3M℠ Health Care Academy

UK & Ireland IV Leadership Summit

Sustained CRBSI reduction through IV catheter bundle enhancement:

A Perspective from Switzerland

Philippe Eggimann MD
www.lausanneuniversityhospital.com

Switzerland

UNIL | Université de Lausanne

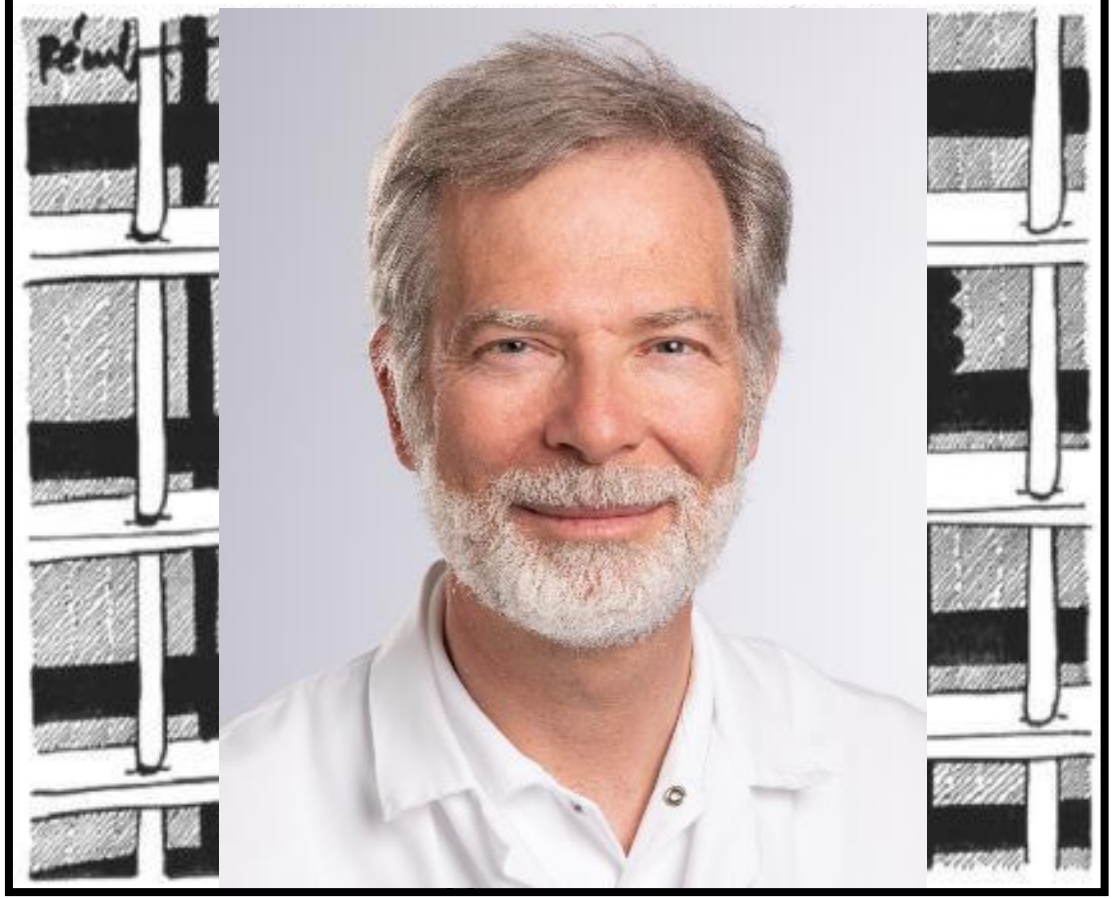
Be careful anything I say can be very biased

Dr Eggimann regularly collaborated in industry-funded clinical trials since the1990s

Dr Eggimann has no offshore account !

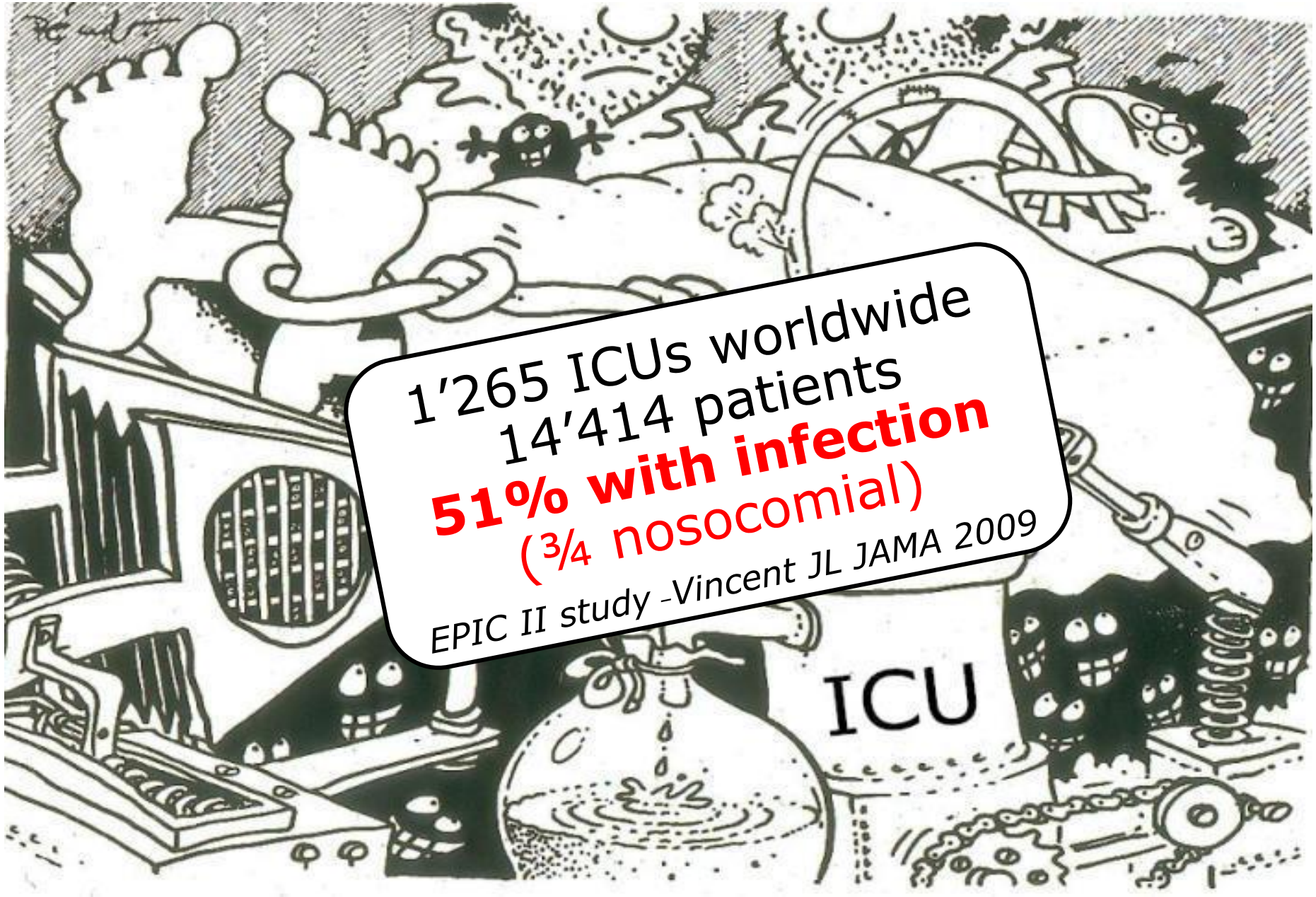
All fees go to the account of the hospital, to pay research nurse, data manager

DISCLOSURE

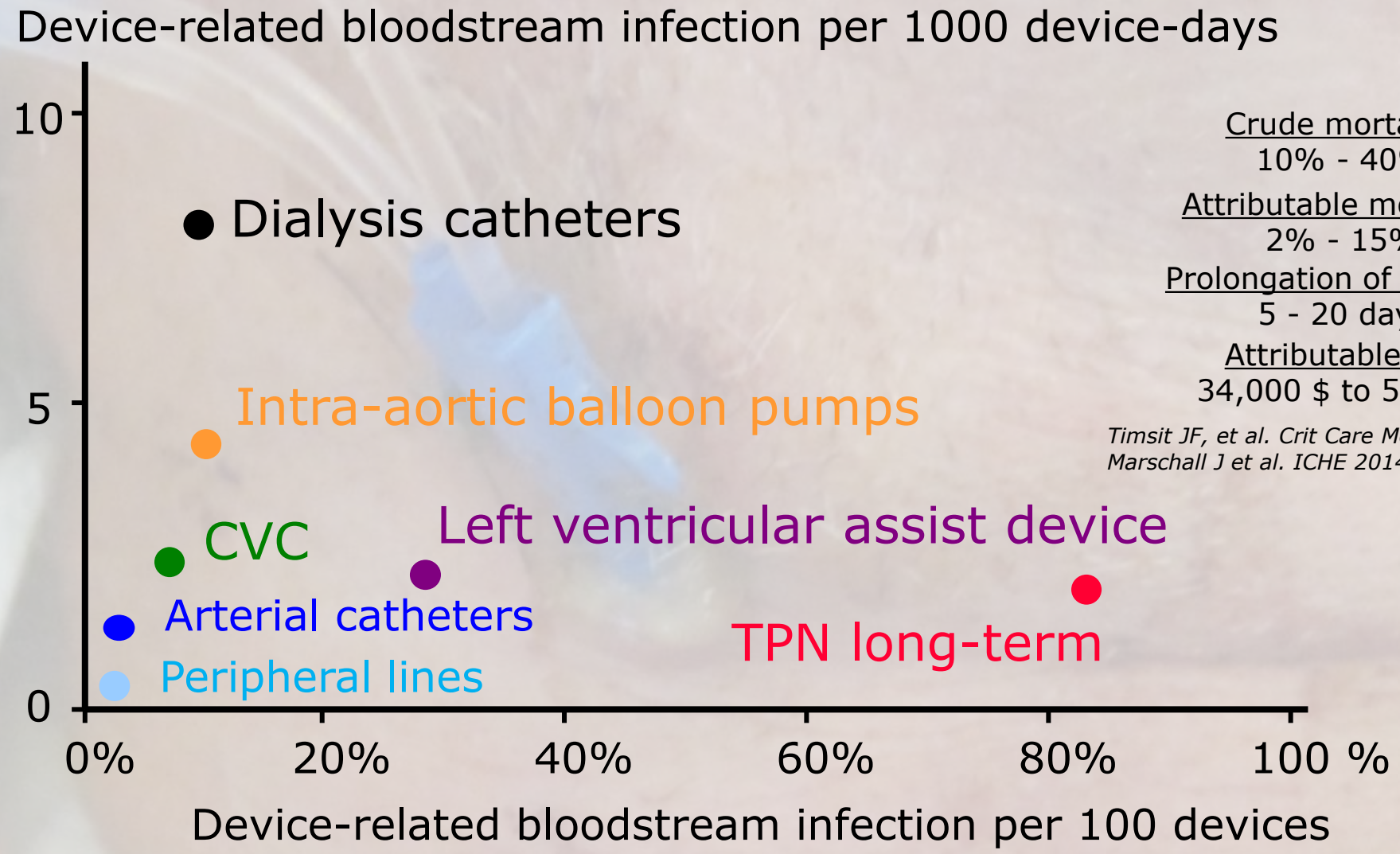


Dr Eggimann served on advisory boards and/or presented sponsored lectures for:
Pfizer, Gillead
MSD, 3M
Astellas,
Roche,
Weyth-Lederle,
Lilly, Bayer
Medex,
Kenta-Biotech
Aridis, Abionic

Welcome to the ICU The world of infection



Including catheter-related infections !!!



Crude mortality
10% - 40%

Attributable mortality
2% - 15%

Prolongation of the LOS
5 - 20 days

Attributable costs
34,000 $ to 56,000 $

Timsit JF, et al. Crit Care Med. 2012;40:1717-14
Marschall J et al. ICHE 2014; 35:753-71

Maki DG, et al. Mayo Clin Proc. 2006;81:1159-71

Including catheter-related infections !!!

Preventable Proportion of Severe Infections Acquired in Intensive Care Units: Case-Mix Adjusted Estimations from Patient-Based Surveillance Data

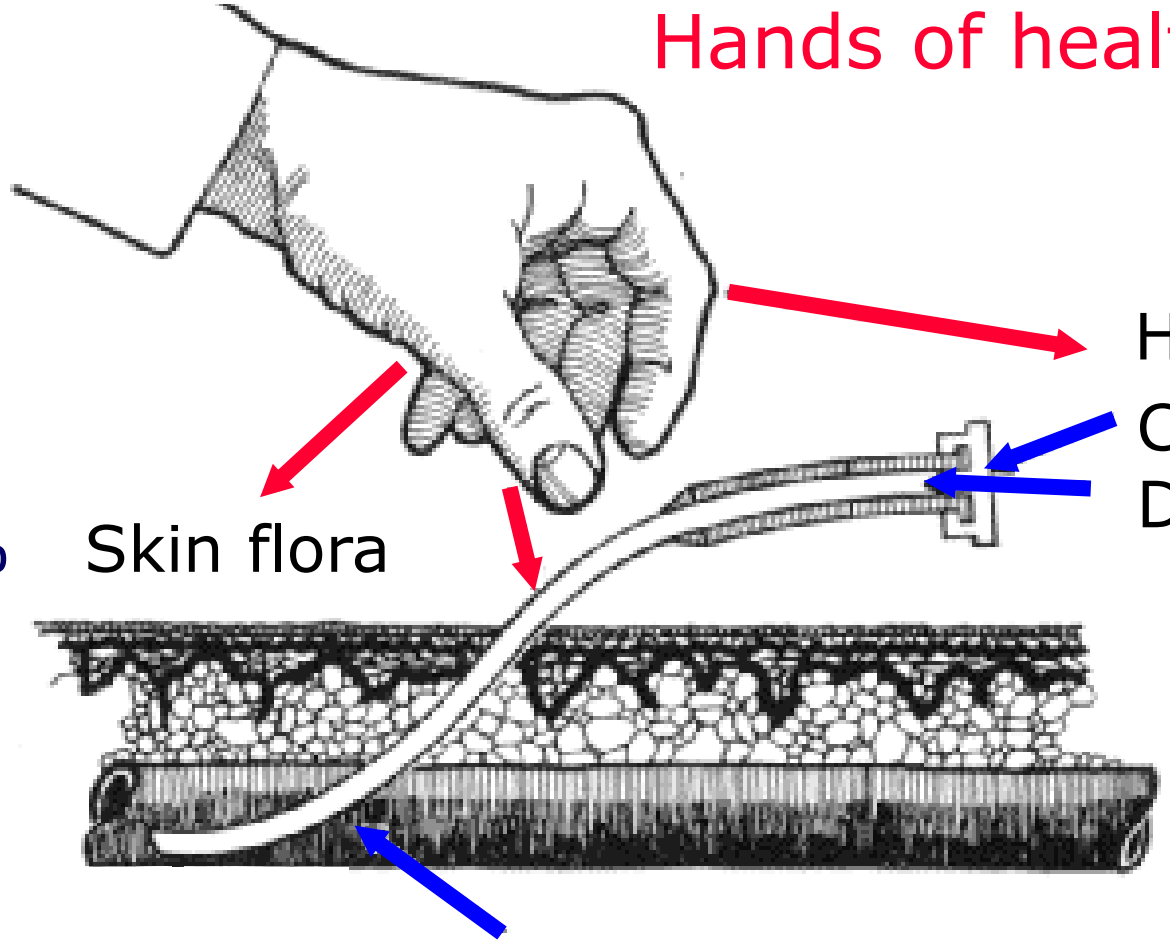
Marie-Laurence Lambert, MD, PhD;[1] Geert Silversmit, PhD;[2] Anne Savey, MD;[3] Mercedes Paloma
Michael Hiesmayr, MD;[6] Antonella Agodi, PhD;[7] Bart Van Rompaye, PhD;[2]
Karl Mertens, MSc;[1] Stijn Vansteelandt, PhD[2]

2/3

TABLE 5. Preventable Number and Proportion of Cases for Ventilator-Associated Pneumonia (VAP) and Blood Infection (BSI)

