Healthcare associated pneumonia (HAP)
Why should we bother and what can we do?

Professor Brett Mitchell

brett.mitchell@avondale.edu.au

Twitter: @1heathau

Professor of Health Services Research and Nursing, Avondale University

Adjunct Professor of Nursing, Monash University

Honorary Professor, University of Newcastle

Conjoint, Central Coast Local Health District

Infection Research Program Co-Lead, Hunter Medical Research Institute

www.webbertraining.com

August 10, 2022

Disclosures

Received competitive research funding from government funding agencies
(NHMRC, Commonwealth government, Office Teaching & Learning)

Received competitive research grants from non-government funding agencies
(HCF Foundation, ACIPC, Cardinal Health, Australian College Nursing)

Consultancy
(Department of Foreign Affairs and Trade, MSD)

Editor-in-Chief, Infection, Disease and Health

None relevant to this presentation

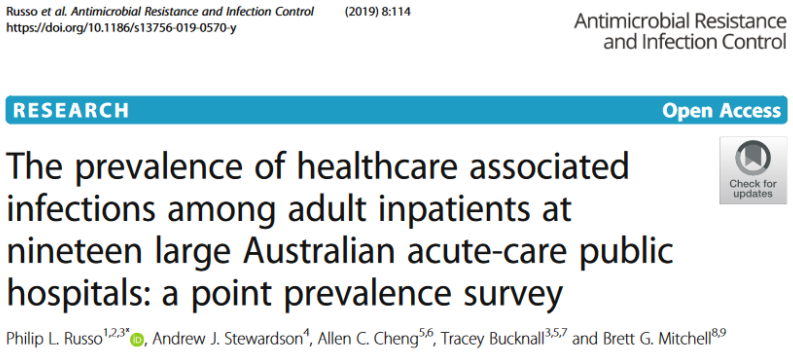
Overview

- Why?
- Causes
- Strategies to prevention HAP
- Challenges and opportunities for HAP prevention and future work

Why? - Frequency

- 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%



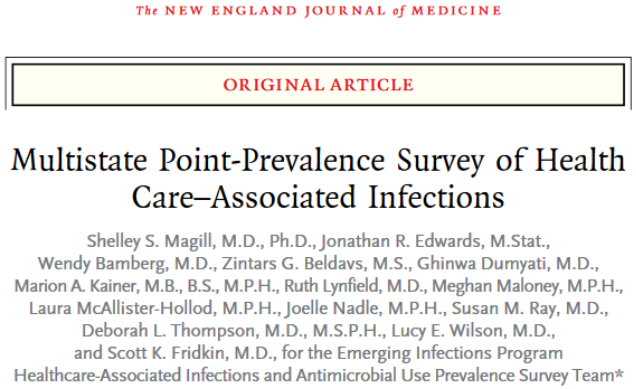
Russo *et al. Antimicrobial Resistance and Infection Control* (2019) 8:114
https://doi.org/10.1186/s13756-019-0570-y

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[1,2,3*], Andrew J. Stewardson[4], Allen C. Cheng[5,6], Tracey Bucknall[3,5,7] and Brett G. Mitchell[8,9]



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? - Burden

Lydeamore *et al.*
Antimicrobial Resistance & Infection Control (2022) 11:69
https://doi.org/10.1186/s13756-022-01109-8

Antimicrobial Resistance and Infection Control

RESEARCH Open Access

Burden of five healthcare associated infections in Australia

M. J. Lydeamore[1,2*], B. G. Mitchell[3,4], T. Bucknall[5,6], A. C. Cheng[2], P. L. Russo[7,8†] and A. J. Stewardson[2†]

Table 1 Annual burden of five healthcare associated infections (HAIs), estimated from Australian point prevalence survey data from 2018

	Number of HAIs (95% UI)	Deaths (95% UI)	DALYs (95% UI)	YLL (95% UI)	YLD (95% UI)
SSI	44,238 (31,176–63,797)	876 (617–1263)	13,197 (9298–19,001)	12,982 (9149–18,722)	214 (145–317)
UTI	42,408 (25,200–68,735)	729 (259–1772)	16,087 (5939–37,218)	10,983 (3899–26,704)	4879 (1745–11,659)
CDI	5125 (2360–10,740)	262 (13–836)	2757 (241–8655)	2,635 (128–8403)	127 (21–384)
HAP	51,499 (31,343–82,877)	1904 (462–4430)	39,276 (17,608–77,915)	23,245 (5644–54,078)	15,684 (8038–28,817)
BSI	23,979 (15,658–36,245)	3512 (1874–6075)	46,773 (26,205–79,104)	39,665 (21,159–68,610)	6,964 (3660–12,446)
All	170,574 (135,779–213,898)	7583 (4941–11,135)	122,376 (85,136–172,784)	93,322 (61,443–135,722)	28,669 (18,571–43,924)

