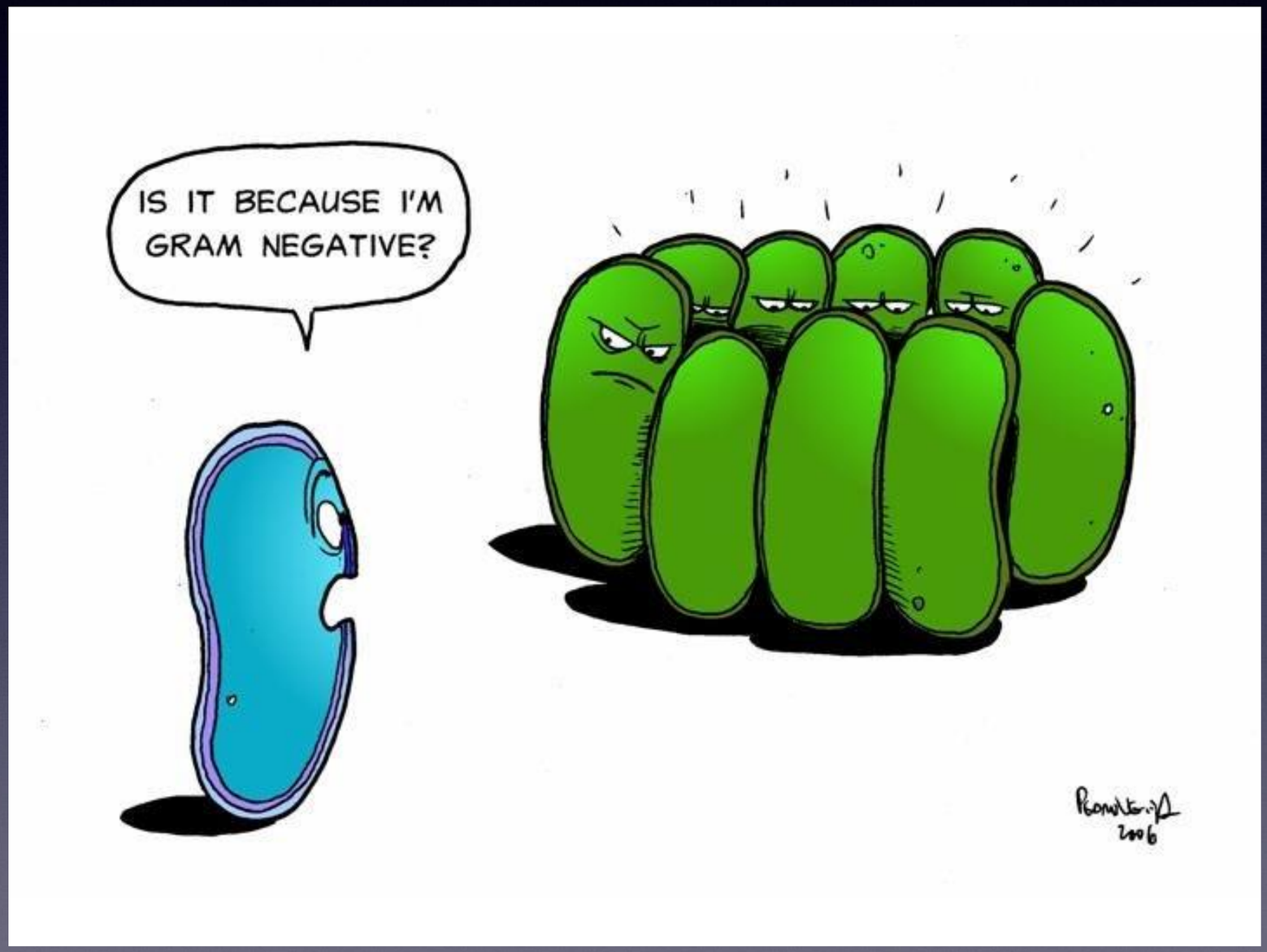
10 Golden rules of Antibiotic Stewardship in ICU

ESGAP
ESCMID STUDY GROUP FOR ANTIBIOTIC POLICIES
European Society of Clinical Microbiology and Infectious Diseases

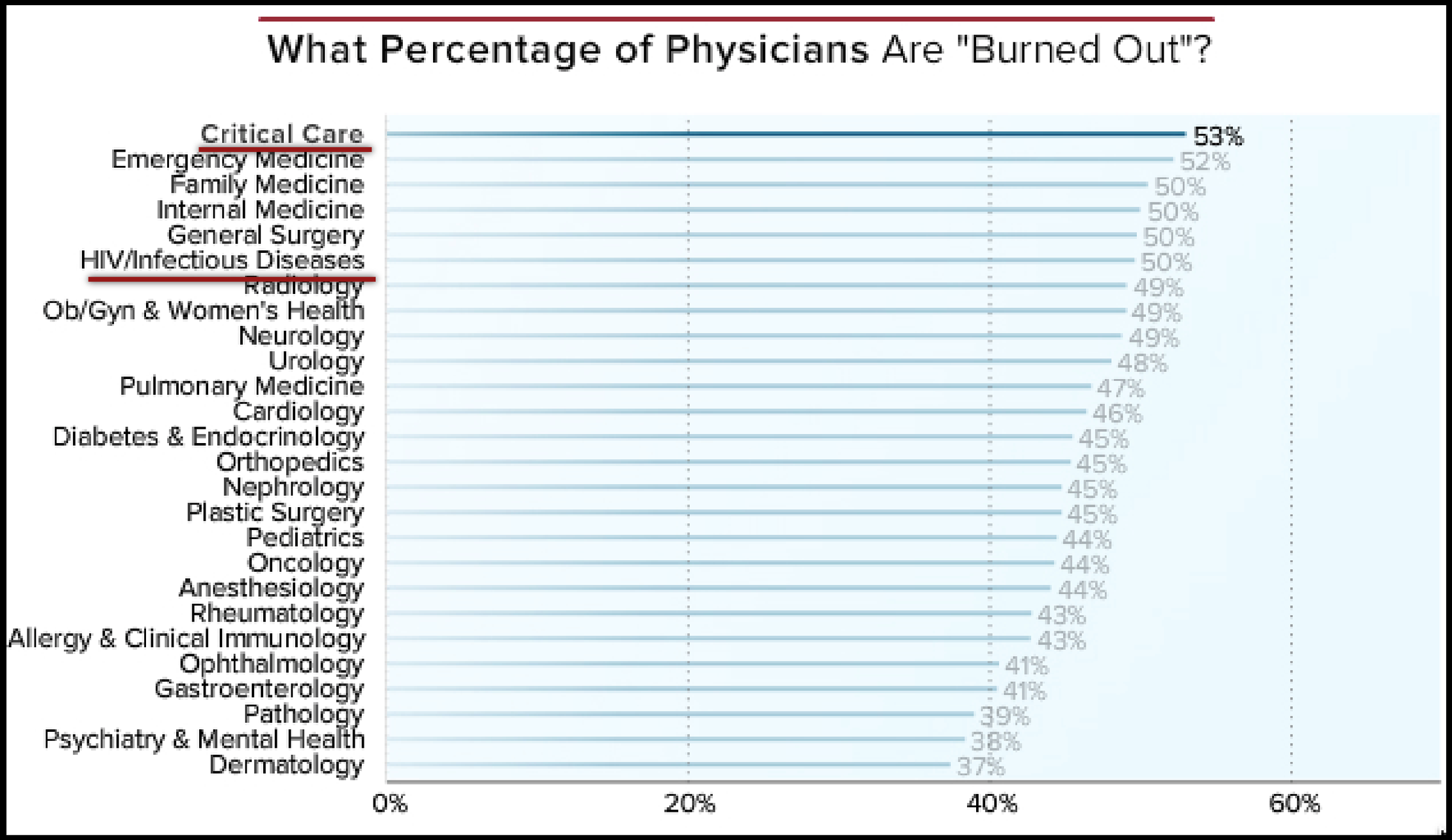
Jeroen Schouten, MD PhD
intensivist, Nijmegen (Neth)
Istanbul, Oct 6th 2017

10 golden rules of Antibiotic Stewardship in the ICU



ID, Pharma & Micro advice in ICU can be a challenge!

The ICU is a tough place



Medscape survey USA 2016

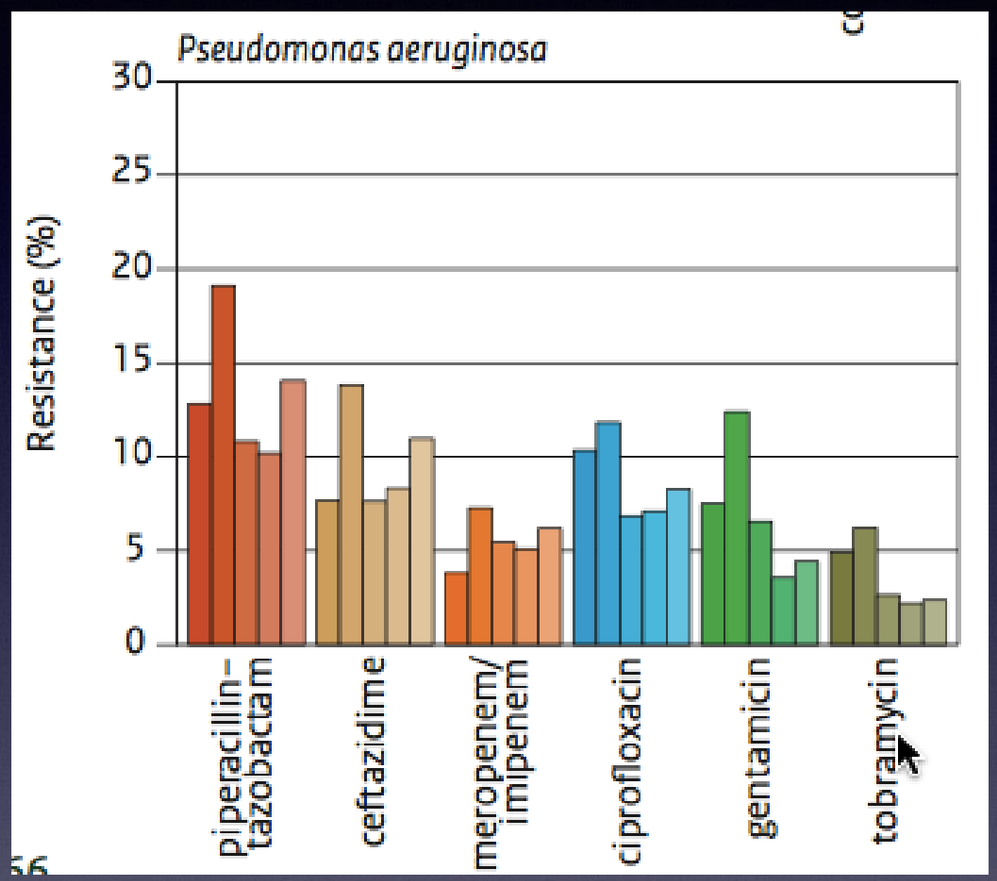
10 golden rules of Antibiotic Stewardship in the ICU

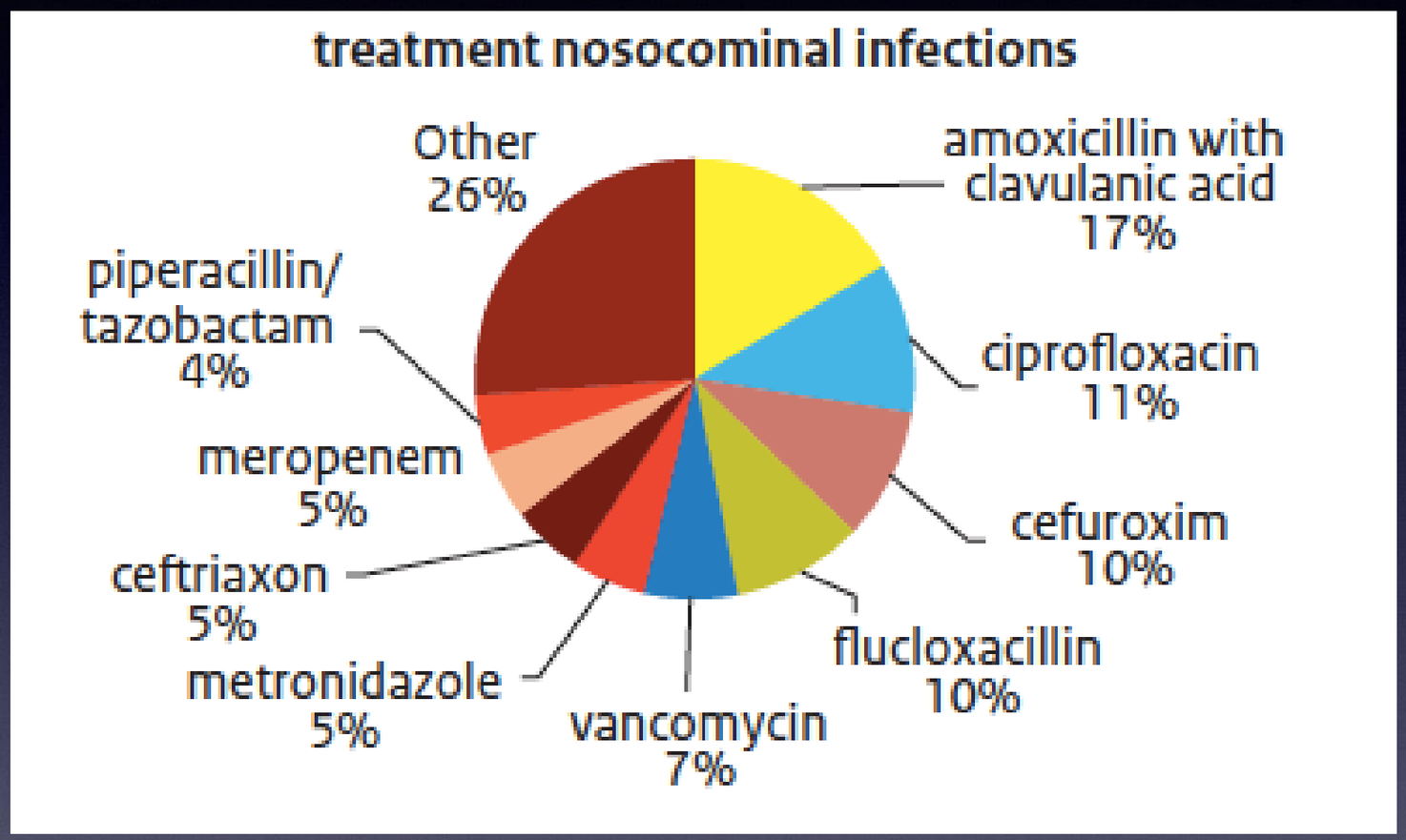
1

γνῶθι σεαυτόν (know yourself): be aware of resistance patterns and antibiotic usage data in your hospital and unit

provide <u>regular</u> feedback on resistance patterns and antibiotic usage data in ICU

