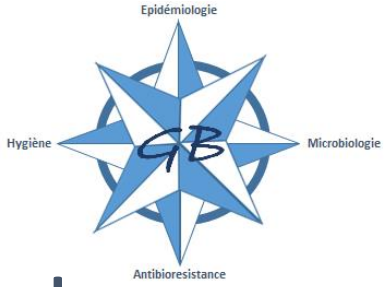


Healthcare associated infections

Read for you!

My ECCMID 2016 by Gabriel Birgand

Blog: http://www.gabrielbirgand.fr/

@Gbirgand

MDR *Enterobacteriaceae*: clinical epidemiology and outcomes

Risk factors, duration of carriage and onward transmission of ESBL-producing *Enterobacteriaceae* acquired during travel

- Large-scale multicenter longitudinal cohort study
  - Dutch travellers (n=2001)
  - their non-travelling household members (n=215)
- Faecal samples and questionnaires
  - before and immediately after travel, and at 1, 3, 6 and 12 months after return.
- Acquisition rate of ESBL-E during travel was 34% among travellers and 3 CPE (NDM)
  - 759 *E. coli*, 67 *K. pneumoniae* and 33 other species were isolated, mainly carrying CTX-M-15 (51%)
  - Southern Asia (75%, CI95 64-89%) and Central/Eastern Asia (49%, CI95 36-66%)
  - The probability to transmit ESBL-E to a household member was 12%.

#O111 Maris Arcilla

Acquisition of travel-associated antibiotic resistant bacteria occurs within several days

- Stool samples from 7 consenting Dutch residents were collected prior and after travelling
- Faecal swabs from each available day during the travel, as well as hand-skin swabs from the first few days of travel
- Median time until ESBL acquisition: 5 days,
  - Earliest detected acquisition: 1st day of travel.
  - Acquired genes were in some cases detectable up to 1 month after travel.

#O112 Christian von Wintersdorff

A longitudinal population-based study of extended spectrum beta-lactamases in the Netherlands

- ESBL prevalence and duration of carriage in the general population
- ~2000 inhabitants of the Netherlands: online an epidemiological questionnaire + faecal sample
  - 3,921 (18.3%) completed the questionnaire,
  - 1,660 (42.3%) provided a faecal sample and
  - 352 provided a sample of a dog or cat
- 53 participants were ESBL-carrier (3.2%) blaCTX-M-15
- Follow-up faecal sample after 1 month: 274 participants
  - 31 from the ESBL-carriers;
  - 4 subjects (1.7%) acquired ESBL-carriage,
  - 13 (41.9%) lost carriage.

#O113 Gerrita van den Bunt

Colonization rates and risk factors for extended-spectrum beta-lactamase producing coliforms (ESBLPCs) in different sections of the asymptomatic general population in England

- How many of the general population in England carry ESBLPCs?

- 2296 (3.9%) of 58,337 returned a stool and questionnaire

- Prevalence of blaCTX-MESBLPCs in 2014: **7.3%**
  - born in the UK 6.5%
  - 15.8% if born outside the UK

#O114 Cliodna McNulty

Comparing two predictive models for early mortality of patients with bloodstream infection due to CPE

- Develop a predictive model for early mortality for patients with BSI due to CPE
- 12 countries, 37 hospitals, retrospective cohort study
  - Patients with monomicrobial BSI due to CPE between January 2007 and December 2013
- Logistic regression model: AUROC of 0.84
  - Severe sepsis or shock at presentation (5 points);
  - Pitt score ≥ 6 (4);
  - Charlson index ≥2 (3);
  - no appropriate empirical therapy and no early targeted therapy (3);
  - source different to urinary or biliary (3);
  - fatal underlying disease (2).

#2399 *Jesús Rodríguez-Baño*

Carbapenem-resistant *K. pneumoniae* bacteraemia: recurrence and impact of antibiotic treatment

- To investigate the rate of and risk factors for recurrent bacteremia in a cohort of patients treated for a CR-KP BSI.
- Prospective observational study
  - 1,420 bed tertiary teaching hospital over 5-year period (June 2010-June 2015)
  - All consecutive adult patients treated for CR-KP BSI.
- 159 patients were treated for a CR-KP BSI;
  - 42 died within 14 days after drawing index BCs,
  - 117 patients were eligible for analysis.
- 23 patients (19.6%) developed a recurrent CR-KP BSI
  - within a median of 37 (IQR 24-45) days from the index BCs,
  - 14 (IQR 4-21) days from the end of therapy.
  - Incidence of recurrent bacteremia was significantly higher in patients with primary BSI, prolonged (>13 days) duration of therapy, and patients receiving meropenem-colistin-tigecycline combination regimen.

#4488 Maddalena Giannella

Dynamics of colistin resistance among *Enterobacter cloacae* during prolonged use of selective decontamination of the digestive tract

- Colistin-resistant *E. cloacae* was first detected in November 2009 and carriage was demonstrated in 141 patients until October 2014

- This study demonstrates a stable low-level endemicity of MREb in two Dutch ICUs with prolonged use of SDD, which was characterized by the persistent presence of two clusters, suggesting incidental clonal transmission.

#4269 *Mirjam Dautzenberg*

Proton pump inhibitor (PPI) use as a risk factor for ESBL-E carriage at hospital admission

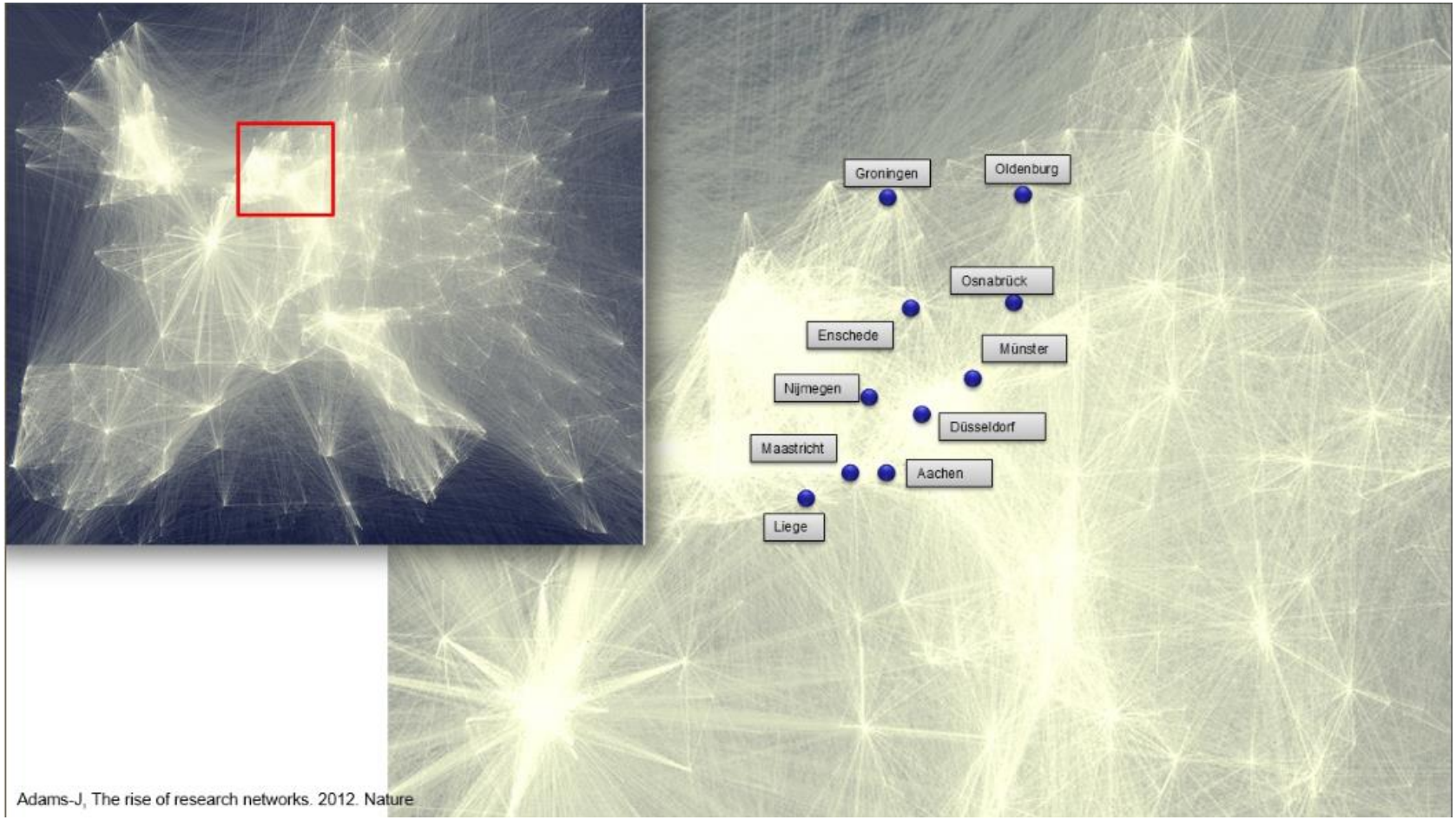
- We investigated whether the use of PPI is a risk factor for ESBL-E carriage at hospital admission.
- October 2014, a prevalence survey
  - to detect rectal ESBL-E carriage in adult patients hospitalised in a Dutch teaching hospital.
- ESBL carriage detected in 12 of 118 (10.2%)
  - PPI-users and 2 of 145 (1.4%)

	Univariable		Multivariable	
Variable	OR	95% CI	OR	95% CI
Use of PPI	8.09	1.77 – 36.93	11.67	2.34 – 58.2
Age (years)	0.99	0.96 – 1.02	0.97	0.94 – 1.01
Female gender	1.74	0.53 – 5.68		
Antibiotic use	1.52	0.47 – 5.03		

#4376 *Pepijn Huizinga*

Compendium of strategies to prevent healthcare-associated infections

Essentials to reduce cross-border MRSA spreading



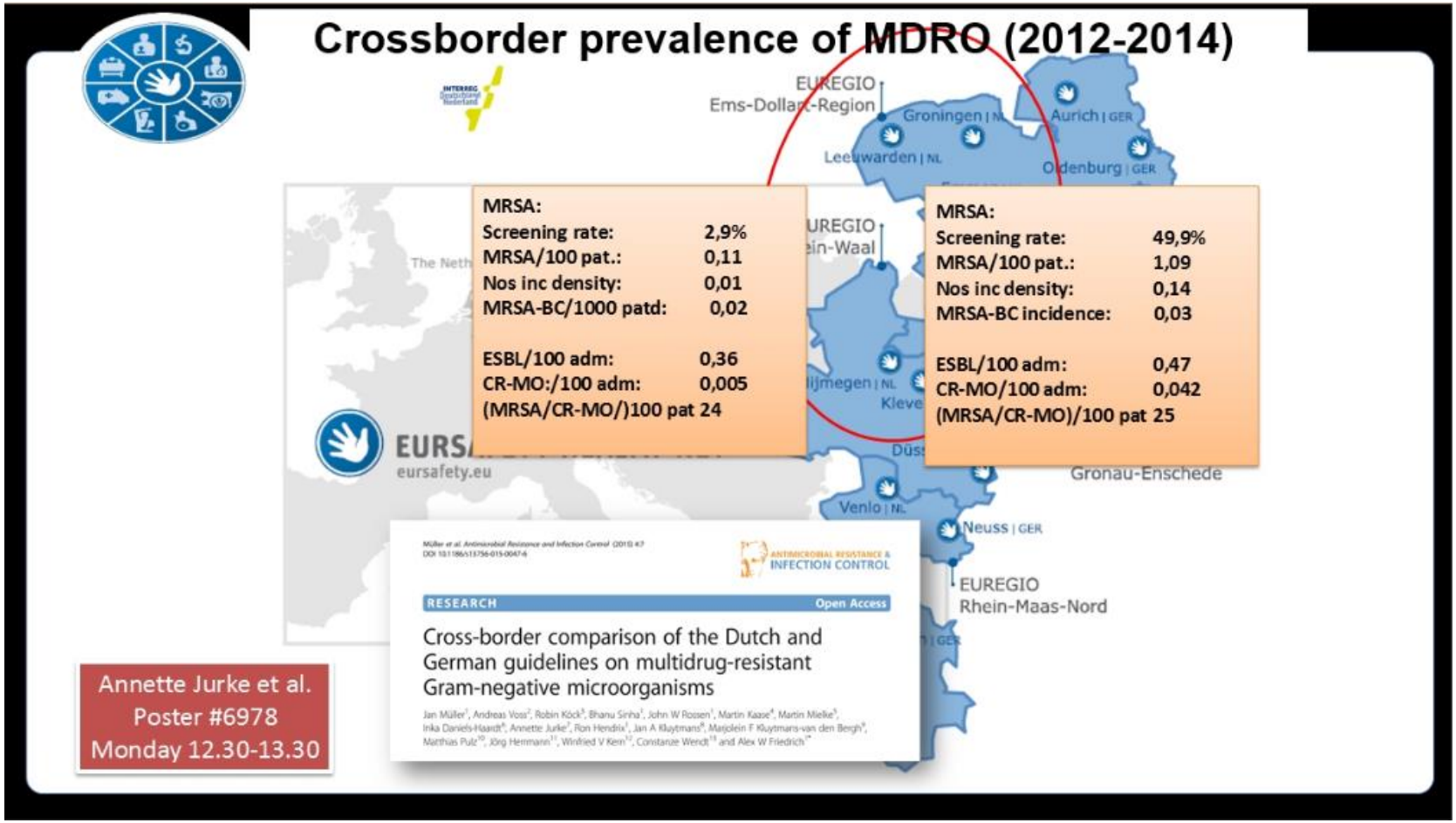
#E031 *Alexander W. Friedrich*

Essentials to reduce cross-border MRSA spreading

EU border regions

#E031 *Alexander W. Friedrich*

Essentials to reduce cross-border MRSA spreading



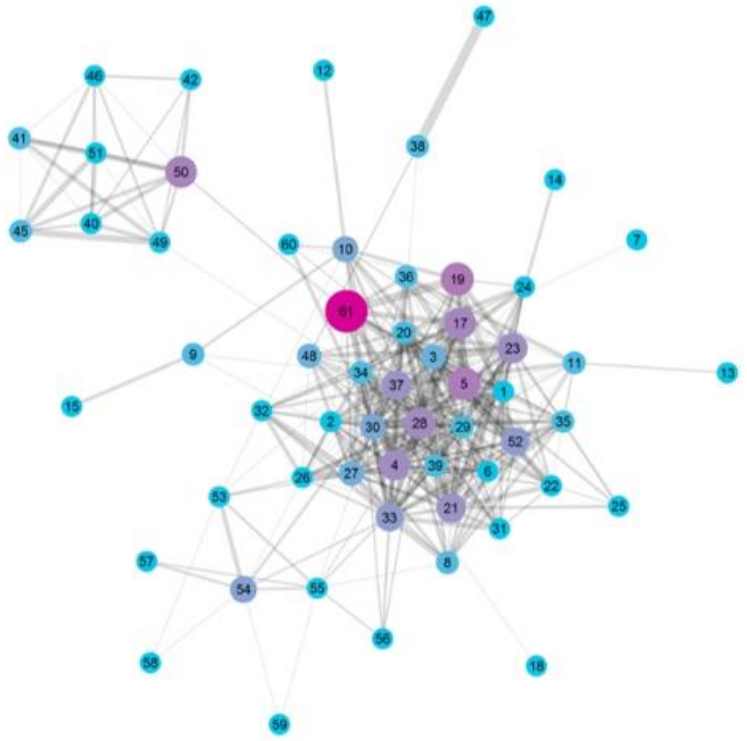
#E031 *Alexander W. Friedrich*

Essentials to reduce cross-border MRSA spreading

Looking for the hub:
Network profiling of patient transfer at the University Medical Center Groningen

Centrality measures

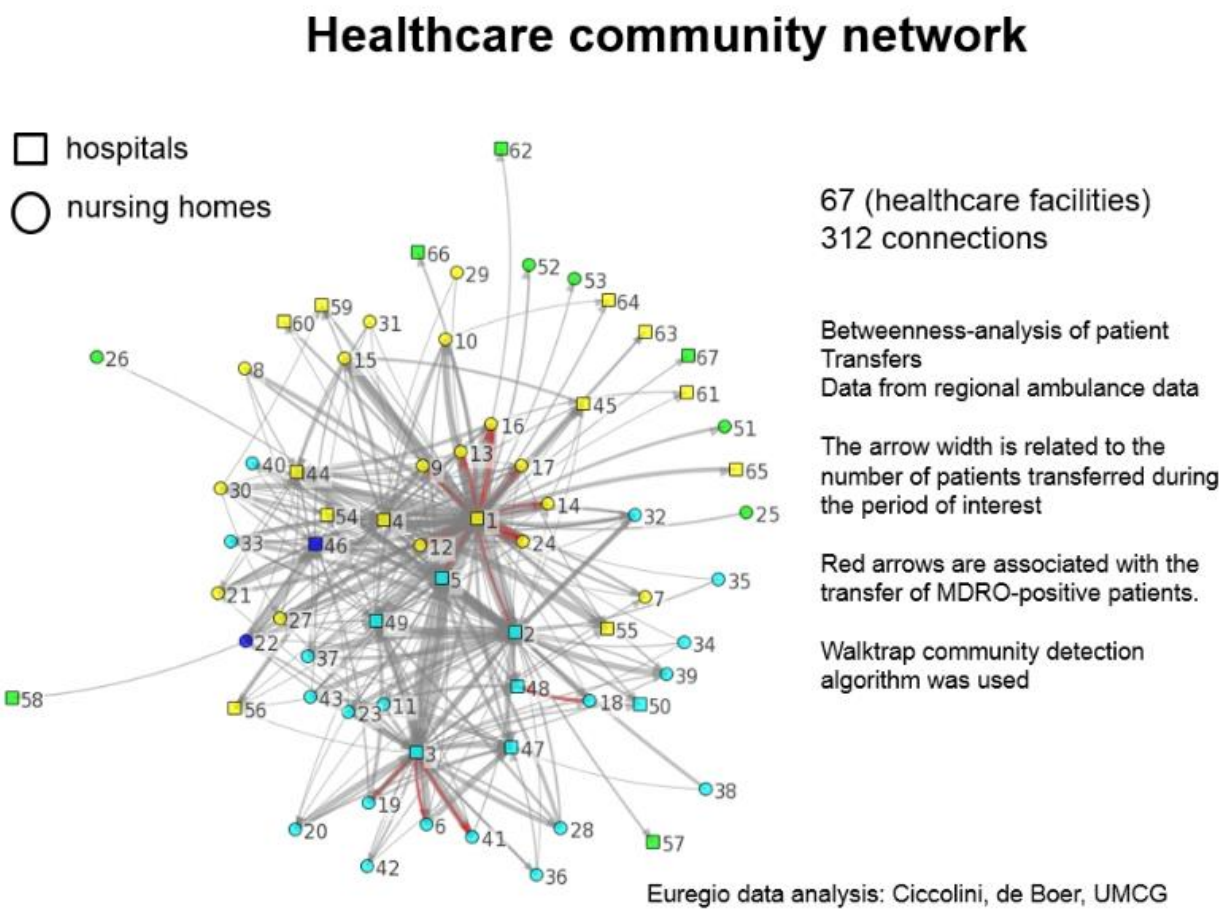
Color and size by weighted betweenness centrality



Top ten care units:

#E031 *Alexander W. Friedrich*

Essentials to reduce cross-border MRSA spreading

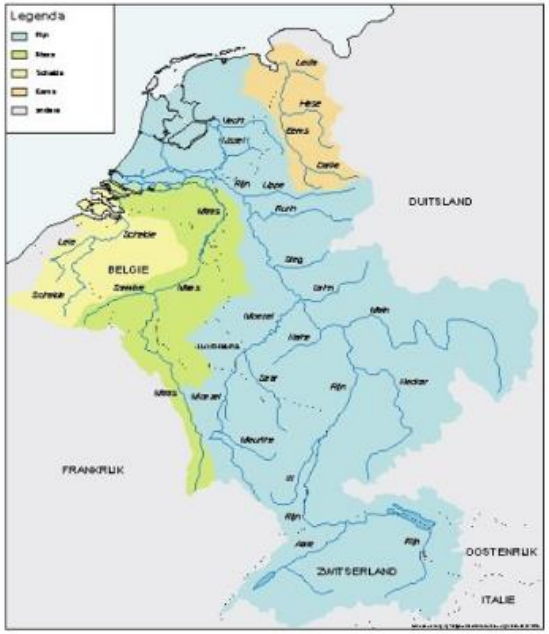


#E031 *Alexander W. Friedrich*

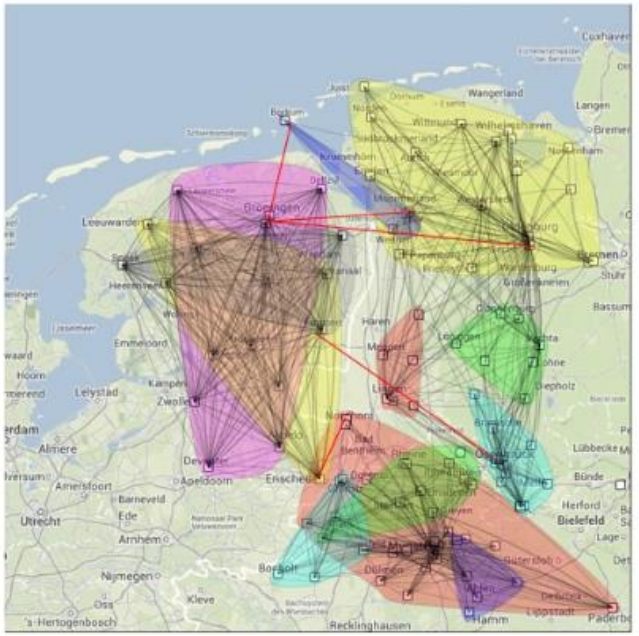
Essentials to reduce cross-border MRSA spreading

MDRO follow their carriers

Natural water flow



Natural patient flow



#E031 *Alexander W. Friedrich*

Essentials to reduce cross-border MRSA spreading

Conclusion

- **Crossborder** thinking in **Networks**
  - Collaborate within your regional healthcare network
  - Start at the hub-hospitals
- **Using Interventional microbiology**
  - Screening as startingpoint of action
  - Outbreak investigation
  - euregional qualification process
- **Take Action: CRE-free Euregio!**
  Collaboration between people, not countries

Prevention of ventilator-associated pneumonia

PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA

Ventilator-Associated Pneumonia as a Quality Indicator for Patient Safety?