Numbers inside brackets indicate 95% uncertainty intervals (UI). *SSI* surgical site infections, *UTI* urinary tract infections, *CDI Clostridioides difficile* infection, *HAP* healthcare acquired pneumonia, *BSI* bloodstream infection, *DALYs* disability adjusted life years, *YLL* years of life lost, *YLD* years lived with disability

Why? - Burden

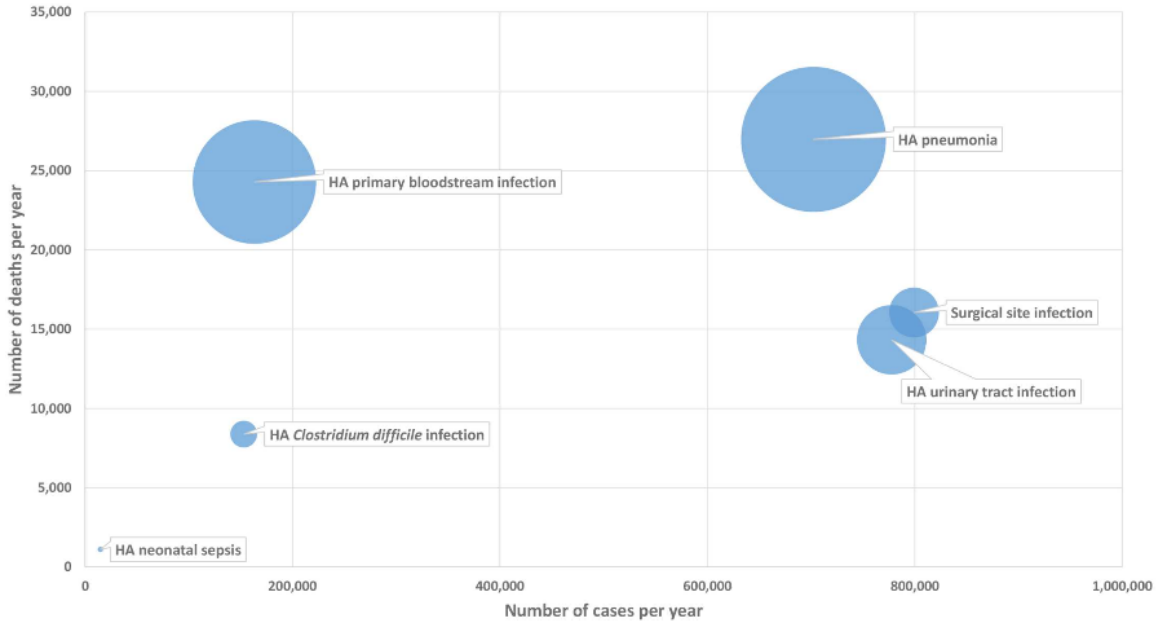


Fig 1. Six healthcare-associated infections according to their number of cases per year (*x*-axis), number of deaths per year (*y*-axis), and DALYs per year (width of bubble), EU/EEA, 2011–2012 (time discounting was not applied). DALY, disability-adjusted life year; HA, healthcare-associated.

PLOS | MEDICINE

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

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

Why? – Morbidity and mortality

- 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? – Morbidity and mortality

- Retrospective cohort study with propensity score matched populations (NV-HAP vs no NV-HAP
- NV-HAP occurred **in 0.6% of admissions**
- Mean **LOS 26.3 days for** NV HAP (6.7 days other HAP)
- **30-day mortality was 18.4%** (4.5% other HAP),
- **1 year mortality was 47.8**% (21.4% other HAP)
- Inpatient **sepsis** occurred in approximately **20%** of NV-HAP admissions

