

# Hospital-Acquired Pneumonia (HAP), the neglected Healthcare-Associated Infection (HAI)?

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AUSTRALIA

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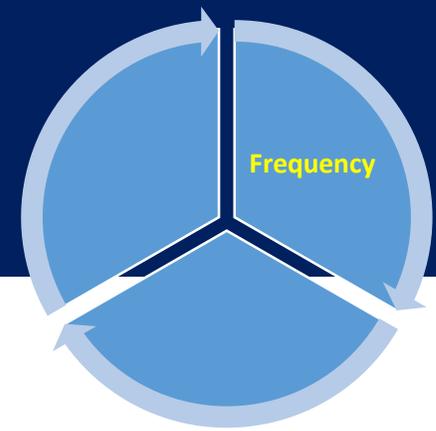
**None relevant to this presentation**



# Overview

- Why is it neglected?
- Strategies to prevention HAP
- Challenges and opportunities for HAP prevention and future work

# Why neglected?



- Pneumonia = 21.4% of HAIs in acute care hospitals
  - 60% not related to ventilation (Magill et al, 2018)
- Pneumonia = 3.7% of HAIs in long term care facilities
  - Other RTI 22%

Russo et al. *Antimicrobial Resistance and Infection Control* (2019) 8:114  
<https://doi.org/10.1186/s13756-019-0570-y>

Antimicrobial Resistance  
and Infection Control

RESEARCH

Open Access

The prevalence of healthcare associated infections among adult inpatients at nineteen large Australian acute-care public hospitals: a point prevalence survey



Philip L. Russo<sup>1,2,3\*</sup>, Andrew J. Stewardson<sup>4</sup>, Allen C. Cheng<sup>5,6</sup>, Tracey Bucknall<sup>3,5,7</sup> and Brett G. Mitchell<sup>8,9</sup>

SURVEILLANCE AND OUTBREAK REPORT

Prevalence of healthcare-associated infections, estimated incidence and composite antimicrobial resistance index in acute care hospitals and long-term care facilities: results from two European point prevalence surveys, 2016 to 2017

Carl Suetens<sup>1</sup>, Katrien Latour<sup>2</sup>, Tommi Kärki<sup>3</sup>, Enrico Ricchizzi<sup>3</sup>, Pete Kinross<sup>1</sup>, Maria Luisa Moro<sup>3</sup>, Béatrice Jans<sup>2</sup>, Susan Hopkins<sup>4</sup>, Sonja Hansen<sup>5</sup>, Outi Lyytikäinen<sup>6</sup>, Jacqui Reilly<sup>7,8</sup>, Aleksander Deptula<sup>9</sup>, Walter Zingg<sup>10</sup>, Diamantis Plachouras<sup>1</sup>, Dominique L Monnet<sup>1</sup>, the Healthcare-Associated Infections Prevalence Study Group<sup>11</sup>

