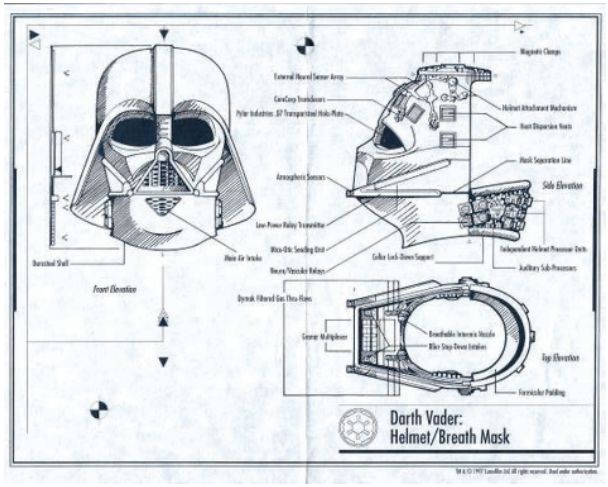
Pneumopathie acquise sous ventilation mécanique



Dr Thibaut BELVEYRE

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Centre médico-chirurgical Magellan

SFAR

srlf
SOCIÉTÉ DE RÉANIMATION DE LANGUE FRANÇAISE

Recommandations formalisées d'experts

PNEUMONIES ASSOCIÉES AUX SOINS DE RÉANIMATION

RFE commune SFAR – SRLF
Société Française d'Anesthésie et de Réanimation
Société de Réanimation de Langue Française

En collaboration avec les Sociétés ADARPEF et GFRUP
Association des Anesthésistes Réanimateurs Pédiatriques d'Expression Française,
Groupe Francophone de Réanimation et Urgences Pédiatriques

HEALTHCARE ASSOCIATED PNEUMONIA IN INTENSIVE CARE UNIT

2017

CrossMark

TASK FORCE REPORT
ERS/ESICM/ESCMID/ALAT GUIDELINES

International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia

Guidelines for the management of hospital-acquired pneumonia (HAP)/ventilator-associated pneumonia (VAP) of the European Respiratory Society (ERS), European Society of Intensive Care Medicine (ESICM), European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and Asociación Latinoamericana del Tórax (ALAT)

Antoni Torres[1,16], Michael S. Niederman[2,16], Jean Chastre[3], Santiago Ewig[4], Patricia Fernandez-Vandellos[5], Hakan Hanberger[6], Marin Kollef[7], Gianluigi Li Bassi[1], Carlos M. Luna[8], Ignacio Martin-Loeches[9], J. Artur Paiva[10], Robert C. Read[11], David Rigau[12], Jean François Timsit[13], Tobias Welte[14] and Richard Wunderink[15]

@ERSpublications
ERS/ESICM/ESCMID/ALAT evidence-based recommendations for HAP/VAP diagnosis, treatment and prevention http://ow.ly/dGhv30dAVoa

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Clinical Infectious Diseases

IDSA GUIDELINE

IDSA Infectious Diseases Society of America

hivma hiv medicine association

OXFORD

Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society

Andre C. Kalil,[1,a] Mark L. Metersky,[2,a] Michael Klompas,[3,4] John Muscedere,[5] Daniel A. Sweeney,[6] Lucy B. Palmer,[7] Lena M. Napolitano,[8] Naomi P. O'Grady,[9] John G. Bartlett,[10] Jordi Carratalà,[11] Ali A. El Solh,[12] Santiago Ewig,[13] Paul D. Fey,[14] Thomas M. File Jr,[15] Marcos I. Restrepo,[16] Jason A. Roberts,[17,18] Grant W. Waterer,[19] Peggy Cruse,[20] Shandra L. Knight,[20] and Jan L. Brozek[21]

2016

De quoi parle t-on ?

- **Pneumopathie Communautaire (CAP)**
- **Pneumopathie nosocomiale (HAP)**
  - ➔ > 48h d'hospitalisation
- **PAVM (VAP)**
  - ➔ > 48 à 72h d'intubation
  - ➔ tardive vs précoce (J5)
- Trachéobronchite acquise sous VM (VAT)
- Pneumopathie associé aux soins (HCAP)
  - ➔ Hospit récente, dialysée chronique, EHPAD…

Pourquoi en parlons nous ?

- **2ème** cause d'infection nosocomiale
- **1ère** cause de mortalité
- Incidence de 5 à 67%...
- Risque de **1,5% / j** chez malade ventilé
  - ➔ augmentation durée hospit de 7j
  - ➔ 40 000 $

Warren et al., CCM 2003

Mortalité

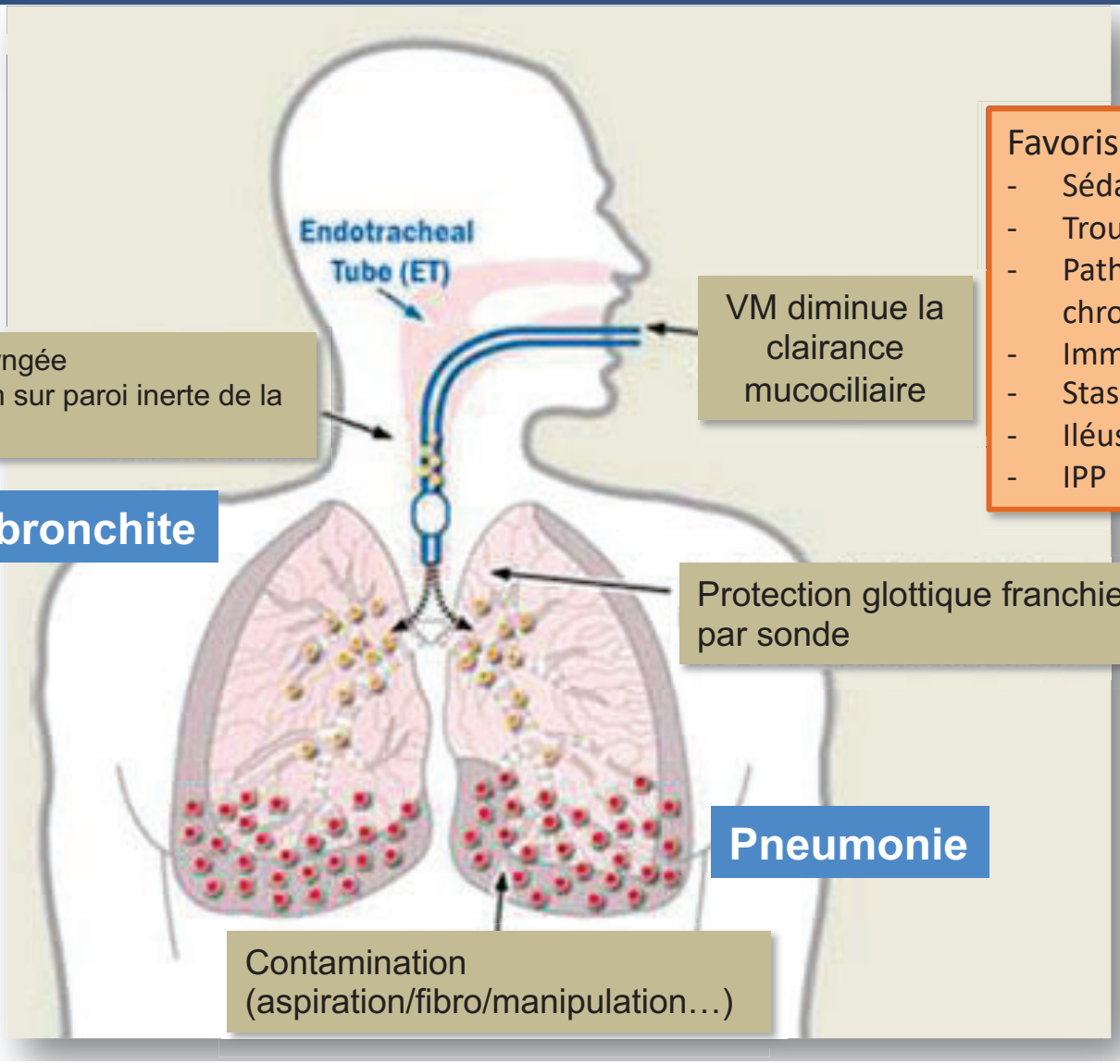
Variable	Patients with VAP: exposed (n = 434)	Patients without VAP: unexposed (n = 2,439)	P value[a]
Male gender, n (%)	315 (72.5)	1,518 (62.2)	0.005
Age, median	62.8	62.7	0.94
SAPS II, median	47.2	46.1	0.06
Admission category			
Medicine, n (%)	292 (67.3)	1,342 (55)	0.0001
Emergency surgery, n (%)	74 (17.1)	595 (24.4)	0.0004
Scheduled surgery, n (%)	68 (15.6)	337 (13.8)	0.36
History of immunosuppression			
Haematological malignancy, n (%)	20 (4.6)	81 (3.3)	0.22
Metastatic cancer, n (%)	20 (4.6)	153 (6.3)	0.21
AIDS, n (%)	11 (2.5)	39 (1.6)	0.26
Corticosteroid therapy, n (%)	82 (18.9)	454 (18.6)	0.94
Anticancer chemotherapy, n (%)	21 (4.8)	125 (5.1)	0.89
Main symptom at ICU admission			
Shock, n (%)	149 (34.3)	731 (29.9)	0.08
Coma, n (%)	100 (23.0)	533 (21.8)	0.62
Acute respiratory failure, n (%)	115 (26.5)	502 (20.5)	0.01
Other chronic illnesses			
Hepatic, n (%)	28 (6.4)	150 (6.2)	0.81
Cardiovascular, n (%)	73 (16.8)	344 (14.1)	0.21
Pulmonary, n (%)	70 (16.1)	330 (13.5)	0.23
Renal, n (%)	14 (3.2)	84 (3.4)	0.81
Diabetes, n (%)	49 (11.2)	202 (8.3)	0.04
ICU mortality, n (%)	119 (27.4)	470 (19.2)	0.0001

Nguile-Makao, ICM 2010

FDR mortalité

- Score APACHE élevé
- Bacteriémie
- Comorbidité importante
- Bactéries résistantes (MDR) :pyo, acinetobacter, enterobactéries…
- Délai dans l’instauration du traitement

Physiopathologie



Colonisation oropharyngée
Formation d'un biofilm sur paroi inerte de la sonde

Tracheo-bronchite

VM diminue la clairance mucociliaire

Favorisé par :
- Sédatif / Coma
- Trouble déglutition
- Pathologie pulmonaire chronique
- Immunodépression
- Stase gastrique
- Iléus
- IPP

Protection glottique franchie par sonde

Pneumonie

Contamination (aspiration/fibro/manipulation…)

Diagnostic

Signes radiologiques

Deux clichés radiologiques successifs à partir desquels l'apparition d'un foyer de pneumonie est suspecté

En l'absence d'antécédents de cardiopathie ou de maladie pulmonaire sous-jacentes, un seul examen radiologique suffit

