

The Connection Between a Healthy Mouth and Prevention of Hospital-Acquired Pneumonia

CareQuest Institute Continuing Education Webinar

Thursday, September 29, 2022

Housekeeping

- We will keep all lines muted to avoid background noise.
- We will send a copy of the slides and a link to the recording via email after the live program.
- We'll also make the slides and recording available on carequest.org.

To receive CE Credits:

- Look for the evaluation form, which we'll send via email.
- Complete the **evaluation by Friday, October 7**.
- Eligible participants will receive a certificate soon after via email.

We appreciate your feedback to help us improve future programs!

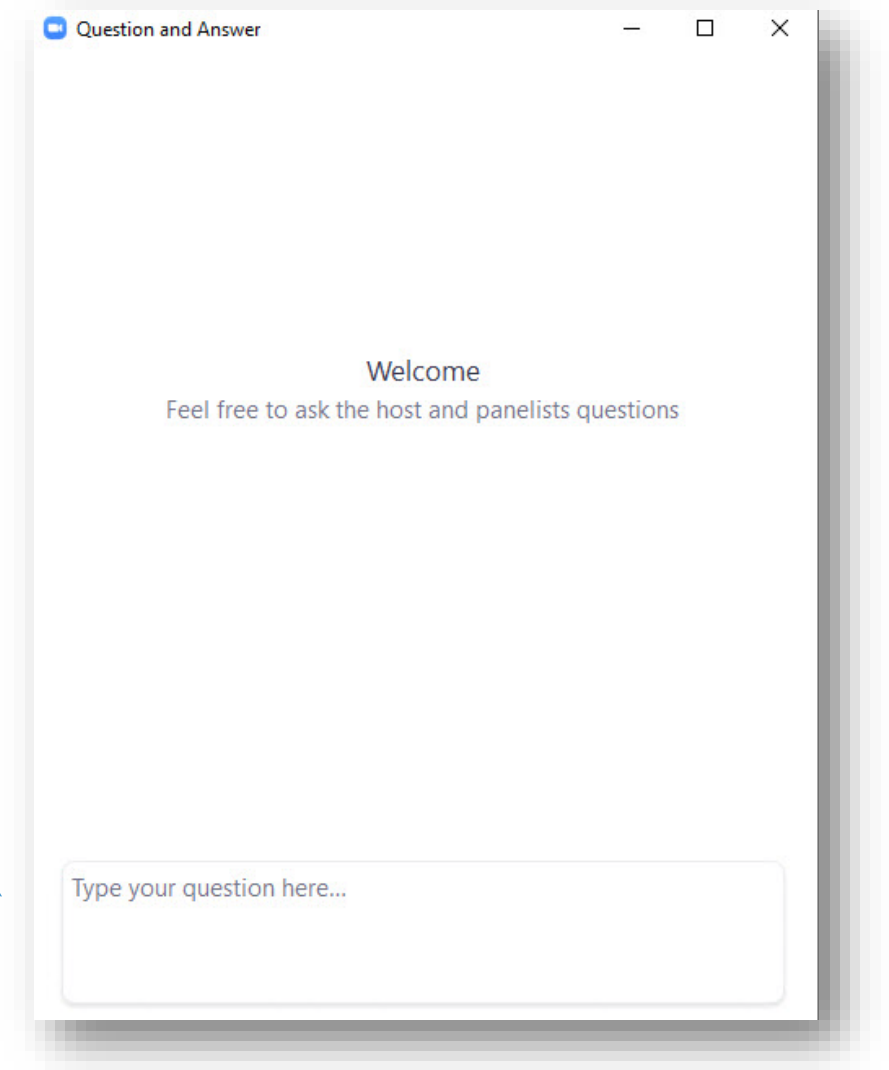


The CareQuest Institute for Oral Health is an ADA CER-P Recognized Provider. This presentation has been planned and implemented in accordance with the standards of the ADA CER-P.

*Full disclosures available upon request

Question & Answer Logistics

- Feel free to enter your questions into the **Question & Answer box** throughout the presentations.
- We will turn to your questions and comments toward the end of the hour.



Learning Objectives

At the end of this webinar, you'll be able to:

- Discuss the connection between preventive oral health care and nonventilator hospital-acquired pneumonia (NVHAP).
- Recognize why it's critical to prevent NVHAP.
- Identify the role oral health care providers should play in a hospital setting.
- Explain the case for adding NVHAP to CMS' Hospital-Acquired Condition Reduction Program.
- Discuss the benefits of integrating dental care and medical care.

Our Strategy

Vision

A future where every person can reach their full potential through optimal health

Mission

To improve the oral health of all

Purpose

To catalyze the future of health through oral health



Presenters

The Connection Between a Healthy Mouth and Prevention of Hospital-Acquired Pneumonia



WEBINAR | Thursday, September 29, 2022 | 1-2 p.m. ET | ADA CERP Credits: 1

MODERATOR



**Lisa Heaton,
PhD**

Science Writer,
Analytics and Evaluation,
CareQuest Institute
for Oral Health

PRESENTER



**Karen Giuliano,
PhD, MSN, MBA**

Associate Professor of Elaine
Marieb College of Nursing,
University of
Massachusetts-Amherst

PRESENTER



**Frank A. Scannapieco,
DMD, PhD**

Chair and SUNY Distinguished Professor,
Department of Oral Biology; Associate
Dean for Faculty and Professional
Development, School of Dental Medicine,
State University of New York at Buffalo

PRESENTER



**Dian Baker,
PhD, APRN**

Professor Emeritus, School
of Nursing, California State
University, Sacramento;
DB Consulting, LLC

Introduction

- What is non-ventilator hospital-acquired pneumonia (NVHAP)?
- How does NVHAP develop?
- What are the costs associated with NVHAP?
- How are oral health and oral care related to prevention of NVHAP?
- What can we all do right now to prevent NVHAP?



Contact Information

Lisa Heaton, PhD

Science Writer, Analytics and Evaluation,
CareQuest Institute for Oral Health

Lheaton@carequest.org

The Connection Between a Healthy Mouth and Prevention of Hospital-Acquired Pneumonia

Dian Baker, PhD, APRN

Karen Giuliano, PhD, MSN, MBA

Frank Scannapieco, DMD, PhD



Disclosures

- **Dr. Dian Baker**

- Consultant for Stryker/ Sage, Sunstar, and Avanos for consultation & research support

- **Dr. Karen Giuliano**

- Consultant for Stryker/ Sage, Sunstar, and Avanos for research support

- **Dr. Frank Scannapieco**

- No conflicts

Meet Arthur . . .