Ilker Uçkay,[1] Qanta A. Ahmed,[2] Hugo Sax,[1] and Didier Pittet[1]

[1]Infection Control Program, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland; and [2]Division of Pulmonary and Critical Care Medicine, Allergy and Clinical Immunology, Medical University of South Carolina, Charleston

CID 2008

NO

Benchmarking VAP rates as outcome parameters between institutions is hazardous and potentially misleading. However, evidence-based process indicators for the prevention of VAP can serve as quality indicators. Structure and outcome indicators can be of additional use. Beyond the detection of outbreaks and feedback of results, a well-defined surveillance system is necessary to monitor, benchmark, and validate all these efforts, with the overall objective being the reduction of the incidence of VAP and the improvement of patient safety and quality of care.

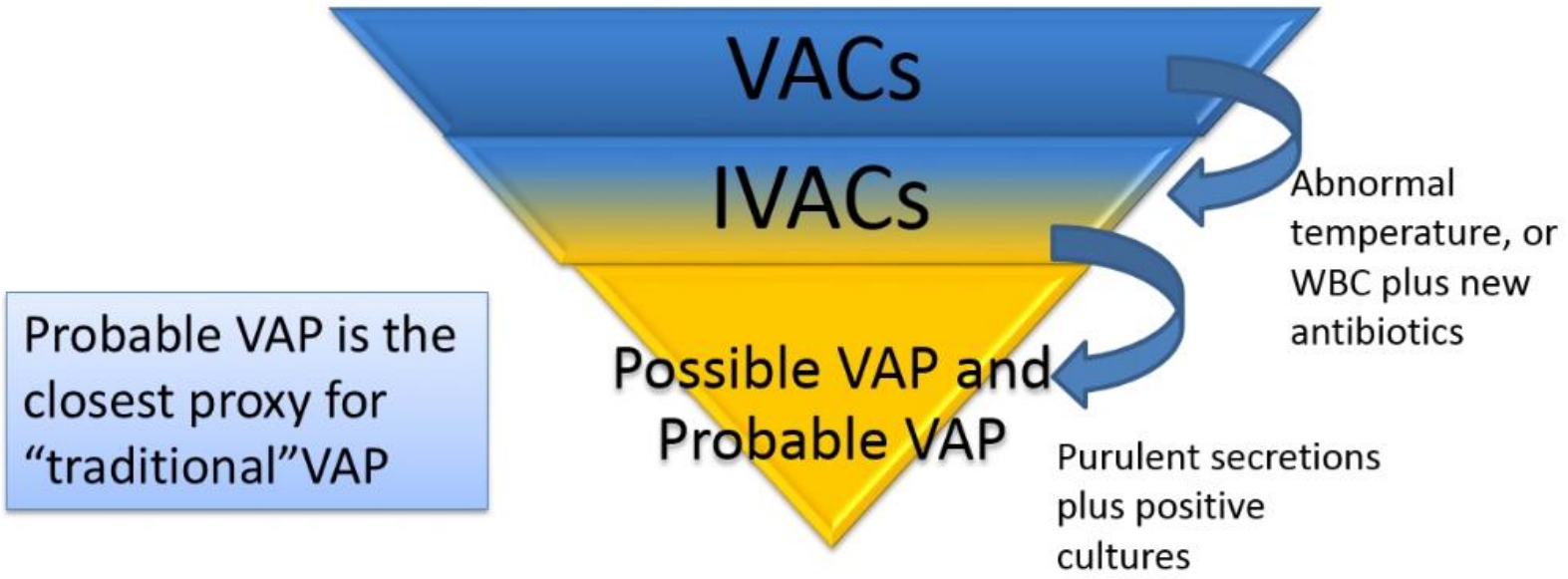
- No "gold standard" diagnosis
- No standardized severity scale
- Complex and often inaccurate surveillance method

#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

New surveillance definitions on board……

3 DEFINITION TIERS



Prevention of ventilator-associated pneumonia

New surveillance definitions on board……

- VAE (VACs) were designed only for adult patients
- VACs are currently the recommended by the CDC metric for ventilated patients
- VAC and IVAC are appropriate for public reporting
- Possible and probable VAP definitions are developed to be used by healthcare facilities for internal quality improvement
- The existing literature and guidelines for VAP prevention is the best available tool to improve outcome for ventilated patients
- Existing recommendations for VAP prevention have little data regarding their impact on VAC and IVAC. May not be sufficient to reduce VAE rates

#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

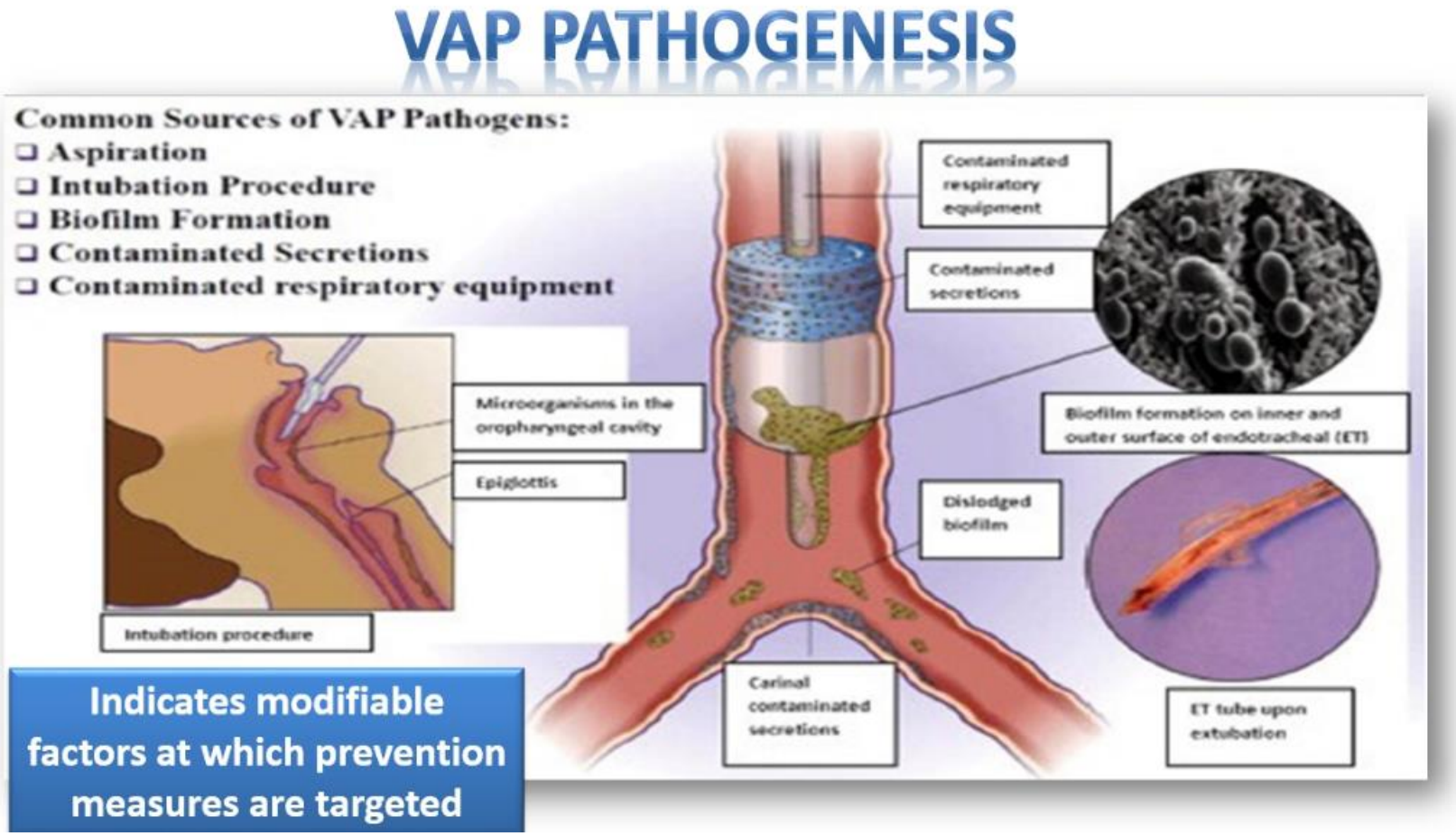
IS VAP PREVENTABLE?

- Because of its importance and impact on morbidity in ICU patients, VAP prevention was included in the IHI campaign to save 100,000 (and 5 million) lives.
- Preventing measures in studies were able to reduce VAP rates. In USA there is a striking decline of VAP (4.9 to 1.4 events /1000 vent. days)
- Zero VAP for the moment is an "artifact" of the old surveillance definition (which has low sensitivity)

Klompas Curr Opin Infect Dis 2012

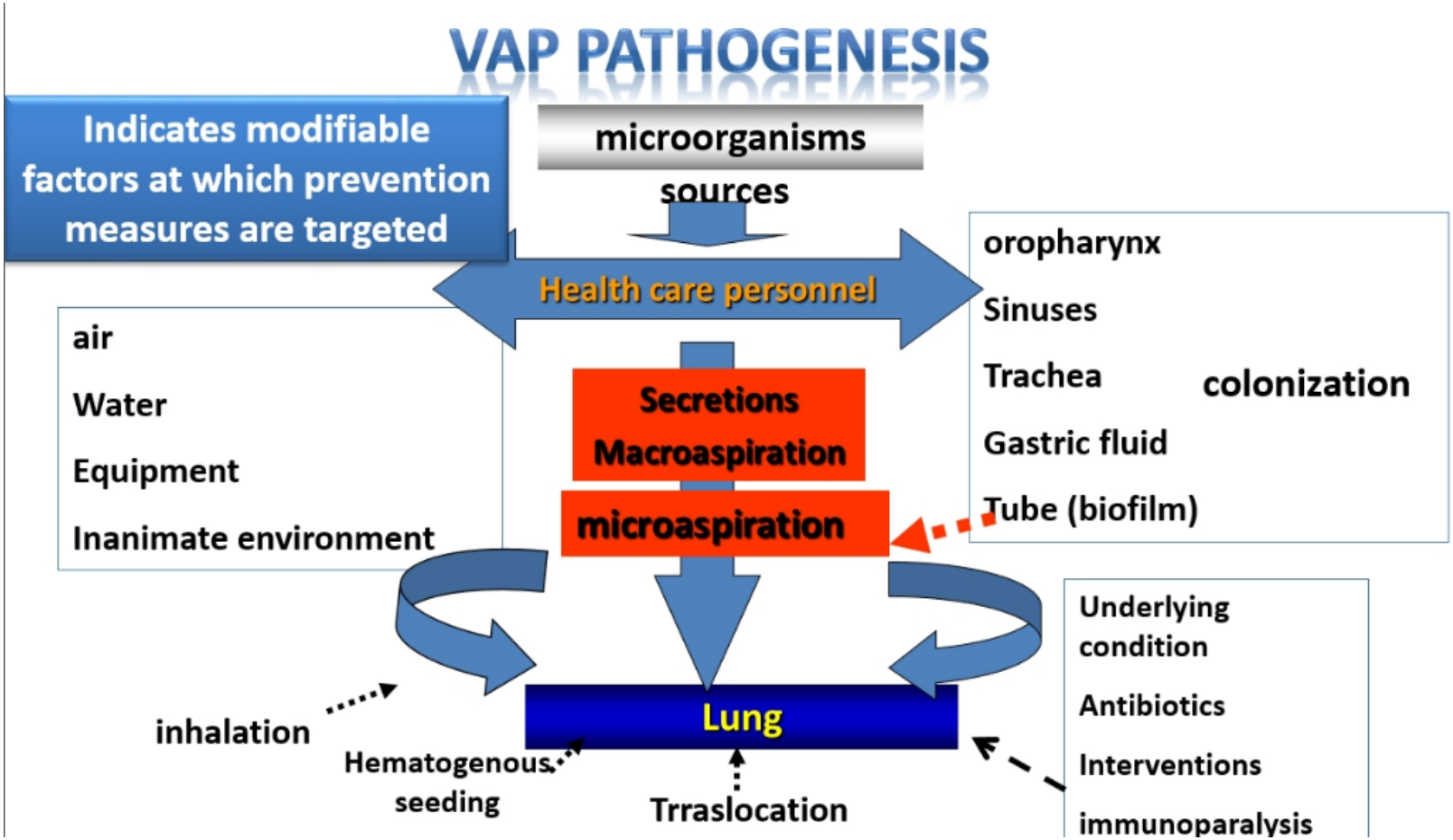
#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia



#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia



#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

VENTILATOR-ASSOCIATED PNEUMONIA

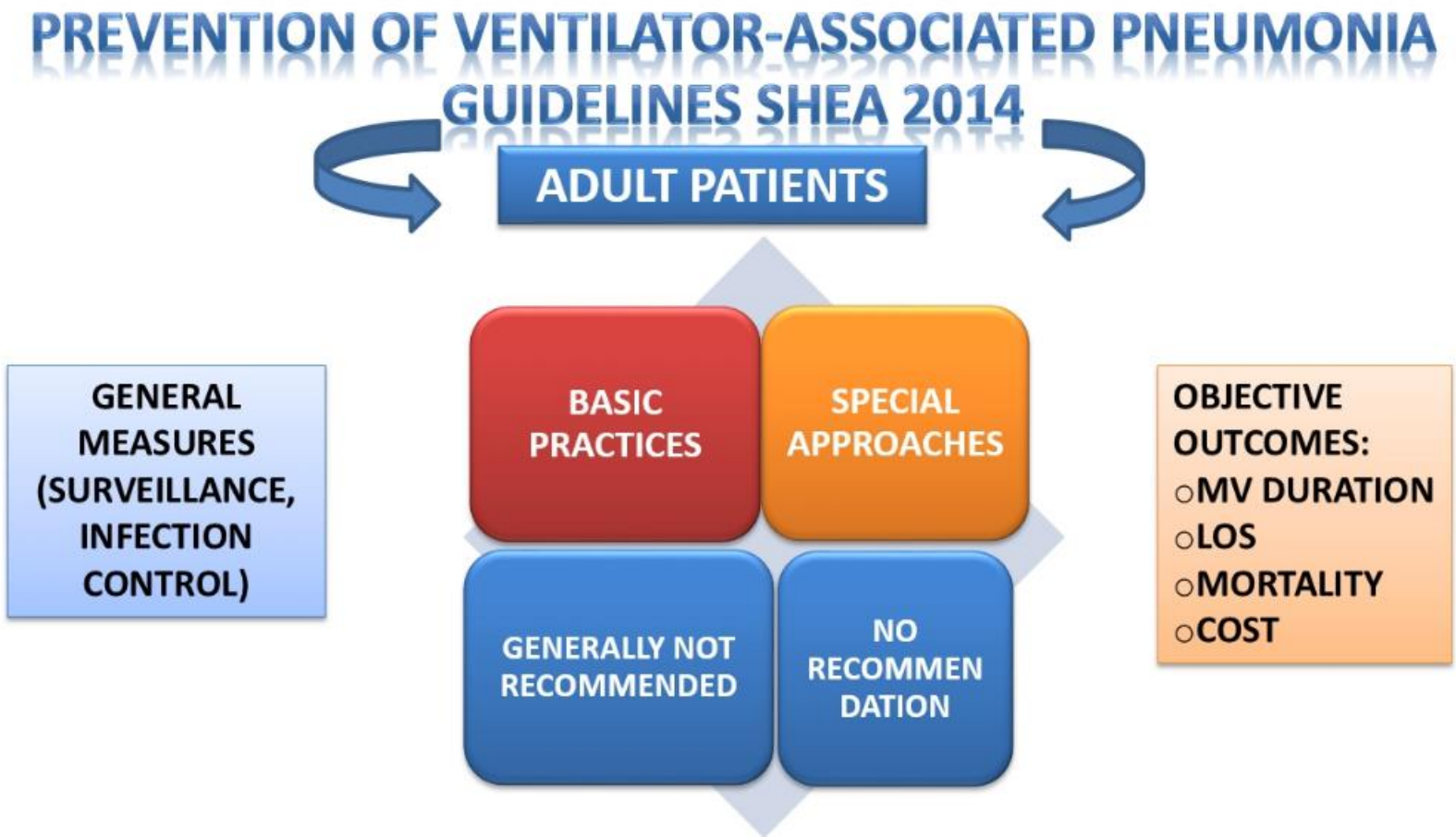
- Defining event for the risk of VAP is intubation (X6-20 times)
- The risk is highest during the first week after intubation, declining after day 10

- **3%/day the first 5 days post intubation**
- **2%/day 6-10 days post intubation**
- **1%/day 11-15 days post intubation**
- **Declining incidence thereafter**

AJRCCM, 15 Feb 2005

#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia



#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA TAKE HOME MESSAGE

- Intubation and mechanical ventilation put the patients in high risk of complications, one of which is ventilator associated pneumonia, with high morbidity, considerable mortality and cost

- Current VAP definitions are subjective, not specific and limit the value of VAP surveillance as a benchmark of improving patient care

- New definitions have been proposed after 2012 by the CDC, recording Ventilation associated Events or Conditions, based on alteration of patient's oxygenation and ventilator's indications

#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA TAKE HOME MESSAGE

- VAP possible and probable are a subgroup of Infectious VACs
- They should be recorded only for internal quality assessment
- VAP prevention guidelines, recently updated in USA, are referred to VAP defined by the old, traditional definitions, aiming at reducing not only VAP incidence, but mainly objective outcome measures: duration of MV, length of hospital stay, mortality and cost

#E030 *Anastasia Antoniadou*

Prevention of ventilator-associated pneumonia

PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA TAKE HOME MESSAGE

- A measure is recommended for the prevention of VAP, if by high or moderate quality evidence can record a change in objective outcome measures

- General, Basic and Special strategies are included in the guidelines, based on modifiable risk factors for VAP

- Implementation strategies are also discussed. VAP bundles are yet to be proved if they will be the most effective implementation strategy, and no consensus exists about which and how many processes to include in a bundle

#E030 *Anastasia Antoniadou*

Single rooms and private toilets as a standard of care

- Presentation not available

#E032 *Marjolein Kluytmans*

Different bundles to prevent infection due to Gram-positive and Gram-negative MDR bacteria?

- Presentation not available

#E026 *Evelina Tacconelli*

MDR screening for isolation and decolonization

Take home questions

- Are you looking for CPE carriers in patients transferred from endemic regions?
- Is your clinical micro laboratory able to detect OXA & KPC & NDM producers?
- Should there be a common control policy in your country?
- To be prepared, we must:
  1. Be aware of the existence of the threat
  2. Be able to detect it
  3. Be able to prevent it in our hospitals

#E027 *Stephan Harbarth*

MDR screening for isolation and decolonization

The Dutch strategy: CPE control preparedness

Principle components:

- Early warning and coordinated action
- Good microbiology with rapid feedback
- Regional networks of microbiology laboratories with expertise and regional mandate
- Includes hospitals, LTCF's, NH's, General Practionners and Public Health
- Funding for control of outbreaks and screening

Courtesy: J. Kluytmans

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HUG Hôpitaux Universitaires de Genève

#E027 *Stephan Harbarth*

Air in the operating room: back to the future?