Et au moins un des signes suivants

Température corporelle > 38,3°C sans autre cause

Leucocytes < 4000 /mm^3 ou ≥ 12000 /mm^3

Se 69% Sp 75%

Et au moins deux des signes suivants

Sécrétions purulentes

Toux ou dyspnée

Désaturation ou besoin accru en oxygène ou nécessité d'assistance ventilatoire

SFAR/SRLF 2017

CPIS

Le *Clinical Pulmonary Infection Score* (CPIS) [16]

Température	
≥ 36,5 °C et ≤ 38,4 °C	0 point
≥ 38,5 °C et ≤ 38,9 °C	1 point
≤ 36 °C ou ≥ 39 °C	2 points
Leucocytose	
≥ 4 G/L et ≤ 11 G/L	0 point
< 4 G/L ou > 11 G/L	1 point
si formes immatures ≥ 0,5 G/L	+1 point
Aspirations trachéales	
< 4 + de sécrétions	0 point
≥ 4 + de sécrétions	1 point
si sécrétions purulentes	+1 point
PaO_2/FIO_2	
> 240 ou SDRA	0 point
≤ 240 sans SDRA	2 points
Radiographie thoracique	
absence d'infiltrat	0 point
infiltrat diffus	1 point
infiltrat localisé	2 points
Culture semi-quantitative des sécrétions trachéales (0, 1, 2 ou 3 +)	
bactérie pathogène ≤ 1+	0 point
bactérie pathogène > 1+	1 point
si même bactérie sur Gram	+1 point

Si > 5 pts
Se > 80%

Pugin, ARRD 1991

Prélèvements

- Littérature contradictoire….
- Non invasif vs distal ?
- Quantitatif vs qualitatif ?
- **US guidelines : ECBC, qualitatif**
- **EU guidelines : LBA ou PDP, quantitatif**

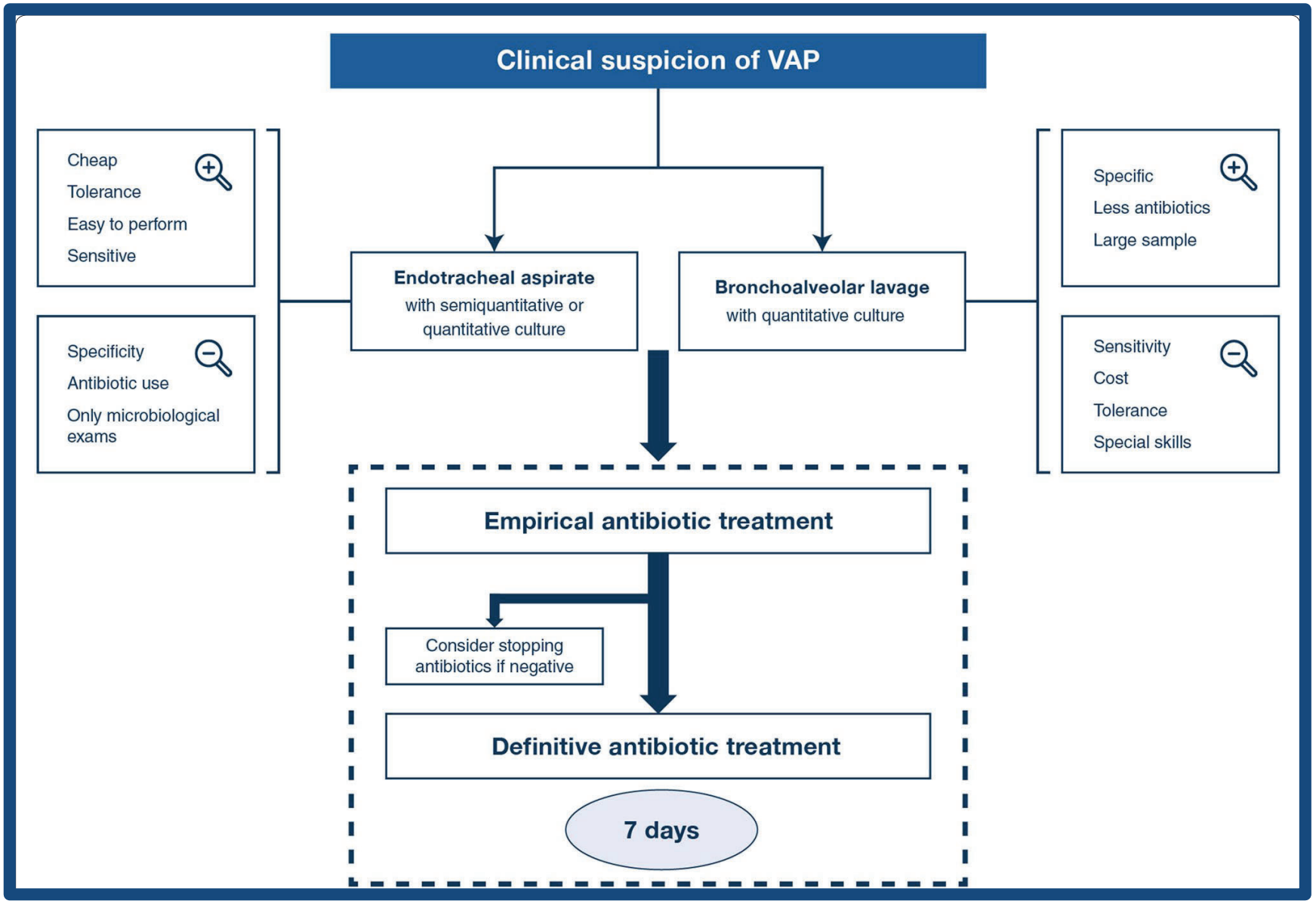
Avant antibiothérapie ++

Intérêt drainage par kinésithérapeute

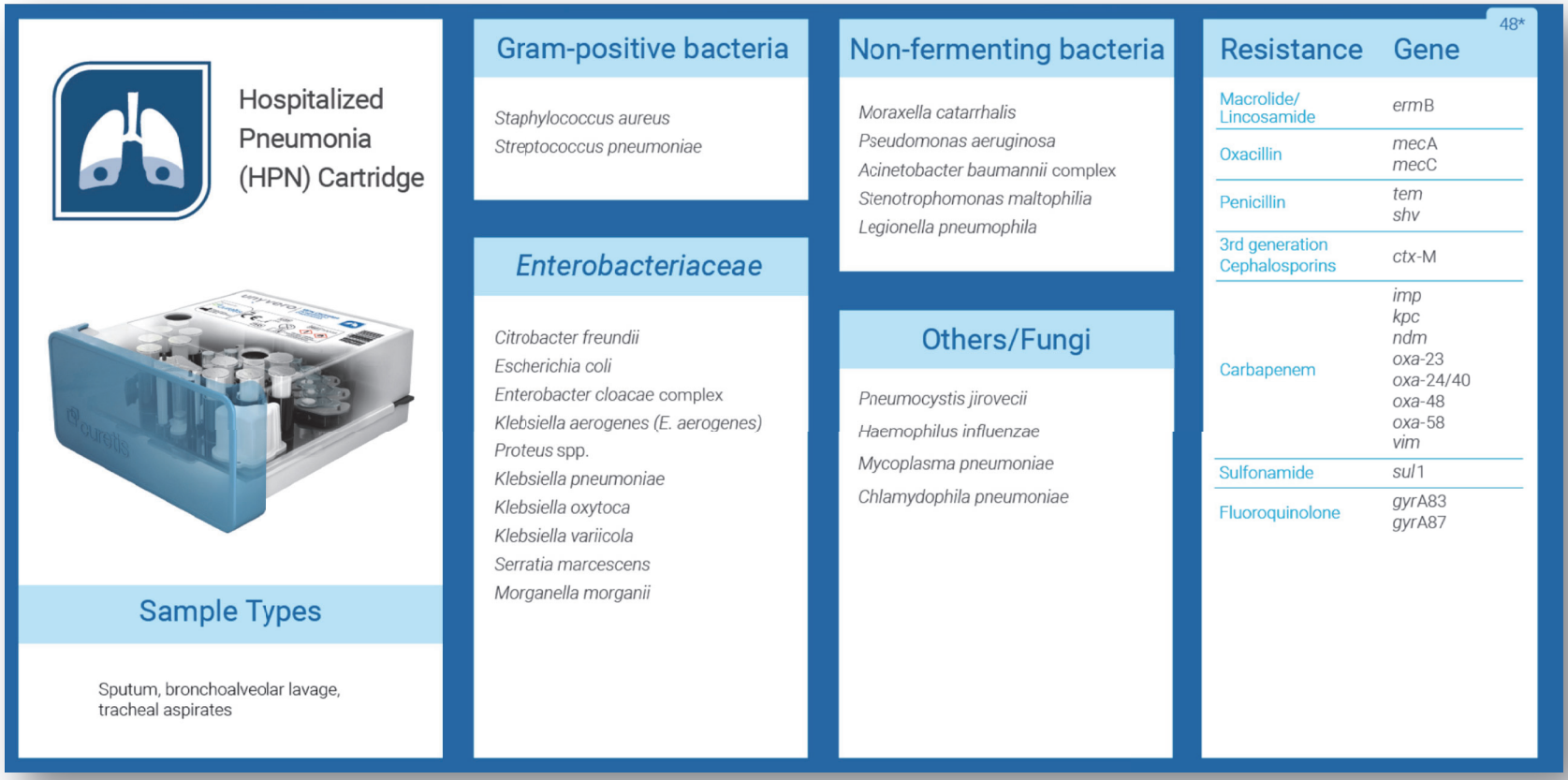
Prélèvements

Type de prélèvements	Sensibilité m±ds (extrêmes)	Spécificité m±ds (extrêmes)
Aspiration trachéale qualitative	(57%-88%)	(14%-33%)
Aspiration trachéale quantitative $\geq 10^6$	76±9% (38%-82%)	75±28% (72%-85%)
Echantillonnage distal non fibroscopique PDP, mini-LBA($\geq 10^3$)	(63%-100%)	(66%-96%)
BTP sous fibroscopie $\geq 10^3$	66±19% (33%-100%)	90±15% (50%-100%)
LBA sous fibroscopie$\geq 10^4$	73±18% (42%-93%)	82±19% (45%-100%)

Avant antibiothérapie ++


Clinical suspicion of VAP
Cheap
Tolerance
Easy to perform
Sensitive
Specificity
Antibiotic use
Only microbiological exams
Endotracheal aspirate
with semiquantitative or quantitative culture
Bronchoalveolar lavage
with quantitative culture
Specific
Less antibiotics
Large sample
Sensitivity
Cost
Tolerance
Special skills
Empirical antibiotic treatment
Consider stopping antibiotics if negative
Definitive antibiotic treatment
7 days

PCR multiplex



Résultats en 4 à 5h...