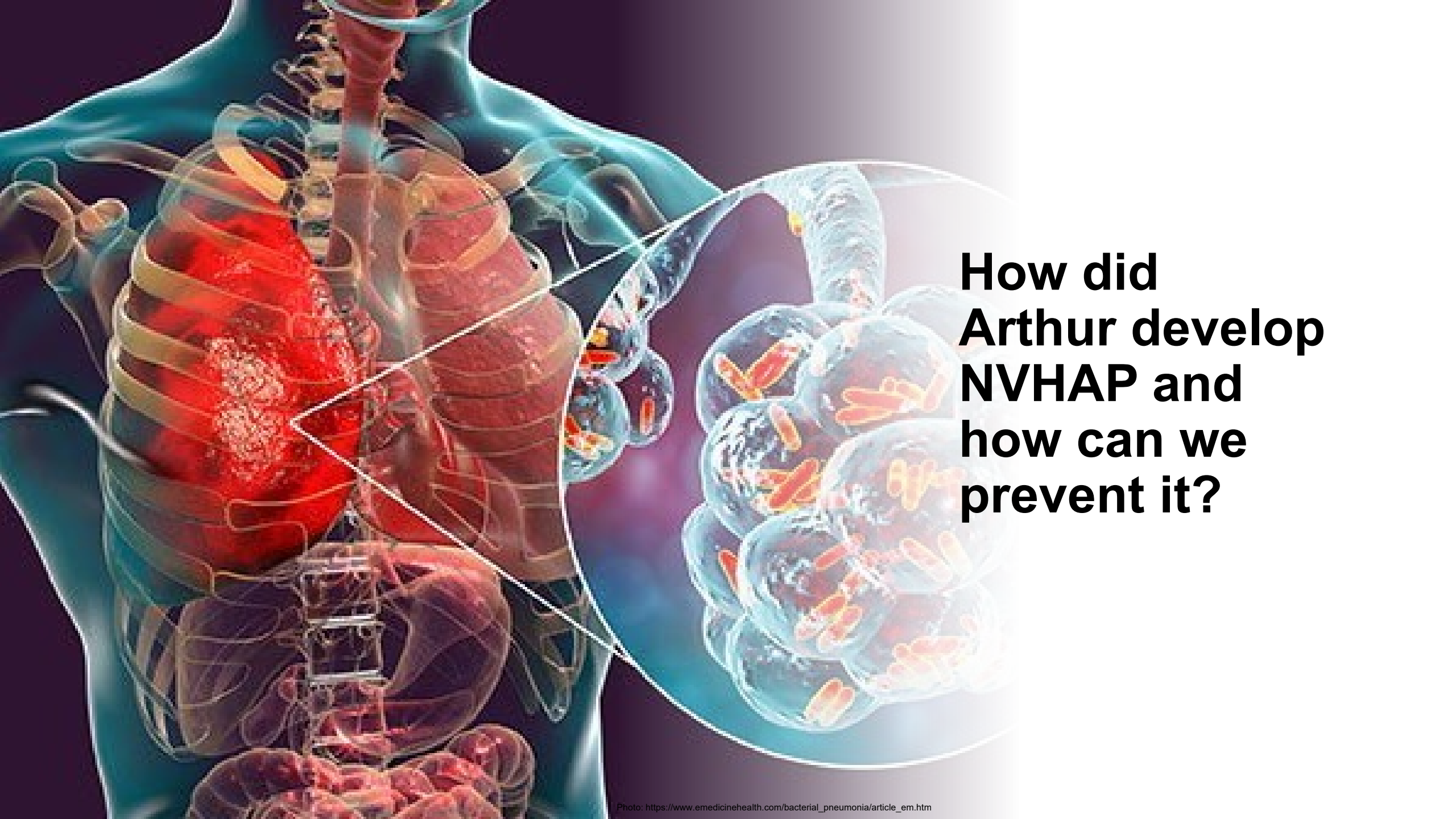


Photo from Honest Kitchen

- Arthur is a healthy 66-year-old, who walked his dog every day. Arthur was admitted to manage his diverticulitis.
- He was doing well until day 3 when he was short of breath and ended up needing non-invasive ventilation and then developed sepsis.
- He was in the hospital for 17 days before he was discharged to long-term care and stayed for 45 days.
- Arthur had not received any preventive dental services in the six months prior to his hospitalizations, and there was no oral care offered to him at the hospital.
- He never had the opportunity to even brush his teeth.

Patient Safety and NVHAP

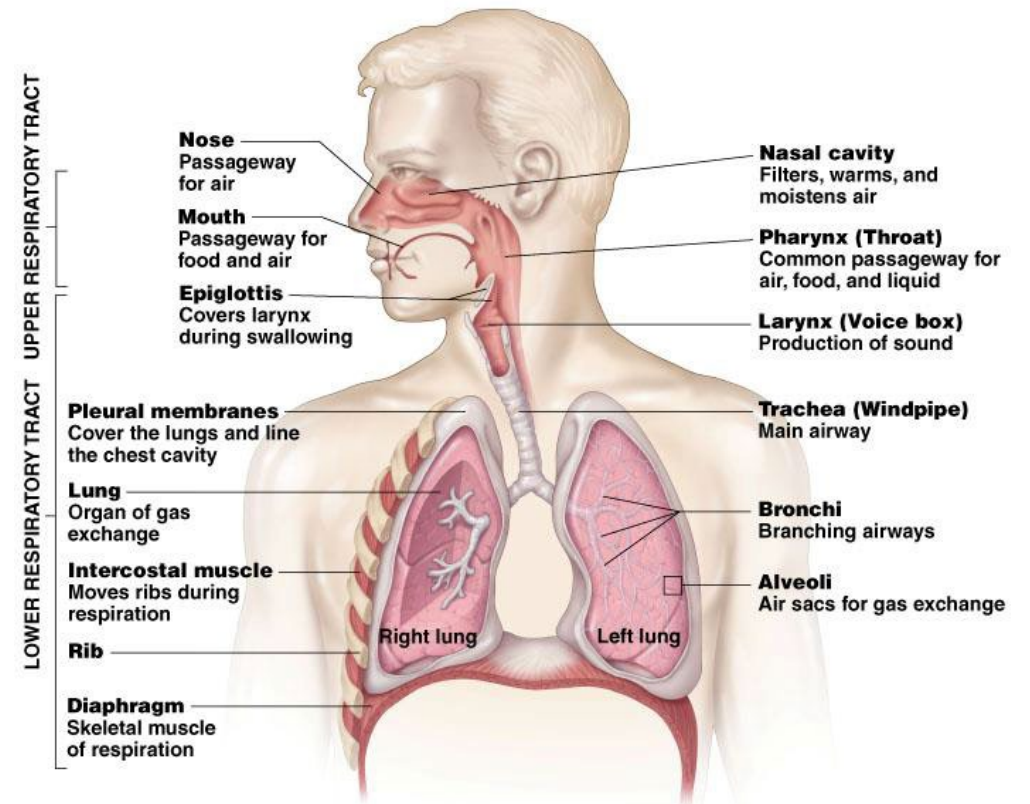
- HAP is estimated to cost **> \$3 billion** per year! (Munro et al. 2021)
- How common is NVHAP? And Who is getting NVHAP?
 - **1 in every 4** hospital acquired infections is pneumonia (Magill et al. NEJM, CDC 2018)
 - Majority of these are NVHAP **(60%)** (Magill et al. NEJM, CDC 2018)
 - NVHAP is found on ALL hospital units **mostly outside the ICU** (Carey, Munro et al. 2021; Baker & Quinn, 2018)
- What happens to patients who acquire NVHAP?
 - Associated mortality = **15.5 to 30.9%**.
 - **8.4X** more likely to die than equally sick patients (Micek et al. 2016)
 - Less likely to go home after NVHAP = Long term care **(25%)** (Baker & Quinn, 2018)
 - Readmissions **(19%)** and ICU utilization **(46%)** (Baker & Quinn, 2018)