Jean-Christophe Lucet
Infection Control Unit
Bichat – Cl Bernard Hospital
Paris 7 Denis Diderot University,

ECCMID, April 9, 2016

Disclosure : none for this prese

Preventive Measures

- Preoperative :
  - Skin preparation:
    - Hair removal? No, or clipper
    - Preoperative shower/toilet? Maybe
  - Nasal decontamination? Yes, in high-risk clean surgery
- Peri-operative:
  - Surgical prophylaxis? Yes
  - Skin preparation? CHG-alcohol
  - Adequate homeostasis? Yes, at least in colorectal surgery
  - Discipline In the operating room (scrub, mask, movements, …) ??
  - Ventilation: LAF or turbulent airflow ??
- Post-operative measures:
  - SSI surveillance? Yes

Preventive Measures

- Preoperative :
  - Skin preparation:
    - Hair removal
    - Preoperative shower/toilet
  - Nasal decontamination (*S. aureus*)
- Peri-operative:
  - Surgical prophylaxis
  - Skin preparation
  - Adequate homeostasis (glycaemia, temperature, oxygenation, …)
  - Discipline In the operating room (scrub, mask, movements, …)
  - Ventilation: LAF or turbulent airflow?
- Post-operative measures:
  - SSI surveillance

Preventing SSI: Laminar Airflow

Rationale for laminar airflow : microbiological approach

- 105 procedures:

  → Airborne contamination x 20 in conventional OR/LAF

  (Hansen D et al, Int J Hyg Environ Health 2005)

- Settle plates (CFUs) during 80 orthopaedic procedures:

  → Small LAF ~ conventional OR > Large LAF

  (Diab-Elschahawi M et al, Am J Infect Control 2011)

- 180 air samples, 60 procedures (cardiac or THR/TKR):

  → Higher bacterial counts with turbulent airflow

  (Birgand G et al, AJIC 2015)

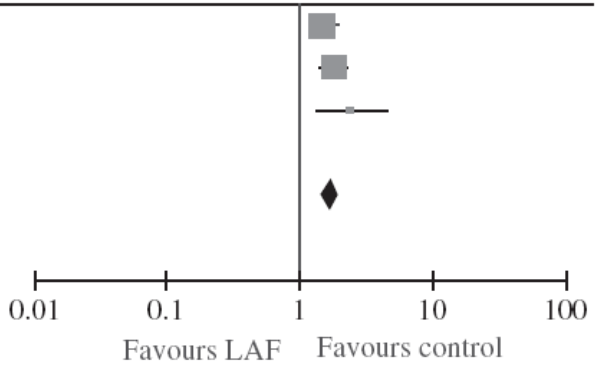
Laminar Airflow in the Real Life?

THR (110 000 procedures)

Study or Subgroup	Risk Ratio M-H, Random, 95% CI
Brandt et al.[13]	1.52 [1.20, 1.92]
Breier et al.[3]	1.83 [1.43, 2.34]
Hooper et al.[2]	2.42 [1.35, 4.32]
Total (95% CI)	1.71 [1.45, 2.01]
Total events	

Heterogeneity: Chi² = 2.66, df = 2 (P = 0.26); I² = 25%

Test for overall effect: Z = 6.47 (P < 0.00001)

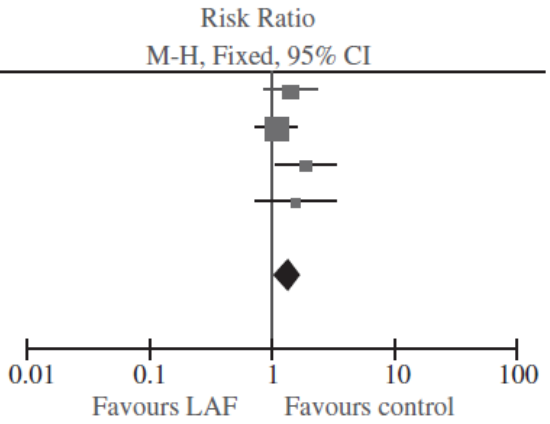


TKR (75 000 procedures)

Study or Subgroup	Risk Ratio M-H, Fixed, 95% CI
Brandt et al.[13]	1.42 [0.87, 2.32]
Breier et al.[3]	1.09 [0.74, 1.60]
Hooper et al.[2]	1.92 [1.10, 3.34]
Miner et al.[12]	1.57 [0.75, 3.29]
Total (95% CI)	1.36 [1.06, 1.74]
Total events	

Heterogeneity: Chi² = 2.91, df = 3 (P = 0.41); I² = 0%

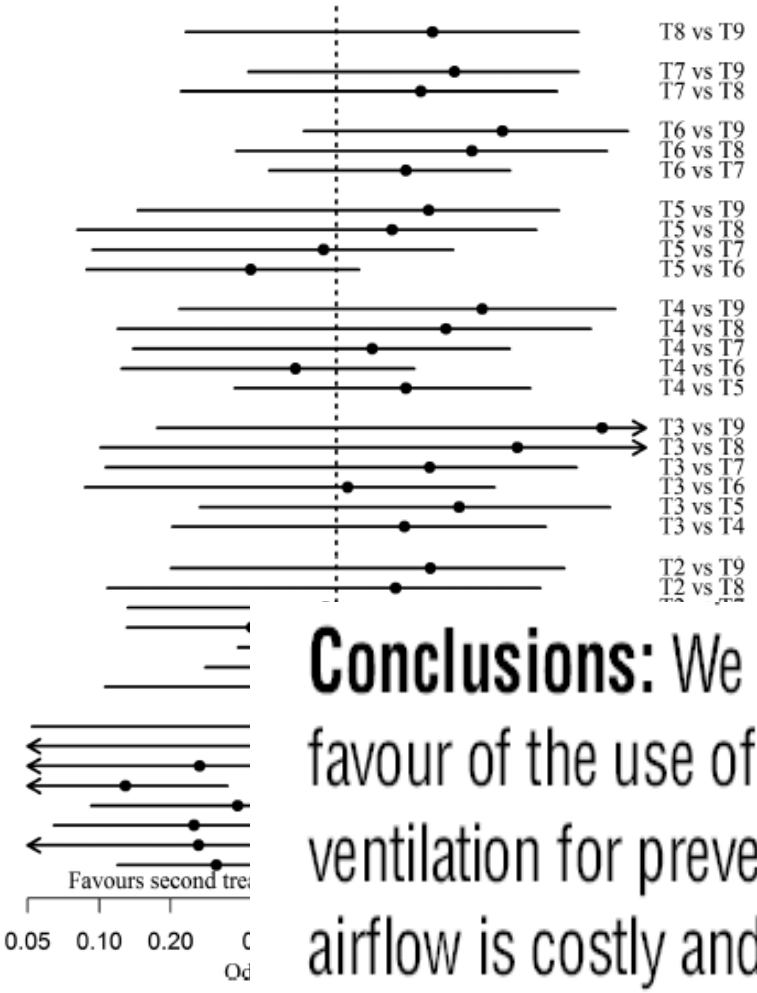
Test for overall effect: Z = 2.42 (P = 0.02)



Gastmeier P at al, J Hosp Infect 2012

Laminar Airflow in the Real Life?

Meta-analysis of control strategies, THR-related SSI, 12 studies



Mixed treatment comparison

- Interventions :
  - Surgical antibiotic prophylaxis
  - Cement with ATB
  - Ventilation

T1 : no intervention

T2 : **SAP**, Std cement, Std ventilation

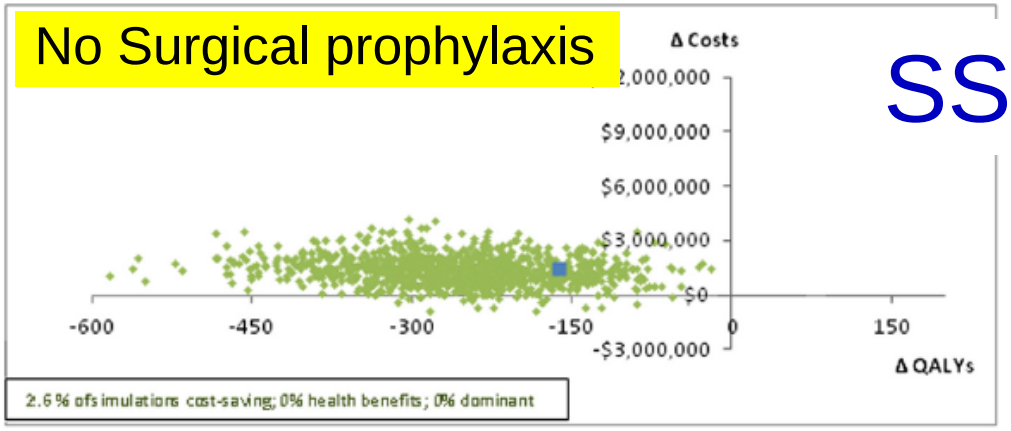
T6 : **SAP, AB cement**, Std ventilation

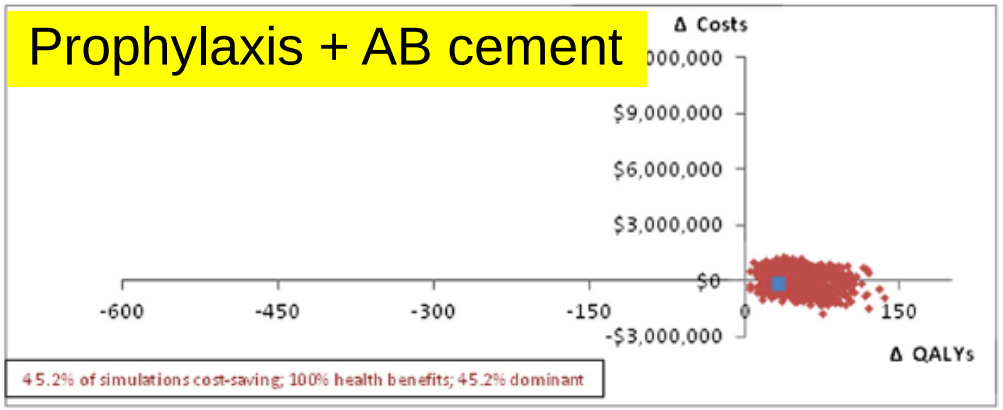
T9 : **SAP, AB cement, LAF**

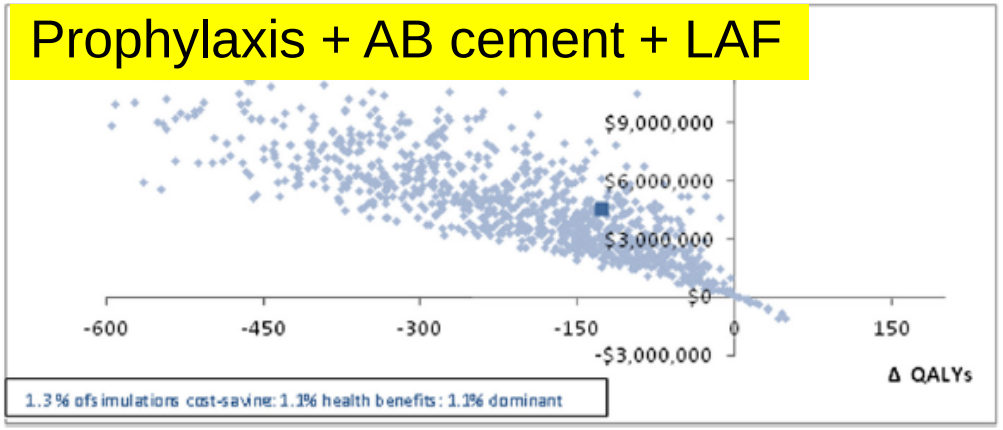
Conclusions: We found no convincing evidence in favour of the use of laminar airflow over conventional ventilation for prevention of THR-related SSIs, yet laminar airflow is costly and widely used. Antib

SSI: Laminar Airflow?

Cost-effectiveness of LAF for THR





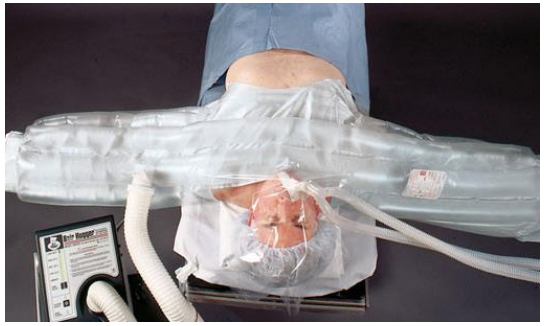


Merollini KMD et al, Am J Infect Control 2013

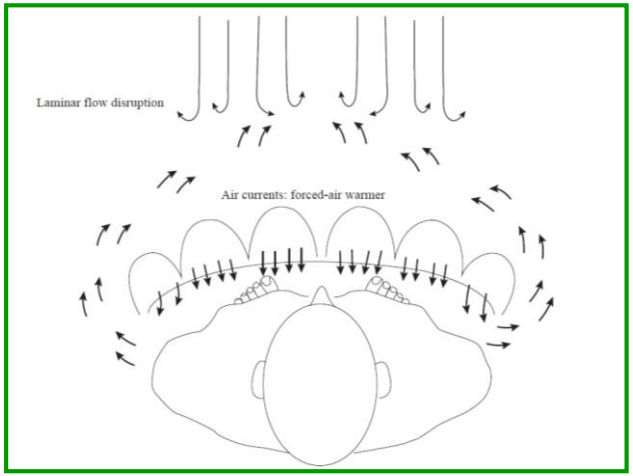
Preventing SSI: Laminar Airflow

Role of forced air warming?

- Temperature gradients
- FAW disrupts ventilation airflow
- Air from floor level transported to the surgical site



→Eddies
→More unclean air under the LAF
→ Increased SSI rate ? *(McGovern PD et al, JBJS 2011)*



Wood AM et al, J Hosp Infect 2014

Conclusions

- “Technical” risk factors are better controlled
- The best laminar airflow cannot correct flaws under the flow
- Behavioural aspects in the operating room appear critical for controlling the SSI risk and other adverse events
- But :
  - Still not solid scientific data
  - Need for defining what are the priorities for decreasing infectious risk in the OR (door opening vs overshoes!)
  - i.e. what falls under infectious risk vs discipline in the OR?
  - No precise recommendation so far
- Bundling also required in the operating room

Ways to improve antibiotic surgical prophylaxis

Goals of antimicrobial surgical prophylaxis

1. **Use antimicrobials for all operations in which there is evidence that their use in prophylaxis can reduce SSI rates**

2. **Use an antimicrobial that is safe, inexpensive, and bactericidal, and with a spectrum covering the most probable intra-operative contaminants**

3. **Warrant a bactericidal concentration of the antimicrobial in serum and tissue by the time of incision**

4. **Maintain therapeutic levels of the antimicrobial in both serum and tissue throughout the operation and for few hours after its closure in the operating room.**

#E029 *Nicola Petrosillo*

Ways to improve antibiotic surgical prophylaxis

Vancomycin in prophylaxis

- **Vancomycin prophylaxis should be considered for patients with known MRSA colonization or at high risk for MRSA colonization in the absence of surveillance data (e.g. patients with recent hospitalization, nursing home resident, hemodialysis patients)**

- **Vancomycin may be included in the regimen of choice when a cluster of MRSA cases (e.g., mediastinitis after thoracic surgery) and MR CNS SSIs have been detected at an istitution.**

- **Data suggest that vancomycin is less effective than cefazolin against MSSA, so vancomycin is used in combination with cefazolin at some institutions with both MSSA and MRSA SSIs.**

SHEA The Society for Healthcare Epidemiology of America IDSA

Bratzler DW et al. Am J Health-Syst Pharm 2013

#E029 *Nicola Petrosillo*

Ways to improve antibiotic surgical prophylaxis

Duration: always one shot, one day?

Antibiotic prophylaxis in cardiac surgery: systematic review and meta-analysis

Prophylaxis duration

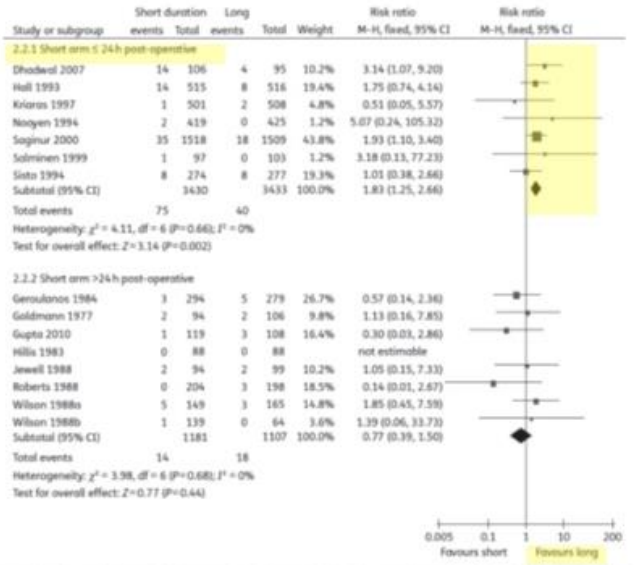


Figure 4. Deep sternal wound infection in trials comparing short prophylaxis duration versus longer duration, stratified by duration of prophylaxis in the short arm.

Shorter duration prophylaxis was associated with a higher rate of deep sternal wound infections (OR= 1.83) - the difference originated from studies in which the short-duration arm was <=24 h post operation.

No difference when the short-duration arm was 48 h

Lador A et al. J Antimicrob Chemother 2012; 67:541-50

#E029 *Nicola Petrosillo*

Ways to improve antibiotic surgical prophylaxis

Improving the pharmacokinetics

- **Since 1989 it is known that in obese patients undergoing gastric surgery, serum and tissue levels of cefazolin were consistenly below the MIC for pathogens causing SSI in patients who received one-gram vs two-gram prophylaxis** (Forse RA et al. Surgery 1989; 106: 750-6)

#E029 *Nicola Petrosillo*

Ways to improve antibiotic surgical prophylaxis

Appropriateness of Surgical Antimicrobial Prophylaxis in the Latium Region of Italy, 2008: A Multicenter Study

- **They assessed SAP appropriateness in a regional prospective multicenter study on the basis of the agreement of the Surgical Care Improvement Project indicators (SCIP-Inf) with Italian guidelines (GL).**

- **Prophylaxis was administered in 2,664 of 2,835 procedures (94%): In 2,346 of 2,468 (95%) as indicated and in 318 of 367 (86.6%) in which they were not indicated.**

- **The SCIP-Inf1 (timing), SCIP-Inf2 (antibiotic choice), and SCIP-Inf3 (duration) were in agreement with GL in 1,172 (50%), 1,983 (84.5%), and 1,121 (48%) of 2,346 procedures, respectively.**

Pittalis S et al. Surg Infect (Larchmt) 2013;14:381-4

#E029 *Nicola Petrosillo*

Ways to improve antibiotic surgical prophylaxis

Systematic review and evidence-based guidance on perioperative antibiotic prophylaxis

ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

Perioperative antibiotic prophylaxis modality	Indicators for each modality
Modality #1: Multidisciplinary antimicrobial management teams	
Hospitals should establish a multidisciplinary AM team (including surgeons, anaesthesiologists, nurses, pharmacists, infection control specialists, and clinical microbiologists) who should develop and implement a protocol of appropriate PAP. *Compliance with this protocol should be audited regularly and the results should be fed back to the antimicrobial prescribers and decision-makers, e.g. chief of surgery, quality committee, AM team.* *The protocol should be reviewed and updated regularly. It should consider adjustment of PAP for patients who are at risk for SSI due to MDROs or who have a BMI over 30. The hospital's local antibiotic susceptibility patterns should also be taken into account.*	The presence of a multidisciplinary AM team which is responsible for developing, implementing and regularly updating the PAP protocol; in charge of regularly updating the local AB protocol; and responsible for regularly analysing and auditing compliance with appropriate PAP.
Modality #2: Responsibility for appropriate timing of perioperative antibiotic prophylaxis	
To ensure appropriate timing, antibiotic prophylaxis before and during surgery should be the responsibility of the anaesthesiologist*. ** This recommendation is supported by the best available evidence. If there is no anaesthesiologist available, another professional present at the time of surgery should be designated.*	Measurement of the presence of an anaesthesiologist or another designated professional at surgery who is responsible for applying PAP.
Modality #3: Timing of perioperative antibiotic prophylaxis	
PAP should be administered within 60 minutes before incision (except when administering vancomycin and fluoroquinolones), ideally at the time of anaesthetic induction.	Rate of compliance with the administration of PAP within 60 minutes.
Modality #4: Dosing and duration of perioperative antibiotic prophylaxis	
Although a single dose of PAP is preferred, subsequent doses should be given depending on the duration of the procedure and the half-life of the antibiotic, and if significant blood loss occurs during surgery.	Rate of compliance with indication, selection and dosage of PAP according to protocol.
Modality #5: Duration and termination of perioperative antibiotic prophylaxis	
Continuing antibiotic prophylaxis after the end of surgery is not recommended*. ** Hospitals should use a reminder/stop order system (e.g. computer system, checklist) in order to encourage appropriate duration and dosage of PAP.*	Rate of compliance with discontinuation of PAP within 24 hours after initiation of surgery.

