

Improving oral health in critically ill adults

Cindy L. Munro

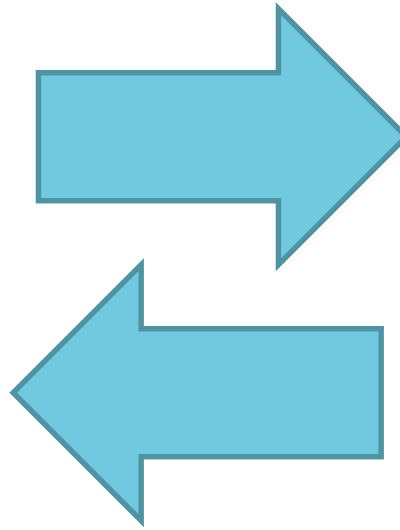
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Associate Dean of Research and Innovation

University of South Florida College of Nursing

Oral Health

- Xerostomia (dry mouth)
 - increased cavity risk
- Gingival disease
 - hyperplasia
 - gingivitis
- Periodontal disease

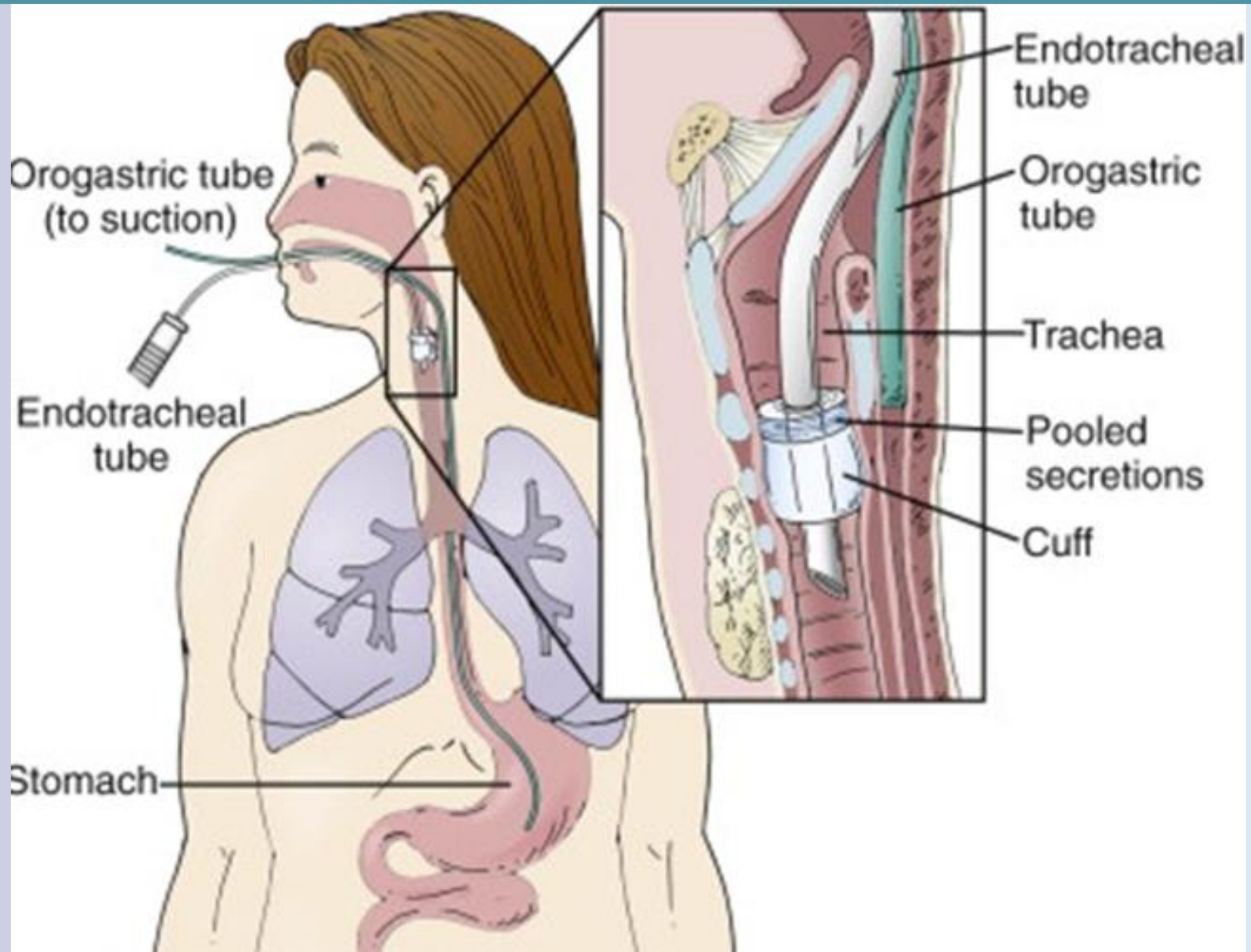


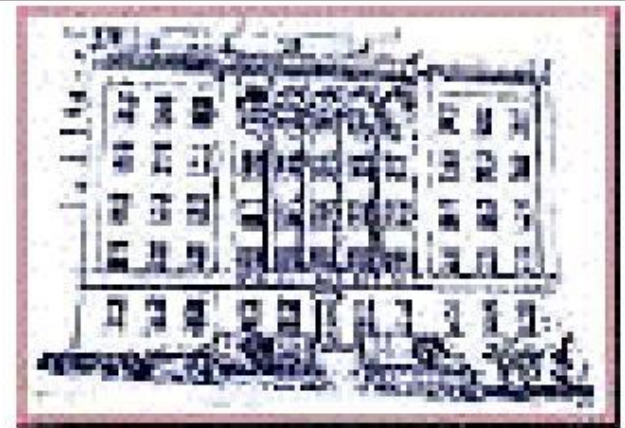
Systemic Health

- Respiratory
 - pneumonia
- Cardiovascular
 - endocarditis
 - bacteremia
 - atherosclerosis
- Endocrine
 - diabetes mellitus control
- Reproductive
 - preterm birth
- Quality of life

Ventilator Associated Pneumonia in the 1990's

- Leading cause of nosocomial infection death
 - One in four mechanically ventilated adults
 - Half of those affected died from VAP
- Associated with increased
 - length of mechanical ventilation
 - length of stay
 - mortality
 - COST





