

3MSM 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

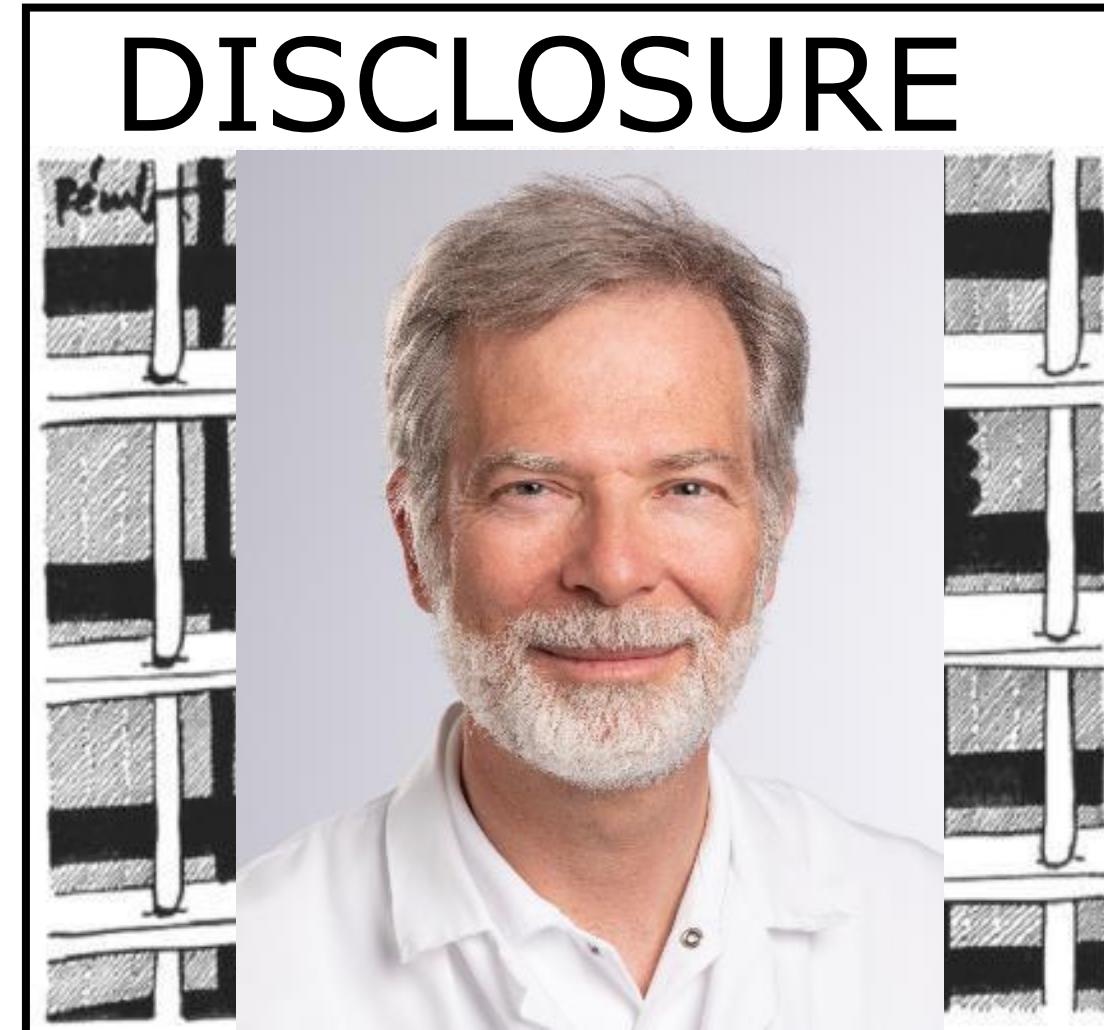


Be careful anything I say can be very biased

Dr Eggimann regularly collaborated in industry-funded clinical trials since the 1990s

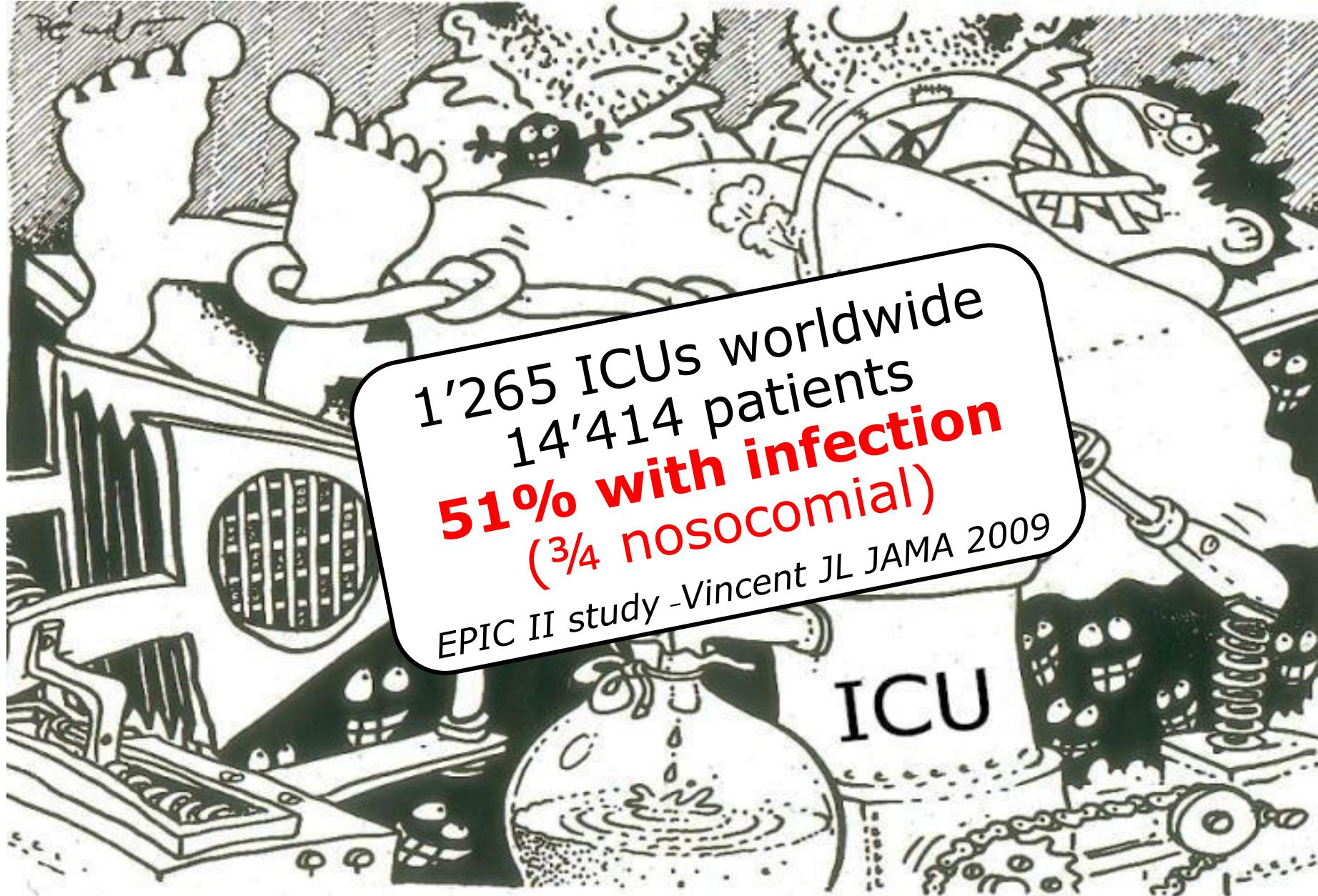
Dr Eggimann has no offshore account !

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

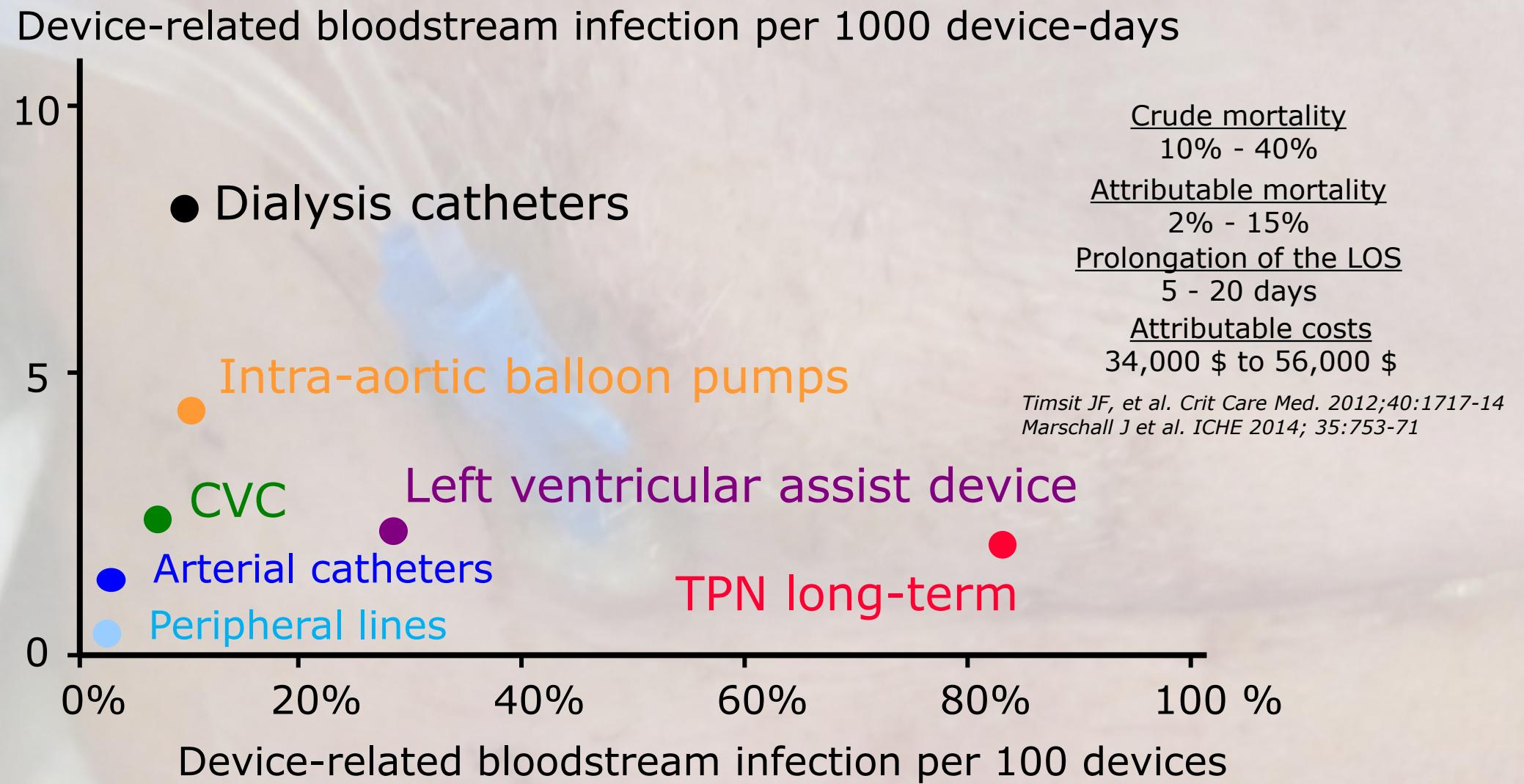


Dr Eggimann served on advisory boards and/or presented sponsored lectures for:
Pfizer, Gilead
MSD, 3M
Astellas,
Roche,
Weyth-Lederle,
Lilly, Bayer
Medex,
Kenta-Biotech
Aridis, Abionic

Welcome to the ICU The world of infection



Including **catheter-related** infections !!!



Including catheter-related infections !!!

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

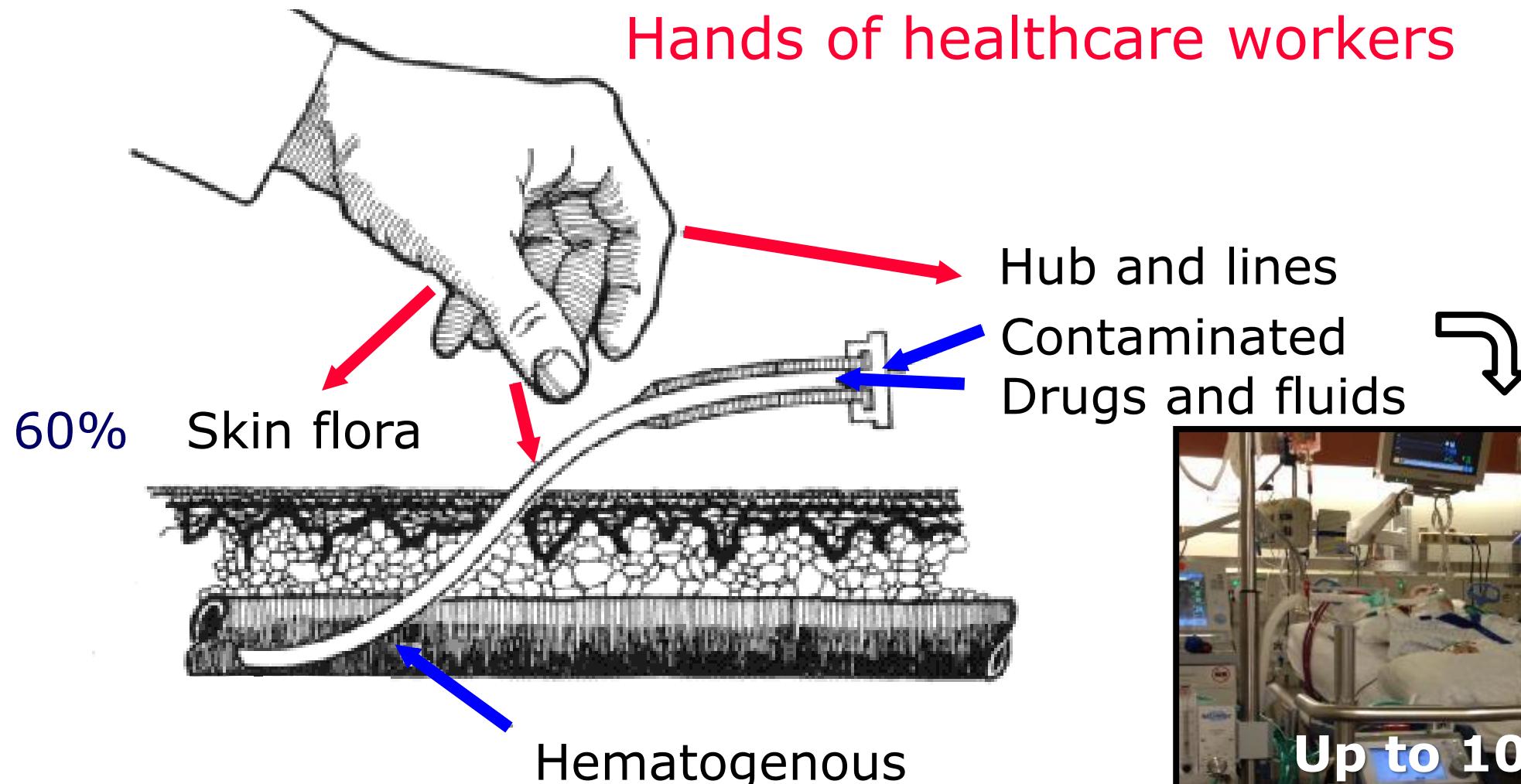
Marie-Laurence Lambert, MD, PhD;¹ Geert Silversmit, PhD;² Anne Savey, MD;³ Mercedes Palomar,
Michael Hiesmayr, MD;⁶ Antonella Agodi, PhD;⁷ Bart Van Rompaye, PhD;²
Karl Mertens, MSc;¹ Stijn Vansteelandt, PhD²

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 case preventable ^b (95% CI)
VAPs	3,148 (2,978–3,318)	.52 (0.51–0.52)
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



Pathophysiology of catheter-related infections



Weaning



Pathophysiology of catheter-related infections

Dressings



What did you do to prevent them ?

I follow
guidelines

INTERVENTIONS FOR HOSPITAL INFECTION CONTROL 2014; 26(1):1-7
JHIA/IDSA PRACTICE RECOMMENDATION

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

Jean Marshall, Michael Leonard, A. Kornet, DO, Naseem Mohamed, PhD, MD, MPH,¹
Eric Dubberke, MD, MS, FRCR,² Alexander Kallen, MD, MPH,³ Nisha P. O'Grady, MD,⁴
Aamir Mirza, MD, PhD,⁵ Gigi M. St. L'Esperance, MD,⁶ and David W. Hartung, MD, MPH,⁷
Lee L. Mangione, MD, MPH,⁸ Deborah S. Tolosa, MD, MPH⁹

PURPOSE:
Previously published guidelines are available that provide comprehensive recommendations for reducing and preventing healthcare-associated infections (HAIs). The focus of this supplement is to update and expand our recommendations for the prevention of central line-associated bloodstream infections (CLABSI) in acute care hospitals. This document applies "Strategies to Prevent Central Line-Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update" (www.idsociety.org/guidelines/central-line-associated-bloodstream-infections-clabsi) to the Society for Healthcare Epidemiology of America (SHEA) and is the product of a collaborative effort led by SHEA, the Infectious Diseases Society of America (IDSA), the American Hospital Association (AHA), the National Patient Safety Foundation (NPSF), the Joint Commission (TJC), and the Center for Disease Control and Prevention (CDC), over the last 2 years. Consensus, where appropriate, from experts across a spectrum of organizations and societies with content expertise is presented in the introduction to the 2014 update.¹

SECTION II: NATIONAL AND STATEMENT OF CONCERN

1. Patients are at risk for CLABSI in acute care facilities.

2. Patients can have CLABSI populations that fall of CLABSI in 300 patients in high Risk areas (e.g. Intensive Care Unit, Emergency Department, etc.)

3. Patients with multiple admissions to the hospital or hospitalization with multiple admissions (e.g. the use of step-down units) are at increased risk for CLABSI.