**How did
Arthur develop
NVHAP and
how can we
prevent it?**

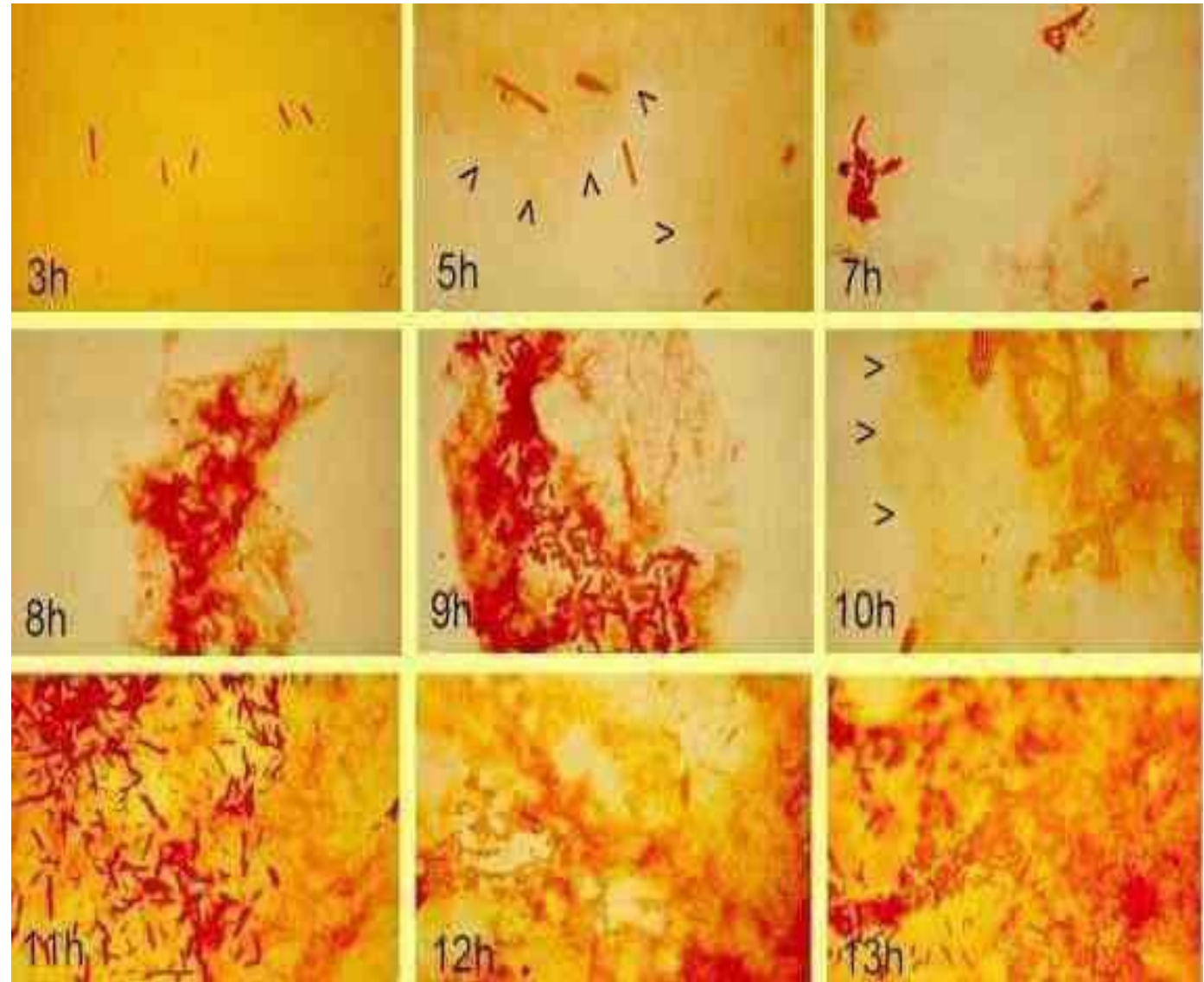
Microaspiration Of Biofilm Nano Particles

- Lung: Body's largest surface area with environmental exposure
- Not as sterile as once thought
- Subclinical microaspiration of germ laden particles is common in healthy adults
- “Adaptive Island Model” – the lung’s microbiome a balance of microbial immigration (microaspiration) and lung’s ability to eliminate contamination (Dickson et al. 2014)
- Changes in saliva pH and microaspiration: *100,000,000 germs in 1 mL*



Respiratory Dysbiosis

- Microbiome of Oral Cavity
 - Millions of oral microbes
 - **700 +** species
 - Replicate **5x in 24 hours**
 - Germs in mouth match germs in lung (Chanderraj& Dickson, 2018)
 - Change flora within **48 hours** of hospitalization
- **Disruption of Microbiome**



From: Biofilm images supplied by: DG Allison & IW Sutherland <http://archive.bio.ed.ac.uk/jdeacon/microbes/biofilm.htm>

- The biofilm is extremely sticky and difficult to remove. Biofilms are resistant to topical antimicrobials.
- This oral biofilm may directly impact the health of the lung.
- Mechanical removal of oral biofilm (dental plaque) by tooth brushing is required.

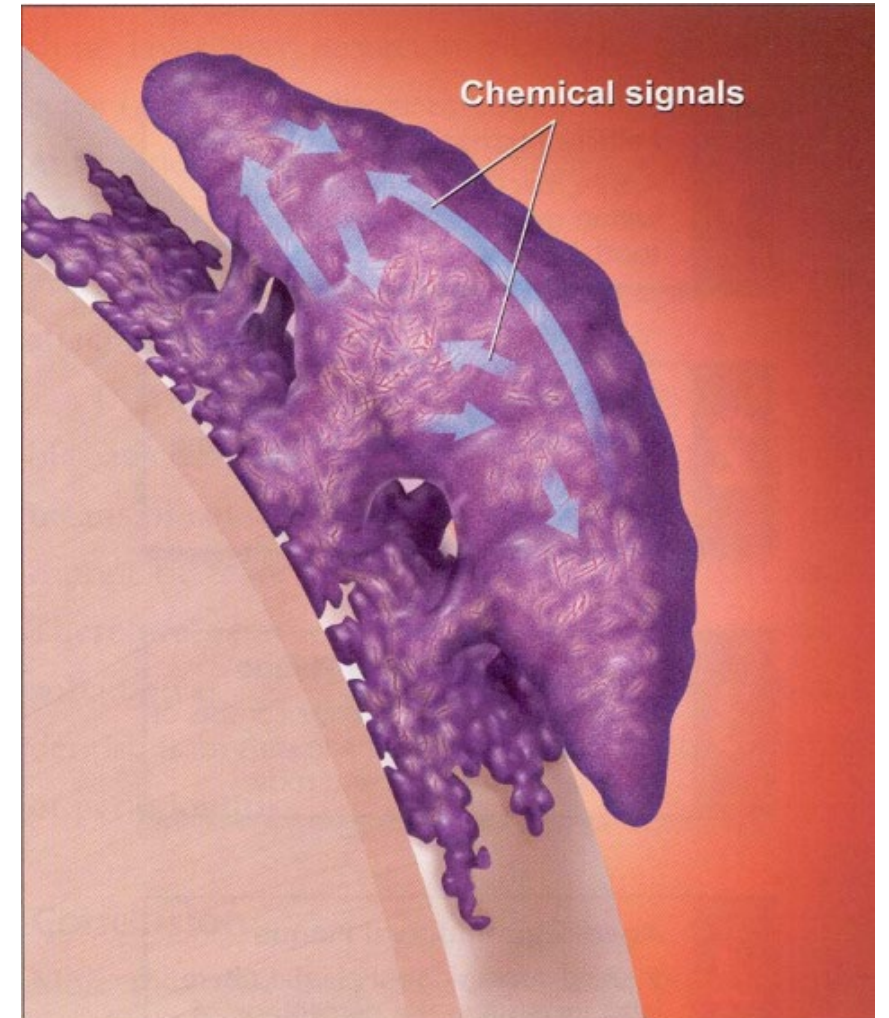


Figure 5. Primitive Communication System. The bacteria in a biofilm use chemical signals to communicate with each other.

Kellum et al 2007 Understanding inflame cytokine response in PNA and sepsis *GenIMS Arch Intern Med.* 2007;167(15):1655-1663

What is the evidence for oral care?