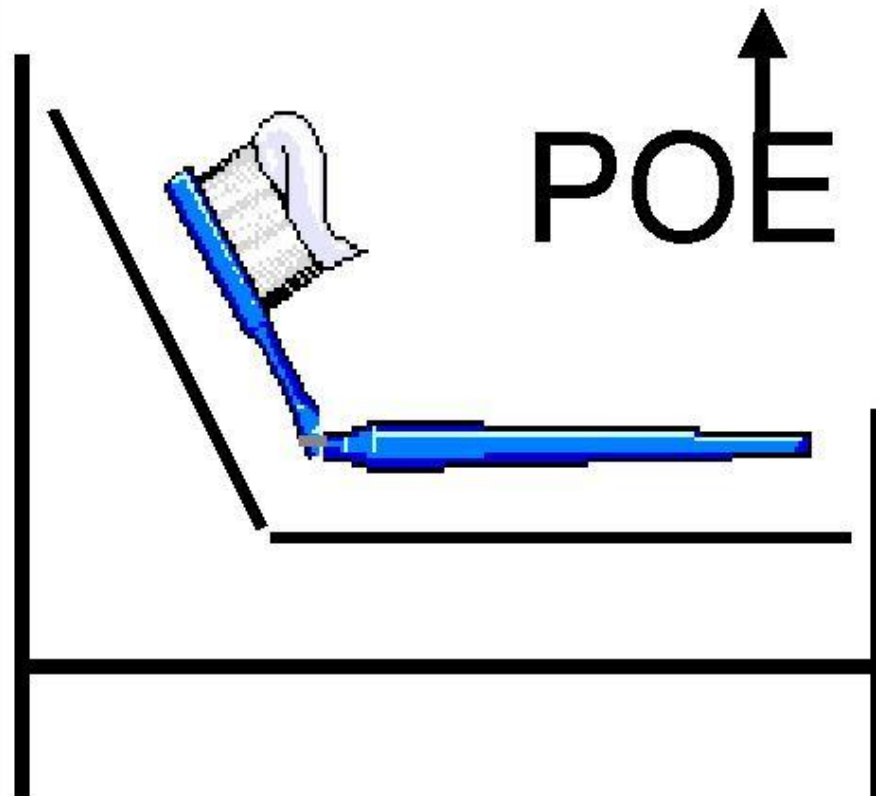
VCU
School of Nursing

Mary Jo Grap, PhD, RN, CCRN, ACNP

Cindy Munro, PhD, RN, ANP

Russel S. Hummel III, MS, EMT-P

Mary Corley, PhD, RN



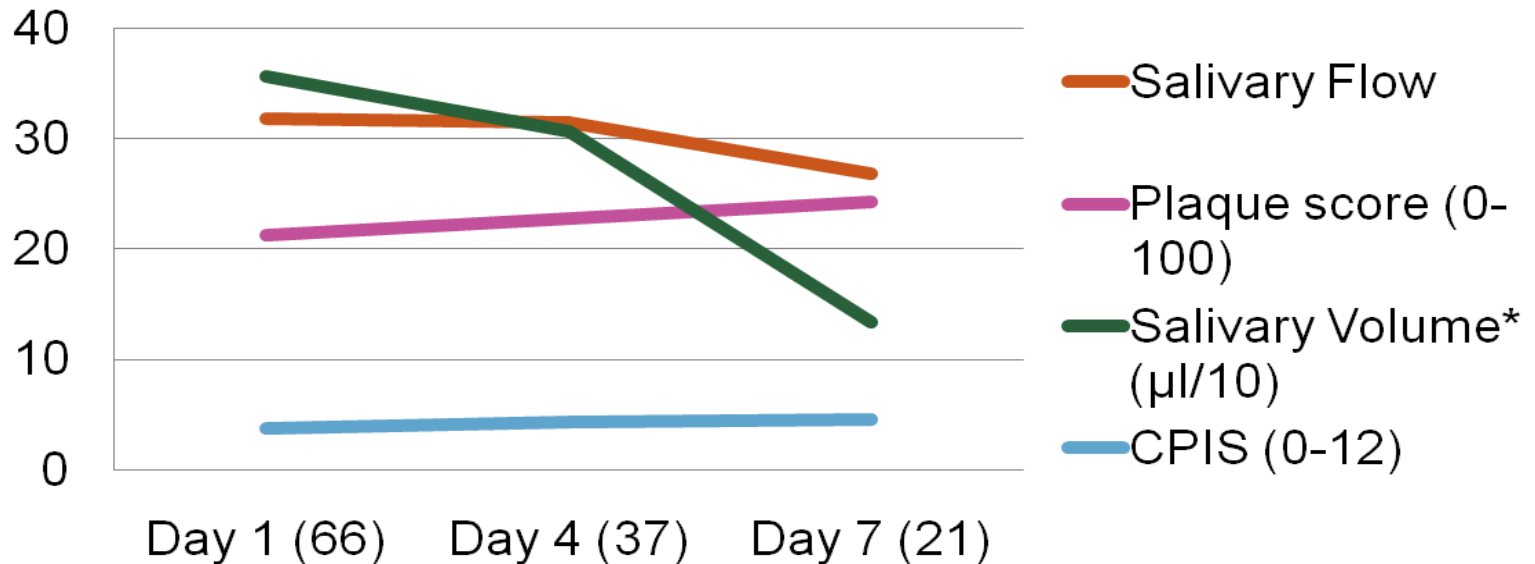
Pneumonia,
Oral health and backrest
Elevation study

Funded by NINR R15NR04730, MJ Grap, PI

POE: Two for one!

- 66 Adult MRICU subjects enrolled within 24 hours of intubation
- Data were obtained on study days 1, 4, and 7 (or until extubation)
 - Oral Health Status
