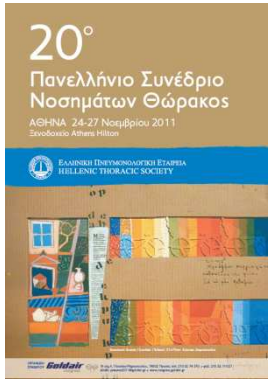


20ο Πανελλήνιο Συνέδριο
Νοσημάτων Θώρακος

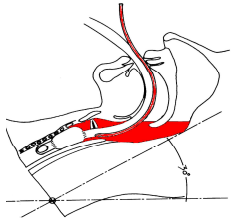
Αθήνα, 24-27 Νοεμβρίου Hilton Athens Hotel

Ventilator Associated Pneumonia:

Μια ιατρογενής επιπλοκή που μπορεί να προληφθεί ;

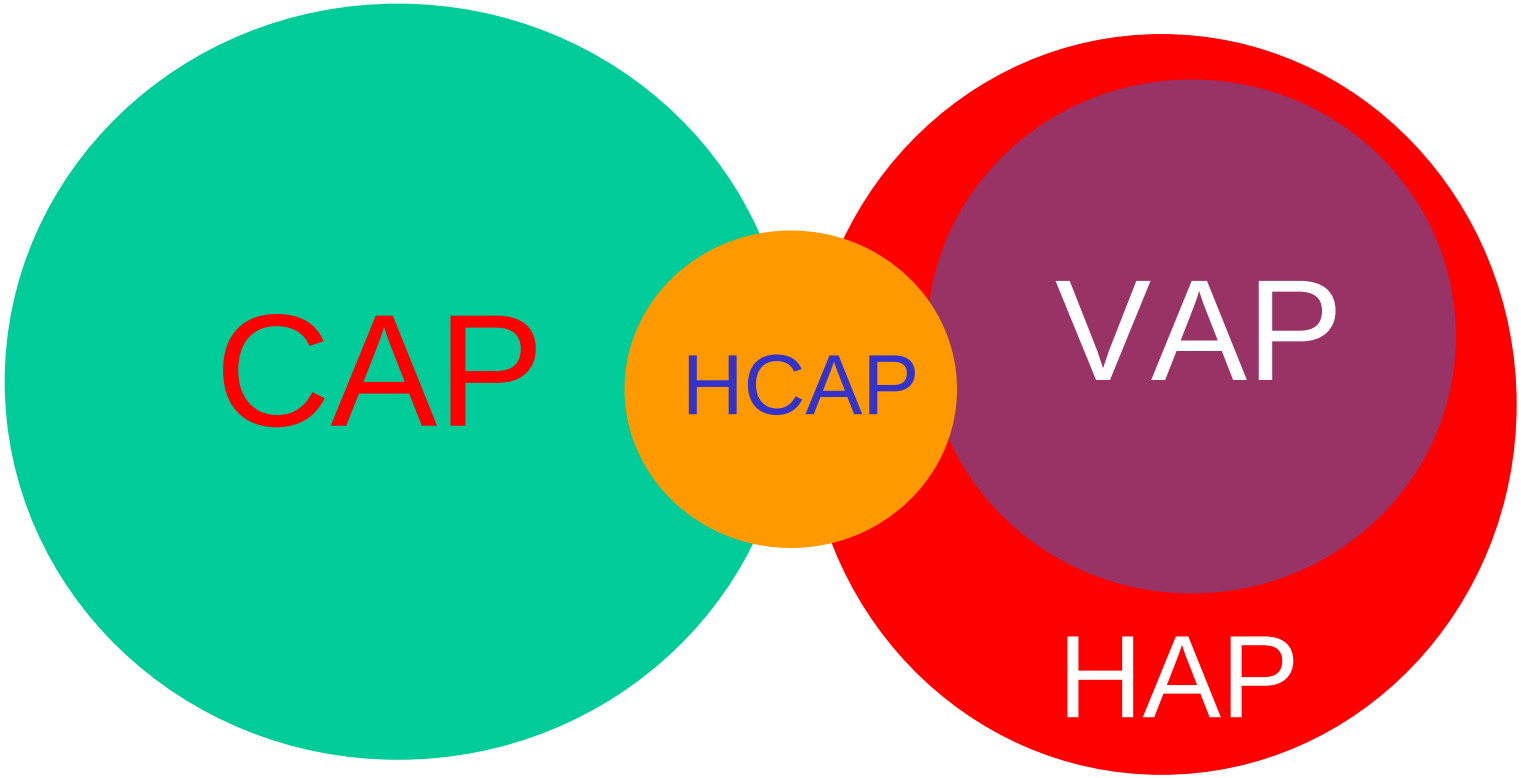




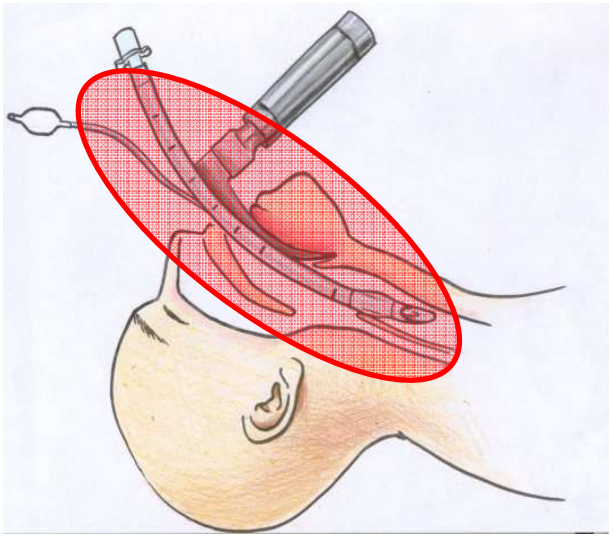


Ιωάννης Πνευματικός
Δημοκρίτειο Πανεπιστήμιο Θράκης

Classification of Pneumonias
(ATS 2005)



What is VAP? (or ETAP?)



VAP is defined

as pneumonia occurring

in a mechanically ventilated patient

after 48 hours

of endotracheal intubation

- *Early onset: <5 ημέρες*
- *Late onset: >5 ημέρες*

Epidemiology

- Incidence: 10-30%
- Mortality
  - crude 30-40%
  - attributable: 5-25%
- LOS in ICU : ~↑ 6 days
- Cost: ~↑ 10.000$!!

ICM 2009; 35:9-29

USA: Great pressure on hospitals to reduce VAP rate!

1. Mandatory public reporting of HCAIs!

2. *Medicare and Medicaid Services* proposal: to add VAP to their list of no reimbursable complications!