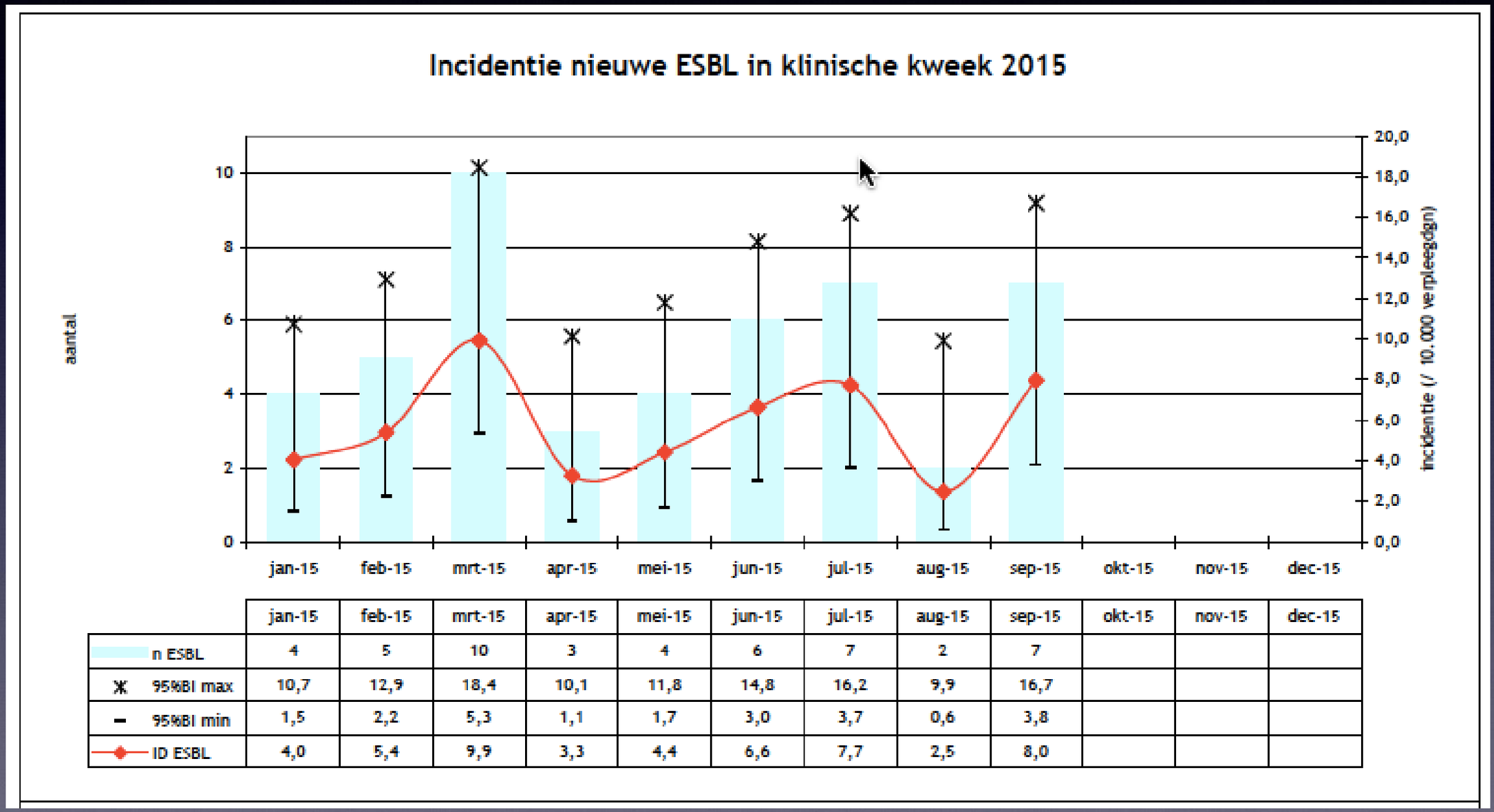
γνῶθι σεαυτόν





Nethmap 2016

γνῶθι σεαυτόν



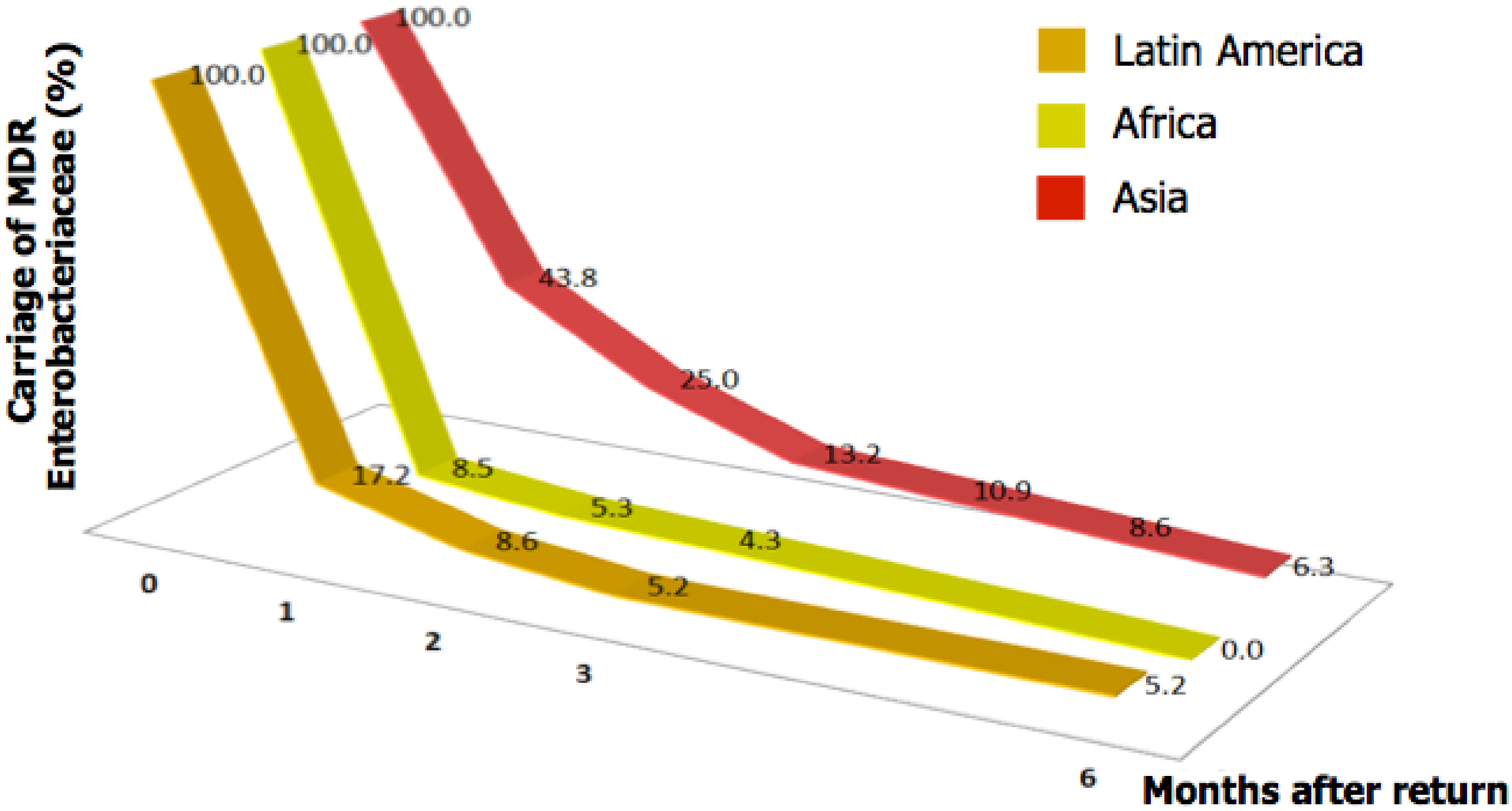
	jan-15	feb-15	mrt-15	apr-15	mei-15	jun-15	jul-15	aug-15	sep-15	okt-15	nov-15	dec-15
n ESBL	4	5	10	3	4	6	7	2	7			
95%BI max	10,7	12,9	18,4	10,1	11,8	14,8	16,2	9,9	16,7			
95%BI min	1,5	2,2	5,3	1,1	1,7	3,0	3,7	0,6	3,8			
ID ESBL	4,0	5,4	9,9	3,3	4,4	6,6	7,7	2,5	8,0			

10 golden rules of Antibiotic Stewardship at the ICU

2

Start Smart comply to the local guideline for empirical therapy but keep in mind the risk factors for colonisation with resistant micro organisms.

Carriage of multidrug-resistant *Enterobacteriaceae* in returning travellers, 2012-2013



Source: Ruppé E, et al. 33rd RICAI, Paris, 27-28 November 2013 [abstr. 195].

10 golden rules of Antibiotic Stewardship at the ICU

3

Start Smart in severe sepsis or septic shock start broadspectrum antibiotic therapy promptly.

and..

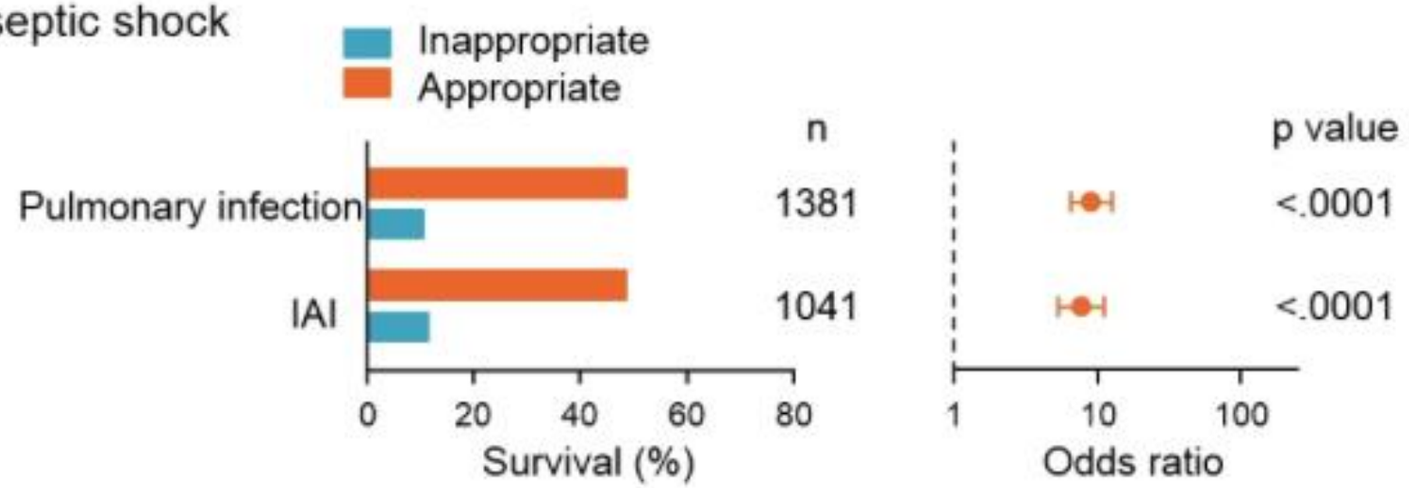
Provide adequate source control

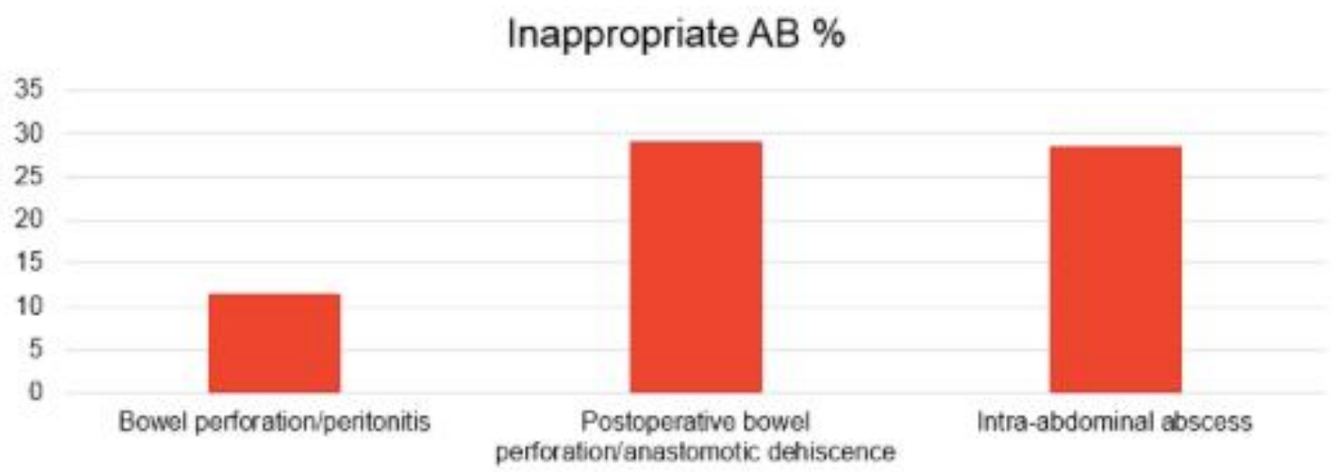
Empirical antibiotic therapy: appropriateness matters!