 - Back rest elevation
 - VAP (CPIS)
 - Data related to risk factors
- A mixed stepwise selection procedure was used to develop a regression model predicting risk of VAP (day 4 CPIS).

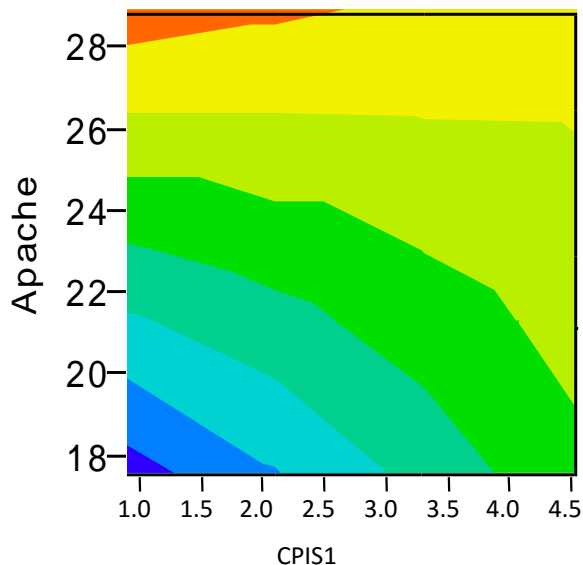
Oral health over time: POE study



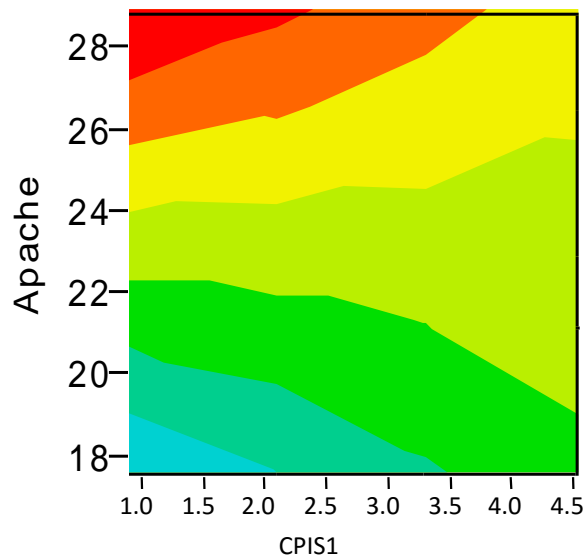
Plaque score ($P < .001$) and CPIS ($P < .01$) increased over time, while salivary flow and salivary volume decreased ($P < .01$)

Lower salivary volume was associated with higher day 4 CPIS ($P = .02$).