Variable	No. of cases preventable[a] (95% CI)	Proportion of cases preventable[b] (95% CI)
VAPs	3,148 (2,978–3,318)	.52 (0.52–0.52)
VAPs per 100 patients with mechanical ventilation	6.2 (5.9–6.5)	.51 (0.51–0.51)
VAPs per 1,000 ventilator-days	8.4 (8.1–8.8)	.55 (0.54–0.55)
BSIs	2,496 (1,596–3,396)	.69 (0.68–0.70)
BSIs per 100 admissions	3.2 (2.0–4.3)	.68 (0.67–0.70)
BSIs per 1,000 ICU-days	3.3 (2.1–4.6)	.69 (0.69–0.70)

Pathophysiology of catheter-related infections



Hands of healthcare workers

Hub and lines

Contaminated Drugs and fluids

60% Skin flora

Hematogenous

http://reaannecy.free.fr/Documents/infectio/infections_catheters.htm

Pathophysiology of catheter-related infections

Weaning

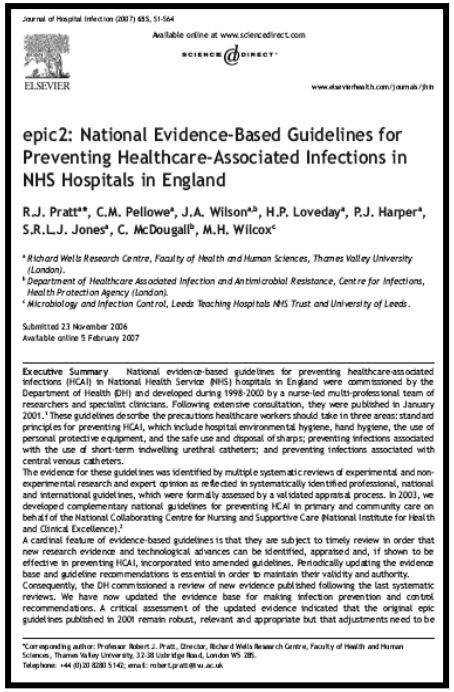
Pathophysiology of catheter-related infections

Dressings

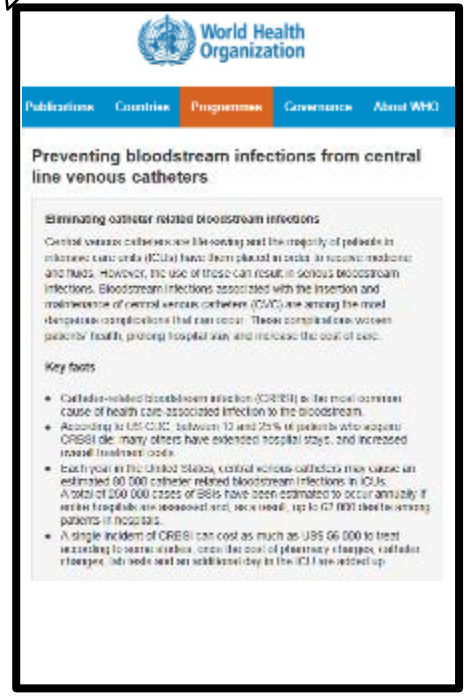
What did you do to prevent them ?

I follow guidelines

Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update



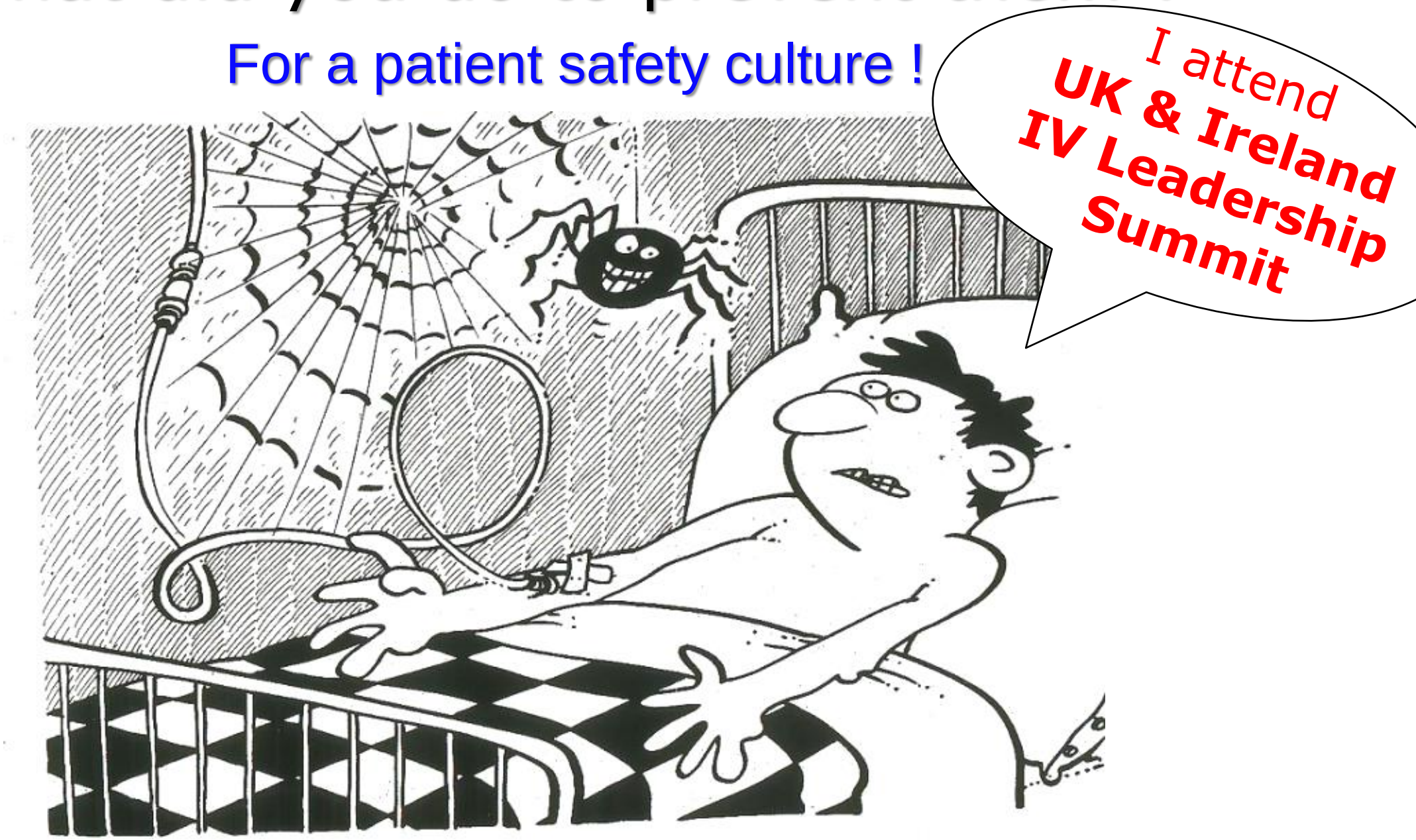
epic2: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England



https://www.cdc.gov/infectioncontrol/pdf/guidelines/bsi-guidelines-H.pdf

What did you do to prevent them ?

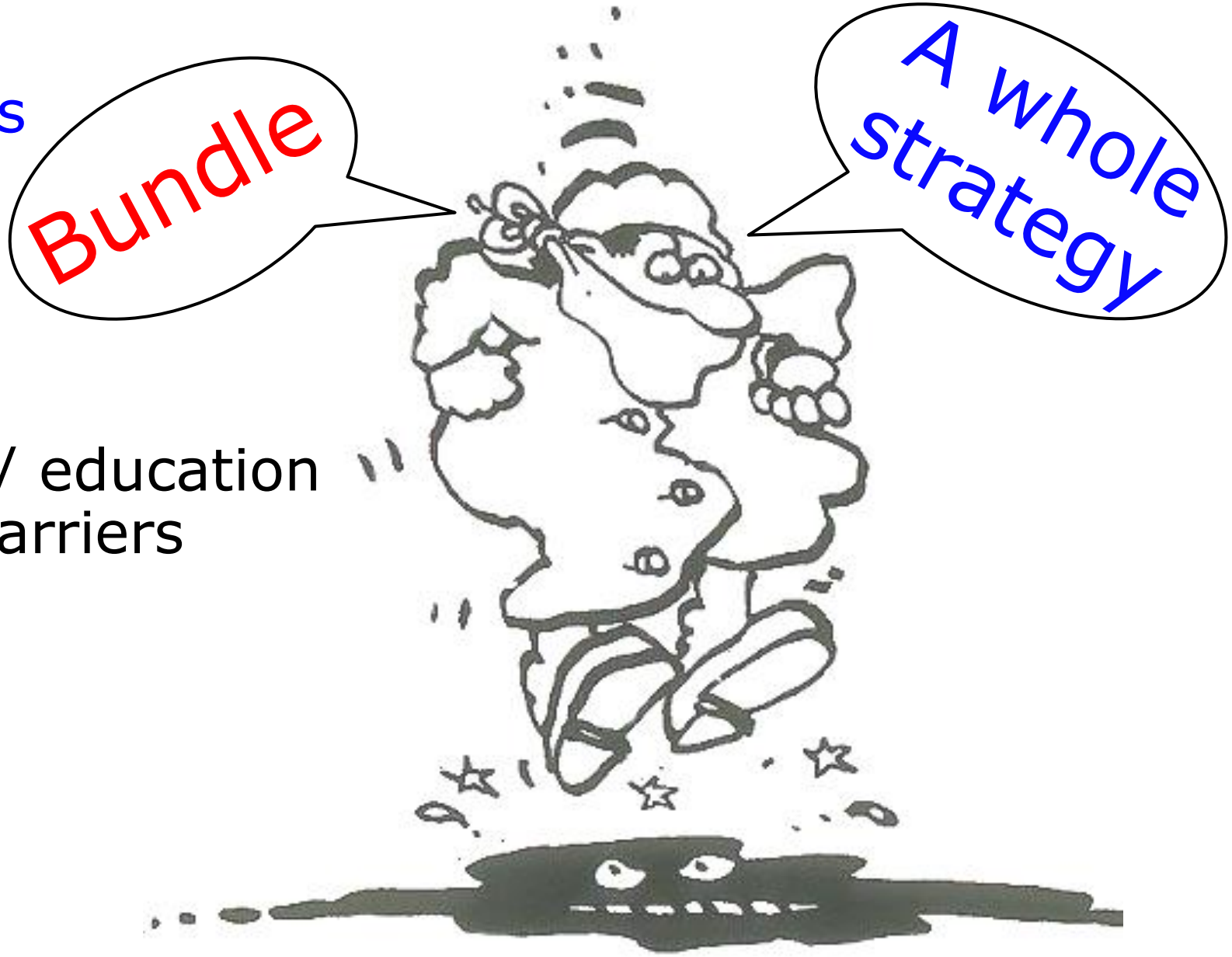
For a patient safety culture !



Prevention of catheter-related infections

General measures
Surveillance
Hand hygiene

Technical aspects
Global approach / education
Maximal sterile barriers



Bundle for the prevention of CRBSI

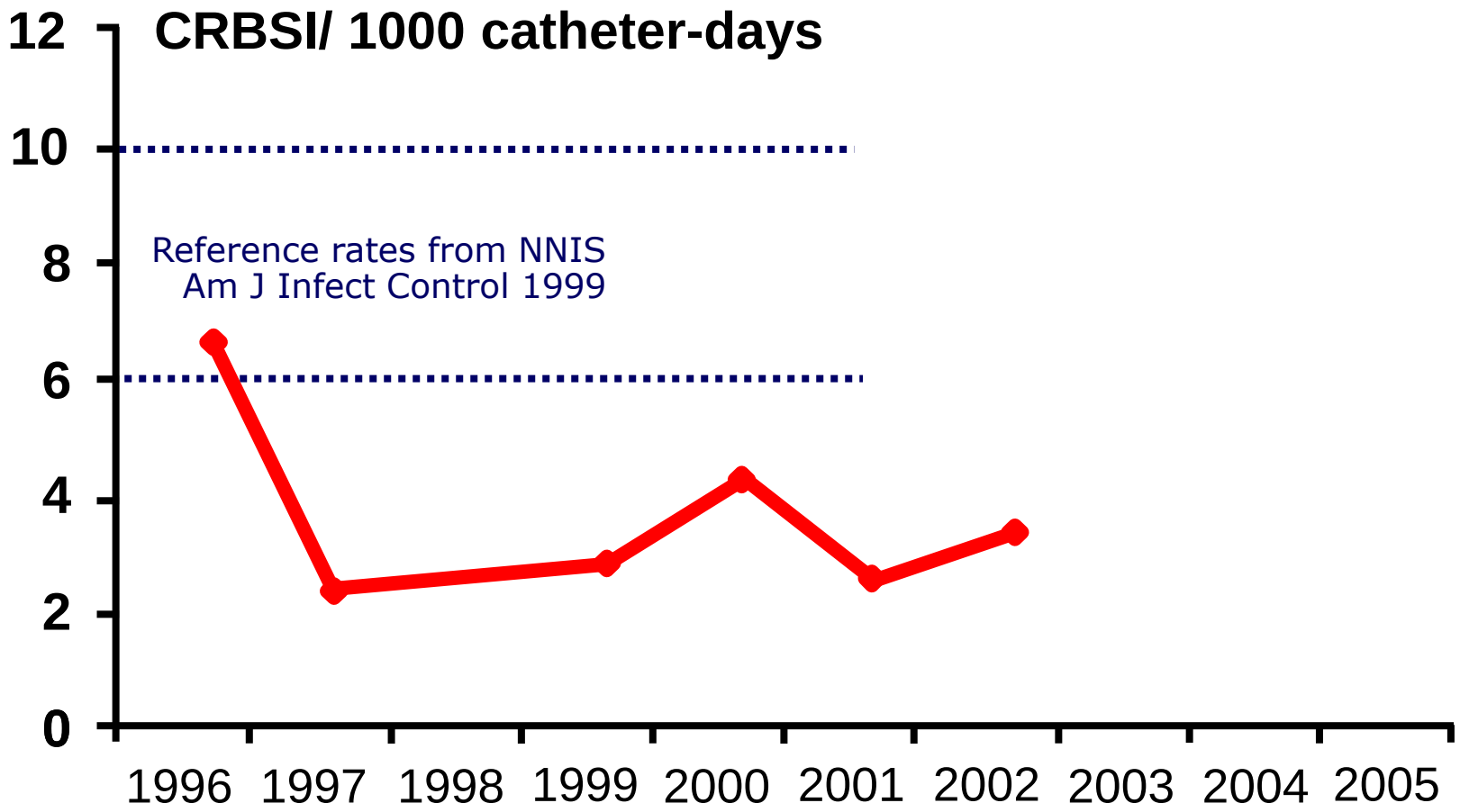
Guidelines included in the multimodal educational program