Systematic Reviews & Metanalysis:

Oral care is best for NVHAP prevention

- **1 in 10** deaths among elderly may be prevented by improving oral hygiene *(Sjogren et al. 2008)*
- Odds of dying from pneumonia are **3x higher** in patients not receiving oral care *(Bassim et al. 2008)*
- Tooth brushing alone reduced risk of fatal pneumonia *(Kaneoka et al. 2015)*
- Oral care was the most effective and commonly studied measure to prevent pneumonia *(Passaro et al. 2016)*
- Oral care was most studied measure and commonly associated with a decrease in HAP rate *(Lyons and Kollef, 2018)*

Recommended for prevention of NVHAP – 2022 Guidelines for HAP Prevention (SHEA, TJC, APIC and other, published in ICHE)

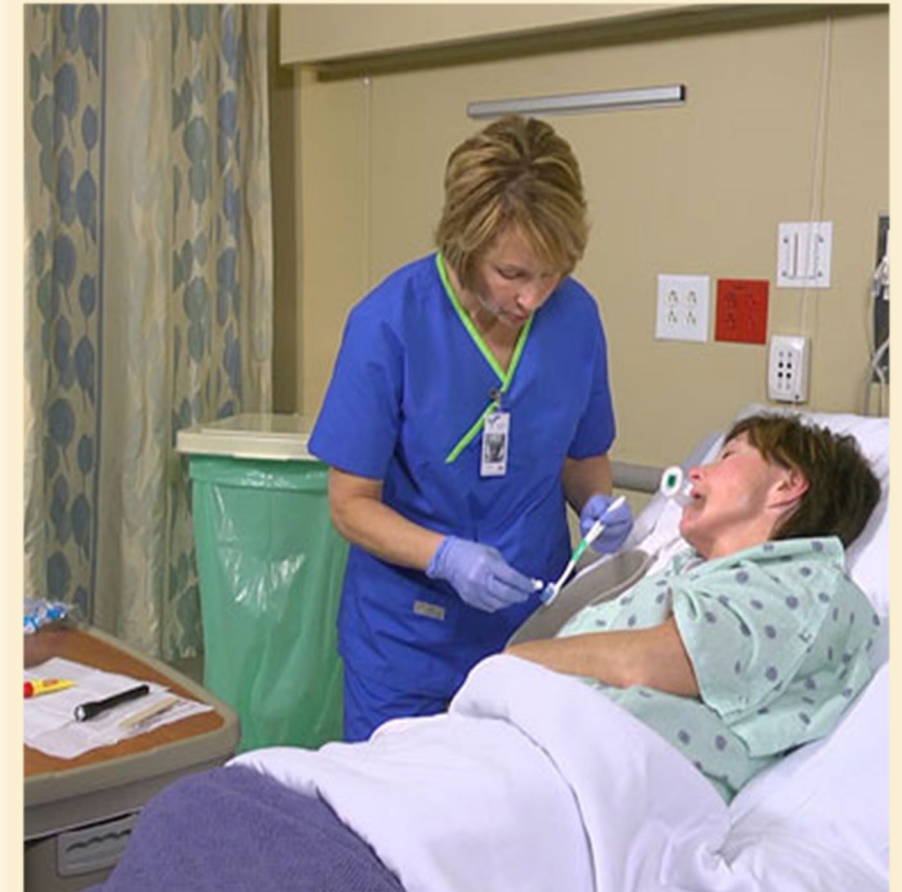


Photo from: <https://www.ndsu.edu/pubweb/bismarcknursing/basic/skill/G001.html>

Most Hospitals Lack Effective Equipment or Protocols to Perform Basic Oral Care

Start with oral health assessment: American Dental Association approved protocol for acute care hospitals

- Soft bristled, effective **toothbrush - use suction toothbrush if needed**
- **Toothpaste** with dentifrice (removes biofilm)
- Antiseptic **mouth rinse** (alcohol-free)
 - consider when *or if* CHG should be used for any patients
- **Moisturizer** for mouth and lips
 - Petroleum-free
- Denture care equipment
 - Storage cup, denture cleanser, denture brush, adhesive
- Patients most at risk for *not receiving oral care* require assistance and may need a suction toothbrush for safe oral care to prevent aspiration AND NVHAP
- **MOST** hospitals do not have protocols for oral care for general units, many do not have quality oral care supplies – toothbrushes
- And many do not provide any suction toothbrushes for the general units

Oral Care During COVID-19 Pandemic

Simple oral care itself is NOT an aerosol producing procedure

- CDC study indicated that *all* monitored HAIs went up during COVID-19 - *May indicate that basic nursing care was also difficult to achieve*
- Recent studies indicate increased risk and incidence of bacterial NVHAP and VAP during COVID-19
- COVID-19 patients not on a ventilator are on *general units*:
 - High flow oxygen and/or non-invasive ventilation
 - NIV - Continuous Positive Airway Pressure (CPAP) and Bi-Level Positive Airway Pressure (BiPAP)
- NIV still require oral care – and are at very high NVHAP risk:
- Be sure to follow all protocols related to PPE in your institution
- In general, NIV can be removed for short periods to allow oral care – consult Respiratory Therapy
- COVID-19 **Oral Grading System (COGS)**
 - Swelling, mucosa, trauma, infection and jaw mobility scale and repeated daily detects presence and severity of oral deficits observed in COVID-19.

What happens when hospital's address NVHAP?

- Patients are safer
- Reduce sepsis and antibiotic usage
- Avoid high cost of extra length of stay – better bed utilization, less ICU

*More important, odds are much higher that **Arthur** would be back walking his dog and would go back home*



Moving Forward & Need Interprofessional Solutions

- Association for Professionals in Infection Control and Epidemiology (APIC): Position Statement on NVHAP and dedicated journal issue (*May 2020*)
- National Organization to Prevent Hospitals Acquire Pneumonia (NVHAP): Call to Action – most news cited study (outside of COVID) (*2021*)
- Veterans Hospital Administration – HAPPEN project: National quality standards that ALL VA patients will receive daily oral care and will likely influence new national standard
- September 15, 2021: The Joint Commission issued a Patient Safety Alert advising hospitals to address NVHAP
(*First prevention measure, among many, was to maintain regular oral care*)
- *Health Affairs Blog – 2022 – recommended health policies*

What's on the safety radar?

ECRI:
Independent, nonprofit organization improving the safety, quality, and cost-effectiveness of care across all healthcare settings worldwide

#6 for 2022: NVHAP



Top 10 Patient Safety Concerns 2022
Nonventilator Healthcare-Associated Pneumonia

Pneumonia is the most common healthcare-associated infection in the United States and is linked to substantial morbidity and mortality. Despite the attention placed on ventilator-associated pneumonia, nonventilator healthcare-associated pneumonia (NV-HAP) diagnoses in the United States make up 65% of the cases, compared with 35% associated with ventilators.

Category	Percentage
Ventilator-Associated Cases	35%
Nonventilator-Associated Cases	65%

Source: Magill et al.

NV-HAP is a preventable event that is underreported as a healthcare complication. About 1 in every 100 hospitalized patients experiences NV-HAP, with mortality rates ranging from 15%-30% for hospitalized patients and 13%-41% for nursing home residents.

The impact of NV-HAP on hospital utilization:

- length-of-stay extended by up to 15 days
- intensive care unit (ICU) admission required in up to 46% of non-ICU cases
- increased antibiotic use
- readmissions within 30 days in up to 20% of survivors

Sources: Munro et al.; Stamm et al.

NV-HAP prevention bundles should be integrated into patient or resident care standards, including:

- comprehensive oral care
- stress ulcer prophylaxis
- maintenance of mobility
- glycemic control
- reduction of aspiration risks
- oral/nasogastric feeding tube assessments
- elevation of head of bed
- age-appropriate immunizations
- swallow assessments for dysphagia
- adequate nutrition

Source: Munro et al.; Greene et al.