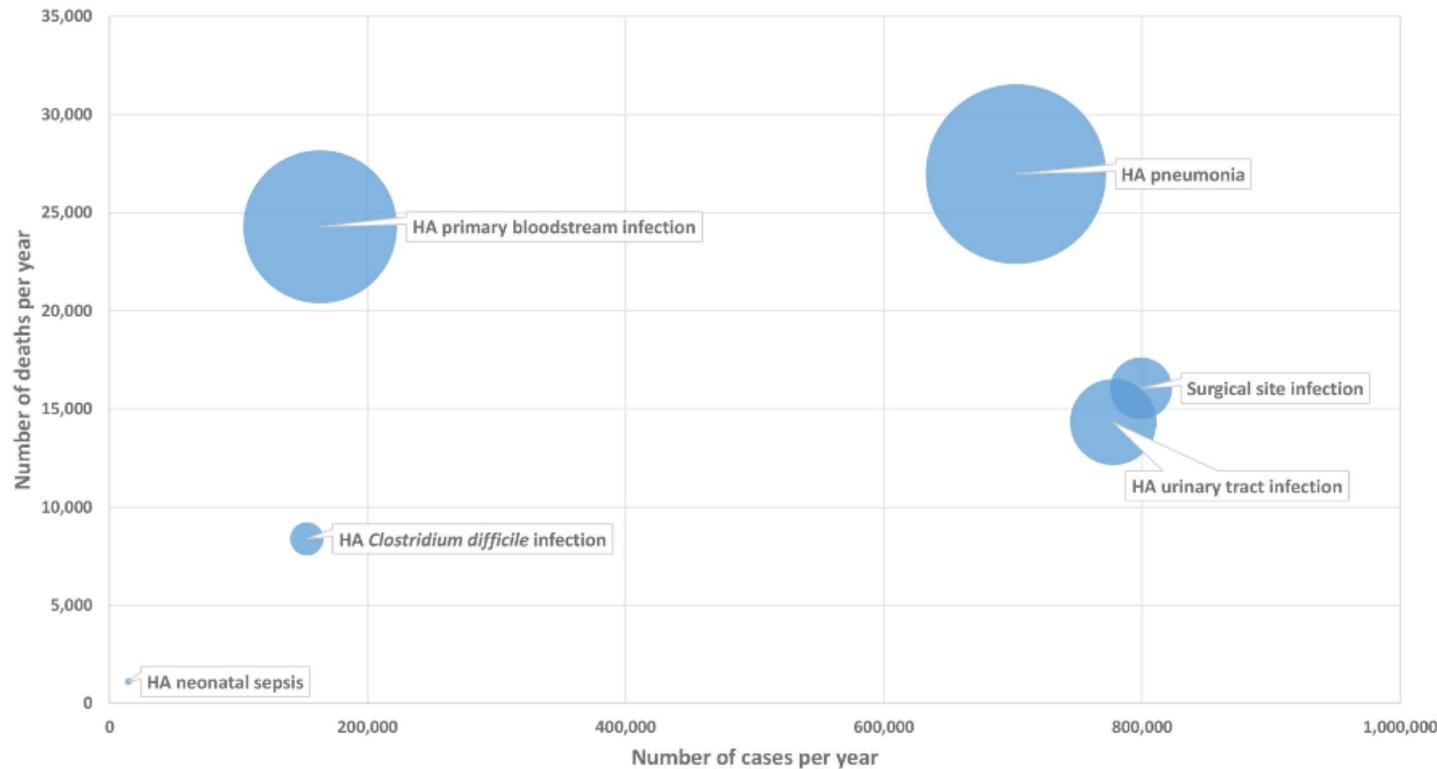
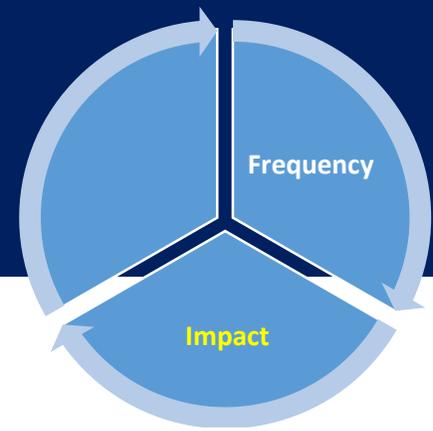
THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Multistate Point-Prevalence Survey of Health Care–Associated Infections

Shelley S. Magill, M.D., Ph.D., Jonathan R. Edwards, M.Stat., Wendy Bamberg, M.D., Zintars G. Beldavs, M.S., Ghinwa Dumyati, M.D., Marion A. Kainer, M.B., B.S., M.P.H., Ruth Lynfield, M.D., Meghan Maloney, M.P.H., Laura McAllister-Hollod, M.P.H., Joelle Nadle, M.P.H., Susan M. Ray, M.D., Deborah L. Thompson, M.D., M.S.P.H., Lucy E. Wilson, M.D., and Scott K. Fridkin, M.D., for the Emerging Infections Program Healthcare-Associated Infections and Antimicrobial Use Prevalence Survey Team\*

# Why neglected?



**Fig 1. Six healthcare-associated infections according to their number of cases per year (x-axis), number of deaths per year (y-axis), and DALYs per year (width of bubble), EU/EEA, 2011–2012 (time discounting was not applied). DALY, disability-adjusted life year; HA, healthcare-associated.**