4. Patients with increased risk:

1. Prosthetic heart valve catheterizations.
2. Prosthetic valvuloplasty.
3. Highly educated endotracheal or the ventilator site.
4. Highly educated endotracheal or the enteral site.
5. Severe sepsis admissions.
6. Recent surgery admissions.

5. Patients with decreased risk:

1. Short-term catheterizations.

SECTION III: NATIONAL STATEMENTS OF CONCERN

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IHI.org
A resource from the Institute for Healthcare Improvement

More than 3,000 hospitals enrolled
Download Data Submission How-to Guide
Get advice from Campaign Mentor Hospitals

The 100,000 Lives Campaign: Prevent Central Line Infections

Institute for Healthcare Improvement
www.ihi.org

Journal of Hospital Infection (2007) 65, S1-S4
Available online at www.sciencedirect.com
SCIENCE @ DIRECT[®]
ELSEVIER

www.easierhealth.com/journal/jhi

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

R.J. Pratt^a, C.M. Pellowe^a, J.A. Wilson^{a,b}, H.P. Loveday^a, P.J. Harper^a,
S.R.J. Jones^a, C. McDougal^a, M.H. Wilcox^c

^a Richard Wels Research Centre, Faculty of Health and Human Sciences, Thames Valley University (London),
^b Department of Healthcare Associated Infection and Antimicrobial Resistance, Centre for Infection, Health Protection Agency (London),
^c Microbiology and Infection Control, Leeds Teaching Hospitals NHS Trust and University of Leeds.

Submitted 23 November 2006
Available online 5 February 2007

Executive Summary National evidence-based guidelines for preventing healthcare-associated infections (HCAI) in the English National Health Service (NHS) hospitals in England were commissioned by the Department of Health (DH) and developed during 1998–2000 by a number of multidisciplinary teams of researchers and specialists from across the NHS. They were published in January 2001. These guidelines describe the precautions healthcare workers should take in three areas: standard principles for preventing HCAI, which include hospital environmental hygiene, hand hygiene, the use of personal protective equipment, and the safe use and disposal of sharps; preventing infections associated with the use of short-term indwelling urethral catheters; and preventing infections associated with central venous catheters.

The evidence for these guidelines was identified by multiple systematic reviews of experimental and non-experimental research and expert opinion as reflected in systematically identified professional, national and international guidelines, which were formally assessed by a validated appraisal process. In 2003, we developed a consensus national guideline for preventing HCAI in primary and community care on behalf of the National Collaborating Centre for Nursing and Supportive Care/National Institute for Health and Clinical Excellence¹.

A cardinal feature of evidence-based guidelines is that they are subject to timely review in order that new research evidence and technological advances can be identified, appraised and, if shown to be effective in preventing HCAI, incorporated into amended guidelines. Periodically updating the evidence base is essential to maintain the validity of the guidelines and to ensure that they remain clinically relevant. Consequently, the DH commissioned a review of new evidence published following the last systematic reviews. We have now updated the evidence base for making infection prevention and control recommendations. A critical assessment of the updated evidence indicated that the original epic guidelines published in 2001 remain robust, relevant and appropriate but that adjustments need to be made to reflect the new evidence.

¹ Corresponding author: Professor Robert J. Pratt, Director, Richard Wels Research Centre, Faculty of Health and Human Sciences, Thames Valley University, 32-38 Lubbe Lane, London W5 2BS. Telephone: +44 (0)1908 5142; email: r.j.pratt@tvu.ac.uk

World Health Organization

Publications Countries Programmes Governance About WHO

Preventing bloodstream infections from central line venous catheters

Eliminating catheter related bloodstream infections

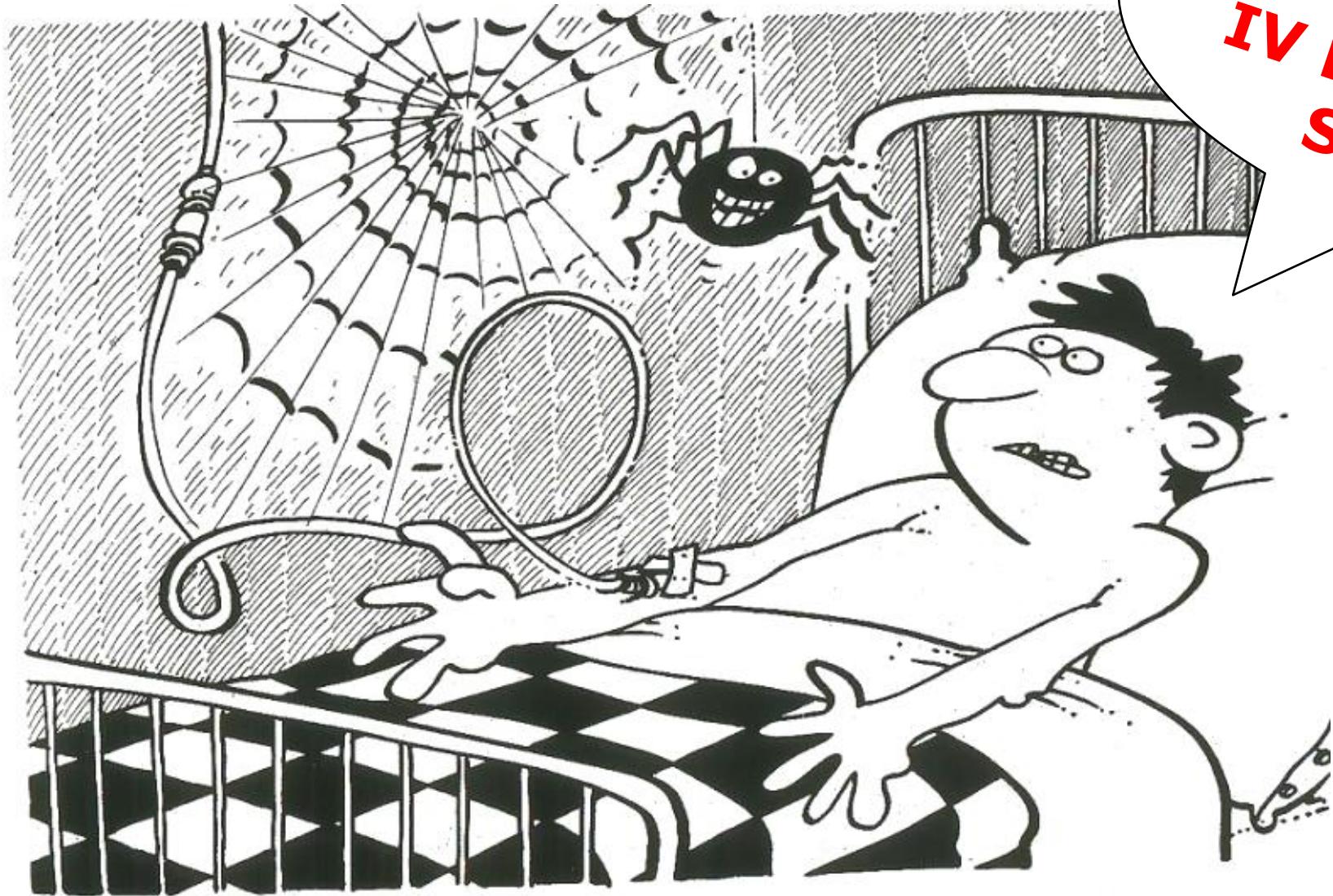
Central venous catheter related bloodstream infections (CRBSI) are the most common cause of health care associated infection in the bloodstream. However, the use of these can result in serious complications and costs. According to US CDC, between 12 and 25% of patients who acquire CRBSI die, many others have extended hospital stays, and increased overall healthcare costs.

Key facts

- Catheter-related bloodstream infection (CRBSI) is the most common cause of health care associated infection in the bloodstream.
- According to US CDC, between 12 and 25% of patients who acquire CRBSI die, many others have extended hospital stays, and increased overall healthcare costs.
- Each year in the United States, central venous catheters may cause an estimated 80,000 catheter related bloodstream infections in ICUs. Around 200,000 cases of CRBSI have been estimated to occur annually if central line catheters are reinserted and, on average, up to 67,000 die among patients in hospitals.
- A single incident of CRBSI can cost as much as US\$ 66,000 to treat, according to surveillance data, once the cost of laboratory charges, radiology charges, and other additional day in the ICU are added up.

What did you do to prevent them ?

For a patient safety culture !



I attend
UK & Ireland
IV Leadership
Summit

Prevention of catheter-related infections

General measures

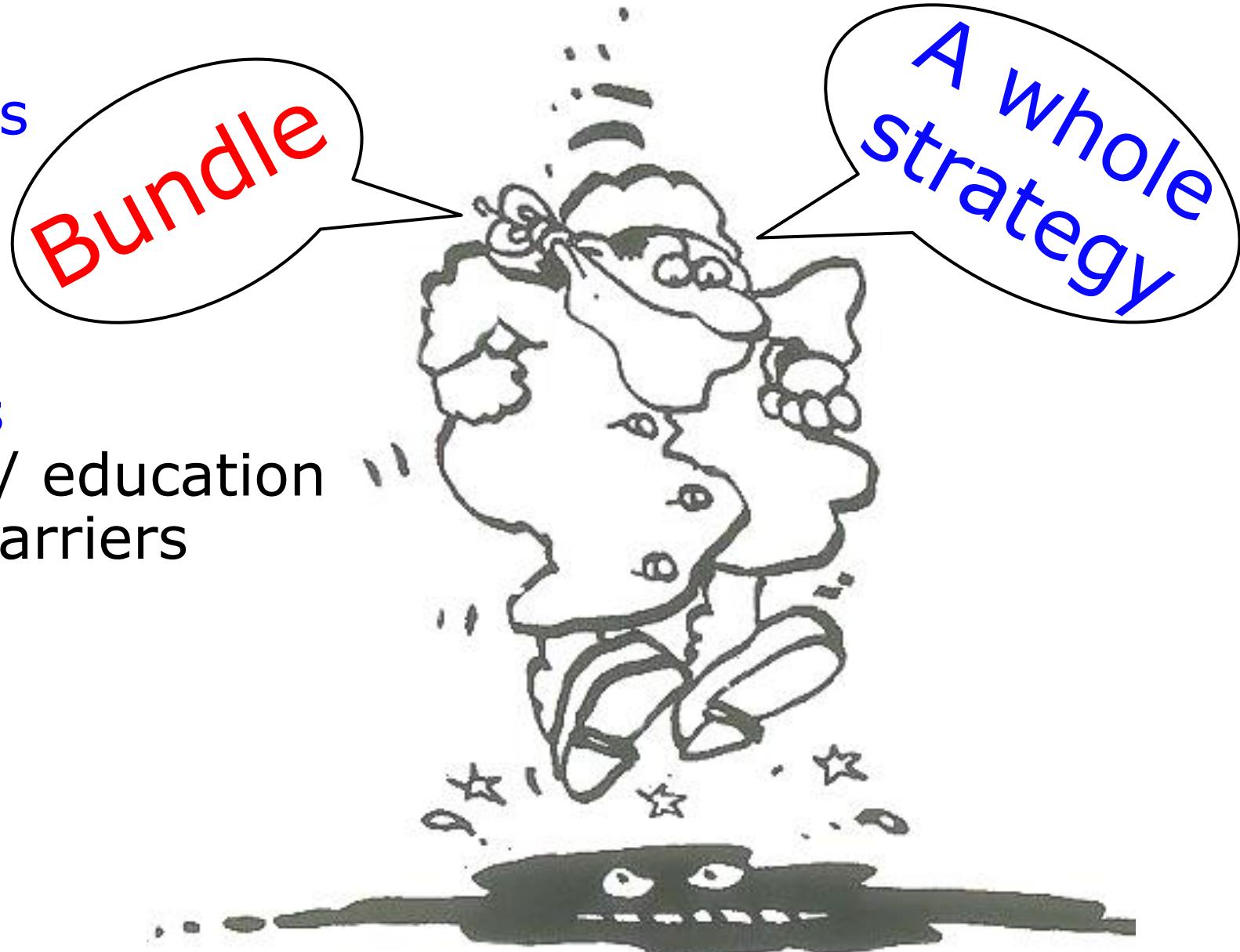
Surveillance

Hand hygiene

Technical aspects

Global approach / education

Maximal sterile barriers



Bundle for the prevention of CRBSI

Guidelines included in the multimodal educational program



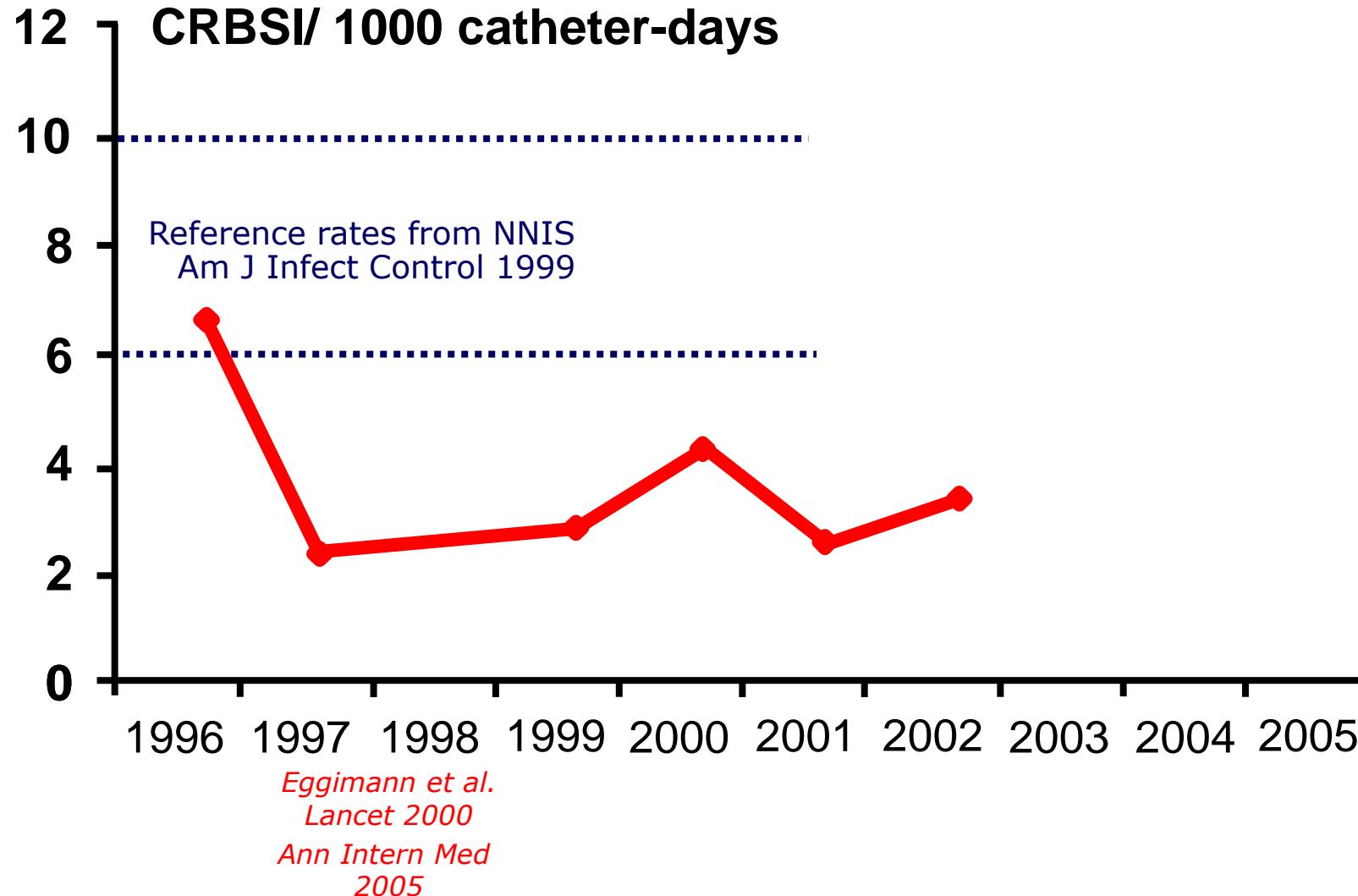
Guidelines **included** in the educational program