Mais pas de différence entre colonisation et infection

Germes

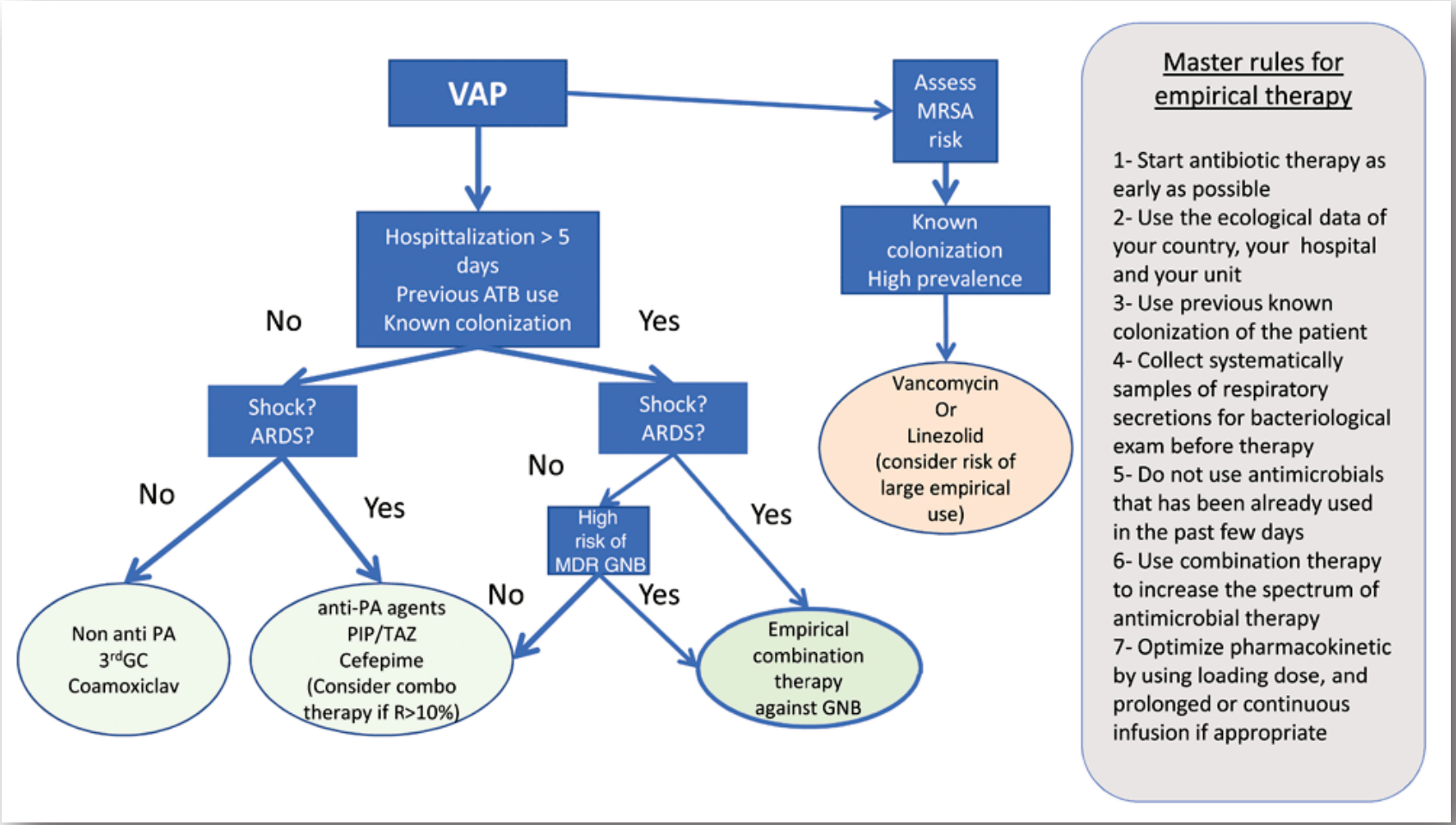
- Entérobactéries (25%)
- Pseudomonas Aeruginosa (20%)
- Staphylocoque Aureus (20%)
- Haemophilus (10%)
- Streptocoques
- Virus et champignons chez ID
- Polymicrobien dans 30% des cas

FDR BMR

Risk factors for multidrug-resistant ventilator-associated pneumonia

Risk factors for MDR pathogens:
▪ IV antibiotic use within the previous 90 days
▪ Septic shock at the time of VAP
▪ ARDS preceding VAP
▪ ≥5 days of hospitalization prior to the occurrence of VAP
▪ Acute renal replacement therapy prior to VAP onset
Risk factors for MDR *Pseudomonas* and other gram-negative bacilli:
▪ Treatment in an ICU in which >10 percent of gram-negative isolates are resistant to an agent being considered for monotherapy
▪ Treatment in an ICU in which local antimicrobial susceptibility rates are not known
▪ Colonization with OR prior isolation of MDR *Pseudomonas* or other gram-negative bacilli
Risk factors for MRSA:
▪ Treatment in a unit in which >10 to 20 percent of *Staphylococcus aureus* isolates are methicillin resistant
▪ Treatment in a unit in which the prevalence of MRSA is not known
▪ Colonization with OR prior isolation of MRSA

Antibiothérapie



Master rules for empirical therapy

1- Start antibiotic therapy as early as possible
2- Use the ecological data of your country, your hospital and your unit
3- Use previous known colonization of the patient
4- Collect systematically samples of respiratory secretions for bacteriological exam before therapy
5- Do not use antimicrobials that has been already used in the past few days
6- Use combination therapy to increase the spectrum of antimicrobial therapy
7- Optimize pharmacokinetic by using loading dose, and prolonged or continuous infusion if appropriate

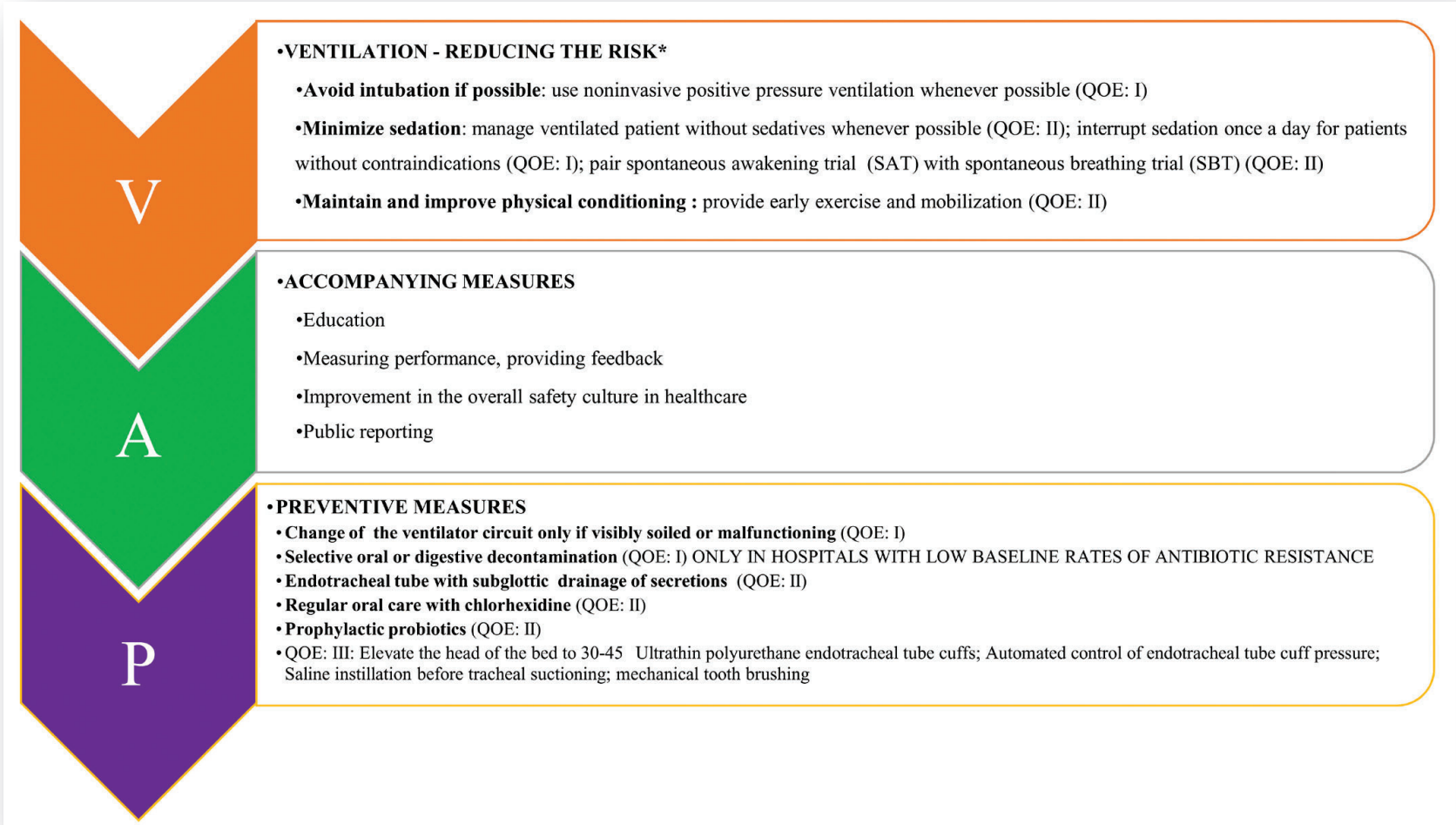
PREVENTION


the best defense
is a good offense
CHANGE MY MIND
imgflip.com

Facteurs de risques

Host-related risk factors	Intervention-related risk factors
Medical history and underlying illness	Peri-operative transfusion of blood products
Male gender	Duration of the mechanical ventilation
Extreme age	Reintubation
Prior central nervous system disorder	Supine head position in patients receiving enteral nutrition
Immunocompromised	Antibiotic therapy[a]
Acute underlying diseases	Enteral nutrition
Emergent surgery	Absence of subglottic secretion drainage[b]
Neurosurgery	Intra-hospital transports
Thoracic surgery	Continuous sedation, use of paralytic agents
Cardiac surgery	Nasogastric tubes
Burns	Tracheostomy
Re-intervention	Frequent ventilator circuit changes
Acute severity factors	Intracuff pressure of less than 20 cm H_2O
Organ system failure index of at least 3	
Acute renal failure	
Acute respiratory distress syndrome	
ECMO, intra-aortic support	
Ulcer disease	

Principe de prévention



Réduire la ventilation !