RESEARCH ARTICLE

## Burden of Six Healthcare-Associated Infections on European Population Health: Estimating Incidence-Based Disability-Adjusted Life Years through a Population Prevalence-Based Modelling Study

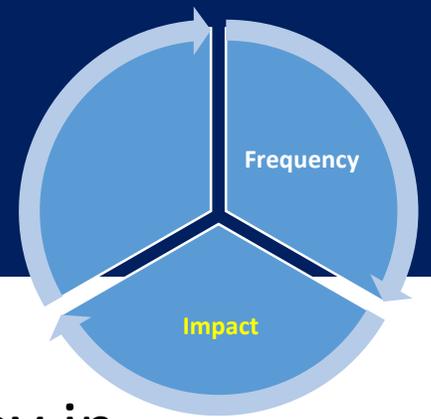
Alessandro Cassini<sup>1,2\*</sup>, Diamantis Plachouras<sup>1\*</sup>, Tim Eckmanns<sup>3</sup>, Muna Abu Sin<sup>3</sup>, Hans-Peter Blank<sup>3</sup>, Tanja Ducomble<sup>3</sup>, Sebastian Haller<sup>3</sup>, Thomas Harder<sup>3</sup>, Anja Klingeberg<sup>3</sup>, Madlen Sixtensson<sup>3</sup>, Edward Velasco<sup>3</sup>, Bettina Weiß<sup>3</sup>, Piotr Kramarz<sup>1</sup>, Dominique L. Monnet<sup>1</sup>, Mirjam E. Kretzschmar<sup>2,4</sup>, Carl Suetens<sup>1</sup>

**1** European Centre for Disease Prevention and Control, Stockholm, Sweden, **2** Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands, **3** Robert Koch Institute, Berlin, Germany, **4** Centre for Infectious Disease Control, National Institute for Public Health and the Environment, Bilthoven, The Netherlands



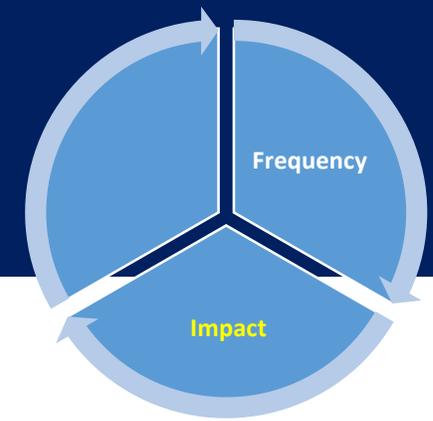
ossMark  
3.10.18 update

# Why neglected?



- HAP (NV-HAP) is also associated with increased length of stay in hospital and increased patient morbidity and mortality
  - 19% of patients with HAP required transfer into an intensive care unit (ICU)  
(Baker & Quinn, Am J Infect Control 2018;46:2-7)
  - Mortality 18%  
(Davis & Finley, Pennsylvania Patient Safety Authority. Patient Saf Advis 2012;9:99-105)
  - Patients with HAP are eight times more likely to die in hospital, than similar patients without HAP  
(Micek et al, Chest 2016;150:1008-14)

# Why neglected?



- Antimicrobial resistance
- HAP is a most common HAIs and is responsible for a large proportion of inappropriate antimicrobial use
  - 24.8% of antimicrobial prescribing of HCA pneumonia was inappropriate
- 165,000 HAIs per year in UK
  - Approximately 33,000 cases of pneumonia

