive Care Unit Undergoing Mechanical Ventilation. *Clinical Infectious Diseases*, 47(12), 1562-1570. doi: 10.1086/593193
- Huxley, E. J., Viroslav, J., Gray, W. R., & Pierce, A. K. (1979). Pharyngeal Aspiration in Normal Adults and Patients with Depressed Consciousness. *Survey of Anesthesiology*, 23(3), 203. doi: 10.1097/00132586-197906000-00061
- Icahn School of Medicine. (2020). Pneumonia in adults - discharge. Retrieved from <https://www.mountsinai.org/health-library/discharge-instructions/pneumonia-in-adults-discharge>
- IHI. (2006). A Framework for Spread: From Local Improvements to System-Wide Change: IHI. Retrieved from <http://www.ihl.org/resources/Pages/IHIWhitePapers/AFrameworkforSpreadWhitePaper.aspx>
- IHI. (2019). Patient Safety Essentials Toolkit: IHI. Retrieved from <http://www.ihl.org/resources/Pages/Tools/Patient-Safety-Essentials-Toolkit.aspx>
- IHI. (2015). 5 Steps for Creating Value Through Process Mapping and Observation. Retrieved from <http://www.ihl.org/communities/blogs/5-steps-for-creating-value-through-process-mapping-and-observation>
- Institute for Quality and Efficiency in Health Care. (2018). What happens if you get pneumonia in the hospital? Cologne, Germany.
- Joanna Briggs Institute. (2016, January). The effectiveness of systematic perioperative oral hygiene... : JBI Evidence Synthesis. Retrieved from https://journals.lww.com/jbisrir/Abstract/2016/01000/The_effectiveness_of_systematic_perioperative_oral.12.aspx
- Kalil, A. C., Metersky, M. L., Klompas, M., Muscedere, J., Sweeney, D. A., Palmer, L. B., ... Brozek, J. L. (2016). Executive Summary: Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. *Clinical Infectious Diseases*, 63(5), 575-582. doi: 10.1093/cid/ciw504
- Kaneoka, A., Pisegna, J. M., Miloro, K. V., Lo, M., Saito, H., Riquelme, L. F., ... Langmore, S. E. (2015). Prevention of Healthcare-Associated Pneumonia with Oral Care in Individuals Without Mechanical Ventilation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Infection Control & Hospital Epidemiology*, 36(8), 899-906. doi: 10.1017/ice.2015.77
- Klompas, M. (2016). Hospital-Acquired Pneumonia in Nonventilated Patients: The Next Frontier. *Infection Control & Hospital Epidemiology*, 37(7), 825-826. doi: 10.1017/ice.2016.101
- Kopp, M. A., Watzlawick, R., Martus, P., Failli, V., Finkenstaedt, F. W., Chen, Y., ... Schwab, J.M. (2017). Long-term functional outcome in patients with acquired infections after acute spinal cord injury. *Neurology*, 88(9), 892-900. doi: 10.1212/wnl.0000000000003652
- Lyons, & Kollef. (2018). Prevention of hospital-acquired pneumonia. *Current Opinion in Critical Care*. doi: 10.1097/MCC.0000000000000523
- Magill, S. S., Edwards, J. R., Bamberg, W., Beldavs, Z. G., Dumyati, G., Kainer, M. A., ... Fridkin, S. K. (2014). Multistate Point-Prevalence Survey of Health Care-Associated

- ed Infections. *New England Journal of Medicine*, 370(13), 1198-1208. doi: 10.1056/nejmoa1306801
- Magill, O'Leary, & Janelle. (2018). Changes in Prevalence of Health Care-Associated Infections in US Hospitals. *New England Journal of Medicine*, 379(18).
- Masterton, R. G., Galloway, A., French, G., Street, M., Armstrong, J., Brown, E., ... Wilcox, M. (2008). Guidelines for the management of hospital-acquired pneumonia in the UK: Report of the Working Party on Hospital-Acquired Pneumonia of the British Society for Antimicrobial Chemotherapy. *Journal of Antimicrobial Chemotherapy*, 62(1), 5-34. doi: 10.1093/jac/dkn162
- Micek, S. T., Chew, B., Hampton, N., & Kollef, M. H. (2016). A Case-Control Study Assessing the Impact of Non-ventilated Hospital-Acquired Pneumonia on Patient Outcomes. *Chest*, 150(5), 1008-1014. doi: 10.1016/j.chest.2016.04.009
- Mitchell, B. G., Russo, P. L., Cheng, A. C., Stewardson, A. J., Rosebrock, H., Curtis, S. J., ... Kiernan, M. (2019, July 4). Strategies to reduce non-ventilator-associated hospital-acquired pneumonia: A systematic review. Retrieved from <https://www.sciencedirect.com/science/article/pii/S2468045119300215>
- Multicenter Study of Hospital-Acquired Pneumonia in Non-ICU Patients. (2005). Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S0012369215323953>
- Munro. (2018). Implementation and dissemination of a Department of Veterans Affairs oral care initiative to prevent hospital-acquired pneumonia among nonventilated patients. *Nursing Administration Quarterly*. doi: 10.1097/NAQ.0000000000000308
- Munro & Baker. (2019). Dental involvement in hospital-acquired pneumonia prevention. *Journal of the Michigan Dental Association*.