Retrospective study

Three countries

5,715 patients with septic shock

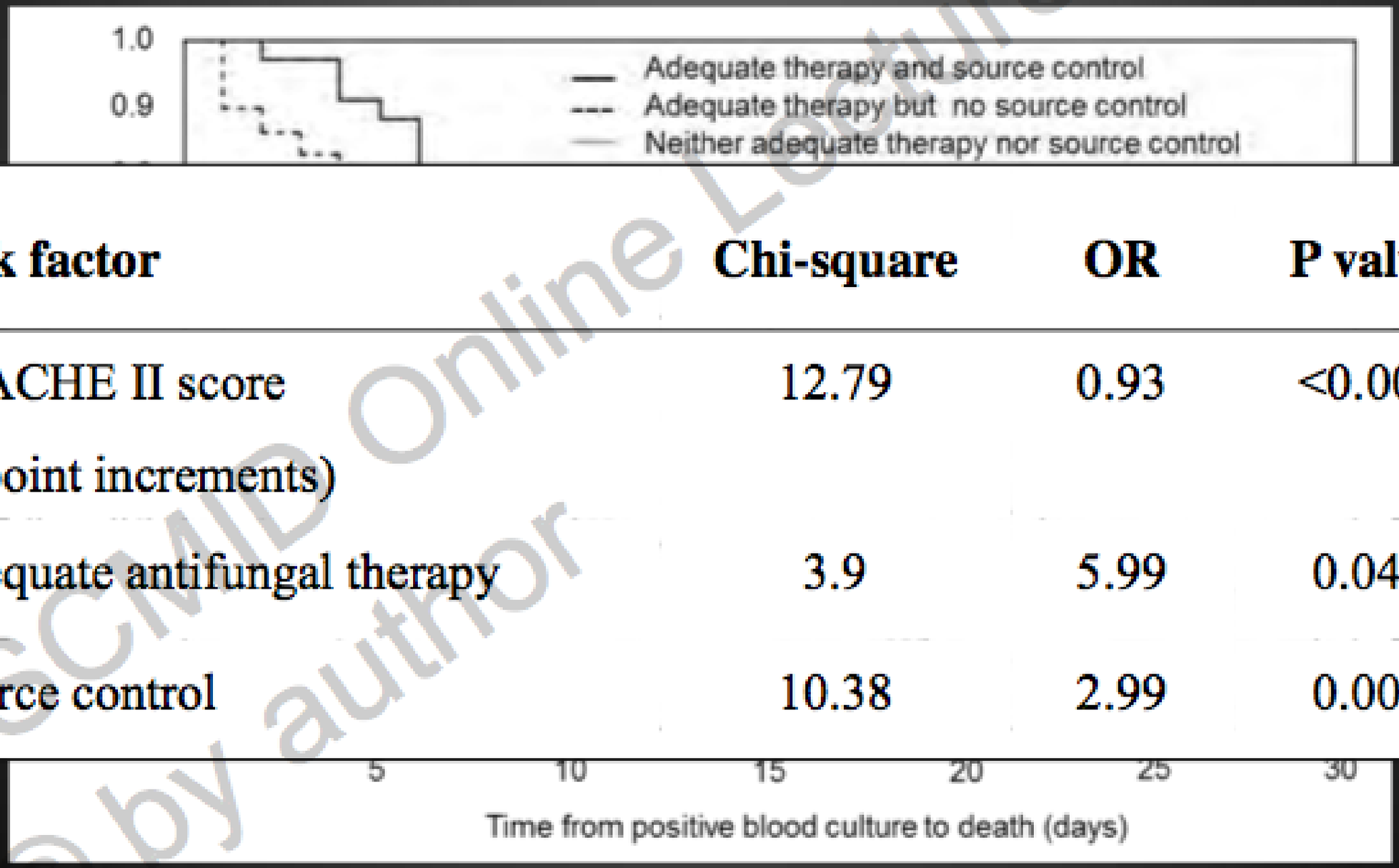




Kumar, Chest 2009

Septic shock attributed to *Candida* infection: Importance of adequate therapy & source control

216 candidaemia with septic shock from Italy – Spain



Risk factor	Chi-square	OR	P value
APACHE II score (1-point increments)	12.79	0.93	<0.001
Adequate antifungal therapy	3.9	5.99	0.048
Source control	10.38	2.99	0.001

Bassetti M, et al. *Intensive Care Med* 2014 May 9

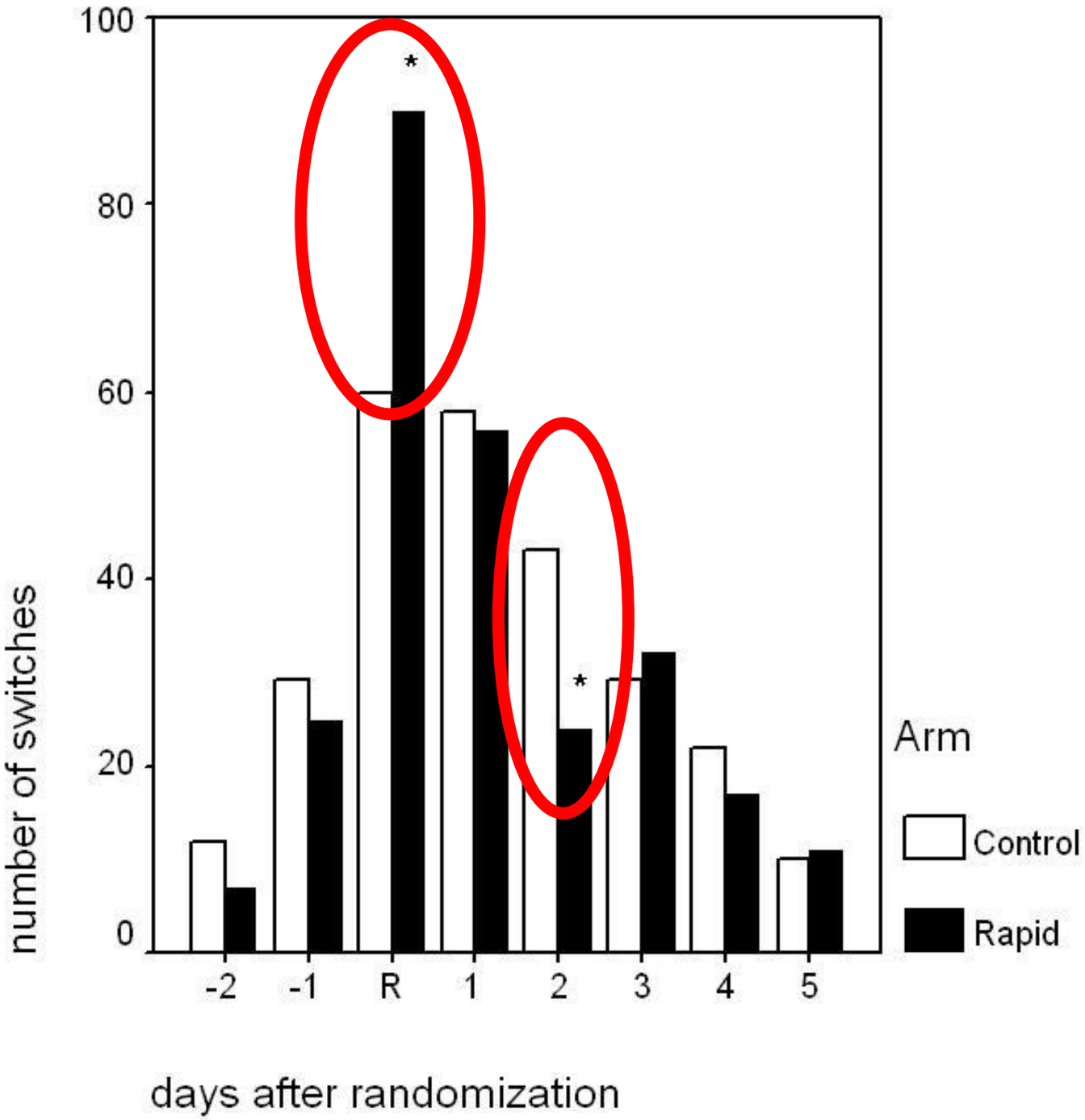
10 golden rules of Antibiotic Stewardship at the ICU

4

Start Smart: decrease time to diagnosis by adequate collection and transport of cultures and other clinical and microbiological diagnostic tests

Day of antibiotic change

Diaconessenhuis
Leiden



Kerremans et al, Eur J Clin Microbiol Infect Dis. 2004 Dec;23(12):892-8.

10 golden rules of Antibiotic Stewardship at the ICU

5

Focus: take PK/PD concepts in consideration in every phase of critical illness

Individualised antibiotic dosing for patients who are critically ill: challenges and potential solutions

Jason A Roberts, Mohd H Abdul-Aziz, Jeffrey Lipman, Johan W Mouton, Alexander A Vinks, Timothy W Felton, William W Hope, Andras Farkas, Michael N Neely, Jerome J Schentag, George Drusano, Otto R Frey, Ursula Theuretzbacher, Joseph L Kuti, on behalf of The International Society of Anti-Infective Pharmacology and the Pharmacokinetics and Pharmacodynamics Study Group of the European Society of Clinical Microbiology and Infectious Diseases

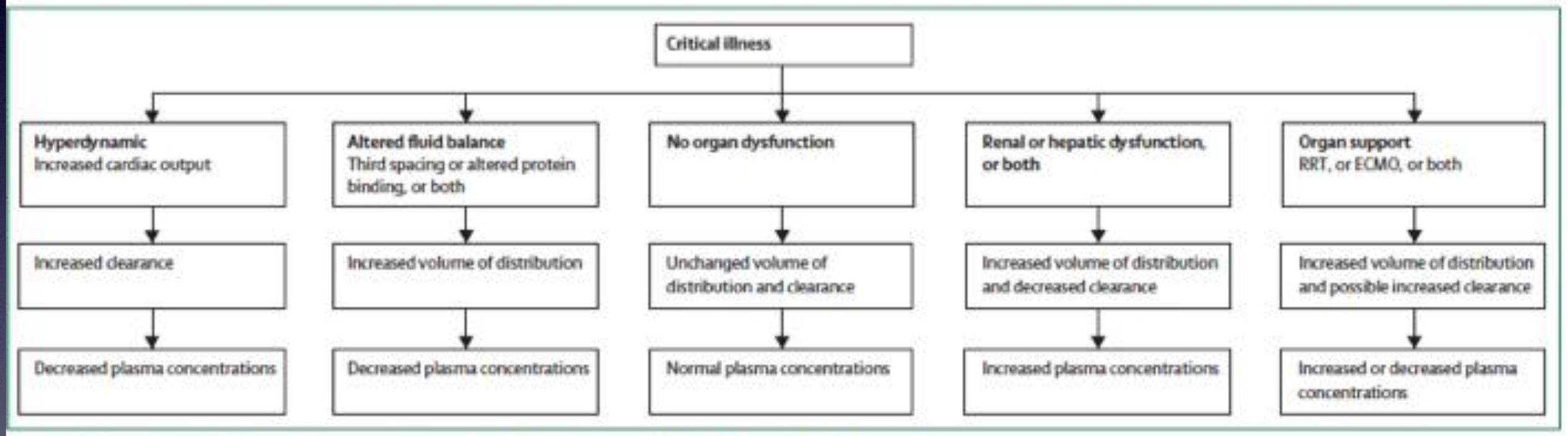
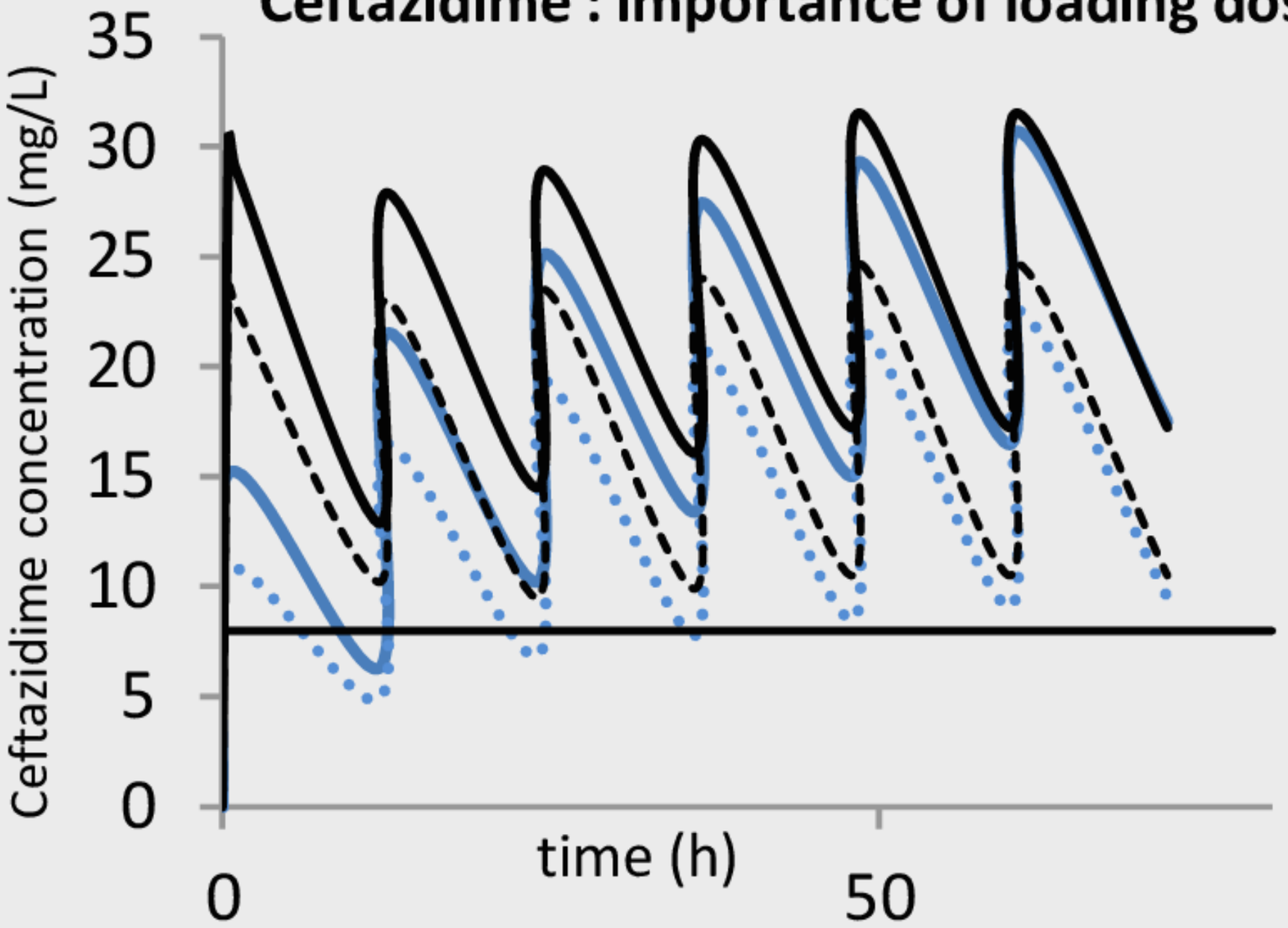


Figure: **The range of altered pathophysiology in patients with critical illness, and its effects on drug concentrations**
RRT=renal replacement therapy. ECMO=extracorporeal membrane oxygenation.