•**VENTILATION - REDUCING THE RISK***

- **Avoid intubation if possible**: use noninvasive positive pressure ventilation whenever possible (QOE: I)
- **Minimize sedation**: manage ventilated patient without sedatives whenever possible (QOE: II); interrupt sedation once a day for patients without contraindications (QOE: I); pair spontaneous awakening trial (SAT) with spontaneous breathing trial (SBT) (QOE: II)
- **Maintain and improve physical conditioning :** provide early exercise and mobilization (QOE: II)

Pneumopathie de l'Immunodéprimé

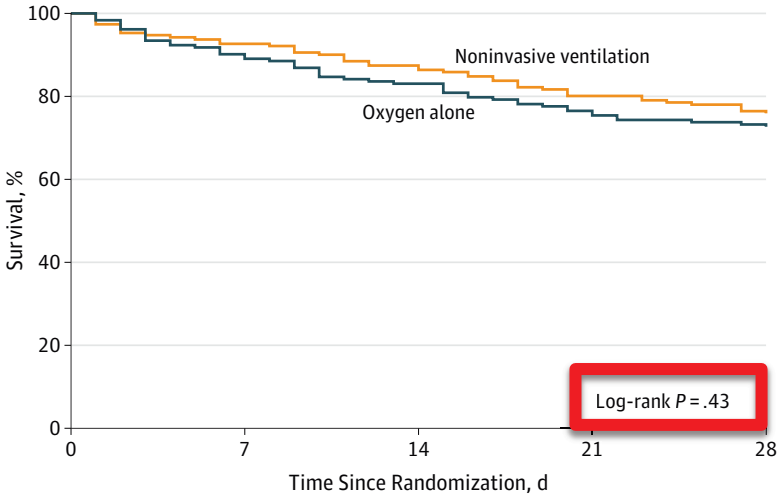
Outcome	Noninvasive-Ventilation Group (N=26)	Standard-Treatment Group (N=26)	P Value	Relative Risk (95% CI)
Intubation — no./total no. (%)	12/26 (46)	20/26 (77)	0.03	0.60 (0.38–0.96)
Immunosuppression from hematologic cancer and neutropenia	8/15 (53)	14/15 (93)	0.02	0.57 (0.35–0.93)
Drug-induced immunosuppression	3/9 (33)	5/9 (56)	0.32	0.60 (0.20–1.79)
Immunosuppression from the acquired immunodeficiency syndrome	1/2 (50)	1/2 (50)	0.83	1.00 (0.14–7.10)
Initial improvement in PaO_2:FiO_2 — no. (%)	12 (46)	4 (15)	0.02	
Sustained improvement in PaO_2:FiO_2 without intubation — no. (%)	13 (50)	5 (19)	0.02	
Death in the ICU — no./total no. (%)†	10/26 (38)	18/26 (69)	0.03	0.56 (0.32–0.96)
Immunosuppression from hematologic cancer and neutropenia	7/15 (47)	13/15 (87)	0.02	0.54 (0.30–0.96)
Drug-induced immunosuppression	3/9 (33)	4/9 (44)	0.50	0.75 (0.23–2.44)
Immunosuppression from the acquired immunodeficiency syndrome	0/2	1/2 (50)	0.50	0.50 (0.13–2.00)
Total duration of any ventilatory assistance — days				
Among all patients	6±3	6±5	0.59	
Among survivors	5±2	3±5	0.12	
Length of ICU stay — days				
Among all patients	7±3	9±4	0.11	
Among survivors	7±3	10±4	0.06	
Death in the hospital — no./total no. (%)	13/26 (50)	21/26 (81)	0.02	0.62 (0.40–0.95)
Immunosuppression from hematologic cancer and neutropenia	8/15 (53)	14/15 (93)	0.02	0.57 (0.35–0.93)
Drug-induced immunosuppression	4/9 (44)	6/9 (67)	0.32	0.67 (0.28–1.58)
Immunosuppression from the acquired immunodeficiency syndrome	1/2 (50)	1/2 (50)	0.83	1.00 (0.14–7.10)

Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Noninvasive Ventilation vs Oxygen Therapy on Mortality Among Immunocompromised Patients With Acute Respiratory Failure

A Randomized Clinical Trial

Figure 2. Probability of Survival at Day 28



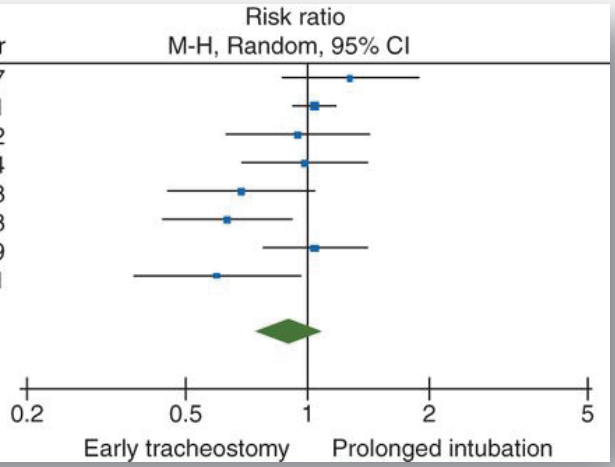
No. at risk					
Noninvasive ventilation	191	177	167	153	146
Oxygen alone	183	165	152	140	134

Trachéotomie précoce ?

Study or Subgroup	Early tracheostomy Events	Total	Prolonged intubation Events	Total	Weight	Risk ratio M-H, Random, 95% CI	Year
Sugerman 1997	25	53	34	92	11.2%	1.28 (0.86, 1.89)	1997
Saffle et al 2002	21	21	22	23	20.5%	1.04 (0.92, 1.18)	2001
Bouderka et al 2004	18	31	19	31	10.7%	0.95 (0.63, 1.43)	2002
Blot et al 2008	30	61	31	62	12.2%	0.98 (0.69, 1.40)	2004
Terragni et al 2010	30	209	44	210	10.3%	0.69 (0.45, 1.05)	2008
Saboori, 2009	12	20	19	20	11.8%	0.63 (0.44, 0.92)	2008
Trouillet 2011	50	109	47	107	14.3%	1.04 (0.78, 1.40)	2009
Zheng et al 2012	17	58	30	61	9.0%	0.60 (0.37, 0.96)	2011
Total (95% CI)		562		606	100.0%	0.90 (0.75, 1.08)	
Total events	203		246				

Heterogeneity. $Tau^2 = 0.04$; $Chi^2 = 18.20$, $df = 7$ ($P = 0.01$); $I^2 = 62\%$

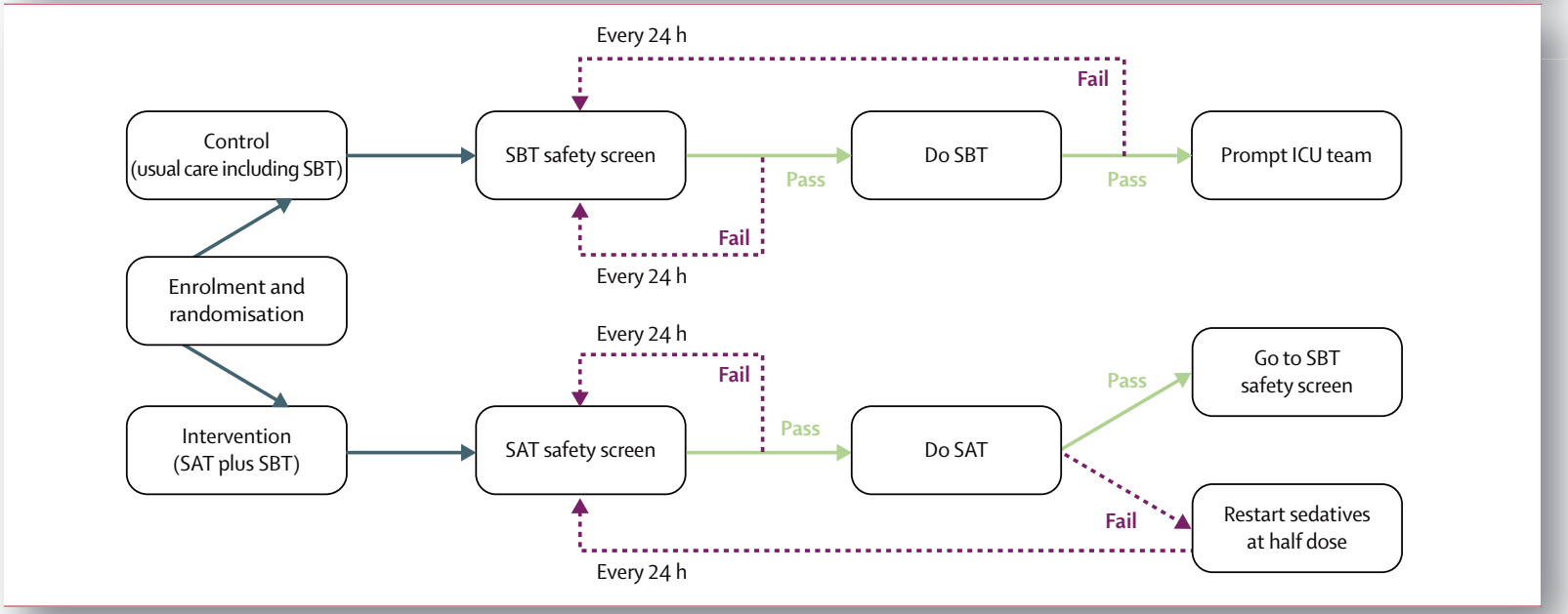
Test for overall effect: $Z = 1.12$ ($P = 0.26$)