Guidelines included in the educational program

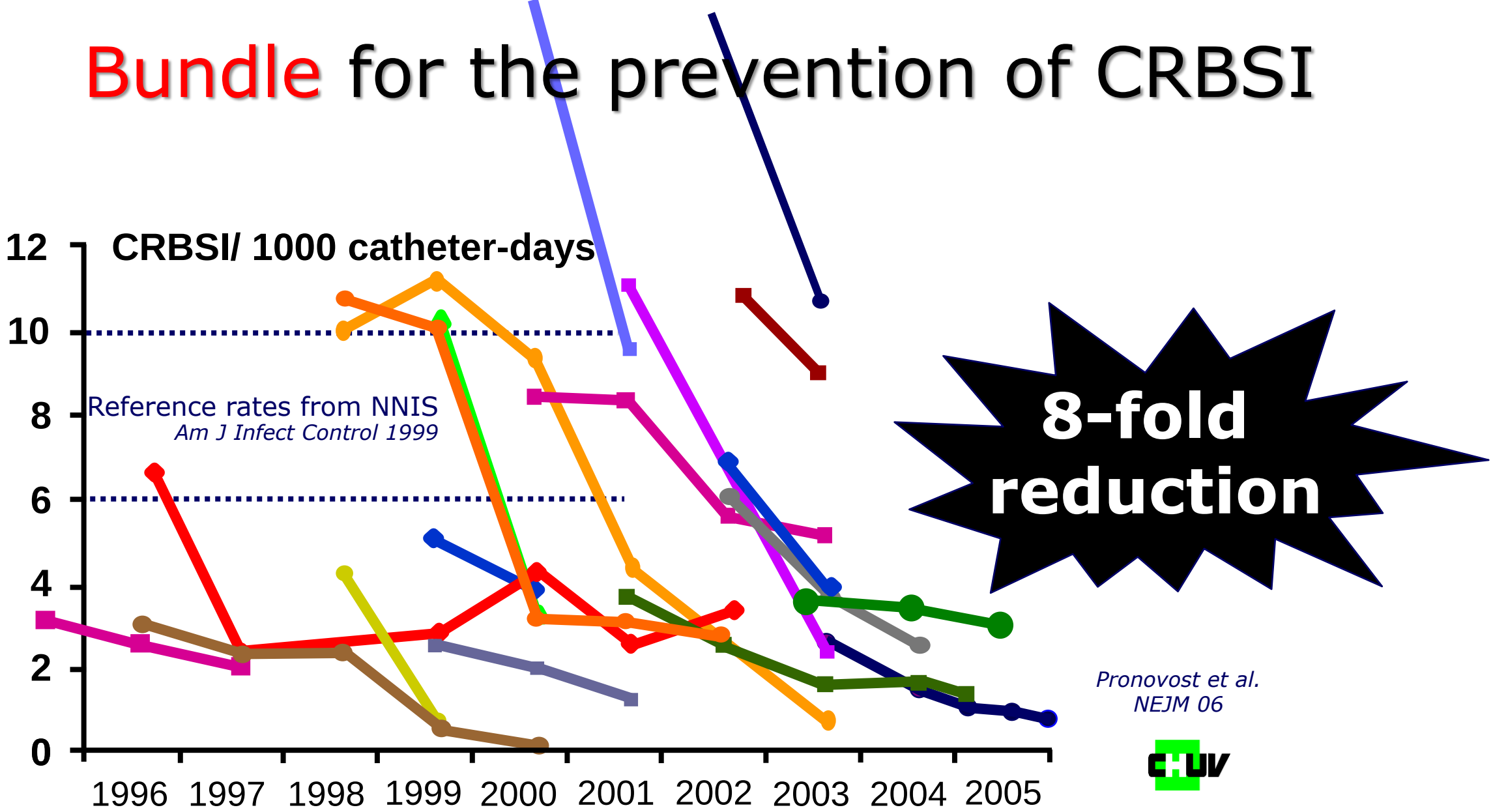
Material	complete listing to avoid insertion interruptions
Insertion	skin preparation: hair cutting instead of shaving
Antisepsis	chlorhexidine 0.5% in alcohol 70°
	maximal barrier precautions: gown, cap, mask, large drapes
Technique	promotion of subclavian/wrist vein
Dressing	dry gauze, occlusive adhesive band
Replacement	72h intervals: dress, sets, devices
	24h intervals: lipid or blood product lines
Removal	peripheral lines after 72 h
	central lines over guidewire as clinically indicated
Hygiene	hand antisepsis strongly emphasized for any care

Eggimann P, Pittet D et al. Lancet; 2000 355:1864-8

Bundle for the prevention of CRBSI



Bundle for the prevention of CRBSI

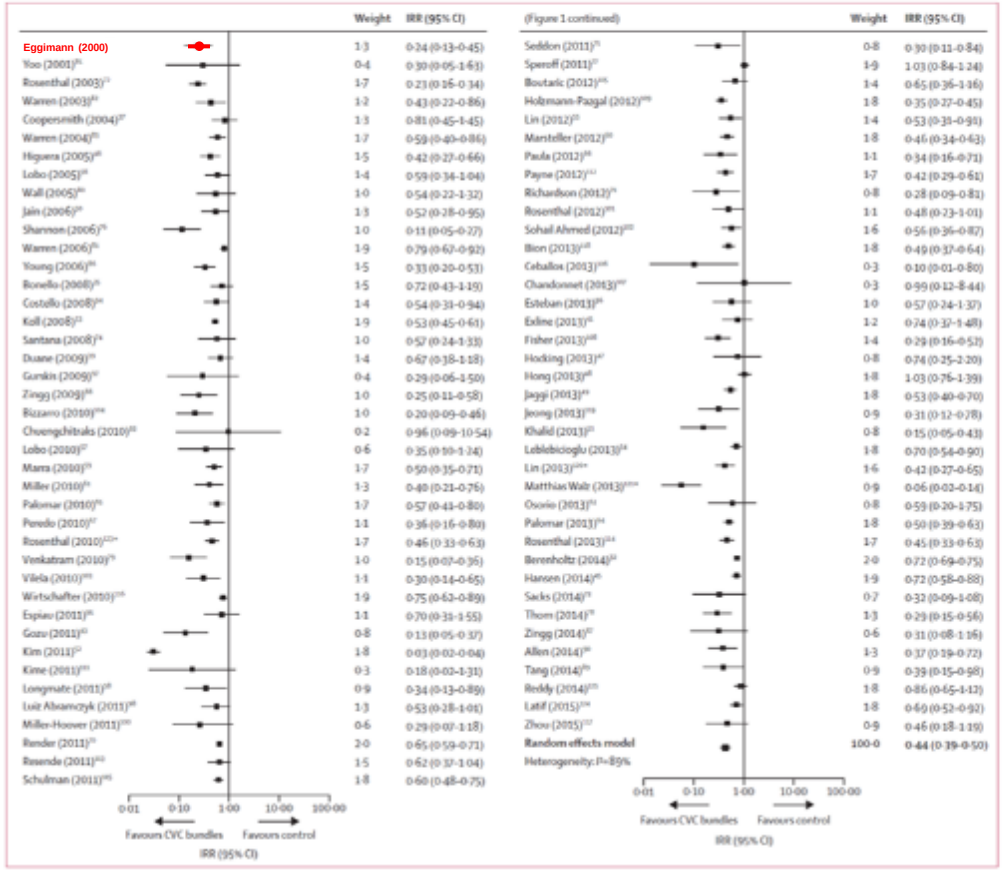


Bundle for the prevention of CRBSI

Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in meta-analysis critically ill patients of all ages: a systematic review and

Lancet Infect Dis 2016; 16: 724-34

Erwin Ista, Ben van der Hoven, René F Kornelisse, Cynthia van der Starre, Margreet C Vos, Eric Boersma, Onno K Helder



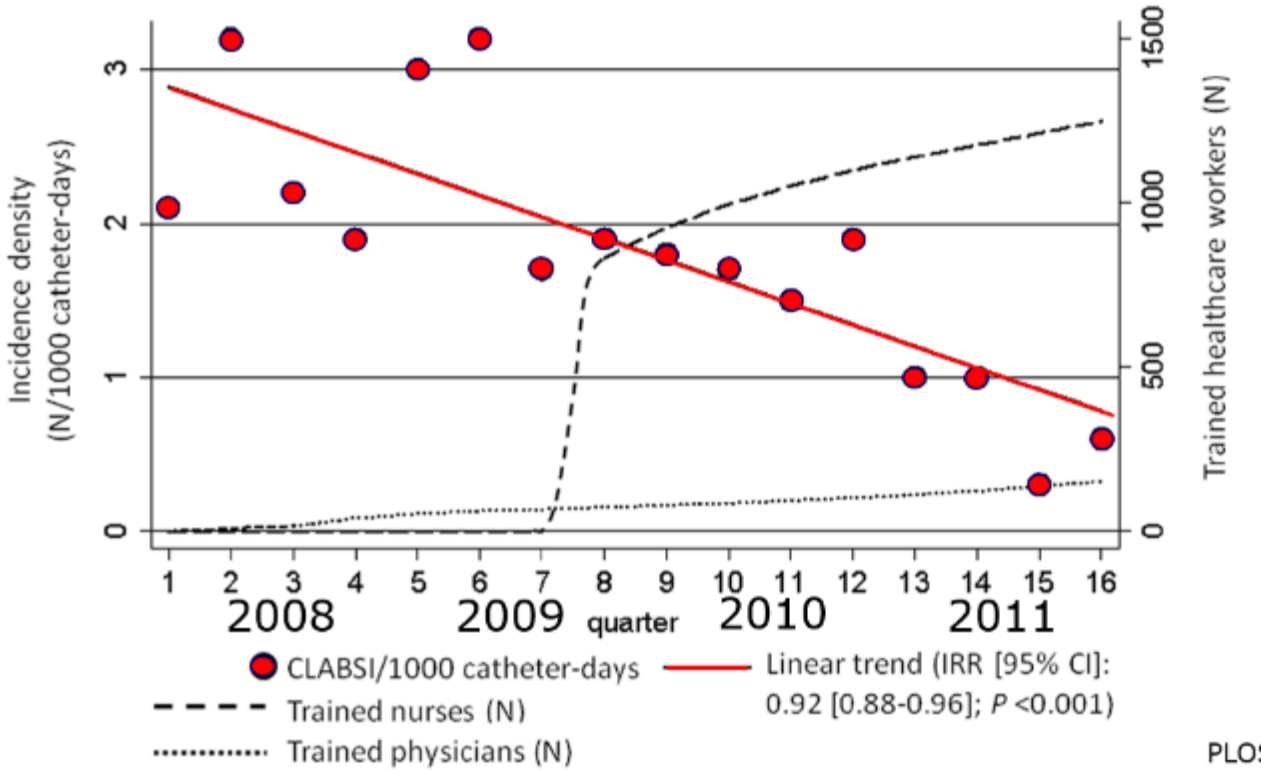
8-fold reduction

	Number of studies	Random effects model	
		ln (IRR [95% CI])	IRR (95% CI)
Overall ICUs	79 (100%)	−0·81 (−0·93 to −0·69)	0·44 (0·39 to 0·50)
Adult ICUs	53 (67%)	−0·80 (−0·95 to −0·65)	0·45 (0·38 to 0·52)
NICUs	14 (18%)	−0·75 (−0·97 to −0·53)	0·47 (0·38 to 0·59)
PICUs	14 (18%)	−0·54 (−0·74 to −0·42)	0·58 (0·48 to 0·71)

Bundle for the prevention of CRBSI

Hospital-Wide Multidisciplinary, Multimodal Intervention Programme to Reduce Central Venous Catheter-Associated Bloodstream Infection

Walter Zingg[1*], Vanessa Cartier[2], Cigdem Inan[2], Sylvie Touveneau[1,3], Michel Theriault[3], Angèle Gayet-Ageron[1], François Clergue[2], Didier Pittet[1,4], Bernhard Walder[2]



PLOS ONE 2014;9:e93898

Enhanced Bundle to prevent CABSI

General measures
Surveillance
Hand hygiene

Technical aspects
Global approach / education
Maximal sterile barriers

Enhanced bundle
CHG-dressings
CHG with alcohol skin disinfection

Pragmatic surveillance of CRBSI/CABSI

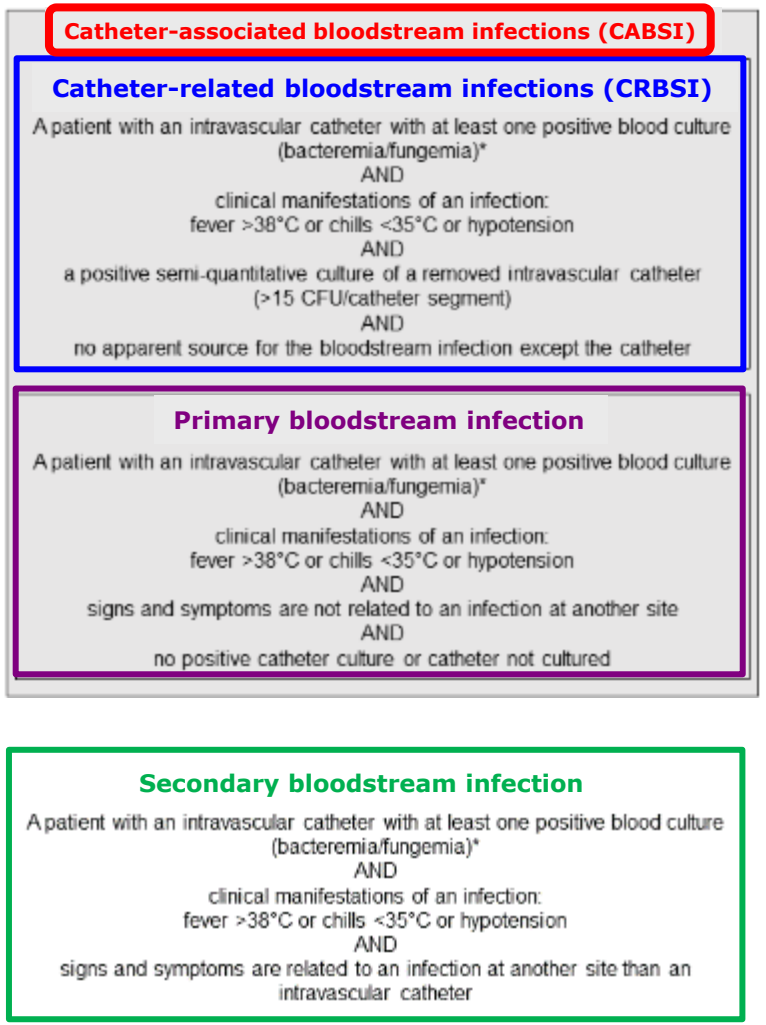
Review/score all positive bloodculture clinicians (MD+ RN)

Need catheter culture
(not routinely performed
for practical reasons
→ underestimation)

+

Review of positive BC
(routinely performed
for clinical purpose
→ overestimation)

Excluded
(not related or associated
with a catheter)

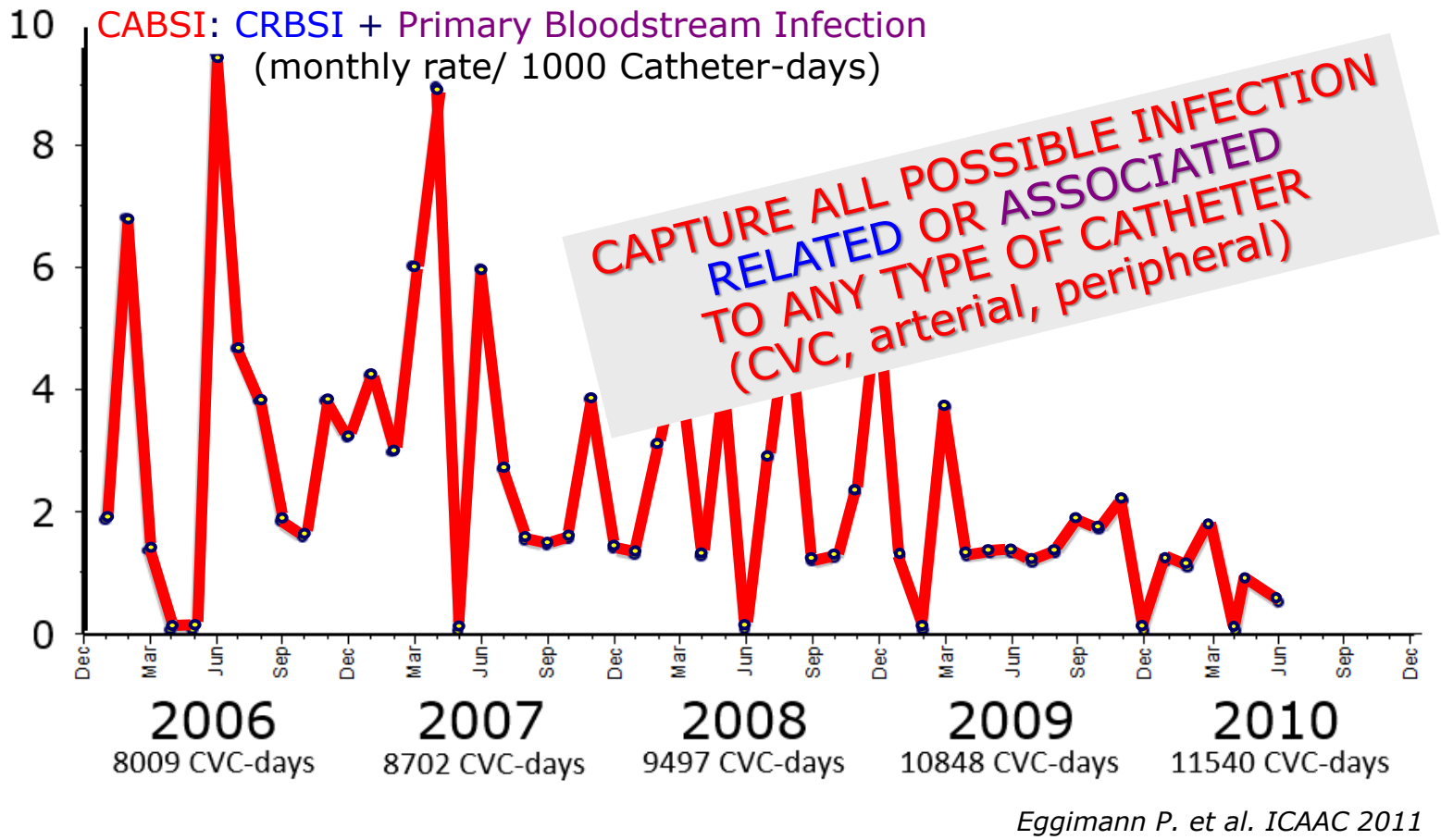


Pragmatic surveillance of CRBSI/CABSI

Review/score all positive bloodculture clinicians (MD+ RN)