EDITORIAL COMMENTARY

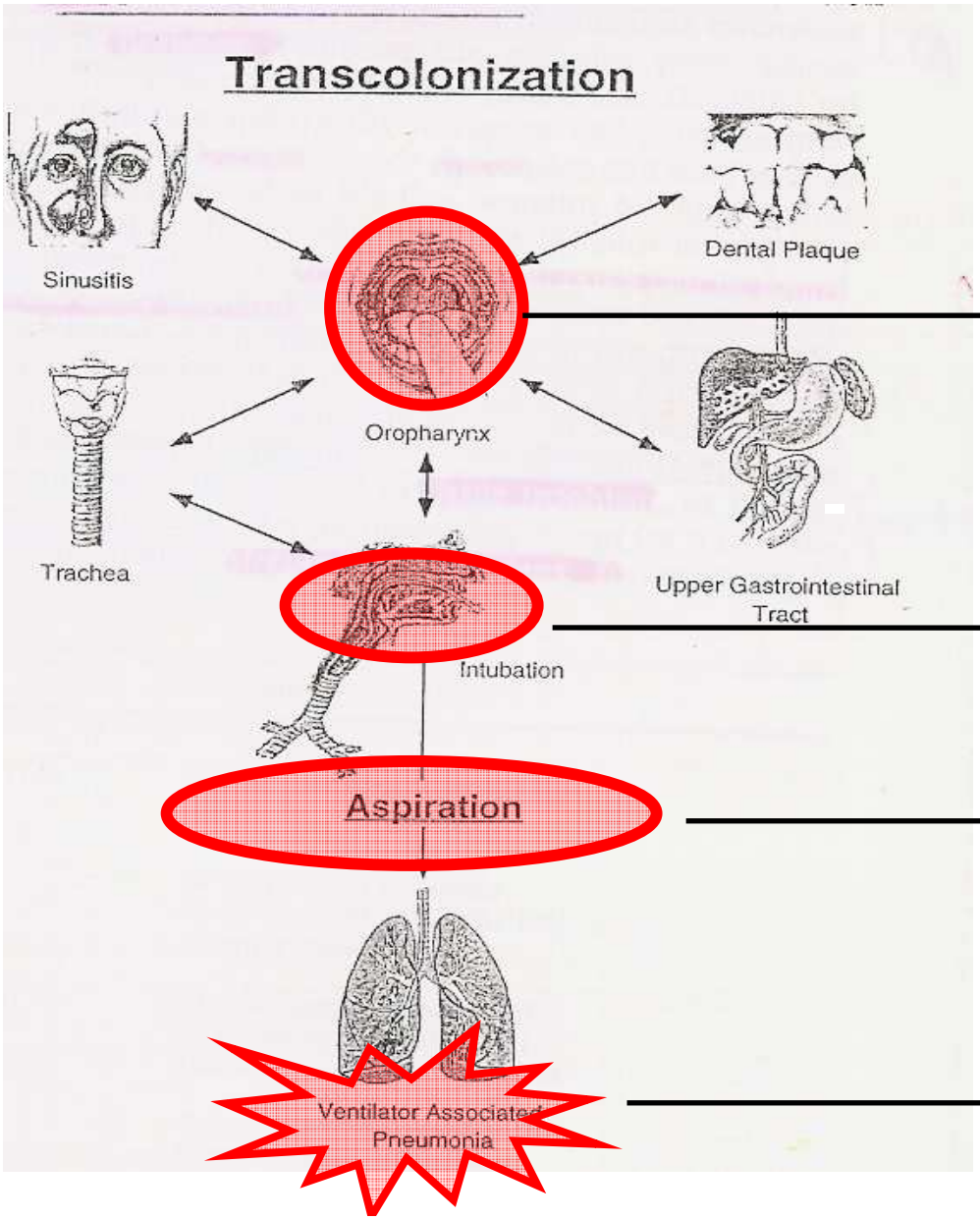
Ventilator-Associated Pneumonia: Is Zero Possible?

Michael Klompas

Infection Control Department, Brigham and Women's Hospital, and Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts

Clinical Infectious Diseases 2010;51(10):1123–1126

Pathogenesis



Colonization

Biofilm

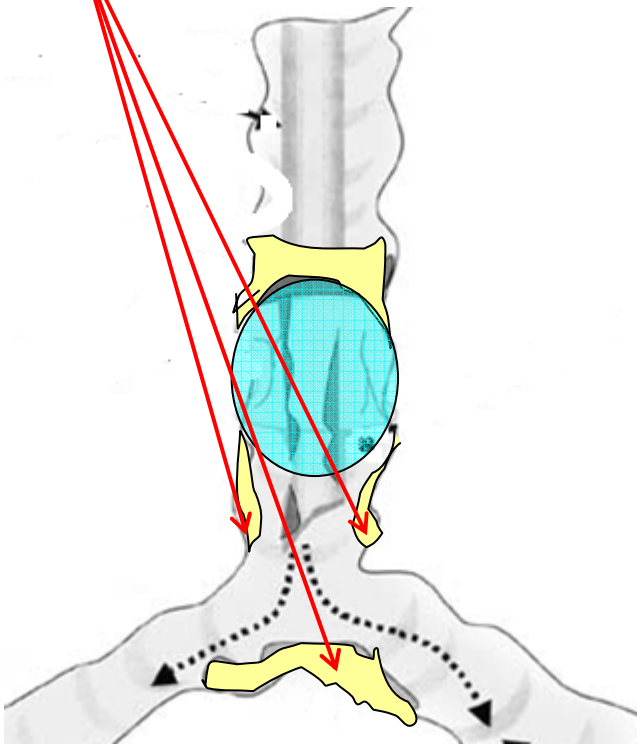
Aspiration

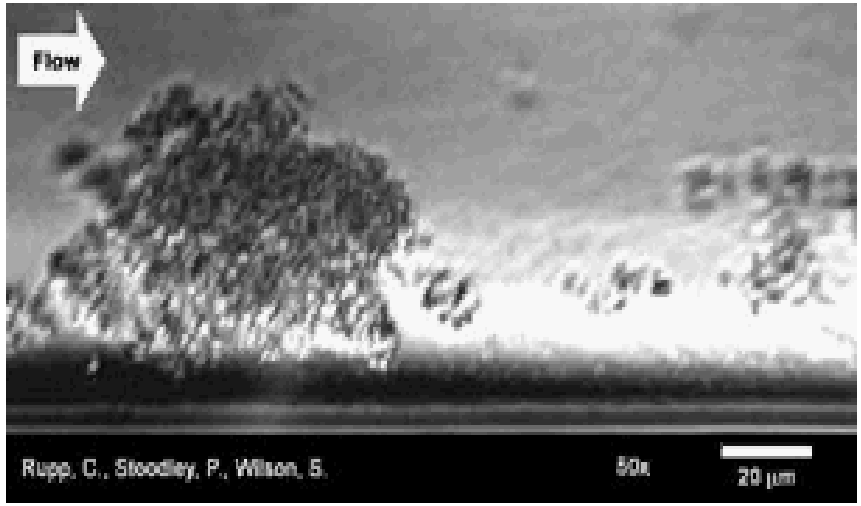
Host defense

Pathogenesis VAP (or ETAP?)

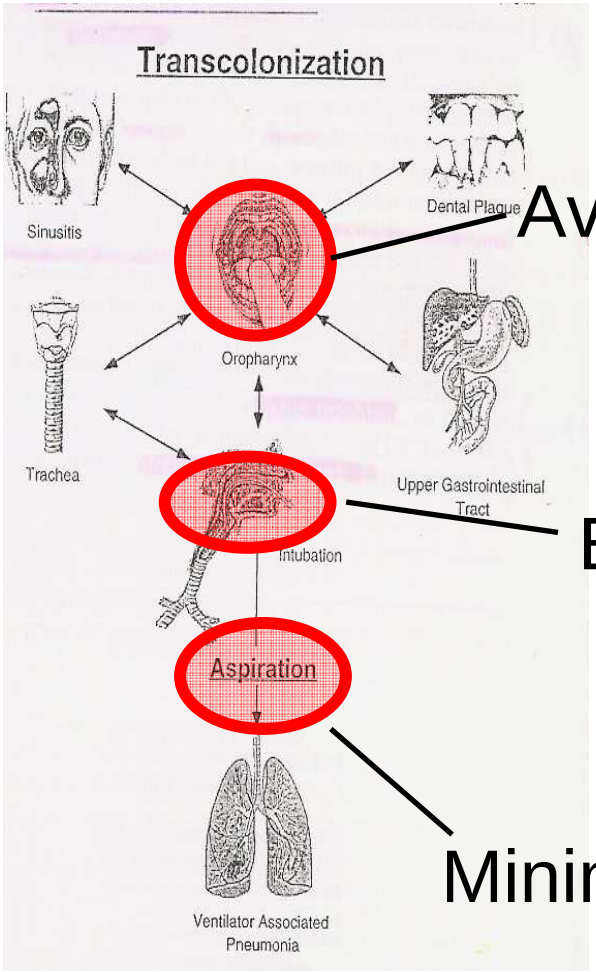
The role of ET

Microaspiration





Prevention



Avoid colonization!