J. Roberts, Lancet Inf Dis 2014; 14: 498-509

Ceftazidime : importance of loading dose



Black: 1 g twice daily with 1 g loading dose
Blue : 1 g twice daily,
solid line = median concentration of 500 simulated patients, dotted line = 5th percentile
Black line : target

M.Carlier et al. ECCMID 2014

Peritoneal antibiotic penetration

Low peritoneal concentration or high plasma - perito… gradient

Ceftazidime; Meropenem; Imipenem; Ertapenem

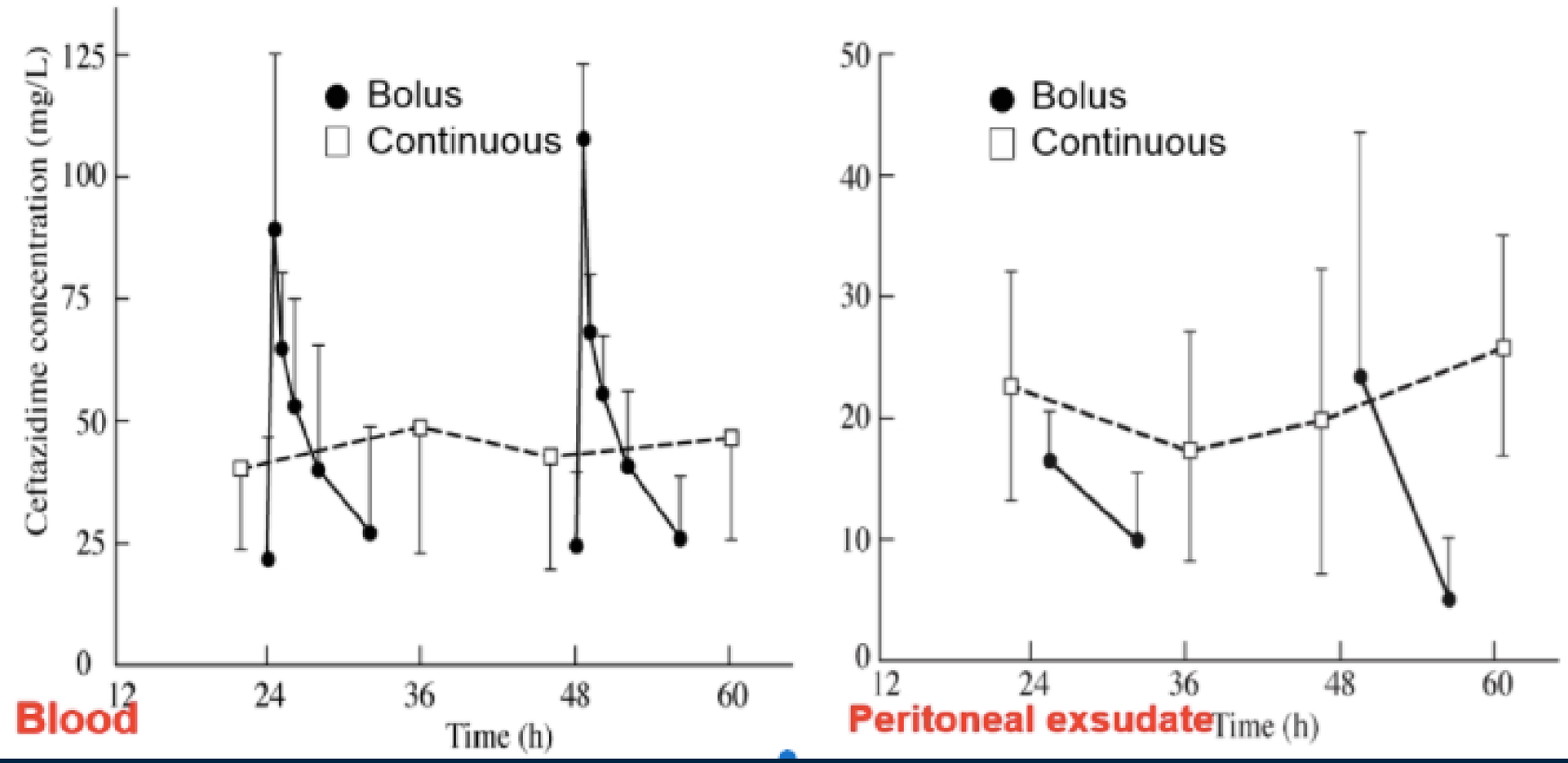
"Adequate" peritoneal concentration

Cefepime; Cefotaxim; Tigecycline,…

02, Karjagin 2008, Dayhot 2010, Ikawa 2007, Verdier 2011, Seguin 2009, Sche…

Pk parameters in peritonitis

Ceftazidime continuous administration 1g bolus then 4.5 g/24H
bolus administration 1.5 g X 3/24 H



Buijk et al. JAC 2002

10 golden rules of Antibiotic Stewardship at the ICU

6

Focus: consider de-escalation and iv-oral switch based on available culture results every day

De-escalation: concept

Increase
MDR pathogens

Broad Spectrum
empirical R/

Link antibiotic use
and development
of resistance

Rapid, adequate
therapy

Narrow spectrum,
reduce AB use

Severely ill patient
with infection

De-escalation

No new antibiotics
in pipeline

figure: Liesbeth de Bus

De-escalation: concept

GUIDELINES

Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

Timothy H. Dellit,[1] Robert C. Owens,[2] John E. McGowan, Jr.,[3] Dale N. Gerding,[4] Robert A. Weinstein,[5] John P. Burke,[6] W. Charles Huskins,[7] David L. Paterson,[8] Neil O. Fishman,[9] Christopher F. Carpenter,[10] P. J. Brennan,[9] Marianne Billeter,[11] and Thomas M. Hooton[12]

Streamlining or de-escalation of empirical antimicrobial therapy on the basis of culture results and elimination of redundant combination therapy can more effectively target the causative pathogen, resulting in **decreased antimicrobial exposure** and **substantial cost savings**

A-II → good evidence, but no RCT's (2007)

De-escalation: concept

Intensive Care Med (2013) 39:165–228
DOI 10.1007/s00134-012-2769-8

GUIDELINES

R. P. Dellinger
Mitchell M. Levy
Andrew Rhodes
Djillali Annane
Herwig Gerlach
Steven M. Opal
Jonathan E. Sevransky
Charles L. Sprung
Ivor S. Douglas
Roman Jaeschke
Tiffany M. Osborn
Mark E. Nunnally
Sean R. Townsend
Konrad Reinhart
Ruth M. Kleinpell
Derek C. Angus
Clifford S. Deutschman
Flavia R. Machado
Gordon D. Rubenfeld
Steven Webb
Richard J. Beale
Jean-Louis Vincent
Rui Moreno
The Surviving Sepsis Campaign Guidelines Committee
including The Pediatric Subgroup*

Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock, 2012

Antimicrobial regimen should be reassessed daily for potential de-escalation

Grade 1B → strong recommendation, but no RCT's (2012)

De-escalation of antimicrobial treatment for adults with sepsis, severe sepsis or septic shock (Review)

Silva BNG, Andriolo RB, Atallah ÁN, Salomão R

THE COCHRANE COLLABORATION®

Authors conclusions (2012)

- *"*We did not include any study"
- There is <u>no adequate evidence</u> that de-escalation of antimicrobial agents is effective and safe in patients with sepsis, severe sepsis and septic shock

De-escalation: definitions

Narrow the spectrum

Reduce the amount of antibiotics

Stop ‘safety’ antibiotics (MRSA)

Stop if infection is unlikely

Therapy aimed at ‘causative pathogen’

‘Switching’

De-escalation: definitions

Narrow the spectrum

Reduce the amount of antibiotics

?

Stop ‘safety’ antibiotics (MRSA)

Stop if infection is unlikely

Therapy aimed at ‘causative pathogen’

‘Switching’

De-escalation: goals?

Reduce selection of MDR bacteria

Reduce colonisation with MDR bacteria

Reduce infection with MDR bacteria

Reduce Antibiotic use (DDD)

Reduce costs

Reduce time to recovery LOS, mortality

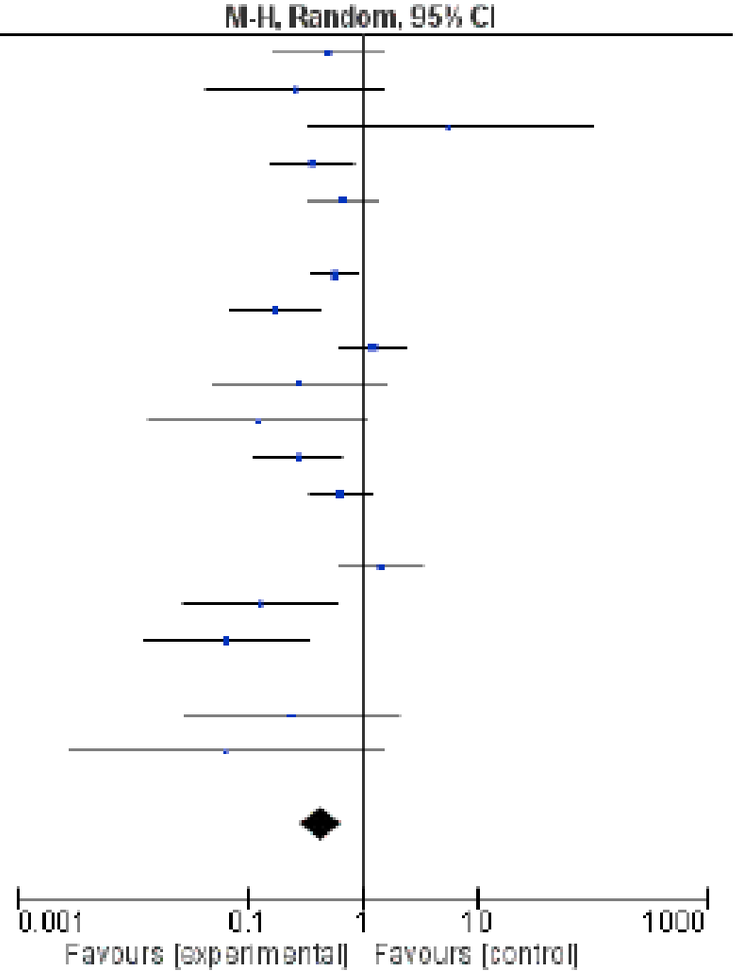
Current evidence on hospital antimicrobial stewardship objectives: a systematic review and meta-analysis

Emelie C Schuts, Marlies E J L Hulscher, Johan W Mouton, Cees M Verduin, James W T Cohen Stuart, Hans W P M Overdiek, Paul D van der Linden, Stephanie Natsch, Cees M P M Hertogh, Tom F W Wolfs, Jeroen A Schouten, Bart Jan Kullberg, Jan M Prins

Fig. 2 Effect on mortality of de-escalation of therapy based on culture results

Study or Subgroup	Experimental Events	Total	Control Events	Total	Weight	Odds Ratio M-H, Random, 95% CI
Alvarez-Lerma et al (2006)	7	48	9	36	6.4%	0.51 [0.17, 1.54]
Bal et al (2014)	4	19	4	8	3.6%	0.27 [0.06, 1.57]
Berild et al (2006)	18	146	0	20	1.7%	5.90 [0.34, 101.78]
Cremers et al (2014)	8	126	23	149	8.0%	0.37 [0.16, 0.86]
Eachempati et al (2009)	26	77	24	57	8.9%	0.70 [0.35, 1.42]
Elhanan et al (1997)	0	0	0	0		Not estimable
Gamacho-Montero et al (2014)	45	179	65	180	10.6%	0.59 [0.38, 0.94]
Giantsou et al (2007)	7	58	37	85	7.6%	0.18 [0.07, 0.44]
Joffe et al (2008)	55	320	13	92	9.2%	1.26 [0.66, 2.43]
Khasawneh et al (2014)	2	33	5	27	3.7%	0.28 [0.05, 1.60]
Khasawneh et al (2014) - 2	1	34	6	31	2.6%	0.13 [0.01, 1.12]
Knaak et al (2013)	11	73	17	44	7.7%	0.28 [0.12, 0.68]
Kollef et al (2006)	15	88	58	245	9.4%	0.66 [0.35, 1.24]
Koupetori et al (2014)	0	36	0	93		Not estimable
Leone et al (2014)	18	59	13	57	8.0%	1.49 [0.65, 3.41]
Mokart et al (2014)	2	44	15	57	4.4%	0.13 [0.03, 0.62]
Schlueter et al (2010)	2	77	7	25	4.0%	0.07 [0.01, 0.36]
Schweizer et al (2011)	0	66	0	56		Not estimable
Shime et al (2011)	1	79	6	122	2.7%	0.25 [0.03, 2.10]
Shime et al (2013)	0	28	2	11	1.4%	0.07 [0.00, 1.52]
Total (95% CI)		**1488**		**1246**	**100.0%**	**0.44 [0.30, 0.66]**
Total events	222		304			

Heterogeneity: Tau² = 0.34; Chi² = 38.94, df = 16 (P = 0.001); I² = 59%
Test for overall effect: Z = 3.98 (P < 0.0001)



E. Schuts, *Lancet Inf Dis 2016*

RCT de-escalation in ICU

Intensive Care Med
DOI 10.1007/s00134-014-3411-8

SEVEN-DAY PROFILE PUBLICATION

Marc Leone
Carole Bechis
Karine Baumstarck
Jean-Yves Lefrant
Jacques Albanèse
Samir Jaber
Alain Lepape
Jean-Michel Constantin
Laurent Papazian
Nicolas Bruder
Bernard Allaouchiche
Karine Bézulier
François Antonini
Julien Textoris
Claude Martin
For the AZUREA Network Investigators

De-escalation versus continuation of empirical antimicrobial treatment in severe sepsis: a multicenter non-blinded randomized noninferiority trial

De-escalation: Leone et al. 2014

- Multicenter (9) ICU study in France
- Radomised: continue vs. de-escalate
- Unblinded
- 120 patients
- Primary outcome: LOS (non-inferiority de-escalation)
- Secundary outcomes: 90 day M; AB free days; superinfections; *Clostridium difficile* infections

De-escalation: Leone et al. 2014

- *Inclusion* severe sepis / septic shock
- Randomisation as soon as positive cultures available
- Adequate empirical therapy acc. guidelines
- *Definition* de-escalation:
  - *Change”Pivotal antibiotic” to AB with narrowest possible spectrum*
  - *Stop combination therapy (quinolone, amino-glycoside or macrolide) at day 3*
  - *Stop Vancomycin if no rationale for MRSA*

De-escalation: Leone et al. 2014

- *Definition* continue:
  - *Continue”Pivotal antibiotic”*
  - *Stop combination therapy (quinolone, amino-glycoside or macrolide) between day 3 and 5*
  - *Stop Vancomycin if no rationale for MRSA*
  - *Therapy duration acc. to international guidelines*

624 screened patients

Non-inclusion: 504
No documentation: 162
Carbapenemase producer: 2
Expected death < 48 h: 18
Other protocol: 21
Antibiotic arrest < 48 h: 52
Late documentation: 12
Inappropriateness: 31
No consent: 22
Deprivation of freedom: 12
Expected withdrowl of care: 81
Early discharge: 12
Lack of inclusion: 79

120 included patients

60 assigned to continuation of appropriate empirical antimicrobial treatment

60 assigned to de-escalation of appropriate empirical antimicrobial treatment

Exclusion: 3 patients (freedom deprivation)