→ Compute according to catheter-days

burned/transplanted excluded (*bundle cannot be applied)*



Eggimann P. et al. ICAAC 2011

Catheter-associated bloodstream infections (CABSI)

Catheter-related bloodstream infections (CRBSI)

A patient with an intravascular catheter with at least one positive blood culture (bacteremia/fungemia)*
AND
clinical manifestations of an infection:
fever >38°C or chills <35°C or hypotension
AND
a positive semi-quantitative culture of a removed intravascular catheter (>15 CFU/catheter segment)
AND
no apparent source for the bloodstream infection except the catheter

Primary bloodstream infection

A patient with an intravascular catheter with at least one positive blood culture (bacteremia/fungemia)*
AND
clinical manifestations of an infection:
fever >38°C or chills <35°C or hypotension
AND
signs and symptoms are not related to an infection at another site
AND
no positive catheter culture or catheter not cultured

~~**Secondary bloodstream infection**~~

~~A patient with an intravascular catheter with at least one positive blood culture (bacteremia/fungemia)*
AND
clinical manifestations of an infection:
fever >38°C or chills <35°C or hypotension
AND
signs and symptoms are related to an infection at another site than an intravascular catheter~~

Enhanced Bundle to prevent CABSI

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Enhanced bundle
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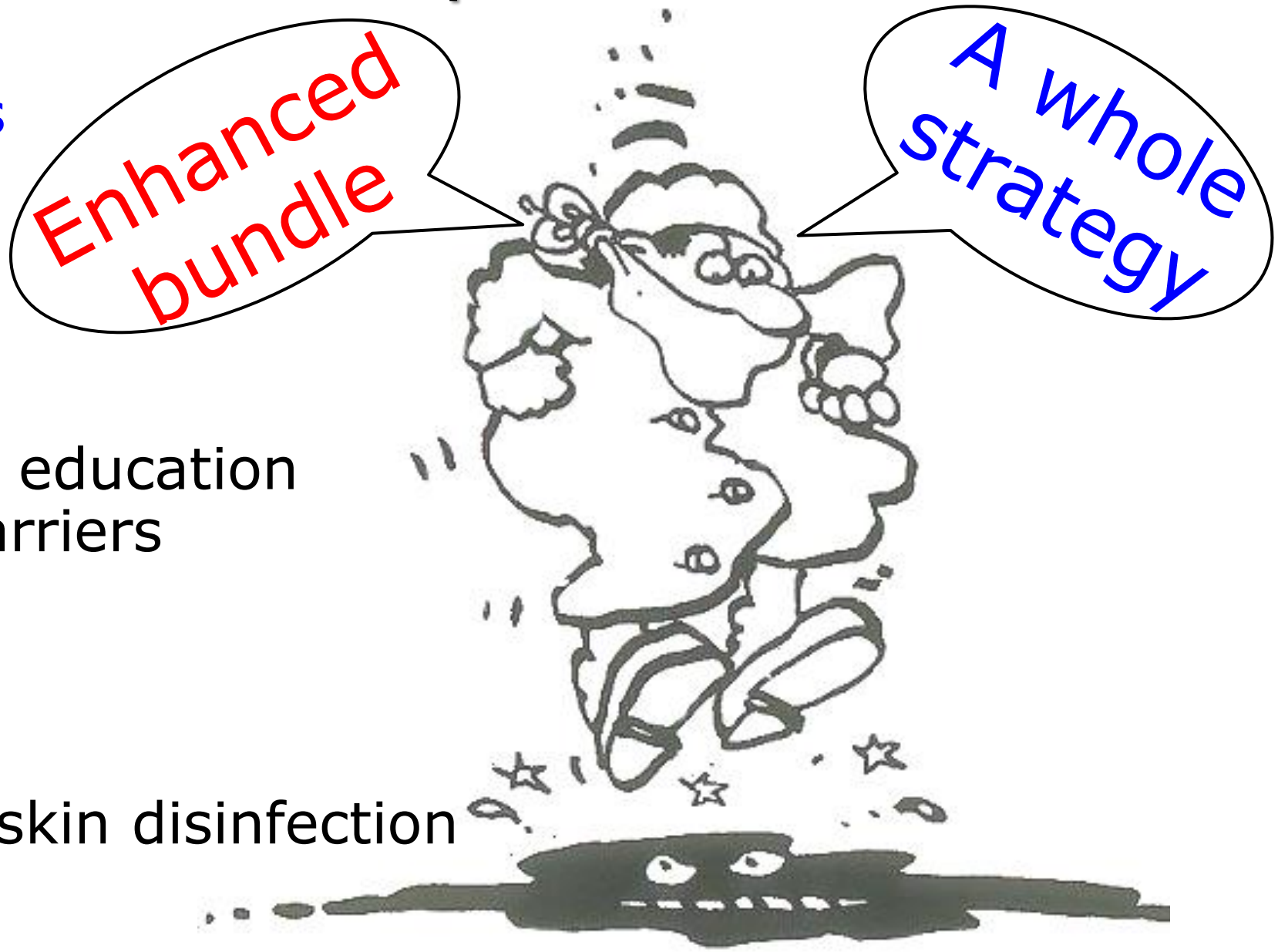
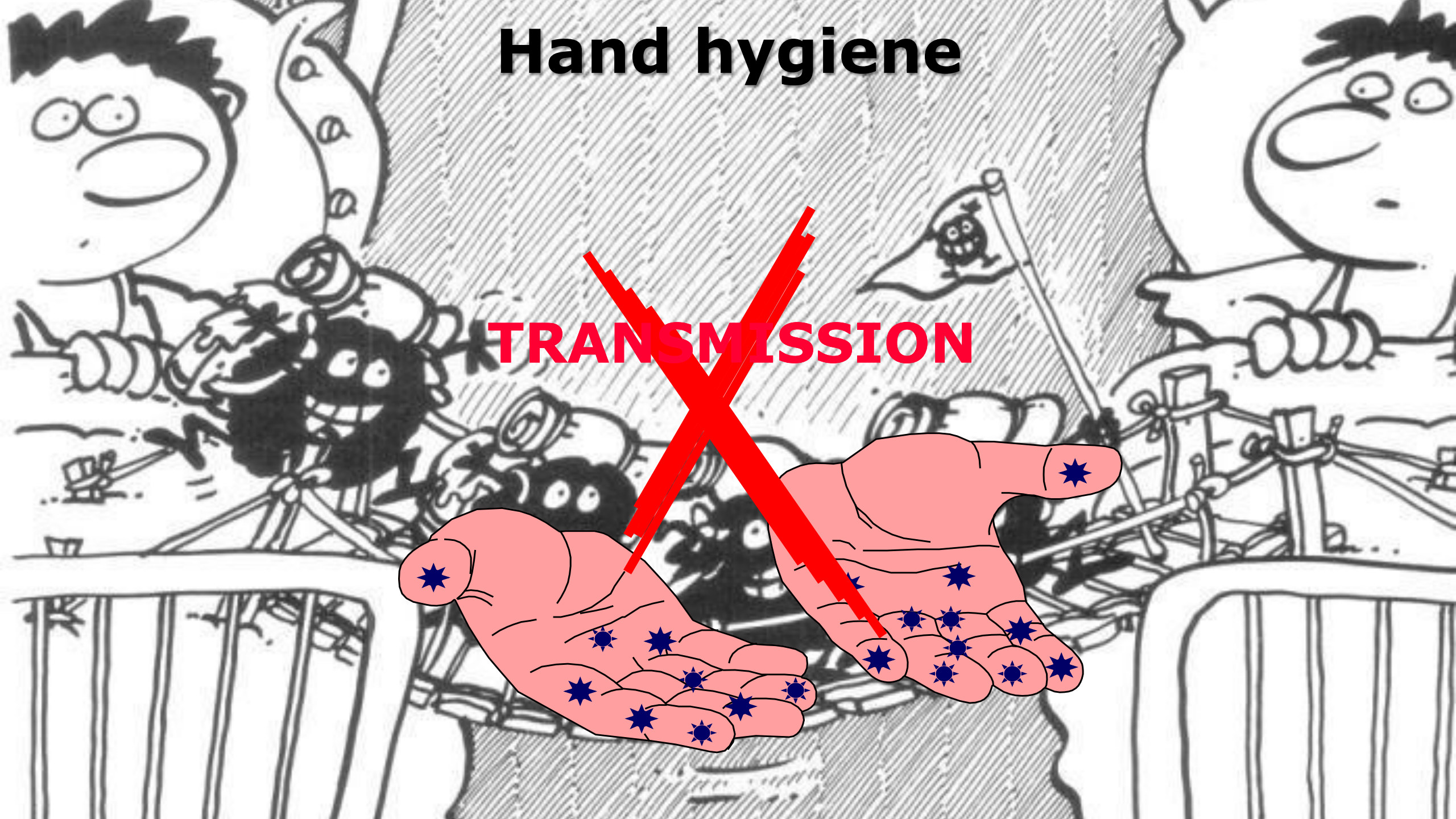
CHG with alcohol skin disinfection



Hand hygiene



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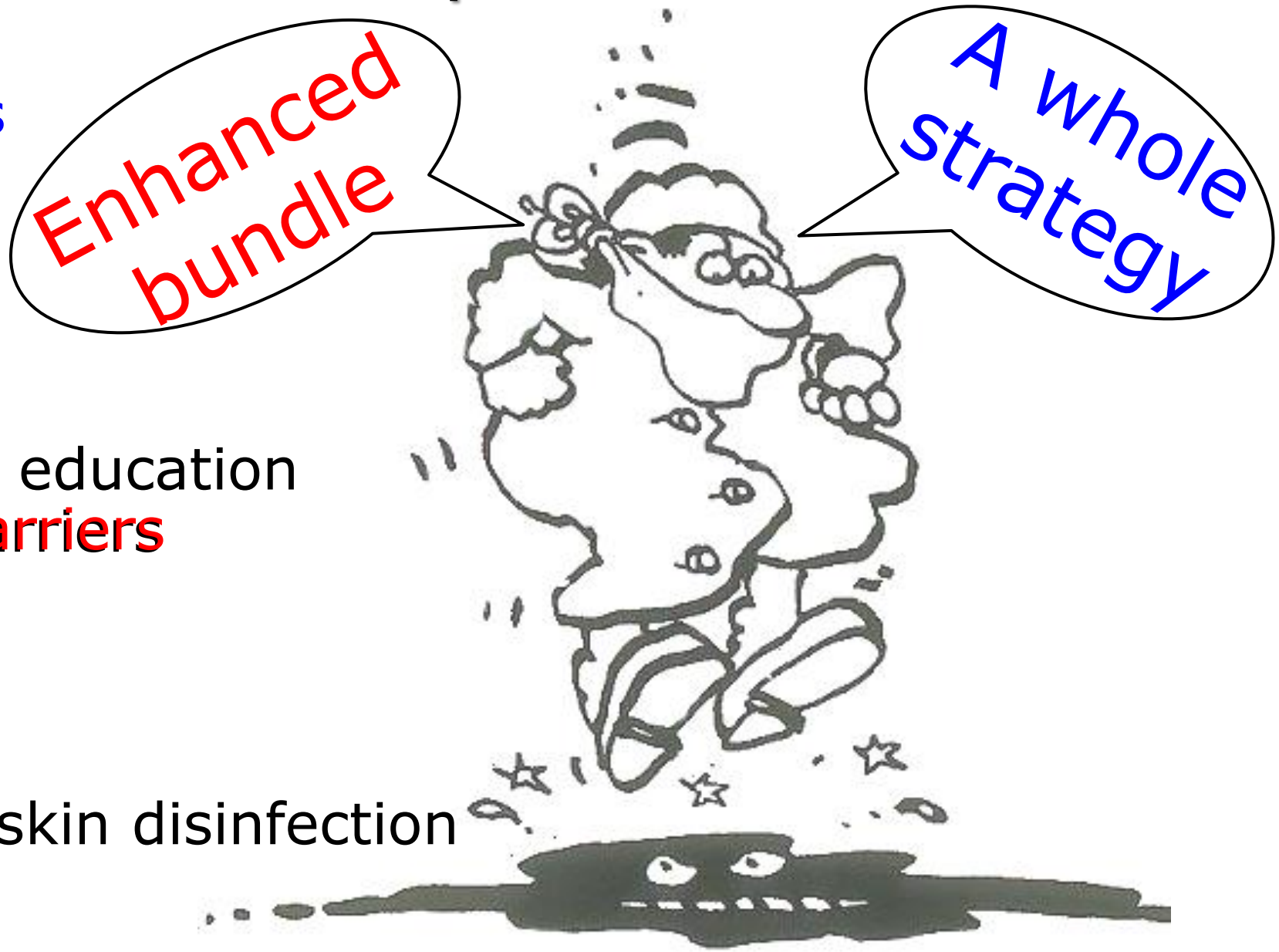