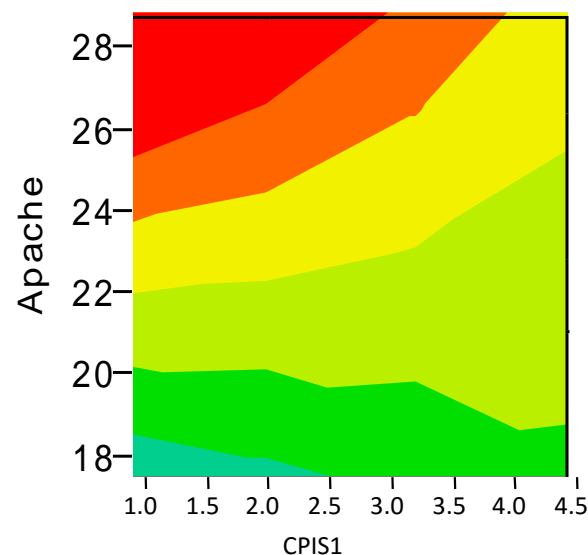
Interaction of Plaque, APACHE II, and Day 1 CPIS in Predicting Day 4 CPIS



Lowest
Plaque Tercile
(Cleanest teeth)



Middle
Plaque Tercile



Highest
Plaque Tercile
(Most plaque)

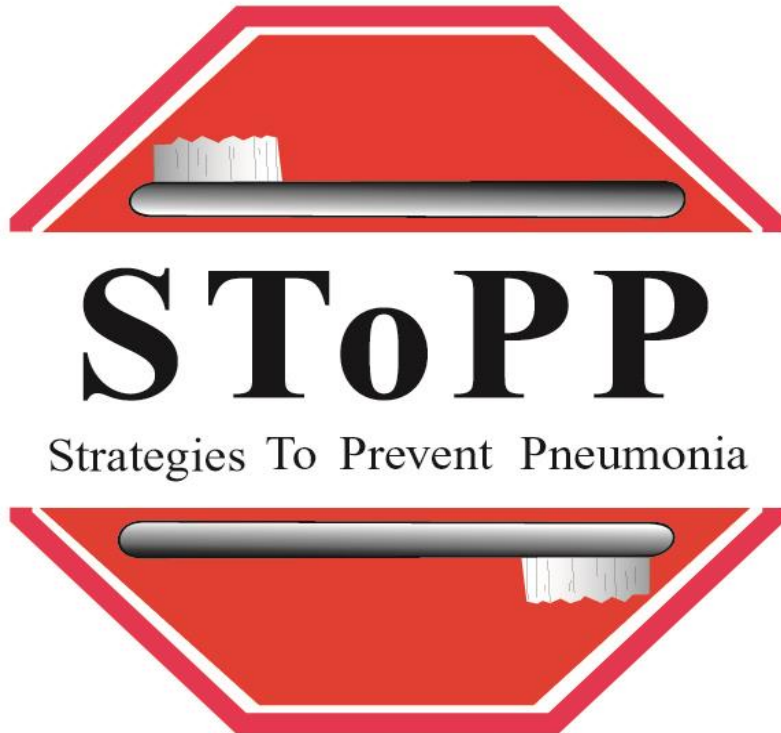
Munro, AJCC, 2006

Dr. Mary Jo Grap



Dr. Curt Sessler

Dr. Deborah Jones



Munro CL, Grap MJ, Carter WH, Sessler C.
Oral Care Intervention in Mechanically
Ventilated Adults. Funded by NIH R01
NR07652, ClinicalTrials.gov NCT00234598