American Journal of Infection Control 000 (2022) 1–7

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

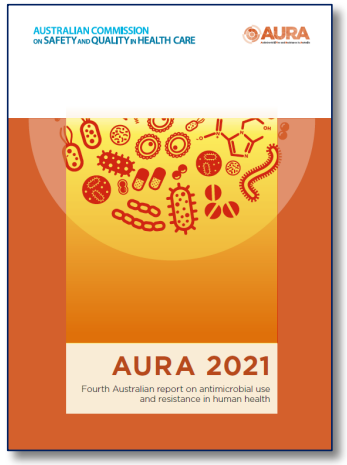
Major article

The association between non-ventilator associated hospital acquired pneumonia and patient outcomes among U.S. Veterans

Evan Carey PhD [a,b,c,*,**], Hung-Yuan P. Chen MPH [a,b], Dian Baker PhD, APRN [d], Richard Blankenhorn MSDA, BSF [a,b], Ryan J. Vega MD, MSHA [e,f], Michael Ho MD, PhD [a,b,g], Shannon Munro PhD, APRN, NP [h]

Why? – 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



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)

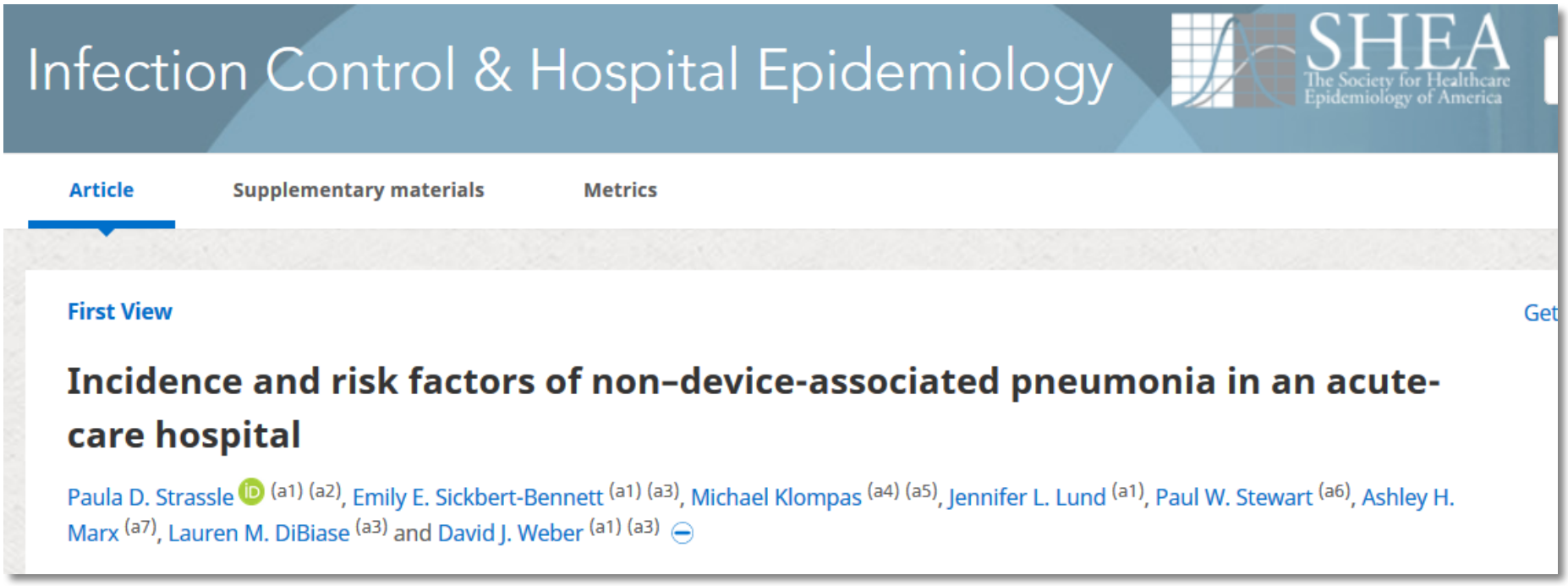
Risk factors

- Frailty
- Age
- Male
- Swallowing difficulties

Disclaimer

- Incidence vs prevalence
- Studies not been designed to answer this question

Risk factors



Infection Control & Hospital Epidemiology

SHEA The Society for Healthcare Epidemiology of America

Article | Supplementary materials | Metrics

First View

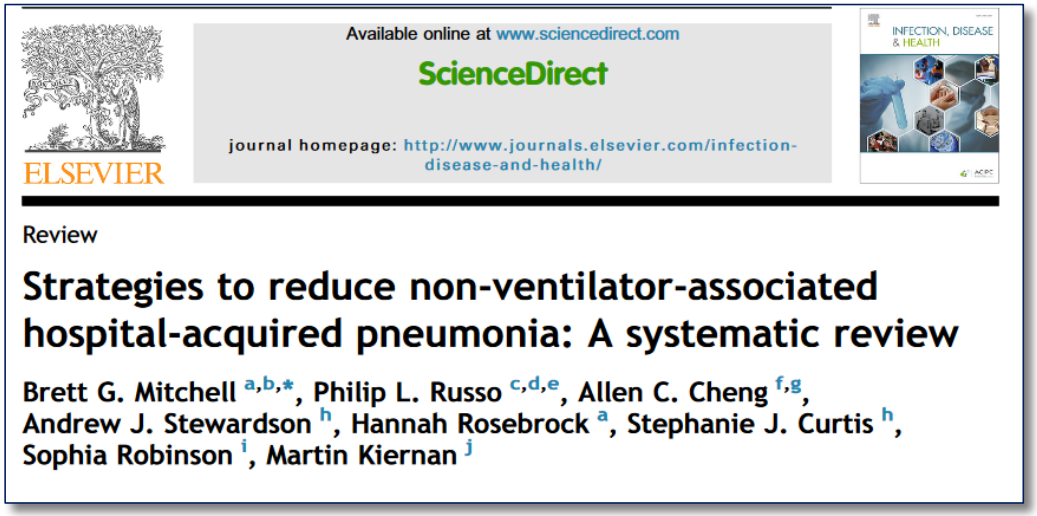
Incidence and risk factors of non–device-associated pneumonia in an acute-care hospital

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

163,000 admissions;
Rate 4.5/10,000 patient days
Male, age bronchitis, heart failure, immunosuppressed

Strategies to prevention HAP

Strategies to prevention HAP: Systematic review



Available online at www.sciencedirect.com