Maximal barrier sterile precautions

Geneva, 1997

Maximal barrier sterile precautions

Maximal barrier sterile precautions

Maximal barrier sterile precautions

Lausanne, 201X

CHG-dressings to prevent CABSI

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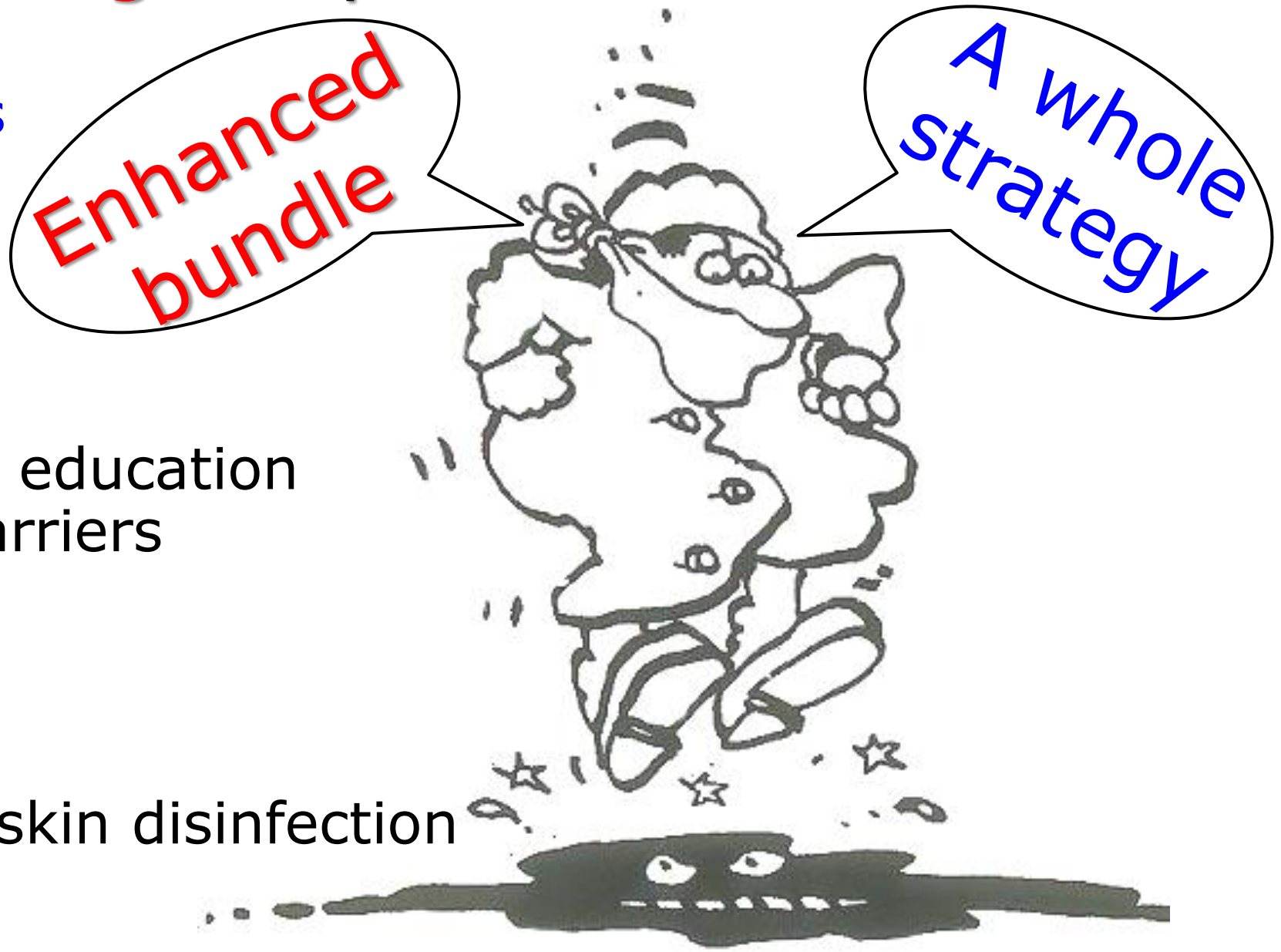
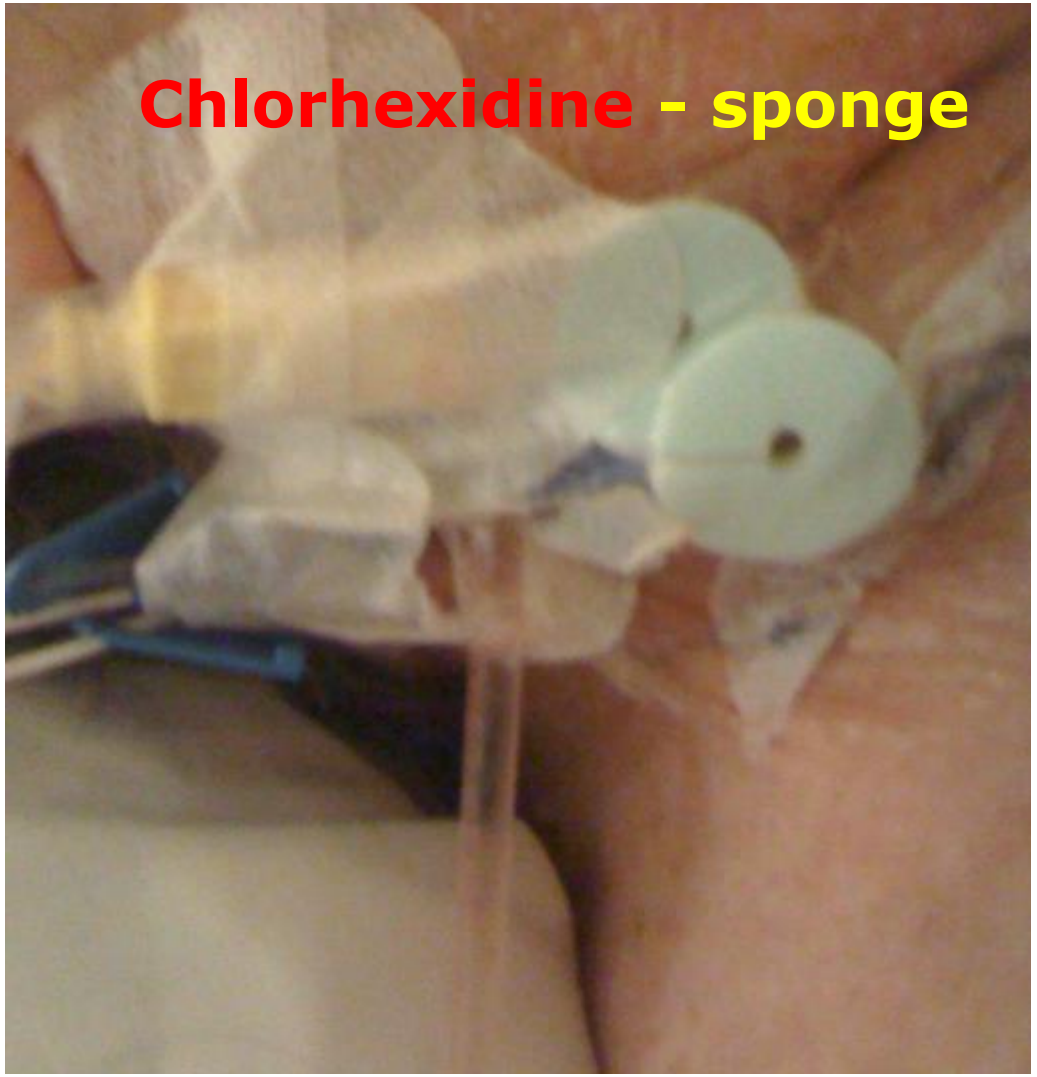
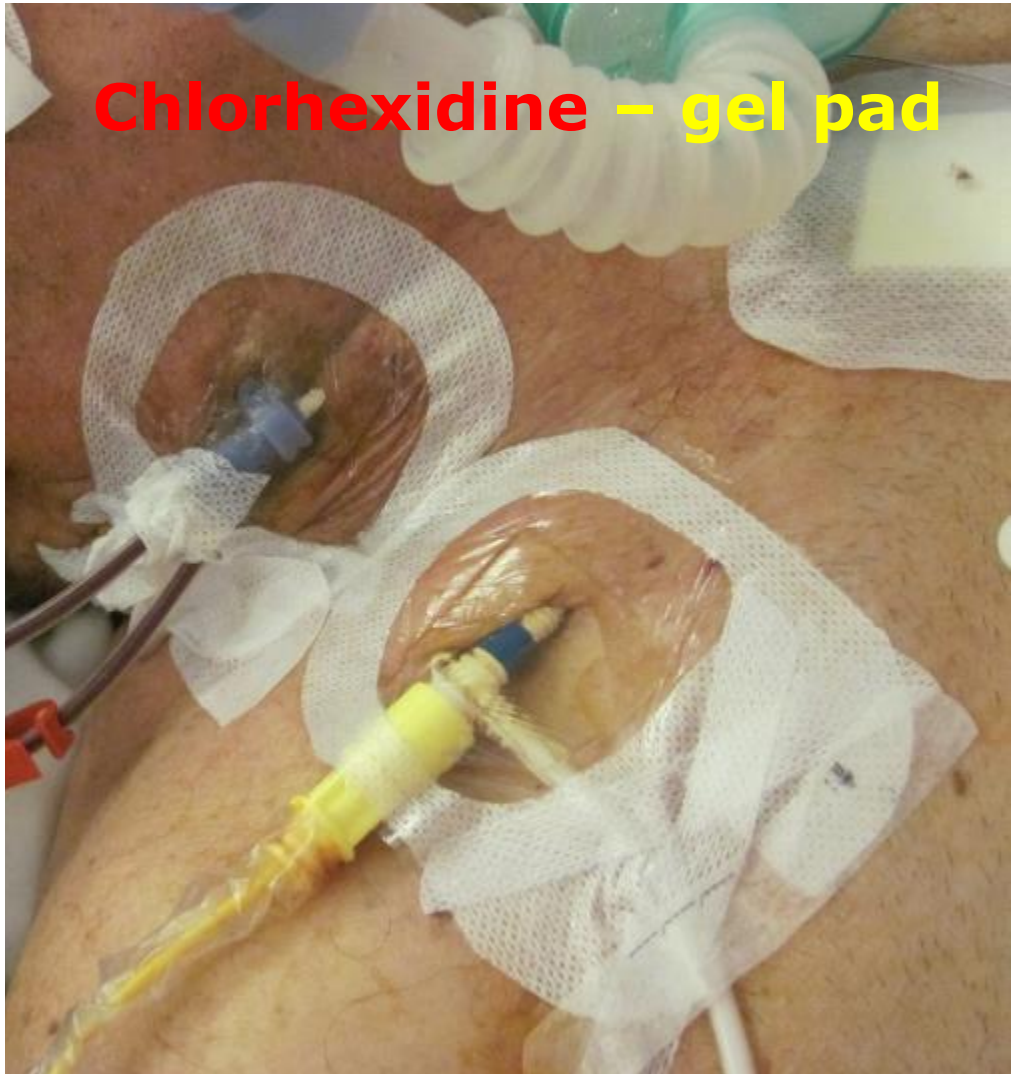
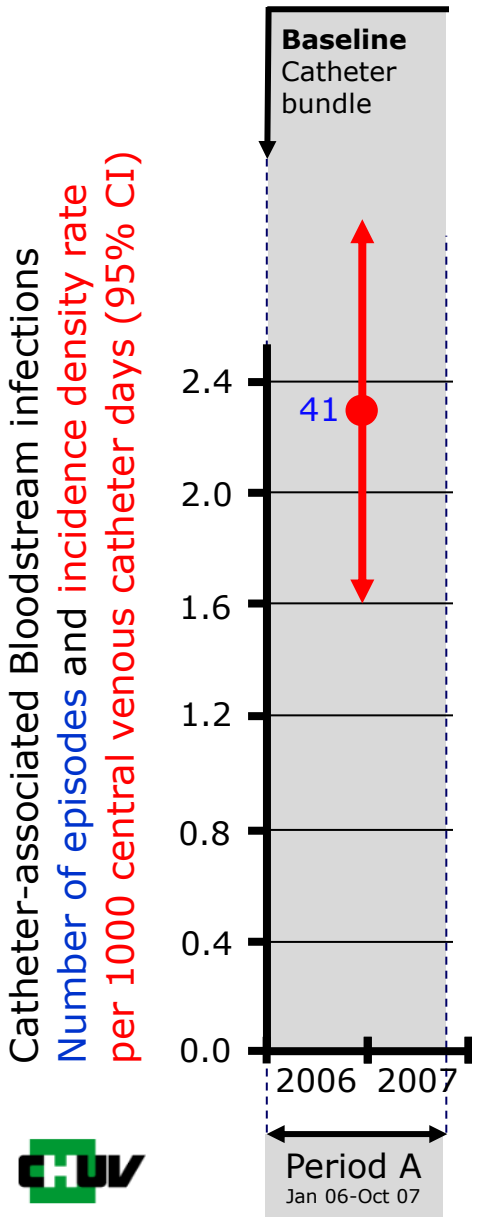


CHG-dressings to prevent CABSI





CHG-dressings to prevent CABSI



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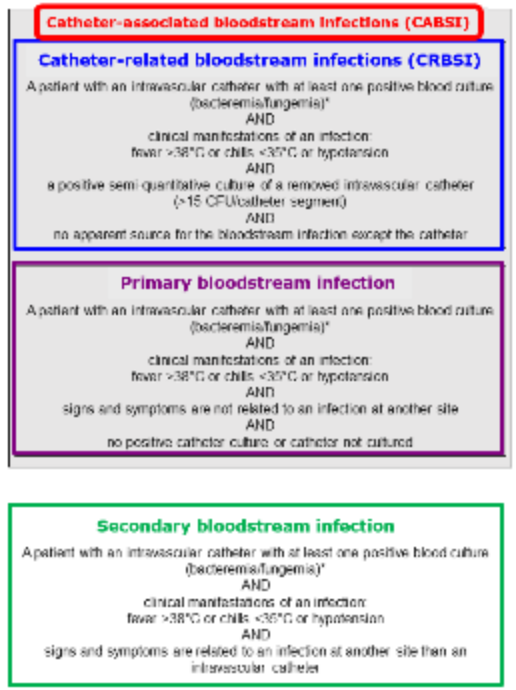
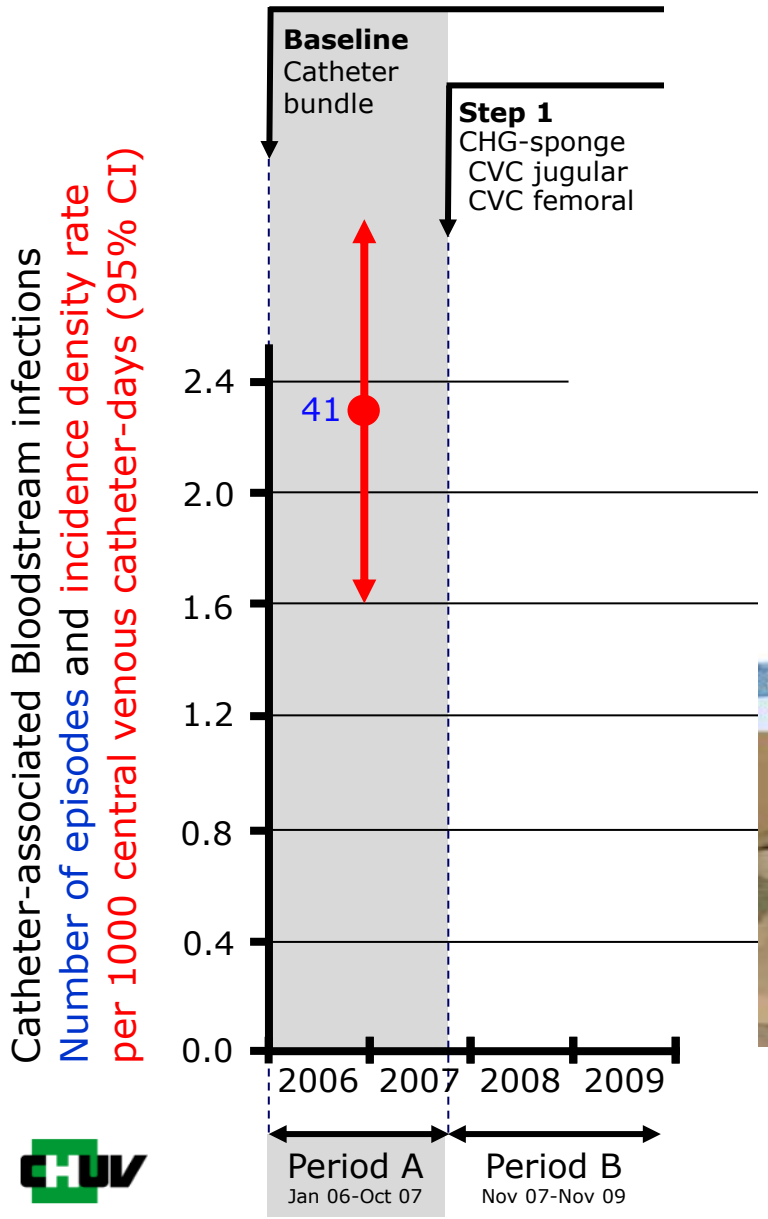


To capture all related or associated infections
due to any type of catheter (CVC, arterial, peripheral)

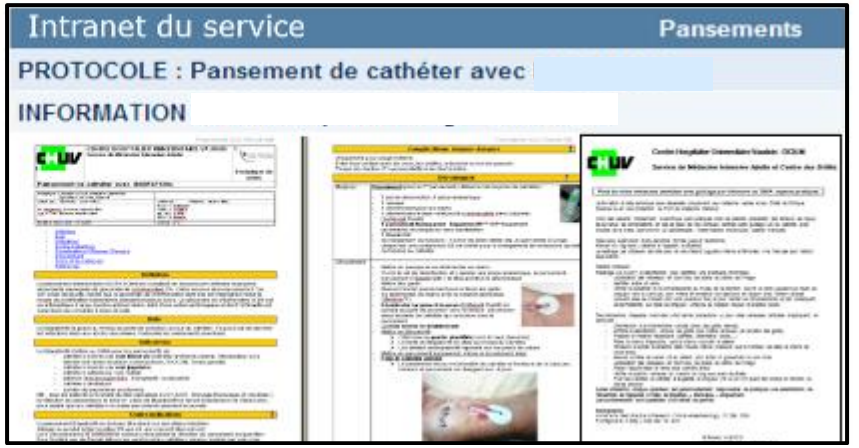
Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