RCT 2X2 Factorial Design



Chlorhexidine (CHX) 0.12% twice a day
Tooth brushing three times a day

SToPP Study VAP Results

Table 2
Comparison of baseline and day 3 outcomes by treatment

| Outcomes | All patients (n = 192) | | <i>p</i> ^a | Patients without pneumonia at baseline (n = 87) | | <i>p</i> ^b |
|--|------------------------|-------------|-----------------------|---|-------------|-----------------------|
| | Day 1 | Day 3 | | Day 1 | Day 3 | |
| Clinical Pulmonary Infection Score, mean (SD) | | | | | | |
| Chlorhexidine | | | .29 | | | .02 ^c |
| Yes | 5.36 (2.17) | 5.26 (2.44) | | 3.56 (1.29) | 4.36 (2.11) | |
| No | 5.70 (2.35) | 5.78 (2.20) | | 3.36 (1.16) | 5.36 (2.08) | |
| Toothbrushing | | | .95 | | | .30 |
| Yes | 5.66 (2.38) | 5.58 (2.34) | | 3.49 (1.30) | 5.02 (2.28) | |
| No | 5.41 (2.16) | 5.48 (2.33) | | 3.43 (1.17) | 4.66 (2.01) | |
| Pneumonia, % | | | | | | |
| Chlorhexidine | | | .13 | | | .006 ^c |
| Yes | 51.1 | 41.3 | | — ^d | 24 | |
| No | 58.0 | 55.0 | | — | 52 | |
| Toothbrushing | | | .86 | | | .54 |
| Yes | 55.7 | 49.5 | | — | 40 | |
| No | 53.7 | 47.4 | | — | 36 | |

^a *P* comparing those with and without the specific intervention, for all patients; analyses controlling for intensive care unit (strata), baseline Clinical Pulmonary Infection Score, and presence of other intervention.

^b *P* comparing those with and without the specific intervention, for patients without pneumonia at baseline; analysis controlling for intensive care unit (strata), baseline Clinical Pulmonary Infection Score, and presence of other intervention.

^c Statistically significant ($P \leq .025$).

^d Dash indicates not applicable.

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^c Statistically significant (*P* ≤ .025).

^d Dash indicates not applicable.

AJCC

American Journal of
Critical Care

Evidence-based interdisciplinary knowledge for high acuity and critical care

Chlorhexidine, Toothbrushing, and Preventing Ventilator-Associated Pneumonia in Critically Ill Adults

Cindy L. Munro, Mary Jo Grap, Deborah J. Jones, Donna K. McClish and Curtis N. Sessler

Am J Crit Care. 2009;18: 428-437 doi: 10.4037/ajcc2009792
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Published online <http://www.ajcconline.org>

Toothbrushing alone did not reduce ventilator-associated pneumonia, and combining toothbrushing with chlorhexidine did not provide additional benefit over chlorhexidine alone.

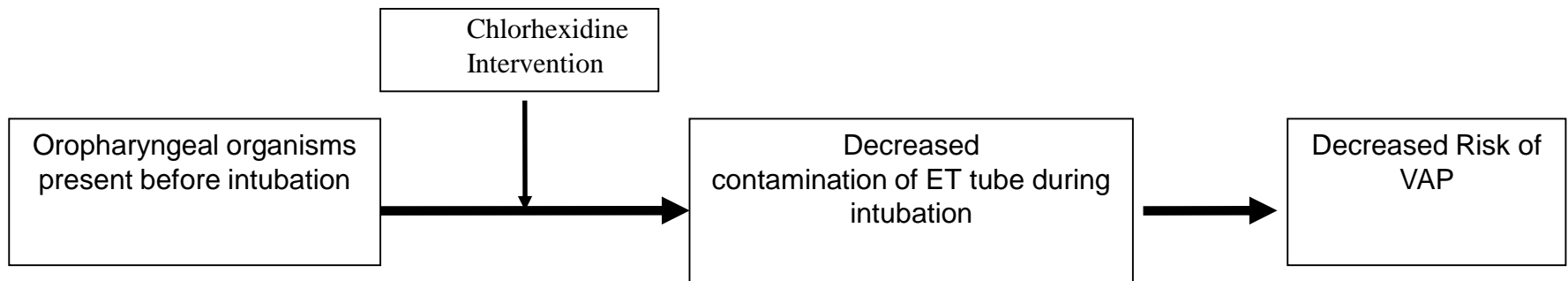
Changes in Practice

- Institute for Healthcare Improvement (IHI)
Ventilator Bundle
 - Elevation of the Head of the Bed
 - Daily “Sedation Vacations”; Assessment of Readiness to Extubate
 - Peptic Ulcer Disease Prophylaxis
 - Deep Venous Thrombosis Prophylaxis
 - Oral care with CHX (added 2010!)
 - SToPP study cited as evidence