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

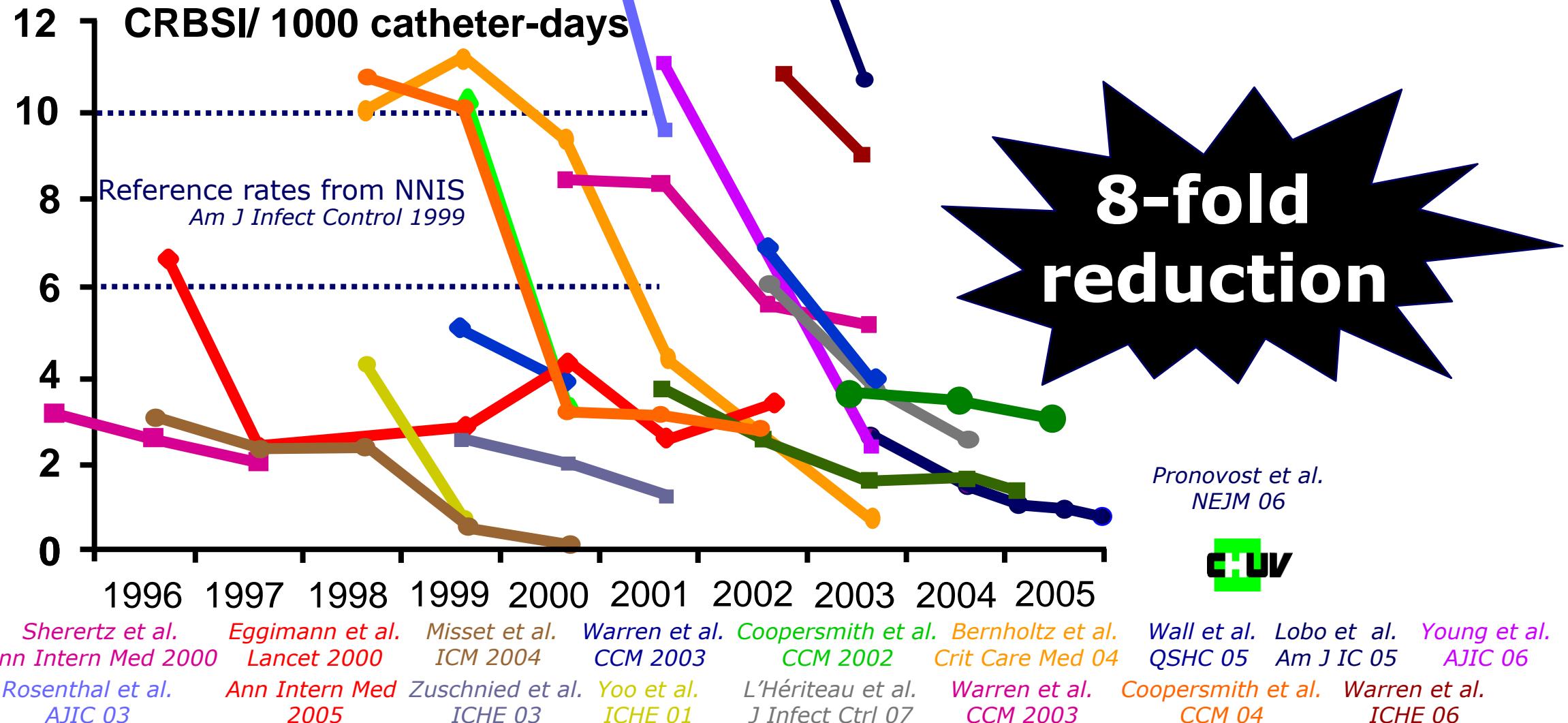


Eggimann P, Pittet D et al. Lancet; 2000 355:1864-8

Bundle for the prevention of CRBSI



Bundle for the prevention of CRBSI

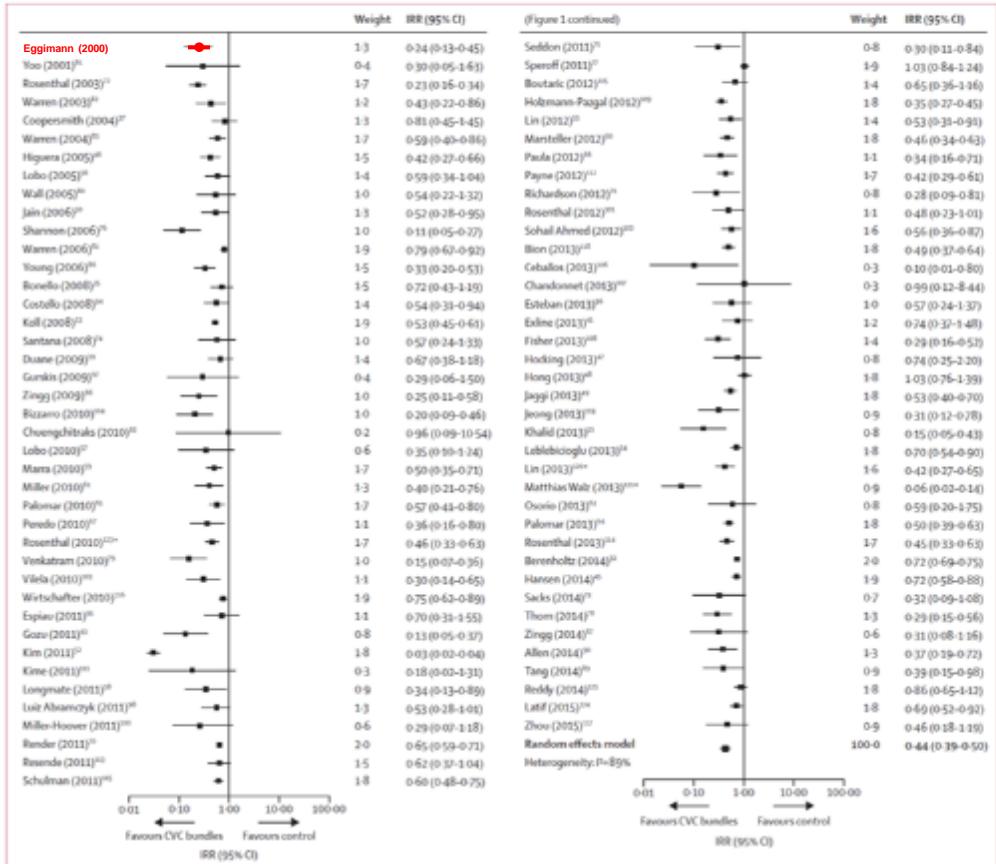


Bundle for the prevention of CRBSI

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



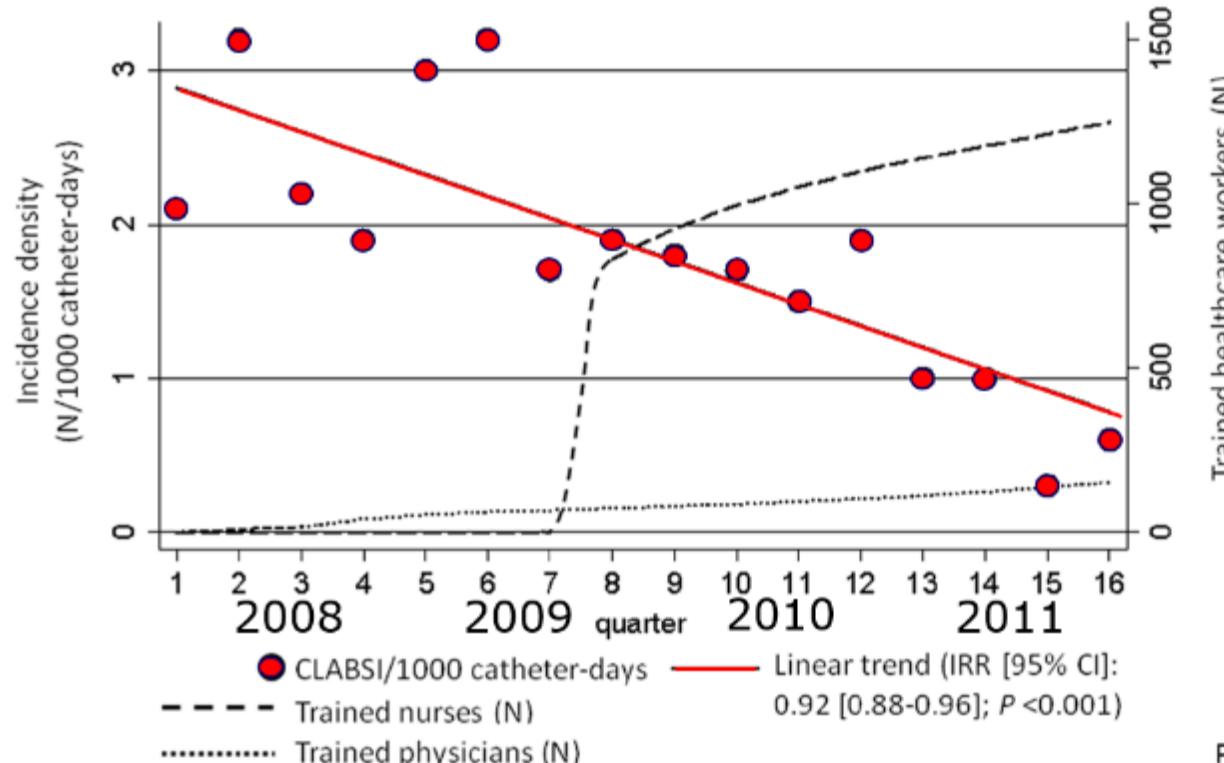
8-fold reduction

	Number of studies	Random effects model	
	In (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 Cartier², Cigdem Inan², Sylvie Touveneau^{1,3}, Michel Theriault³, Angèle Gayet-Ageron¹, François Clergue², Didier Pittet^{1,4}, Bernhard Walder²

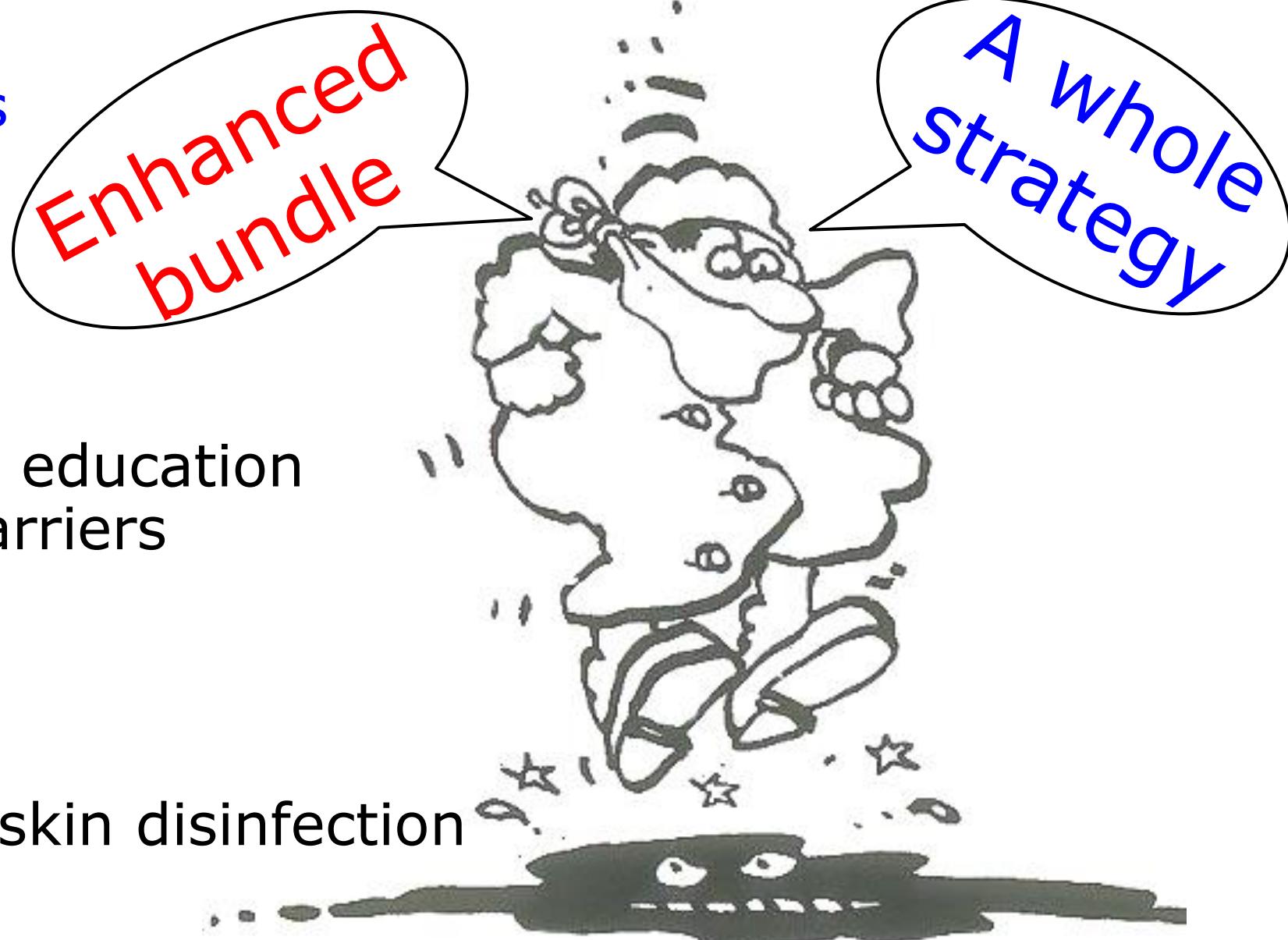


Enhanced Bundle to prevent CABSI

General measures
Surveillance
Hand hygiene

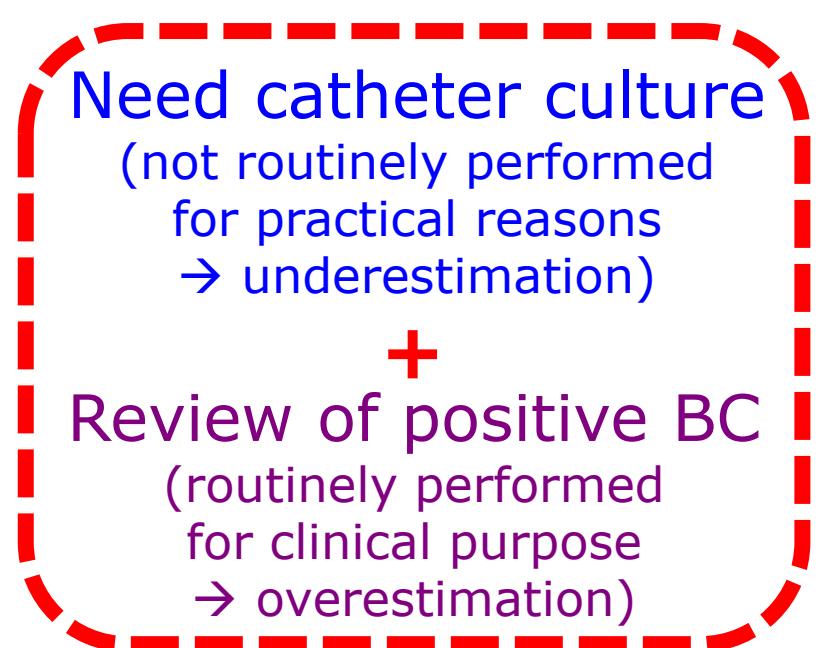
Technical aspects
Global approach / education
Maximal sterile barriers