Szakmany, BJA 2015

Protocole de sevrage

Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial

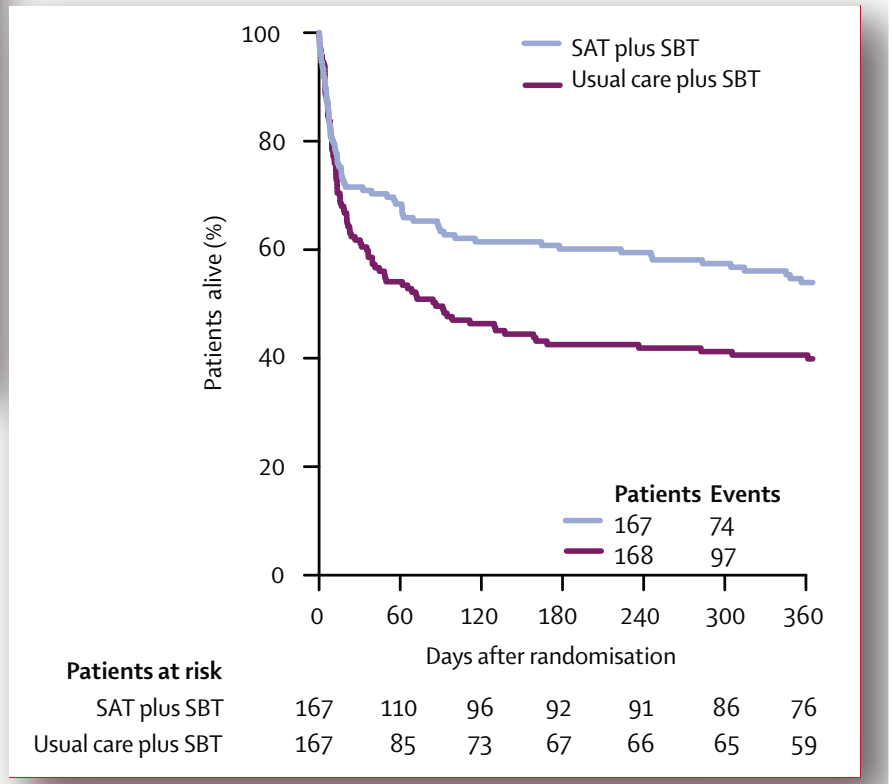


Girard et al, Lancet 2008

	Intervention group (n=167)	Control group (n=168)	p value
Ventilator-free days*			
Mean	14·7 (0·9)	11·6 (0·9)	0·02
Median	20·0 (0 to 26·0)	8·1 (0 to 24·3)	
Time to discharge (days)			
From intensive care	9·1 (5·1 to 17·8)	12·9 (6·0 to 24·2)	0·01
From hospital	14·9 (8·9 to 26·8)	19·2 (10·3 to NA)†	0·04
28-day mortality	47 (28%)	58 (35%)	0·21
1-year mortality	74 (44%)	97 (58%)	0·01
Duration of brain dysfunction (days)			
Coma	2 (0 to 4)	3 (1 to 7)	0·002
Delirium	2 (0 to 5)	2 (0 to 6)	0·50
RASS at first successful SBT	−1 (−3 to 0)	−2·5 (−4 to 0)	0·0001
Complications			
Any self-extubation	16 (10%)	6 (4%)	0·03
Self-extubation requiring reintubation‡	5 (3%)	3 (2%)	0·47
Reintubation‡	23 (14%)	21 (13%)	0·73
Tracheostomy	21 (13%)	34 (20%)	0·06

Data are mean (SD), n (%), or median (IQR). RASS=Richmond agitation-sedation scale. SAT=spontaneous awakening trial. SBT=spontaneous breathing trial. *Ventilator-free days from study day 1 to 28. †Greater than 25% of patients in the SBT group remained in the hospital at study day 28. ‡Reintubation within 48 hours of extubation.

Table 3: **Main outcomes**

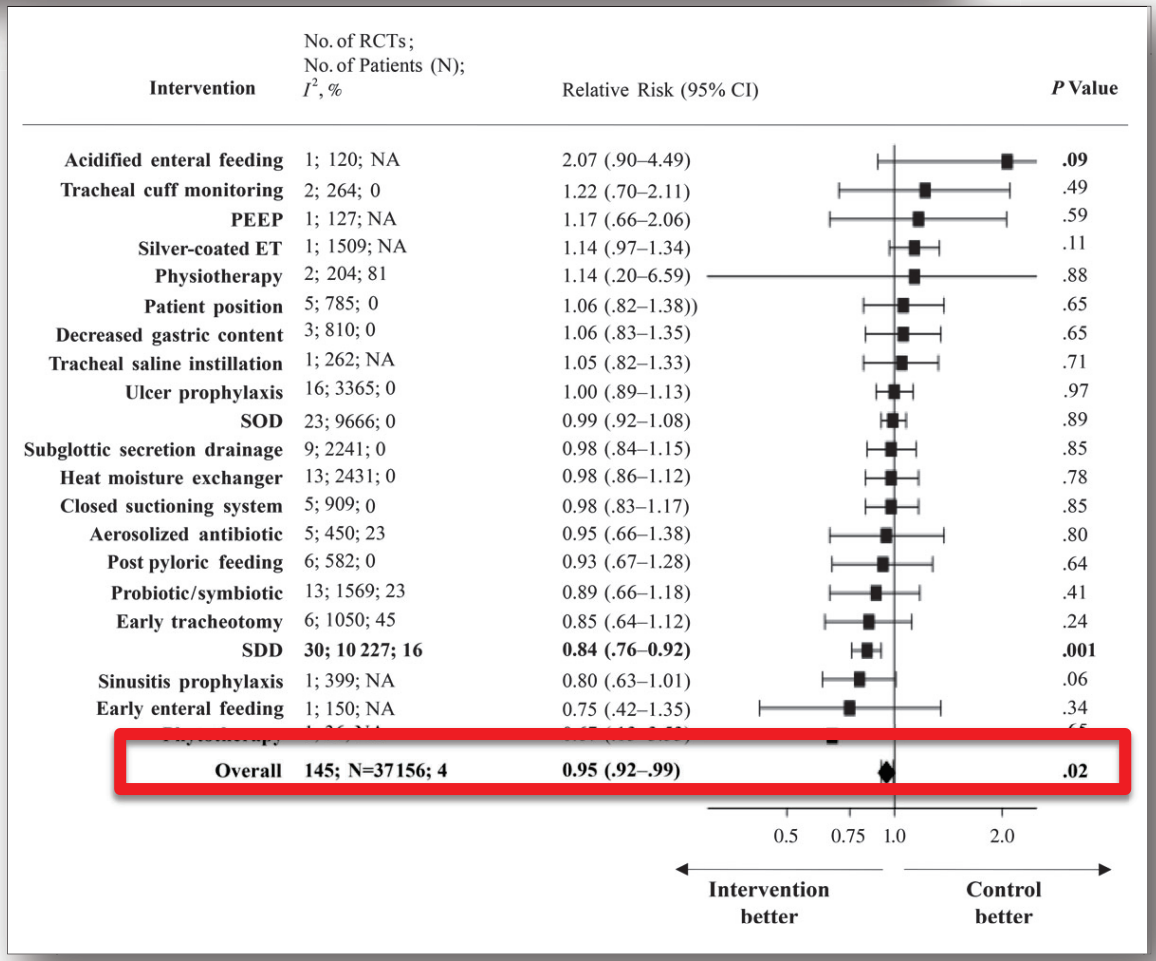


Surveiller / Eduquer

- **ACCOMPANYING MEASURES**
  - Education
  - Measuring performance, providing feedback
  - Improvement in the overall safety culture in healthcare
  - Public reporting

Pneumonia Prevention to Decrease Mortality in Intensive Care Unit: A Systematic Review and Meta-analysis

Antoine Roquilly,[1] Emmanuel Marret,[3] Edward Abraham,[4] and Karim Asehnoune[1,2]



Intervention	No. of RCTs; No. of Patients (N); I^2, %	Relative Risk (95% CI)	*P* Value
Acidified enteral feeding	1; 120; NA	2.07 (.90–4.49)	**.09**
Tracheal cuff monitoring	2; 264; 0	1.22 (.70–2.11)	.49
PEEP	1; 127; NA	1.17 (.66–2.06)	.59
Silver-coated ET	1; 1509; NA	1.14 (.97–1.34)	.11
Physiotherapy	2; 204; 81	1.14 (.20–6.59)	.88
Patient position	5; 785; 0	1.06 (.82–1.38))	.65
Decreased gastric content	3; 810; 0	1.06 (.83–1.35)	.65
Tracheal saline instillation	1; 262; NA	1.05 (.82–1.33)	.71
Ulcer prophylaxis	16; 3365; 0	1.00 (.89–1.13)	.97
SOD	23; 9666; 0	0.99 (.92–1.08)	.89
Subglottic secretion drainage	9; 2241; 0	0.98 (.84–1.15)	.85
Heat moisture exchanger	13; 2431; 0	0.98 (.86–1.12)	.78
Closed suctioning system	5; 909; 0	0.98 (.83–1.17)	.85
Aerosolized antibiotic	5; 450; 23	0.95 (.66–1.38)	.80
Post pyloric feeding	6; 582; 0	0.93 (.67–1.28)	.64
Probiotic/symbiotic	13; 1569; 23	0.89 (.66–1.18)	.41
Early tracheotomy	6; 1050; 45	0.85 (.64–1.12)	.24
SDD	**30; 10 227; 16**	**0.84 (.76–0.92)**	**.001**
Sinusitis prophylaxis	1; 399; NA	0.80 (.63–1.01)	.06
Early enteral feeding	1; 150; NA	0.75 (.42–1.35)	.34
Overall	**145; N=37156; 4**	**0.95 (.92–.99)**	**.02**

Roquilly et al, CID 2015

Long-Term Impact of a Multifaceted Prevention Program on Ventilator-Associated Pneumonia in a Medical Intensive Care Unit

Lila Bouadma,[1] Emmanuelle Deslandes,[2] Isabelle Lolom,[3] Bertrand Le Corre,[1] Bruno Mourvillier,[1] Bernard Regnier,[1] Raphael Porcher,[2] Michel Wolff,[1,4] and Jean-Christophe Lucet[3]

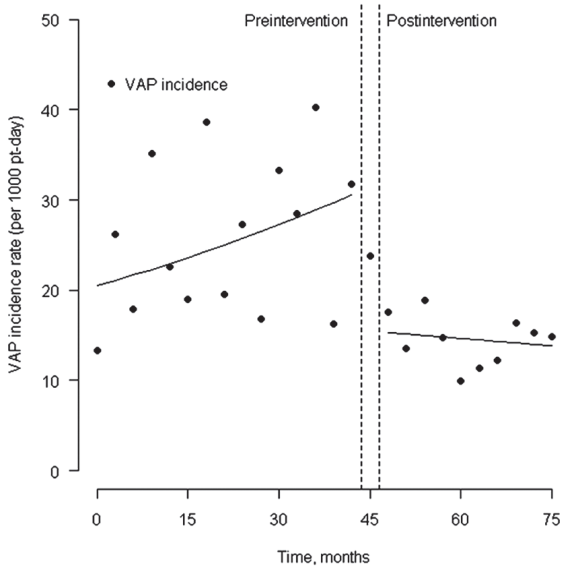
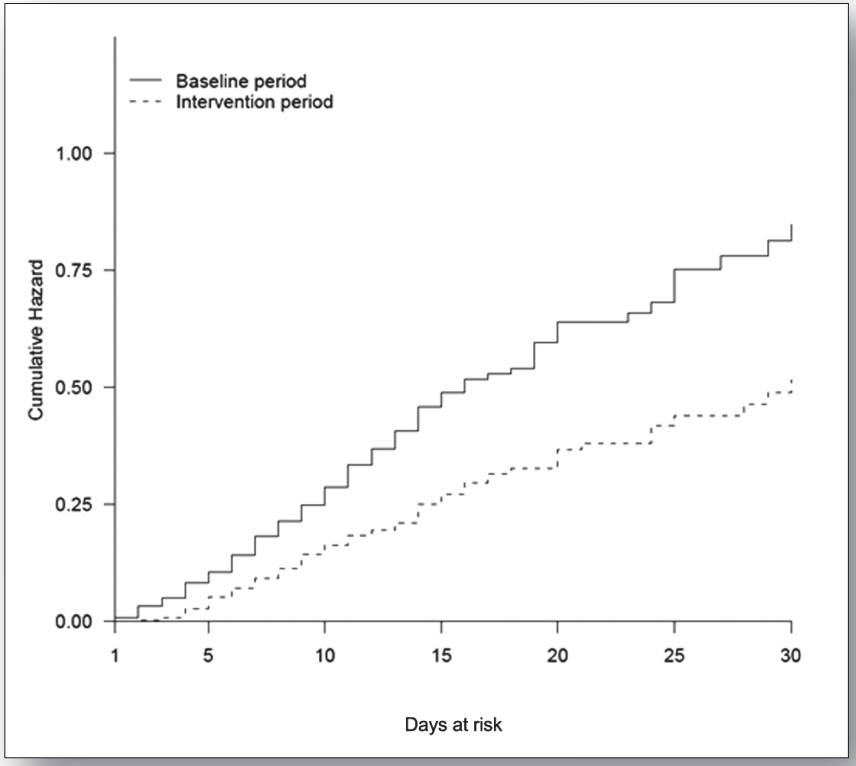


Figure 1. Segmented Poisson regression analysis, comparing incidence rates of ventilator-associated pneumonia (VAP) in the intensive care unit before and after a preventive intervention.