AUSTRALIAN COMMISSION  
ON SAFETY AND QUALITY IN HEALTH CARE

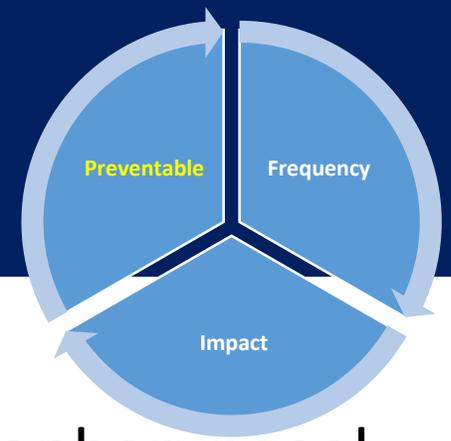


## Antimicrobial prescribing practice in Australian hospitals

Results of the 2016 Hospital  
National Antimicrobial  
Prescribing Survey

July 2018

# Pathogenesis

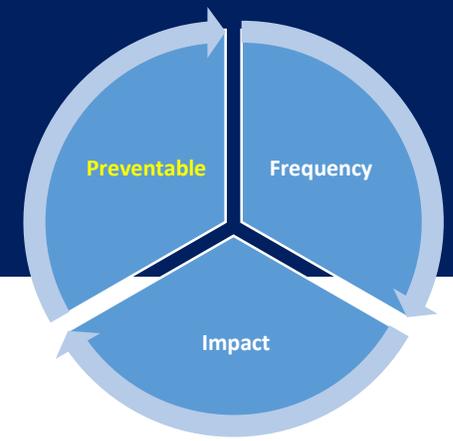


- HAP occurs because of aspiration of the patients' own oropharyngeal material, with hospital respiratory pathogens more commonly found in the mouths of those who are unable to clear secretions

(Ewan V, et al, Age and ageing 2017;46:352-8)



# Why bother?



- Unsurprisingly, evidence suggests that improving oral care may reduce the incidence of HAP  
(Pássaro L, et al, Antimicrob Resist Infect Control 2016;5:43)
- Improvements in oral care are considered a modifiable risk factor for HAP

# Risk factors

[Article](#)

[Supplementary materials](#)

[Metrics](#)

[First View](#)

[Get](#)

## Incidence and risk factors of non-device-associated pneumonia in an acute-care hospital

Paula D. Strassle  <sup>(a1)</sup> <sup>(a2)</sup>, Emily E. Sickbert-Bennett <sup>(a1)</sup> <sup>(a3)</sup>, Michael Klompas <sup>(a4)</sup> <sup>(a5)</sup>, Jennifer L. Lund <sup>(a1)</sup>, Paul W. Stewart <sup>(a6)</sup>, Ashley H. Marx <sup>(a7)</sup>, Lauren M. DiBiase <sup>(a3)</sup> and David J. Weber <sup>(a1)</sup> <sup>(a3)</sup> 

163,000 admissions;

Rate 4.5/10,000 patient days

Male, age bronchitis, hearth failure, immunosuppressed

# Strategies to prevention HAP

- Disclaimer
  - Poor reliable / variable diagnosis and definitions
  - Incidence vs prevalence
  - Study settings vary

# Strategies to prevention HAP: Systematic review



Review

## Strategies to reduce non-ventilator-associated hospital-acquired pneumonia: A systematic review

Brett G. Mitchell <sup>a,b,\*</sup>, Philip L. Russo <sup>c,d,e</sup>, Allen C. Cheng <sup>f,g</sup>,  
Andrew J. Stewardson <sup>h</sup>, Hannah Rosebrock <sup>a</sup>, Stephanie J. Curtis <sup>h</sup>,  
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<sup>f</sup> Infection Prevention and Healthcare Epidemiology Unit, Alfred Health, Melbourne, Victoria, Australia

<sup>g</sup> School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

<sup>h</sup> Department of Infectious Diseases, Alfred Hospital and Central Clinical School, Monash University, Melbourne, Victoria, Australia

<sup>i</sup> School of Nursing and Midwifery, Deakin University, Burwood, Victoria, Australia

<sup>j</sup> Richard Wells Research Centre, College of Nursing, Midwifery and Health Care, University of West London, London, United Kingdom

# Strategies to prevention HAP

- A systematic review to identify research exploring and evaluating NV-HAP preventive measures in hospitals and aged-care facilities
- The electronic search, January 1998 to August 2018
- The inclusion criteria were all randomised controlled trials and observational studies that examined measures to reduce HAP in hospitals and aged-care facilities (excluding vaccination and systematic antimicrobial therapy)
- Adult population
- Excluded studies that did not analyse the effect of any prevention measure, VAP, all grey literature, non-peer-reviewed literature, reviews, editorials and commentaries.