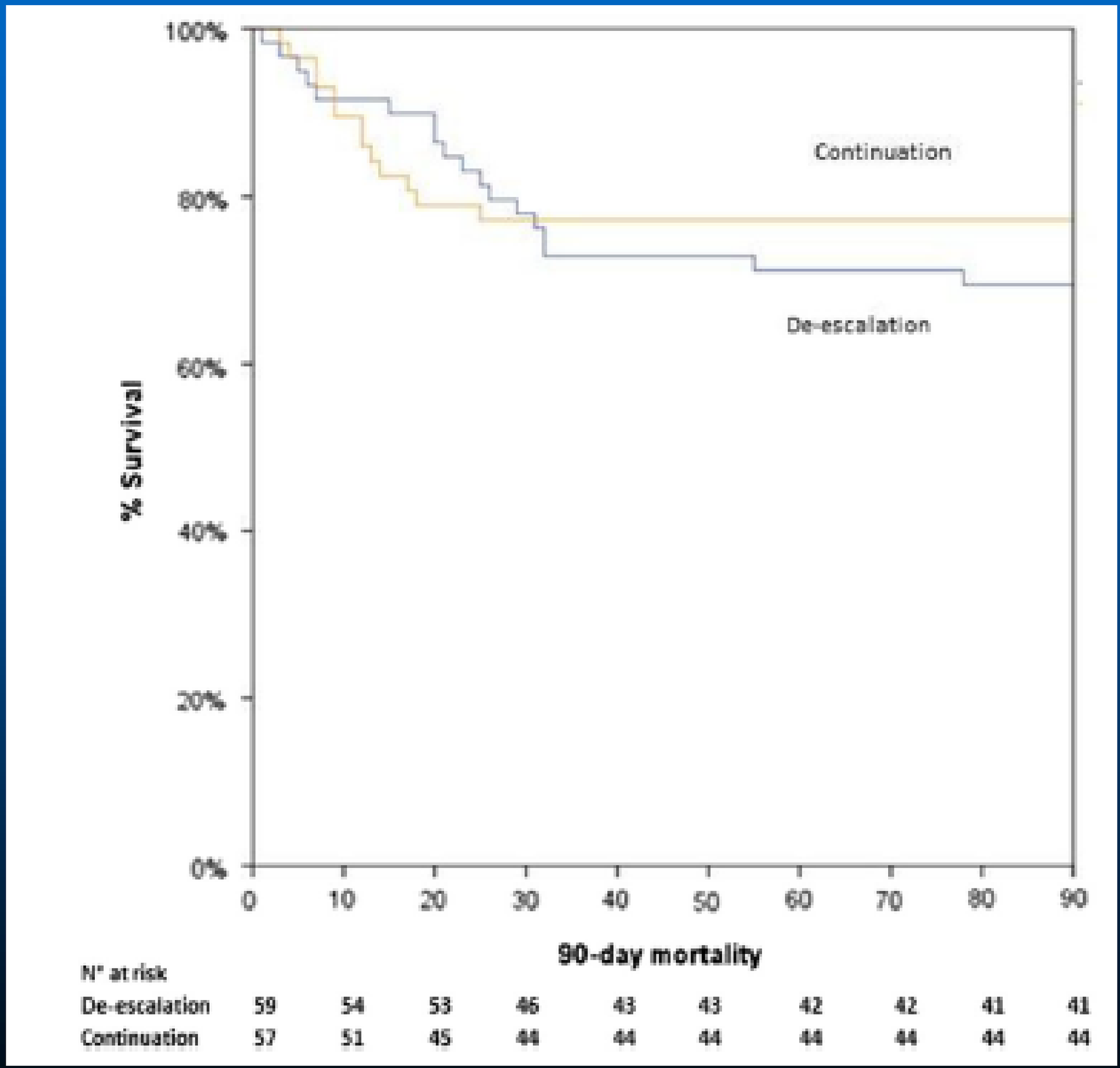
Exclusion: 1 patient (freedom deprivation)

57 patients in the per-protocol analysis

59 patients in the per-protocol analysis

0 Lost to follow-up (day 90)

0 Lost to follow-up (day 90)

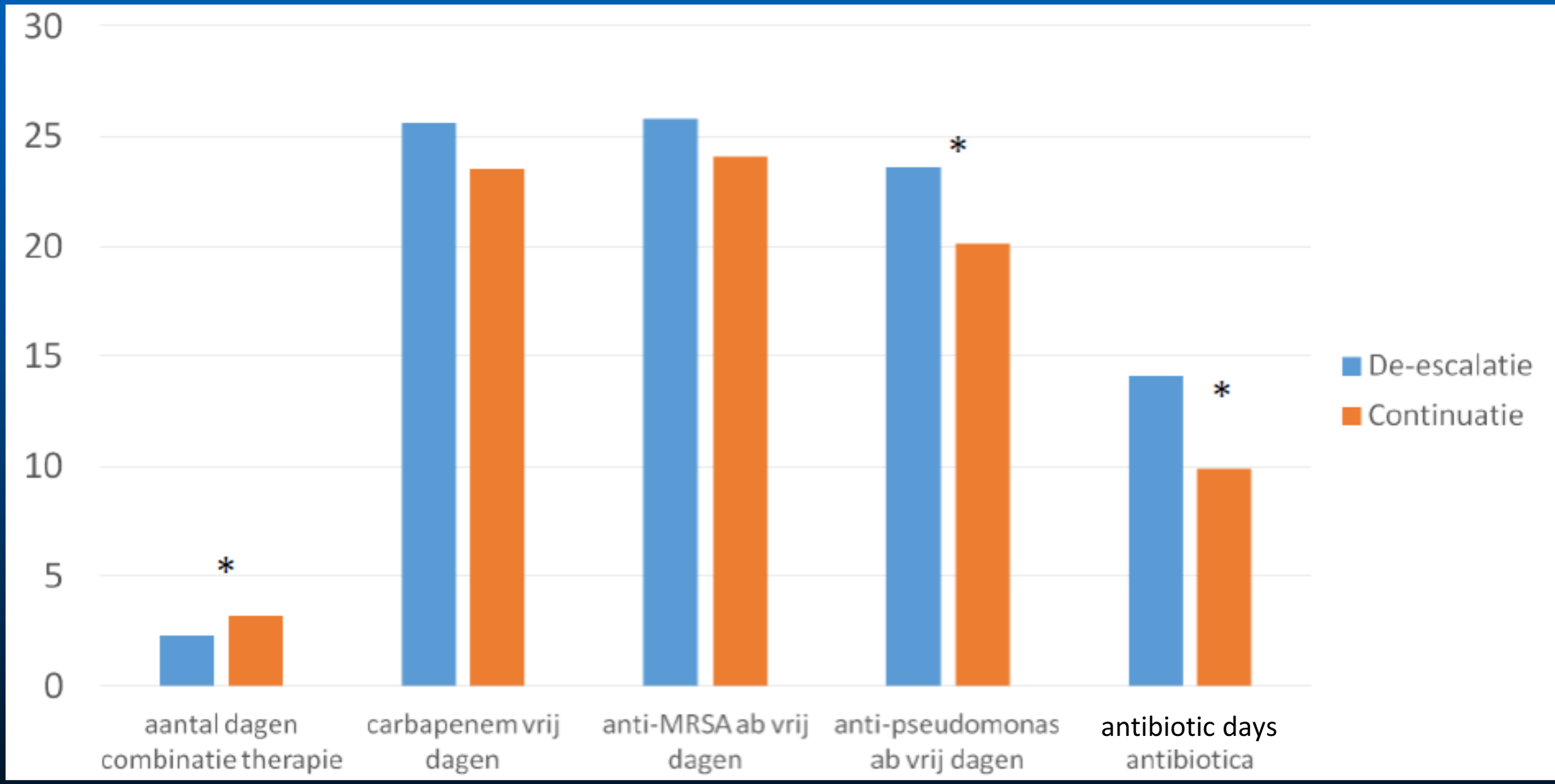

100%
80%
60%
40%
20%
0%
% Survival
Continuation
De-escalation
0
10
20
30
40
50
60
70
80
90
90-day mortality
N° at risk
De-escalation 59 54 53 46 43 43 42 42 41 41
Continuation 57 51 45 44 44 44 44 44 44 44

p = 0.35

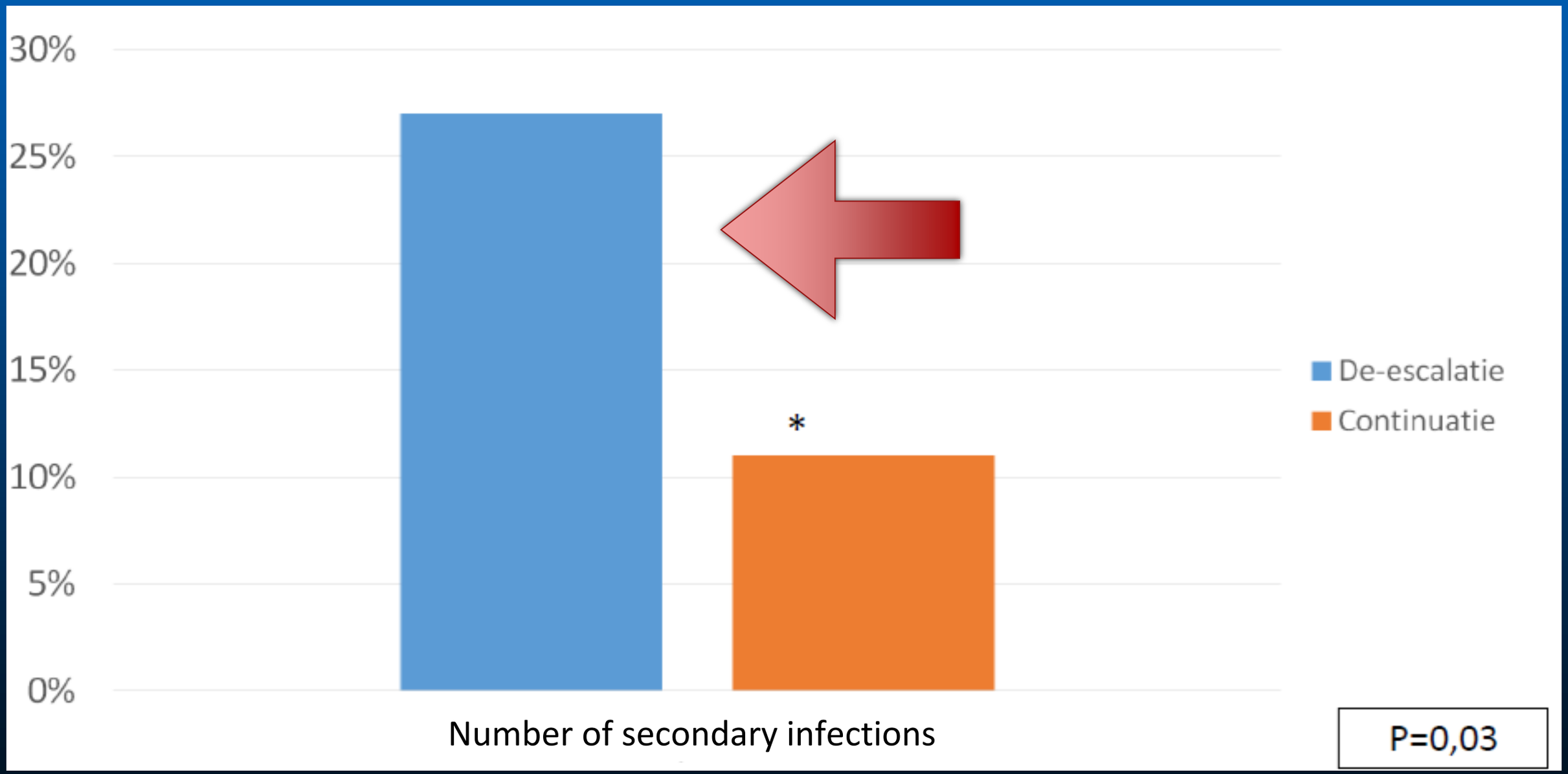
De-escalation: Leone et al. 2014

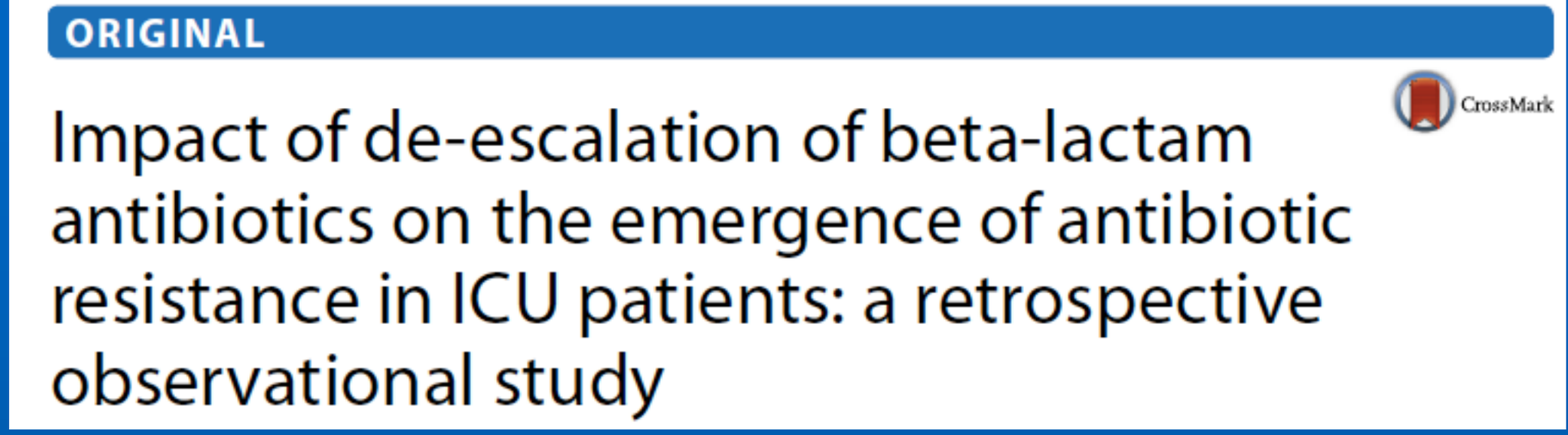
Duration	De-escalation group ($n = 59$)	Continuation group ($n = 57$)	P
Duration of ICU stay (days)			
From inclusion to discharge	15.2 ± 15.0	11.8 ± 12.6	0.71
	9 [1–79]	8 [1–60]	
From admission to discharge	29.1 ± 50.0	18.1 ± 15.7	0.11
	13 [1–375]	12 [3–67]	

De-escalation: Leone et al. 2014



De-escalation: Leone et al. 2014





- Retrospective study comparing de-escalation vs. escalation vs. continuation for betalactam use
- Outcomes:
  - ✴ Duration of antibiotic course, Antibiotic consumption
  - ✴ Cumulative incidence of MDR resistant pathogens to the initial betalactam antibiotic using systematically collected surveillance cultures (!)