1. *Avoid unnecessary antibiotics*
2. *Shorten antibiotic courses*
3. *Prevention of maxillary sinusitis*
4. *Avoid ulcer prophylaxis*
5. *Consider SDD*
6. *Probiotics*
7. *Chlorexidine oral rinse*
8. *Hand hygiene*

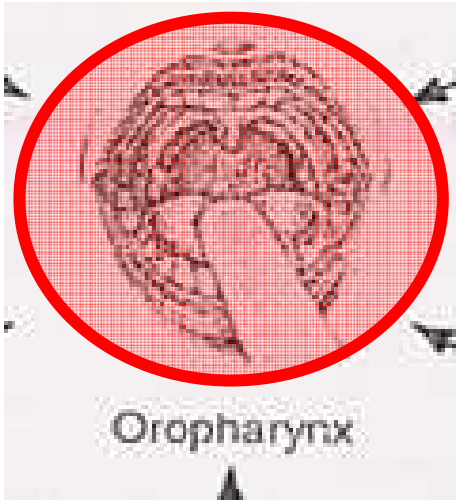
Eliminate biofilm!

1. *Antimicrobial-coated ETs?*

Minimize Aspiration!

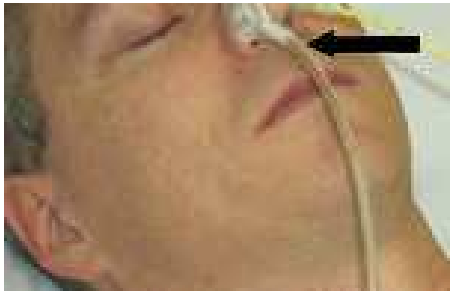
1. *Shorten duration of MV*
2. *Semi-recumbent position*
3. *ET cuff material*
4. *Subglottic secretions aspiration*
5. *Avoid patient transport*
6. *Reduce accidental intubations*

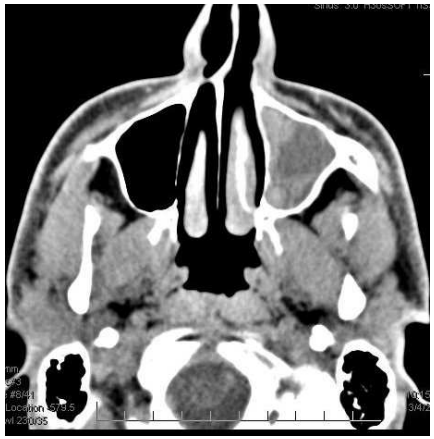
A. Avoid Colonization!



1. *Prevention of nosocomial sinusitis*
2. *Selective Digestion Decontatmination, SDD*
3. *Chlorexidine oral rinse*
4. *Probiotics*

Prevention of maxillary sinusitis



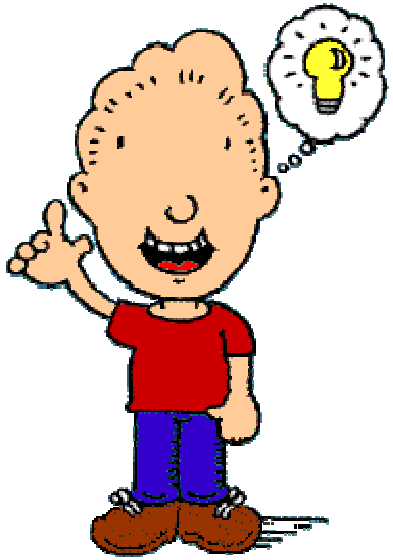


1. *Avoid nasotracheal intubation!*
2. *Avoid nasogastric tubes!*
3. *Consider nasal decongestant and/or corticosteroids!*

Pneumatikos et al ICM (2006) 32:532–537

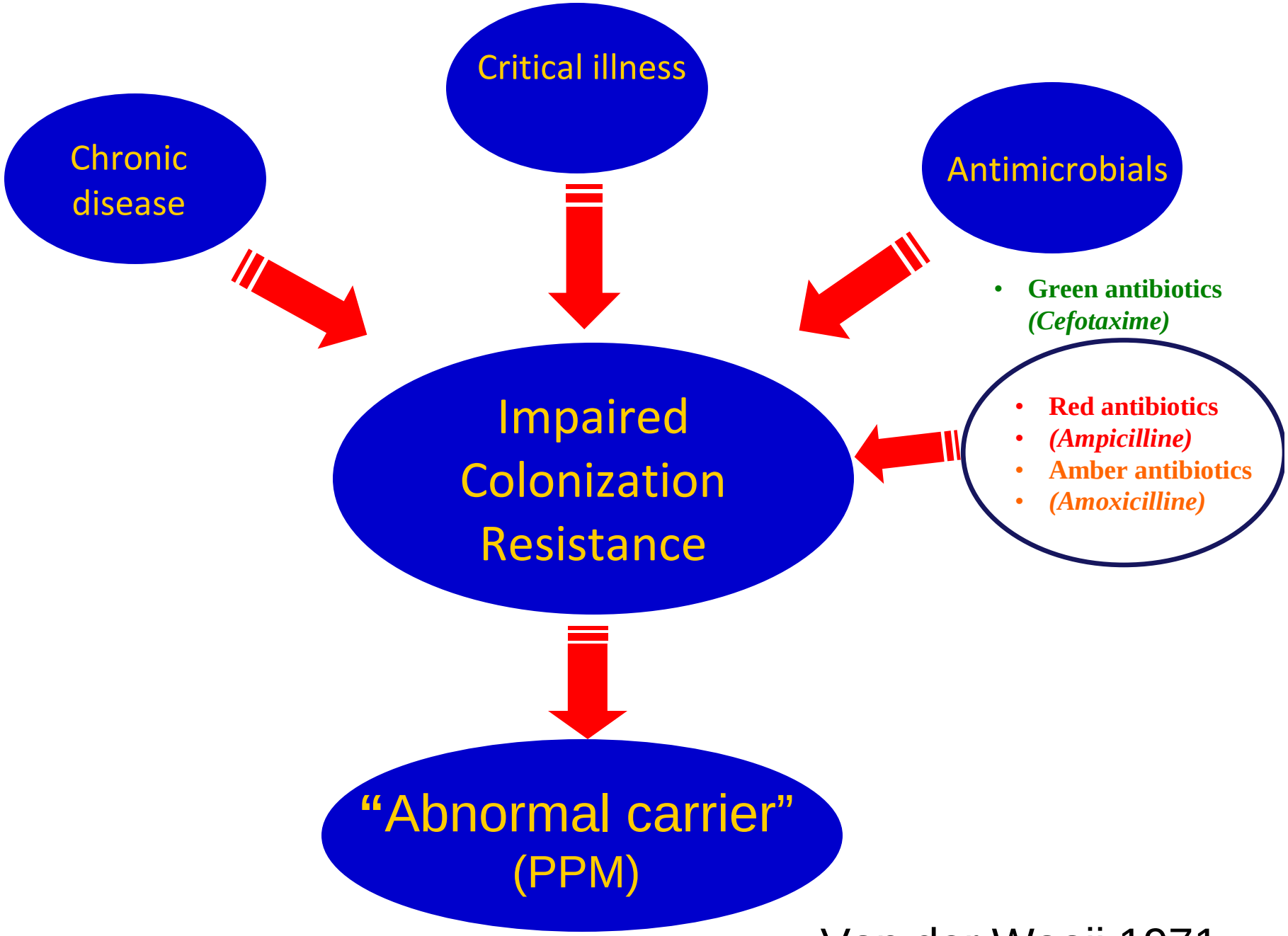
Selective Digestion Decontatmination

Colonization Resistance (1971)



Gut anaerobic bacteria with low pathogenicity are not only harmless, they also protect against overgrowth with potentially pathogenic/or resistant microorganisms.

Van der Waaij 1971



Van der Waaij 1971

Table 1. Pathogenicity of bacteria

Low pathogenicity
Coagulase negative Staphylococci
Str. viridans
Enterococccus sp.
Bacteroides sp.
Potentially pathogenic microorganisms (PPM)
S. pneumoniae
H. influenzae
Moraxella cattharrhalis
Escherichia coli
S. aureus
Candida albicans
Klebsiella sp.
Proteus sp.
Morganella sp.
Enterobacter sp.
Citrobacter sp.
Serratia sp.
Pseudomonas sp.
Acinetobacter sp.
High pathogenicity
Salmonella sp.
Neisseria meningitides
Str. pyogenes

SDD concept

Microorganisms in ICU:

~15 are responsible

for >95% of infections!