ScienceDirect

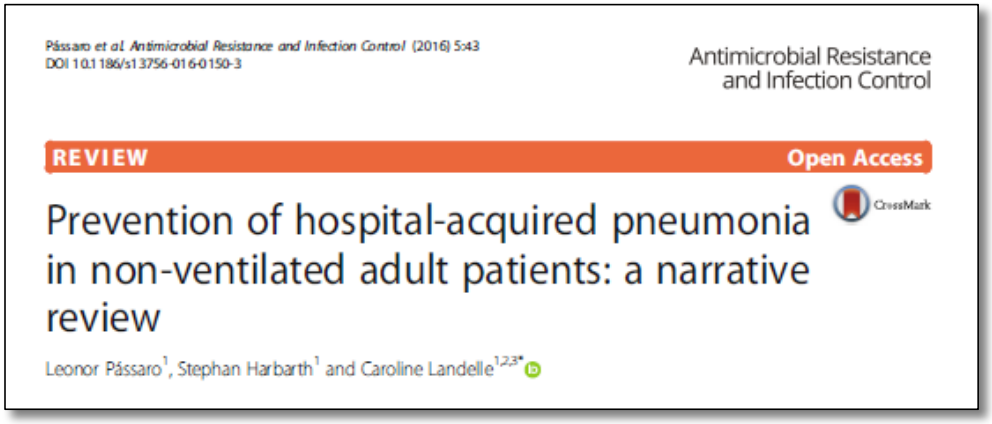
journal homepage: http://www.journals.elsevier.com/infection-disease-and-health/

ELSEVIER

Review

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

Brett G. Mitchell [a,b,*], Philip L. Russo [c,d,e], Allen C. Cheng [f,g], Andrew J. Stewardson [h], Hannah Rosebrock [a], Stephanie J. Curtis [h], Sophia Robinson [i], Martin Kiernan [j]



Pássaro et al. Antimicrobial Resistance and Infection Control (2016) 5:43
DOI 10.1186/s13756-016-0150-3

Antimicrobial Resistance and Infection Control

REVIEW Open Access

Prevention of hospital-acquired pneumonia in non-ventilated adult patients: a narrative review

Leonor Pássaro[1], Stephan Harbarth[1] and Caroline Landelle[1,2,3*]

15 articles

Table 1 Studies included in the review.

Author, Year	Design	Sample	Setting	Broad intervention strategy	Significant change in pneumonia
Adachi et al., 2002 [28]	RCT	141	Nursing home	Oral care (professional)	YES
Bellisimo-Rodrigues et al., 2014 [29]	RCT	254	Hospital (Intensive Care Unit)	Oral care (professional)	YES
Boden et al., 2018 [32]	RCT	441	Hospital	Physical activity	YES
Bouringault et al., 2010 [30]	RCT	2513	Nursing home	Oral care (professional)	NO
Chen et al., 2016 [40]	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
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

Note: + significance values not provided.