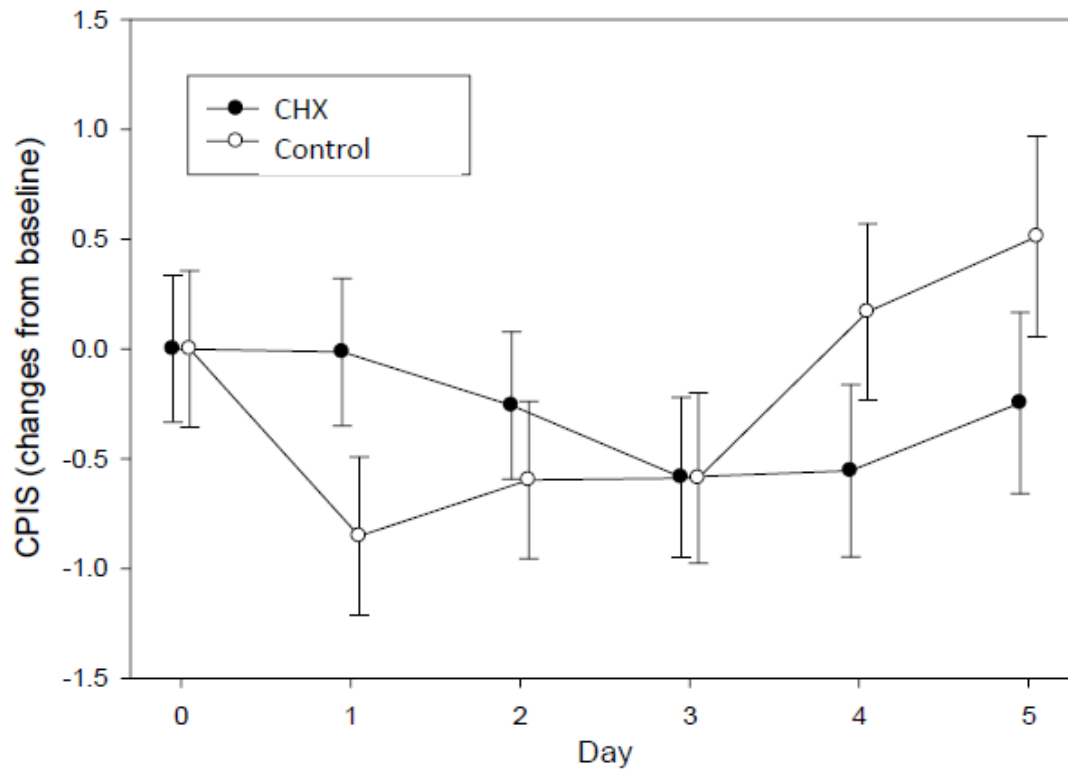
Next step...SToPP2!

- Application of chlorhexidine BEFORE intubation (in patients other than cardiac surgery)