What's on the safety radar?

2010

- Focused on device-related infection
- Non-ventilator hospital-acquired pneumonia not monitored

2022

- Hospital-acquired pneumonia now #1 hospital-acquired infection
- Non-ventilator hospital-acquired pneumonia still not monitored

This means it is **up to all health care providers NOT to wait** – they must lead this effort NOW to keep our patients safe!!

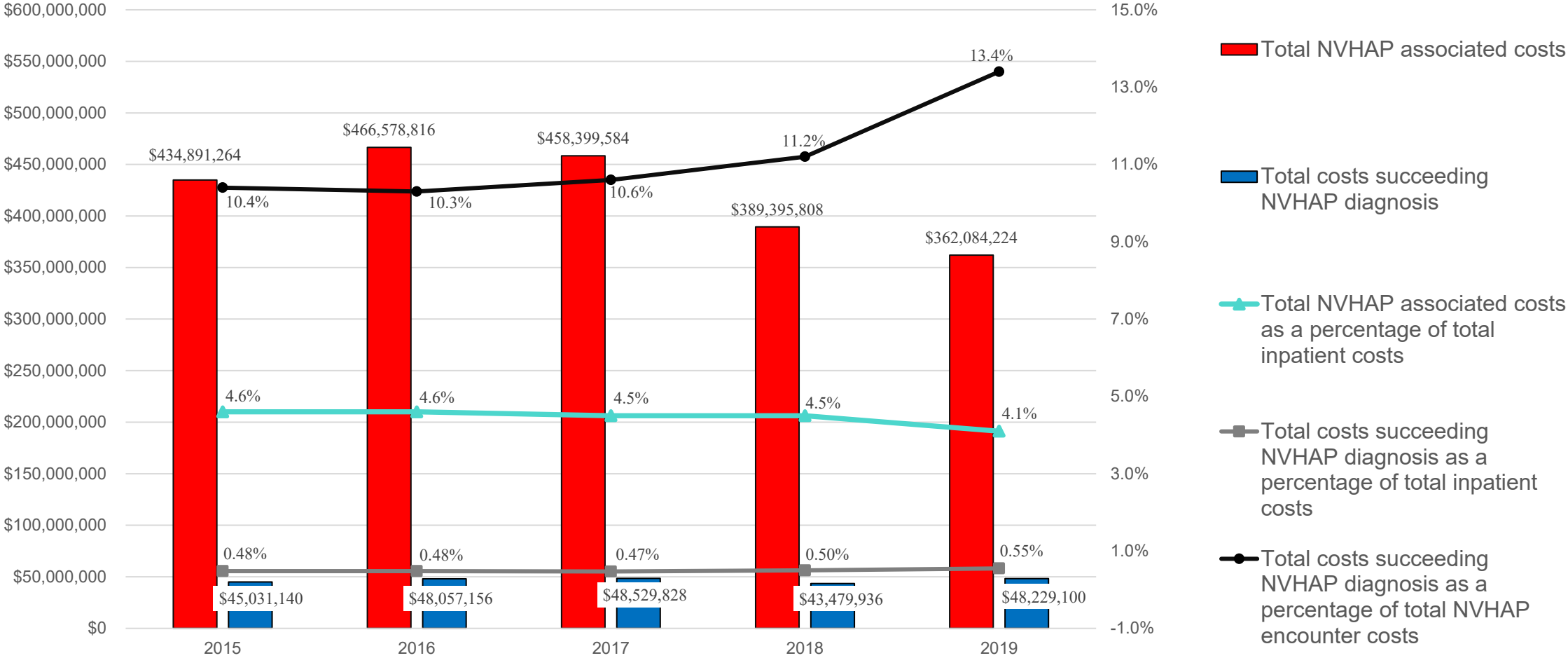
2015-19: NVHAP Incidence, Mortality, and Costs

- Data from 13 de-identified states from the IBM Watson MarketScan Medicaid Database
 - Includes de-identified person-specific information on inpatient and outpatient medical care, dental services, and administrative claims
- Examined trends in incidence of NVHAP from 2015 to 2019
- Primary outcome = inpatient NVHAP diagnosis
 - Diagnosis of pneumonia 48 hours or more after hospital admission
 - Not present on admission
 - Not associated with mechanical ventilation

2015-19: NVHAP Incidence and Mortality

- Of the **5,668,417** Medicaid beneficiaries included in the **2015-2019** dataset, **75,909** were diagnosed with NVHAP
 - Overall rate = **1.34%**; incidence = **2.63 per 1,000 patient days**
- Those aged **45-64** had the highest NVHAP incidence/**1,000 patient days** (5.18)
- Males had a higher NVHAP incidence/1,000 patient days than females (**3.1 vs 2.32 respectively**)
 - Almost twice as many females (N = 3,625,421) as males (N = 1,971,500) in the sample
- Overall NVHAP 5-year mortality rate was **7.76%**

2015-19: NVHAP Costs



Oral Care as Prevention for NVHAP: A Four-Unit Cluster Randomized Trial



Primary Study Aim

- reduction in NVHAP as measured by incidence per 1000 patient days

Process Outcome

- Frequency of oral care

Secondary Outcomes

- NVHAP associated morbidity and mortality, readmission rates, mortality, unplanned ICU transfer, and the development of sepsis not present on admission



Primary Study Aim: Is the implementation of a universal, standardized oral care protocol vs. usual care associated with a reduction in NVHAP as measured by incidence per 1000 patient days? ⁴⁴

Treatment Group	NV-HAP			
	No	Yes	Total	Incidence Rate per 1,000 Patient-Days
Medical Control, No. (%)	2,059 (99.2)	16 (0.8)	2,075	1.40
Medical Intervention, No. (%)	2,706 (99.9)	3 (0.1) ^a	2,709	0.21
Total	4,765	19	4,784	-85 (% difference)
Surgical Control, No. (%)	2,075 (99.4)	13 (0.6)	2,088	1.17
Surgical Intervention, No. (%)	1,830 (99.6)	7 (0.4) ^b	1,837	0.51
Total	3,905	20	3,925	-56 (% difference)

CI = confidence interval; NV-HAP = nonventilator hospital-acquired pneumonia; OR = odds ratio.

^a OR for medical control vs. medical intervention units (OR: 7.1; 95% CI, 2.01-24.1, *P* = 0.002).

^b OR for surgical control vs. surgical intervention units (OR: 1.6; 95% CI, 0.65-4.1, *P* = 0.29).

Summary of Findings

- Overall increase in oral care
 - But *remained lower than target level of 3 to 4 times/day*
- Reduced NVHAP on both intervention unit
 - But only medical intervention unit reached statistical significance
- Did not reach the patient enrollment target of 10,320 total patients
- **Incidence of sepsis in NVHAP group matched our previous research**



**“Sepsis in the
Context of NVHAP”**
*American Journal of
Critical Care*
Giuliano & Baker (2020)

Sepsis incidence associated with NVHAP –
19 times greater than that associated with
AP (admitted with pneumonia) (36.3% vs
1.9%/ p=.001)

Length of stay significantly longer, and total
hospital charges were significantly greater
for patients with sepsis associated with
NVHAP(p=.001)