Enhanced bundle
CHG-dressings
CHG with alcohol skin disinfection

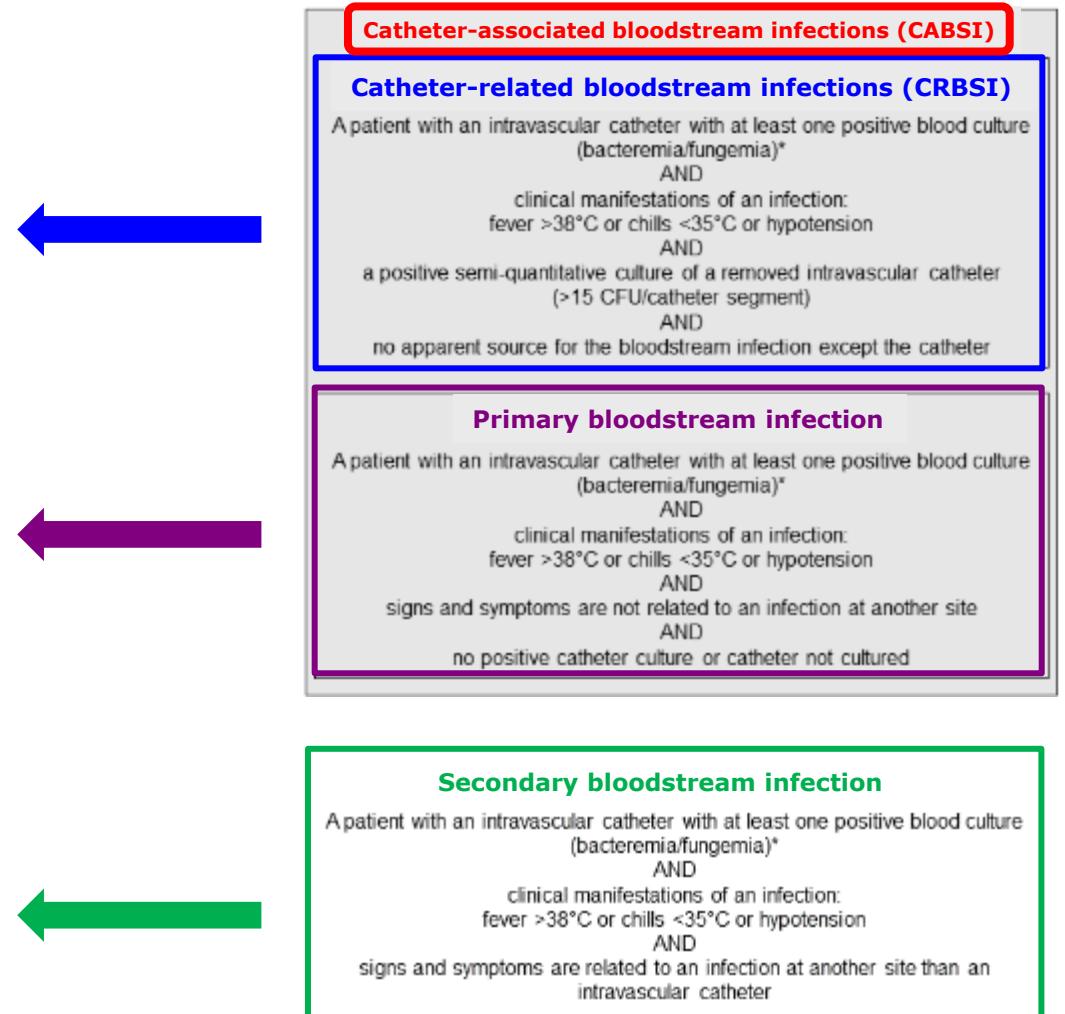


Pragmatic surveillance of CRBSI/CABSI

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



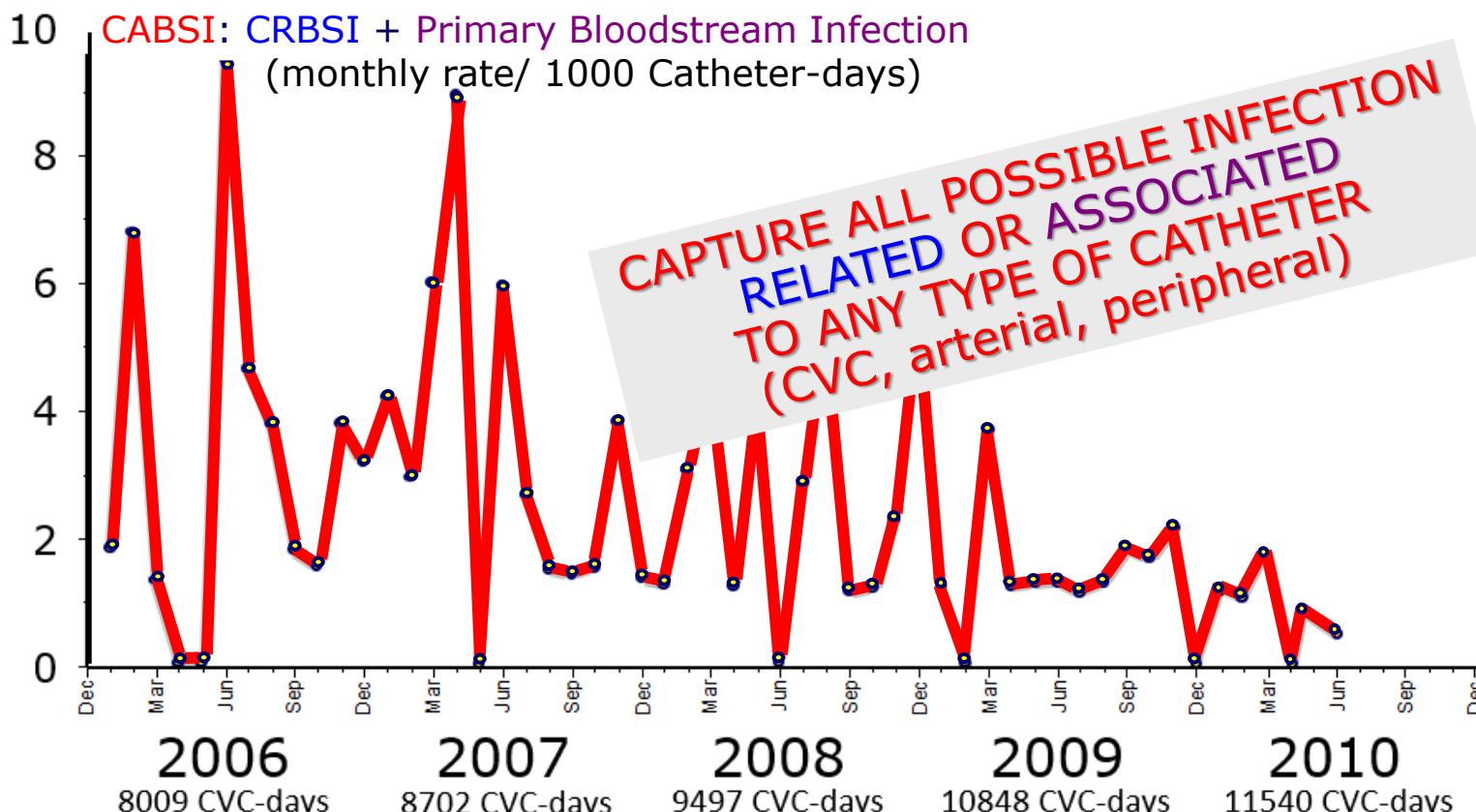
Excluded
(not related or associated
with a catheter)



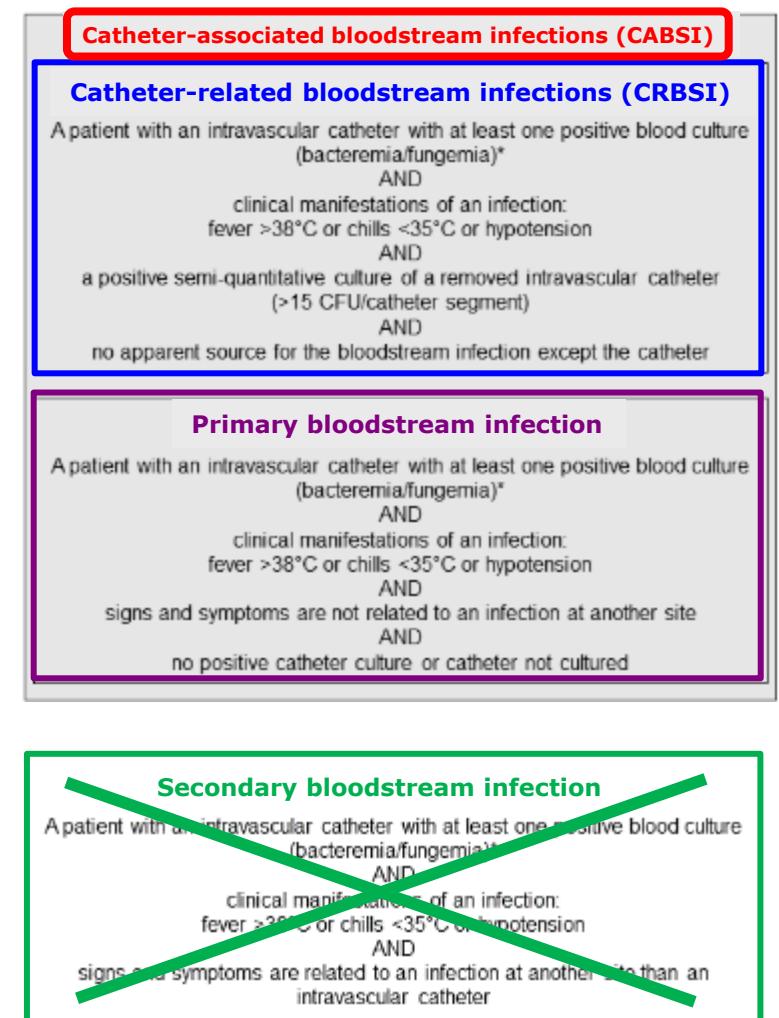
Pragmatic surveillance of CRBSI/CABSI

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

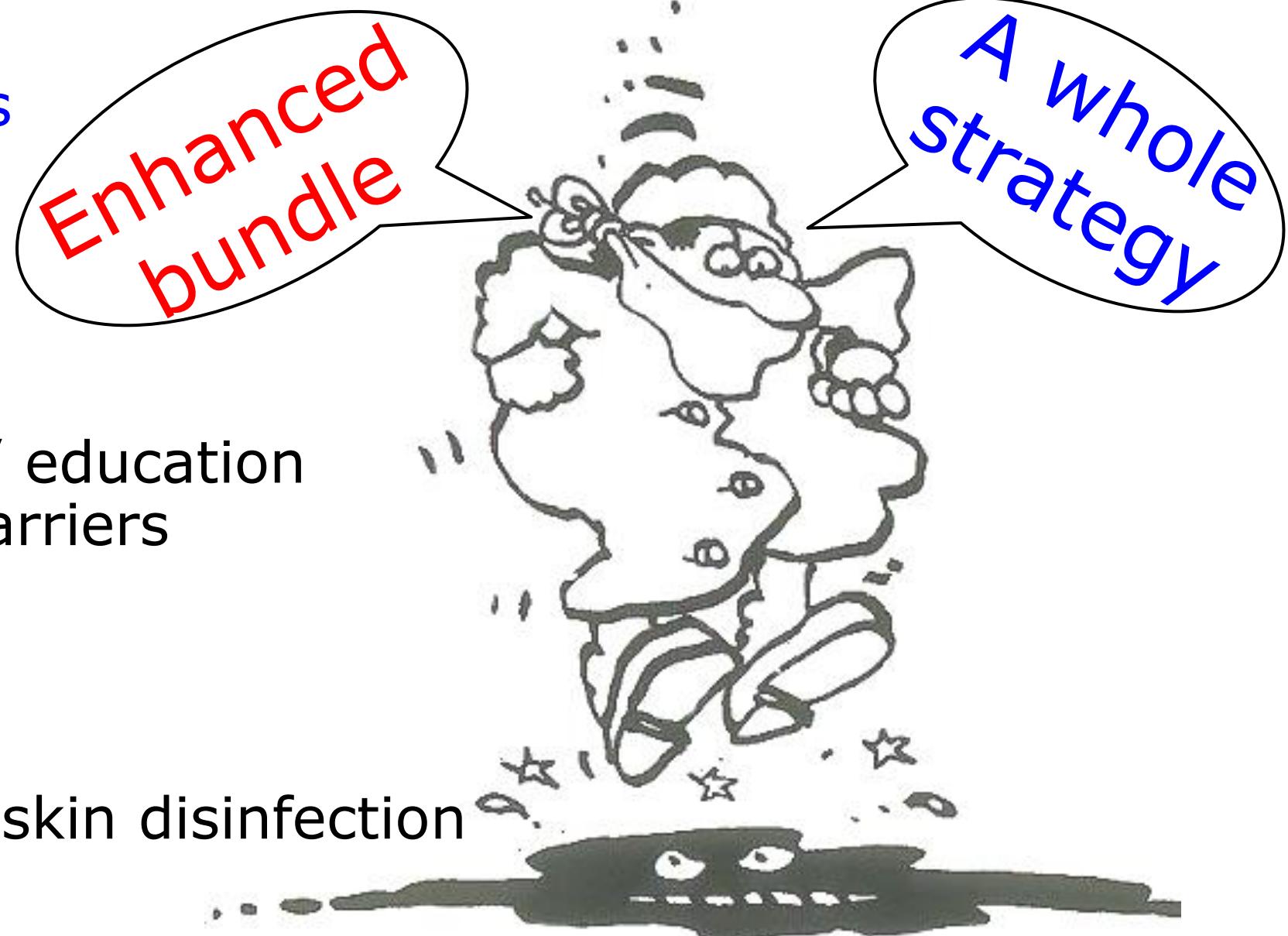


Enhanced Bundle to prevent CABSI

General measures
Surveillance
Hand hygiene

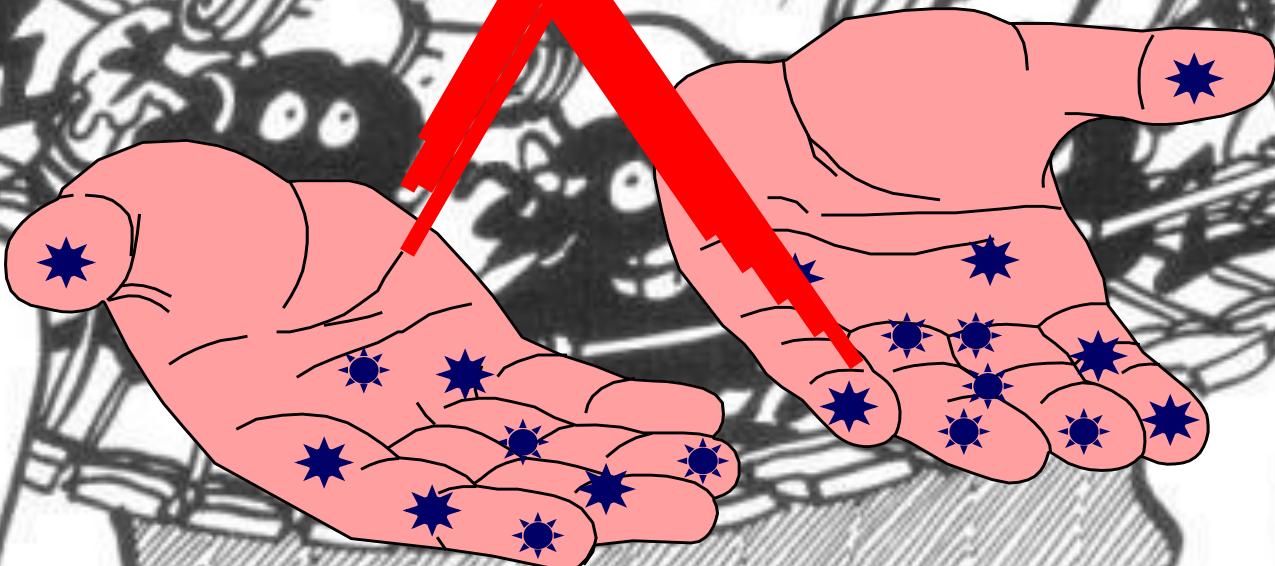
Technical aspects
Global approach / education
Maximal sterile barriers