2013

#E029 *Nicola Petrosillo*

Multidrug- and extremely drug-resistant Gram-negative bacilli: the storm is here

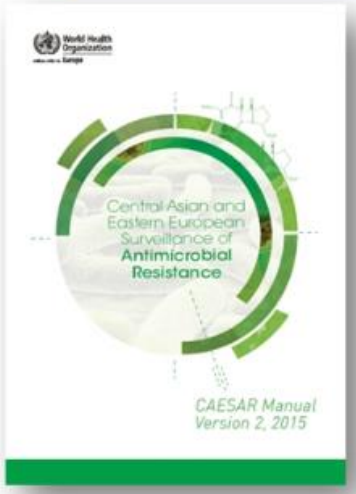
Carbapenemases 2016, a worldwide overview

- Presentation not available

#S202 *Giuseppe Cornaglia*

Antimicrobial resistance at European borders: the CAESAR project results

CAESAR Methodology



- EARS-net compatible
- Blood isolates

(S. pneumoniae, S. aureus, E. faecalis, E. faecium, E. coli, K. pneumoniae, P. aeruginosa, Acinetobacter sp.)

- Support/Feedback to countries

- AMR data
  - Level of evidence
  - Reader's guide
- EQA data
- Country progress on development national AMR surveillance systems

World Health Organization
REGIONAL OFFICE FOR Europe

http://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance

#S203 *Nienke van de Sande-Bruinsma*

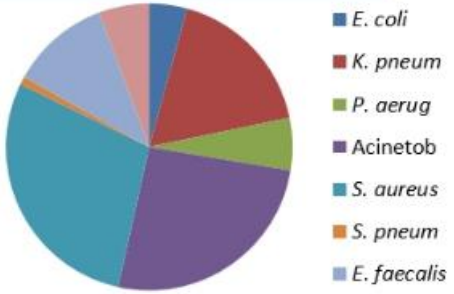
Antimicrobial resistance at European borders: the CAESAR project results

Belarus (n=1339)

Table 2. Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Belarus 2014

	E. coli		*K. pneumoniae*	
	N	*resistance (%)*	*N*	*resistance (%)*
Aminopenicillins (R)	45	87	NA	NA
3rd gen. Cephalosporins (R)	55	64	227	90
3rd gen. Cephalosporins (I+R)	55	71	227	90
Aminoglycosides (R)	54	37	211	85
Fluoroquinolones (R)	54	63	190	84
Fluoroquinolones (I+R)	54	63	190	84
Carbapenems (R)	53	2	229	52
Carbapenems (I+R)	53	6	229	56

NA = Not applicable
The aminopenicillins group consists of amoxicillin and ampicillin
The third generation cephalosporins group consists of cefotaxime, ceftriaxone, and ceftazidime
The aminoglycosides group consists of amikacin, gentamicin, and tobramycin
The fluoroquinolones group consists of ciprofloxacin, ofloxacin, and levofloxacin
The carbapenems group consists of imipenem and meropenem



Level of evidence		B
Surveillance System	Geographic coverage	+
	Hospital types	+
Sampling procedures	Selection of patients	-
	Sample size	+
Laboratory procedures	AST methods	+/-
	AST breakpoints	+/-

World Health Organization
REGIONAL OFFICE FOR Europe

#S203 *Nienke van de Sande-Bruinsma*

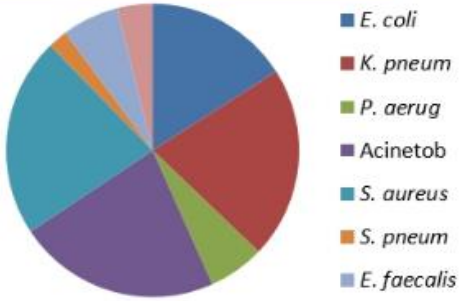
Antimicrobial resistance at European borders: the CAESAR project results

Serbia (n=1535)

Table 19. Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Serbia 2014

	E. coli		*K. pneumoniae*	
	N	*resistance (%)*	*N*	*resistance (%)*
Aminopenicillins (R)	224	74	NA	NA
3rd gen. Cephalosporins (R)	245	33	324	89
3rd gen. Cephalosporins (I+R)	245	36	324	89
Aminoglycosides (R)	243	33	288	77
Fluoroquinolones (R)	240	30	305	71
Fluoroquinolones (I+R)	240	33	305	75
Carbapenems (R)	244	1	325	34
Carbapenems (I+R)	244	1	325	37

NA = Not applicable
The aminopenicillins group consists of amoxicillin and ampicillin
The third generation cephalosporins group consists of cefotaxime, ceftriaxone, and ceftazidime
The aminoglycosides group consists of amikacin, gentamicin, and tobramycin
The fluoroquinolones group consists of ciprofloxacin, ofloxacin, and levofloxacin
The carbapenems group consists of imipenem and meropenem



Level of evidence		B
Surveillance System	Geographic coverage	+
	Hospital types	-
Sampling procedures	Selection of patients	+/-
	Sample size	+
Laboratory procedures	AST methods	+
	AST breakpoints	+

World Health Organization
REGIONAL OFFICE FOR Europe

#S203 *Nienke van de Sande-Bruinsma*

Antimicrobial resistance at European borders: the CAESAR project results

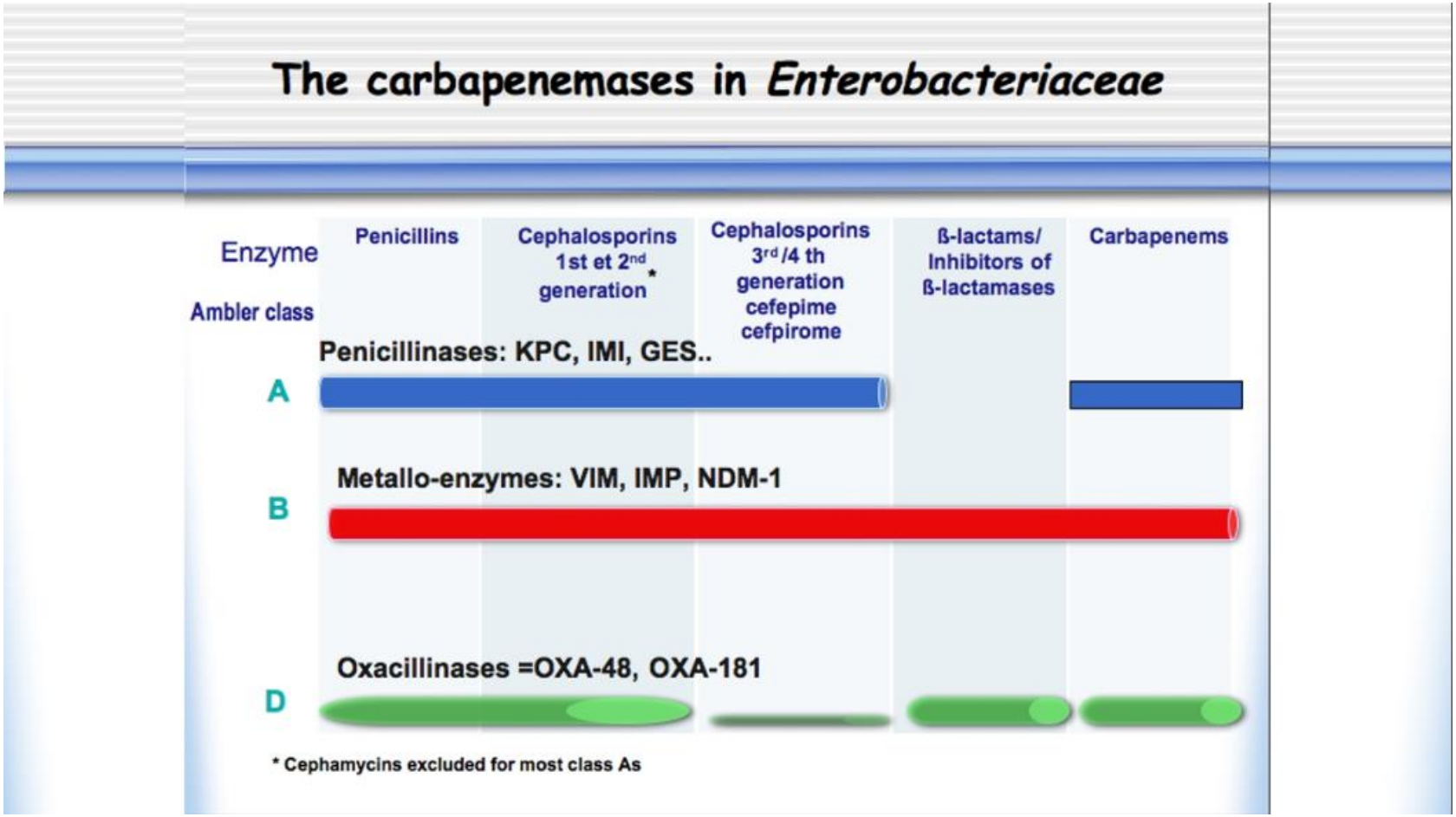
Conclusions

- High resistance levels reported
- Interpretation with caution, selective sampling → further strengthening national surveillance networks
- Indicating transmission of multi-resistant strains → Importance of Infection Prevention and Control

World Health Organization
REGIONAL OFFICE FOR Europe

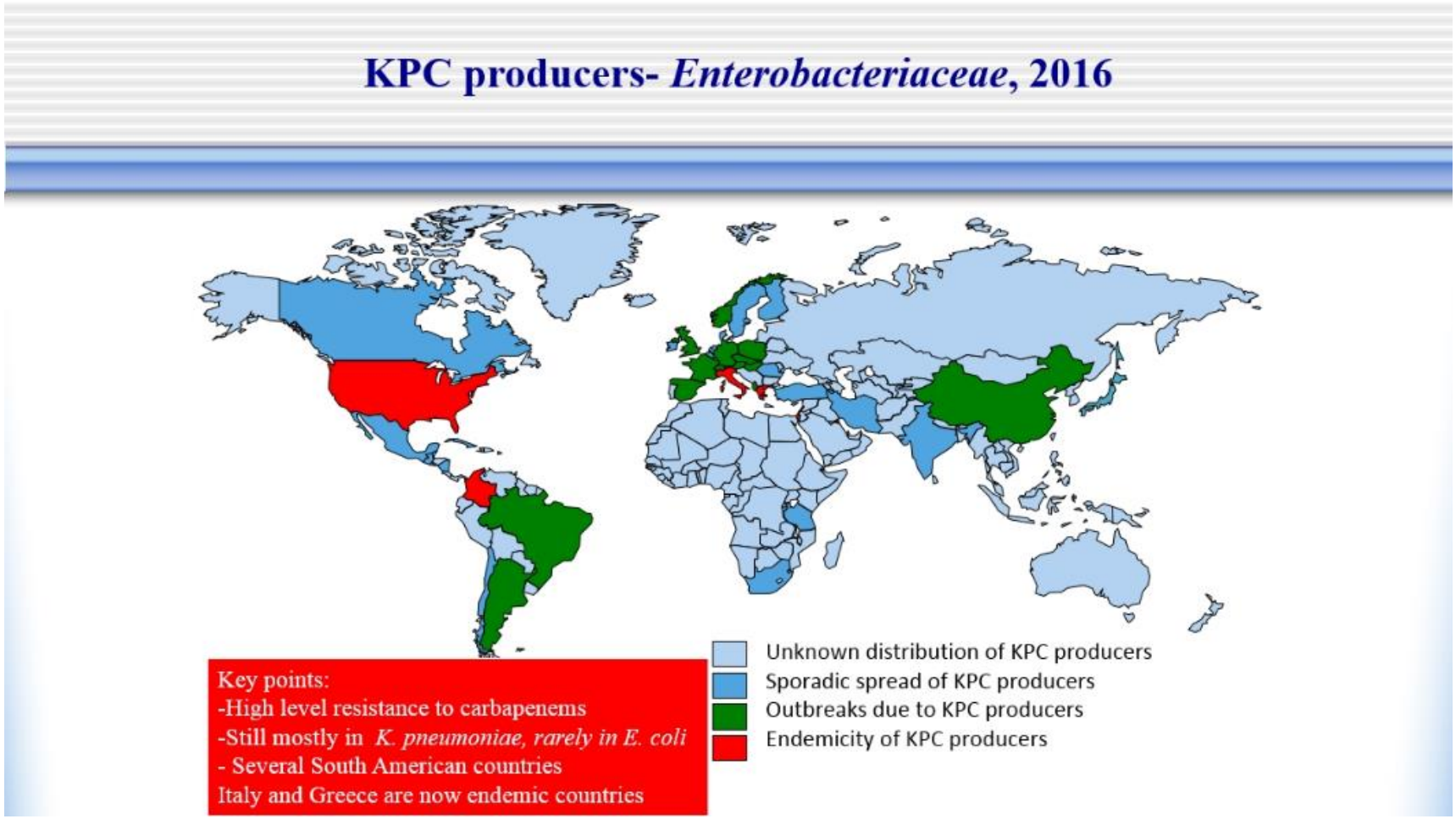
#S203 *Nienke van de Sande-Bruinsma*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



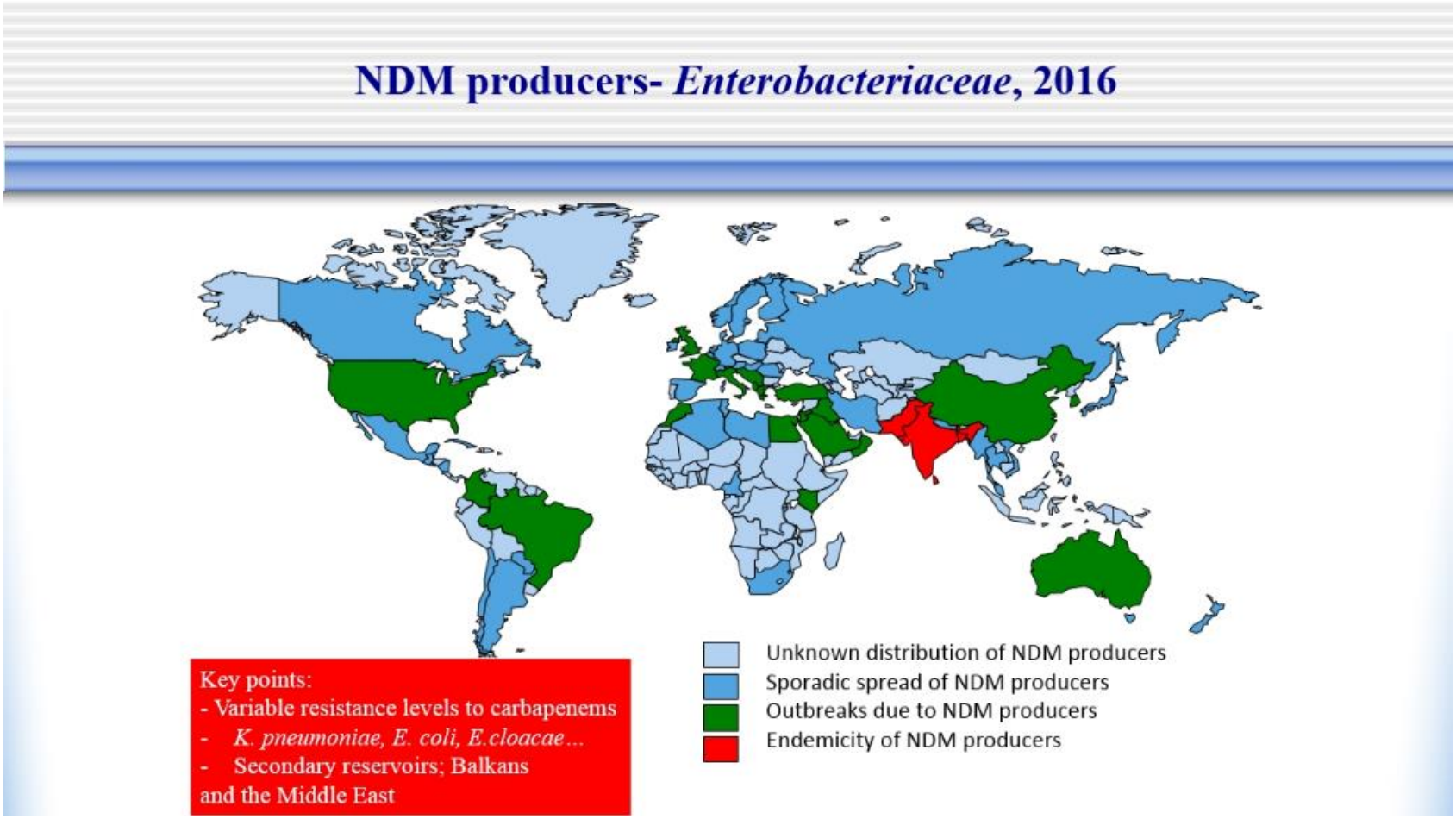
#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



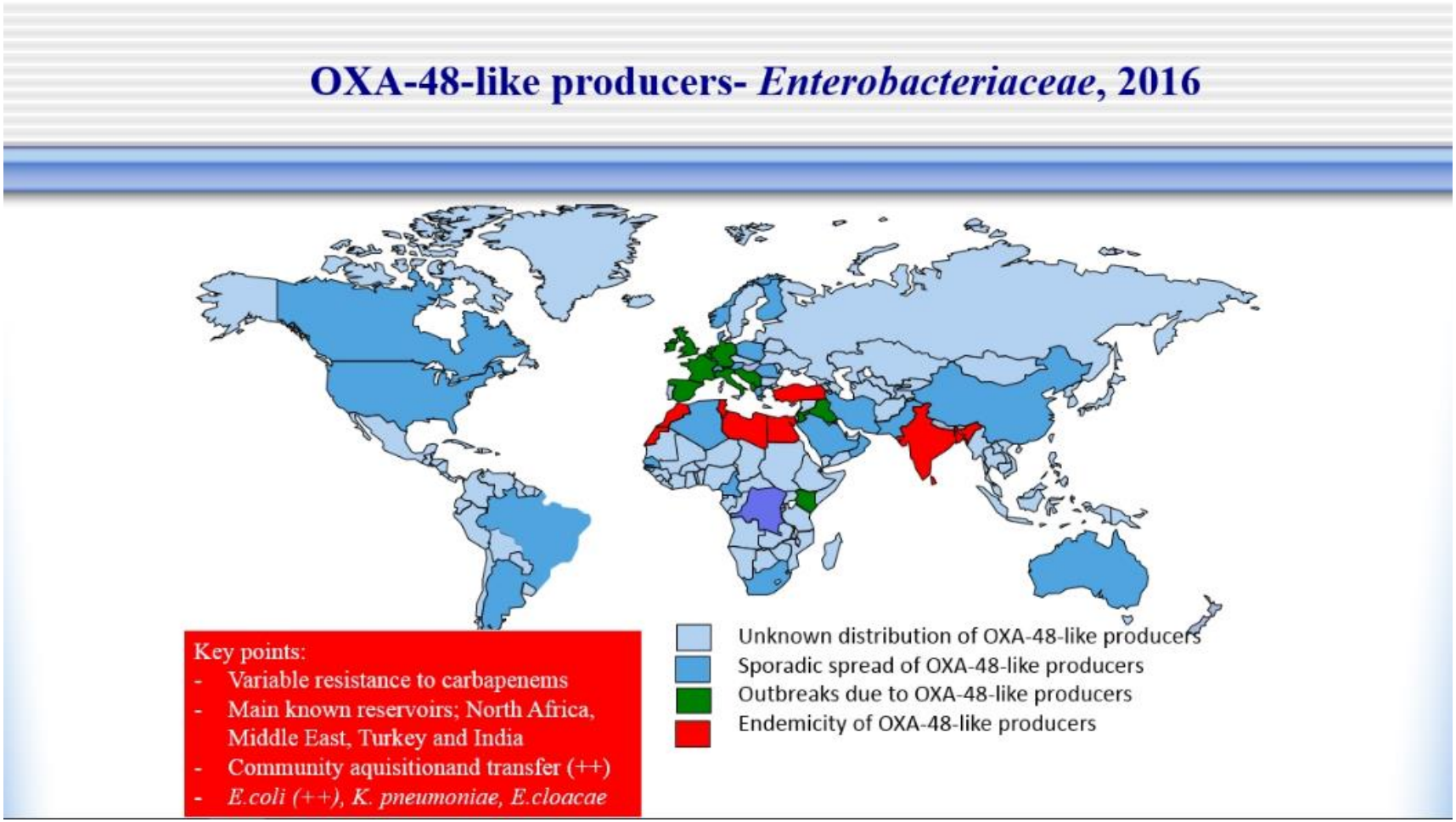
#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