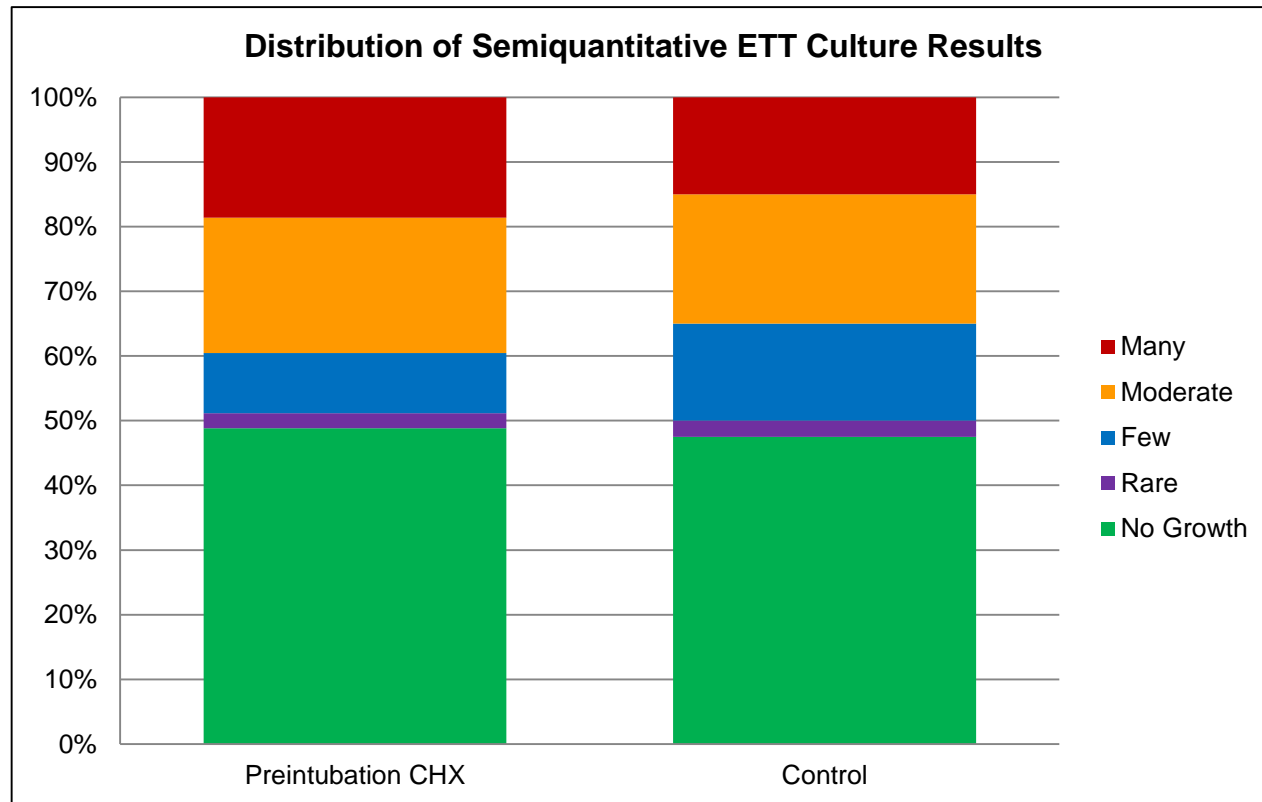
SToPP2 Results

- Preintubation CHX did not provide additional benefit to daily CHX



SToPP2 Results

- ETT colonization rates were equivalent between groups



Preintubation Application of Oral Chlorhexidine Does Not Provide Additional Benefit in Prevention of Early-Onset Ventilator-Associated Pneumonia

Cindy L. Munro, PhD, RN, ANP; Mary Jo Grap, PhD, RN; Curtis N. Sessler, MD, FCCP; Ronald K. Eswick Jr, PhD; Devanand Mangar, MD; Rachel Karlinski-Overall, PhD; and Paula Cairns, BSN, RN

BACKGROUND: Daily application of oral chlorhexidine gluconate (CHX) following intubation to reduce the risk of ventilator-associated pneumonia (VAP) is now the standard of care in many ICUs. This randomized clinical trial evaluated the benefit of adding a preintubation CHX dose to the known benefit of postintubation CHX to reduce the risk of early-onset VAP. A secondary aim was to test the effect of a preintubation oral application of CHX on early endotracheal tube (ETT) colonization.

METHODS: Subjects (N = 314) were recruited from two teaching hospitals and were randomly assigned to oral application of 5 mL CHX 0.12% solution before intubation (intervention group, n = 157), or to a control group (n = 157) who received no CHX before intubation. All subjects received CHX bid after intubation. Groups were compared using a repeated-measures model with Clinical Pulmonary Infection Score (CPIS) as the response variable. In a planned subset of subjects, ETts were cultured at extubation.

RESULTS: Application of a preintubation dose of CHX did not provide benefit over the intervention period beyond that afforded by daily oral CHX following intubation. ETT colonization at extubation was < 20% in both groups (no statistically significant difference). Mean CPIS remained below 6 (VAP threshold score) in both groups.

CONCLUSIONS: Although it is feasible to deliver CHX prior to intubation (including emergent or urgent intubation), the results suggest that preintubation CHX may be inconsequential when the ventilator bundle, including daily oral CHX, is in place. During the preintubation period, providers should focus their attention on other critical activities.

TRIAL REGISTRY: ClinicalTrials.gov; No.: NCT00893763; URL: www.clinicaltrials.gov

Ventilator Associated Pneumonia in the 2010's

- Reduced incidence
- New CDC surveillance definitions
 - VAE (ventilator-associated *events*)
 - VAC (ventilator-associated *condition*)
 - IVAC (*infection-related ventilator-associated complication*)
 - » VAP (ventilator-associated pneumonia)
 - No use of chest radiographs in surveillance
 - Implications for CPIS
 - VAC identified only after 3 days of stability or improvement
 - VAP for internal reporting purposes

Where to next?



Assuming one tooth brushing for each patient for each day of ICU care in the US,

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tooth brushing is performed at least 18 million times annually in the ICU.


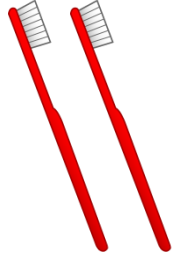
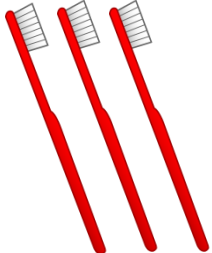
Assuming one tooth brushing for each patient for each day of ICU care in the US,