Risk of sepsis developing was 28.8 times
greater with NVHAP than with AP

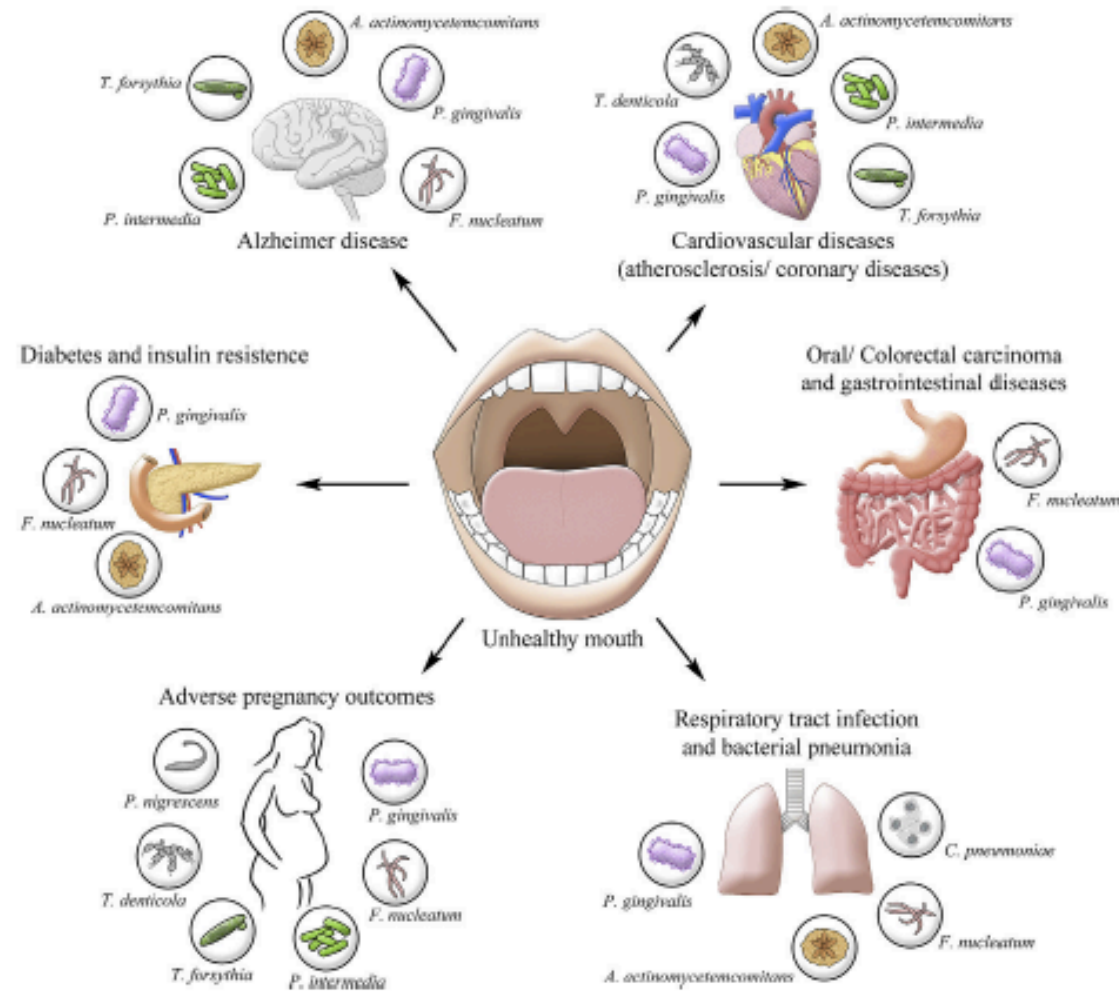


Fig. 1 Schematic representation of different systemic diseases and their association with oral pathogens. Periodontal diseases can predispose individuals to several systemic diseases such as cardiovascular disease, oral and colorectal cancer, gastrointestinal diseases, respiratory tract infection and pneumonia, adverse pregnancy outcomes, diabetes and insulin resistance, and Alzheimer's disease. The arrows show systemic diseases that can be affected by the oral cavity, and the periodontal pathogens associated with each systemic disease.

The New England Journal of Medicine

Copyright, 1969, by the Massachusetts Medical Society

Volume 281

NOVEMBER 20, 1969

Number 21

CHANGING PHARYNGEAL BACTERIAL FLORA OF HOSPITALIZED PATIENTS*

Emergence of Gram-Negative Bacilli

WALDEMAR G. JOHANSON, M.D., ALAN K. PIERCE, M.D., AND JAY P. SANFORD, M.D.

Abstract The prevalence of gram-negative bacilli among the oropharyngeal bacterial flora was low in physiologically normal subjects despite hospital exposure but rose markedly in patients with illnesses of varying severity. This increased prevalence was not correlated with antibiotic administration or inhalation therapy, was not dependent on duration of hospitalization and correlated best with the clinical severity of illness. Increased exposure to these

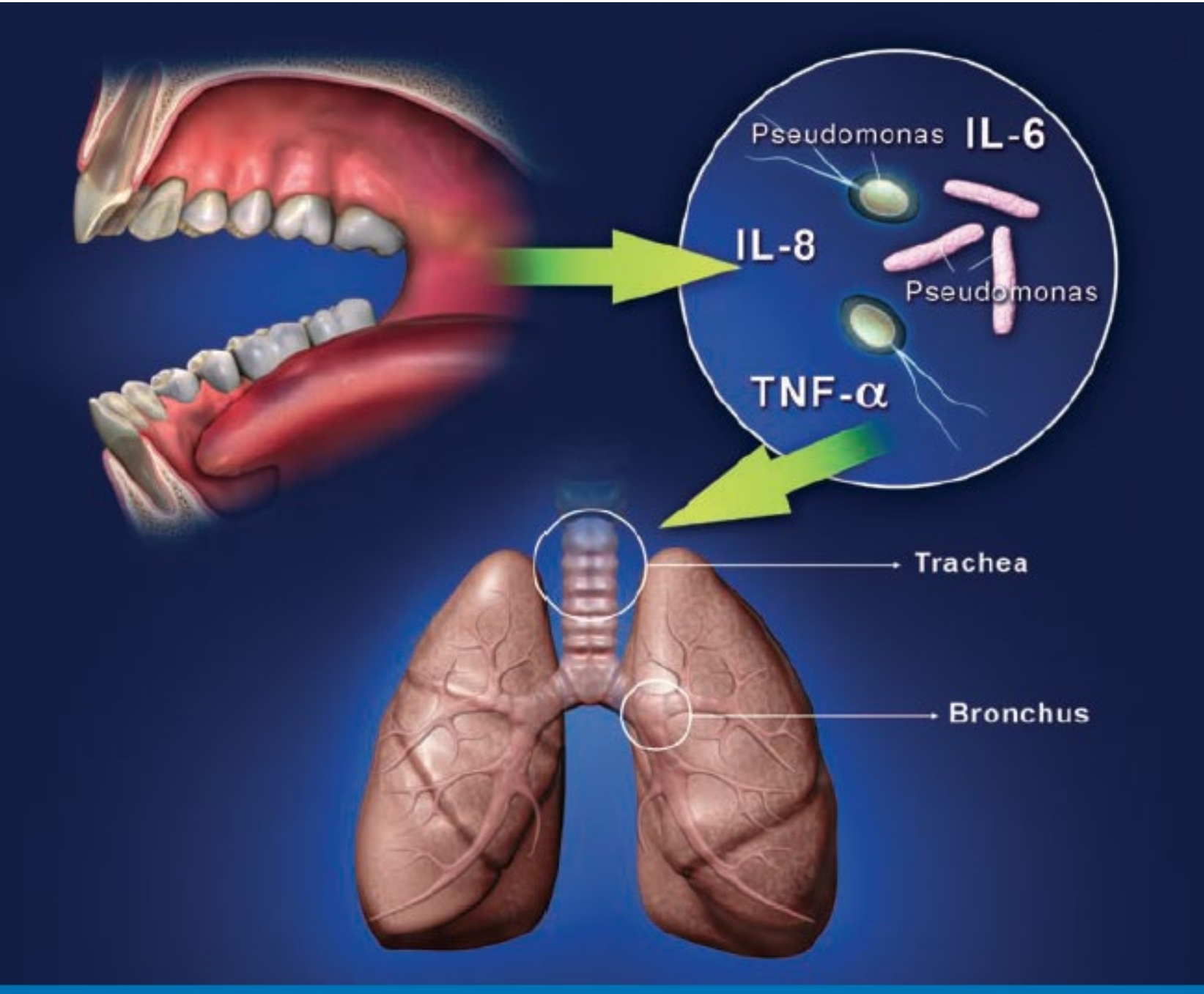
organisms alone does not adequately explain these findings, suggesting that pharyngeal clearance mechanisms are impaired in these patients. Since most bacterial pneumonias begin with the aspiration into the lung of bacteria present in the upper respiratory tract, this alteration in the pharyngeal flora of ill patients may represent an important initial step in the pathogenesis of pneumonia due to gram-negative bacilli.