RCT
- 3 in NH
- 3 in hospital

RCT
- 4 professional care
- 2 physical activity

Oral care: No RCT

Table 1 Studies included in the review.

Author, Year	Design	Sample	Setting	Broad intervention strategy	Significant change in pneumonia
Adachi et al., 2002 [28]	RCT	141	Nursing home	Oral care (professional)	YES
Bellisimo-Rodrigues et al., 2014 [29]	RCT	254	Hospital (Intensive Care Unit)	Oral care (professional)	YES
Boden et al., 2018 [32]	RCT	441	Hospital	Physical activity	YES
Bouringault et al., 2010 [30]	RCT	2513	Nursing home	Oral care (professional)	NO
Chen et al., 2016 [40]	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
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

Note: + significance values not provided.

Prevention: 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	
Professional dental care						
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	✓
	Fatal pneumonia	14	184	30	182	✓
Bourigault	Patients with pneumonia	93	868	203	1645	
	Fatal pneumonia	15	868	26	1645	
Non-professional dental care						
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	✓

<u>Significant heterogeneity in interventions</u>

- Type
- Frequency
- Antiseptic

Prevention: Oral care

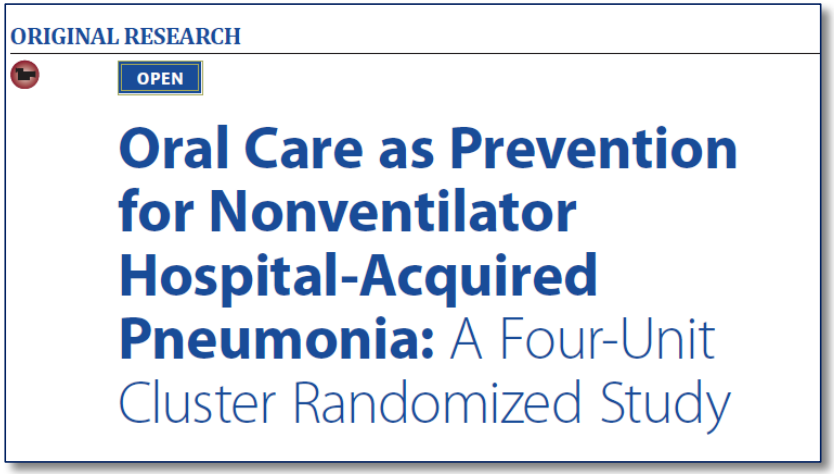
- Unsurprisingly, evidence suggests that improving oral care may reduce the incidence of HAP

  (Pássaro L, et al, Antimicrob Resist Infect Control 2016;5:43)

- Improvements in oral care are considered a modifiable risk factor for HAP

Prevention: Oral care

- Effectiveness of standardised oral care
- Oral care
  - ↑ 0.95 to 2.25 / day
- NV-HAP incidence rate
  - ↓ 82%



American Journal of Nursing (2021)

Karen K. Giuliano, Daleen Penoyer, Aurea Middleton, Dian Baker

The challenges with oral care

The challenges with oral care

- While oral care may seem deceptively simple in terms of base care provision, hospital and nursing services struggle to provide effective oral care delivery with high-reliability.

- Barriers to oral care include:
  - (1) the perception that oral care is an optional daily care activity for patient's comfort
  - (2) hospitals supply inadequate, poorly designed oral care materials, and
  - (3) hospitals are not required to monitor the incidence of NV-HAP.

- Munro, S., & Baker, D. (2018). Reducing missed oral care opportunities to prevent non-ventilator associated hospital acquired pneumonia at the Department of Veterans Affairs. *Applied Nursing Research*, *44*, 48-53.