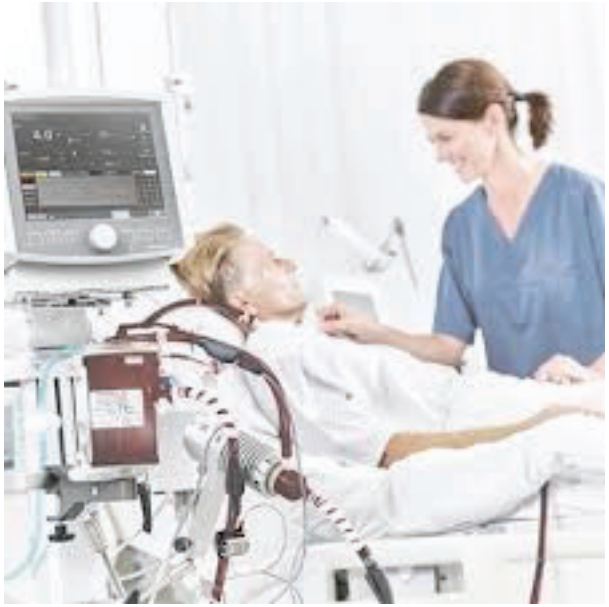


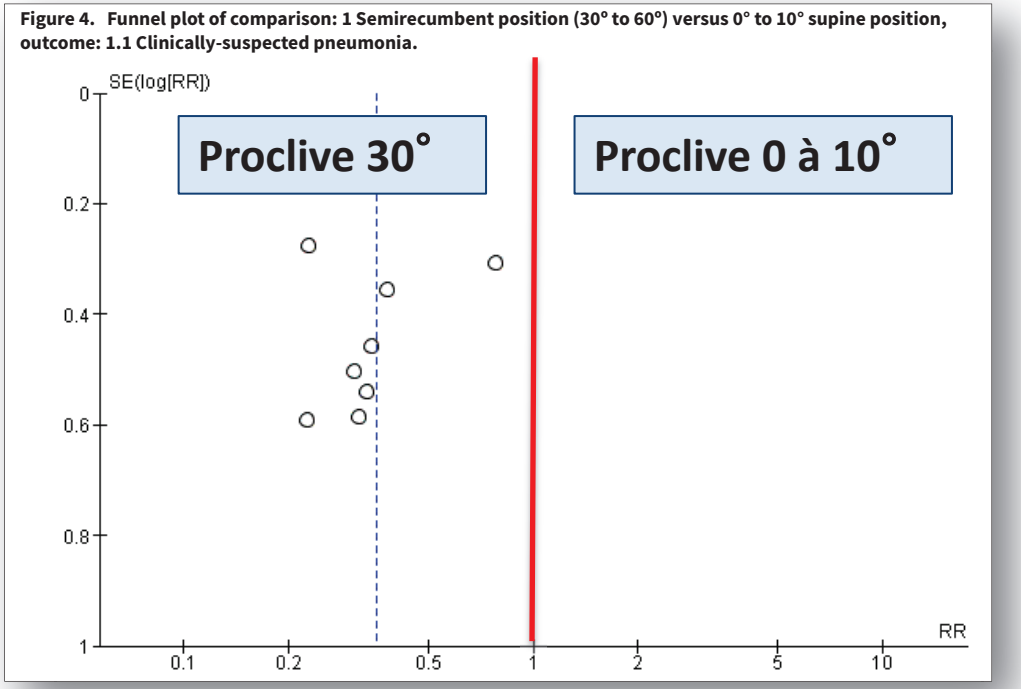
Bouadma et al, CID 2010

Prévenir = BUNDLE

- **PREVENTIVE MEASURES**
  - **Change of the ventilator circuit only if visibly soiled or malfunctioning** (QOE: I)
  - **Selective oral or digestive decontamination** (QOE: I) ONLY IN HOSPITALS WITH LOW BASELINE RATES OF ANTIBIOTIC RESISTANCE
  - **Endotracheal tube with subglottic drainage of secretions** (QOE: II)
  - **Regular oral care with chlorhexidine** (QOE: II)
  - **Prophylactic probiotics** (QOE: II)
  - QOE: III: Elevate the head of the bed to 30-45 Ultrathin polyurethane endotracheal tube cuffs; Automated control of endotracheal tube cuff pressure; Saline instillation before tracheal suctioning; mechanical tooth brushing

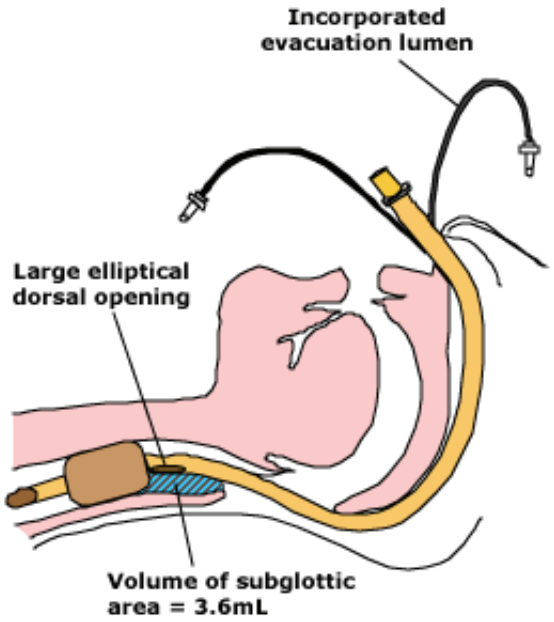
Prévenir l’inhalation





Prévenir l'inhalation

Device for continuous aspiration of subglottic secretions



Representation of a specially designed endotracheal tube that permits the drainage of subglottic secretions. Hi-Lo EVAC tube (Mallinckrodt).

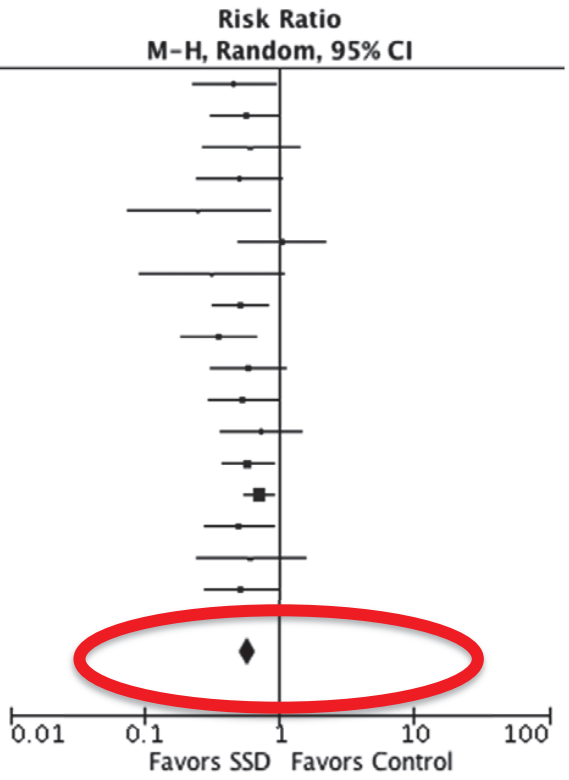
Subglottic Secretion Drainage and Objective Outcomes: A Systematic Review and Meta-Analysis

Daniel A. Caroff, MD[1,2]; Lingling Li, PhD[1]; John Muscedere, MD[3]; Michael Klompas, MD, MPH[1,2]

Study or Subgroup	SSD Events	SSD Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Mahul 1992	9	70	21	75	3.8%	0.46 [0.23, 0.93]	1992
Valles 1995	14	95	25	95	5.5%	0.56 [0.31, 1.01]	1995
Kollef 1999	8	160	15	183	2.8%	0.61 [0.27, 1.40]	1999
Bo 2000	8	35	15	33	3.7%	0.50 [0.25, 1.03]	2000
Smulders 2002	3	75	12	75	1.3%	0.25 [0.07, 0.85]	2002
Girou 2004	5	8	6	10	3.5%	1.04 [0.50, 2.18]	2004
Liu S 2006	3	48	10	50	1.3%	0.31 [0.09, 1.07]	2006
Liu Q 2006	14	41	30	45	8.5%	0.51 [0.32, 0.82]	2006
Lorente 2007	11	140	31	140	4.6%	0.35 [0.19, 0.68]	2007
Zheng 2008	9	30	16	31	4.6%	0.58 [0.31, 1.11]	2008
Yang 2008	12	48	20	43	5.6%	0.54 [0.30, 0.97]	2008
Bouza 2008	13	345	19	369	4.0%	0.73 [0.37, 1.46]	2008
Lacherade 2010	25	169	42	164	9.6%	0.58 [0.37, 0.90]	2010
Tao 2014	52	102	34	47	28.3%	0.70 [0.54, 0.91]	2014
Damas 2014	15	170	32	182	5.7%	0.50 [0.28, 0.89]	2014
Koker 2014	5	23	10	28	2.3%	0.61 [0.24, 1.53]	2014
Gopal 2015	13	120	25	120	5.0%	0.52 [0.28, 0.97]	2015
Total (95% CI)		**1679**		**1690**	**100.0%**	**0.58 [0.51, 0.67]**	
Total events	219		363				

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 12.12$, df = 16 (P = 0.74); $I^2 = 0\%$

Test for overall effect: Z = 7.71 (P < 0.00001)



Caroff et al, CCM 2016

Lorente *et al. Critical Care* 2014, **18**:R77
http://ccforum.com/content/18/2/R77