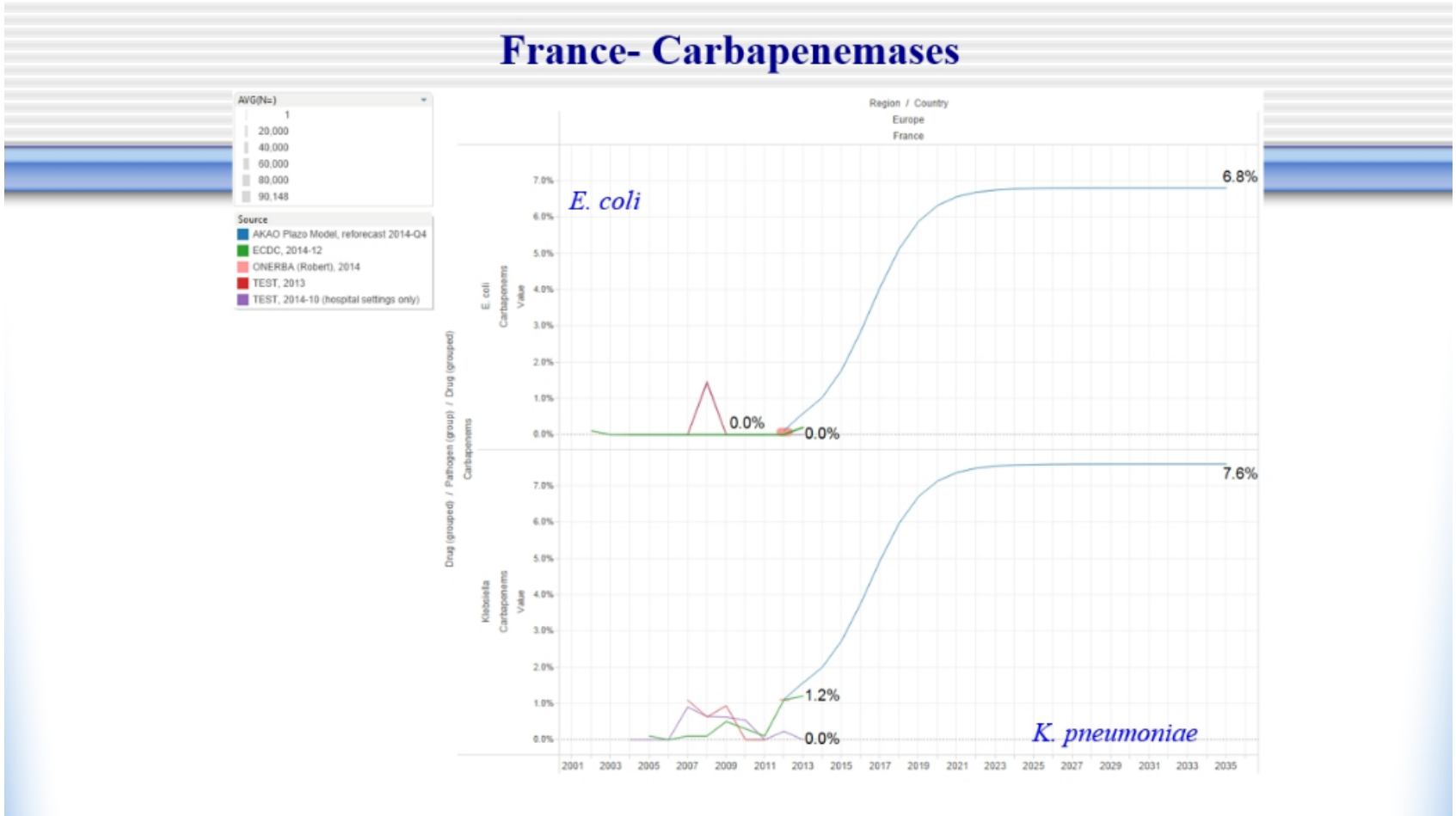
#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



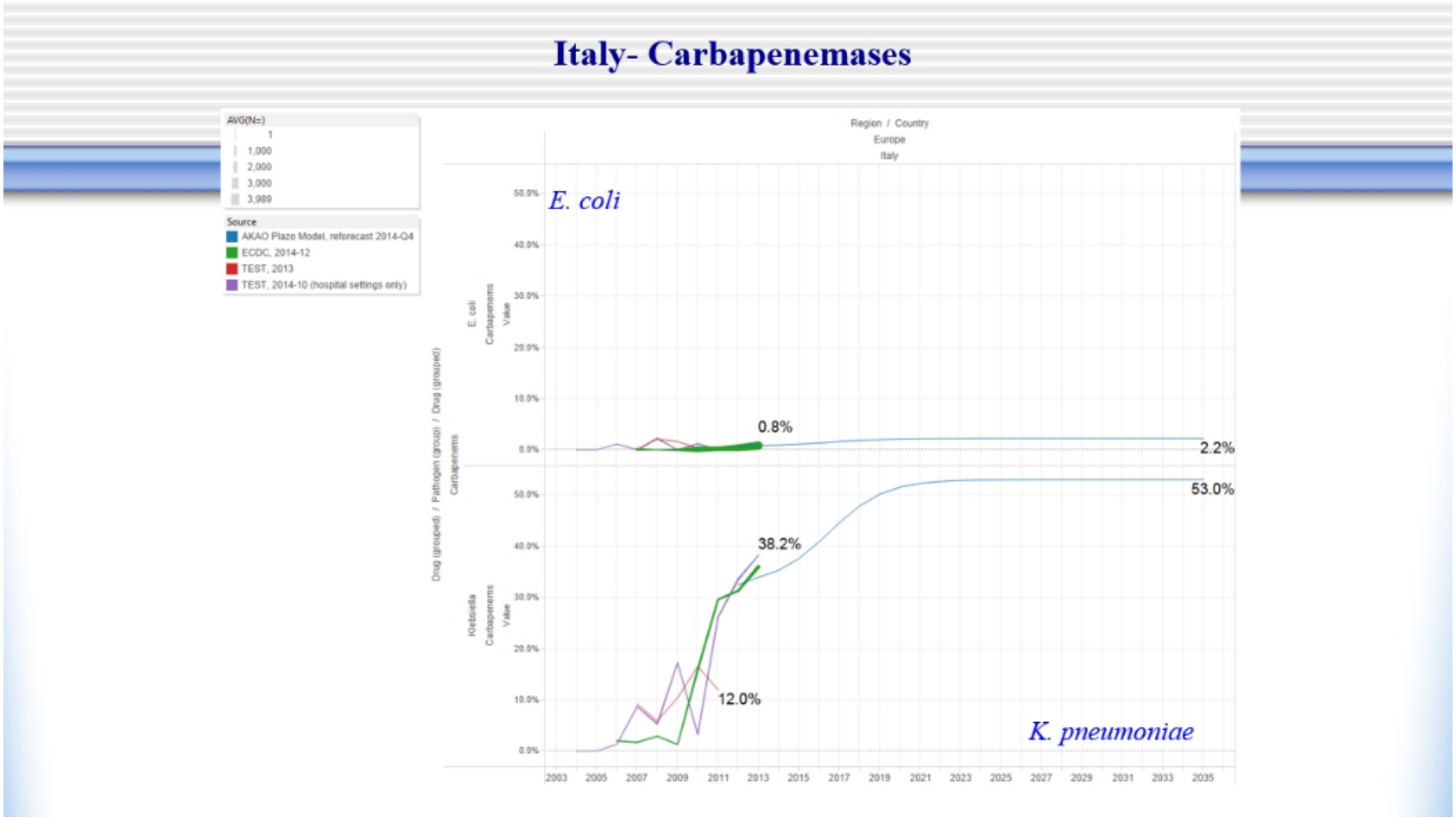
#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



#S204 *Patrice Nordmann*

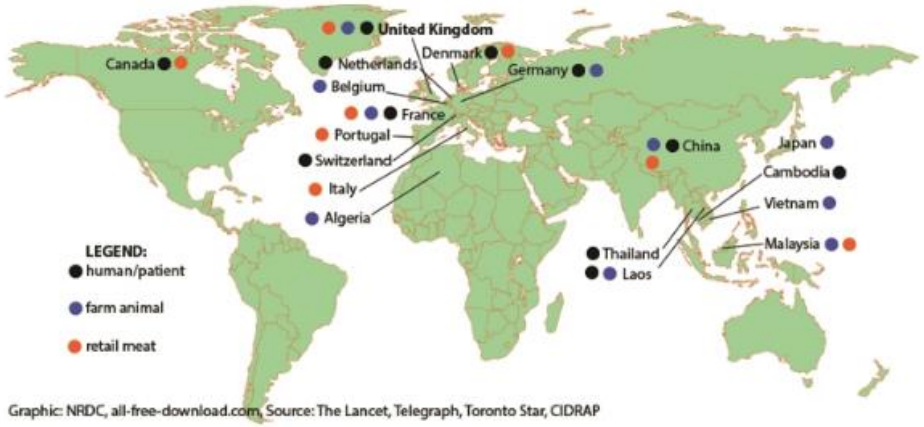
Epidemiology of multi/extreme drug resistance in Enterobacteriaceae



#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae

MCR-1-producing bacteria worldwide



#S204 *Patrice Nordmann*

Epidemiology of multi/extreme drug resistance in Enterobacteriaceae

Take home message (2)

- **Reversion of resistance is rare, and mostly impossible in Gram negtive bacteria**
- **Evolution to multidrug resistance and pandrug resistance.. becoming a reality**
- **Increasing evidence of the relationship between antibiotic resistance and mortality**
- **Increasing infected population as the target (2020-2050); aging, immunocompromised, ICU patients, transplanted, surgery patients.**
- **Spread of important antibiotic resistance determinants now observed not only among nosocomial but also among community-acquired pathogens**

#S204 Patrice Nordmann

Year in Infection Control

Rosana Richtmann

Anucha Apisarnthanarak

Sebastian W. Lemmen

Part 1

What are the TOP 10 challenges in Infection control nowadays?

- **New challenges**
  - Understanding the Microbiome
  - MRSA screening and surveillance
  - Prevention of CLABSI
  - Emerging infection organisms and resistance
  - Zika virus – Chikungunya and beyond

Part 1

What are the TOP 10 challenges in Infection control nowadays?

- **Old, however still challenges**
  - Hand hygiene
  - Engaging housekeeper and environmental services staff
  - Unnecessary use of antibiotics
  - Low Level of vaccination in HCW

Part 2

Topics

- Evolving Epidemiology of *Acinetobacter baumannii*
- Environmental cleaning: What is new?
- Epidemiology and Control of HAIs and Multi-Drug Resistant Organisms in Resource-Limited Settings: What do we need?
- Unusual Outbreaks & Outbreak worthy of our attention
- Filling the Gap in Infection Control: Thinking outside the box!

#S186 *Anucha Apisarnthanarak*

Part 2

Infrequent air contamination with *Acinetobacter baumannii* of air surrounding known colonized or infected patients.

Rock C, Harris AD, Johnson JK, Bischoff WE, Thom KA.

Using a validated air sampling method we found Acinetobacter baumannii in the air surrounding only 1 of 12 patients known to be colonized or infected with A. baumannii. Patients' closed-circuit ventilator status, frequent air exchanges in patient rooms, and short sampling time may have contributed to this low burden.

Infect Control Hosp Epidemiol. 2015 Jul;36(7):830-2.

#S186 *Anucha Apisarnthanarak*

Part 2

Conclusions

- Enhanced terminal room disinfection strategies decreased the clinical incidence of target MDROs by 10-30% among exposed patients
- Biggest impact on vegetative bacteria
- Quat + UV for vegetative bacteria
- Compliance with study protocol was high (remarkable 90% compliance >20,000 rooms)
- Do different pathogens have different winner strategy?

#S186 *Anucha Apisarnthanarak*

Part 2

SHEA White Paper

Necessary Infrastructure of Infection Prevention and Healthcare Epidemiology Programs: A Review

Kristina A. Bryant, Anthony D. Harris, Carolyn V. Gould, Eve Humphreys, Tammy Lundstrom, Denise M. Murphy, Russell Olmsted, Shannon Oriola and Danielle Zerr

Essential activities

- Surveillance
- Performance improvement for HAIs
- Acute event response & outbreak investigation
- Education and training HCWs and patients
- National reporting of HAIs

Resource Necessary for IPC/HE Program

- Personal resource (HE/IPC)
  (1-1.5 FTE vs. 0.5-1 FTE)
- Additional support personnel (administration)
- Information technology and health informatics
- Education, data and report presentation

#S186 *Anucha Apisarnthanarak*

Part 2

What can We do to Prevent Infection?

- IP associated with ERCP and GI scopes is multifaceted (e.g., manufacturer, federal authority, IPCs) and no single available strategy will eliminate this problem.
- This immediate risks can be minimized by a multi-component strategy (e.g., compliance with endoscope reprocessing guideline, HLD followed by ETO, periodic microbiologic sampling).
- Only when we implement new technologies (e.g., equipment redesign, single-use sterile endoscopes, sterilization of GI endoscopes with technology that achieves an SAL of 10^{-12}) will we eliminate the risk of infection.

Rutala W, Weber D. Outbreaks of Carbapenem-Resistant *Enteriobacteriaceae* Infections Associated with Duodenoscopes: What Can We Do to Prevent Infections? Am J Infect Control 2016 (in press)

#S186 *Anucha Apisarnthanarak*

Part 2

A Dilemma

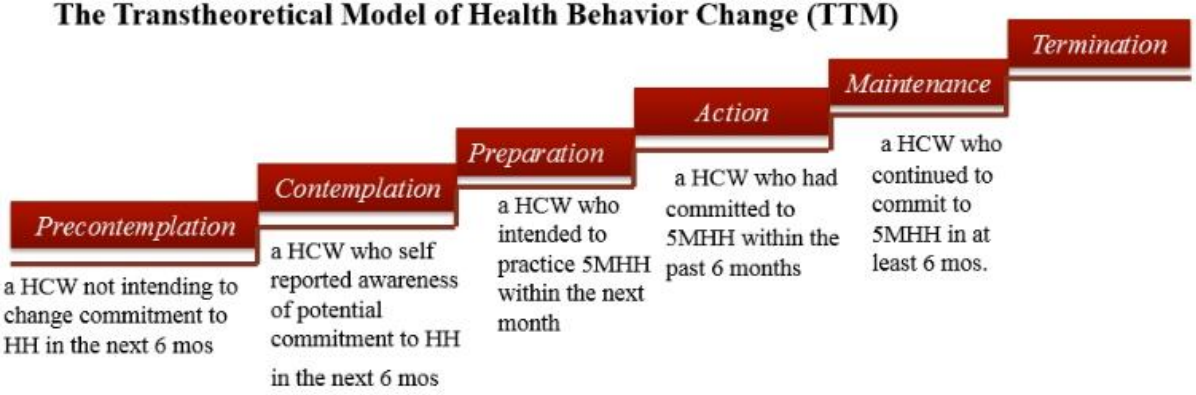
- **Much of what we do in healthcare – especially in the hospital – is reflexive**
  - If a patient is hypoxemic: we give oxygen
  - Low BP: IV fluids
  - Positive blood cultures: antibiotics
  - Frequency, urgency, and dysuria: dx UTI
- **These rote responses are usually helpful**
  However, this reflex-like approach can lead to problems
  - Pt sick enough to be admitted from the ED: Foley catheter
  - Asymptomatic catheterized patient has a "dirty" urine: antibiotics

Part 2

Methods

- **The behavior Theorem**

The Transtheoretical Model of Health Behavior Change (TTM)



- Prochaska JO, The transtheoretical model of health behavior change. Am J Health Promot. 1997
- Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991

#S186 *Anucha Apisarnthanarak*

Part 3

Topics

- New data on isolation because of MDRO
- Prevention of HAI
- The Chlorhexidine story goes on
- Norovirus can fly
- Animals – our best friends

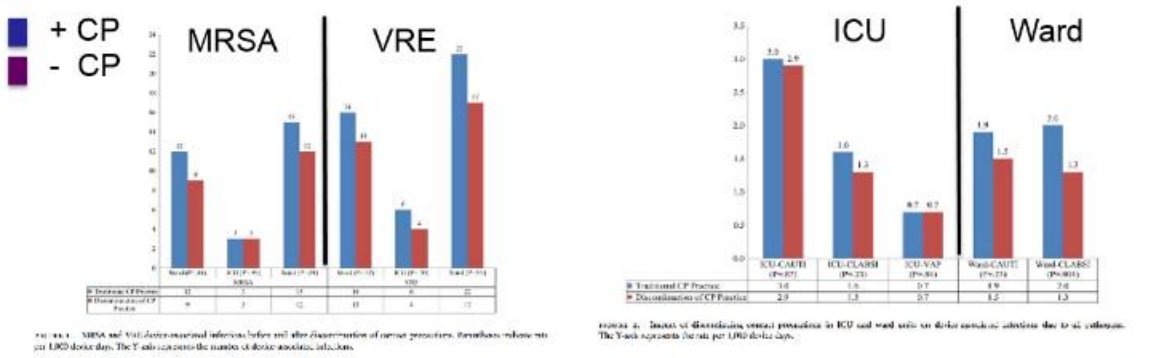
Part 3

The Impact of Discontinuing Contact Precautions for VRE and MRSA on Device-Associated Infections

Michael B. Edmond, MD, MPH, MPA;[1] Nadia Masroor, BS;[2] Michael P. Stevens, MD, MPH;[2] Janis Ober MSN, RN, CIC;[2] Gonzalo Bearman, MD, MPH[2]

patient days on CP: 40.000 → 22.000 (- 45%)

device associated infections



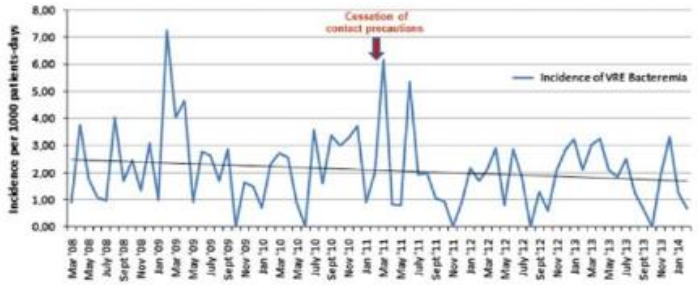
Infect Control Hosp Epidemiol. 2015 Aug;36(8):978-80.

#S187 *Sebastian W. Lemmen*

Part 3

Discontinuation of Systematic Surveillance and Contact Precautions for Vancomycin-Resistant *Enterococcus* (VRE) and Its Impact on the Incidence of VRE *faecium* Bacteremia in Patients with Hematologic Malignancies

Nikolaos G. Almyroudis, MD;[1,2] Ryosuke Osawa, MD;[1,2] George Samonis, MD, PhD;[3] M. Wetzler, MD;[1,2,4] Eunice S. Wang, MD;[1,2] Philip L. McCarthy, Jr., MD;[1,2] Brahm H. Segal, MD[1,2,4]



	Active VRE Surveillance and Contact Precautions (March 2008 to Feb 2011)	Cessation of Active VRE Surveillance and Contact Precautions (March 2011 to Feb 2014)	*P* Value
Incidence of VRE bacteremia (per 1,000 patient days of care)	2.32	1.87	NS
Aggregate antibiotic utilization (days of antibiotics per 1,000 patient days of care)			
Total cohort	916	889	NS

Infect. Control Hosp. Epidemiol. 2016;1–6

#S187 *Sebastian W. Lemmen*

Part 3

The Effect of Contact Precautions on Frequency of Hospital Adverse Events

Lindsay D. Croft, MS, PhD;[1] Michael Liquori, MD;[2,5] James Ladd, MD;[1] Hannah Day, MS, PhD;[1] Lisa Pineles, MA;[1] Elizabeth Lamos, MD;[2] Ryan Arnold, MD;[2] Preeti Mehrotra, MD;[4] Jeffrey C. Fink, MD, MS;[1,3,5] Patricia Langenberg, PhD;[1] Linda Simoni-Wastila, BSPharm, MSPH, PhD;[6] Eli Perencevich, MD, MS;[7,8] Anthony D. Harris, MD, MPH;[1,5] Daniel J. Morgan, MD, MS[1,5]

adjustment for: gender, prior hospitalization, Charleston morbidity score

TABLE 3. Adjusted Rates of Noninfectious Adverse Events Among Patients on Contact Precautions vs Patients Not on Contact Precautions

Type of Adverse Event	R,R (95% CI)	*P* Value
Noninfectious adverse events[a]		
Patients on contact precautions vs. not on contact precautions	0.70 (0.51–0.95)	.02
Prior hospitalization in previous 30 days	1.22 (0.87–1.70)	.25
Charlson comorbidity score ≥2	1.04 (0.75–1.45)	.80
Male gender	0.73 (0.54–0.99)	.05
Preventable noninfectious adverse events[a]		
Patients on contact precautions vs not on contact precautions	0.85 (0.59–1.24)	.41
Male gender	0.67 (0.46–0.98)	.04
Charlson comorbidity score ≥2	0.89 (0.60–1.33)	.57

NOTE. R,R, rate ratio; CI, confidence interval.
[a]Adjusted for matching by unit of enrollment (surgery/transplant; oncology; general medicine).