Podcast on infection control matters: HAP

Professor Dian Baker

- "The human and financial cost of HAP"

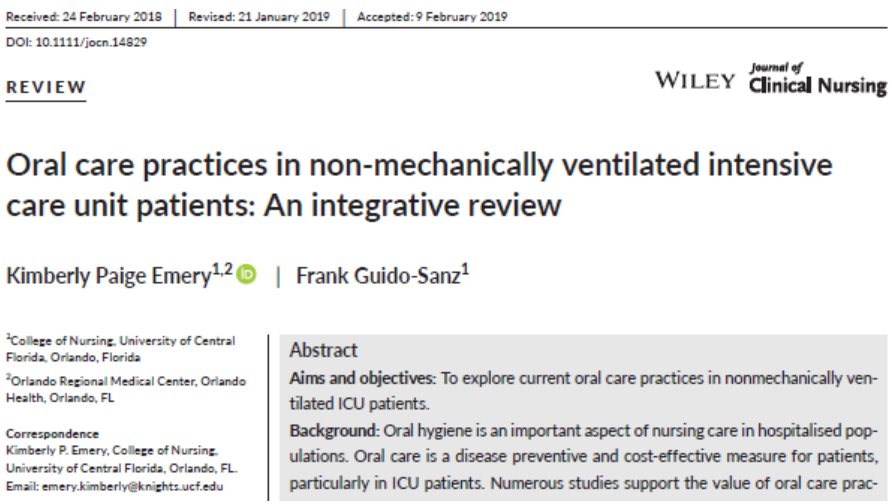
Dr Mark Garvey

- "Mouth care matters"

Podcast: Free, not sponsored, no ads

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[1,2] | Frank Guido-Sanz[1]

[1]College of Nursing, University of Central Florida, Orlando, Florida
[2]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.

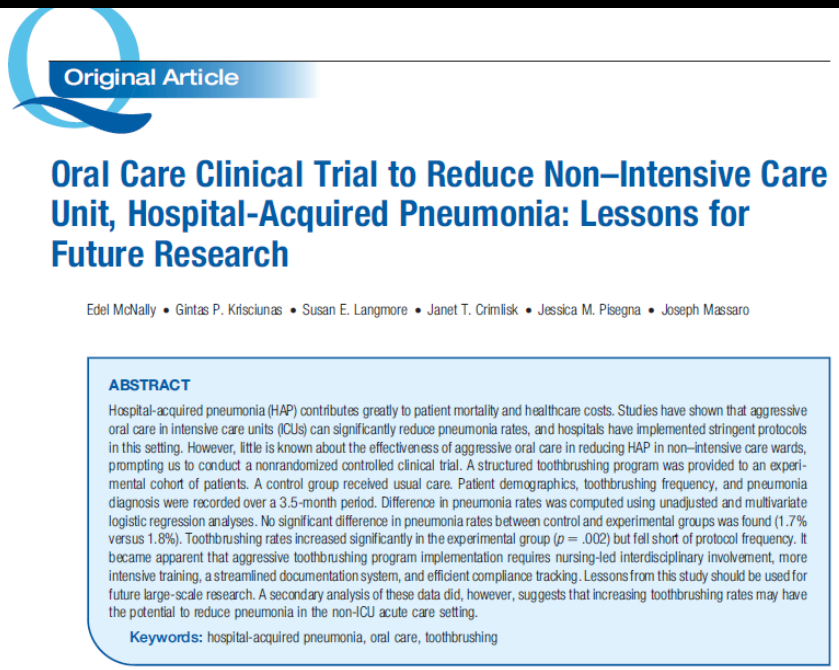
Background: Oral hygiene is an important aspect of nursing care in hospitalised populations. Oral care is a disease preventive and cost-effective measure for patients, particularly in ICU patients. Numerous studies support the value of oral care prac-

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. Pisegna • 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, suggests 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)

Prevention: Dysphagia

- 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

(Schrock et al., 2018; Titsworth et al., 2013)

Prevention: Movement

- Studies that involve a form of physical activity as a way of reducing the incidence of NV-HAP
  - effect of turning and passive mobilisation on patients with acute ischemic stroke (TurnMob study) (Cuesy et al., 2010) (RCT)
  - pre-operative patient education, early ambulation and self-directed breathing exercises, and additional pre-operative physiotherapy (Boden et al., 2018) (RCT)
  - physiotherapy-based intervention that involved early mobilisation in patients following a hip fracture (Stolbrink et al., 2014)

Diagnosis

Diagnosis

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

- ❖Chest radiography with clinical symptoms of pneumonia
- ❖Administrative coding data
- ❖Clinical Pulmonary Infection Score
- ❖Centers for Disease Control and Prevention (CDC) definition
- ❖National professional guidelines
- ❖Less clear or did not specify the diagnostic approach