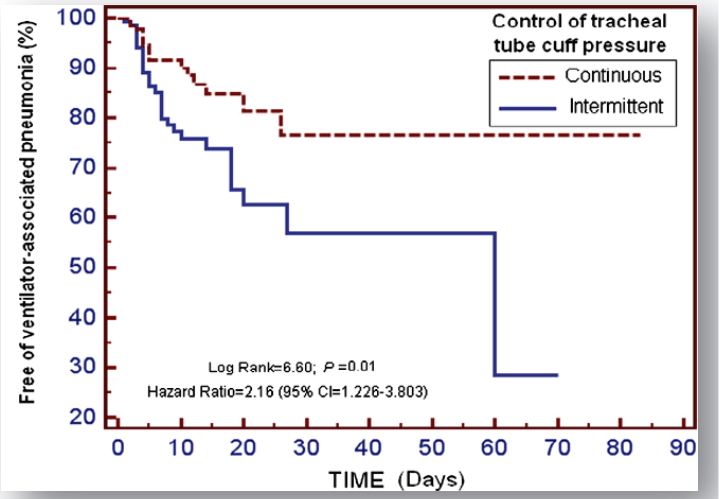
CRITICAL CARE

RESEARCH Open Access

Continuous endotracheal tube cuff pressure control system protects against ventilator-associated pneumonia

Leonardo Lorente[1*], María Lecuona[2], Alejandro Jiménez[3], Lisset Lorenzo[1], Isabel Roca[1], Judith Cabrera[1], Celina Llanos[1] and María L Mora[1]

- Etude prospective espagnole monocentrique
- 25 cmH2O
- Continu vs toutes les 8h
- 284 patients
- NS sur durée d'hospit et mortalité



Prévenir : la Décontamination

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Decontamination of the Digestive Tract and Oropharynx in ICU Patients

- Etude multicentrique randomisée
- 13 réas, Pays Bas
- 5939 patients ventilés plus de 72h
- 3 groupes:

→ SDD : Cefotaxime IV 4j + application orale de Tobramycine + Colistine + Ampho B

→ SOD : Pate orale seule

→ Groupe contrôle

De Smet et al, NEJM 2009

Table 2. Primary and Secondary End Points.*

End Point	Study Group			Unadjusted Odds Ratio or Hazard Ratio (95% CI)†		Adjusted Odds Ratio or Hazard Ratio (95% CI)†		
	Standard Care (N=1990)	SDD (N=2045)	SOD (N=1904)	Standard Care	SDD	SOD	Standard Care	SDD	SOD
Death — no. (%)									
During the first 28 days	544 (27.5)	546 (26.9)	502 (26.6)	1.00	0.94 (0.82–1.08)	0.95 (0.82–1.10)	1.00	0.83 (0.72–0.97)	0.86 (0.74–0.99)
In the ICU	443 (22.3)	440 (21.5)	416 (21.8)	1.00	0.91 (0.79–1.06)	0.97 (0.83–1.13)	1.00	0.81 (0.69–0.94)	0.87 (0.74–1.02)
In the hospital	632 (31.8)	665 (32.6)	584 (30.7)	1.00	0.99 (0.86–1.13)	0.94 (0.82–1.08)	1.00	0.88 (0.76–1.01)	0.85 (0.74–0.98)
Time to outcome for survivors at day 28 — days									
Cessation of mechanical ventilation				1.00	1.06 (0.96–1.18)	1.01 (0.89–1.15)	1.00	1.10 (0.99–1.22)	1.03 (0.90–1.17)
Median	8	7	8						
Interquartile range	3–17	4–15	4–15						
Discharge from ICU				1.00	1.02 (0.92–1.12)	1.00 (0.89–1.11)	1.00	1.09 (0.99–1.21)	1.06 (0.94–1.19)
Median	9	9	9						
Interquartile range	6–19	6–18	6–17						
Discharge from hospital				1.00	1.04 (0.91–1.19)	1.05 (0.91–1.22)	1.00	1.13 (1.01–1.25)	1.13 (0.96–1.32)
Median	29	28	28						
Interquartile range	16–48	16–45	16–47						

De Smet et al, NEJM 2009

Table 3. Cumulative Incidence of ICU-Acquired Bacteremia and Candidemia.*

Type of Infection	Study Group			Crude Odds Ratio (95% CI)		
	Standard Care (N=1990)	SOD (N=1904)	SDD (N=2045)	SDD vs. Standard Care	SOD vs. Standard Care	SDD vs. SOD
		no. (%)				
Staphylococcus aureus	22 (1.1)	9 (0.5)	9 (0.4)	0.40 (0.18–0.86)	0.43 (0.20–0.93)	0.93 (0.37–2.40)
Streptococcus pneumoniae	3 (0.2)	1 (0.1)	1 (0.0)	0.32 (0.03–3.12)	0.35 (0.04–3.35)	0.93 (0.06–14.90)
GNF-GNR species†	36 (1.8)	17 (0.9)	16 (0.8)	0.43 (0.24–0.77)	0.49 (0.27–0.87)	0.88 (0.44–1.74)
Enterobacteriaceae	87 (4.4)	59 (3.1)	18 (0.9)	0.19 (0.12–0.32)	0.70 (0.50–0.98)	0.28 (0.16–0.47)
Enterococcus species	55 (2.8)	49 (2.6)	48 (2.3)	0.85 (0.57–1.25)	0.93 (0.63–1.37)	0.91 (0.61–1.36)
Candida species	16 (0.8)	14 (0.7)	8 (0.4)	0.49 (0.21–1.11)	0.91 (0.45–1.85)	0.53 (0.23–1.24)
Patients with at least one episode of bacteremia or candidemia — no. (%)	186 (9.3)	124 (6.5)	88 (4.3)	0.44 (0.34–0.57)	0.68 (0.53–0.86)	0.65 (0.49–0.85)

➔ **Mais augmentation de résistance des germes...**

De Smet et al, NEJM 2009

ORIGINAL

Ecological effects of selective oral decontamination on multidrug-resistance bacteria acquired in the intensive care unit: a case–control study over 5 years

Check for updates

Table 3 ICU-acquired MDRB over a 5-year period in all patients under study

1 > all included patients	86,281 days with SOD ($n = 3340$)		32,177 days without SOD ($n = 1694$)		Comparison of two rates
	No	Incidence densities/1000 days	No	Incidence densities /1000 days	*p* value
Methicillin-resistant *S. aureus*	16	0.19	12	0.37	0.06
Vancomycin-resistant *E. faecium*	62	0.72	10	0.31	
ESBL-producing *E. coli*	58	0.67	15	0.47	
Fluoroquinolone-resistant *E. coli*	57	0.66	25	0.78	
ESBL-producing *K. pneumoniae*	19	0.22	18	0.56	
Carbapenem-resistant *K. pneumoniae*	3	0.03	4	0.12	
Enterobacter cloacae	36	0.42	13	0.40	
Serratia marcescens	10	0.12	4	0.12	
Stenotrophomonas maltophilia	80	0.93	33	1.03	
Pseudomonas aeruginosa	58	0.67	25	0.78	
Acinetobacter baumannii	16	0.19	3	0.09	

ICU, intensive care unit; *SOD*, selective oropharynx decontamination; *MDRB*, multidrug-resistant bacteria; *ESBL*, extended-spectrum beta-lactamas

Pas de différence sur incidence BMR
(hors ERV)

Table 6 Health-care-associated infections in both groups after propensity score matching

ICU-acquired infections during prevention*	with SOD ($n = 1694$)			Without SOD ($n = 1694$)			*p* value
	Number of cases	%	Incidence density/1000 days	Number of cases	%	Incidence density/1000 days	
Ventilator-associated pneumonia	243	14	10.2	302	18	14.1	< 0.01
Bacteremia	218	13	8.92	182	11	8.48	0.61
Urinary tract infections	162	10	6.79	138	8	6.43	0.64

*Days at risk with mechanical ventilation: 23,876 days with SOD, 21,467 days without SOD

ICU, intensive care unit; *SOD*, selective oropharynx decontamination

Table 7 Incidence rate of death in the ICU in both groups

Death in the ICU*	With SOD			Without SOD			*p* value
	No	%	Incidence density/1000 days	No	%	Incidence density/1000 days	
Before propensity score matching	759/3340	23	8.8	509/1694	30	15.8	< 0.01
After propensity score matching	478/1694	28	13.2	509/1694	30	15.8	< 0.01

*Days at risk in the ICU: 86,281 and 36,167 days with SOD, respectively; 32,177 days without SOD

ICU, intensive care unit; *SOD*, selective oropharynx decontamination

Diminution VAP et mortalité en réa

Wang et al, ICM 2022

Rôle du pH gastrique ?

Acid Suppressive Medication Use and the Risk for Hospital Acquired Pneumonia

Shoshana J. Herzig MD
Michael D. Howell MD MPH
Long H. Ngo PhD
Edward R. Marcantonio MD SM

Context The use of acid-suppressive medication has been steadily increasing, particularly in the inpatient setting, despite lack of an accepted indication in the majority of these patients.

Objective To examine the association between acid-suppressive medication and hospital-acquired pneumonia.

Table 4. Rates of Hospital-Acquired Pneumonia According to Type of Acid-Suppressive Medication

	Acid-Suppressive Medication	No Acid-Suppressive Medication	Unadjusted OR (95 CI)	Adjusted OR (95 CI)
Proton-Pump Inhibitors[a]				
Total admissions, No.	25 374	30 956	56 330	56 330
Hospital-acquired pneumonia, No. ( )	1340 (5.3)	610 (2.0)	2.8 (2.5-3.1)	1.3 (1.1-1.4)[b]
Histamine$_2$ Receptor Antagonists[c]				
Total admissions, No.	5686	30 956	36 642	36 642
Hospital-acquired pneumonia, No. ( )	176 (3.1)	610 (2.0)	1.6 (1.3-1.9)	1.2 (0.98-1.4)[b]

Herzig et al., JAMA 2009

Rôle du pH gastrique ?

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 DECEMBER 6, 2018 VOL. 379 NO. 23

Pantoprazole in Patients at Risk for Gastrointestinal Bleeding in the ICU

- Étude prospective, randomisée, multicentrique, internationale
- 3298 patients avec FDR d'hémorragie digestive haute (anticoagulants, choc, ventilation, EER…)
- Pantoprazole 40mg vs Placebo

Rôle du pH gastrique ?

Table 2. Primary and Secondary Outcome Measures.