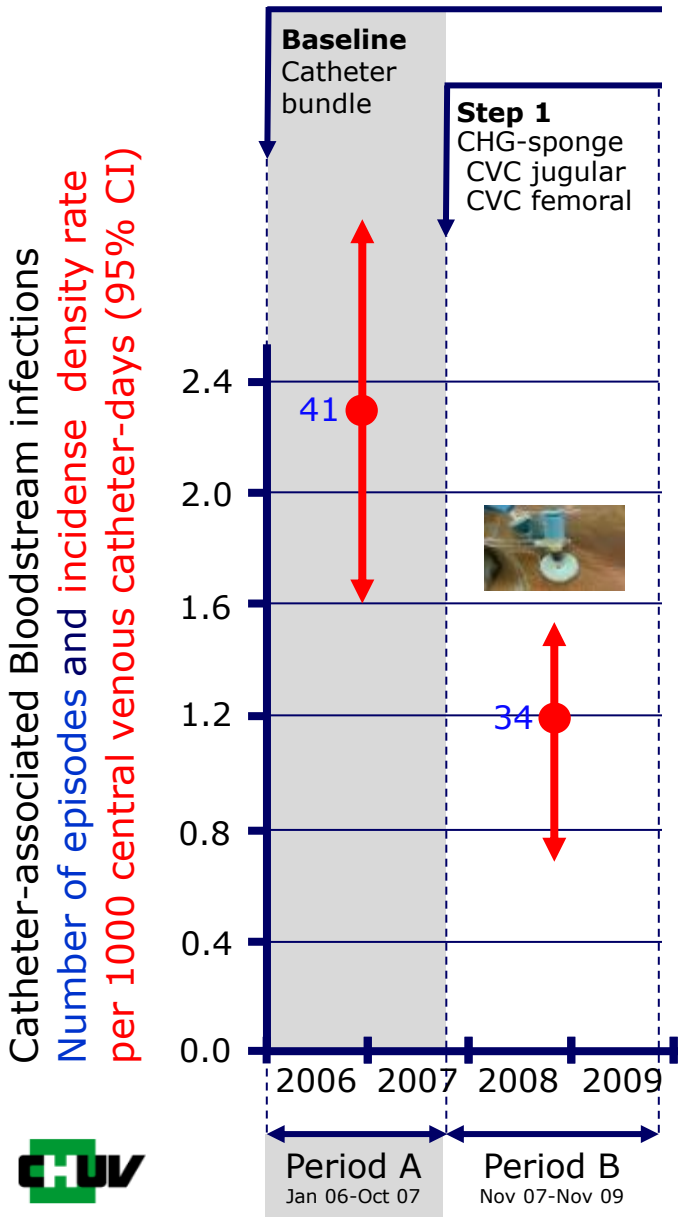
CHG dressings

- New detailed protocol
- Intense teaching
  workshops/seminar/feedback
  to nursing staff + doctors



Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



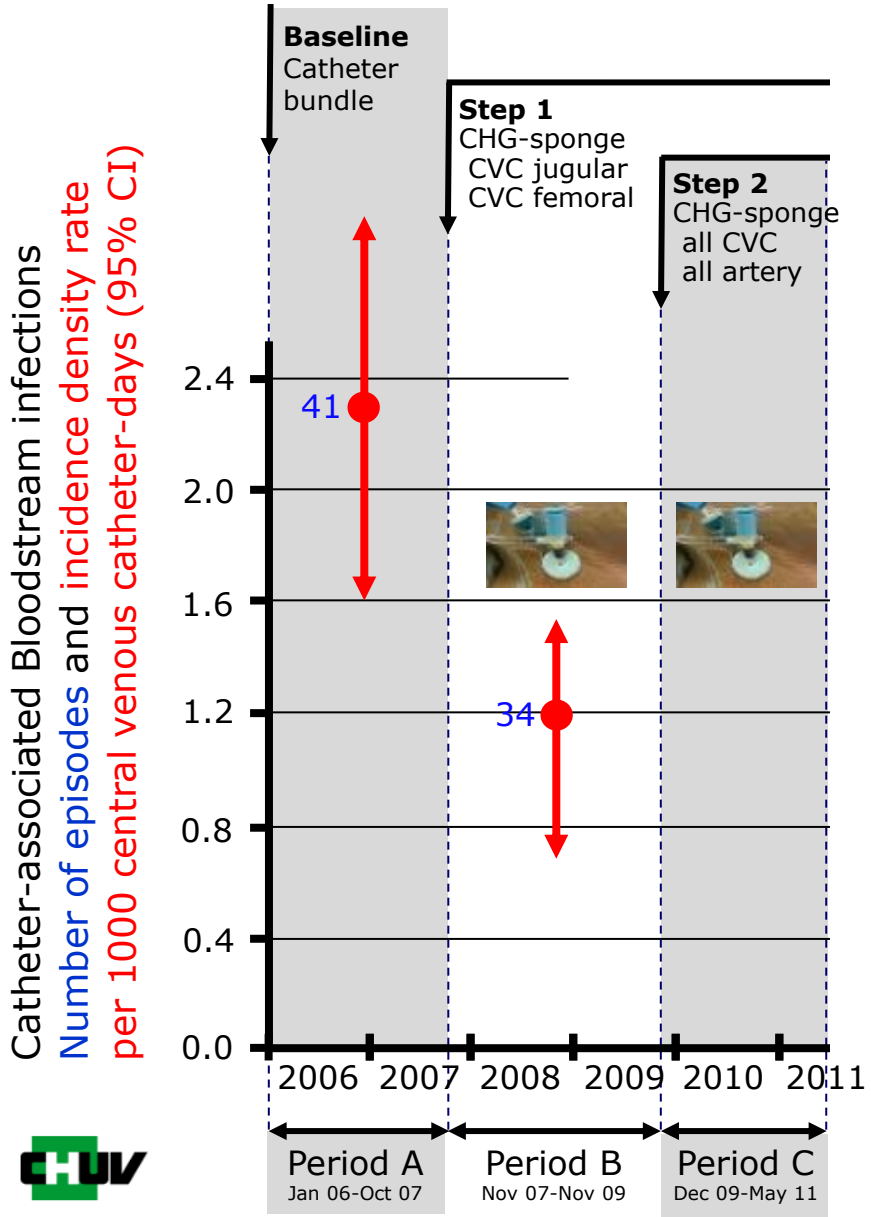
60% of CVC
0% of arteries

only ← No official budget

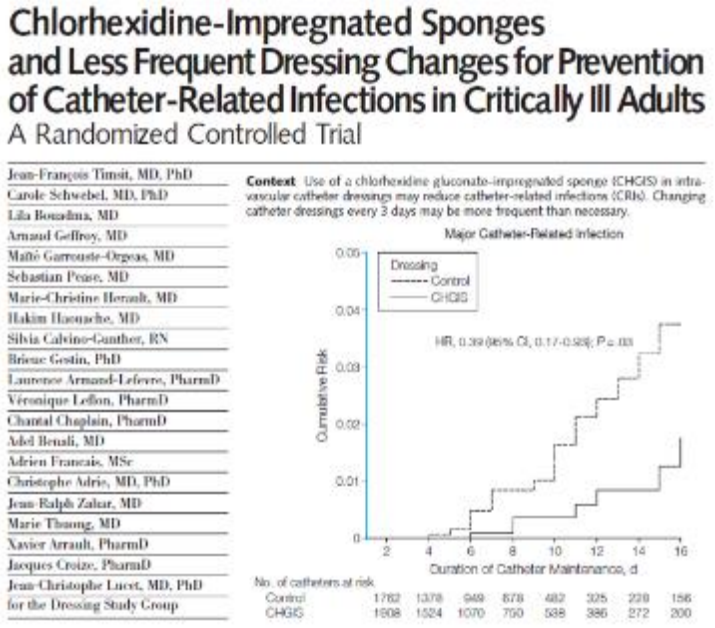
Investment for CHG-dressings should be justified

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



C.Joseph et coll. SRLF 2010



Chlorhexidine-Impregnated Sponges and Less Frequent Dressing Changes for Prevention of Catheter-Related Infections in Critically Ill Adults

A Randomized Controlled Trial

Jean-François Timsit, MD, PhD
Carole Schwebel, MD, PhD
Lila Bouadma, MD
Armand Geffroy, MD
Maïté Garrouste-Orgeas, MD
Sebastian Pease, MD
Marie-Christine Herault, MD
Hakim Haouache, MD
Silvia Calvino-Gunther, RN
Brieuc Gestin, PhD
Laurence Armand-Lefevre, PharmD
Véronique Lefon, PharmD
Chantal Chaplain, PharmD
Adel Benali, MD
Adrien Francais, MSc
Christophe Adrie, MD, PhD
Jean-Ralph Zahar, MD
Marie Thuong, MD
Xavier Arrault, PharmD
Jacques Croize, PharmD
Jean-Christophe Lucet, MD, PhD
for the Dressing Study Group

Context Use of a chlorhexidine gluconate–impregnated sponge (CHGIS) in intravascular catheter dressings may reduce catheter-related infections (CRIs). Changing catheter dressings every 3 days may be more frequent than necessary.

Major Catheter-Related Infection

Dressing
Control
CHGIS

Cumulative Risk

Duration of Catheter Maintenance, d

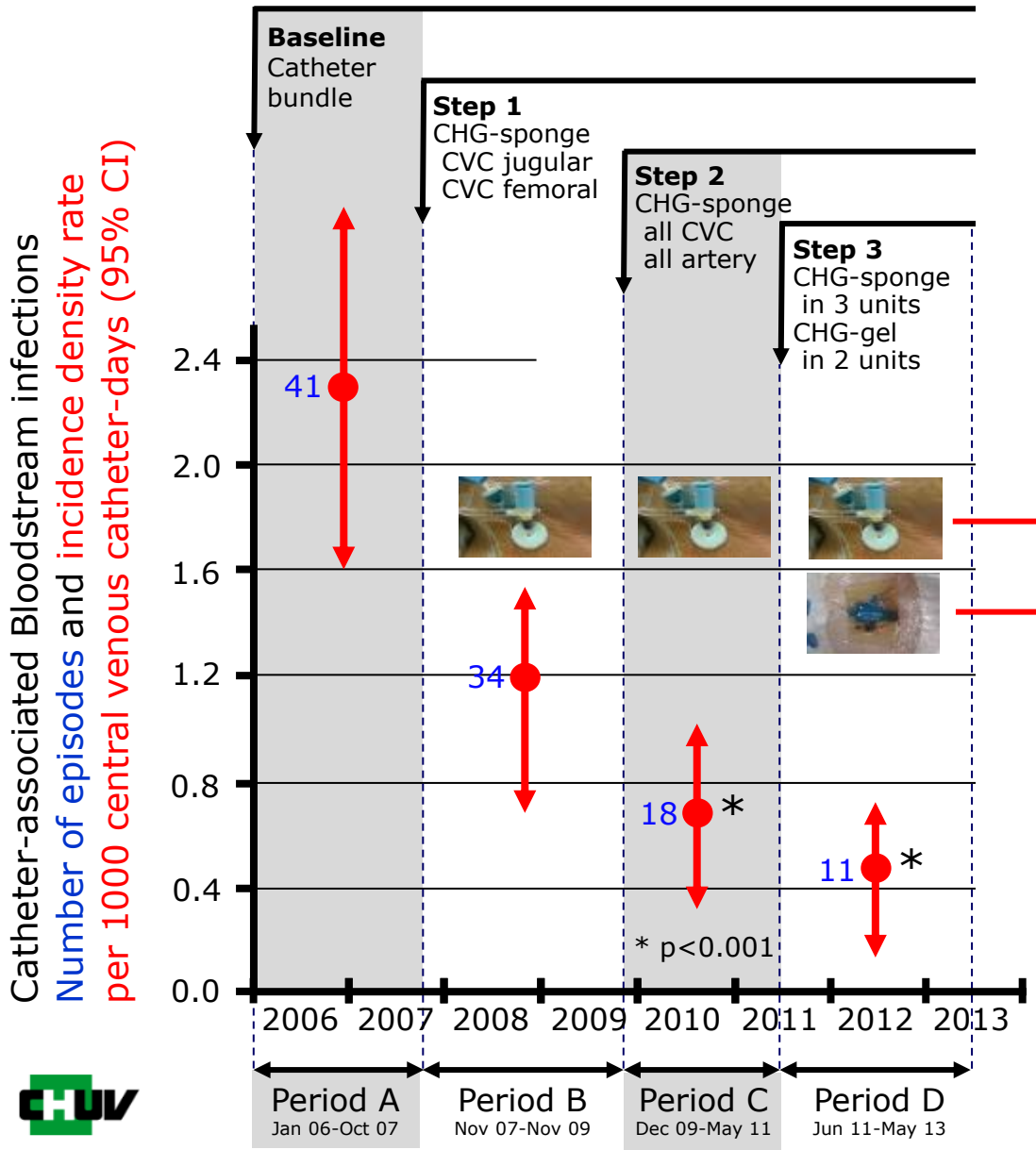
No. of catheters at risk

Control	1782	1378	949	678	482	325	228	156
CHGIS	1908	1524	1070	750	588	386	272	200

JAMA. 2009;301(12):1231-1241

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI

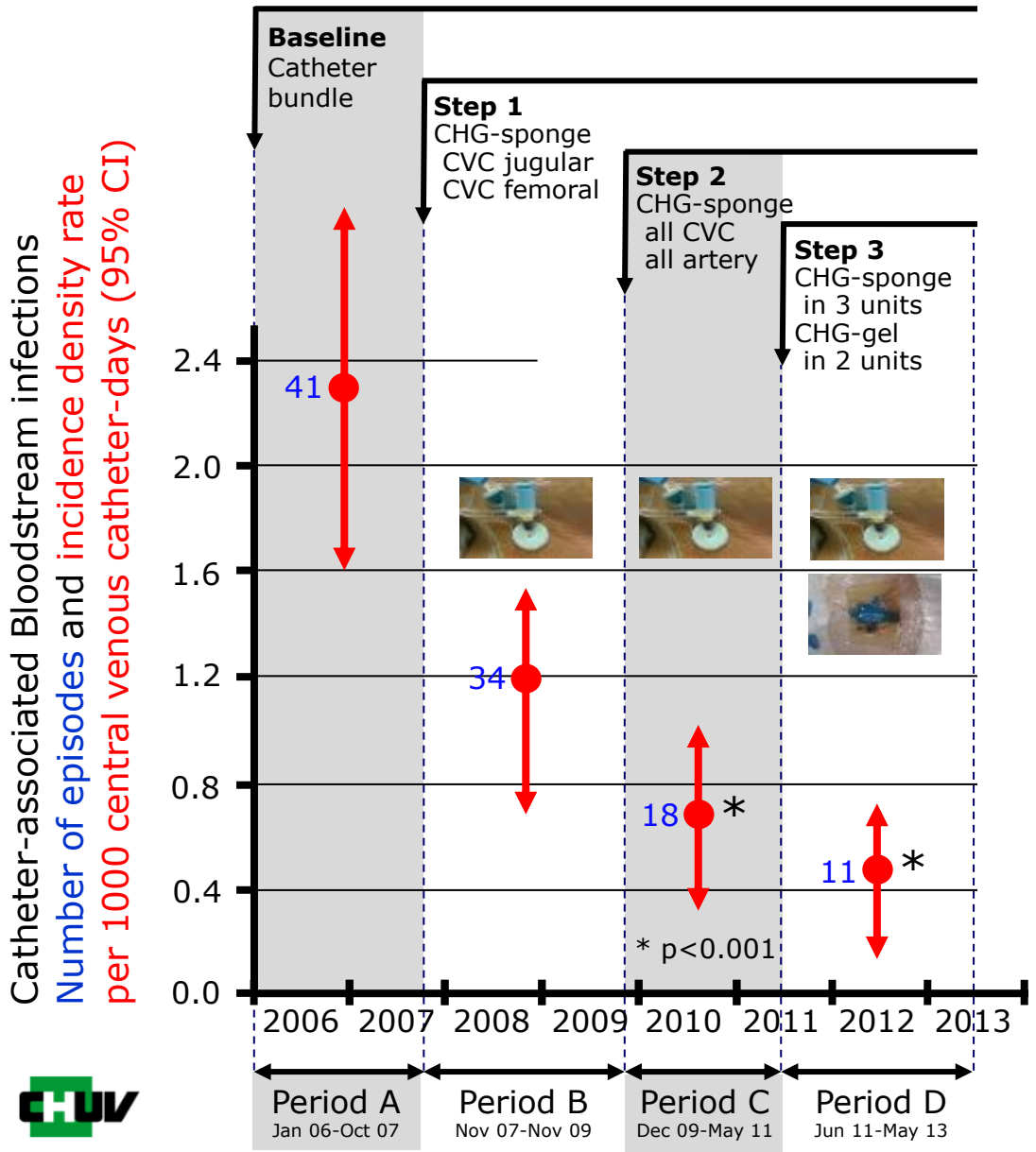


CHG-gel-pad dressing in 2 of 5 units

P=0.059

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



CHG-gel-pad dressing in 2 of 5 units

June 2011 to January 2012:

CHG-gel pad: 26 reactions (5.5/1000 device-days)
CHG-sponge: 5 reactions (0.9 /1000 device-days)