Infections in ICU:

1. Endogenous (80%)
   - Primary (60%)
   - Secondary (20%)
2. Exogenous (20%)

SDD Protocol

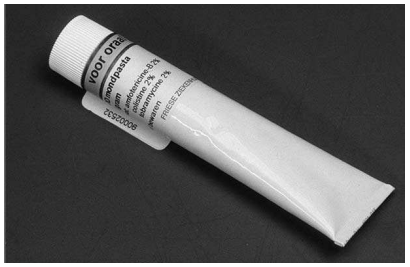
1.Treat primary endogenous

2.Prevent secondary endogenous

3.Prevent exogenous infections

4.Surveillance cultures

Selective Digestive Decontamination (SDD regimen)



1. Oral paste: 0.5 gr X 4
   - *(POLY-E 2% + TOB 2% + AMPH 2%)*
2. Gastric Tube: 10 ml X 4
   - *POLY-E 100mg + TOB 80mg + AMPH 500mg*

±

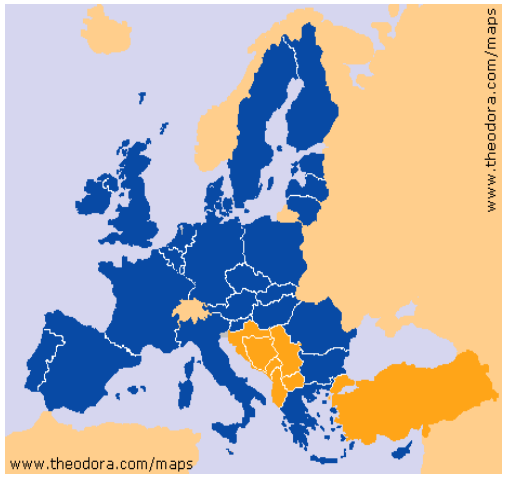
3. Intravenous
   - *Cefotaxime 1gr x 4 IV*

SDD: 1987-2011

- 62 RCTs
  - Reduced infections (especially VAP) in most studies !!
  - Reduced mortality in 3 RCTs !!
- 13 Meta-analyses
  - Reduced infections in all meta-analyses !!
  - Reduced mortality in 4/8 of meta-analyses !!!

Evidence I

SDD in Europe



SDD is routinely used :

- 4% of UK ICUs (2008)
  - *"Doesn't work or no evidence" (51%) !*
  - *Concerns for antibiotic resistance (47%) !*
- 24% of Netherlands ICUs (2001)

Why SDD is not yet widely used?

- More effort from ICU team?
  - Commitment and monitoring!
- No promotion by pharmaceutical companies?
  - SDD antibiotics inexpensive/out of patent!
- Is “the primacy of experts opinion over evidence”?
  - Why?
- Concerns about antibiotic resistance !
  - Yet uncertain but ominous!

Prevention of ventilator-associated pneumonia with oral antiseptics: a systematic review and meta-analysis

*Sonia O Labeau, *Katrien Van de Vyver, Nele Brusselaers, Dirk Vogelaers, Stijn I Blot

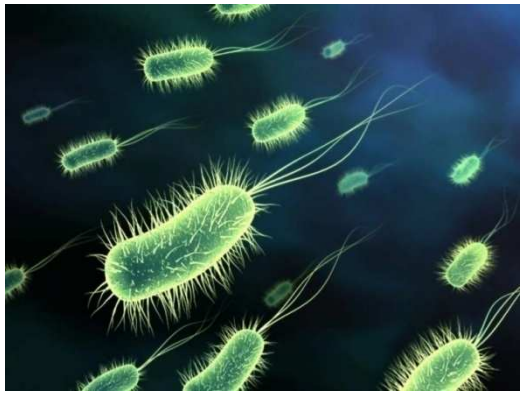
14 RCSs, 2481 pts

1. CHX (0.12, 0.2, 2%) (12/14, 2341 pts)
   ↓Incidence : *(p=0·02)*

2. povidone-iodine (2/14, 140 pts)
   No effect: (p=0·14)

*Lancet Infect Dis 2011;*11: 845–54

Probiotics



Living microbial agents of human origin that are able to tolerate the hostile gastrointestinal environment (acid and bile) such that they ultimately persist in the lower alimentary tract to confer health benefits to the host.

1. ↓ overgrowth of PPMs,
2. ↑ gut mucosal barrier function,
3. ↓ bacterial translocation,
4. ↓ reduce toll-like receptor–mediated up-regulation of immune function

http://www.who.int/foodsafety/fs_management/en/probiotic_guidelines.pdf

Probiotic Prophylaxis of Ventilator-associated Pneumonia

A Blinded, Randomized, Controlled Trial

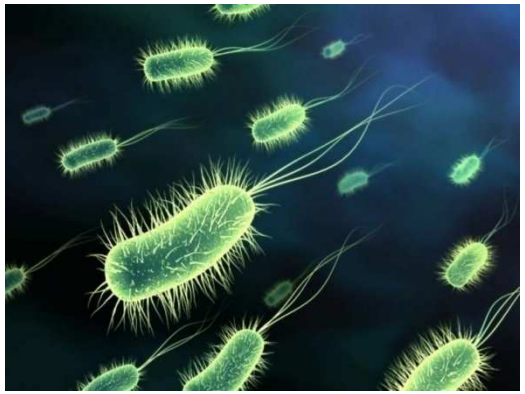
Lee E. Morrow[1], Marin H. Kollef[2], and Thomas B. Casale[3]

- 68 pts enteral probiotcs *(Lactobacillus rhamnosus GG)* X 2 vs 70 pts placebo X 2
- **Incidence of VAP ↓ :** 19.1% vs 40.0% (P <0.007)
- **Days of antibiotics ↓ :** 5.6 ± 7.8 d vs 8.66±10.3. (p<0.05)
- **Clostridium difficile–associated diarrhea ↓ :** 5.8% vs 18.6 % (p < 0.02),
- **Conclusions:** *L. rhamnosus GG* is safe and efficacious in preventing VAP in a select, high-risk ICU population.

Am J Respir Crit Care Med Vol 182. pp 1058–1064, 2010

Impact of the administration of probiotics on the incidence of ventilator-associated pneumonia: A meta-analysis of randomized controlled trials*

Ilias I. Siempos, MD; Theodora K. Ntaidou, MD; Matthew E. Falagas, MD, MSc, DSc



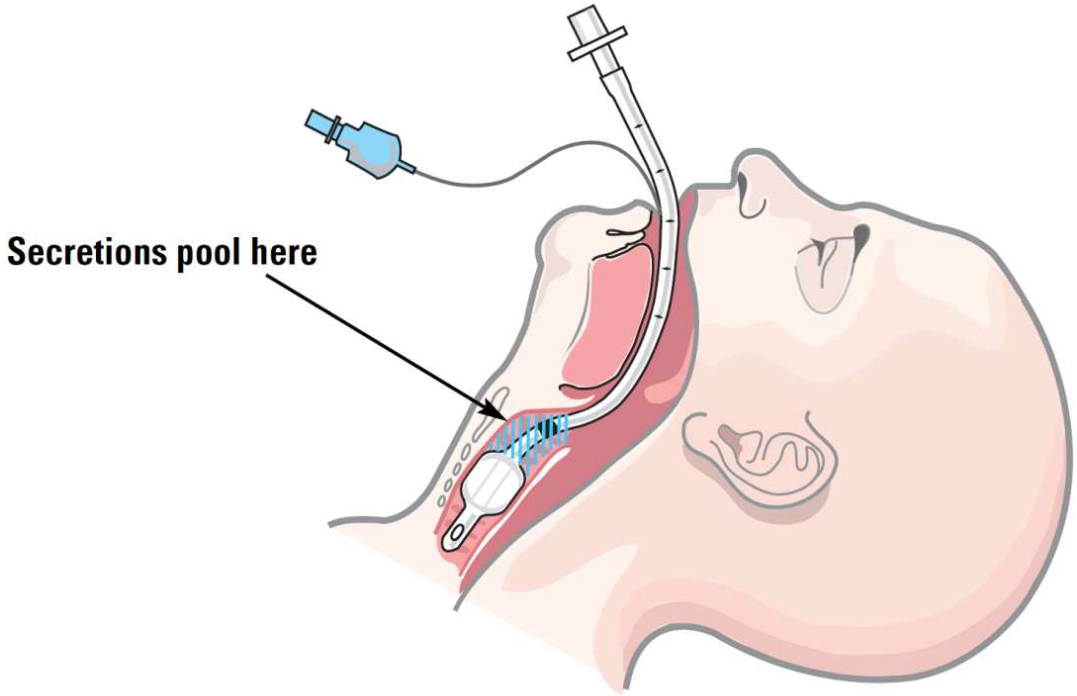
1. ↓ incidence of VAP,
2. ↓ LOS_{ICU}
3. ↓ Colonization *Ps aerug*.