Outcomes	Pantoprazole	Placebo	Relative Risk (95% CI)*	P Value†
Primary outcome: death by day 90 — no./total no. (%)	510/1642 (31.1)	499/1640 (30.4)	1.02 (0.91–1.13)	0.76
Secondary outcomes				
One or more clinically important events — no./total no. (%)‡	360/1644 (21.9)	372/1647 (22.6)	0.96 (0.83–1.11)	—
One or more episodes of clinically important gastrointestinal bleeding — no./total no. (%)	41/1644 (2.5)	69/1647 (4.2)	0.58 (0.40–0.86)	—
One or more infectious adverse events — no./total no. (%)§	276/1644 (16.8)	279/1647 (16.9)	0.99 (0.84–1.16)	—
Severe adverse reaction — no./total no. (%)¶	0/1644 (0)	0/1647 (0)	—	—
Median percentage of days alive without the use of life support (IQR)‖	92 (60–97)	92 (65–97)	—	—

Prévention : autres mesures

- Pas d'intérêts à l'utilisation de :

- Probiotiques

- Sonde IOT recouvertes d'argent ou forme ballonnet « optimisée »

- Corticoïdes

- Système d'aspiration clos

- Antibioprophylaxie par aérosols

- Changement quotidien du circuit ou filtre

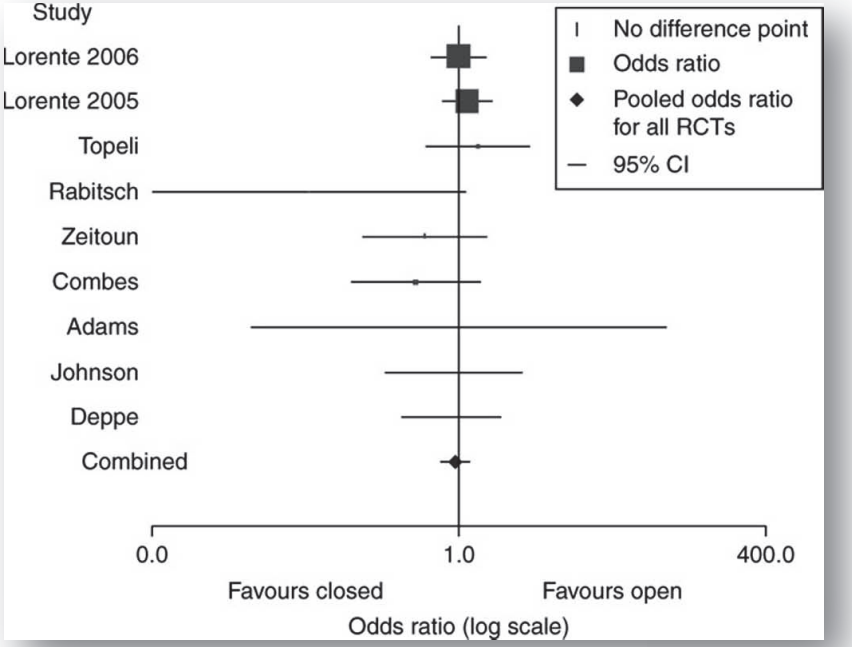
British Journal of Anaesthesia **100 (3):** 299–306 (2008)
doi:10.1093/bja/aem403 Advance Access publication February 4, 2008

BJA

Closed tracheal suction systems for prevention of ventilator-associated pneumonia

I. I. Siempos[1], K. Z. Vardakas[1] and M. E. Falagas[1 2 3]*

[1]Alfa Institute of Biomedical Sciences (AIBS), 9 Neapoleos Street, 151 23 Marousi, Athens, Greece. [2]Department of Medicine, Henry Dunant Hospital, Athens, Greece. [3]Department of Medicine, Tufts University School of Medicine, Boston, MA, USA



- NS sur incidence PAVM
- Augmentation durée de ventilation et colonisation bactérienne

Impact kinésithérapie ?

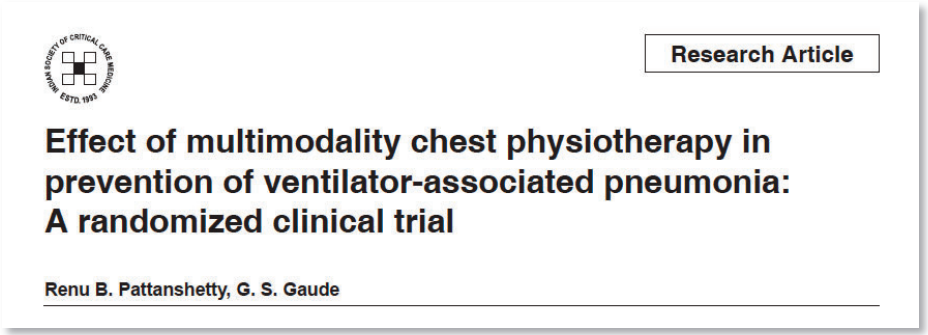
Intensive Care Med (2002) 28:850–856
DOI 10.1007/s00134-002-1342-2

ORIGINAL

G. Ntoumenopoulos
J. J. Presneill
M. McElholum
J. F. Cade

Chest physiotherapy for the prevention of ventilator-associated pneumonia

2002, n=60
Diminution VAP

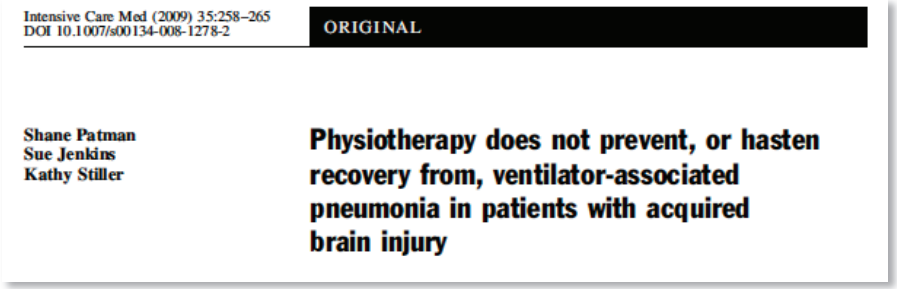


Research Article

Effect of multimodality chest physiotherapy in prevention of ventilator-associated pneumonia: A randomized clinical trial

Renu B. Pattanshetty, G. S. Gaude

2010, n=101
Diminution du score CPIS



Intensive Care Med (2009) 35:258–265
DOI 10.1007/s00134-008-1278-2

ORIGINAL

Shane Patman
Sue Jenkins
Kathy Stiller

Physiotherapy does not prevent, or hasten recovery from, ventilator-associated pneumonia in patients with acquired brain injury

2008, n=101, neurolésé
Pas de diminution survenue VAP
ni d'amélioration pronostic si VAP

Donnée contradictoire …

Impact kinésithérapie ?

Chest physiotherapy for the prevention of ventilator-associated pneumonia: A meta-analys

Meng-Yang Wang BS [a,*], Lei Pan M

[a] Joint Programme of Nanchang University of London, Nanc
[b] Department of Respiratory and Critical Care Medicine, Bi

First author/y/reference	RR (95%CI)	Weight %
Ntoumenopoulos G, 1998[19]	0.55 (0.19, 1.56)	3.85
Templeton M, 2007[20]	1.37 (0.90, 2.08)	16.61
Patman S, 2009[21]	0.74 (0.40, 1.35)	9.80
Pattanshetty RB, 2010[22]	1.04 (0.94, 1.15)	39.94
Pattanshetty RB, 2011[23]	1.13 (0.88, 1.45)	27.75
Zeng H, 2017[24]	0.21 (0.05, 0.91)	2.05
Overall (I^2 = 49.0%, P = .081)	1.02 (0.82, 1.26)	100.00

NOTE: Weights are from random effects analysis

20.9

Peu d'études, petits effectifs, hétérogénicité…

Wang et al, AJIC 2019

Prévention

Prévention

Quels moyens de prévention des pneumonies associées aux soins faut-il utiliser pour diminuer la morbimortalité des patients de réanimation ?

R1.1 – Il faut utiliser une approche standardisée multimodale de prévention des pneumonies associées aux soins pour diminuer la morbidité des patients hospitalisés en réanimation.
GRADE 1+, ACCORD Fort

SFAR

srlf
SOCIÉTÉ
DE RÉANIMATION
DE LANGUE FRANÇAISE

Protocole multimodal de prévention des pneumonies associées aux soins

1 - Favoriser la ventilation non-invasive (notamment en post-opératoire de chirurgie digestive et chez le BPCO)

En cas de nécessité de ventilation invasive

2 - Appliquer un protocole de décontamination digestive sélective avec une antibiothérapie systémique < 5 jours si prévalence de BMR faible (< 20%)

3 - Associer certaines des méthodes suivantes (1ère intention) :

- Favoriser le recours à la VNI pour éviter l'intubation
- Limiter les doses et la durée d'administration de sédatifs et analgésiques liés à la ventilation mécanique
- Initier précocement une nutrition entérale
- Contrôler régulièrement la pression du ballonnet de la sonde endotrachéale
- Réaliser une aspiration sous-glottique (/6-8 heures) à l'aide de sonde endotrachéale adaptée
- Préférer la voie orotrachéale pour l'intubation

NB: l'association d'un proclive > 30° et/ou d'une décontamination oro-pharyngée à la chlorhexidine 0,12 ou 0,2% pourraient être proposée en association à ces mesures malgré une faible efficacité car elles sont peu coûteuses et bien tolérées

4- Eviter d'utiliser les méthodes suivantes :

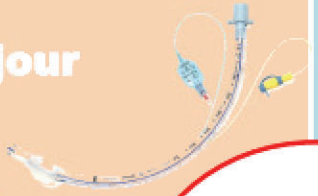
- Trachéotomie précoce systématique (hors indication spécifique)
- Prophylaxie anti-ulcéreuse (hors indication spécifique)
- Nutrition entérale post-pylorique (hors indication spécifique)
- Administration de probiotiques
- Changement précoce (hors recommandation du constructeur) des filtres humidificateurs en systématique
- Utilisation des systèmes clos d'aspiration endo-trachéale
- Utilisation de sonde d'intubation imprégnée avec un antiseptique, ou à forme « optimisée » du ballonnet
- Décontamination oro-pharyngée à la polyvidone iodée
- Utilisation d'une antibioprophylaxie par aérosols
- Décontamination cutanée quotidienne par antiseptique

PREVENTION DES PAVM

5 POINTS CLÉS

Aspiration sous glottique

3x/jour



Pression du ballonnet

25-30 cm H2O

Elévation tête du lit

30-45°

Evaluation sédation/extubation

1x/jour

Soins de bouche

6x/jour

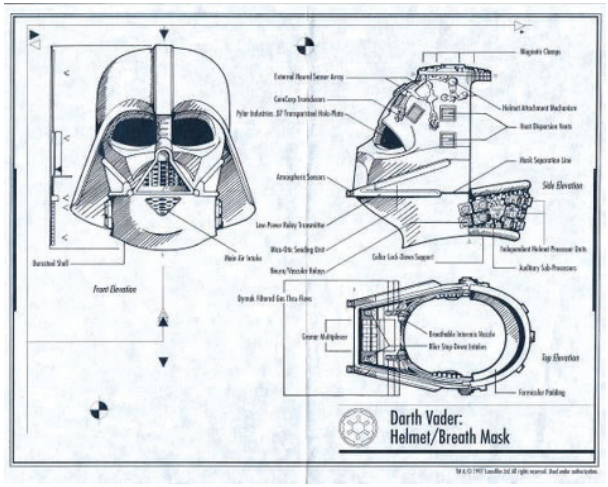
Janvier 2020-CHU0257

CHU Hôpitaux de Bordeaux

Conclusions

- Moins de ventilation… moins de PAVM !
- Diagnostic précoce pour traitement adapté
- **Protocole de service pour prévention = BUNDLE**

Pneumopathie acquise sous ventilation mécanique



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