- 30%, s

- 15%, ns

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY NOVEMBER 2015, VOL. 36, NO. 11

#S187 *Sebastian W. Lemmen*

Part 3

Detection and Quantification of Airborne Norovirus During Outbreaks in Healthcare Facilities

Laetitia Bonifait,[1] Rémi Charlebois,[1] Allison Vimont,[2] Nathalie Turgeon,[1] Marc Veillette,[1] Yves Longtin,[3] Julie Jean,[2,4] and Caroline Duchaine[1,5]

Conclusion:

concentration in the air in pat.room is sufficient to cause disease

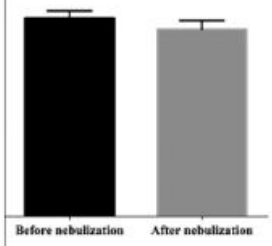
23/48 air samples positive in

ivity remained unchanged

Table 1. Detection and Concentration Recovered From the Air in Patient Rooms, Stations During 8 Confirmed Norovirus Ou

Healthcare Center Location	No. of Positive Samples Detected in Air
Patients' rooms	14/26
Nurses' stations	3/6
Hallway/common areas	6/16

1m



Clinical Infectious Diseases® 2015;61(3):299–304

#S187 *Sebastian W. Lemmen*

Modelling and metaanalyses of antimicrobial stewardship efficacy

Quantifying where selection occurs: a mathematical modelling approach to better inform antimicrobial resistance control

- To provide the first estimate of relative selection in these within the community or the hospital environment.
- The majority of antibiotic resistance selection:
  - the community rather than in the hospital environment.
- Beta-lactam resistant E. coli:
  - less than 30% of resistance was likely to be generated in the hospital setting.
  - levels of transmission of bacteria and levels of antimicrobial exposure, as well as time to clearance of resistance carriage in the community.
- Societal interventions to decrease antimicrobial resistance
  - greater impact if they decrease antimicrobial use in the community rather than in hospital settings.

#O233 *Gwenan Knight*

New insights in the epidemiology and treatment of *Clostridium difficile*

Prevalence of community-associated *Clostridium difficile* infection in England

- In 2007/08: 55,498 CDIs in England (108/100,000 population)
  - The majority (63%) of infections in 2007/08, were healthcareonset (HO),
- Fall by 75% to 14,165 (26.3/100,000 population) by 2014/15.
  - HA; by 2014/15, HOHA accounted for only 38% of all CDI episodes (Table 1).
- The percentage of community-onset :
  - HA (COHA) infections increased by >40% from 23% of CDIs in 2007/08 to 32% in 2014/15.
  - This equates to an overall 18% decrease in HA-CDI, from 86% in 2007/08 to 70% in 2014/15.
  - A two-fold increase was observed in both CO, indeterminate-association (COIA) and community-associated (COCA) infections over the same time period.

#O235 Sarah Gerver

Global spread of multiple-antibiotic resistant *Clostridium difficile* between animals and humans

- The global spread of type 078 and compared animal and human isolates.
- *C. difficile* type 078 is a clonal population that has spread globally
  - animal and human samples are highly similar supporting the idea of frequent transmission between both populations.

#O236 *Cornelis Knetsch*

Complications and long term-follow-up of fecal microbiota transplantation for treatment of recurrent *Clostridium difficile* infection

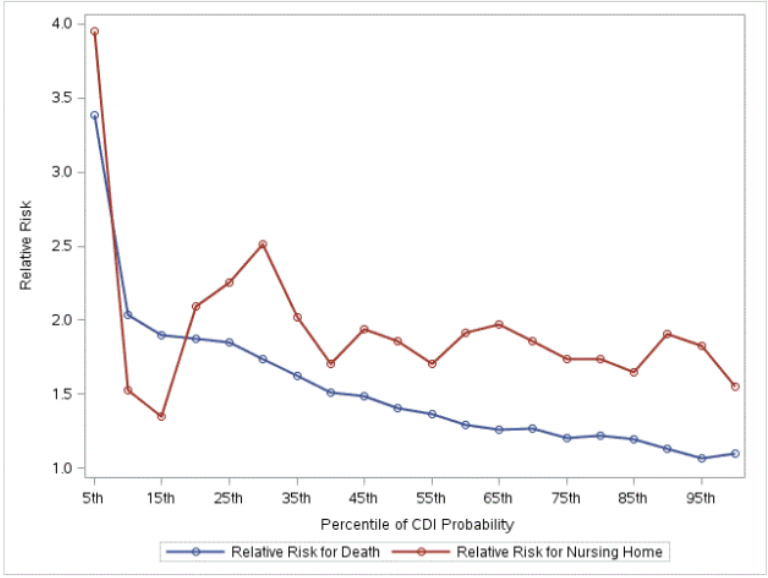
- To provide data on procedure related complications and long term follow-up data of patients treated with FMT for recurrent CDI.
- 73 patients were treated with FMT
  - 8 patients experienced early CDI recurrence, yielding a primary cure rate of 89%.
  - One case of pneumonia and subsequent death occurred within one week after FMT, possibly following (donor)fecal regurgitation, and aspiration.
  - 14/31 patients (45%) had used antibiotics during post FMT follow-up for unrelated indications, of whom one developed a CDI relapse.
  - No long-term side effects were reported.

#O237 *Yvette H. van Beurden*

C. difficile infection (CDI) attributable 1-year mortality and nursing home admission in the US Medicare population

- 180,348 persons newly coded for CDI in 2011 and 1,277,529 controls,
- 40.9% of CDI cases died within 1 year compared to 6.7% of controls.
- 35.7% of CDI cases died versus 24.7% of matched controls, for an attributable 1-year mortality of 11.0% (OR 1.49, 95% confidence interval (CI) 1.44- 1.52).

Among the elderly U.S. population, CDI had an attributable one-year mortality of 11% and attributable one-year new admission to nursing home of 3.5% in 2011.



#O239 *Erik Dubberke*

Prevention and management of bloodstream infections: from here to where?

Achievements in preventing central line-associated bloodstream infection

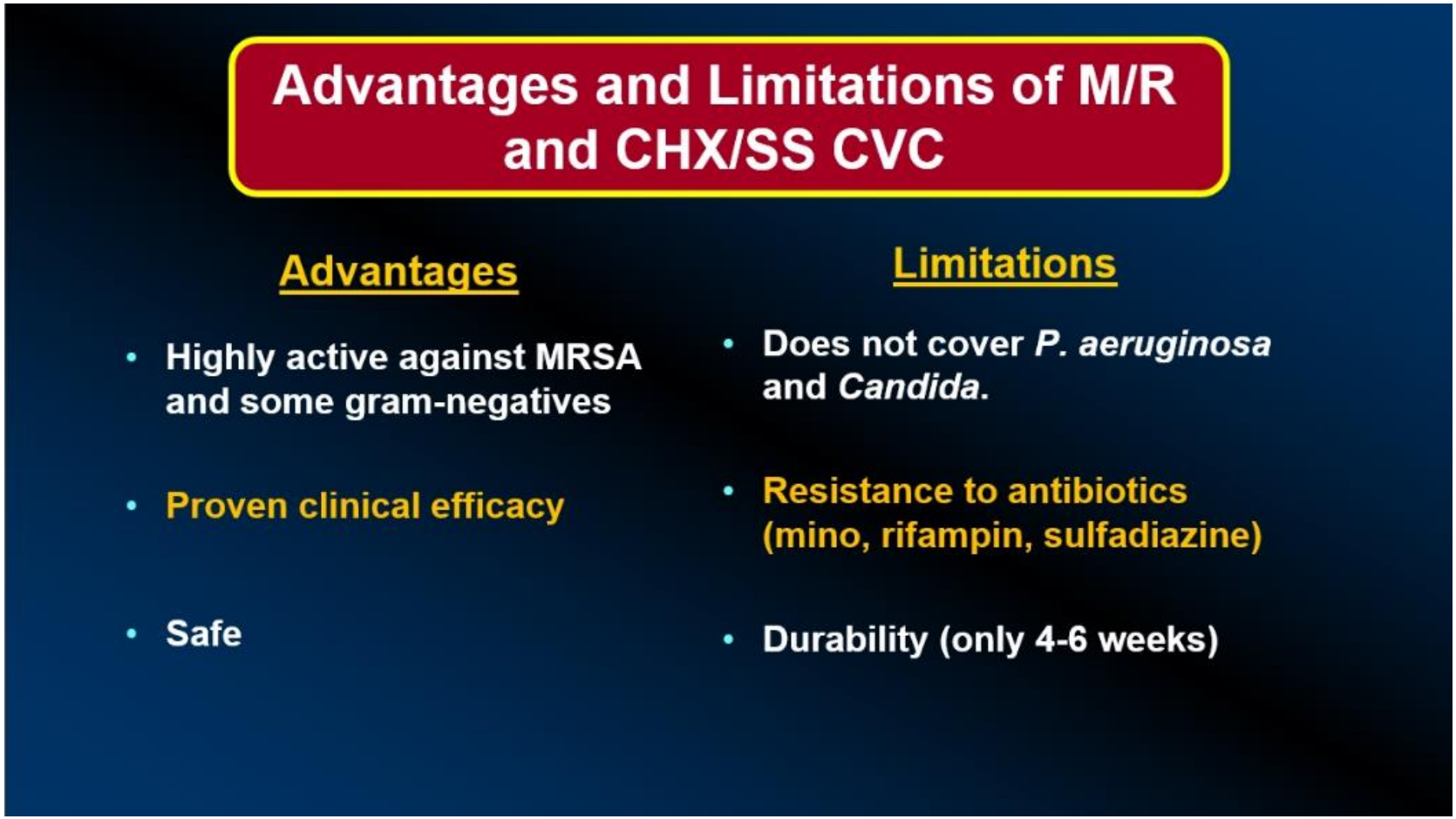
Preventive Approaches that Reduce CRBSI

New Recommendation	References	Category
1) Maximal sterile barriers	• Raad et al. ICHE 15:231, 1994	IB
2) Catheter site antiseptic: 2% chlorhexidine	• Maki et al. Lancet 338:339, 1991 • Humor et al. CID 31:1001, 2000	IA
3) Antimicrobial CVC	• Raad et al. Ann Intern Med 129:267, 1997 • Maki et al. Ann Intern Med 127:257, 1997 • Darouiche et al. NEJM 340:1-8, 1999	IA

CDC Guidelines for the Prevention of Catheter-related Infections, 2011.

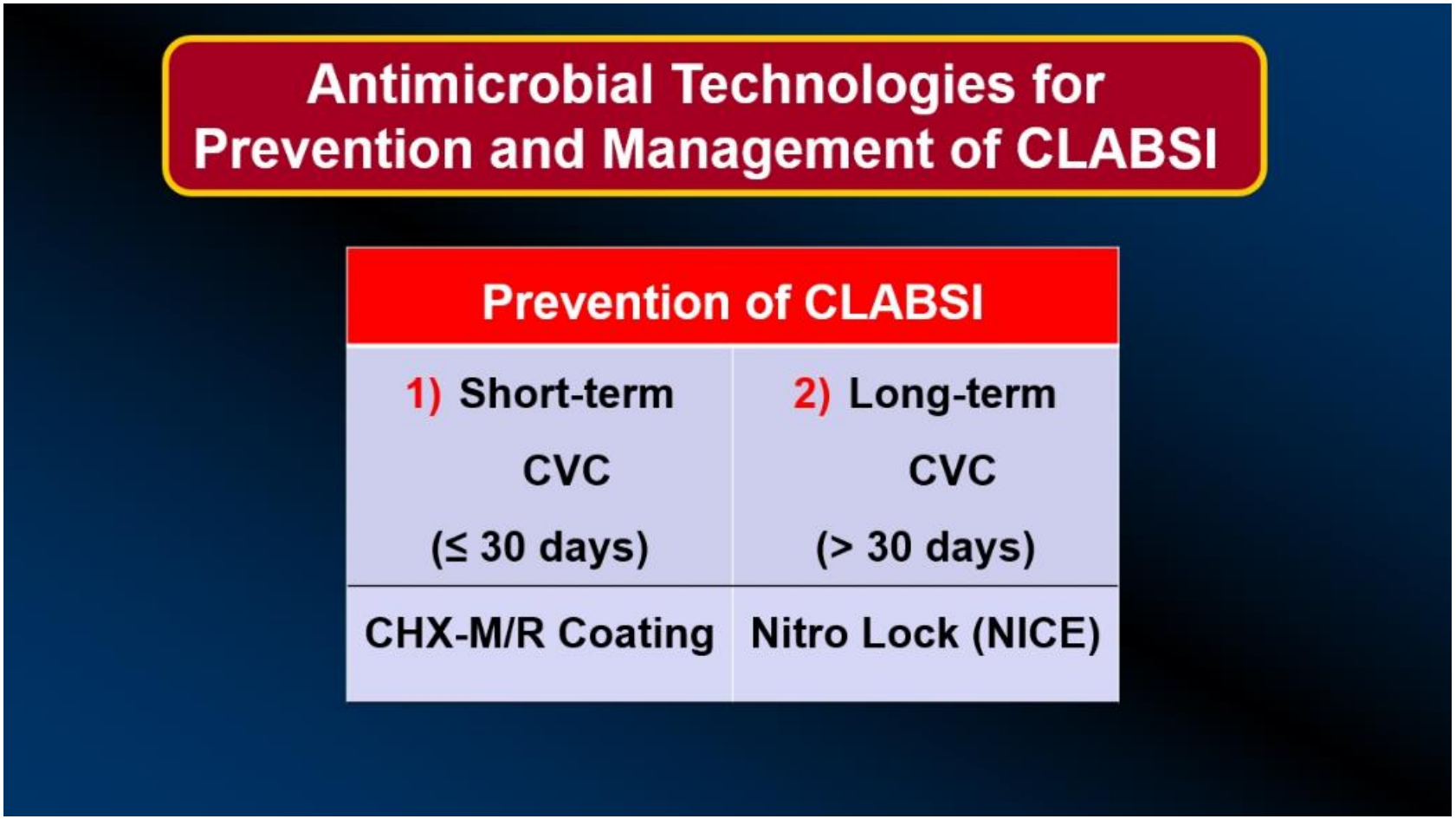
#S241 *Issam Raad*

Achievements in preventing central line-associated bloodstream infection



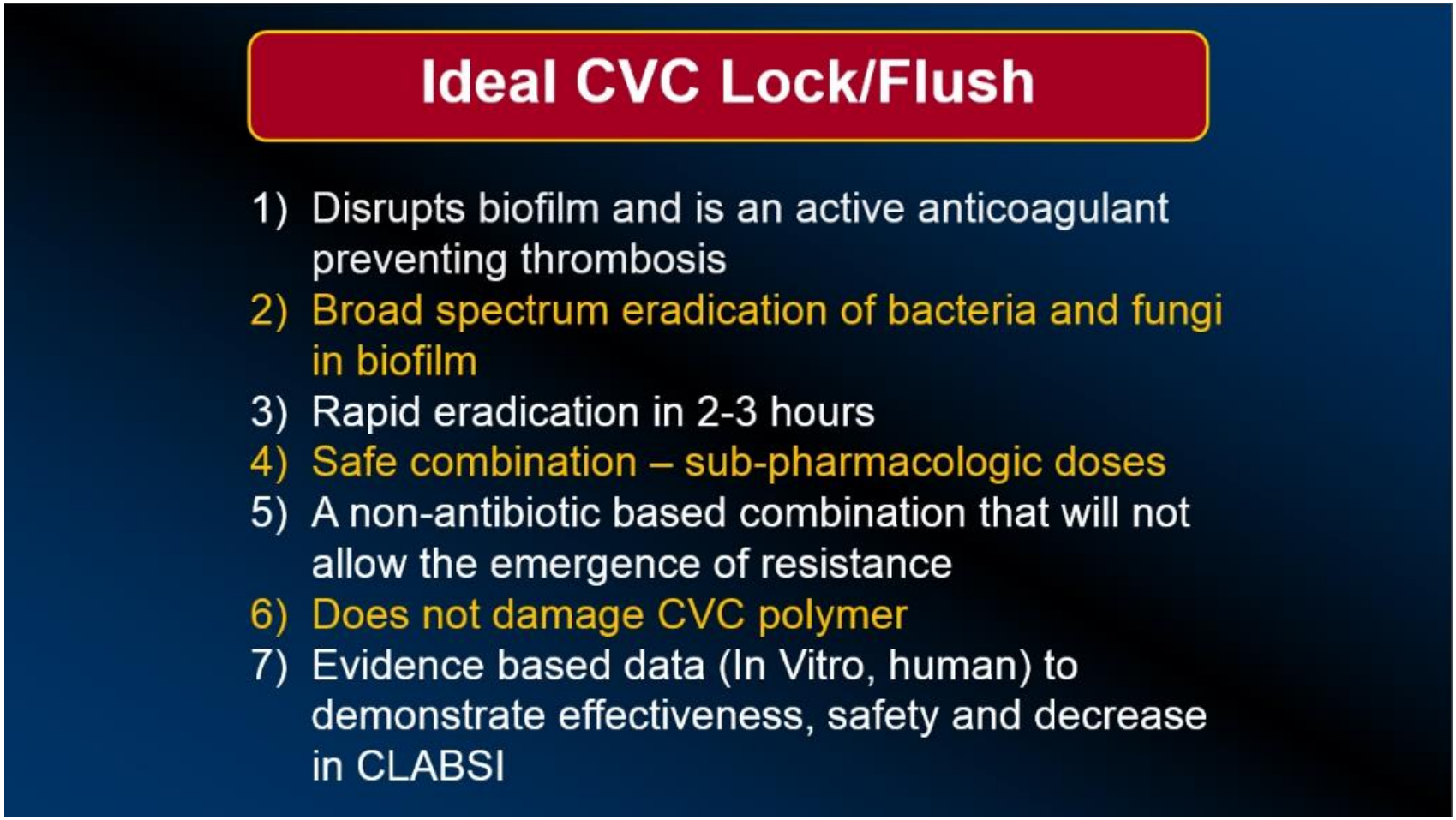
#S241 *Issam Raad*

Achievements in preventing central line-associated bloodstream infection



#S241 *Issam Raad*

Achievements in preventing central line-associated bloodstream infection



#S241 *Issam Raad*

Prevention of surgical site infections: the holy grail of infection control

Duration of antibiotic therapy in post-operative peritonitis: the Durapop study

- To determine whether a 8-day antibiotic treatment is more effective than a 15-day treatment
- 410 patients diagnosed as having POP May 2011 to February 2015.
- 249 of them were randomised:
  - 120 patients were assigned to receive 8-days
  - 116 to receive 15-days of antibiotic therapy.
- No differences between the two groups with respect of any demographic variable
- The patients treated for 15-days had lower median antibiotic-free days than those treated for 8-days (15 [7:20] vs 12 [6:13] days, respectively

#O334 *Philippe Montravers*

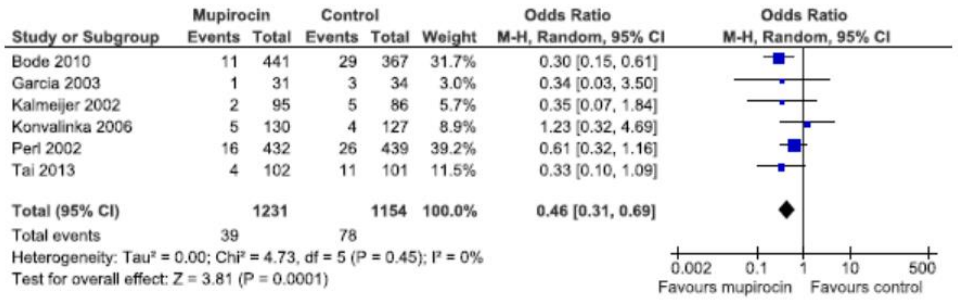
Development of a prediction model to estimate the risk of *S. aureus* surgical site infection or bacteraemia after cardiothoracic surgery

- To develop and internally validate a risk prediction model for *S. aureus* SSI or bacteraemia within 90 days after cardiothoracic surgery based
- 150/7,647 included patients (2.0%) developed the event of interest.
- independent risk factors for developing the primary outcome
  - pre-operative colonization with S. aureus (OR 3.27, 95% confidence interval [CI] 2.33-4.55),
  - diabetes mellitus (OR 1.98, 95% CI 1.40-2.79),
  - CABG (OR 3.19, 95% CI 2.22-4.68).
  - The overall performance of the final prediction model was 0.09 (Nagelkerke R2), with moderate discrimination (AUC-value of 0.74)

#O334 *Philippe Montravers*

Mupirocin ointment for preventing *Staphylococcus aureus* infections in nasal carriers undergoing surgery: a systematic review

- 320 hits, six randomised controlled trials (RCT) were identified
- cardiac, orthopaedic, general, gastrointestinal, gynaecological, neurological, vascular
- Mupirocin ointment with or without a combination with chlorhexidine gluconate medicated soap (MUP-CHX)
  - less nosocomial S. aureus infections in carriers (5 RCTs, n=2180, OR 0.48; 95% CI 0.32-0.71,)
  - less S. aureus surgical site infections (SSI) (6 RCTs, n=2385, OR 0.46; 95% CI 0.31-0.69).