Diagnosis

Clinical Microbiology and Infection 25 (2019) 1428.e7–1428.e13

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com

Original article

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

A. Wolfensberger [1,*], W. Jakob [2], M. Faes Hesse [1], S.P. Kuster [1], A.H. Meier [1], P.W. Schreiber [1], L. Clack [1], H. Sax [1]

Infection, Disease & Health (2021) 26, 67–71

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: http://www.journals.elsevier.com/infection-disease-and-health/

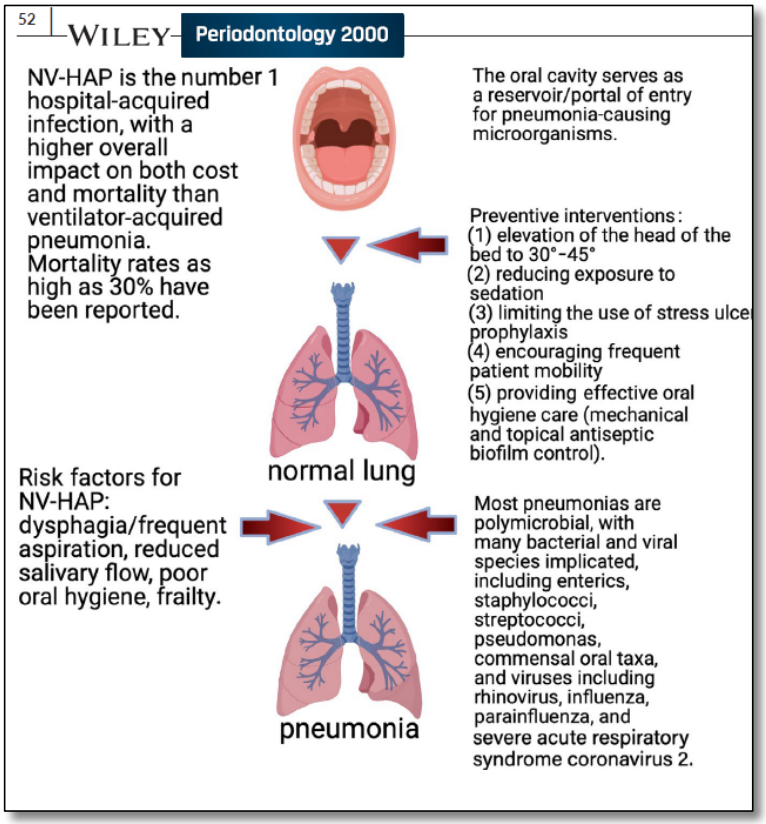
Research paper

How accurately is hospital acquired pneumonia documented for the correct assignment of a hospital acquired complication (HAC)?