L. De Bus, Intensive Care Medicine 2016

Table 3 Patient outcome after de-escalation and escalation of anti-pseudomonal beta-lactam therapy

Patient outcome	Treatment				*p* value	
	Total (*n* = 344)	Continuation (*n* = 221; 64%)	De-escalation (*n* = 85; 25%)	Escalation (*n* = 38; 11%)	De-escalation vs. continuation	Escalation vs. continuation
Antibiotic treatment duration in the ICU for the infection under study (days)	6 (5–9)	5 (4–7)	8 (6–10)	11 (8–19)	<0.001	<0.001
Total antibiotic consumption in the ICU (days)	10 (5–20)	7 (4–15)	12 (7–22)	24 (13–39)	<0.001	<0.001
Antibiotic-free days (14 days after onset of infection)[a] (*n* = 116)	1 (0–4)	2 (0–6)	1 (0–3)	0 (0–1)	0.04	<0.001

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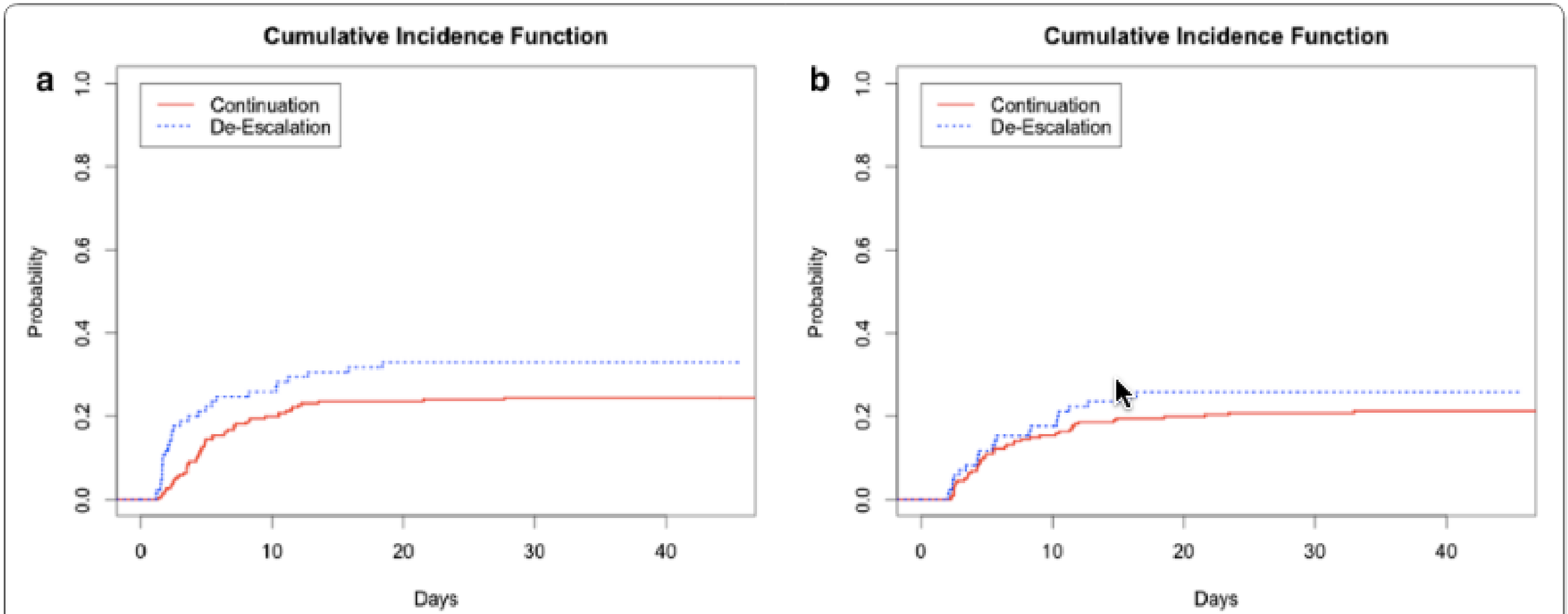


Fig. 2 **a** Cumulative incidence function (after adjustment for ICU discharge and death as competing risk events) of emergence of pathogens resistant to the initial anti-pseudomonal betalactam antibiotic. **b** Cumulative incidence function (after adjustment for ICU discharge and death as competing risk events) of emergence of MDR pathogens

ation of expected favorable effect of de-escalation on selection of antimicrobia

L. De Bus, Intensive Care Medicine 2016

De-escalation: future

De-escalation?

-no uniform definition

-no reduction of AB duration, costs or length of stay

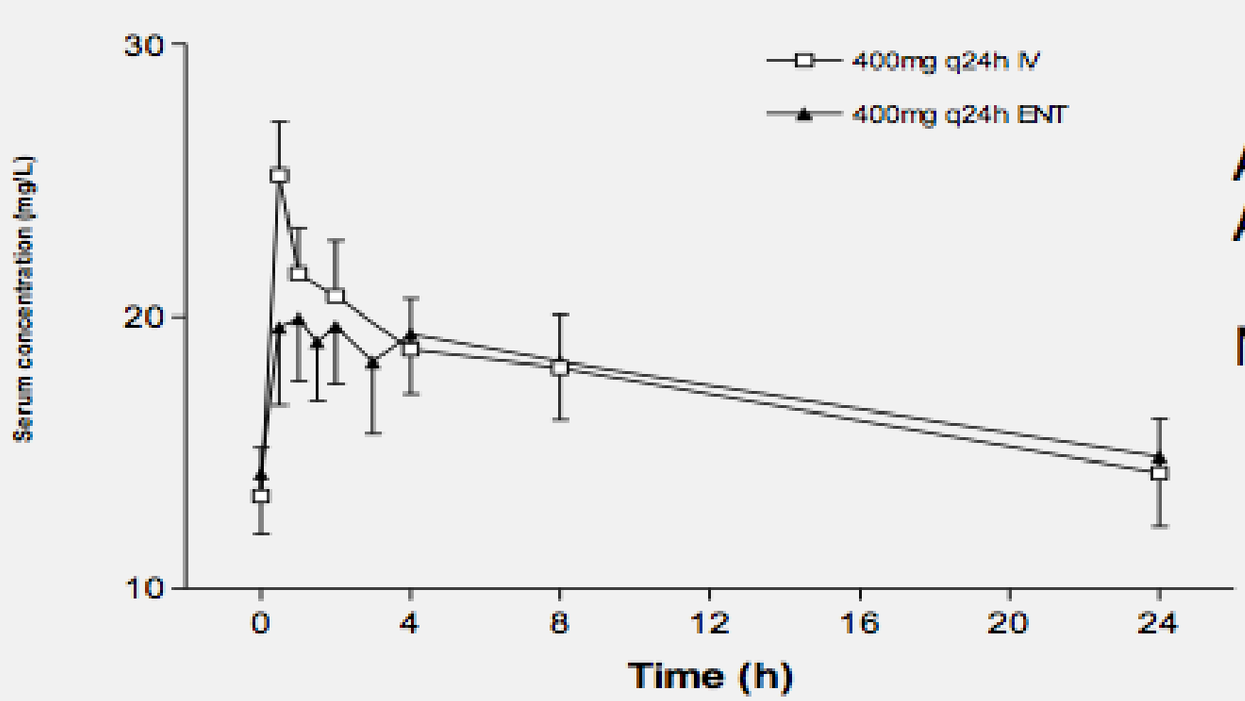
-no effects on AMR

-protective of mortality? bias!

for the moment: probably safe

lly…iv-oral switch in ICU? reasona

Bioavailability of fluconazole in ICU patients, including compromised intestinal function



AUC iv = 409 (336-482)
AUC ent =418 (319-516)

Mg.h/L

Buijk et al, Int care med 2001 27:115

10 golden rules of Antibiotic Stewardship at the ICU

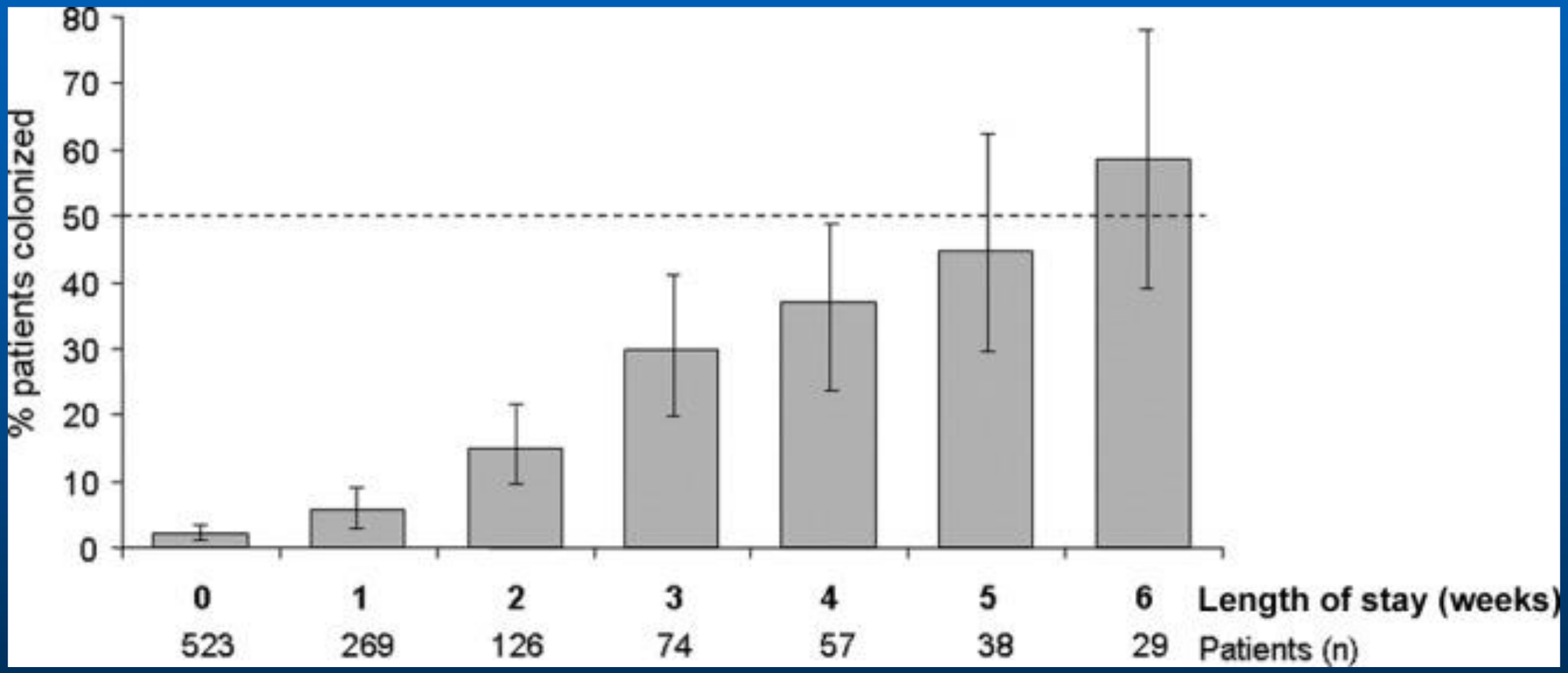
7

Focus: Actively reduce antibiotic treatment duration in ICU

Consider using procalcitonin (PCT) levels as guidance

Is any risk associated with duration of antibiotic therapy?

Rates of intestinal colonization by imipenem-resistant gram-negative bacilli in intensive care patients



Days of imipenem exposure				<0.01
0	8 (22.2)	22 (61.1)	1.0	1.0
1 to 3	10 (27.8)	6 (16.7)	4.4 (1.1–20.5)	5.9 (1.5–25.7)
4 to 21	18 (50.0)	8 (22.2)	6.0 (1.7–23.3)	7.8 (2.4–29.8)

Laurence Armand-Lefèvre et al, Antimicrob. Agents Chemother, 2013

Even short courses of antibiotics cause selection of resistant bacteria

Harbarth Circulation 2000

Taconelli AAC 2010

Lefevre AAC 2013

- we need to move to more rapid culture-independent micro identification methods
- we need swift communication between micro lab and ICU:

leading to faster achievement of appropriate therapy

so….duration of empirical therapy may be limited

Are short courses of antibiotics feasible in ICU infections?

PRO

VAP *(Singh AJRCCN 2000)*
Early onset pneumonia *(Capellier Plos One 2012)*
CAP *(Avdic CID 2012)*
Bacteremia *(Havey Crit Care 2011)*
Intra-abdominal infection *(Sawyer NEJM 2015)*

CON

VAP *(Magnotti J Am Coll Surgeon 2011)*
VAP *(Chastre JAMA 2003)*
VAP *(Kollef Crit Care 2012)*

Strategies to reduce curative antibiotic therapy in intensive care units

Short course (5 days)

- no major comorbidities
- low risk pathogen
- adequate source control
- rapid clinical improvement
- favorable PK/PD

Longer course?

- immunosuppression
- high risk pathogen (S. aureus)
- inadequate source control
- slow, partial clinical response
- unfavorable PK/PD, tissue diff

Bretonniere, ICM 2015

Efficacy and safety of procalcitonin guidance in reducing the duration of antibiotic treatment in critically ill patients: a randomised, controlled, open-label trial

Evelien de Jong, Jos A van Oers, Albertus Beishuizen, Piet Vos, Wytze J Vermeijden, Lenneke E Haas, Bert G Loef, Tom Dormans, Gertrude C van Melsen, Yvette C Kluiters, Hans Kemperman, Maarten J van den Elsen, Jeroen A Schouten, Jörn O Streefkerk, Hans G Krabbe, Hans Kieft, Georg H Kluge, Veerle C van Dam, Joost van Pelt, Laura Bormans, Martine Bokelman Otten, Auke C Reidinga, Henrik Endeman, Jos W Twisk, Ewoudt M W van de Garde, Anne Marie G A de Smet, Jozef Kesecioglu, Armand R Girbes, Maarten W Nijsten, Dylan W de Lange