# Strategies to prevention HAP: Systematic review

- More on diagnosis later....
- We accepted the definitions and application of defining pneumonia as stated in the paper
- Risk of bias

# Strategies to prevention HAP: Systematic review

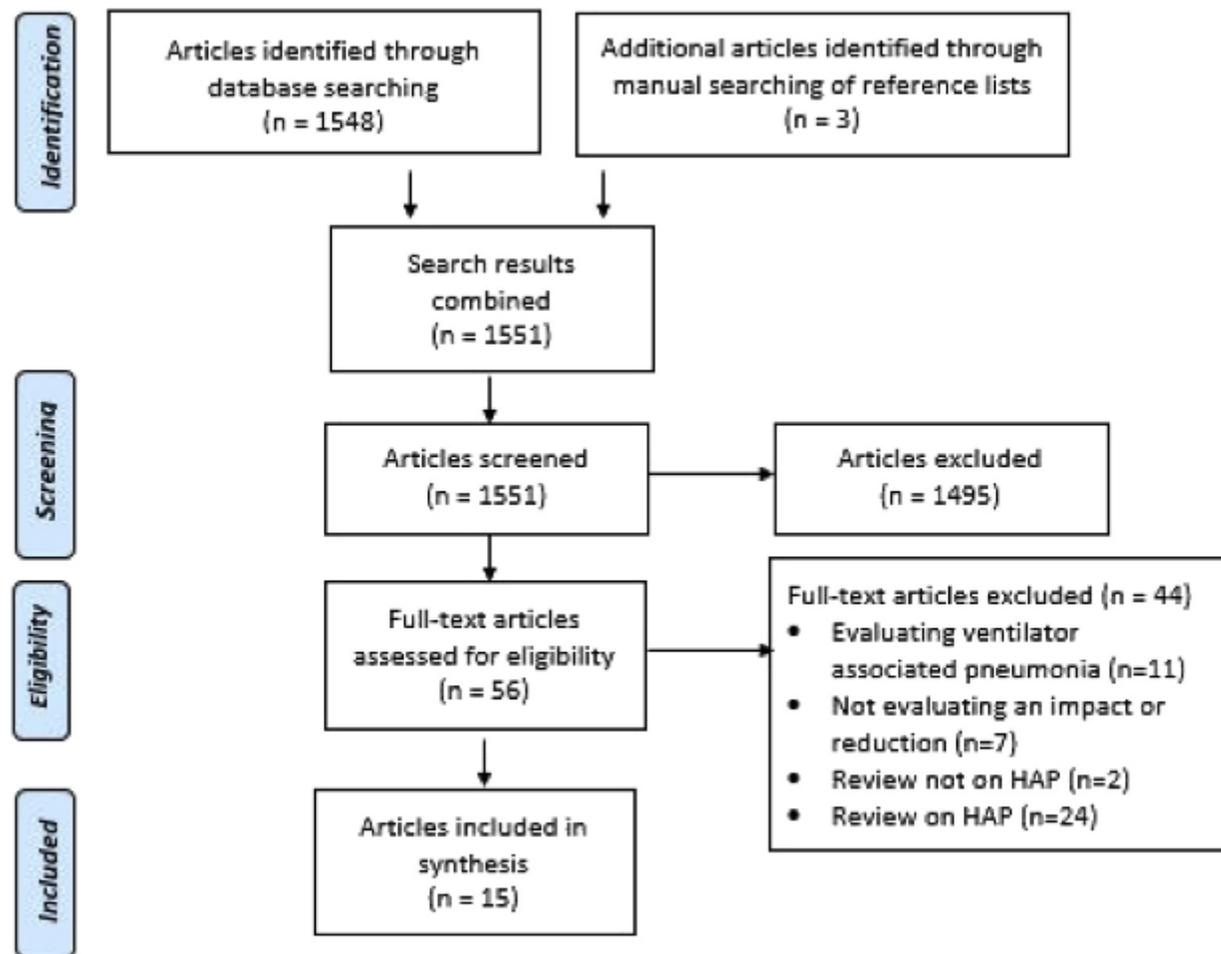


Figure 1 Flow diagram for selection of articles.