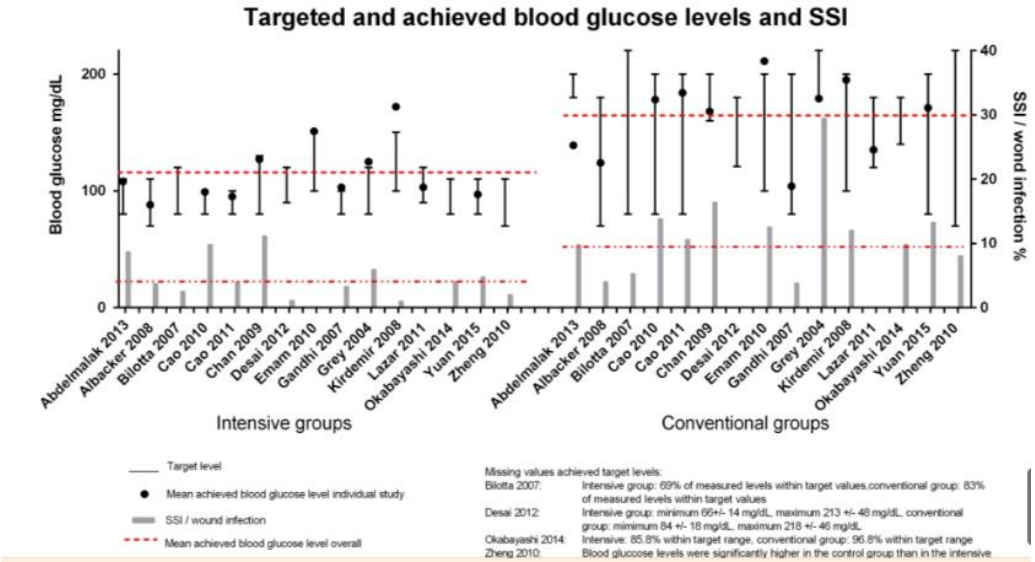


results in less *S. aureus* nosocomial infections (a.o. SSI), less costs for the hospitals and a lower one-year mortality in clean surgery

#O336 *Miranda van Rijen*

Targeting lower perioperative glucose levels to reduce surgical site infections without an increased risk of mortality or stroke - A systematic review and meta-analysis.

- intensive glucose control protocols with conventional protocols in terms of reducing surgical site infections.



- Targeting stricter and lower blood glucose levels reduce surgical site infections.

#O337 *Fleur de Vries*

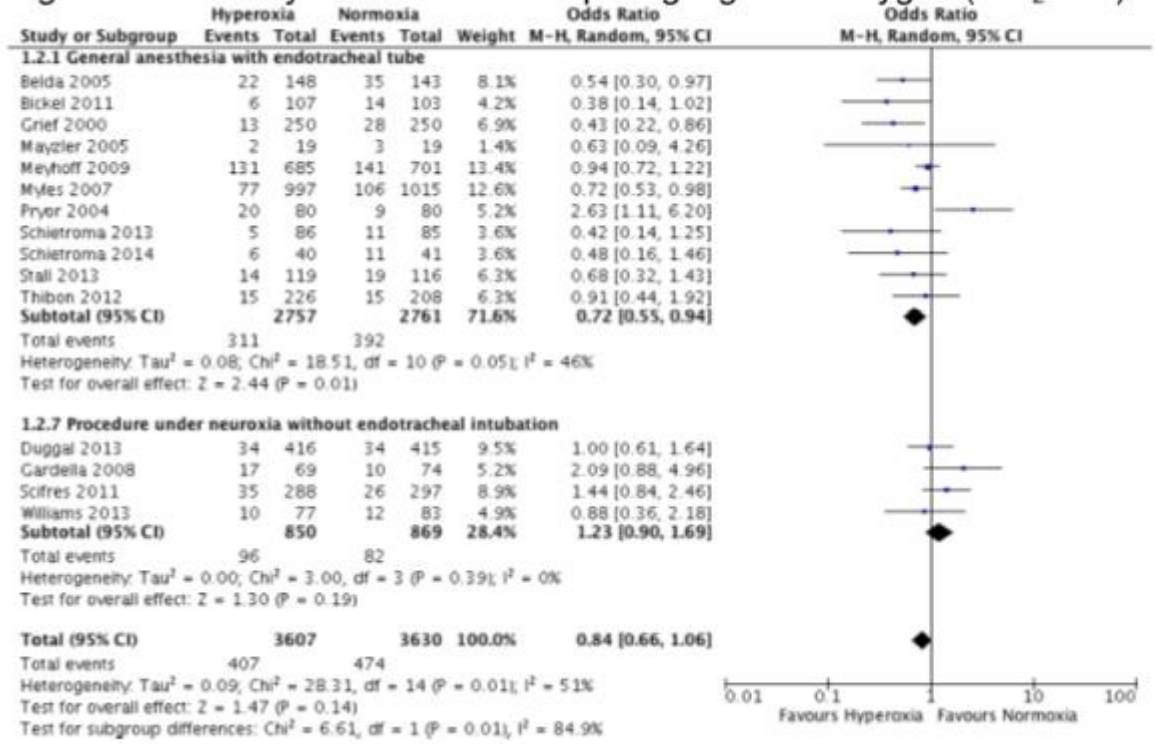
Optimal duration for antibiotic prophylaxis. A systematic review and meta-analysis

- A systematic literature review and meta-analysis was conducted on the optimal duration of SAP to reduce SSI
- Meta analysis of 43 studies including 17733 patients showed
  - postoperative continuation of SAP had no benefit in prevention SSI when compared to a single preoperative dose of SAP or redosing according to the duration of surgery (OR: 1.11; 95%CI: [0.96-1.28]; P=0.16).
- Moderate quality of evidence over all types of surgery shows that prolonged SAP has no benefit compared to single dose of SAP in reducing SSI.

#O339 *Stijn W. de Jonge*

It is all about the tube: a systematic review (SR) of hyperoxygenation in the prevention of surgical site infection

Figure: meta-analysis of studies comparing high flow oxygen (FiO_2=0.8) vs standard (FiO_2=0.3-0.35)



#O340 *Joseph S. Solomkin*

Epidemiology and outcome differences in surgical site infections associated to elective colon and rectal surgery. Are we talking about the same surgical procedure?

- Presentation not available

#O341 *Aina Gomila*

Semi-automated surveillance of deep surgical site infections after primary total hip and knee arthroplasty

Aim

To develop a semi-automated surveillance model based on electronic health records in order to retrospectively discriminate between patients with a low and high probability of having developed a deep surgical site infection after primary total hip or knee arthroplasty

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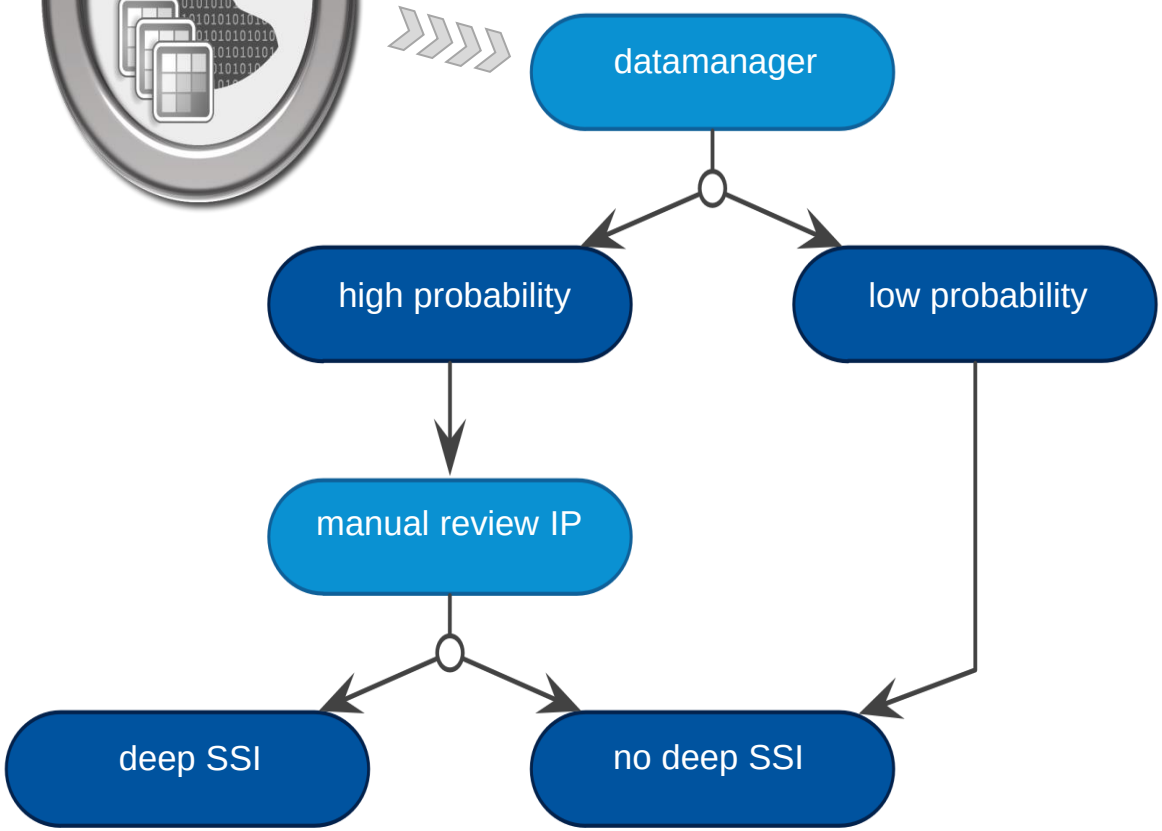
#O342 *Meander Sips*

Electronic health records

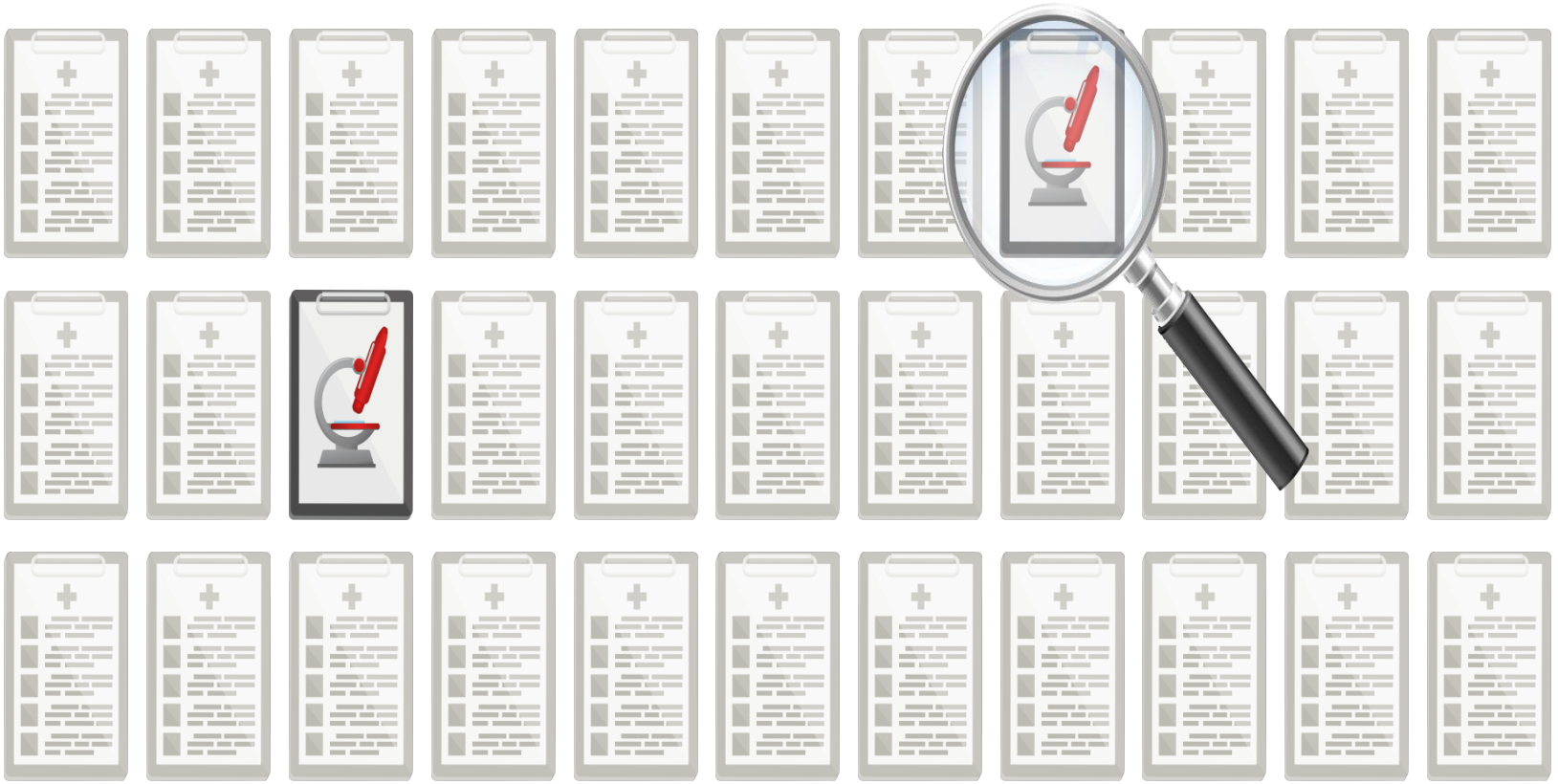
ChipSoft Epic

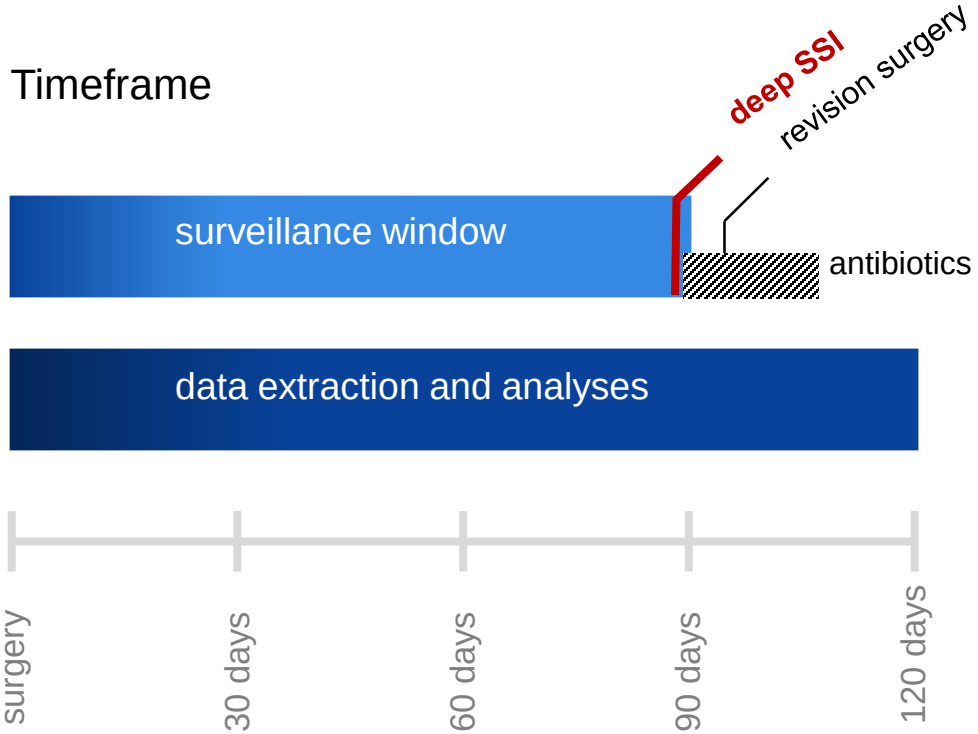
McKESSON HiX

Routine care data



Current routine surveillance





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Results

1637 procedures in 1402 patients (36.7% male, median age 66 years (IQR 56-74))

- 684 TKA (41.8%) and 953 THA (58.2%)
- 30 deep SSI (1.8%)
  - ~3 deep SSIs / year

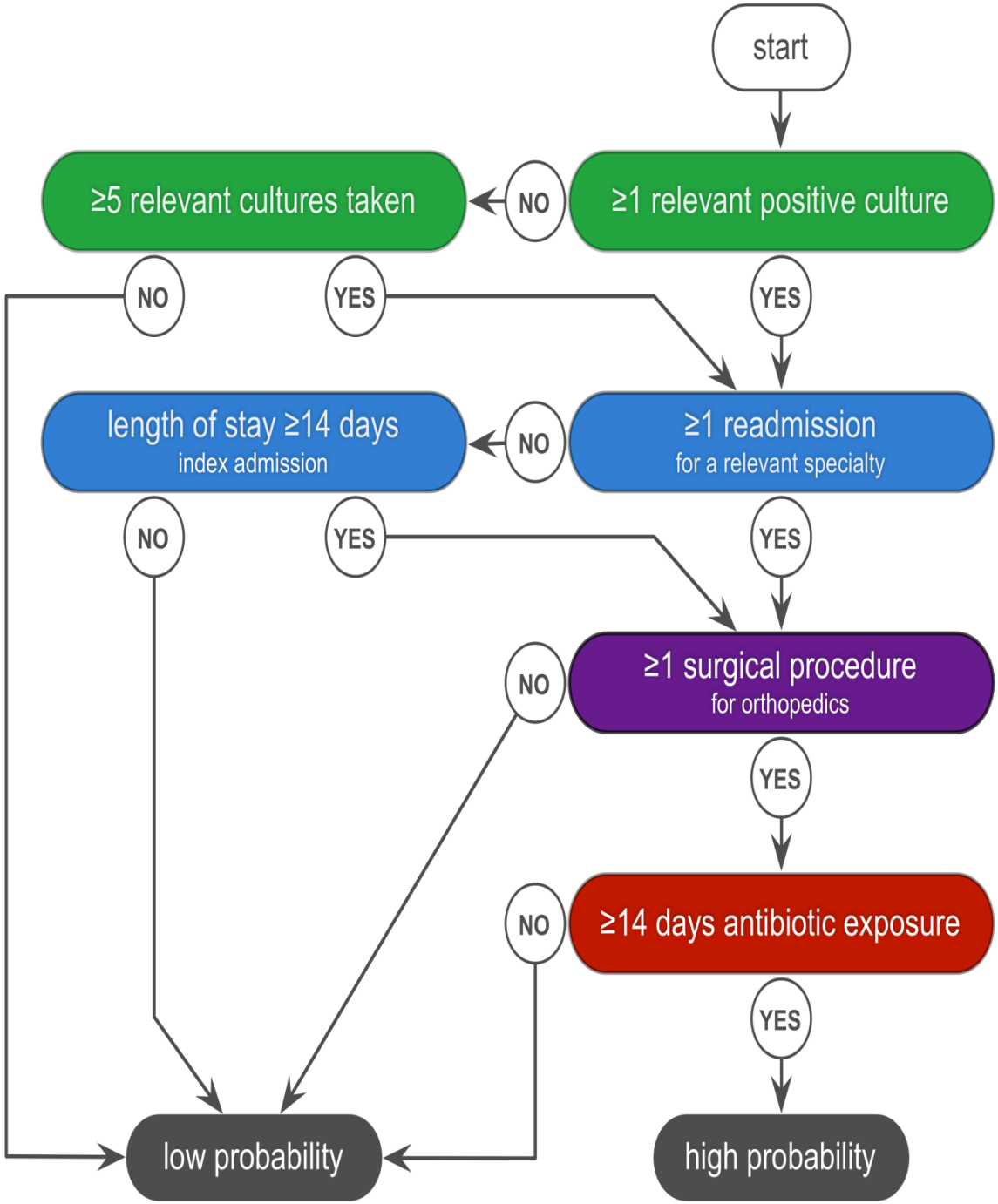
At least one relevant culture taken?