TABLE 1. *Results of Single-Culture Surveys.*

STUDY GROUP	NO. OF SUBJECTS	CULTURES CONTAINING GRAM- NEGATIVE BACILLI
		%
Normal subjects:		
Nonhospital associated	82	2
Hospital associated	47	2
Patients:		
Psychiatry service	20	0
Moderately ill	81	16
Moribund	23	57

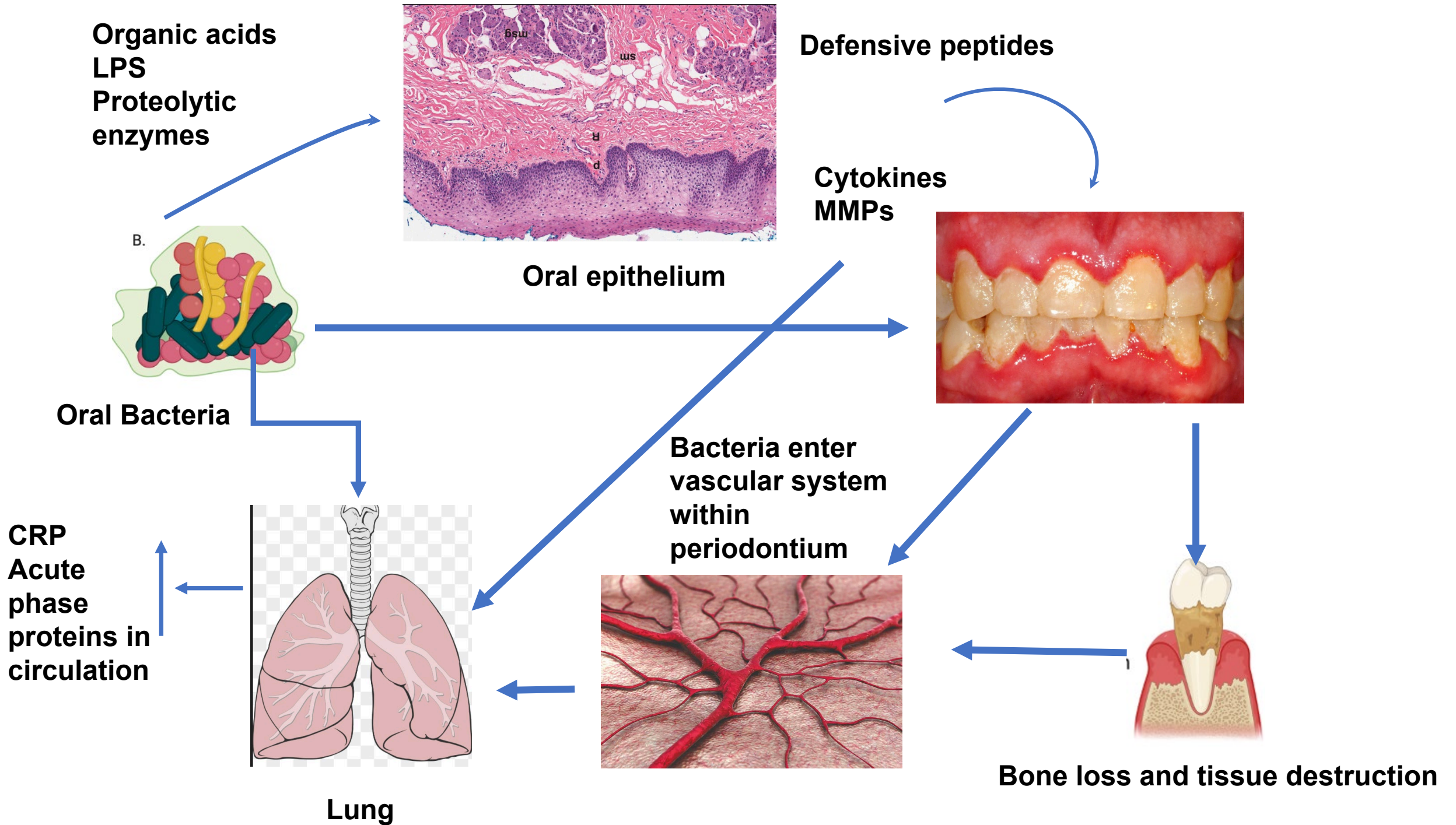
Oral cavity as the source of pneumonia pathogens?





Biological Mechanisms

- **Direct action of aspirated microbes on host tissues**
- **Indirect action through inflammatory pathways**





Hypothesis: Improved oral hygiene may prevent oral colonization by respiratory pathogens and NVHAP