**Table 1** Studies included in the review.

Author, Year	Design	Sample	Setting	Broad intervention strategy	Significant change in pneumonia
	RCT	141	Nursing home	Oral care (professional)	
	RCT	254	Hospital (Intensive Care Unit)	Oral care (professional)	
	RCT	441	Hospital	Physical activity	
	RCT	2513	Nursing home	Oral care (professional)	
	Cohort	873	Hospital (Intensive Care Unit)	Oral care	
	RCT	223	Hospital	Physical activity	
Jonansen et al., 2016 [37]	Cohort	88	Hospital (Ear, Nose and Throat Department)	Prophylactic antibiotics	
McNally et al., 2018 [38]	Quasi-experimental	2891	Hospital (non-ICU)	Oral care	NO
Quinn et al., 2014 [14]	Quasi-experimental		Hospital	Oral care	Decrease+
Robertson et al., 2013 [20]	Quasi-experimental	85	Hospital (acute neurosurgical unit)	Oral care	YES
Schrock et al., 2018 [35]	Cohort	2372	Hospital	Dysphagia screen	YES
Stolbrink et al., 2014 [34]	Quasi-experimental	156	Hospital (respiratory and elderly wards)	Physical activity	YES
Titsworth et al., 2013 [36]	Cohort	2334	Hospital	Dysphagia screen	YES
Wagner et al., 2016 [39]	Cohort	1656	Hospital	Oral care	YES
Yoneyama et al., 2012 [31]	RCT	366	Nursing Home	Oral care (professional)	NO

RCT

- 3 in NH
- 3 in hospital

RCT

- 4 professional care
- 2 physical activity

**Note:** + significance values not provided.

**Table 1** Studies included in the review.

Author, Year	Design	Sample	Setting	Broad intervention strategy	Significant change in pneumonia
	RCT	141	Nursing home	Oral care (professional)	YES
	RCT	254	Hospital (Intensive Care Unit)	Oral care (professional)	YES
Chen et al., 2016 [40]	RCT	441	Hospital	Physical activity	YES
	RCT	2513	Nursing home	Oral care (professional)	NO
	Cohort	873	Hospital (Intensive Care Unit)	Oral care	YES
Cuesy et al., 2010 [33]	RCT	223	Hospital	Physical activity	YES
Johansen et al., 2016 [37]	Cohort	88	Hospital (Ear, Nose and Throat Department)	Prophylactic antibiotics	YES
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Yoneyama et al., 2012 [31]	RCT	366	Nursing Home	Oral care (professional)	NO

**Note:** + significance values not provided.

Oral care

- No RCT

# Oral care

**Table 3** Summary of findings involving oral care and healthcare associated pneumonia.

Study (first author)	Outcome	Intervention (n)		Control (n)	
		Event	Total	Event	Total
<b>Professional dental care</b>					
Adachi	Fatal aspiration pneumonia	2	40	8	48
Bellisimo-Rodrigues	Pneumonia in non-ventilated patients	0	127	1	127
Yoneyama	Pneumonia	21	184	34	182
Bourigault	Fatal pneumonia	14	184	30	182
	Patients with pneumonia	93	868	203	1645
	Fatal pneumonia	15	868	26	1645
<b>Non-professional dental care</b>					
Chen	Hospital acquired pneumonia	84	661	44	212
McNally	Hospital acquired pneumonia	25	1403	26	1487
Quinn	Hospital acquired pneumonia	Unclear	Unclear	Unclear	Unclear
Robertson	Hospital acquired pneumonia	2	32	13	51
Wagner	Hospital acquired pneumonia (post-stroke)	98	949	99	707



## Significant heterogeneity in interventions

- Type
- Frequency
- Antiseptic

# Oral Care

- The interventions included:
  - Oral care kits that contained an antiseptic cetylpyridinium chloride and 1.5% hydrogen peroxide)
  - Oral care by swabbing with an antiseptic (chlorhexidine gluconate vs. metronidazole)
  - Increased volume of oral care and the use of an antiseptic (0.05% cetylpyridinium chloride)
  - Oral care kits and the use of a toothbrush containing sodium bicarbonate and an anti- septic (antiseptic unspecified)
  - Moisturiser, toothbrushes and oral swabs impregnated with sodium bicarbonate and an antiseptic rinse