Enhanced bundle
CHG-dressings
CHG with alcohol skin disinfection



Hand hygiene

~~TRANSMISSION~~

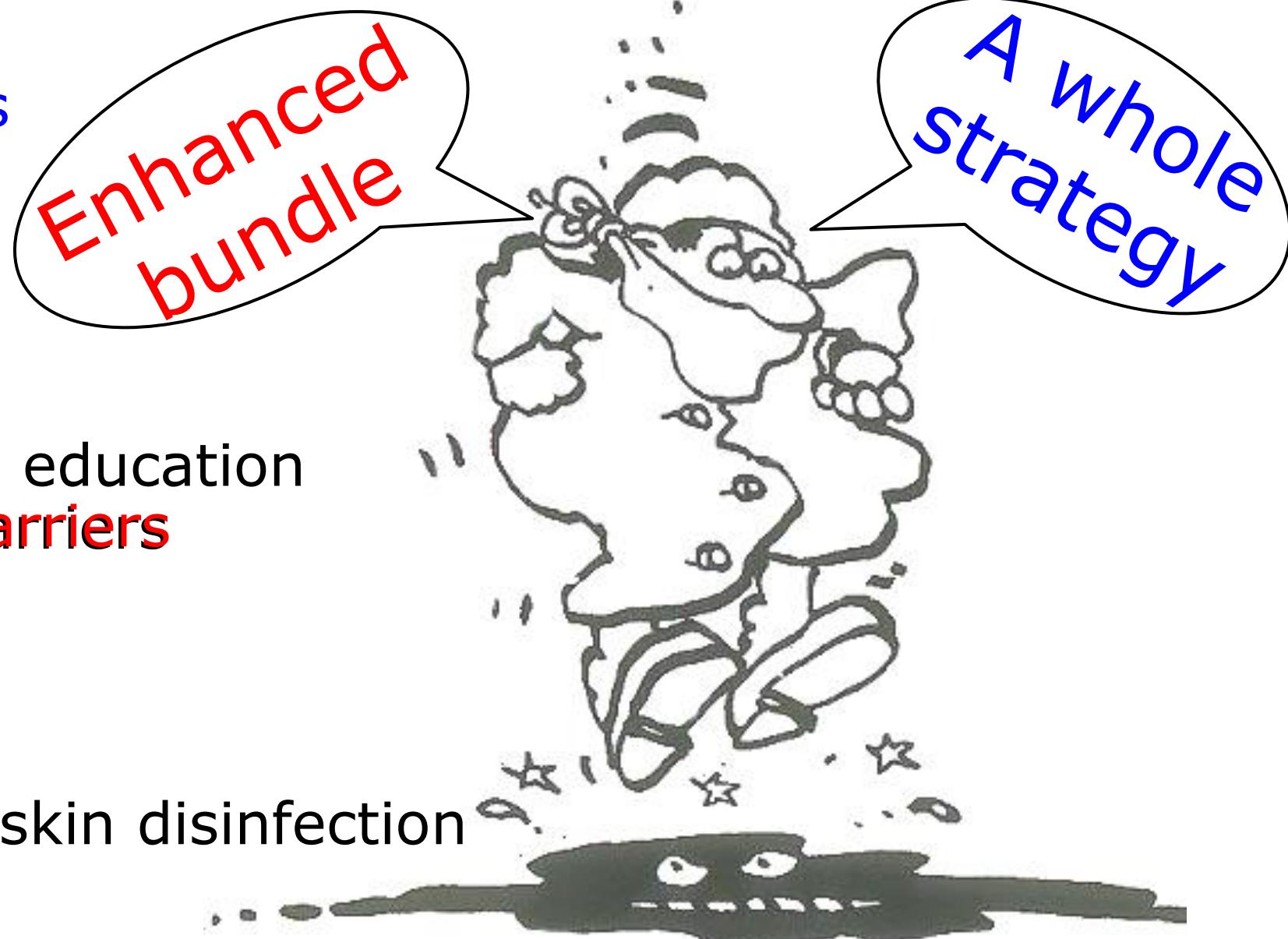


Enhanced Bundle to prevent CABSI

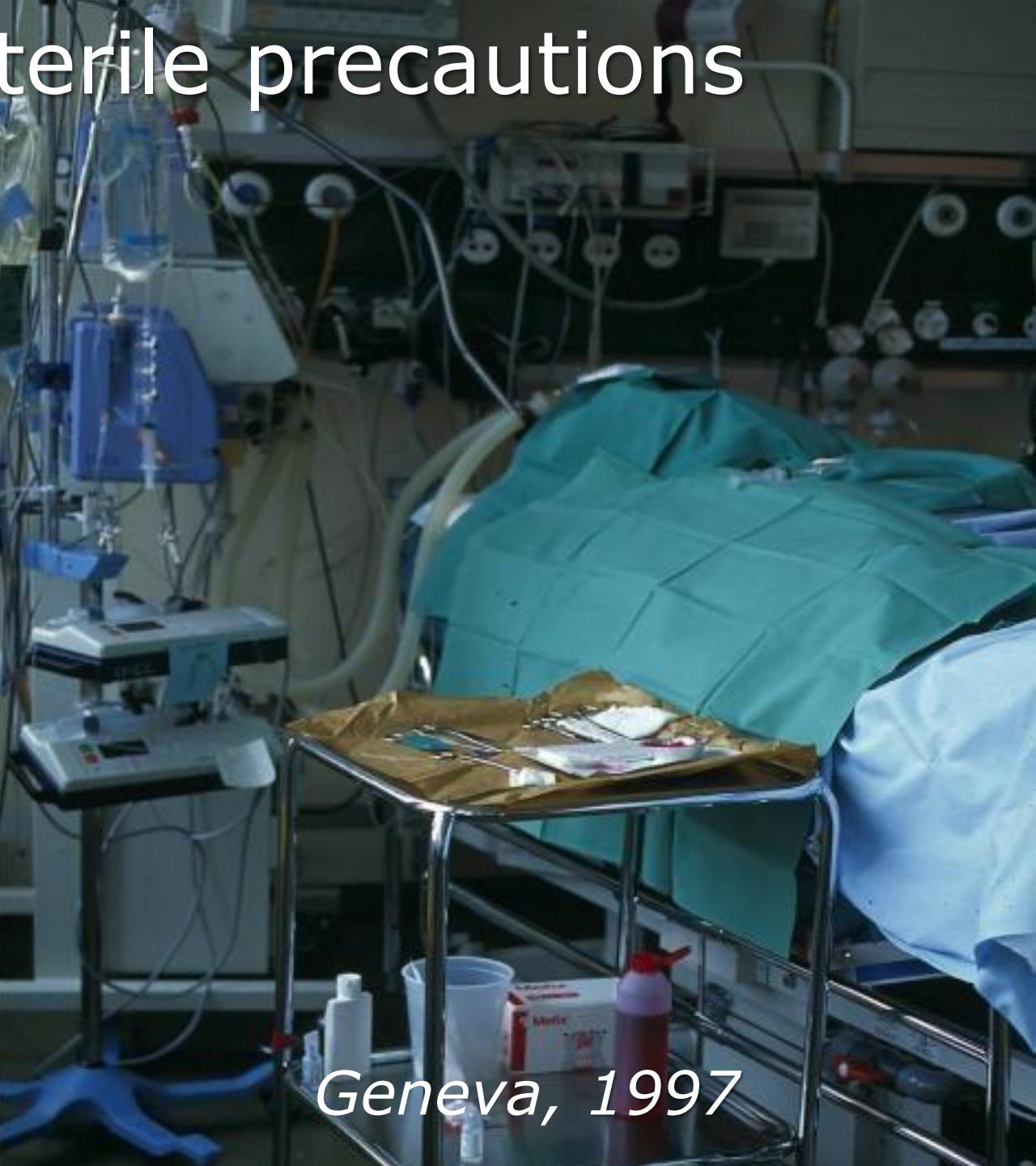
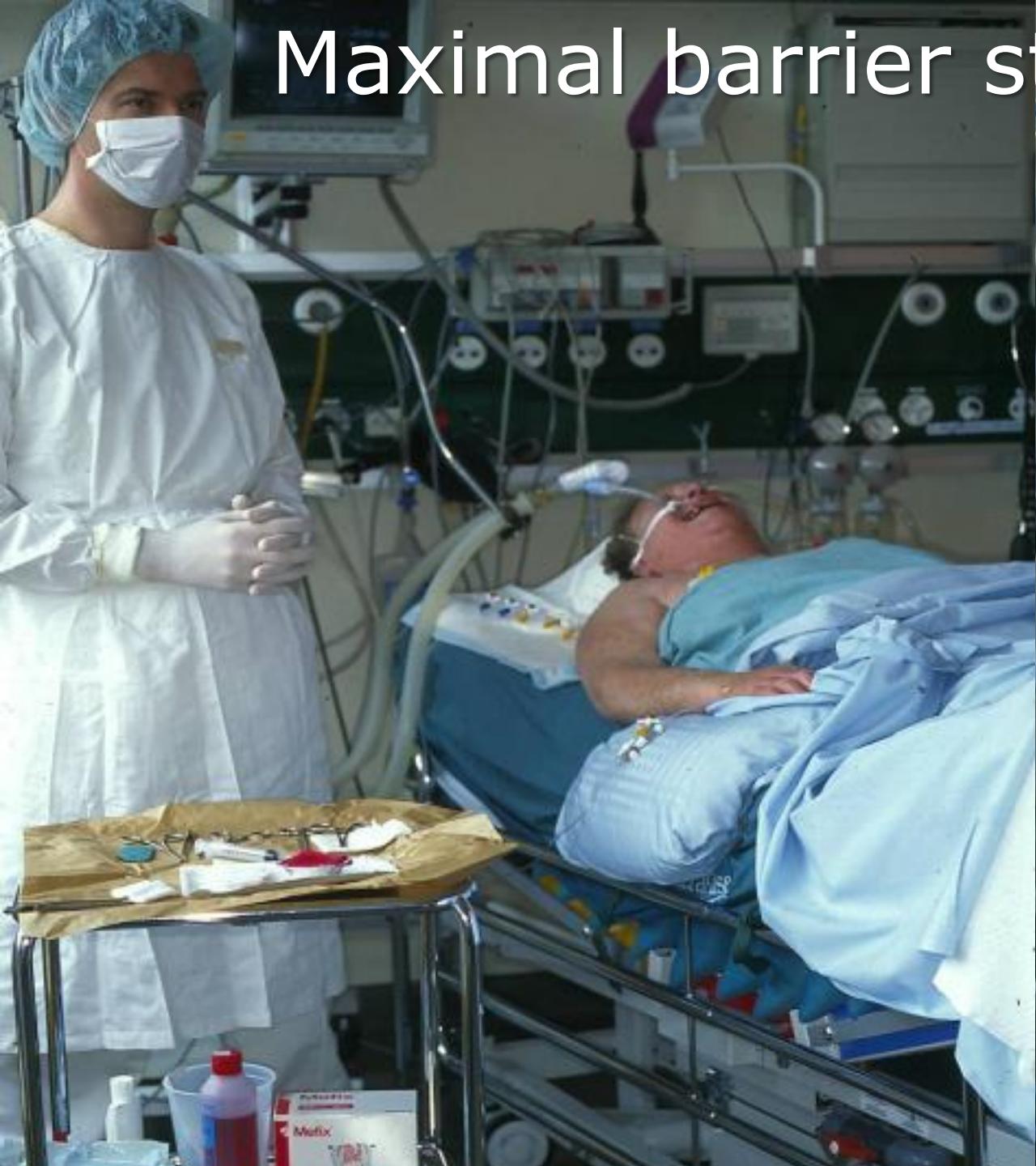
General measures
Surveillance
Hand hygiene

Technical aspects
Global approach / education
Maximal sterile barriers

Enhanced bundle
CHG-dressings
CHG with alcohol skin disinfection



Maximal barrier sterile precautions



Geneva, 1997

Maximal barrier sterile precautions



Maximal barrier sterile precautions



Maximal barrier sterile precautions



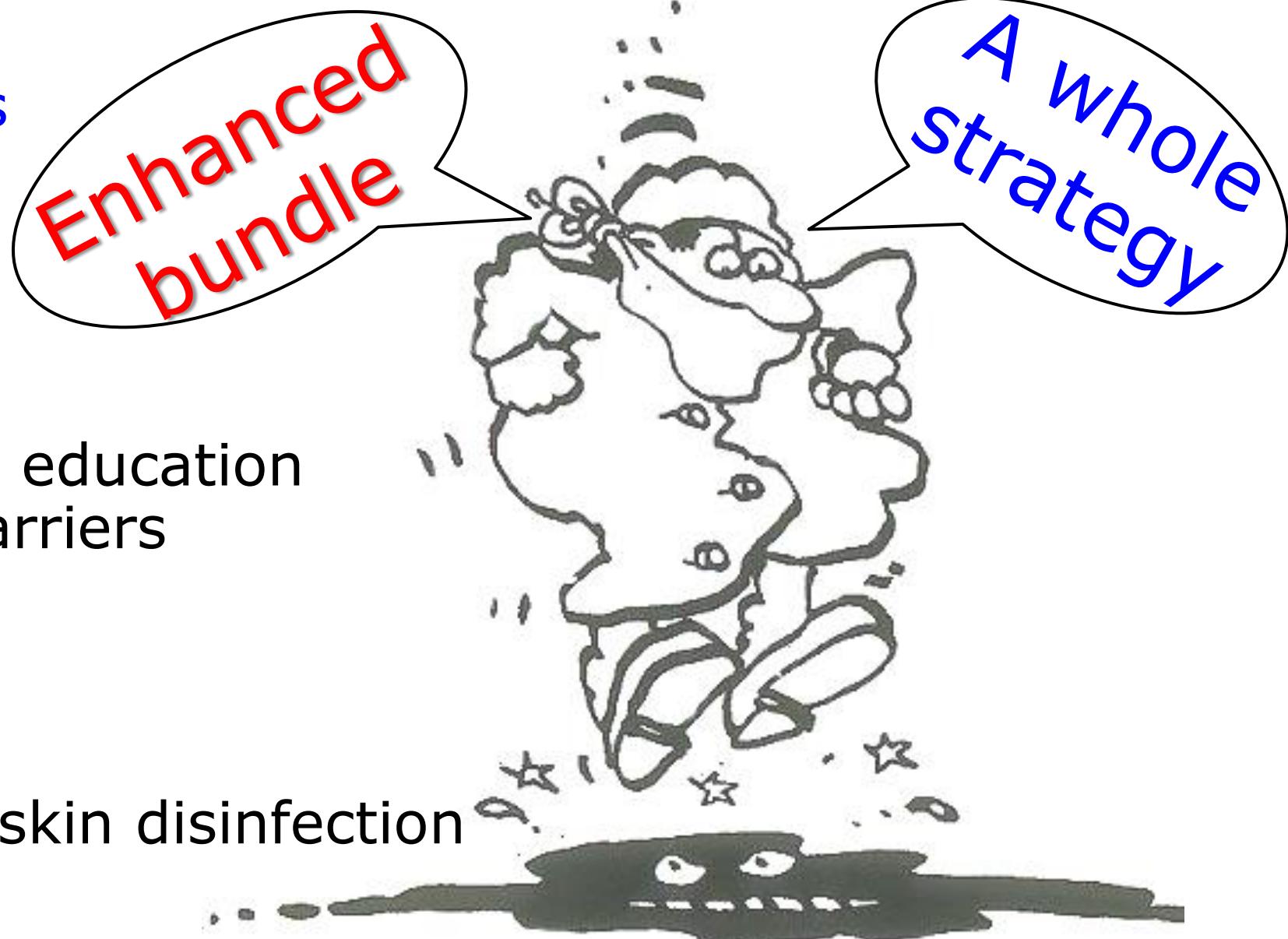
Lausanne, 201X

CHG-dressings to prevent CABSI

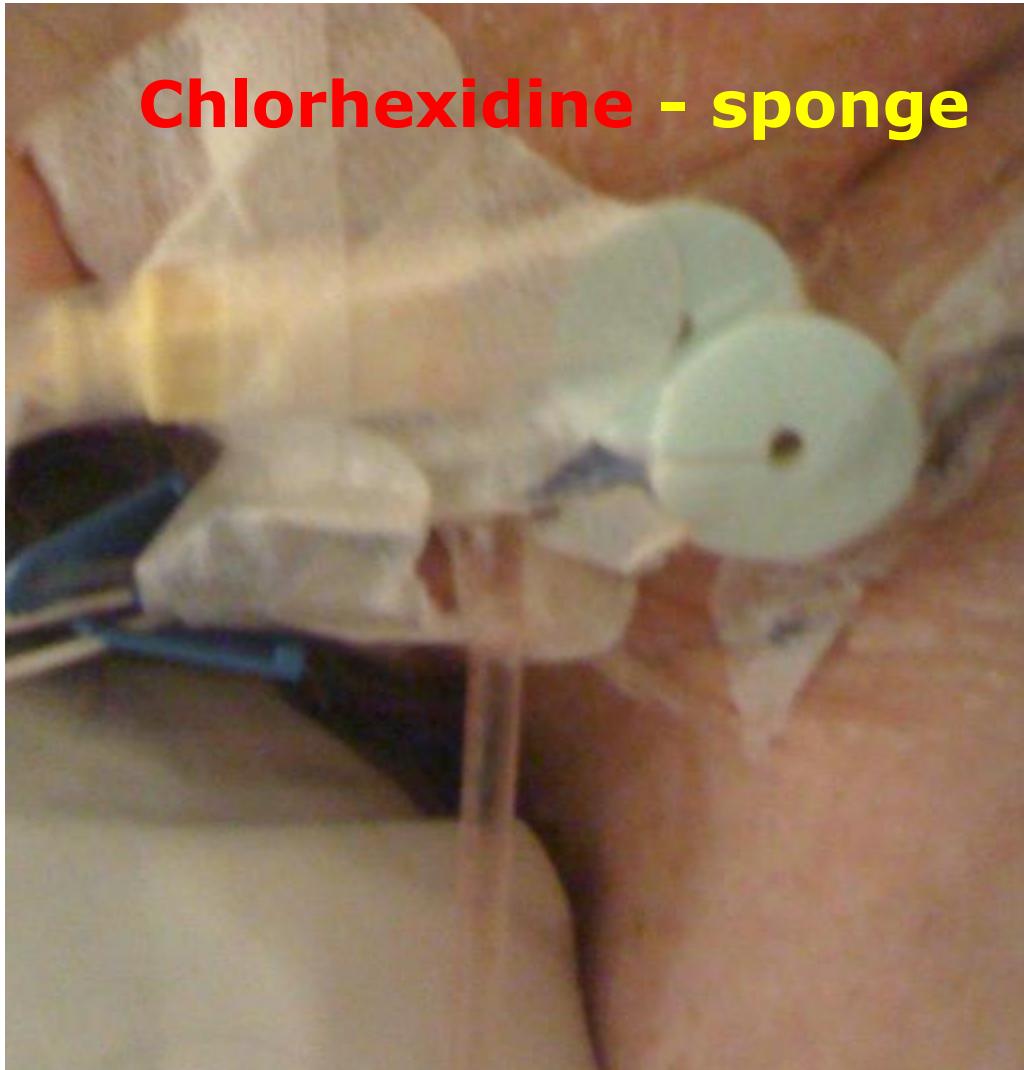
General measures
Surveillance
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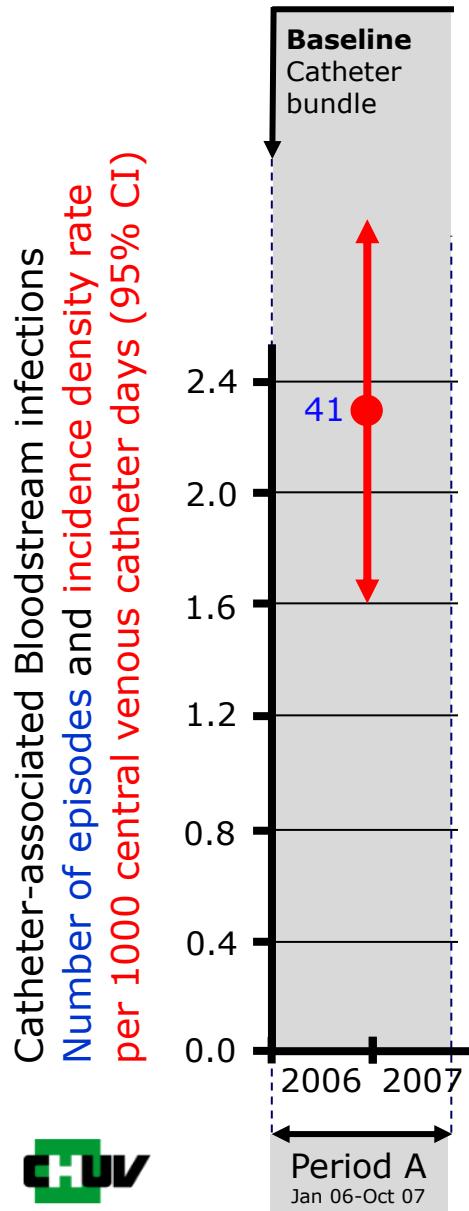
Enhanced bundle
CHG-dressings
CHG with alcohol skin disinfection



CHG-dressings to prevent CABSI



CHG-dressings to prevent CABSI



Pragmatic surveillance of CRBSI/CABSI

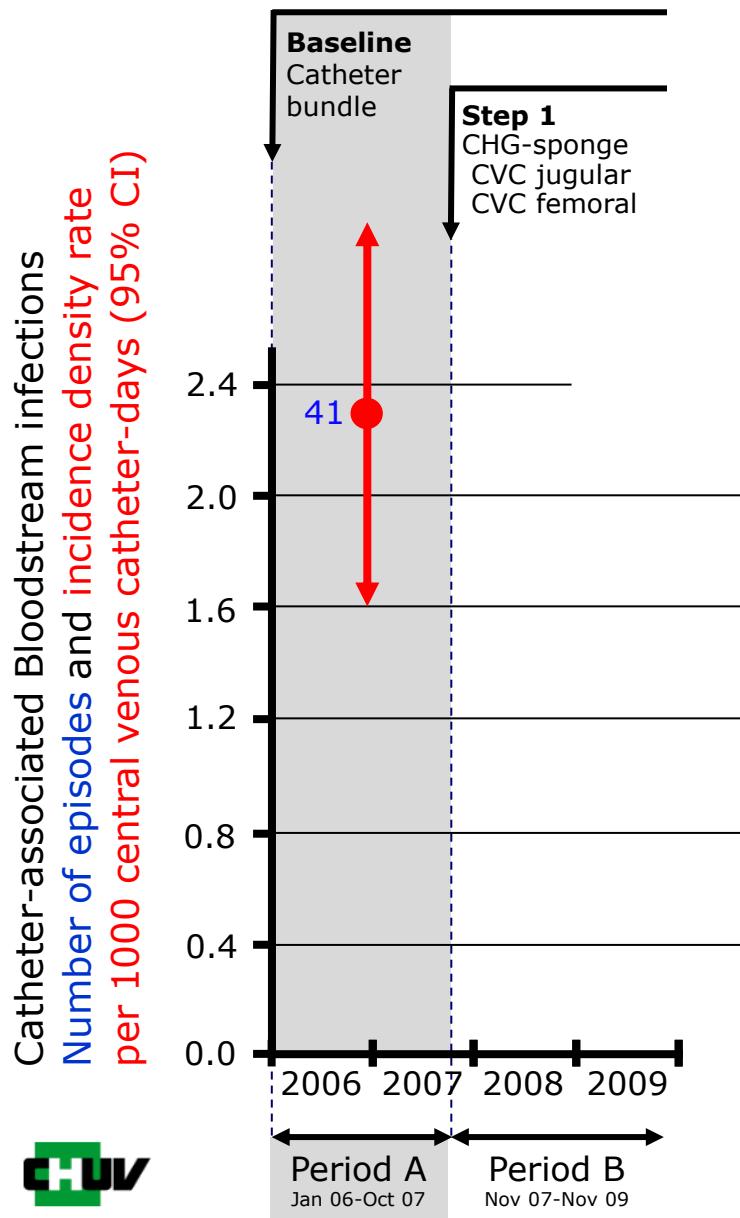
Review/score all positive bloodculture clinicians (MD+ RN)