All were scored as allergic reaction
No CABSI

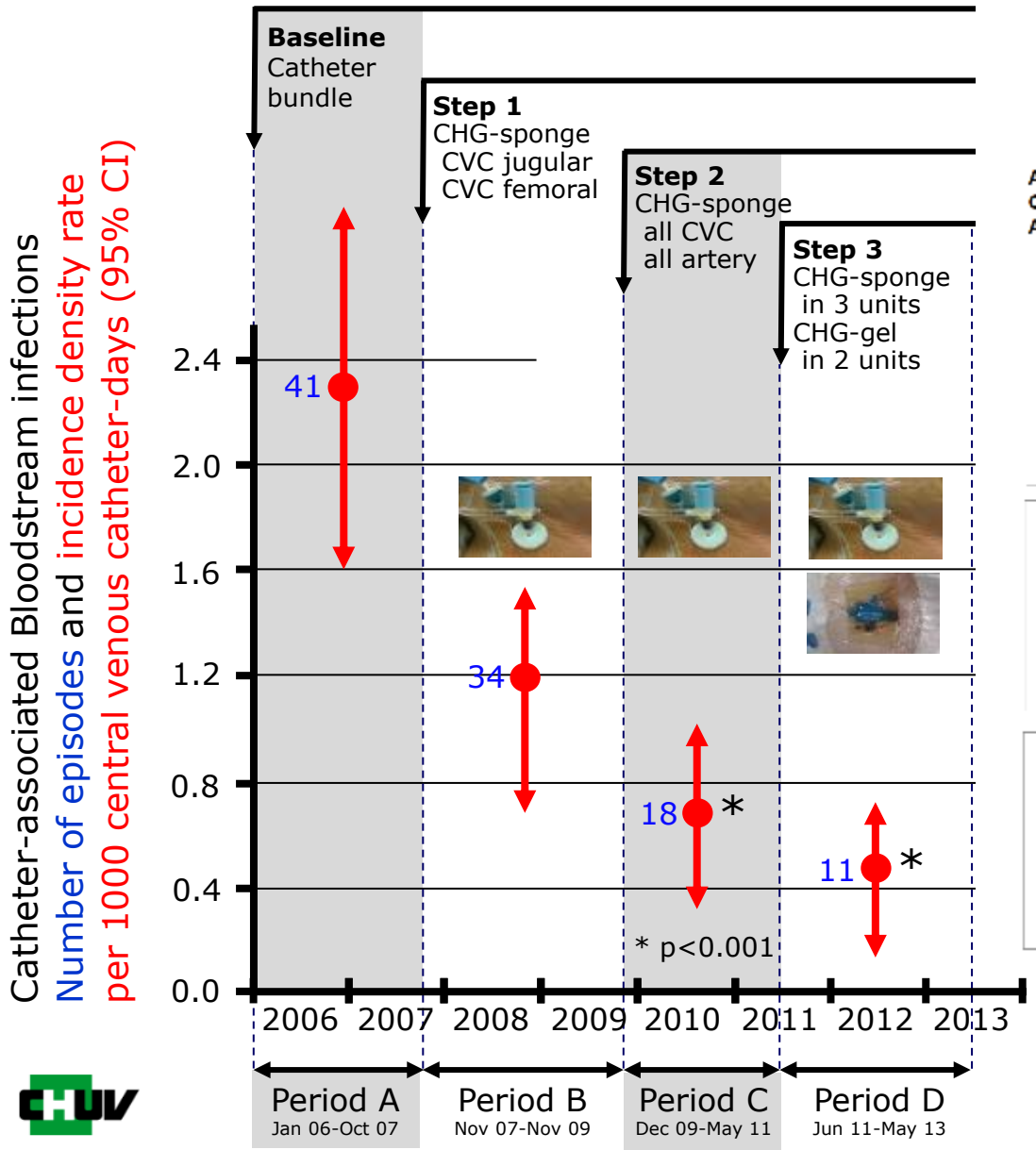
→ **CHG-gel pad with improved evaporation capability**

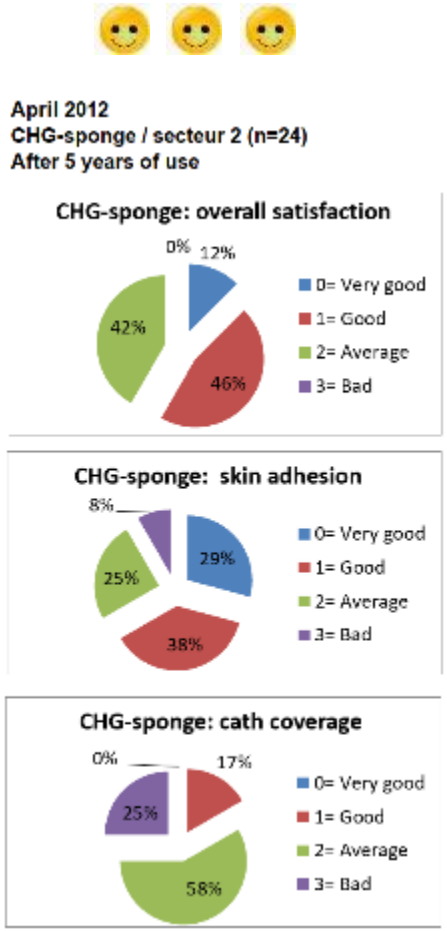
March 2012 to May 2013:

CHG-gel pad : 2 reactions (0.3 /1000 device-days)
CHG-sponge : 3 reactions (0.3 /1000 device-days)

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI

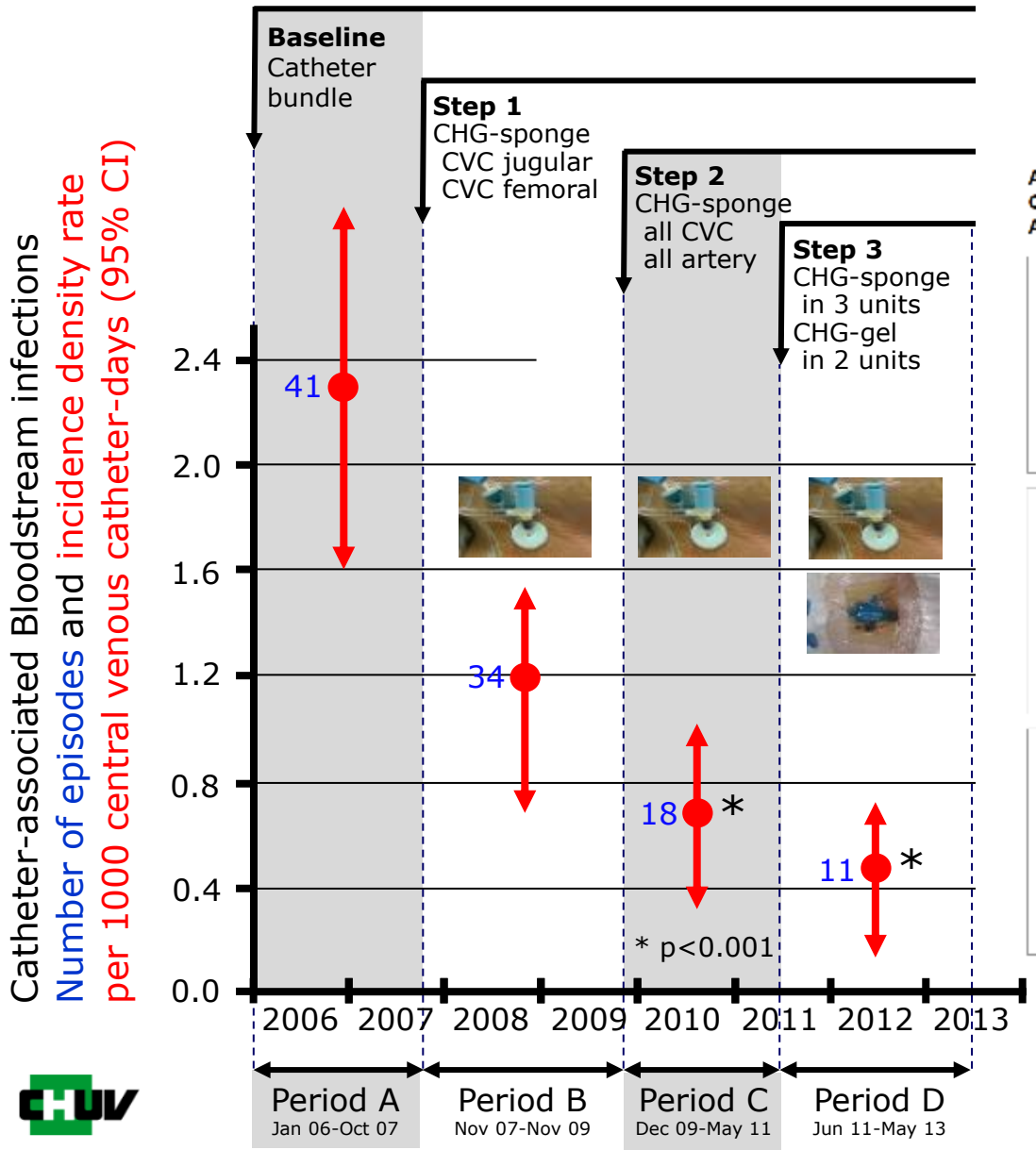




Eggimann P, Joseph C and Thevenin MJ. ARIC 2015; 4 (suppl1):206

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



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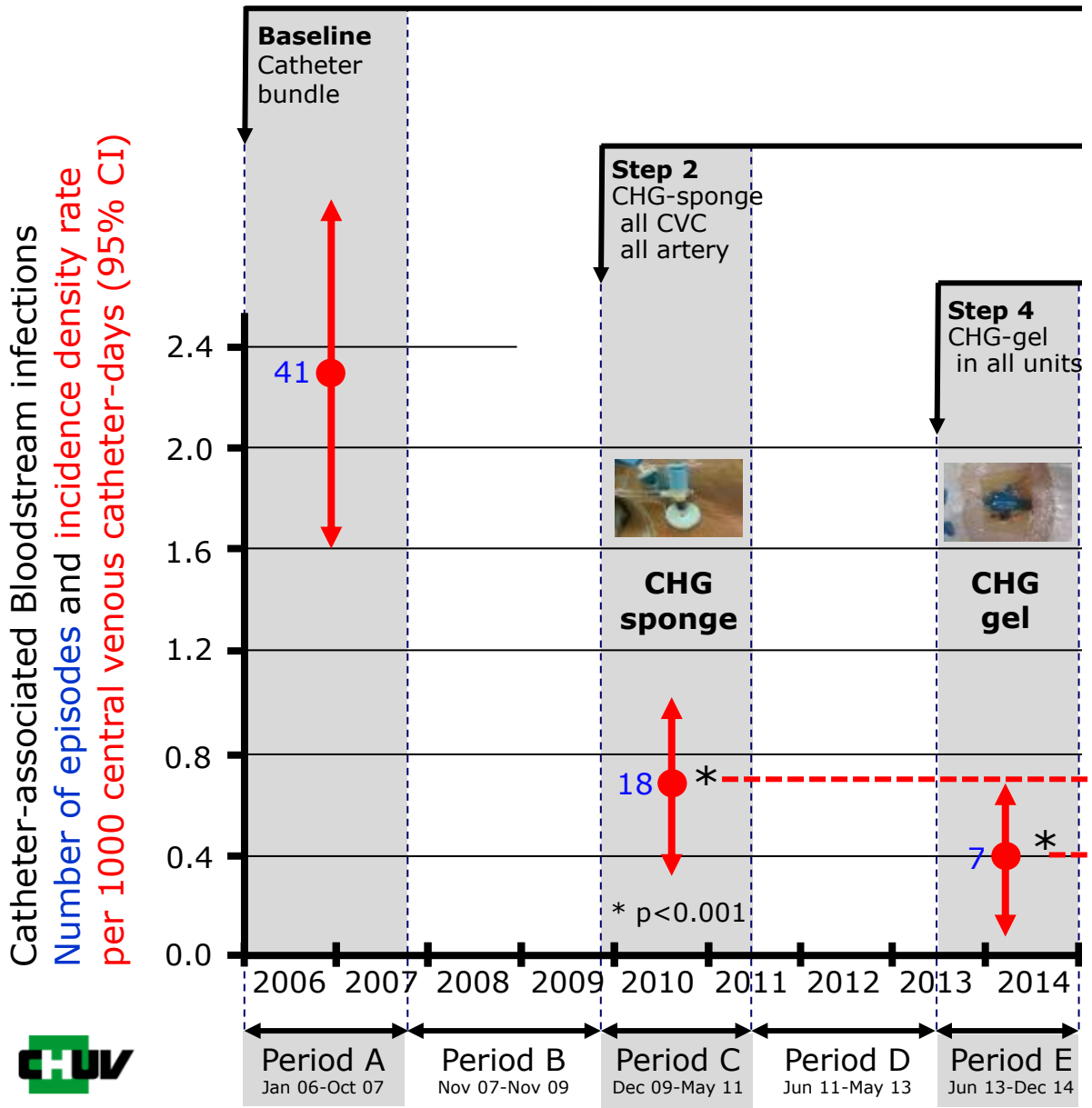
CHG-dressings to prevent CABSI