No two oral care interventions were the same

# Dysphagia

- Two non-randomised studies used dysphagia screening as the primary method for NV-HAP prevention
  - dysphagia screening test was applied to all acute stroke patients in the emergency department.
  - a nurse-led bedside dysphagia screen and a rapid clinical swallow undertaken by a speech pathologist

# Movement

- Three studies that involved a form of physical activity as a way of reducing the incidence of NV-HAP (2 RCTs)
  - effect of turning and passive mobilisation on patients with acute ischemic stroke (TurnMob study)
  - pre-operative patient education, early ambulation and self-directed breathing exercises, and additional pre-operative physiotherapy
  - physiotherapy-based intervention that involved early mobilisation in patients following a hip fracture

# Diagnosis



# Diagnosis

Used different definitions for determining cases of NV-HAP, including

❖ Chest radiograph

❖ Administrative

❖ Clinical Pathology

❖ Centers for Disease Control and Prevention

❖ National Nosocomial Infection Survey

❖ Less clear

The screenshot shows the top portion of a journal article page. At the top, the journal title "Clinical Microbiology and Infection" is displayed in a small font, followed by the issue information "25 (2019) 1428.e7–1428.e13". Below this, a navigation bar contains the text "Contents lists available at ScienceDirect" and the journal title "Clinical Microbiology and Infection" in a larger font. The Elsevier logo is on the left, and the ESCMID logo is on the right. The main title of the article is "Development and validation of a semi-automated surveillance system—lowering the fruit for non-ventilator-associated hospital-acquired pneumonia (nvHAP) prevention☆". The authors listed are A. Wolfensberger<sup>1,\*</sup>, W. Jakob<sup>2</sup>, M. Faes Hesse<sup>1</sup>, S.P. Kuster<sup>1</sup>, A.H. Meier<sup>1</sup>, P.W. Schreiber<sup>1</sup>, L. Clack<sup>1</sup>, and H. Sax<sup>1</sup>. The text "or did not specify the diagnostic approach" is partially visible at the bottom of the screenshot.

Original article

Development and validation of a semi-automated surveillance system—lowering the fruit for non-ventilator-associated hospital-acquired pneumonia (nvHAP) prevention<sup>☆</sup>

A. Wolfensberger<sup>1,\*</sup>, W. Jakob<sup>2</sup>, M. Faes Hesse<sup>1</sup>, S.P. Kuster<sup>1</sup>, A.H. Meier<sup>1</sup>, P.W. Schreiber<sup>1</sup>, L. Clack<sup>1</sup>, H. Sax<sup>1</sup>

or did not specify the diagnostic approach

# Risk of bias

First Author	Year	Elements of Newcastle–Ottawa Scale			
		Selection (0–4)	Comparability (0–2)	Exposure (0–3)	Total stars
Adachi	2002	4	0	0	4
Bellisimo-Rodrigues	2014	2	2	3	7
Boden	2018	2	2	3	7
Bourigaulta	2010	4	1	0	5
Chen	2016	3	0	2	5
Cuesy	2010	3	1	3	7
Johansen	2016	3	2	3	8
McNally	2018	3	2	3	8
Quinn	2014	2	0	3	5
Robertson	2013	4	0	3	7
Schrock	2018	3	0	2	5
Stolbrink	2014	3	2	2	7
Titsworth	2013	4	2	2	8
Wagner	2016	3	2	2	7
Yoneyama	2002	4	1	3	8

# Take home messages (from systematic review)

- Oral care, dysphagia, mobilisation appear to have some benefit
- Studies suffer with a high risk of bias (5/15)
- Significant differences in studies, pooling and determining effect not possible

# Other considerations

**We know oral care is sub-standard, and improving oral care is hard**

Received: 24 February 2018 | Revised: 21 January 2019 | Accepted: 9 February 2019

DOI: 10.1111/jocn.14829

## REVIEW

WILEY *Journal of*  
**Clinical Nursing**

### Oral care practices in non-mechanically ventilated intensive care unit patients: An integrative review

Kimberly Paige Emery<sup>1,2</sup>  | Frank Guido-Sanz<sup>1</sup>

<sup>1</sup>College of Nursing, University of Central Florida, Orlando, Florida

<sup>2</sup>Orlando Regional Medical Center, Orlando Health, Orlando, FL

#### Correspondence

Kimberly P. Emery, College of Nursing, University of Central Florida, Orlando, FL  
Email: emery.kimberly@knights.ucf.edu