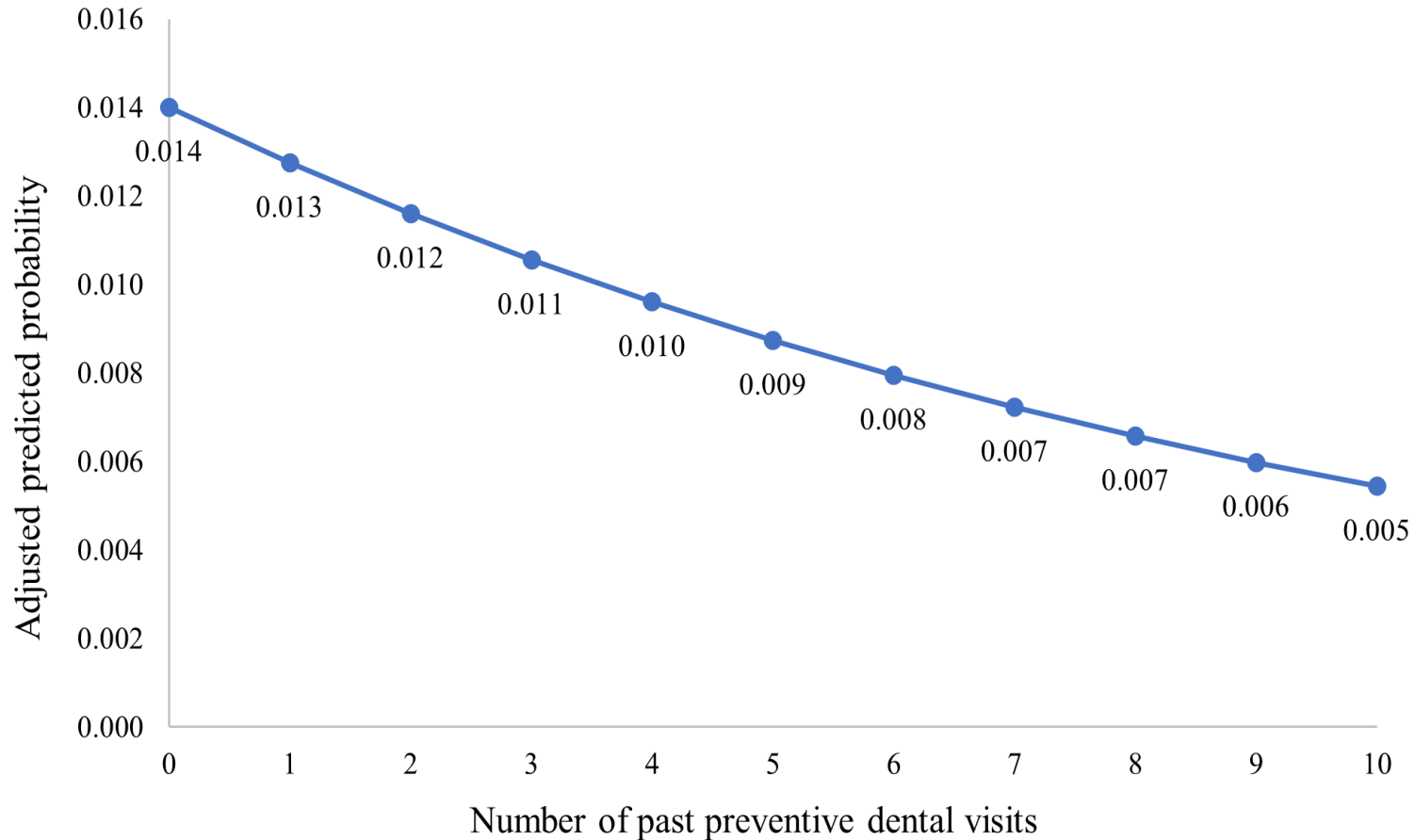
Dental Services and NVHAP

- Data from 2019 IBM Watson MarketScan Medicaid Database
- All Medicaid beneficiaries who were admitted to a hospital at some point in 2019 with no missing inpatient claims data
- NVHAP cases were first identified using related, not present on admission, ICD-10-CM codes; verified by the secondary DRG code for pneumonia on second or later day of hospital admission
- 2 types of dental services received in the 2 years prior to 2019 hospitalization:
 - Number of dental diagnostic, prophylaxis, or preventive visits, and
 - Scaling and root planing (SRP) services for periodontal disease

Dental Services and NVHAP

- Overall, **13.7%** (N = 13,866) of 1,012,025 Medicaid beneficiaries admitted to the hospital for ≥ 2 days in 2019 were diagnosed with NVHAP
 - 1.95 per 1,000 patient days
 - 121.9 per 100,000 Medicaid beneficiaries
- Beneficiaries with least 1 preventive dental visit within a year of hospitalization were **10% less likely** to get NVHAP
 - (adjusted odds ratio [aOR], 0.90; 95% confidence interval [CI], 0.86–0.95; $P < .001$)
- Use of periodontal services (SRP) < 6 months prior to hospitalization decreased the odds of NVHAP diagnosis **by 30%** (aOR, 0.70; 95% C, 0.56–0.89; $P = .003$)

Dental Services and NVHAP



Predicted probability of diagnosis of NVHAP decreased with each additional preventive dental visit 1 year prior to hospitalization

Prevention of Pneumonia Likely Requires Complete Removal of Oral Biofilms

- Chlorhexidine alone is insufficient (and may cause harm when delivered inappropriately)
- Utilization of dental hygienists, or specially trained nursing assistants, in hospitals and nursing homes may be required for more complete (mechanical) removal of oral biofilms
- It is suggested that all patients scheduled for elective surgery have professional tooth cleaning prior to admission

What can we all do right now?

- We can partner with hospitals, dental offices, patients, and families.
- Visit your dentist, when possible, before you go into the hospital to have an oral assessment and tooth cleaning.
- Appropriate oral care supplies should be available for nurses and caregivers in medical settings
- Everyone, including patients, should be asking their local hospitals – what is your oral care policy, to keep patients free from pneumonia?

Contact Information

Karen Giuliano, PhD, MSN, MBA

Professor of Elaine Marieb College of Nursing, University of Massachusetts-Amherst
kkgiuliano@umass.edu

Frank A. Scannapieco, DMD, PhD

Chair and SUNY Distinguished Professor, Department of Oral Biology, School of Dental Medicine,
State University of New York at Buffalo
fas1@buffalo.edu

Dian Baker PhD, APRN

Professor Emeritus, School of Nursing, California State University, Sacramento;
DB Consulting, LLC
dlbconsulting21@gmail.com

Question and Answer

To Explore More Industry-Leading Research

Resource Library

We publish white papers, research reports, briefs, articles, posters, infographics, and tools on topics ranging from adult dental benefits to teledentistry. Use the filters below to find resources by type or topic.

Search by Keyword: Filter by Topic: Filter by Type:

Title	Topic	Type
Improving Care Coordination Between Oral and Medical Providers	Care Coordination	Video
Veteran Oral Health: Expanding Access and Equity	Expanding Access	White Paper
2021 Oral Health Information Technology Virtual Convening	Care Coordination	Presentation
Dental Fear Is Real. Providers Can Help.	Expanding Access, Health Equity	Visual Report
Why We (Still) Need to Add Dental to Medicare	Adult Dental Benefit, Expanding Access, Health Equity	Report
A Cross-Sectional Analysis of Oral Health Care Spending over the Life Span in Commercial- and Medicaid-Insured Populations	Expanding Access, Health Equity	Article
Time Is on the Side of Change in Dentistry	COVID-19 and Oral Health, Health	Article

www.carequest.org/education/resource-library

Missed Connections
Providers and Consumers Want More Medical-Dental Integration

Oral health and overall health are inextricably linked. There is mounting evidence to suggest that poor oral health is related to a variety of chronic health conditions, such as high blood pressure, dementia, diabetes, and obesity. Despite this known connection, dental care is still largely siloed from medical care. The Centers for Disease Control and Prevention (CDC) estimates that integrating basic health screenings into a dental setting could save the health care system up to \$100 million every year.¹

CareQuest Institute for Oral Health conducted a nationally representative survey in January and February 2021 to assess consumers' perspectives on oral and overall health (n=5,320). CareQuest Institute also conducted a nationwide survey of oral health providers to assess perspectives and current behaviors related to interprofessional practice (n=377). Consumers and oral health providers described a lack of integration between medical and oral health care, and a desire for increased interprofessional collaboration.

Key Findings:
Medical-dental collaboration is currently uncommon.

- 63% of consumers report that their primary medical doctor "rarely" or "never" asks about their oral health.
- 33% of consumers report that their oral health provider "rarely" or "never" asks about their overall health.
- 45% of responding oral health providers report "rarely" integrating their care with clinicians outside of dentistry, with only 14% reporting it is part of their "daily" practice.
- Less than a third of consumers report receiving general health screenings from their oral health provider.
- A majority (89%) of adults report never receiving a referral from their oral health provider to a non-oral health professional.
- Almost a fourth (24%) of participating oral health providers report currently implementing interprofessional practice.

Webinar Evaluation

Complete the **evaluation by Friday, October 7** to receive CE credit.

Next Webinars:

Thursday October 13, 2022, 7–8 p.m. ET

Update: The Latest on Infection Prevention and Control for Dental Professionals

Thursday, October 20, 2022, 1–2 p.m. ET

Are You Ready for the Transition to Value-Based Care?

Sign up to receive our newsletter to get more information on future webinars!

Sign up for News and Updates

Email*

CareQuest Institute for Oral Health uses the information you provide to share updates on work and offerings to improve the oral health of all. You may unsubscribe at any time (See [Privacy Policy](#)).

Submit



Stay Connected

Follow us on social media



@CareQuestInstitute



@CareQuestInstitute



@CareQuestInst



CareQuest Institute