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

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

CHG-dressings to prevent CABSI



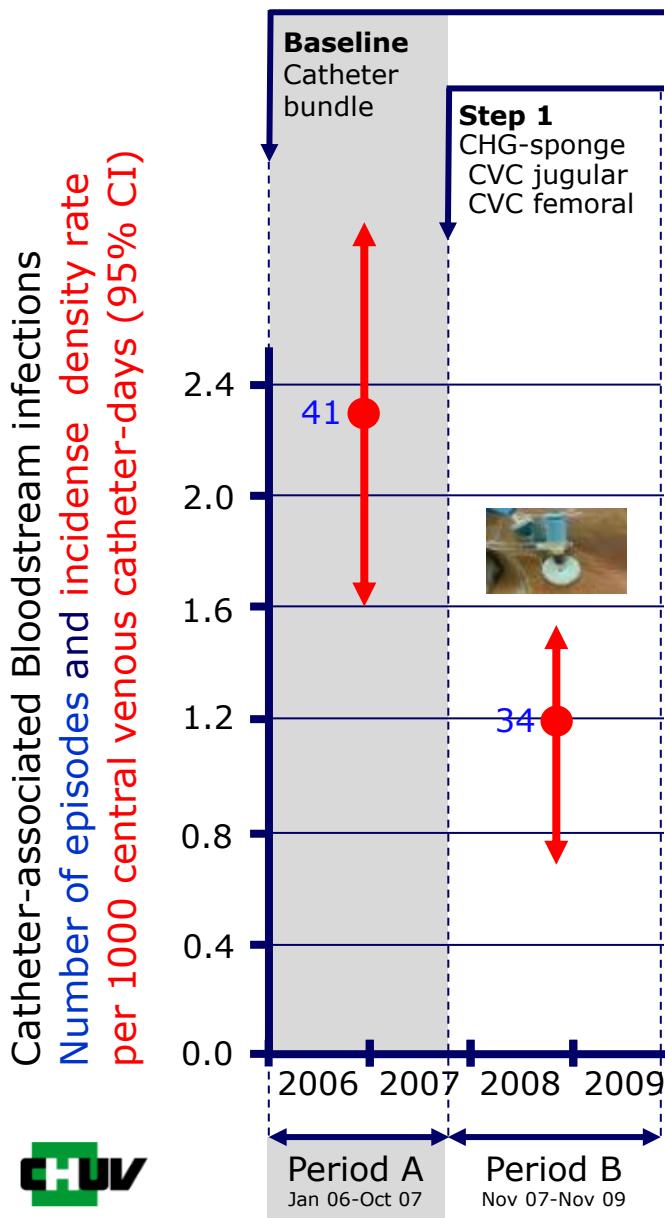
CHG dressings

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



Surgical clipper

CHG-dressings to prevent CABSI



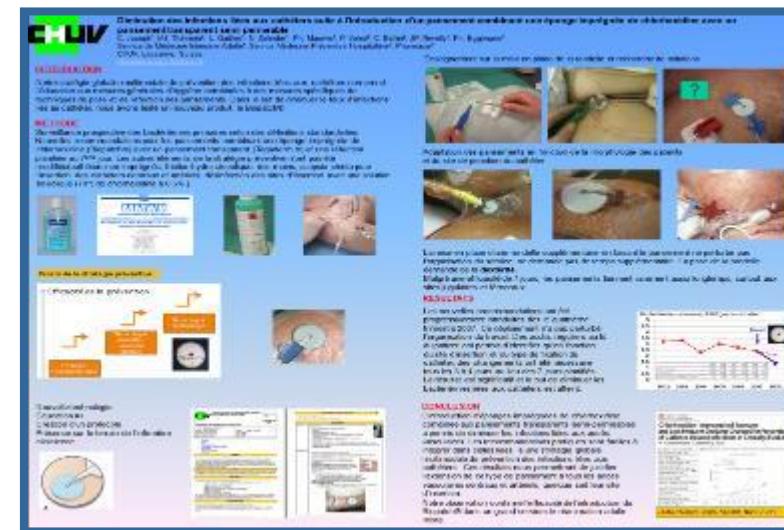
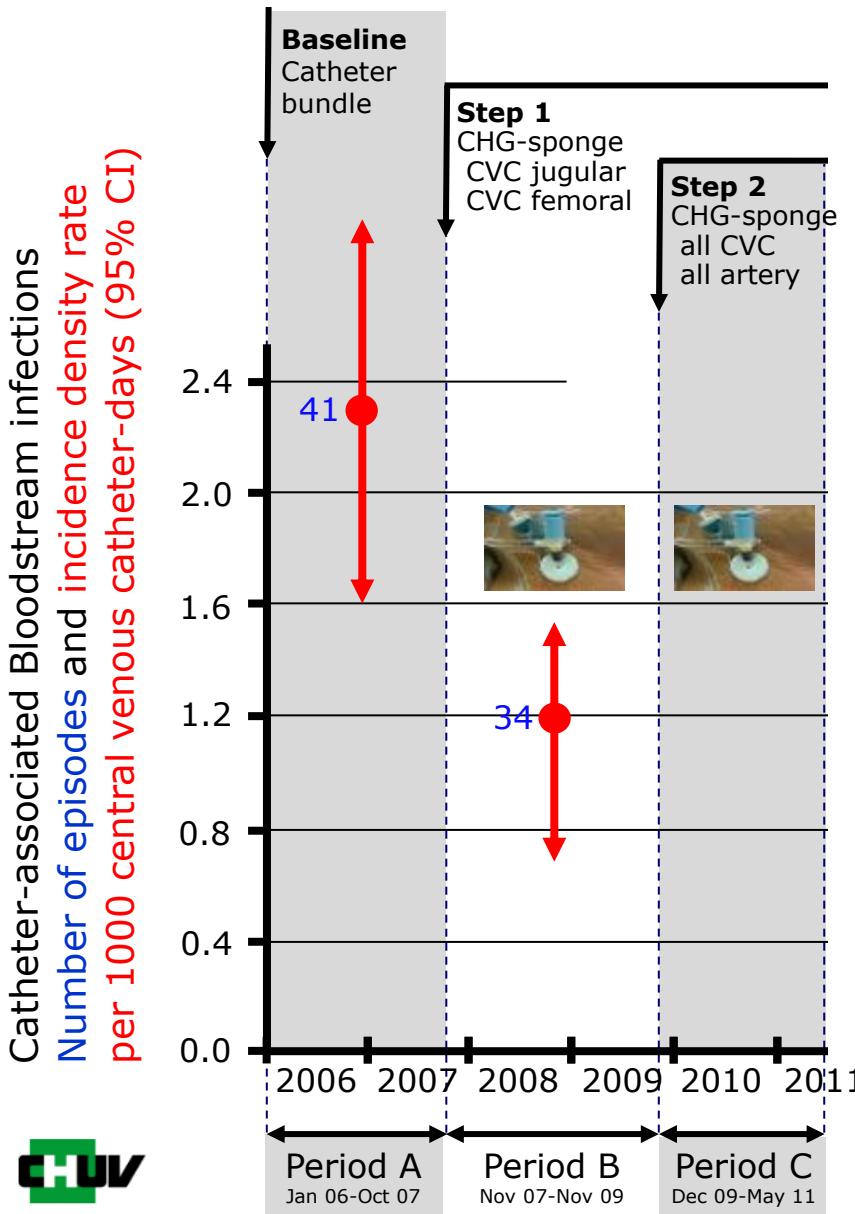
60% of CVC
0% of arteries

only

No official budget

Investment for CHG-dressings
should be justified

CHG-dressings to prevent CABSI

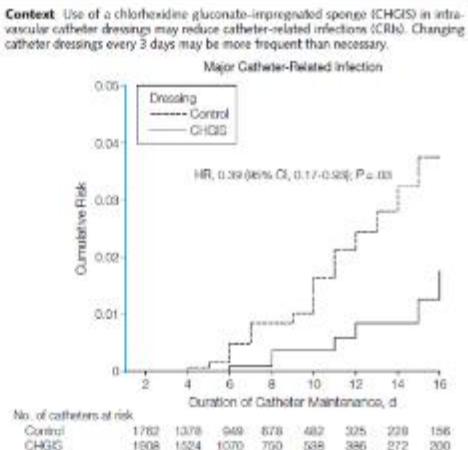


C.Joseph et coll. SRLF 2010

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

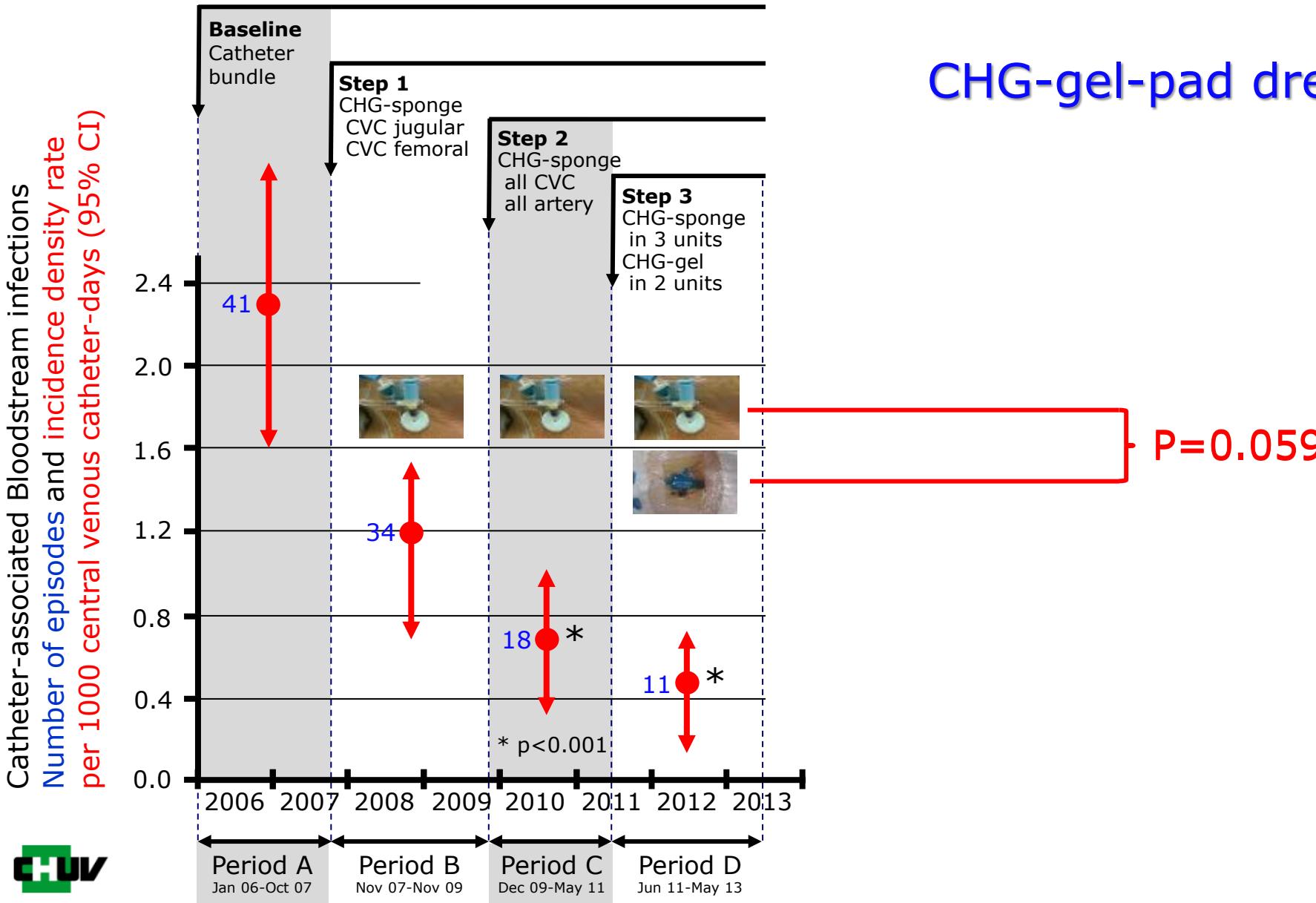
Context: Use of a chlorhexidine gluconate-impregnated sponge (CHGIS) in intravascular catheter dressings may reduce catheter-related infections (CRIs). Changing catheter dressings every 3 days may be more frequent than necessary.

Major Catheter-Related Infection

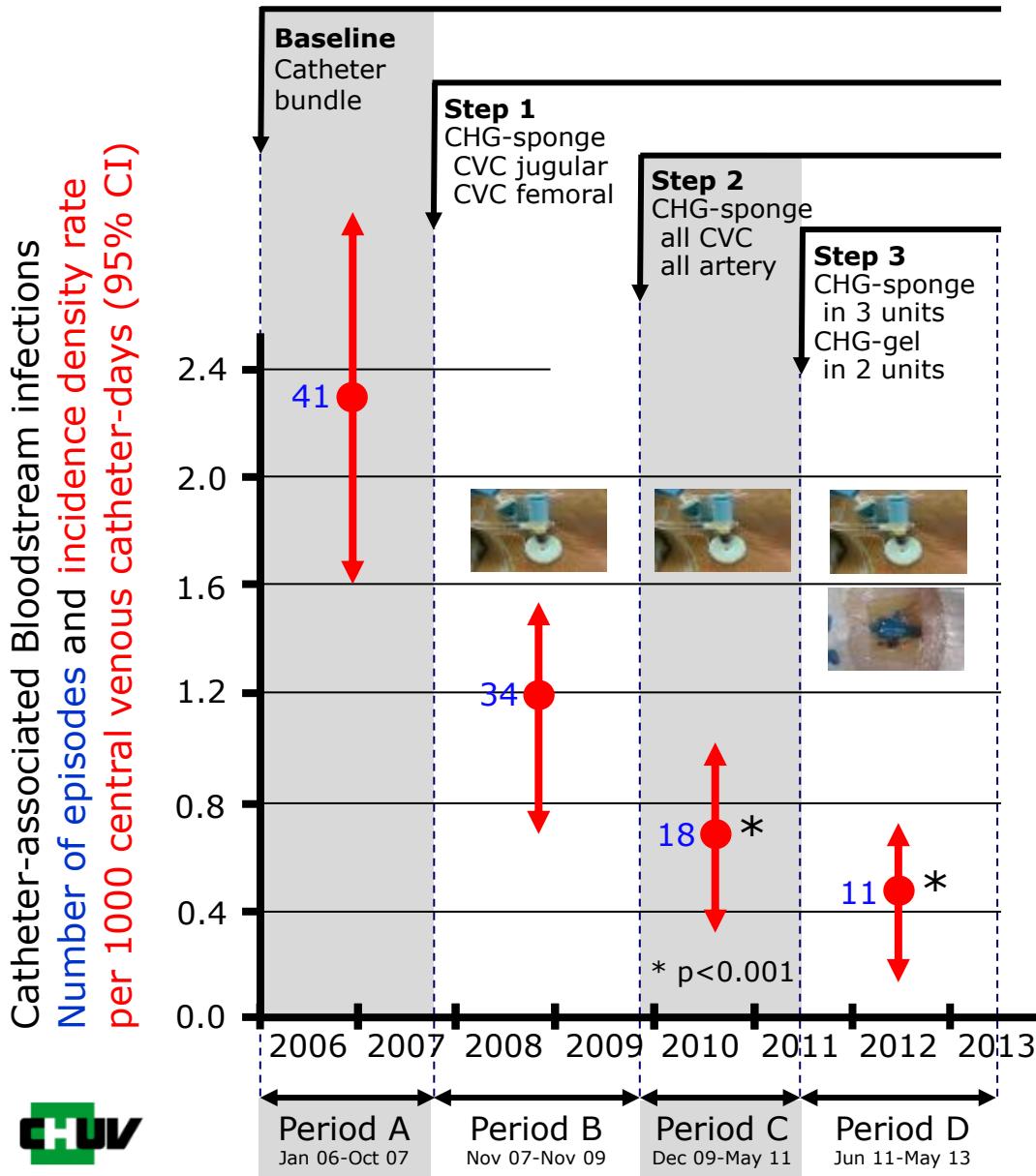


JAMA. 2009;301(12):1231-1241

CHG-dressings to prevent CABSI



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)