#### Abstract

**Aims and objectives:** To explore current oral care practices in nonmechanically ventilated ICU patients.

**Background:** Oral hygiene is an important aspect of nursing care in hospitalised populations. Oral care is a disease preventive and cost-effective measure for patients, particularly in ICU patients. Numerous studies support the value of oral care prac-

## Variation in

- ✓ Type of oral care
- ✓ Products used
- ✓ Frequency
- ✓ Documented practices
- ✓ Staff performing

# Other considerations

We know oral care is sub-standard, and improving oral care is hard



Original Article

## Oral Care Clinical Trial to Reduce Non-Intensive Care Unit, Hospital-Acquired Pneumonia: Lessons for Future Research

Edel McNally • Gintas P. Krisciunas • Susan E. Langmore • Janet T. Crimlisk • Jessica M. Plsegna • Joseph Massaro

### ABSTRACT

Hospital-acquired pneumonia (HAP) contributes greatly to patient mortality and healthcare costs. Studies have shown that aggressive oral care in intensive care units (ICUs) can significantly reduce pneumonia rates, and hospitals have implemented stringent protocols in this setting. However, little is known about the effectiveness of aggressive oral care in reducing HAP in non-intensive care wards, prompting us to conduct a nonrandomized controlled clinical trial. A structured toothbrushing program was provided to an experimental cohort of patients. A control group received usual care. Patient demographics, toothbrushing frequency, and pneumonia diagnosis were recorded over a 3.5-month period. Difference in pneumonia rates was computed using unadjusted and multivariate logistic regression analyses. No significant difference in pneumonia rates between control and experimental groups was found (1.7% versus 1.8%). Toothbrushing rates increased significantly in the experimental group ( $p = .002$ ) but fell short of protocol frequency. It became apparent that aggressive toothbrushing program implementation requires nursing-led interdisciplinary involvement, more intensive training, a streamlined documentation system, and efficient compliance tracking. Lessons from this study should be used for future large-scale research. A secondary analysis of these data did, however, suggest that increasing toothbrushing rates may have the potential to reduce pneumonia in the non-ICU acute care setting.

**Keywords:** hospital-acquired pneumonia, oral care, toothbrushing

- Aggressive oral care
- Non randomised trial
- No difference in pneumonia found
- Tooth brushing rates increased but fell short of protocol frequency
- Average 1.2 to 1.6 day (goal 3 times a day)

# Other considerations

Mouth Care Matters

NHS Health Education England

Welcome News About the Programme e-Learning Links and Resources



frontiers in Cellular and Infection Microbiology

ORIGINAL RESEARCH  
published: 20 February 2018  
doi: 10.3389/fcimb.2018.00042

Check for updates

## Oropharyngeal Microbiota in Frail Older Patients Unaffected by Time in Hospital

Victoria C. Ewan<sup>1,2\*</sup>, William D. K. Reid<sup>3</sup>, Mark Shirley<sup>4</sup>, A. John Simpson<sup>2</sup>, Steven P. Rushton<sup>4</sup> and William G. Wade<sup>5</sup>

<sup>1</sup> South Tynes Hospital, NHS Foundation Trust, Middlesbrough, United Kingdom, <sup>2</sup> Institute of Cellular Medicine, Medical School, Newcastle University, Newcastle upon Tyne, United Kingdom, <sup>3</sup> Marine Sciences, School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom, <sup>4</sup> Modat, Evidence, Policy, School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne, United Kingdom, <sup>5</sup> Centre for Immunobiology, Blizard Institute, Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom



Dysphagia identification

# Other considerations

Study designs are a challenge

Sample  
size

Outcomes

Randomisation

Consent

# Opportunities

- Epidemiological understanding
- Baseline oral care look like and how can we improve oral care?
- Baseline patient movement

# HAP – Findings from a recent systematic review and implications for future work

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