No difference!

1.LOS MV
2.ICU mortality,
3.Hospital mortality,

CCM 2010; 38:954-962

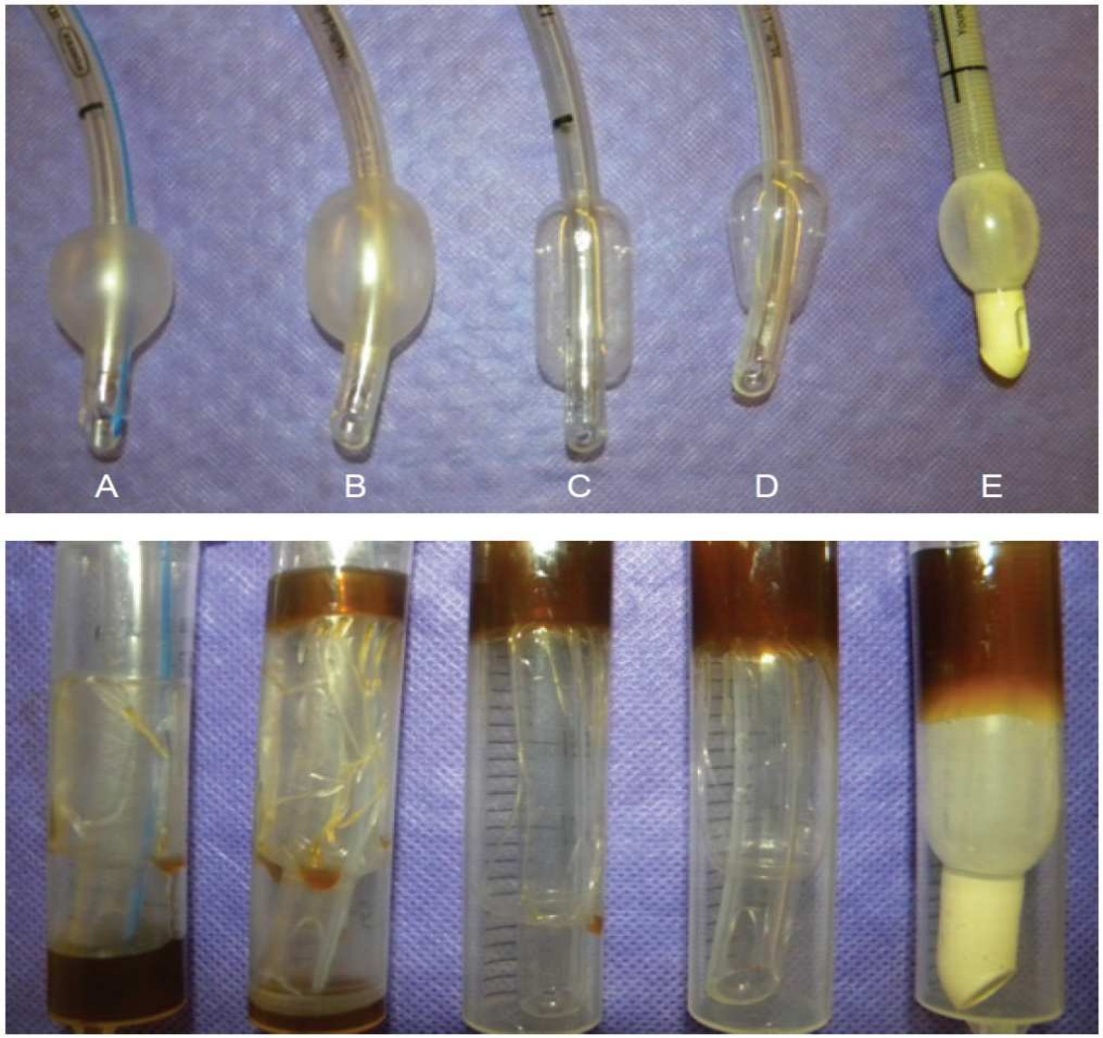
B. Avoid Aspiration!



1. Type of cuff

2. Subglottic Secretion Drainage

Cuff pressure, material, shape



Critical Care 2010; 38:486

Cuff material

Conventional ETT (PVC)

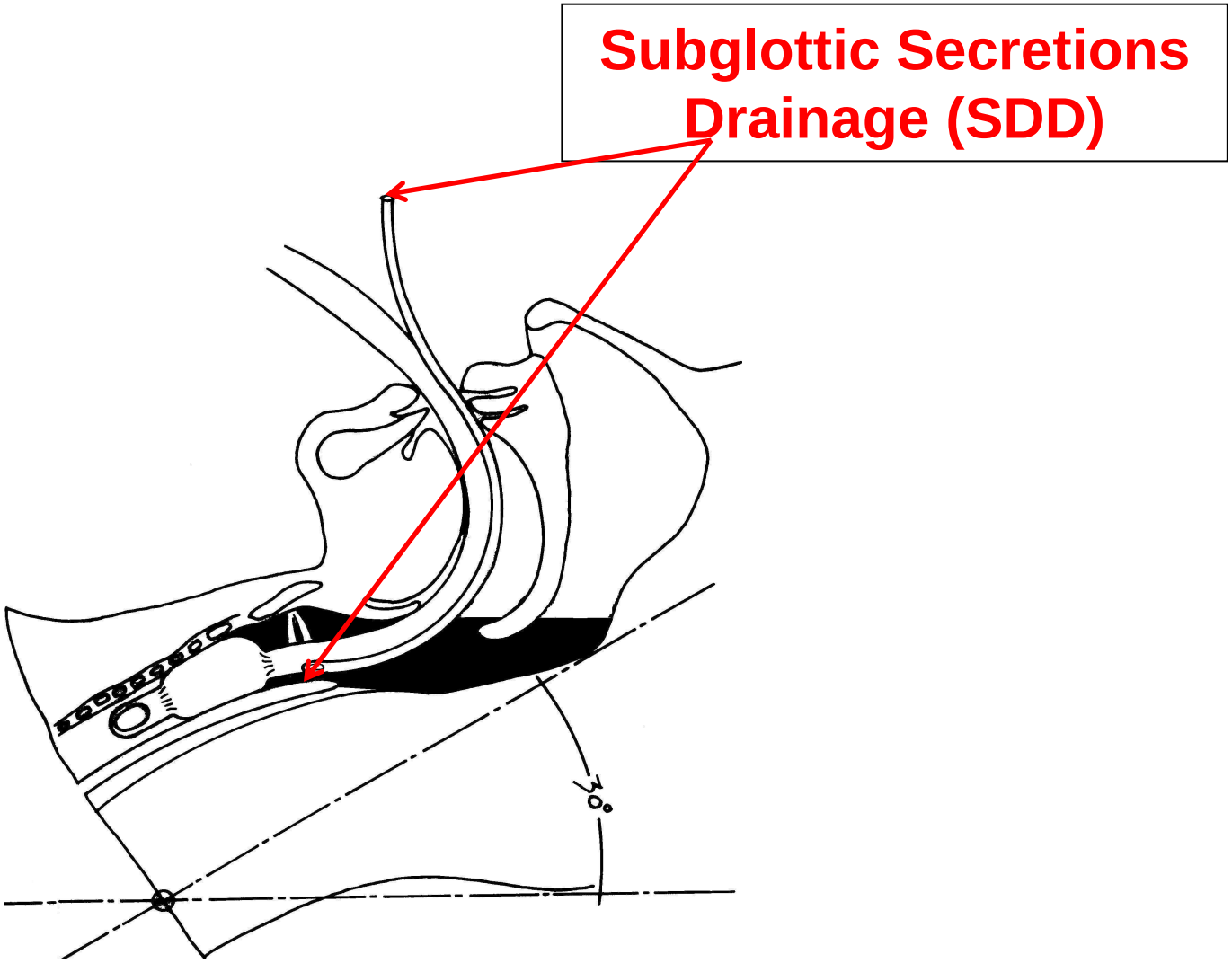
Microcuf* ETT (PU)