- Munro & Baker. (2018). Reducing missed oral care opportunities to prevent non-ventilator associated hospital acquired pneumonia at the Department of Veterans Affairs. *Applied Nursing Research*.
- Pasquale, M. D., Aliberti, S., Mantero, M., Bianchini, S., & Blasi, F. (2016). Non-Intensive Care Unit Acquired Pneumonia: A New Clinical Entity? *International Journal of Molecular Sciences*, 17(3), 287. doi: 10.3390/ijms17030287
- Pedersen, P. U., Larsen, P., & Håkonsen, S. J. (2016). The effectiveness of systematic perioperative oral hygiene in reduction of postoperative respiratory tract infections after elective thoracic surgery in adults: a systematic review. *JBI Database of Systematic Reviews and Implementation Reports*, 14(1), 140-173. Doi:10.11124/jbisrir-2016-2180
- Quinn, Baker, Ewan, & Giuliano. (2019). Sustaining quality improvement: Long-term reduction of non-ventilator hospital-acquired pneumonia. *Journal of Nursing Care Quality*, 34(3).
- Quinn, B., Baker, D. L., Cohen, S., Stewart, J. L., Lima, C. A., & Parise, C. (2013). Basic Nursing Care to Prevent Nonventilator Hospital-Acquired Pneumonia. *Journal of Nursing Scholarship*, 46(1), 11-19. doi: 10.1111/jnu.12050
- Robertson, & Carter. (2013). Oral intensity: reducing non-ventilator-associated hospital-acquired pneumonia in care-dependent, neurologically impaired patients. *Can J Neurosci Nurs*, 35(2).
- Scannapieco, F. A. (2013). The oral microbiome: Its role in health and in oral and systemic infections. *Clinical Microbiology Newsletter*, 35(20), 163-169. Doi: 10.1016/j.clinmicnews.2013.09.003
- Schutte, Medei, Warren, & Wood. (2019). A nurse-driven oral care protocol to reduce hospital-acquired pneumonia. *American Journal of Nursing*.
- See, I., Chang, J., Gualandi, N., Buser, G. L., Rohrbach, P., Smeltz, D. A., ... Magill, S. S. (2016). Clinical Correlates of Surveillance Events Detected by National Healthcare Safety Network Pneumonia and Lower Respiratory Infection Definitions—Pennsylvania, 2011-2012. *Infection Control & Hospital Epidemiology*, 37(7), 818-824. doi: 10.1017/ice.2016.74
- Shay, & Scannapieco. (2014). Oral health disparities in older adults: oral bacteria, inflammation, and aspiration pneumonia. *Dental Clinics of North America*, 58(4).
- Sogren, P., Nilsson, E., Forsell, M., Johansson, O., & Hoogstraate, J. (2008). A Systematic Review of the Preventive Effect of Oral Hygiene on Pneumonia and Respiratory Tract Infection in Elderly People in Hospitals and Nursing Homes: Effect Estimates and Methodological Quality of Randomized Controlled Trials. *Journal of the American Geriatrics Society*, 56(11), 2124-2130. doi: 10.1111/j.1532-5415.2008.01926.x
- Sopena, N., Heras, E., Casas, I., Bechini, J., Guasch, I., Pedro-Botet, M. L., ... Sabrià, M. (2014). Risk factors for hospital-acquired pneumonia outside the intensive care unit: A case-control study. *American Journal of Infection Control*, 42(1), 38-42. doi: 10.1016/j.ajic.2013.06.021
- Sopena, N., & Sabrià, M. (2005). Multicenter Study of Hospital-Acquired Pneumonia in Non-ICU Patients. *Chest*, 127(1), 213-219. doi: 10.1378/chest.127.1.213
- Tablan, O., Anderson, L., Besser, R., Bridges, C., & Hajjeh, R. (2003). Guidelines for Preventing Health-Care--Associated Pneumonia, 2003. Retrieved from <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm>
- Torres, A., et al. (2018). Summary of the international clinical guidelines for the management of hospital-acquired and ventilator-acquired pneumonia. *RJ Open Res*, doi: <https://doi.org/10.1183/23120541.00028-2018>
- Weitzel, T., Robinson, S. B., & Holmes, J. (2006). Preventing Nosocomial Pneumonia. *AJN, American Journal of Nursing*, 106(9). doi: 10.1097/00000446-200609000-00031
- What is your hospital doing about the #1 hospital acquired infection? (n.d.). Retrieved from <https://www.aha.org/system/files/2018-03/What-is-your-hospital-doing-about-the-number-one-hai-3-27-2018pdf.pdf>
- Yoneyama, T., Yoshida, M., Ohruji, T., Mukaiyama, H., Okamoto, H., Hoshiba, K., ... Members Of The Oral Care Working Group. (2002). Oral Care Reduces Pneumonia in Older Patients in Nursing Homes. *Journal of the American Geriatrics Society*, 50(3), 430-433. doi: 10.1046/j.1532-5415.2002.50106.x