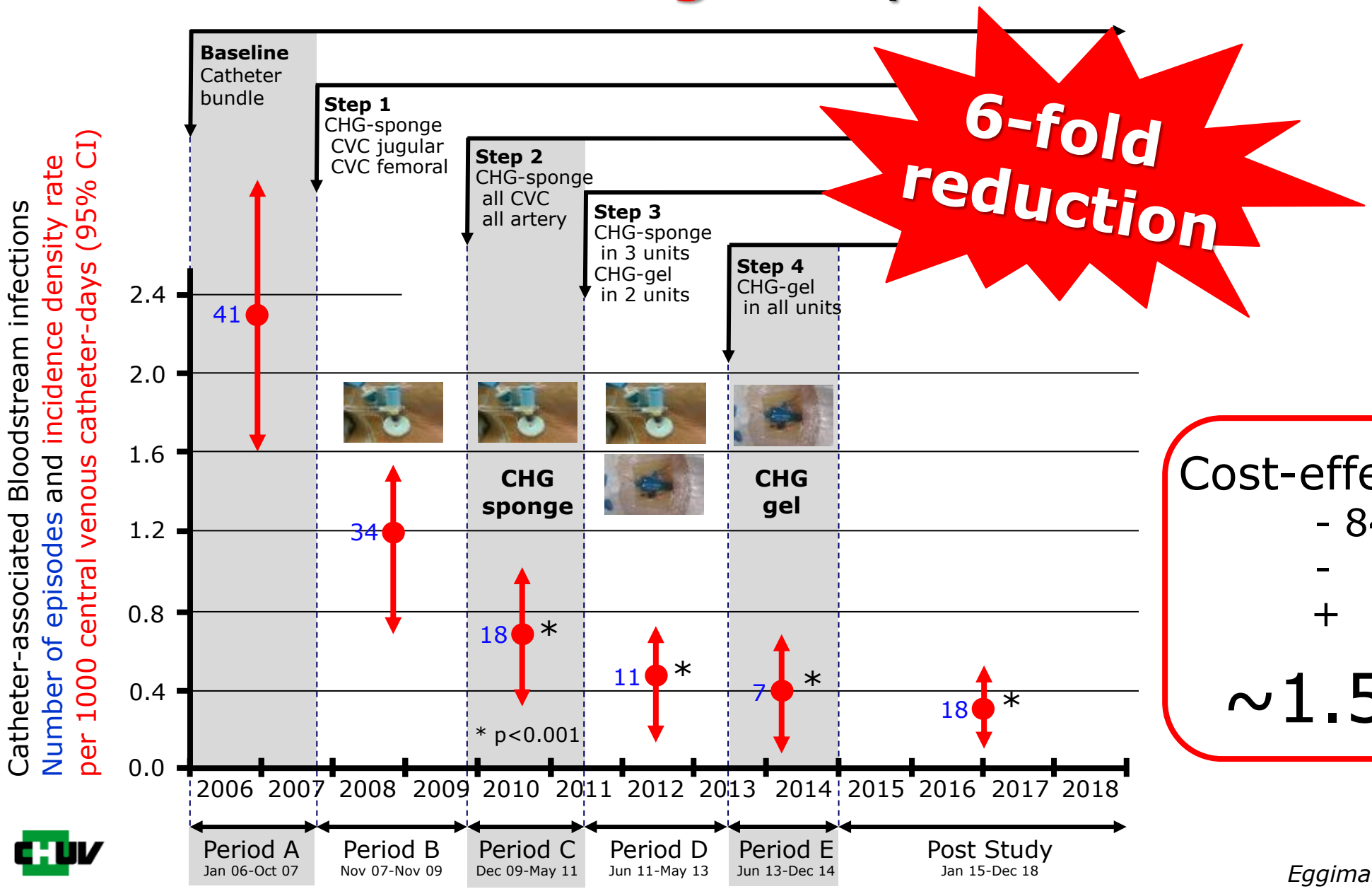
CHG-sponge in 5 of 5 units

CHG-gel-pad dressing in 5 of 5 units

P=0.019

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI



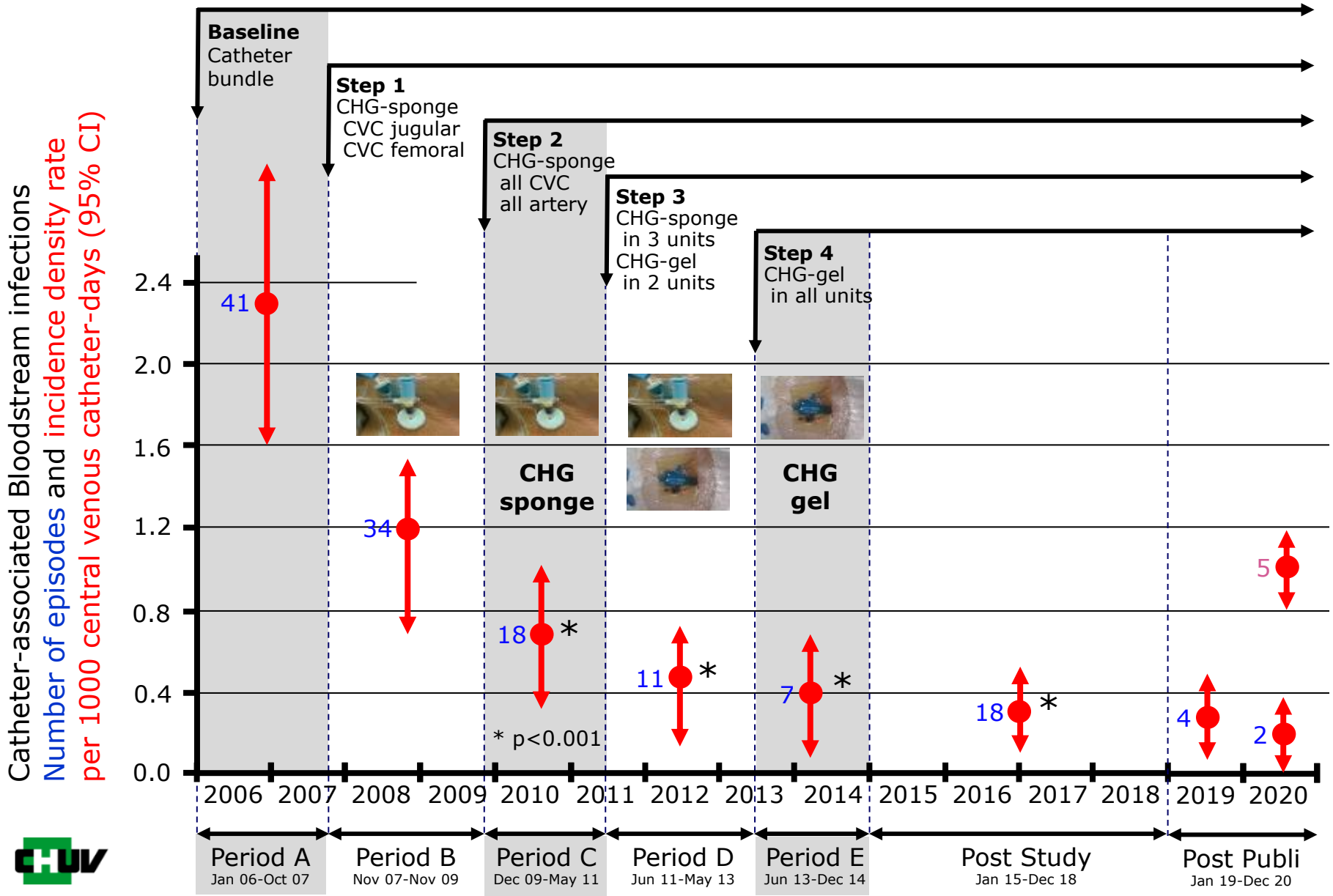
Cost-effectiveness/**year**

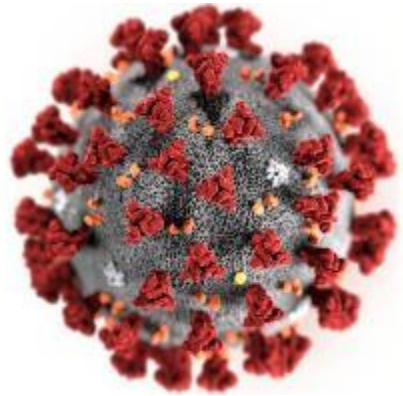
- 840'000 Euros
- 1'000 ICU-days
+ 125 Patients

~1.5 ICU beds

Eggimann P et al. ICM 2019;45: 823-33

CHG-dressings to prevent CABSI





5
in 316 COVID patients (1.6%)

2
in 1709 other patients (0.1%)

Courtesy Pagani JL (ICU) and Grandbastien B (Infect ctrl)

COVID-19 increased the risk of ICU-acquired bloodstream infections: a case–cohort study from the multicentric OUTCOMEREA network

Niccolò Buetti[1,11], Stéphane Ruckly[1], Etienne de Montmollin[1,9], Jean Reignier[2], Nicolas Terzi[3,4], Yves Cohen[5,6,7], Shidasp Siami[8], Claire Dupuis[1,10] and Jean-François Timsit[1,9*]

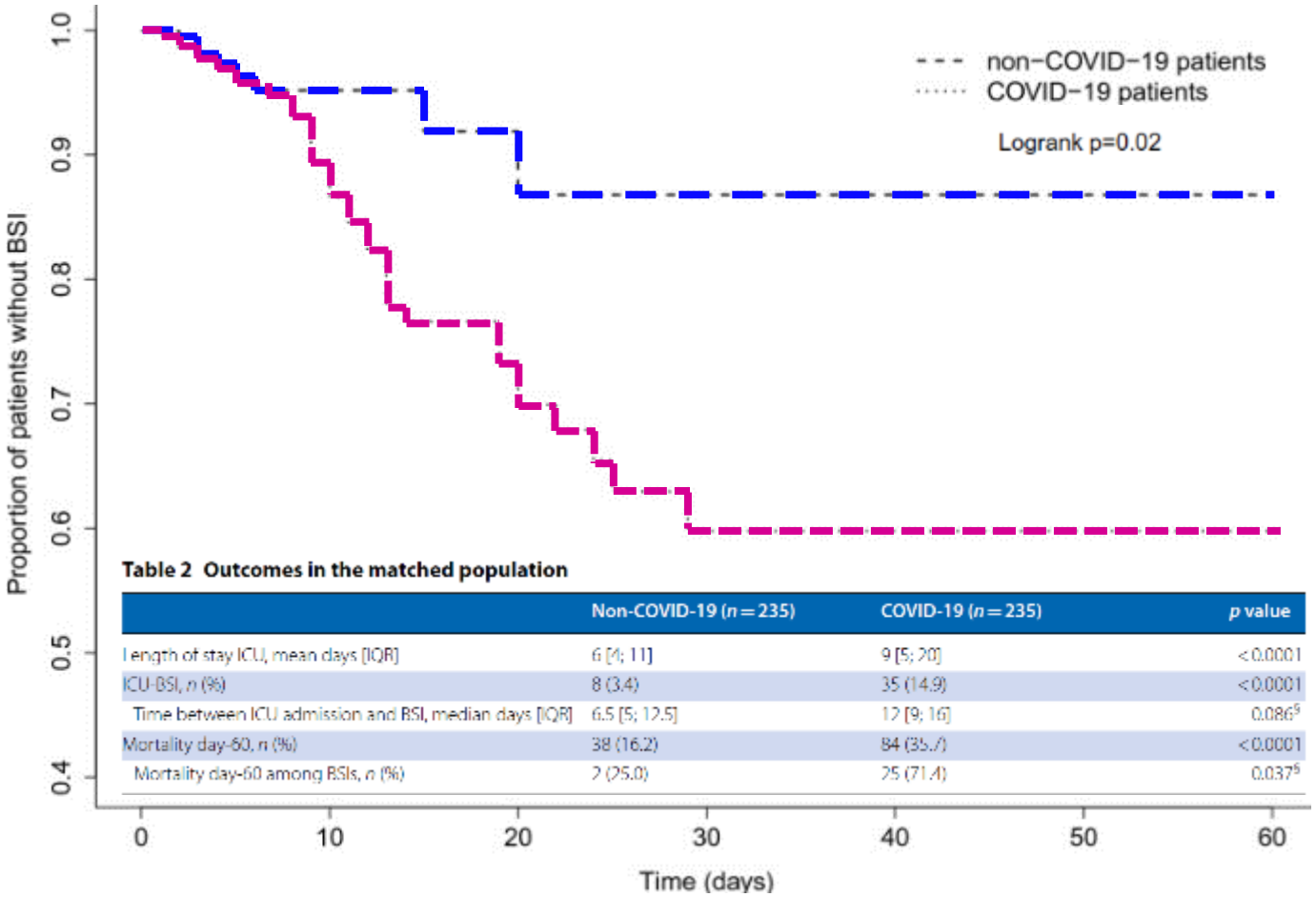


Table 2 Outcomes in the matched population

	Non-COVID-19 (*n* = 235)	COVID-19 (*n* = 235)	*p* value
Length of stay ICU, mean days [IQR]	6 [4; 11]	9 [5; 20]	< 0.0001
ICU-BSI, *n* (%)	8 (3.4)	35 (14.9)	< 0.0001
Time between ICU admission and BSI, median days [IQR]	6.5 [5; 12.5]	12 [9; 16]	0.086[$]
Mortality day-60, *n* (%)	38 (16.2)	84 (35.7)	< 0.0001
Mortality day-60 among BSIs, *n* (%)	2 (25.0)	25 (71.4)	0.037[$]

Table 3 Distribution of microorganisms in ICU bloodstream infections (BSI, *n* = 48) and sources of infection (*n* = 46) among COVID-19 and non-COVID-19 patients

	Non-COVID-19	COVID-19
Microorganisms identified (n = 48)*		
Coagulase negative Staphylococci	2 (22.2)	14 (35.9)
Staphylococcus aureus	1 (11.1)	3 (7.7)
Enterococcus spp	0 (0)	4 (10.3)
Other Gram positive	3 (33.3)	3 (7.7)
Enterobacterales	2 (22.2)	5 (12.8)
Pseudomonas aeruginosa	1 (11.1)	5 (12.8)
Anaerobic bacteria	0 (0)	1 (2.6)
Candida albicans	0 (0)	4 (10.3)
Source of infection (n = 46)		
Intra-abdominal	1 (12.5)	1 (2.6)
Skin/soft tissue	0 (0)	2 (5.3)
CRBSI	2 (25)	8 (21.1)
Pulmonary	3 (37.5)	8 (21.1)
Urinary tract	0 (0)	1 (2.6)
Unknown	2 (25)	18 (47.4)

Values were expressed as number and percentage. The total number of ICU-BSI was 43

26 in 316 COVID patients (8.1%)

5 in 316 COVID patients (1.6%)

4 in 1709 other patients (0.4%)

2 in 1709 other patients (0.1%)

Prevention of catheter-associated infections

48-fold reduction of infection over 25 years

Sustained reduction of catheter-associated bloodstream infections with enhancement of catheter bundle by chlorhexidine dressings over 11 years

Philippe Eggimann, Jean-Luc Pagani, Elise Dupuis-Lozeron, Bruce Ekholm MS, Marie-Josèphe Thévenin, Christine Joseph, et al.

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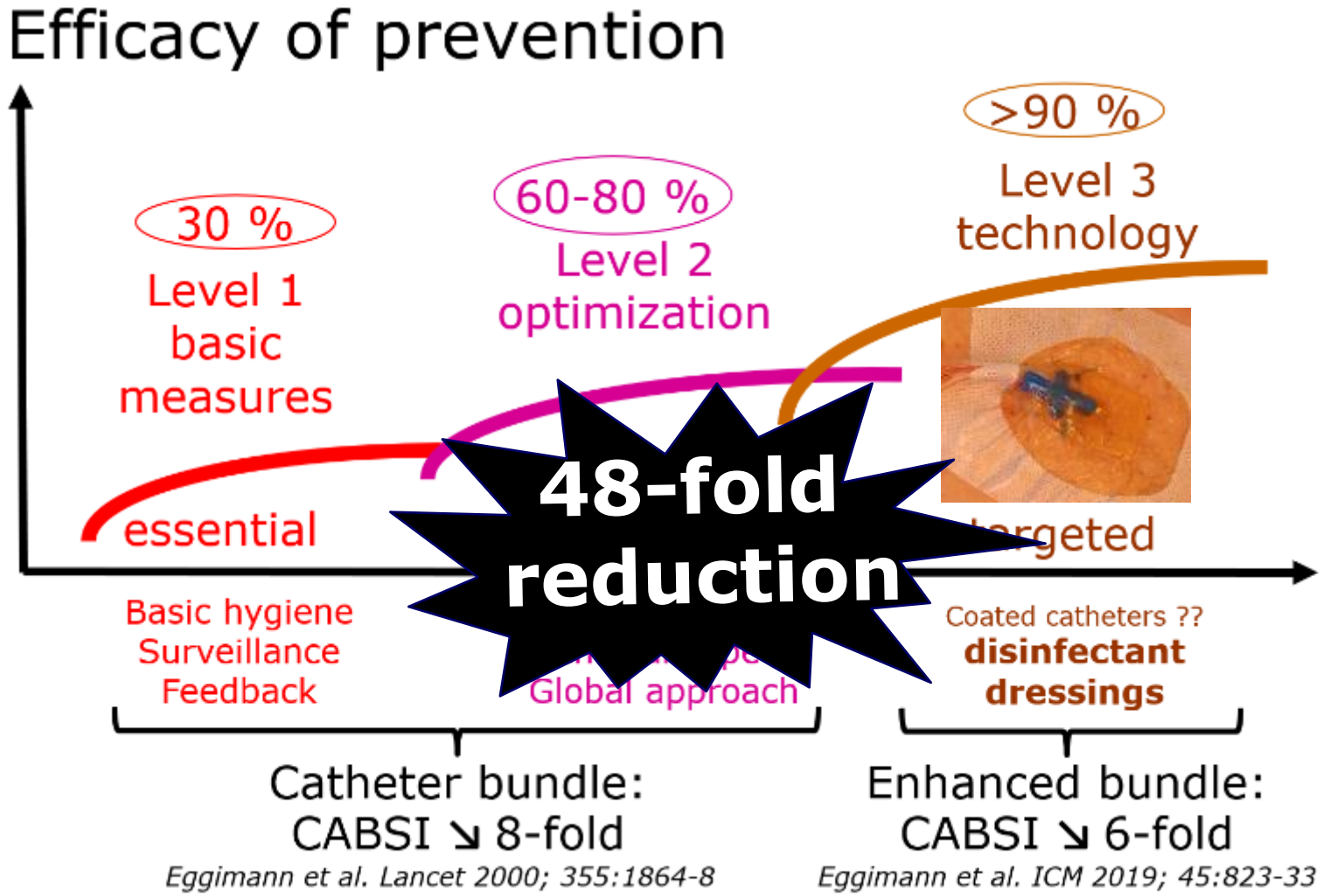


Prevention of catheter-associated infections

From bundle

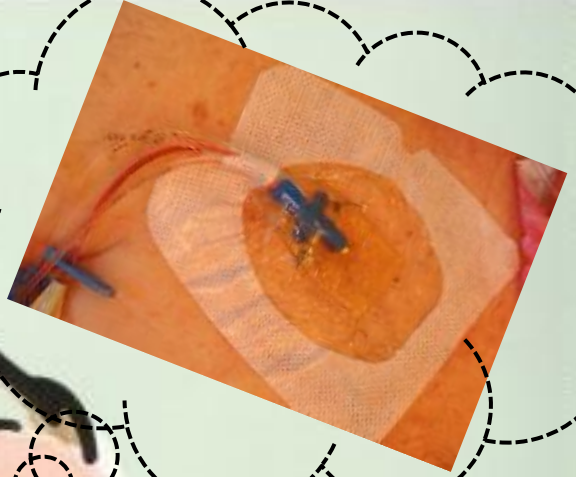
to

CHG-dressings

8-fold reduction

48-fold reduction

6-fold reduction



Thank you
for
your attention
and for
the invitation