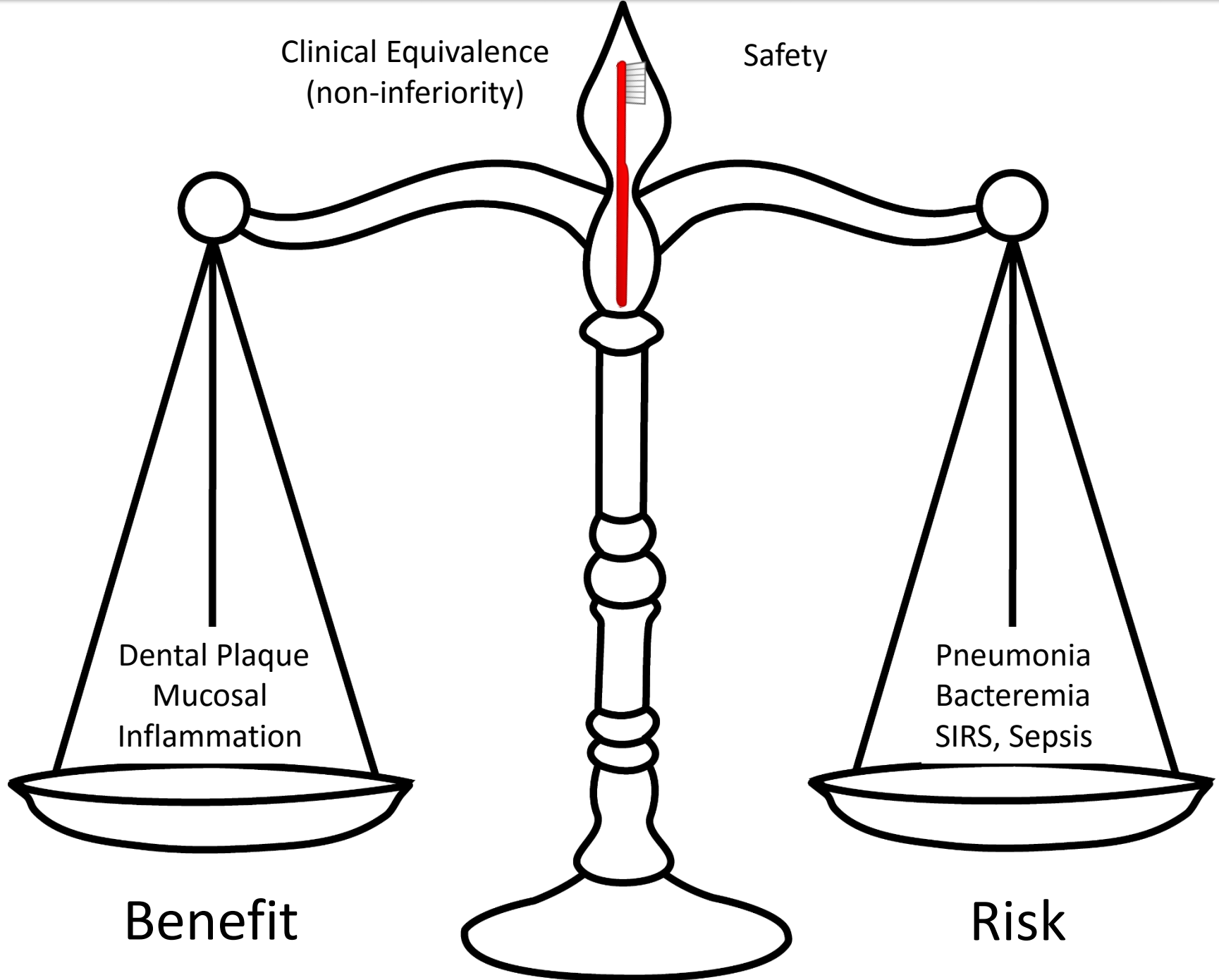
tooth brushing is performed at least 18 million times annually in the ICU.

We have NO evidence to guide frequency of toothbrushing in the ICU!

Frequency of Oral Care Intervention Study: FOCIS

- Design permits assessment of clinical equivalence and safety- “best practice” recommendation
- Determining the best brushing interval
 - Balancing risk and benefit

- Randomized to  or  or  daily



Frequency of Oral Care Intervention Study (FOCIS)

SToPP2

325 mechanically ventilated adults
CHX before intubation: no VAP difference

Strategies to Prevent Pneumonia (SToPP)

545 mechanically ventilated adults
VAP: CHX beneficial, tooth brushing not, no interaction

Observational studies, POE, SToPP-IT

Oral care intervention in
mechanically ventilated adults
NIH R01 NR007652

Behind every exquisite meal
someone peels the potatoes



Dr. Mary Jo Grap
and students

Behind every exquisite meal
someone peels the potatoes

Dr. Frank Macrina
and lab and students
Dr. Todd Kitten
and lab and students
Dr. Ping Xu
and lab and students

VCU Colleagues
Dr. Curt Sessler
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Dr. Kevin Ward



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Dr. Rachel Karlnosky

AJCC colleagues
Dr. Richard Savel
Dr. Melissa Jones
Michael Muscat

Dr. Mary Lou Sole

FUNDERS and Institutions:
NIH (Special Kudos to NINR)
Virginia Commonwealth U
U South Florida
MedImmune, Inc
VCU Health System
Tampa General Hospital

ALL of the nurses who supported the work!