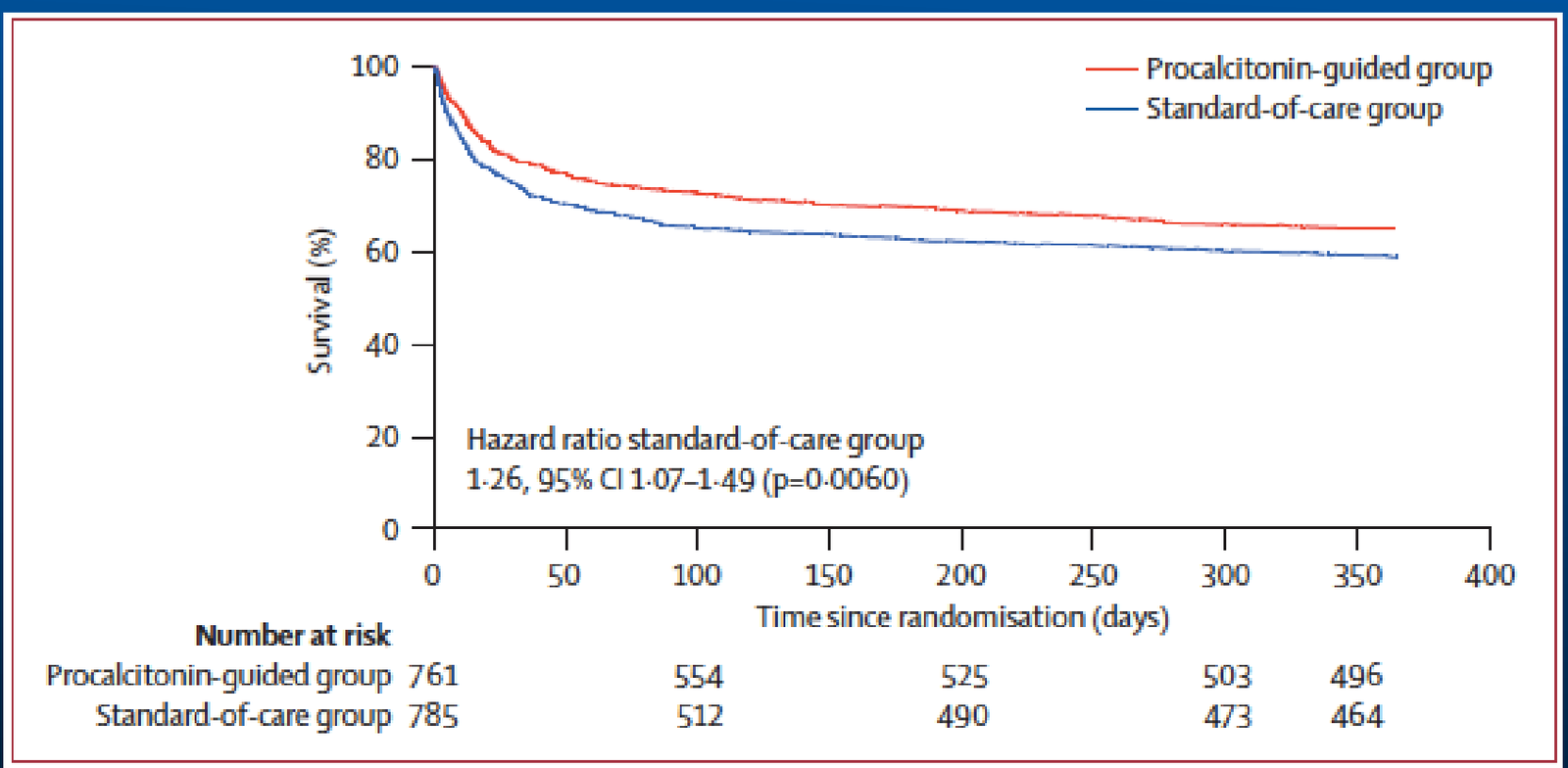


Figure 2: **Kaplan-Meier plot for probability of survival from random assignment to day 365, in the modified intention-to-treat population**

De Jong, Lancet Infect Dis 2016

	Procalcitonin-guided group (n=761)	Standard-of-care group (n=785)	Between-group absolute difference in means (95% CI)	p value
Antibiotic consumption (days)				
Daily defined doses in first 28 days	7·5 (4·0 to 12·8)	9·3 (5·0 to 16·5)	2·69 (1·26 to 4·12)	<0·0001
Duration of treatment	5·0 (3·0 to 9·0)	7·0 (4·0 to 11·0)	1·22 (0·65 to 1·78)	<0·0001
Antibiotic-free days in first 28 days	7·0 (0·0 to 14·5)	5·0 (0 to 13·0)	1·31 (0·52 to 2·09)	0·0016
Mortality (%)				
28-day mortality	149 (19·6%)	196 (25·0%)	5·4% (1·2 to 9·5)	0·0122
1-year mortality	265 (34·8%)	321 (40·9%)	6·1% (1·2 to 10·9)	0·0158
Adverse events				
Reinfection	38 (5·0)	23 (2·9)	−2·1% (−4·1 to -0·1)	0·0492
Repeated course of antibiotics	175 (23·0)	173 (22·0)	−1·0% (−5·1 to 3·2)	0·67
Time (days) between stop and reinstitution of antibiotics	4·0 (2·0 to 8·0)	4·0 (2·0 to 8·0)	−0·22 (−1·31 to 0·88)	0·96
Costs				
Total cumulative costs of antibiotics	€150 082	€181 263	NA	NA
Median cumulative costs antibiotics per patient	€107 (51 to 229)	€129 (66 to 273)	€33·6 (2·5 to 64·8)	0·0006
Length of stay (days)				
On the intensive care unit	8·5 (5·0 to 17·0)	9·0 (4·0 to 17·0)	−0·21 (−0·92 to 1·60)	0·56
In hospital	22·0 (13·0 to 39·3)	22·0 (12·0 to 40·0)	0·39 (−2·69 to 3·46)	0·77

Data are median (IQR), n (%), or mean (95% CI). Between-group absolute differences were calculated using the mean values, percentage differences, and 95% CIs.
NA=not applicable.

Table 2: **Primary and secondary outcome measures**

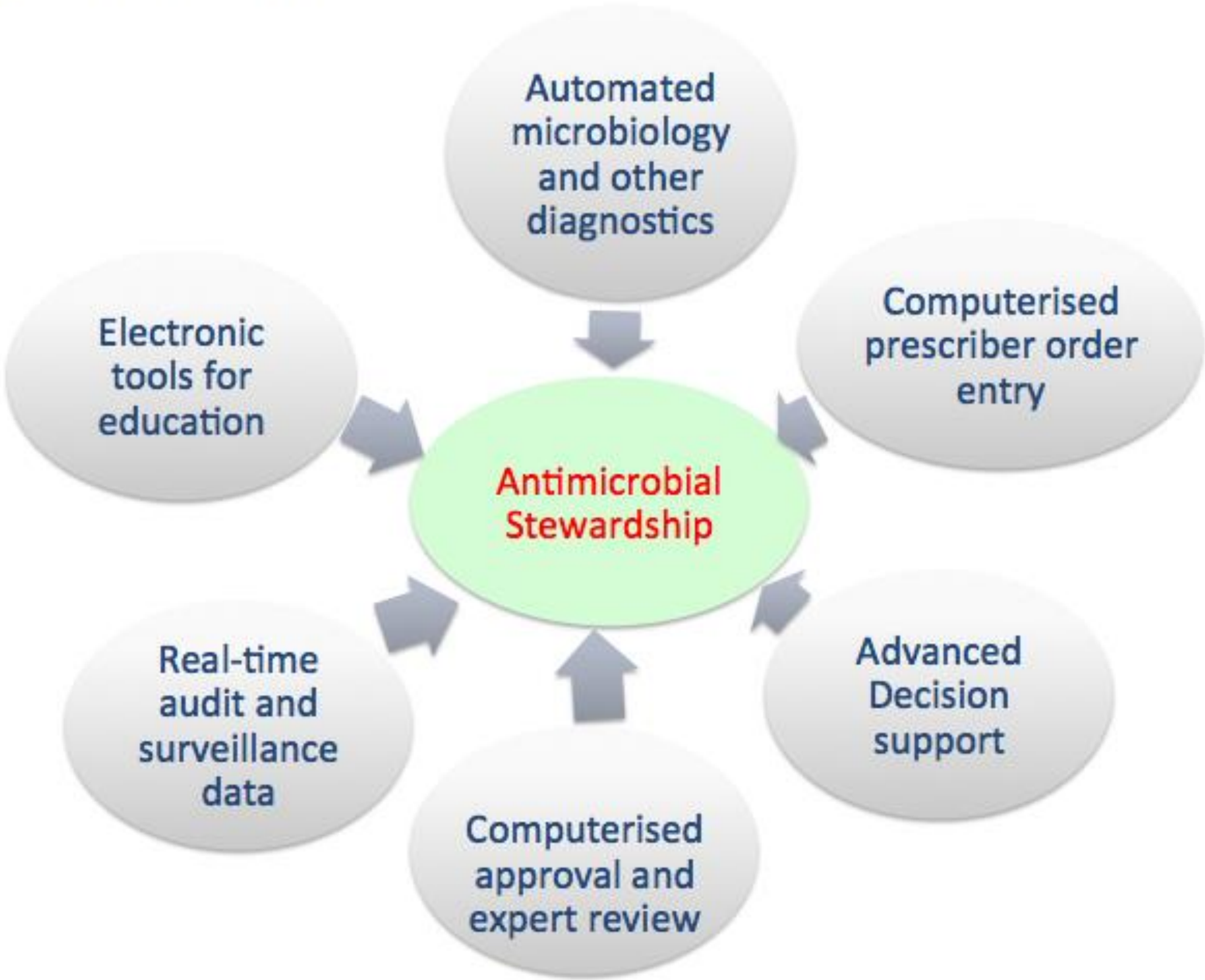
E de Jong, *Lancet Infect Dis march 2016*

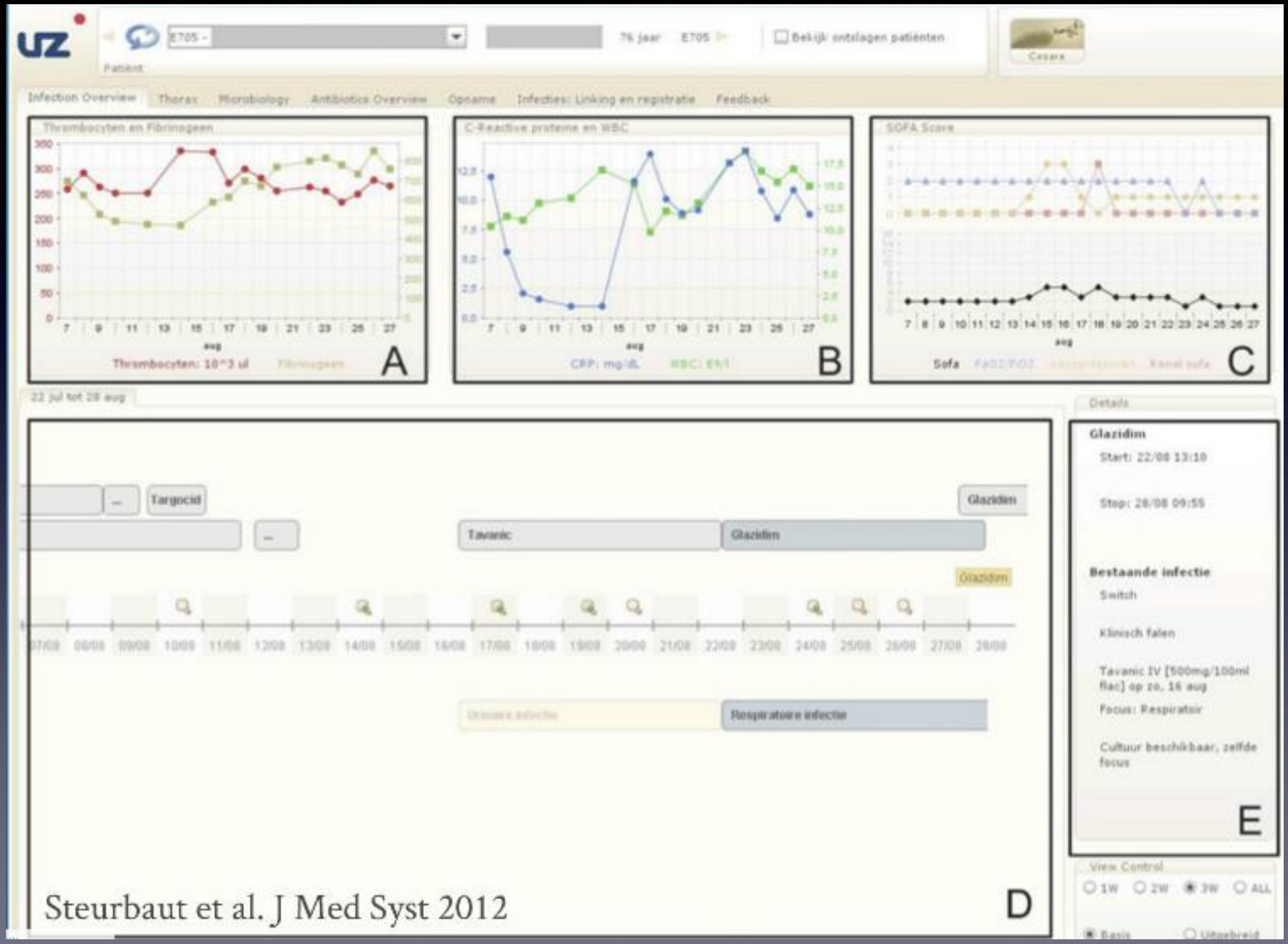
10 golden rules of Antibiotic Stewardship at the ICU

8

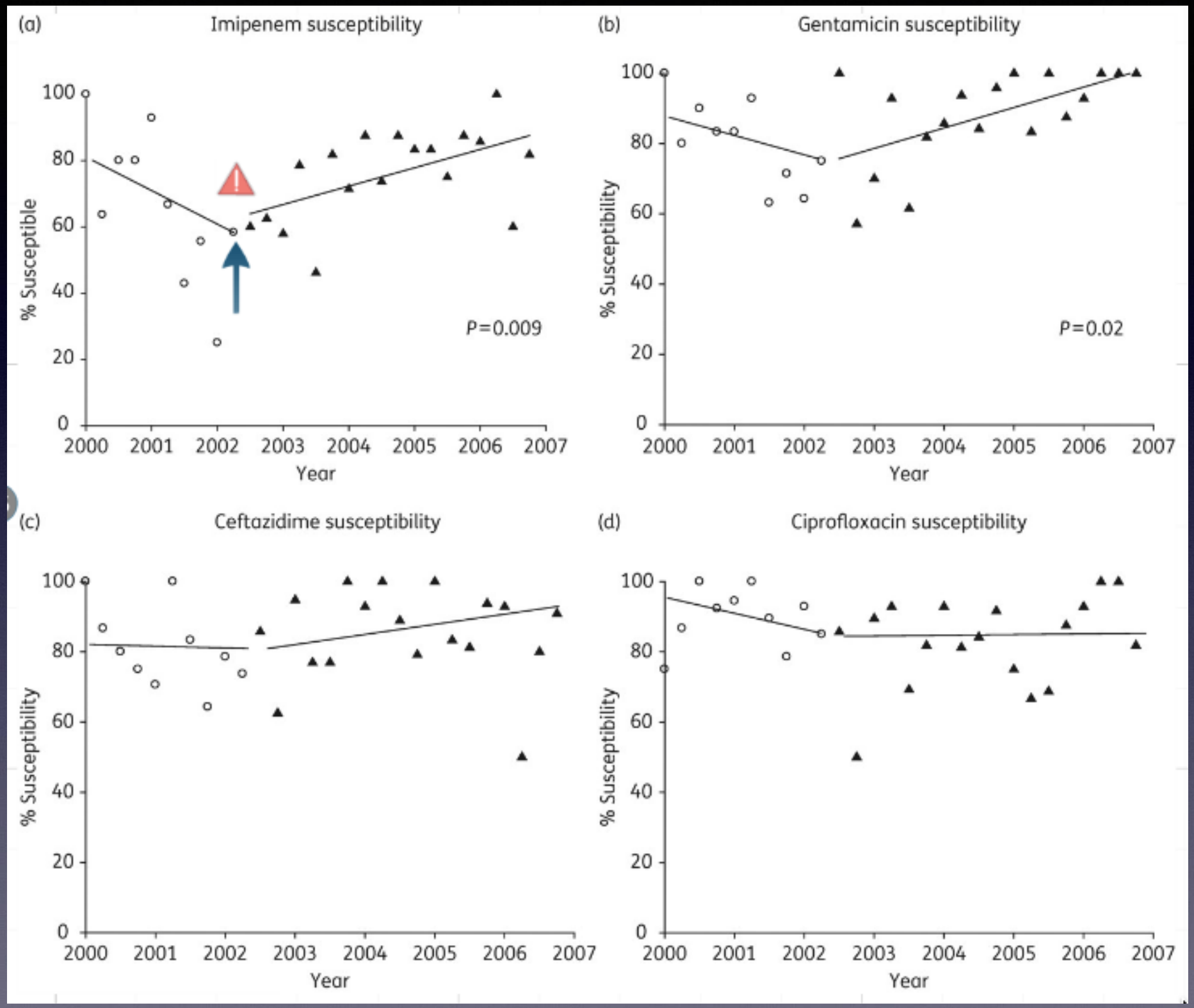
Integrate antibiotic stewardship principles in your EMR or PDMS at the Intensive Care

Looking into the (near) future …





Steurbaut et al. J Med Syst 2012



Yong at al. *J. Antimicrob. Chemother (2010)*

10 golden rules of Antibiotic Stewardship at the ICU

9

Organise structured and efficient communication between microbiology lab, clinical pharmacist and infectious disease physician in direct ICU patient care

Invite an intensive care specialist to be part of the hospital antibiotic stewardship team

Use ICU specific quality indicators for appropriate antibiotic use to maintain control (bundle approach)

ICU physicians just lóóóve care bundles!