Five ICUs, 85 beds in an AH

2006-7, PVC EET	2007-8, PU EET	7/2008-10/2008, PVC EET
5,3/1000 v/days	2,8/1000 v/days P=0.013	3,5/1000 v/days

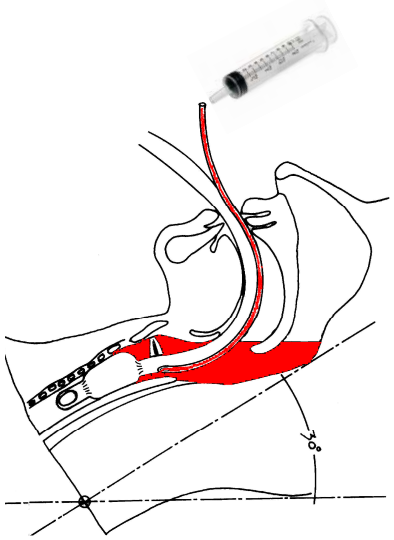
Journal of Critical Care 2011; 26(3):280

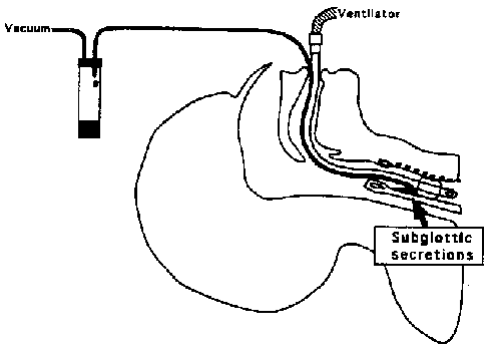
The Hi-Lo Evac ETT



Subglottic secretion drainage for the prevention of ventilator-associated pneumonia: A systematic review and meta-analysis*

John Muscedere, MD, FRCPC; Oleksa Rewa, MD; Kyle Mckechnie, MD; Xuran Jiang, Msc; Denny Laporta, MD, FRCPC; Daren K. Heyland, MD, FRCPC





13 RCSs, 2442 pts

1. ↓Incidence : (12/13)
2. ↓ LOS_{MV}!
3. ↓ LOS_{ICU} !

No difference in mortality!

Crit Care Med 2011 Vol. 39, No. 8

Continuous lateral rotation therapy to prevent ventilator-associated pneumonia*

Crit Care Med 2010; 38:486–490

Weaning intolerance: 39%!
Mortality?

- CLRT: a full cycle of ~7 min
  - ↓EVLW, V/Q, secretolysis
- RCT : 75/75 pts
- VAP incidence: 8 (11%) vs 17 (23%) (p=0.048)
- Duration of MV: 8+5 vs 14+23 (p=0.02)
- LOS : 25+22 vs 39+45 (p=0.01)

CCM 2010; 38:486

C. Antimicrobial-coated ETs

Silver-coated ETs

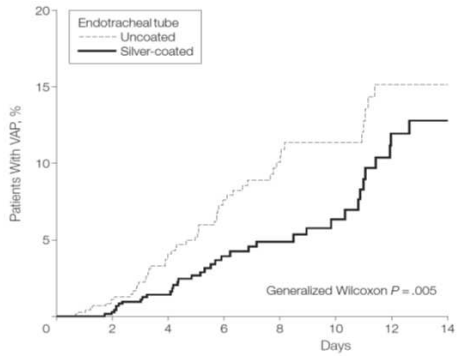
Silver-Coated Endotracheal Tubes and Incidence of Ventilator-Associated Pneumonia

The NASCENT Randomized Trial

JAMA. 2008;300(7):805-813

No difference (!)

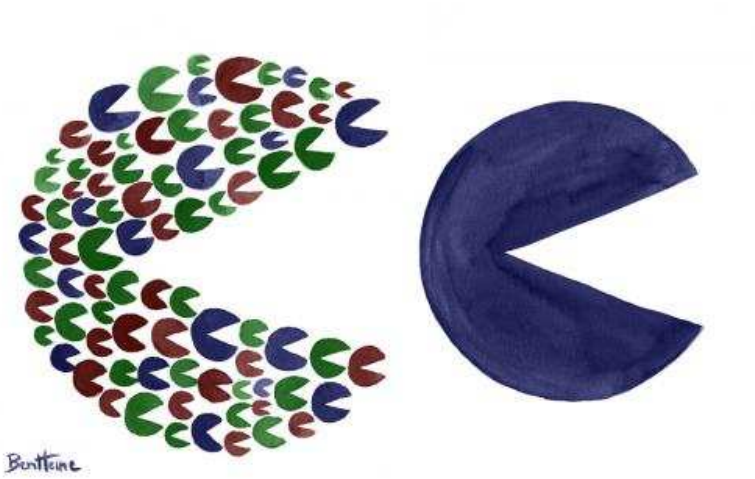
1. *LOS_{MV} !*
2. *LOS_{ICU} !*
3. *LOS_{hosp}*
4. *Mortality!*



- Study:
  - PRCT , 54 centers, (2002 – 2006) 9417 / **2003** for MV>24hs.
  - SCENT: 766 vs 743 NCENT
  - VAP diagnosis BALF:>10^4 cfu/ml
- Incidence of VAP:
  - 4.8% (37/766 patients) vs 7.5% (56/743 patients)
  - ↓ 35.9% (p=0.03)
- Time to VAP onset:
  - $T_{SCENT} > T_{NCENT}$ p=0.005
- NNT:
  - 37 to prevent 1 case of VAP

Care Bundles

“Η ισχύς εν τη ενώσει»



“Care Bundles”

- A “care bundle” is a collection of interventions (usually 3-5) that may be applied to the management of a particular condition
  - *best practices based on evidence*
  - *“all on non” approach*
  - *a person or team “owns” the bundle*
  - *must occur in a specified period and place*

“Ventilator bundle”

1. Elevate the head of bed
2. Interrupt sedation daily,
3. Assess for weaning daily
4. Apply prophylaxis for DVT and peptic ulcer

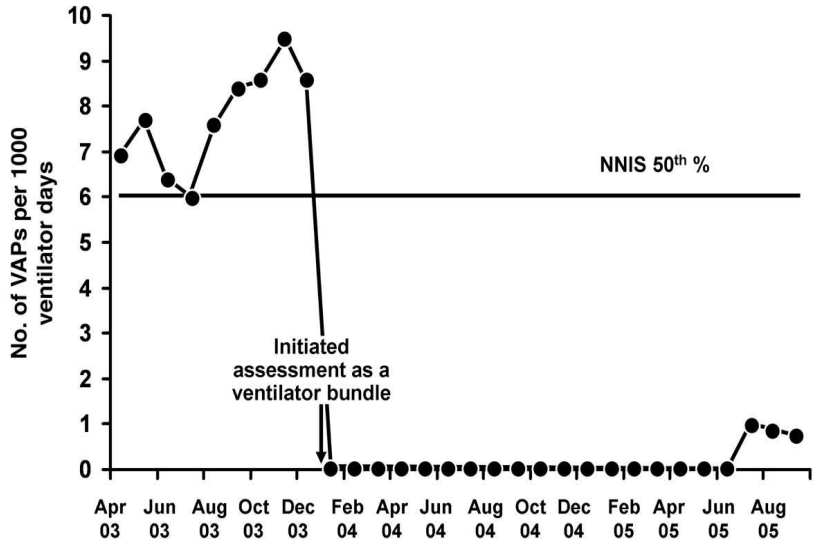


FIGURE. 1. Medical intensive care unit ventilator-associated pneumonia (VAP) rate. NNIS = National Nosocomial Infections Surveillance System.