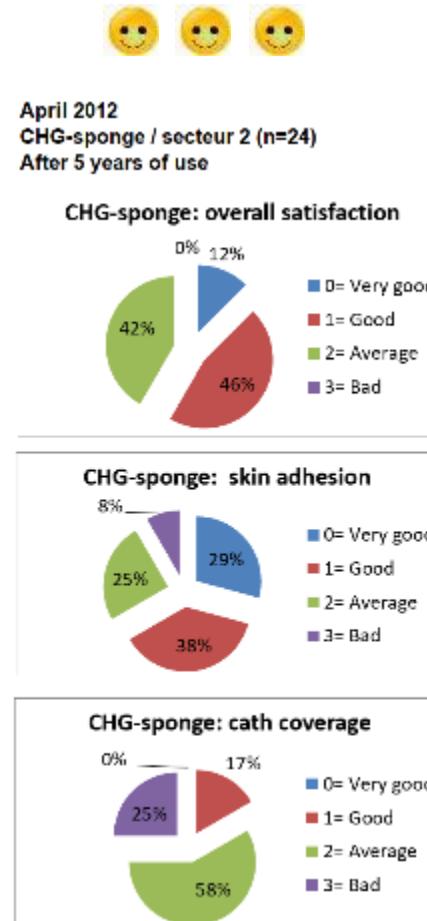
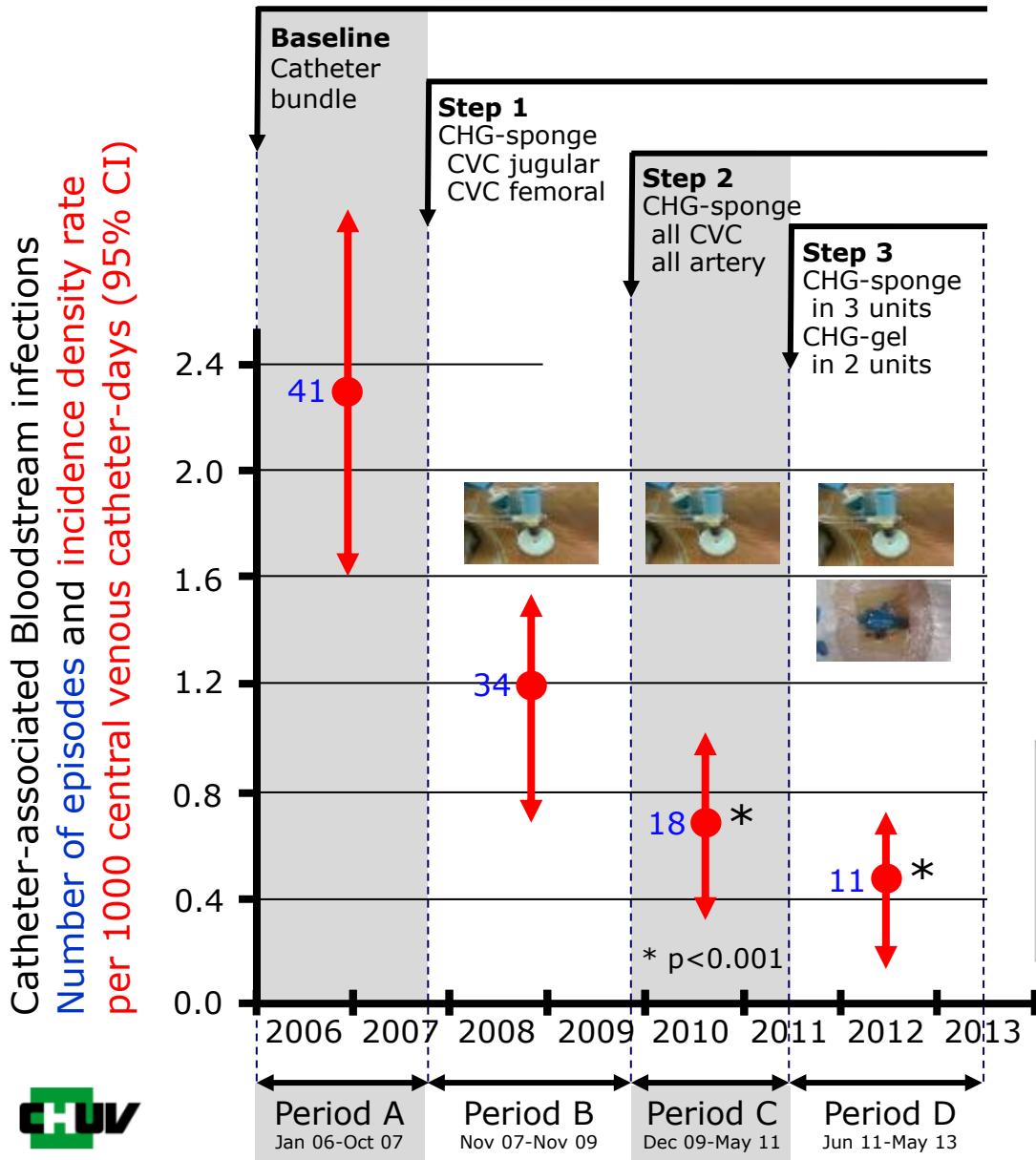
All were scored as allergic reaction
No CABSI

→ CHG-gel pad with improved evaporation capability

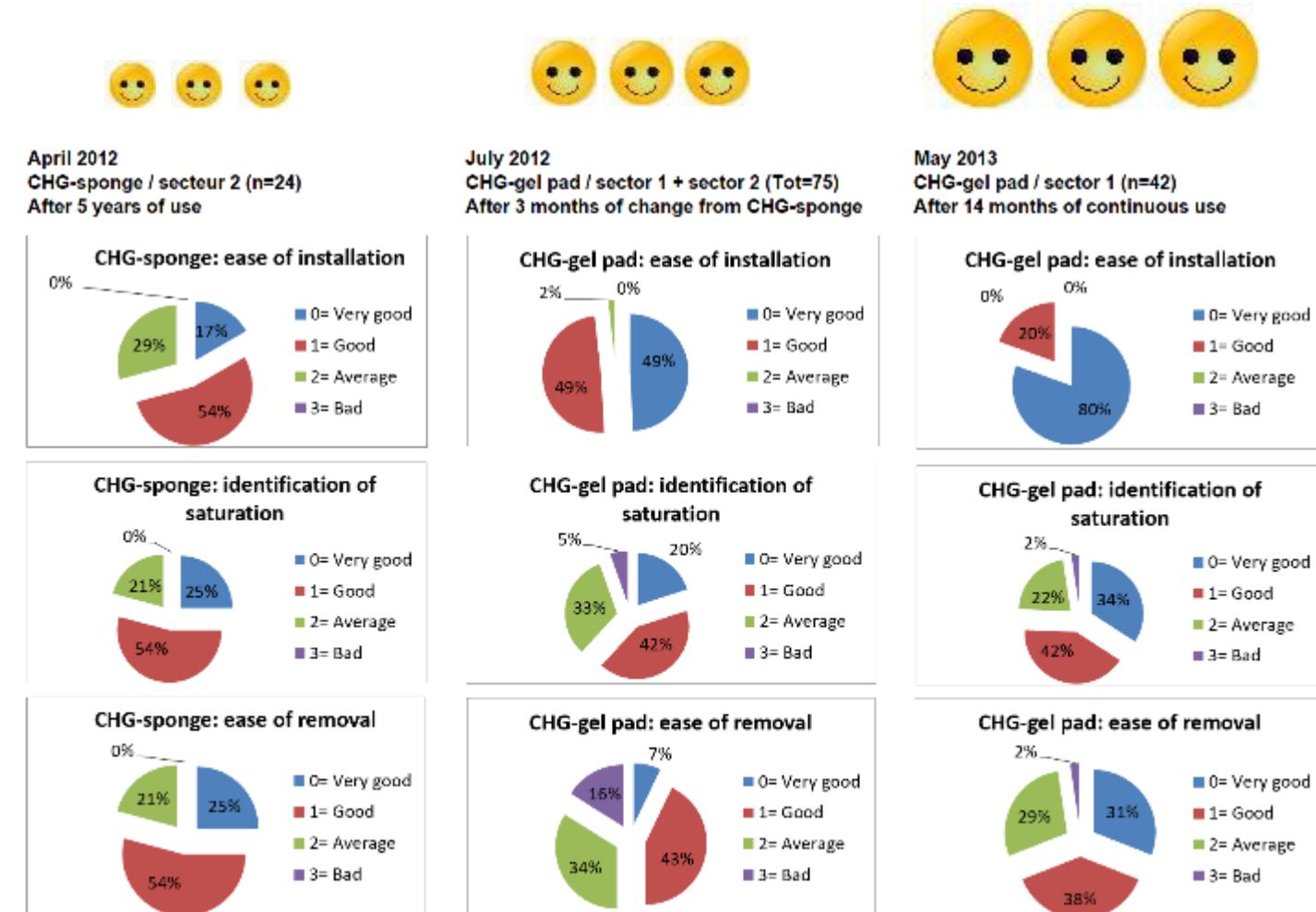
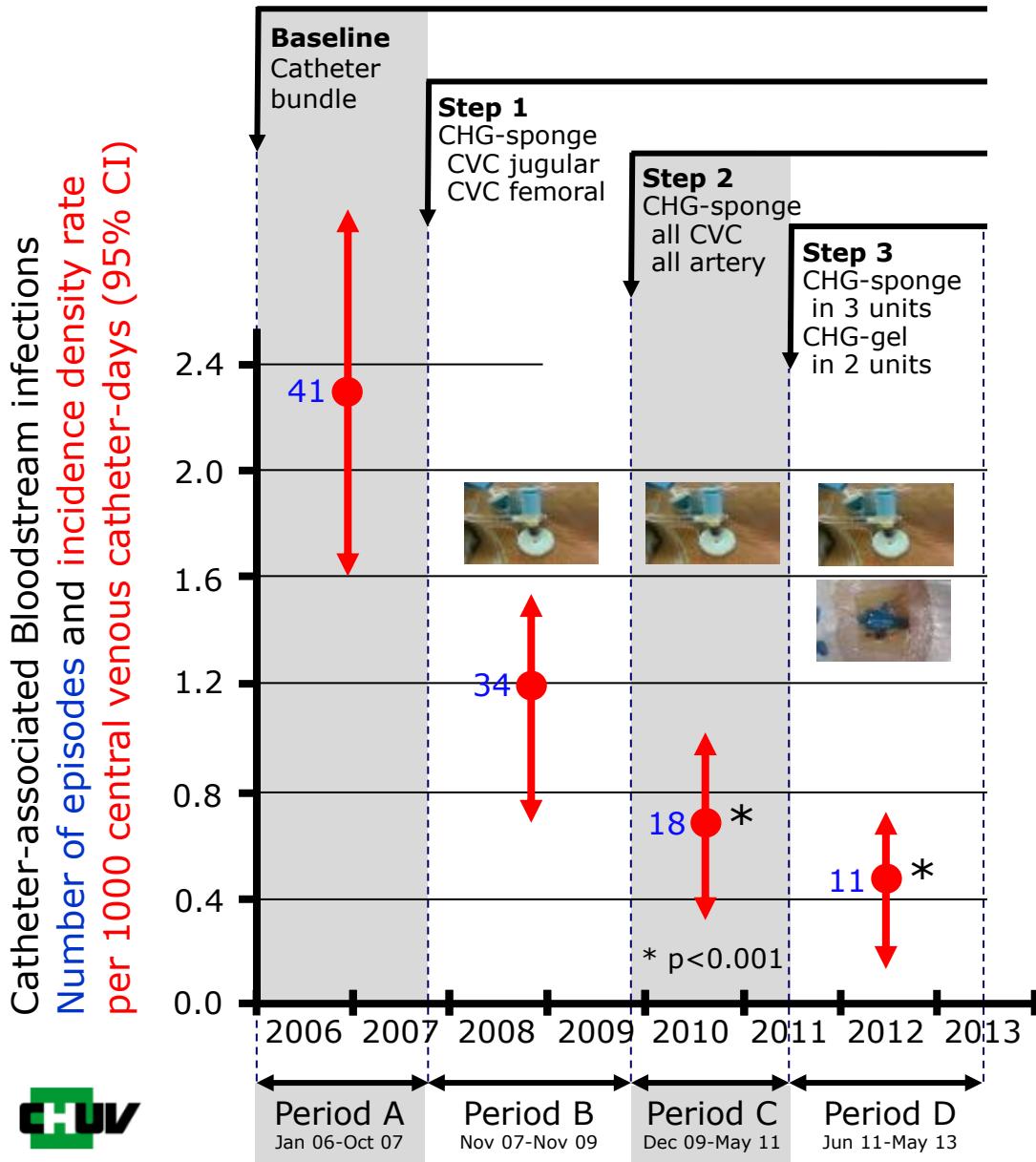
March 2012 to May 2013:

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

CHG-dressings to prevent CABSI



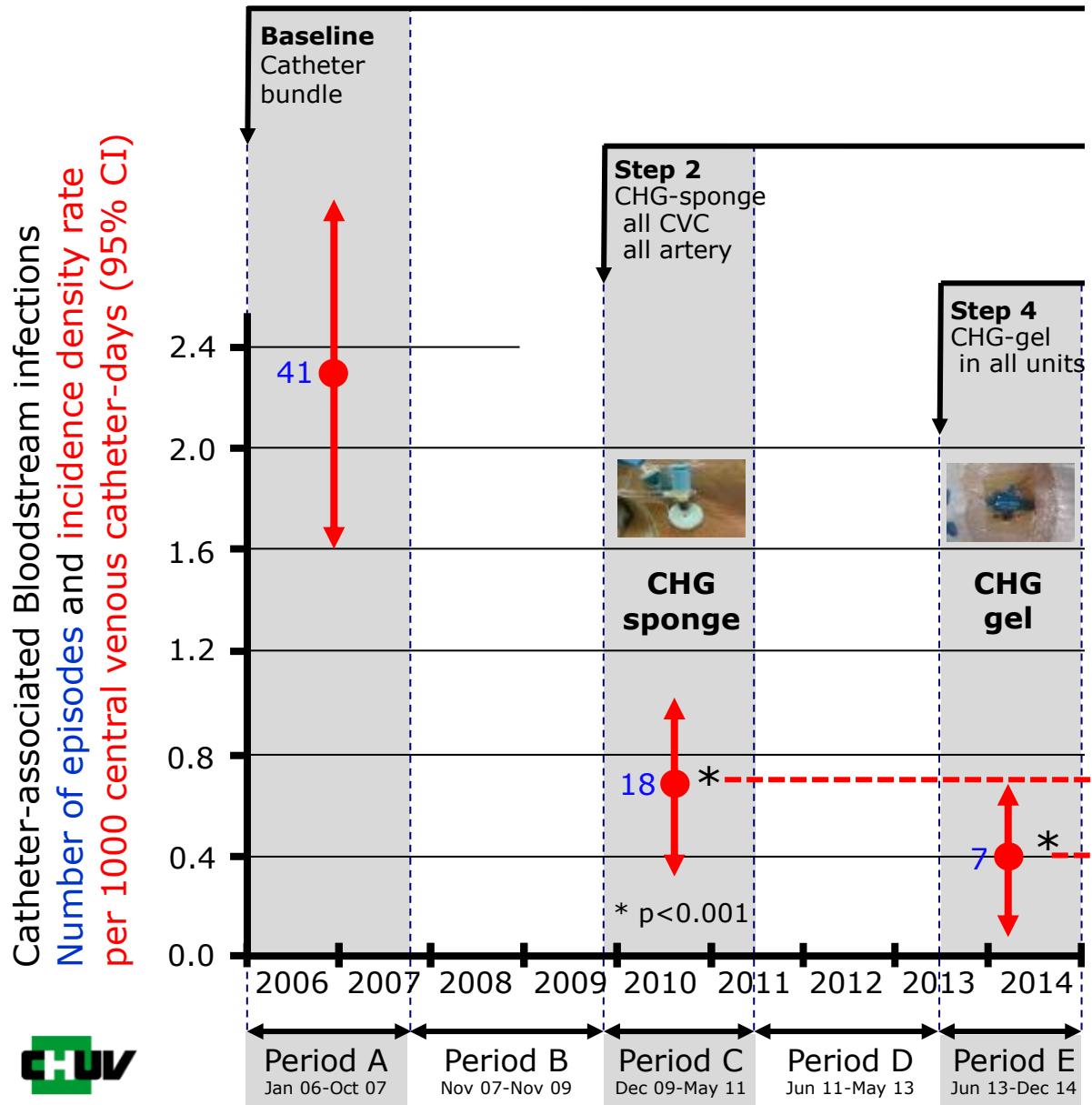
CHG-dressings to prevent CABSI



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

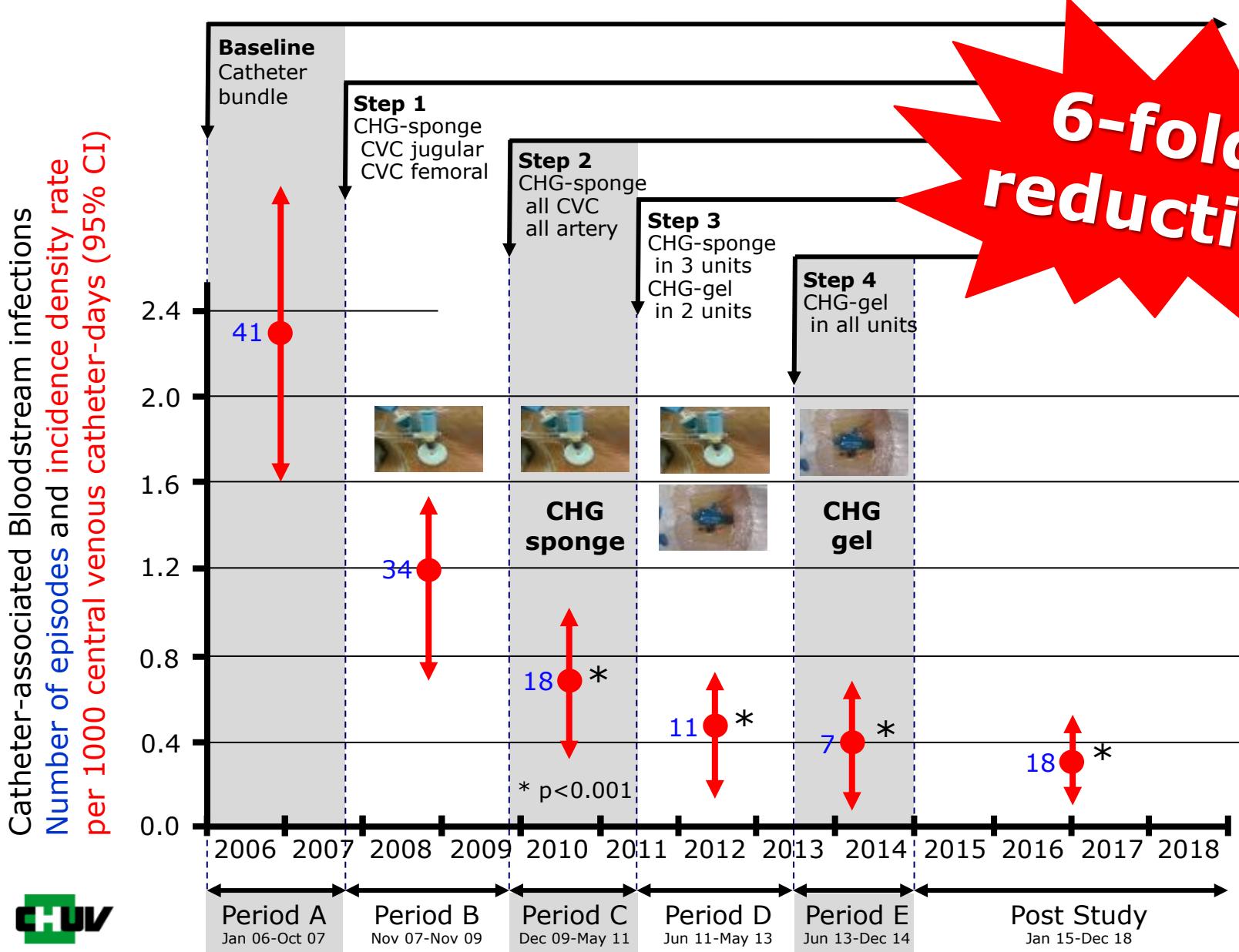


CHG-sponge in 5 of 5 units

CHG-gel-pad dressing in 5 of 5 units

P=0.019

CHG-dressings to prevent CABSI



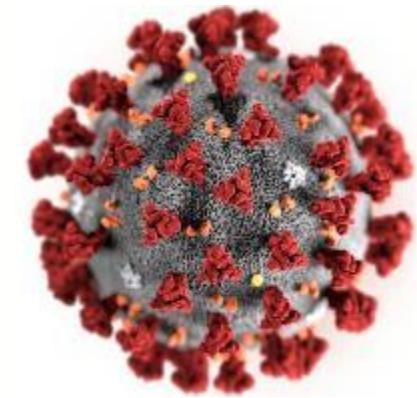
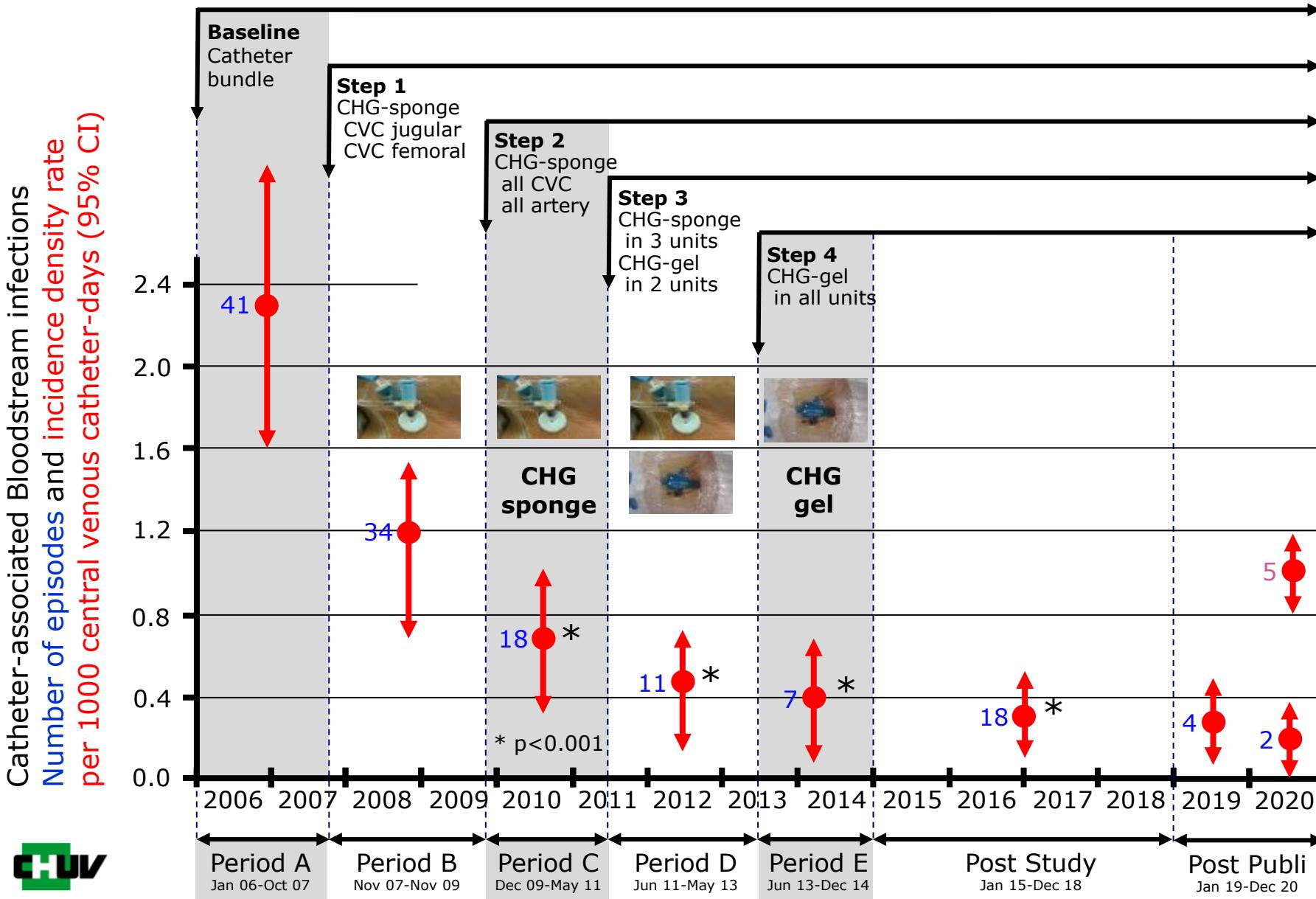
Cost-effectiveness/**year**

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

~ 1.5 ICU beds



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

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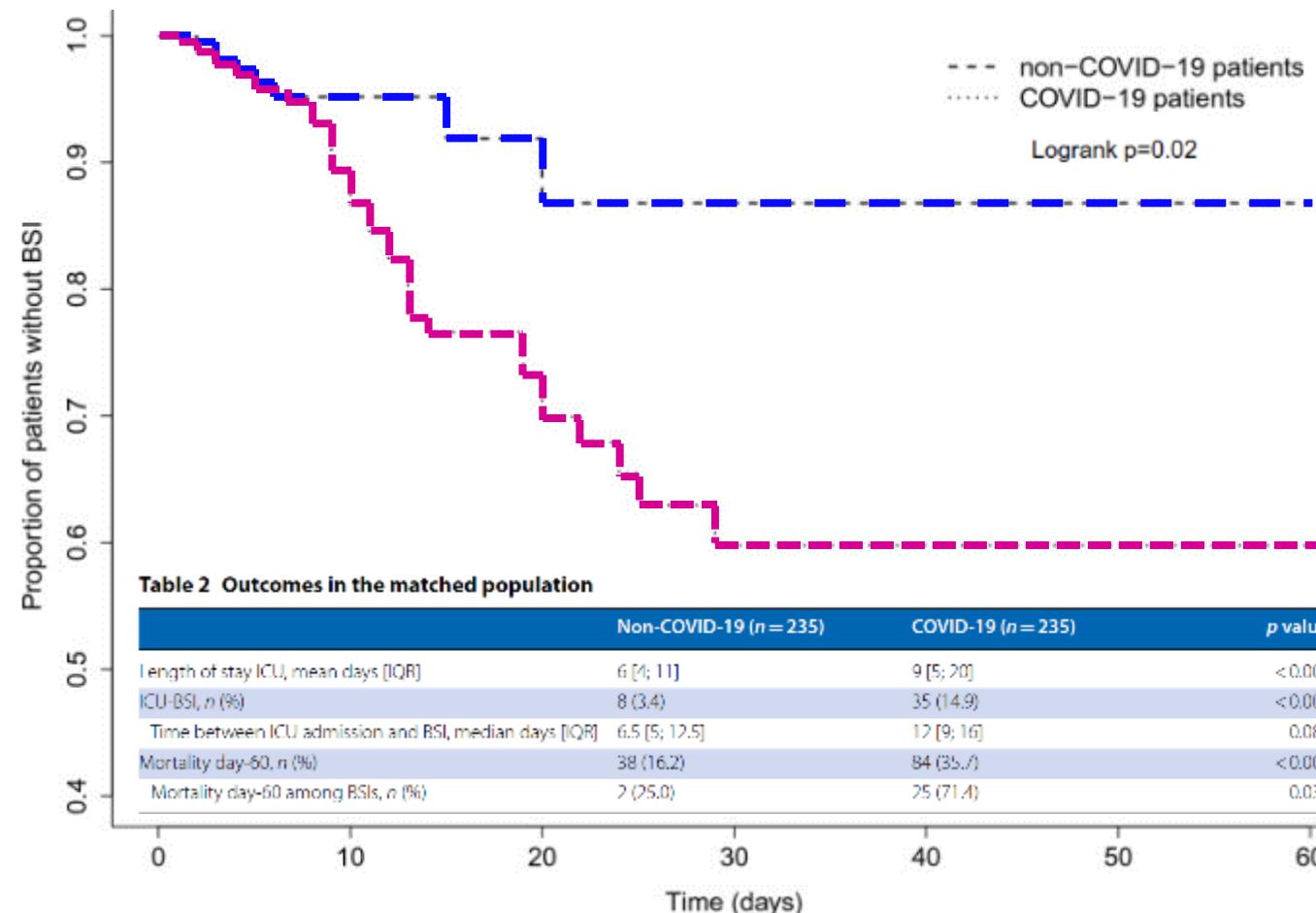


Table 2 Outcomes in the matched population

	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 ⁹
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 ⁶

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
<i>Microorganisms identified (n = 48)*</i>		
Coagulase negative Staphylococci	2 (22.2)	14 (35.9)
<i>Staphylococcus aureus</i>	1 (11.1)	3 (7.7)
<i>Enterococcus</i> spp	0 (0)	4 (10.3)
Other Gram positive	3 (33.3)	3 (7.7)
<i>Enterobacteriales</i>	2 (22.2)	5 (12.8)
<i>Pseudomonas aeruginosa</i>	1 (11.1)	5 (12.8)
Anaerobic bacteria	0 (0)	1 (2.6)
<i>Candida albicans</i>	0 (0)	4 (10.3)
<i>Source of infection (n = 46)**</i>		
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%)

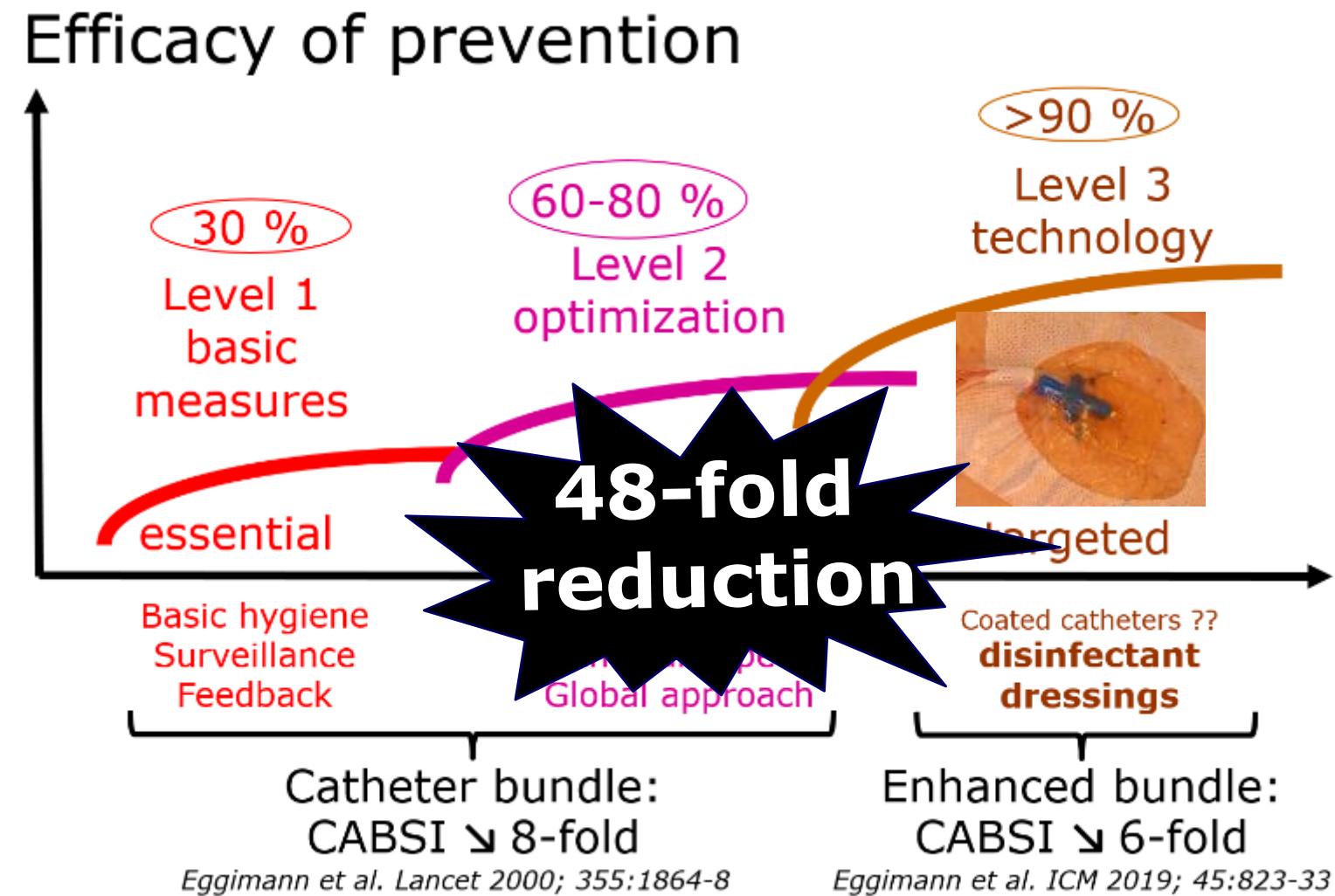
4
in 1709 other patients (0.4%)
2
in 1709 other patients (0.1%)

Prevention of catheter-associated infections

SUMMARY



48-fold reduction of infection over 25 years



Prevention of catheter-associated infections

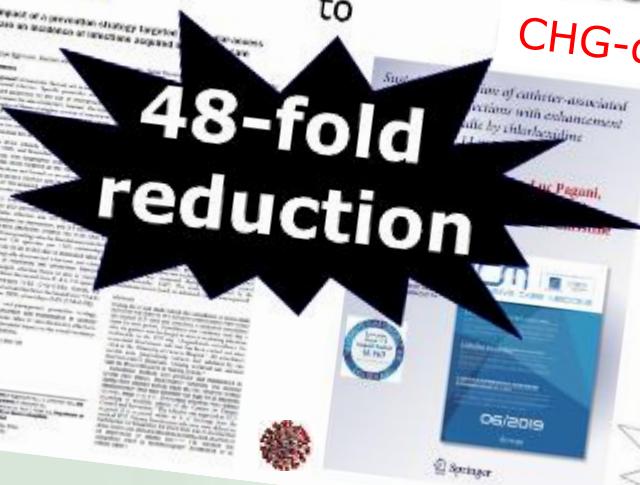
From bundle

to
CHG-dressings

**48-fold
reduction**

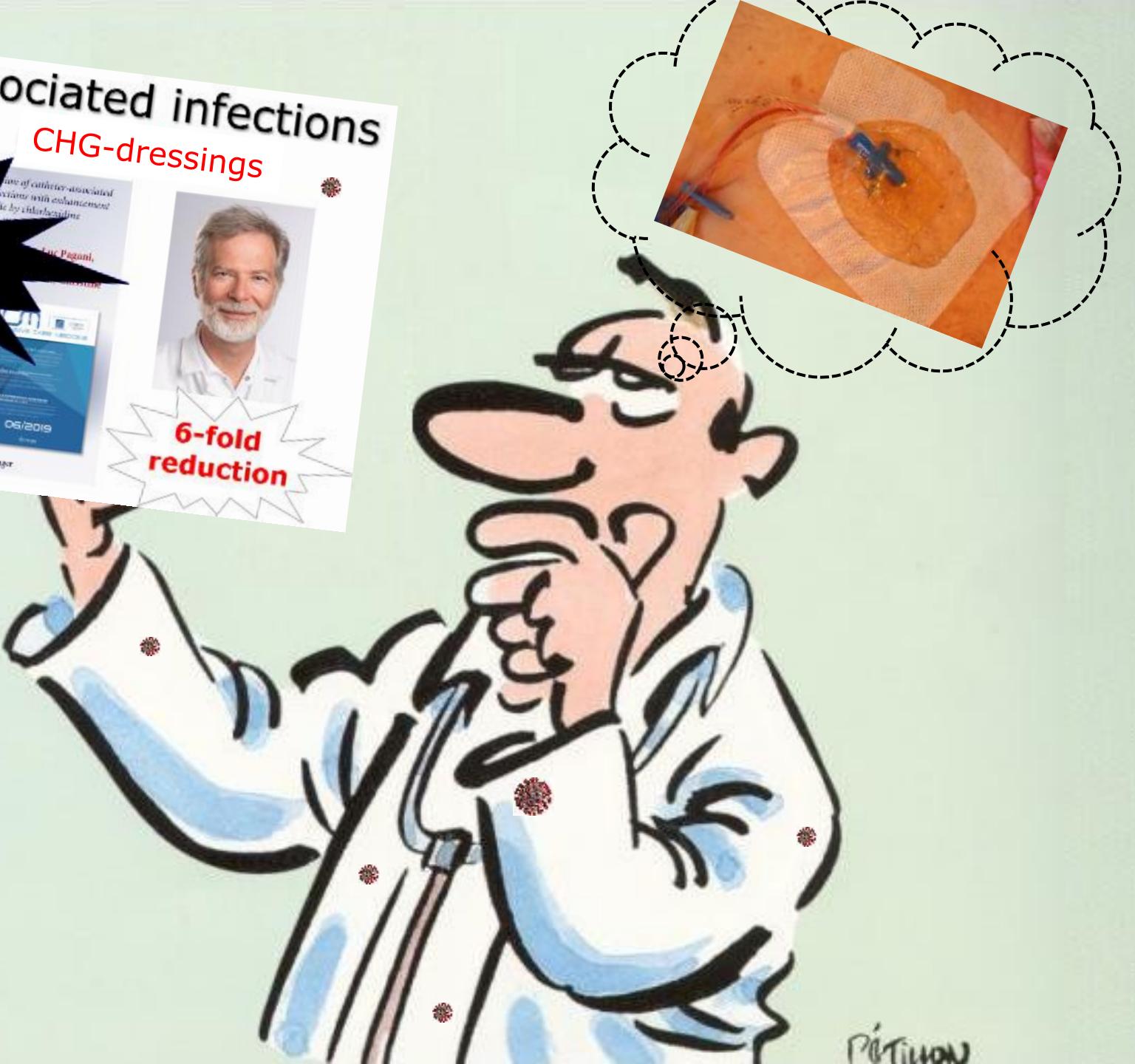


**8-fold
reduction**



**6-fold
reduction**

Thank you
for
your attention
and for
the invitation



Pictilow