NEWLY MODIFIED ABCDEF BUNDLE[3-5]

ABCDEF Bundle

- **A** Assess, prevent, and manage pain
- **B** Both SAT and SBT
- **C** Choice of analgesia and sedation
- **D** Delerium: Assess, prevent and manage
- **E** Early mobility and exercise
- **F** Family engagement and empowerment

CAM-ICU

Feature 1: Acute change or fluctuating course of mental status

And

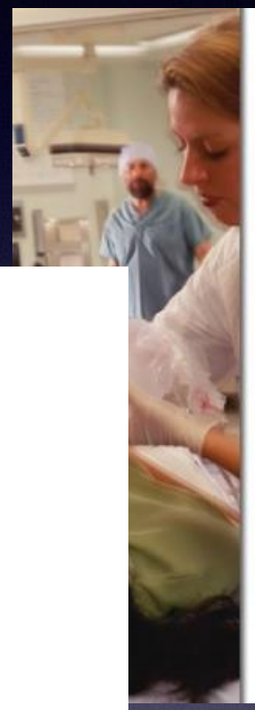
Feature 2: Inattention

And

Feature 3: Altered level of consciousness

Or

Feature 4: Disorganized thinking



Ventilator Bundle

- Elevating the head of the patient's bed to 30 degrees or higher
- Prophylactic treatment for deep venous thrombosis
- Prophylactic treatment for peptic ulcer disease
- Daily "sedation vacation" accompanied by an assessment of the patient's readiness to wean from the ventilator

Central Line Bundle

- Hand Hygiene
- Maximal Barrier Precautions Upon Insertion
- Chlorhexidine Skin Antisepsis
- Optimal Catheter Site Selection, with Subclavian Vein as the Preferred Site for Non-Tunneled Catheters
- Daily Review of Line Necessity with Prompt Removal of Unnecessary Lines

Bundles.

Surviving Sepsis Campaign Bundles

TO BE COMPLETED WITHIN 3 HOURS:

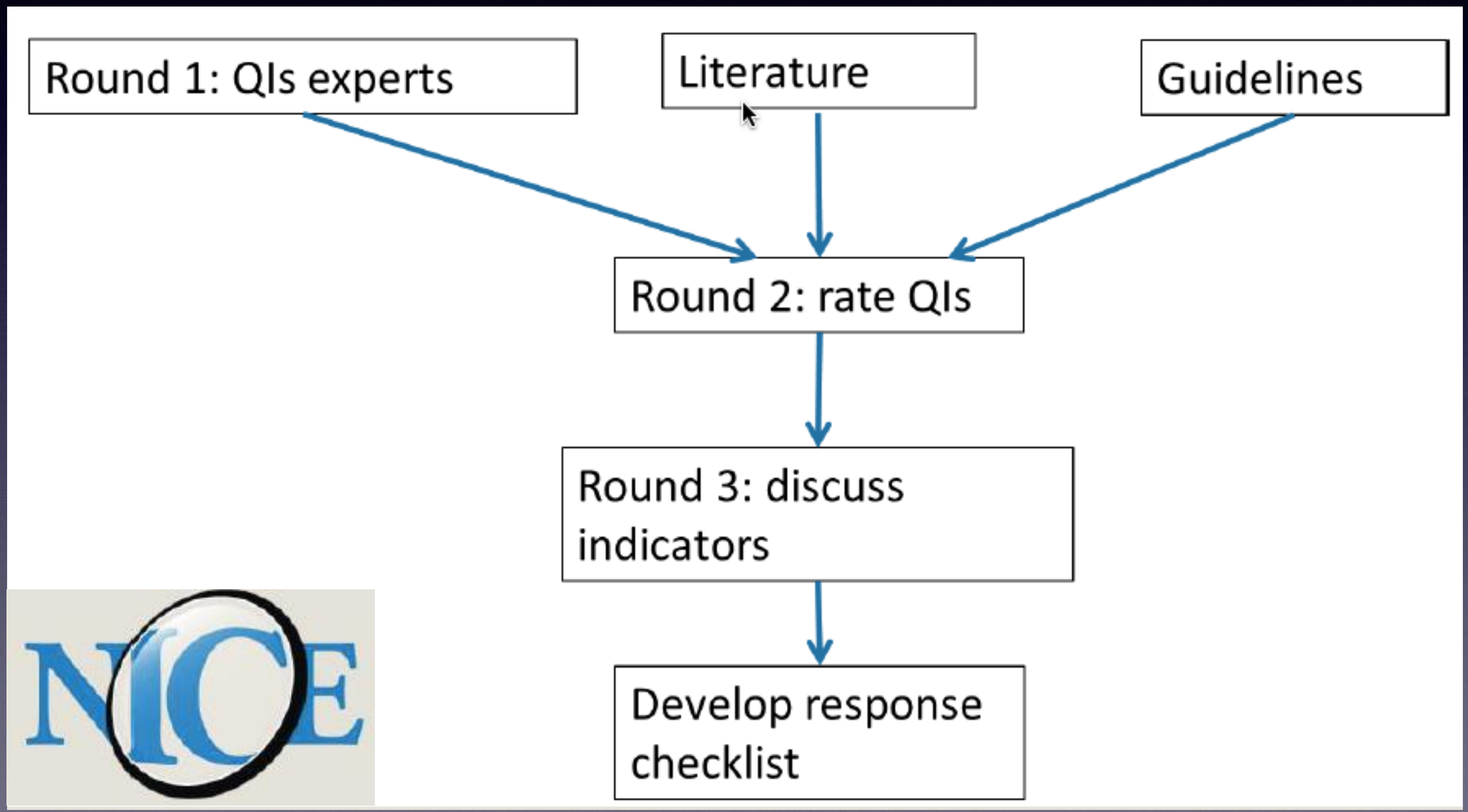
1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 mL/kg crystalloid for hypotension or lactate ≥4 mmol/L

TO BE COMPLETED WITHIN 6 HOURS:

5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥4 mmol/L (36 mg/dL):
   -Measure central venous pressure (CVP)*
   -Measure central venous oxygen saturation ($Scvo_2$)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥8 mm Hg. $Scvo_2$ of ≥70%, and normalization of lactate.

Developing Quality Indicators for antibiotic use in ICU



Dongelmans D. NICE data 2015

Quality Indicators for antibiotic use in dutch ICU's

- 1. Days of therapy (DOT) per 100 patient days or 100 admissions.
- 2. Performance of blood cultures prior to starting antibiotics: percentage of patients in who(m) at least two sets of blood cultures were performed 48 hours before until 24 hours after start of empirical systemic antibiotic therapy on ICU.
- 3. Adequate performance of antibiotic concentration levels: percentage of patients in whom a level was performed timely and at the correct indication
- 4. Performance of surveillance cultures during SDD and SOD: percentage of patient in whom -during their ICU stay at least one surveillance culture was performed for the presence of resistant GNB
- 5.'Resistance meeting': how many times per year does a face-to-face meeting take place between ICU and Dpt of ID / Microbiology regarding the development of resistance in the ICU

Dongelmans D. NICE data 2015

5 day antibiotic use bundle in ICU

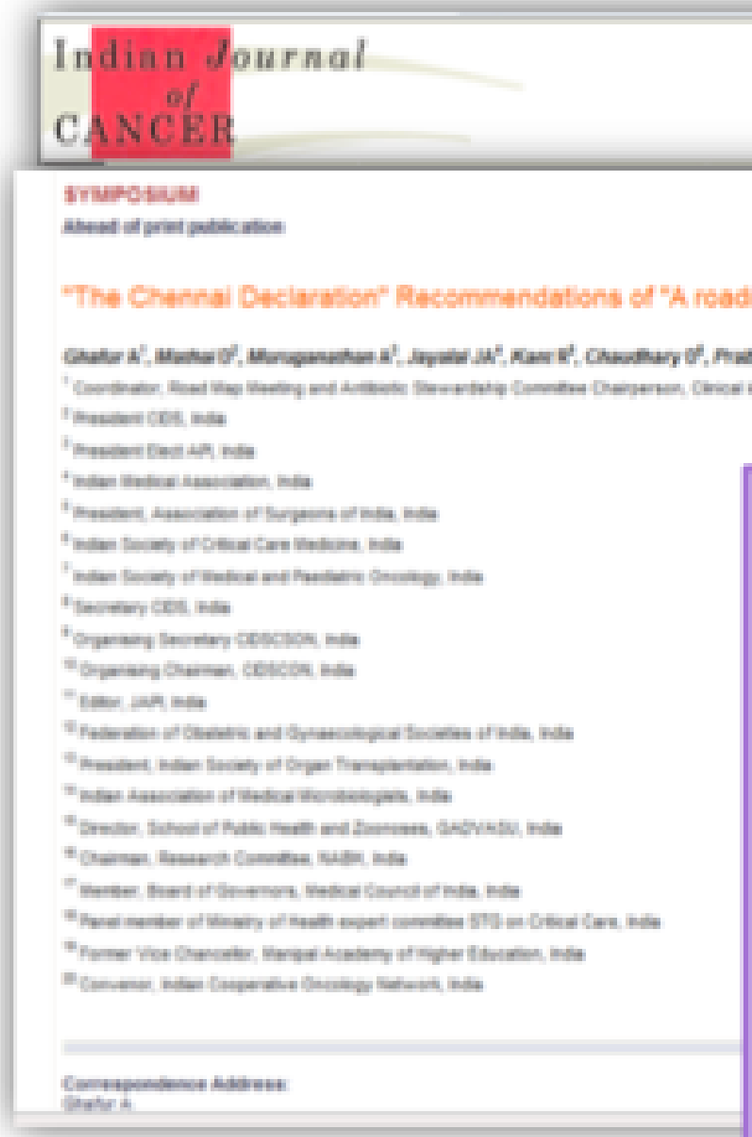
1st	the clinical rational for antibiotic start should be documented in the medical chart at the start of therapy
	appropriate microbiological culture according to local and/or international guidelines should be collected
	the choice of empirical antibiotic therapy should be performed according to local guidelines
2nd	review of the diagnosis based on newly acquired microbiological cultures
	de-escalation therapy (the narrowest spectrum as possible) according to available microbiological results
3rd-5th	review of the diagnosis based on newly acquired microbiological cultures
	de-escalation therapy (the narrowest spectrum as possible) according to available microbiological results
	interruption of treatment should be considered according to local and/or international guidelines

Mutters, Int J Antimicrob Agents 2017

10 golden rules of Antibiotic Stewardship at the ICU

10

Infection prevention in the ICU is an integral part of stewardship policies to prevent development and spread of resistant microorganisms


Indian Journal of CANCER

SYMPOSIUM

Ahead of print publication

"The Chennai Declaration" Recommendations of "A roadmap- to tackle the challenge of antimicrobial resistance" - A joint meeting of medical societies of India

Ghafur A[1], Mathai D[2], Muruganathan A[3], Jayalal JA[4], Kanri B[5], Chaudhary D[6], Prabhash K[7], Abraham OC[8], GopalaKrishnan R[9], Ramasubramanian V[10], Shah SK[11], Pardeshi N[12], Hudgoi A[13], Kapil A[14], Gill JPS[15], Singh S[16], Rissam HS[17], Todi S[18], Hegde BM[19], Parikh P[20]

[1] Coordinator, Road Map Meeting and Antibiotic Stewardship Committee Chairperson, Clinical Infectious Diseases Society, India
[2] President CDS, India
[3] President Elect API, India
[4] Indian Medical Association, India
[5] President, Association of Surgeons of India, India
[6] Indian Society of Critical Care Medicine, India
[7] Indian Society of Medical and Paediatric Oncology, India
[8] Secretary CDS, India
[9] Organising Secretary CEDCSON, India
[10] Organising Chairman, CEDCSON, India
[11] Editor, JAPI, India
[12] Federation of Obstetric and Gynaecological Societies of India, India
[13] President, Indian Society of Organ Transplantation, India
[14] Indian Association of Medical Microbiologists, India
[15] Director, School of Public Health and Zoonoses, GADVASU, India
[16] Chairman, Research Committee, NABH, India
[17] Member, Board of Governors, Medical Council of India, India
[18] Panel member of Ministry of Health expert committee STG on Critical Care, India
[19] Former Vice Chancellor, Manipal Academy of Higher Education, India
[20] Convenor, Indian Cooperative Oncology Network, India

Correspondence Address:
Ghafur A.

The declaration also has a much broader scope stretching beyond antibiotic stewardship to improve patient care and patient safety, as it promotes the important role of the infection control committee and team by mandating that there must be one in every hospital. The roadmap states that it will be these infection control committees that should deliver the hospitals antibiotic stewardship agenda, and this integration of infection control and antimicrobial stewardship is a critical component of the action plan. A lack of infection prevention and control activity and committees in Indian hospitals has been recognized as a cause for concern.

. *Holmes ,Sharland. J. Antimicrob. Chemother. March 18, 2013*

Chennai Declaration: A roadmap to tackle the challenge of antimicrobial resistance 2013