Mayo Clin Proc June 2006;81(6):849-854

Intensive Care Med (2010) 36:773–780
DOI 10.1007/s00134-010-1841-5

ORIGINAL

Jordi Rello
Hartmut Lode
Giuseppe Cornaglia
Robert Masterton
The VAP Care Bundle Contributors

A European care bundle for prevention of ventilator-associated pneumonia

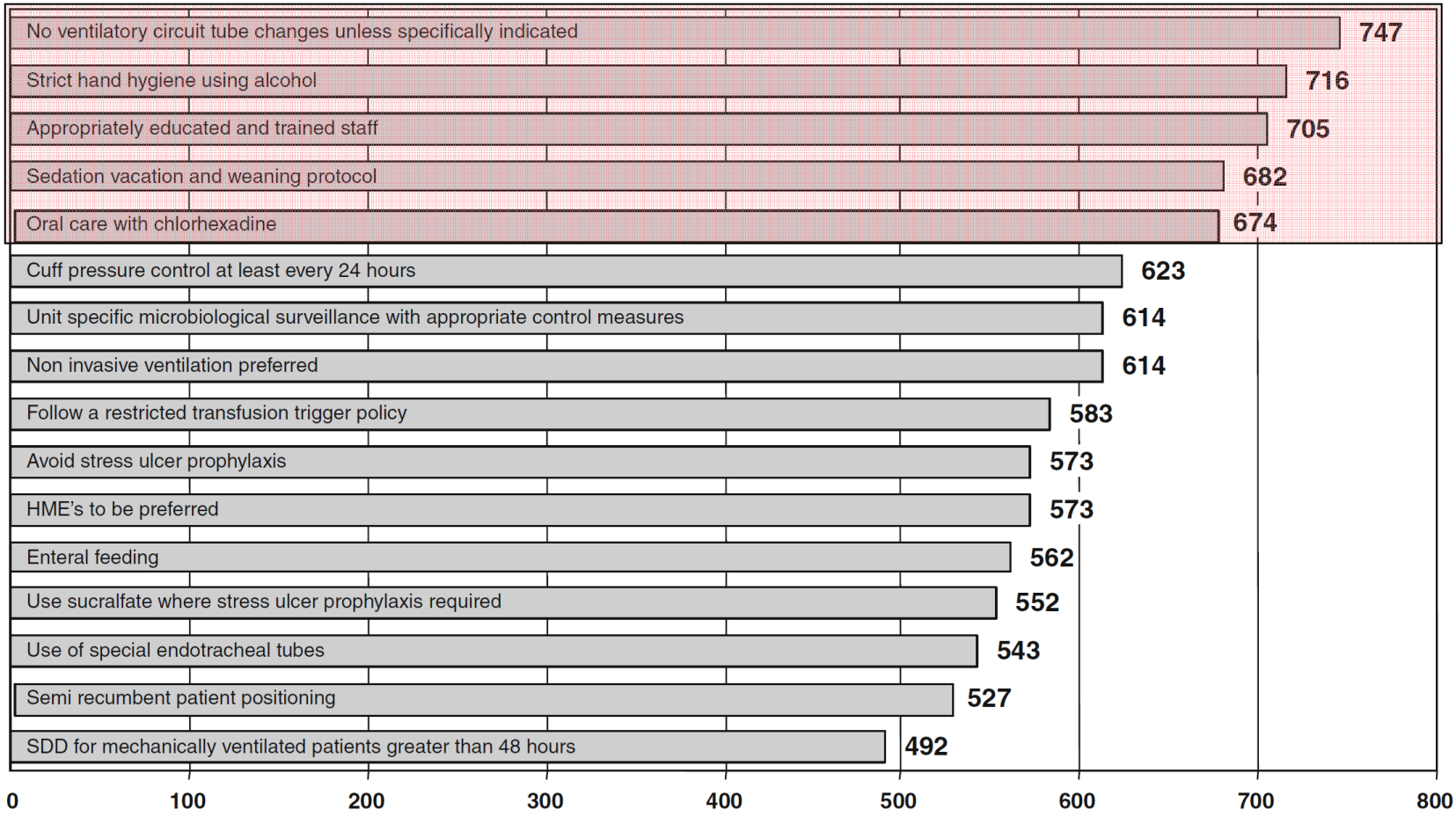
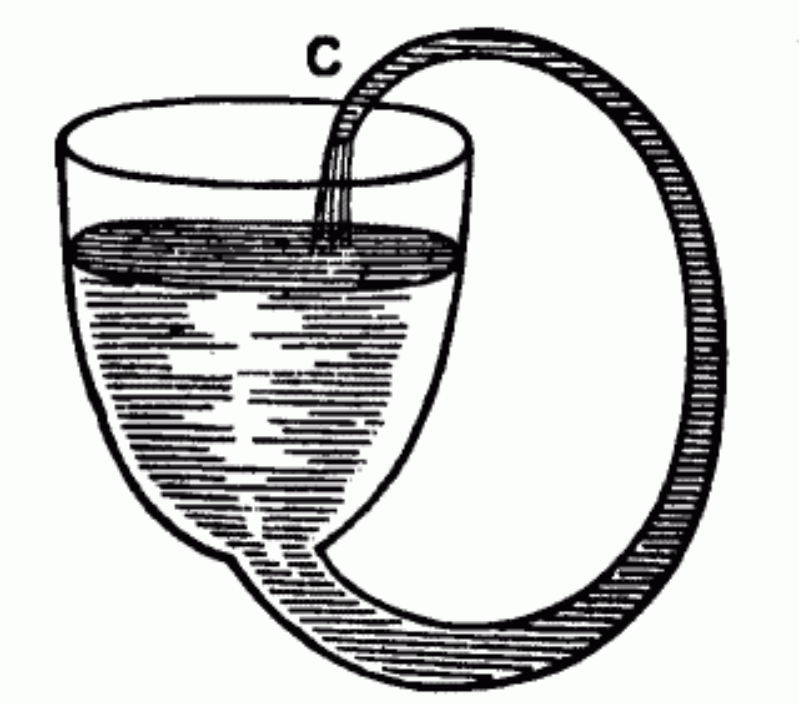
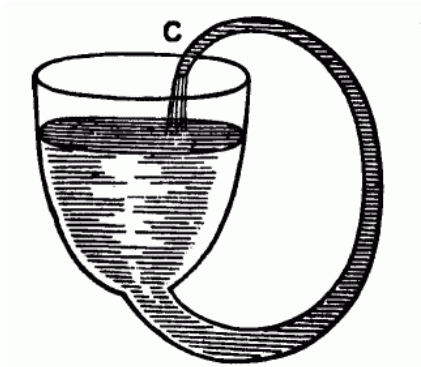


Fig. 1 Ranking of VAP prevention interventions. *SDD* selective decontamination of the digestive tract

“The VAP prevention paradox”



The VAP Prevention Paradox



	VAP Rates	Vent LOS	ICU LOS	Hospital LOS	Death
Head-of-bed elevation	↓	—	—	—	—
Regular oral care with chlorhexidine	↓	—	—	—	—
Continous aspiration of subglottic secretions	↓	—	—	—	—
Silver-coated endotracheal tubes	↓	—	—	—	—

Klompas, *Critical Care* 2009;13:315

"The wards and the postmortem room show a very striking contrast in their pneumonia statistics.."