D. Bartley [a], R. Panchasarp [a], S. Bowen [b], J. Deane [c], J.K. Ferguson [c,d,*]

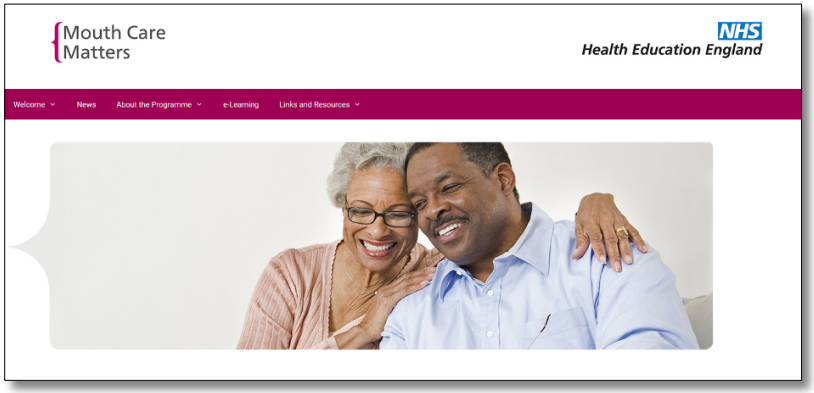
Take home messages

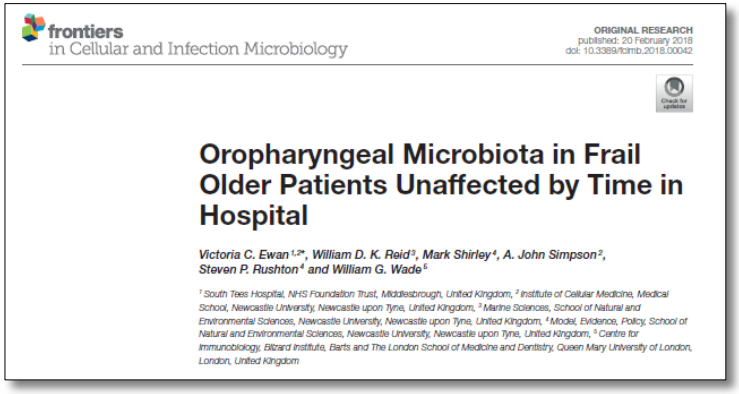
- Oral care
- Dysphagia
- Mobilisation



- Scannapieco, F. A., Giuliano, K. K., & Baker, D. (2022*). Periodontology 2000*, 89(1), 51-58.

Other considerations




frontiers in Cellular and Infection Microbiology

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

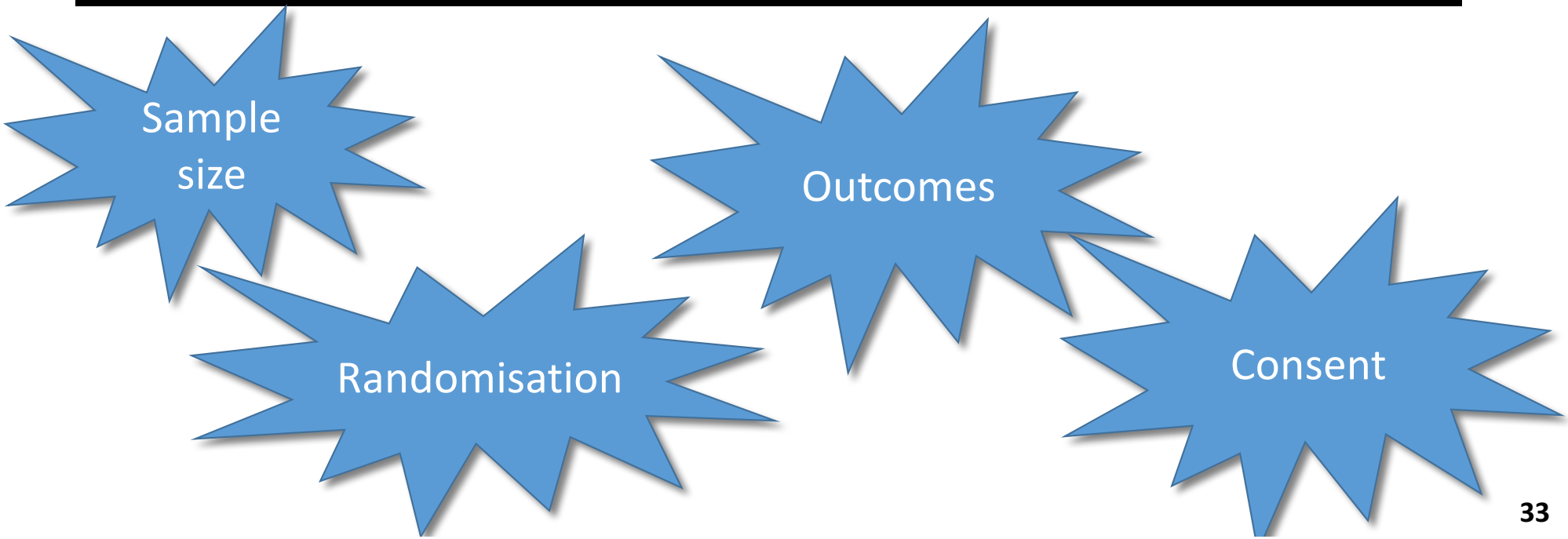
Oropharyngeal Microbiota in Frail Older Patients Unaffected by Time in Hospital

Victoria C. Ewan[1,2], William D. K. Reid[3], Mark Shirley[4], A. John Simpson[2], Steven P. Rushton[4] and William G. Wade[5]*

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

Other considerations

Study designs are a challenge



Opportunities

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

Healthcare associated pneumonia (HAP) Why should we bother and what can we do?

Professor Brett Mitchell

brett.mitchell@avondale.edu.au

Twitter: @1heathau

Avondale UNIVERSITY

INFECTION CONTROL MATTERS

DISCUSSIONS ON INFECTION PREVENTION

www.webbertraining.com/schedulep1.php

Thanks to Teleclass Education

PATRON SPONSORS

diversey.com

virox.com

gojo.com

gamahealthcare.com