Sir William Osler, 1907

Diagnosis

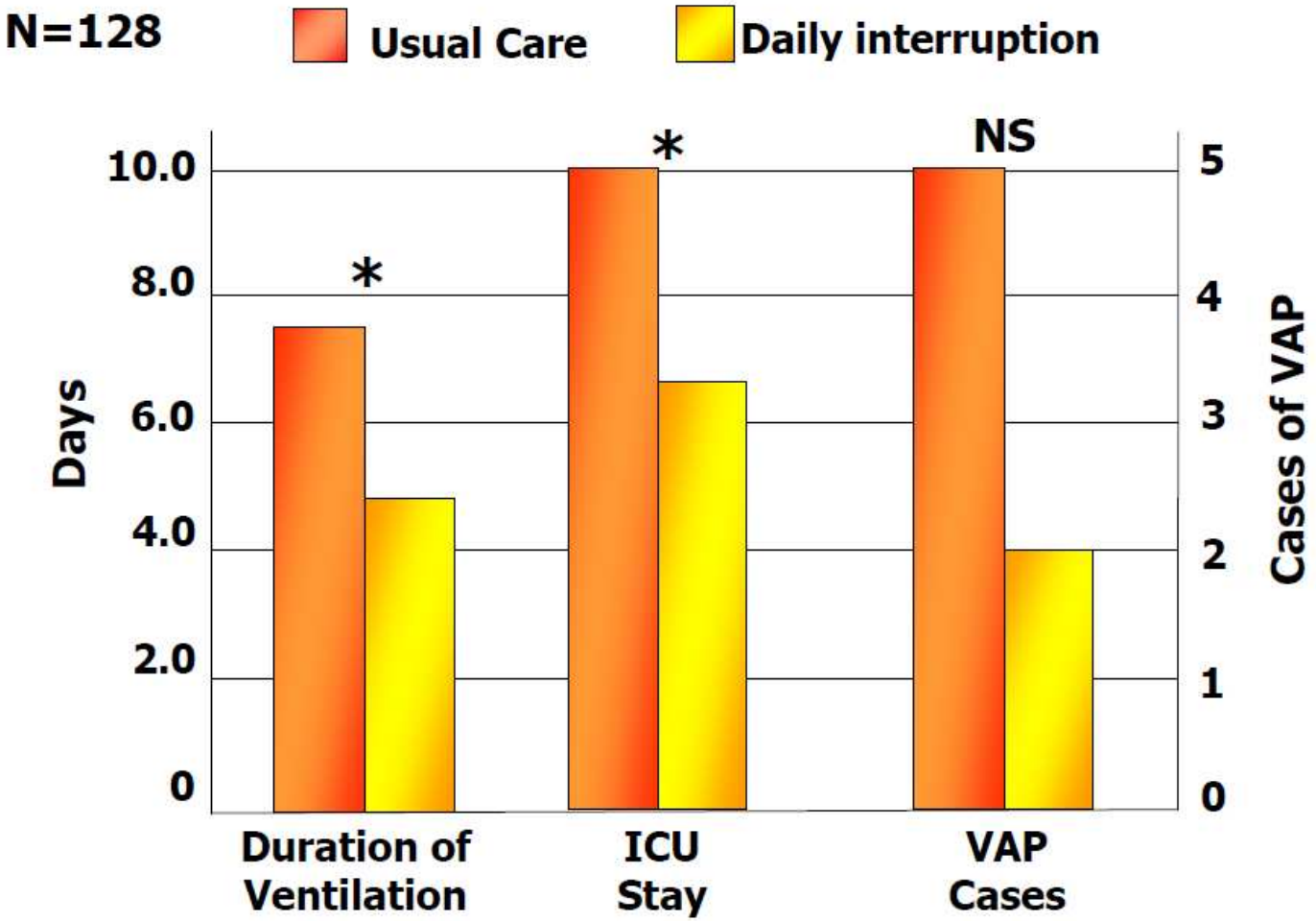
In ventilator-dependent patients who are suspected of having pneumonia based on clinical findings the actual incidence of pneumonia on postmortem exam is 30-40%

Wunderink RG. Chest 2000; 117:191S-194S

What does work?

	Vent LOS	ICU LOS	Hospital LOS	Mortality
Sedative interruption	↓	↓	–	–
Readiness to extubate	↓	↓	–	–
Sedative interruption AND Readiness to extubate	↓	↓	↓	Maybe!

Daily Interruption of Sedation



Kress, *NEJM* 2000:342:1471
Schweickert, *Crit Care Med* 2004;32:1272

Daily Interruption of Sedation & Daily Spontaneous Breathing Trials

Daily sedative interruption AND spontaneous breathing trial N=168

VS

Daily spontaneous breathing trial alone N=168

Outcome	Impact	P
Time on Ventilator	↓3.1 days	.02
ICU Length of Stay	↓3.8 days	.01
Hospital Length of Stay	↓4.3 days	.04
Mortality at 1 year	↓32%	.01

Girard, *Lancet* 2008;371:126

Reducing ventilator-associated pneumonia in intensive care: Impact of implementing a care bundle*

Andrew Conway Morris, MB, ChB, MRCP; Alasdair W. Hay, FRCA; David

VAP prevention bundle

1. Sedation stop
2. Weaning trial
3. Head-up position
4. Chlorexidine mouth care

Incidence↓

Before : 216/1460 (15%)

After : 43/501 (9%)

p=0.001

Mortality↓

Before : 367/1460 (25%)

After : 101/501 (20%)

p=0.03

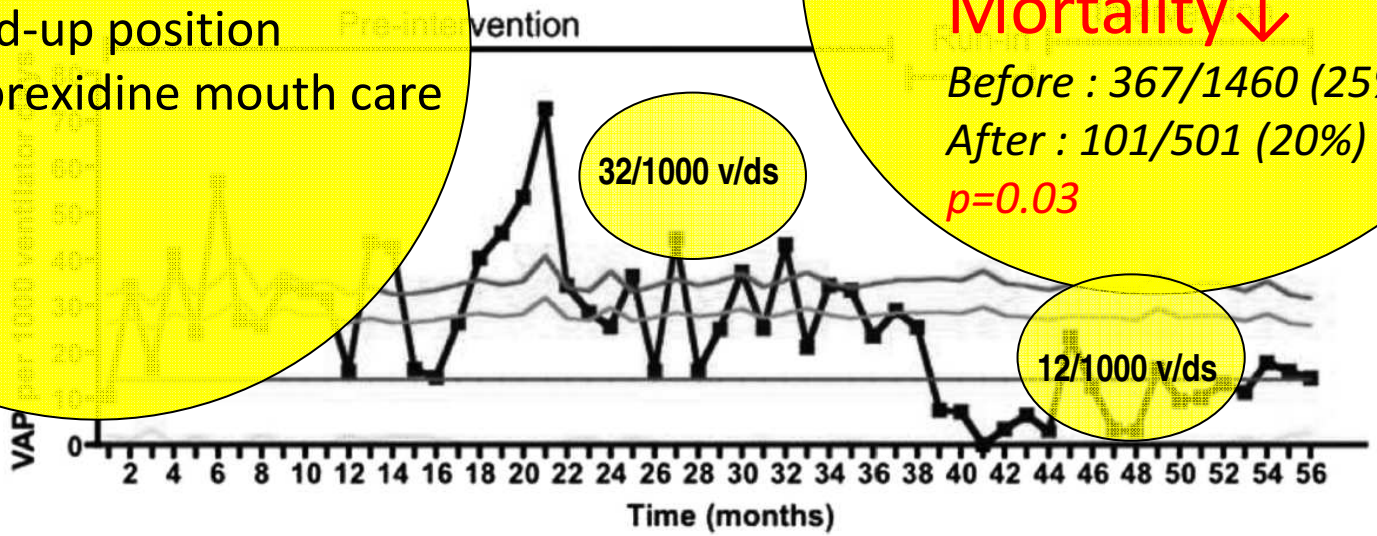


Figure 2. A run chart showing the incidence of clinical ventilator-associated pneumonia (*VAP*), expressed per 1000 ventilator days, on a month-by-month basis. VAP indicates rate of VAP per 1000 ventilator days. *LCL*, lower control line; *LWL*, lower warning line; *process avg*, process average; *UCL*, upper control line; *UWL*, upper warning line.