- PPV *routine surveillance* = 7.7%

		deep SSI		
		yes	no	
culture	yes	30	358	388
	no	0	1249	1249
		30	1607	1637

	deep SSI		no deep SSI			
	n=30		n=1607		sensitivity	PPV
≥5 relevant microbiological cultures taken	30	(100.0%)	58	(3.6%)	100.0%	34.1%
≥1 positive relevant microbiological culture	30	(100.0%)	81	(5.0%)	100.0%	27.0%
≥1 readmission for a relevant specialty	23	(76.7%)	90	(5.6%)	76.7%	20.4%
length of hospital stay ≥14 days	16	(53.3%)	220	(13.7%)	53.3%	6.8%
≥1 surgical procedure for orthopedics	30	(100.0%)	90	(5.6%)	100.0%	25.0%
≥2 surgical procedures for orthopedics	25	(83.3%)	10	(0.6%)	83.3%	71.4%
treated with gentamicin beads	28	(93.3%)	11	(0.7%)	93.3%	71.8%
antibiotic exposure ≥14 days	30	(100.0%)	50	(3.1%)	100.0%	37.5%
antibiotic exposure ≥21 days	28	(93.3%)	27	(1.7%)	93.3%	50.9%

microbiology admission data surgical procedures antibiotics ● included in final model



Item 1 microbiology

Item 2 admission data

Item 3 surgical procedures

Item 4 antibiotics

Results

		deep SSI		
		yes	no	
probability	high	30	14	44
	low	0	1593	1593
		30	1607	1637

Semi-automated model 1

4/4 items positive

sensitivity	100.0%
specificity	99.1%
PPV	68.2%
NPV	100.0%

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Results

		deep SSI		
		yes	no	
probability	high	30	46	76
	low	0	1561	1561
		30	1607	1637

Semi-automated model 2

3/4 items positive

sensitivity	100.0%
specificity	97.1%
PPV	39.5%
NPV	100.0%

= 32 more medical records to assess in 10 years

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Workload reduction

Medical records to assess during a 10 year surveillance period (= 50 medical records)

Manual review of all medical records

1637

Current routine surveillance (preselection based on cultures)

388

Semi-automated surveillance: 3/4 criteria

76

Semi-automated surveillance: 4/4 criteria

44

Conclusion

Semi-automated surveillance of deep SSIs using a model based on EHRs can substantially reduce workload while retaining a 100% sensitivity

Future internal and external validation

- Robustness to clinical practice variations
- Generalizability across hospitals

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(1A OR 1B) AND (2A OR 2B) AND (3) AND (4)

1A	≥5 relevant microbiological cultures taken
1B	≥1 positive relevant microbiological culture
2A	≥1 readmission for a relevant specialty
2B	length of hospital stay ≥14 days
3	≥1 surgical procedure for orthopedics
4	antibiotic exposure ≥14 days

New insights in the control of multi-resistant Gram-negatives

Screening for CPE: sensitivity of serial admission screens

- Overseas resident patients or those with overnight admission to any hospital in the past 12 months
  - rectal swabs, the 1 st at <24 hours, 2 nd between 25-72 hours and 3 rd between 73-120 hours.
- 15,551 CPE rectal screens have been taken from a total of 7,673 patients (Jun – Nov 15).
- The carriage rate of CPE was 22 (0.5%) of 3932 patients at Screen 1, compared with 3 (0.2%) of 1227 patients at Screen 3 (p<0.166)

Table 1: Carriage rate of Gram-negative bacteria at the 1st, 2nd and 3rd admission screen.

	Screen 1 (within 24 hour)		Screen 2 (25-72 hours)		Screen 3 (73-120 hours)	
	n	%	n	%	n	%
Number of patients	3932	-	1652	-	1227	-
Gram-negative bacteria	161	4.1	38	2.3	45	3.7
Enterobacteriaceae	108	2.7	29	1.8	41	3.3
Resistant Enterobacteriaceae	80	2.0	21	1.3	24	2.0
CPE	22	0.5	2	0.1	3	0.2

#O378 Jon Otter

The prevention paradox of extended-spectrum beta-lactamase-producing Enterobacteriaceae (ESBL-E): species-specific risk and burden of transmission

- To quantify the species-specific risk and burden of ESBL-E transmission in Dutch hospitals.
- multi-centre cluster-randomised study comparing
  - ESBL-E were placed on contact precautions and enrolled in the study (index patient).
  - Ward-based ESBL-E prevalence surveys, using perianal swabs, were performed 5-9 days after enrolment of the index patient.
- 662 index patients and 11,677 wardmates were enrolled.
  - ESBL-E was cultured in 1,076 (9.2%) wardmates.
  - Transmission of ESBL-E to wardmates was detected for 36 (5.4%) index patients.
    - The risk of transmission was 4.4% (22/501) for E. coli,
    - 11.0% (10/91) for Klebsiella pneumoniae, (RR 2.59; 95% CI 1.31-5.32)
    - 10.0% (4/40) for Enterobacter cloacae, (RR 2.28; 95% CI 0.68-6.43)
    - 0% (0/30) for other Enterobacteriaceae.
    - 61.1% [44.8%- 75.3%] of all ESBL-E transmissions were attributable to E. coli, whereas only 27.8% [95% CI 15.7%- 44.1%] and 11.1% [3.8%-25.9%] were attributable to K. pneumoniae and E. cloacae, respectively.

#O379 Marjolein Kluytmans

Quantifying hospital-acquired carriage of extended-spectrum beta-lactamase-producing *Enterobacteriaceae* in Dutch hospitals

- To provide estimates on the acquisition of ESBL-E during hospitalisation, using datasets from two different studies.
- R-GNOSIS and the SoM study are both multi-centre cluster-randomised studies comparing isolation strategies for known ESBL-E carriers
  - SoM: culture results blinded
  - R-GNOSIS contact precautions for all patients with an ESBL-E positive culture
- SoM study dataset: 8,400 admissions and 9,017 cultures.
- R-GNOSIS dataset: 5,450 admissions and 8,133 cultures,

	SoM-crude		R-GNOSIS-crude		R-GNOSIS-model	
Prevalence at admission, % [95% CI/CrI]	7.4%	[6.2%-8.7%]	6.4%	[5.2%-7.8%]	7.0%	[6.2%-7.8%]
Prevalence at discharge, % [95% CI /CrI]	9.9%	[8.2%-11.8%]	8.7%	[6.8%-11.0%]	9.3%	[8.6%-10.0%]
Hospital-acquired prevalence at discharge, % [95%CI/CrI]	2.5%	[1.7%-3.6%]	2.3%	[1.3%-3.6%]	2.3%	[1.7%-2.9%]
Acquisition rate, n/1000 patientdays at risk [95% CI/CrI)	3.2	[2.2-4.5]	2.7	[1.4-4.2]	3.8	[2.9-4.9]

95% CI/CrI: 95% confidence/credible interval

#O380 *Suzan van Mens*

Source tracking Pseudomonas aeruginosa infections in augmented care units using whole-genome sequencing

- Snapshot of *P. aeruginosa* colonisation rates in hospital water systems from four hospital sites in England
  - sampling augmented care areas at 3 time points over a sixteen week period.
- 4 hospital sites detected P. *aeruginosa* in water outlets,
  - positivity rates for each sampling period varying between 5 to 28%.
  - Positive outlets frequently remained positive at multiple time points
  - the majority of isolates belonged to clones identified previously in European hospitals,
  - considerable genetic diversity was detected between hospitals. This diversity extended to differences between individual tap outlets which often had unique genotypes.
  - Little to no genetic changes were detected meaning that whole genome information could be used for source tracking.
  - WGS able to detect frequent examples of transmission from water outlets to patients and predict the most likely source.

#O382 *Beryl Oppenheim*

Modelling costs and benefits of strategies to control the spread of extended-spectrum beta-lactamase-producing Enterobacteriaceae (ESBL-PE) in an intensive care unit

- To evaluate the costs and benefits of strategies to control the spread of ESBL-PE in the ICU.

Strategy	ESBL-PE infections (n)	Cost of infections (€)	Cost of intervention (€)	Total cost (€)	Infections averted (n)	Net monetary benefit (€)
Base case Hand hygiene (before/after contact)=55%/60%; no cohorting; patients on antibiotics at ICU admission=56%	25	768,864	52,318	821,182	reference strategy	reference strategy
1 intervention						
Hand hygiene 55%/80%	19	601,662	98,281	699,943	6	121,239
Hand hygiene 80%/80%	17	513,923	146,518	660,441	8	160,741
2 interventions						
Hand hygiene 80%/80%+Antibiotic reduction*	16	493,631	212,518	706,149	9	115,032
3 interventions						
Hand hygiene 80%/80%+Cohorting in 75% of contacts+Antibiotic reduction	15	463,592	471,574	935,166	10	-113,985

*Antibiotic reduction= Reduced proportion of patients under antibiotics at admission and antibiotic duration.

#O383 *Lidia Kardas-Sloma*

ERCP duodenoscopes in Dutch ERCP centres: high prevalence of bacterial contamination despite reprocessing

- To determine the prevalence of bacterial contamination of reprocessed ERCP duodenoscopes in the Netherlands.
- All 71 Dutch ERCP centres were invited to sample 2 or more ERCP duodenoscopes.
- June to December 2015: 664 samples of 134 ERCP duodenoscopes
  - 12 different scope types of 3 distinct scope manufacturers
    - 54/134 (40%) Olympus TJF-Q180V, 32/134 (24%) Olympus TJF-160VR, 8/134 (6%) Pentax ED-3490TK, 7/134 (5%) Pentax ED34-i10T and 4/134 (3%) Fujinon ED-530XT8 scopes.
- 25 (42%) centres had 1 or more contaminated ERCP duodenoscope.
  - 32 (24%) ERCP duodenoscopes had 1 or more contaminated sample site.
  - 16 (12%) ERCP duodenoscopes of 13 (22%) hospitals contaminated with gastro-intestinal microorganisms, including Enterobacter cloacae, Enterococcus faecalis, Escherichia coli, Klebsiella pneumonia and yeasts.
  - Types of all 3 manufacturers were contaminated:
    - Olympus with 14/54 (26%) TJF-Q180V, 11/32 (35%) TJF-160VR and 1/1 TJF-160R, Pentax with 1/7 ED34-i10T and Fujinon with 1/1 ED-530XT.
  - 50/664 (7.5%) sample sites were contaminated of which the brush that was swiped through the suction and biopsy channel (16/50 - 32%) and forceps elevator (14/50 - 28%) were most often affected.

#O384 *Arjan W. Rauwers*

Multicentre point-prevalence survey of multidrug-resistant organisms among nursing home residents in Belgium

- To determine the point prevalence of asymptomatic carriage of MDRO including CPE in nursing home residents in Belgium.
- 29 nursing homes equally distributed across the three regions in Belgium
- 1498 residents screened,
  - 8.6% for MRSA (95%CI: 7.1-10.0%; range 0-22%)
  - 10.7% for ESBLE (95%CI: 9.1-12.3%; range 0-45%).
  - 1 OXA-48-producing K. *pneumoniae*
  - 1 E. *faecium* VRE
    - Estimated prevalence of <0.1% for each of these MDROs.

#O385 *Te-Din Daniel Huang*

Epidemiological differences in controlling the spreading of carbapenem-resistant bacterial strains in hospitalized patients

- 780 articles reviewed in details
  - 222 outbreaks due to A. *baumannii* (n=96), K. *pneumoniae* (n=84), P. aeruginosa (n=39), and *E.coli* (n=3)
- ICUs were the most common outbreak setting with blood stream infections (BSI)
  - A. *baumannii* had the highest attack rate (21/1000 pm) and infection rate (20.8/1000 pm)
  - *K.pneumoniae* (2.7 and 1.5)
  - *P.aeruginosa* (3.4 and 1.5).
- The sentinel case of the outbreak was more often detected through surveillance screening for *P.aeruginosa*, while first case of K. *pneumoniae* and A. *baumannii* were detected in clinical samples.
- Adjusted multivariate regression, showed that outbreaks involving UTI (OR=5.04, $p<0.001$) and due to *K.pneumoniae* (OR=2.93, $p=0.03$) were significantly more difficult to contain.

#O386 *Evelina Tacconelli*

The effects of selective decontamination on mortality in surgical and medical ICU-patients; an individual patient data network meta-analysis

- Data network meta-analysis from RT in ICUs
  - 2841 patients with standard care (4 studies), 1988 (2 studies) with SOD, 2748 (3 studies) with SDD.

	SC N=2841	**SOD** N=1988	**SDD** N=2748	**SOD vs. SC** adjusted OR (95% - CI), NNT	**SDD vs. SC** adjusted OR (95% - CI), NNT	**SDD vs. SOD** adjusted OR (95% - CI)
Hospital mortality	32.5%	30.9%	30.7%	0.82 (0.72 – 0.94) 23.8	0.83 (0.73 – 0.93) 25.3	1.01 (0.87 – 1.16)
Medical	36.8%	34.7%	36.2%	0.84 (0.70 – 1.01) 25.3	0.87 (0.73 – 1.03) 31.5	1.04 (0.87 – 1.24)
Surgical	28.6%	26.5%	25.2%	0.81 (0.66 – 0.99) 24.4	0.78 (0.66 – 0.93) 20.9	0.97 (0.79 – 1.19)
Comparison surgical vs. medical				p = 0.79	p = 0.39	p = 0.62
ICU mortality	23.8%	22.2%	20.1%	0.82 (0.70 – 0.95) 29.3	0.72 (0.62 – 0.82) 18.4	0.88 (0.75 – 1.03)
Medical	26.0%	25.3%	24.5%	0.90 (0.74 – 1.10) 50.6	0.82 (0.68 – 0.99) 27.5	0.91 (0.75 – 1.12)
Surgical	21.9%	18.5%	15.6%	0.73 (0.58 – 0.91) 20.4	0.61 (0.50 – 0.75) 18.9	0.83 (0.66 – 1.06)
Comparison surgical vs. medical				p = 0.16	p = 0.03	p = 0.56

Legend: OR, odds ratio; CI, confidence interval; N, number of patients; NNT, number needed to treat.

#O387 Nienke Leonie Plantinga

Controversies about controlling VRE - possible or impossible?

Yves Longtin

Andreas Voss

Chlorhexidine bathing in critically ill patients

Didier Pittet

Susan S. Huang

Reprocessing endoscopes and DaVinci instruments: new sources for the spread of resistant Gram-negatives

Petra Gastmeier #M517

Petra Gastmeier #M517

First author	Year	Country	Pathogen	Infections + Colonisations
Aumeran	2008	France	*K.pneumoniae*, CTX-M15	8 + 4
Alrabaa	2008	USA	*K.pneumoniae*, Imipenem-R.	6 + 0
Sanderson	2008	USA	*K.pneumoniae*, Imipenem-R.	5 + 46
Carbonne	2009	France	*K.pneumoniae*, KPC-2	11 + 9
Kola	2015	Germany	*K.pneumoniae*, OXA-48	10 + 5
Verfaille	2014	Netherlands	*P.aeruginosa* -VIM-2	22
Epstein	2014	USA	*E.coli*, NDM-1	35
N.N. Berlin	2014	Germany	*K.pneumoniae*, OXA-48	13
N.N. LA	2015	USA	Carbapenem-p. Enterobacteria	7 + ? 2 died
N.N. LA	2015	USA	Carbapenem-p. Enterobacteria	4
Wendorf	2015	USA	*E.coli*, AmpC–producing	7
Marsh	2015	USA	K.pneumoniae, KPC	37
Smith	2015	USA	E.Coli NDM-1	4

Petra Gastmeier #M517

My conclusions for ERCP and other devices

- Facilities should be aware of the potential for transmission of antimicrobial-resistant organisms via this route
- They should conduct regular reviews of their duodenoscope reprocessing procedures to ensure optimal manual cleaning and disinfection
- Modifications of design of medical devices may compromise safety and should be announced and investigated by FDA/similar national agencies

Petra Gastmeier #M517

Nosocomial Infections via GI Endoscopes in general

Infections traced to deficient practices

a) inadequate cleaning (all channels?)

b) inappropriate/ineffective disinfection (time, perfusion of channels, ineffective or inappropriate disinfectant, concentration)

C) Failure to follow recommended disinfection practices (tapwater rinse)

D) Flaws in design of endoscopes or disinfection machines

Petra Gastmeier #M517

da Vinci® General Surgery Procedures

Control console

Petra Gastmeier #M517

Petra Gastmeier #M517

Table 3. Incidence of developing infectious complications after surgery

	n (%)			
	RRP	RARP	Total	*P* Value
SSI	216 (4.5)	6 (0.6%)	222 (4.6%)	<.001
Urinary tract infection	58 (1.2)	17 (1.6%)	75 (1.3%)	.284
Sepsis/bacteremia	7 (0.1)	1 (0.1)	8 (0.1)	1.00

RRP = retropubic radical prostatectomy
RARP = robotic-assisted radical prostatectomy

Tollefson et al. UROLOGY 78: 827–831, 2011

Petra Gastmeier #M517

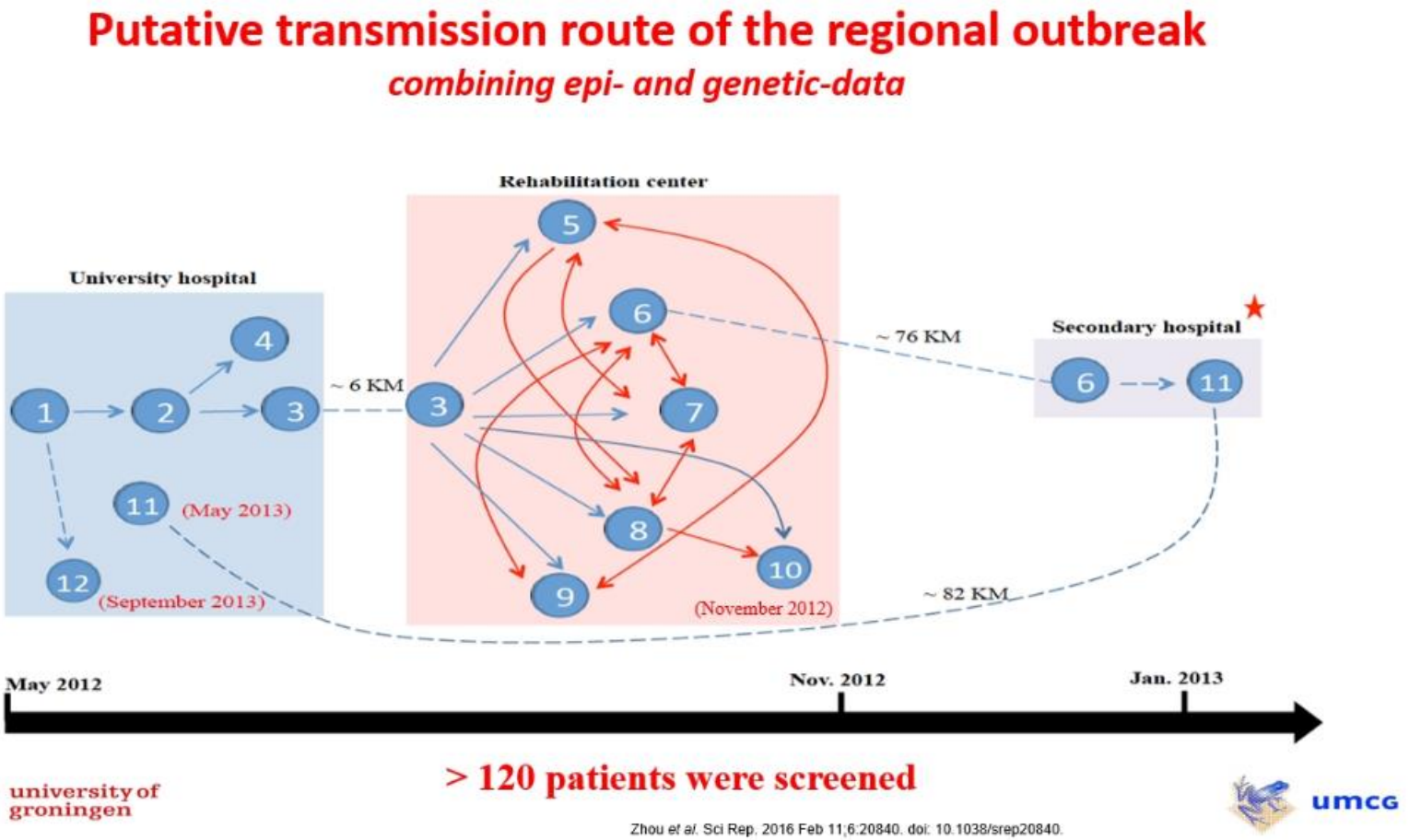
Conclusion

In conclusion, this study provides new information suggesting that the incidence of SSI may be increased after robot-assisted surgery compared with traditional open surgery for certain surgical sites or classes of wounds, which may be related to the learning curve associated with use of the robot. Because of the above-mentioned limitations, further studies are needed to fully evaluate the role that robot-assisted surgery may play in relation to SSI. In particular, future studies should investigate how the duration of surgery changes over time as surgeons become more familiar with the robotic system and whether a decrease in surgical duration results in a reduction in the incidence of SSI.

Hermsen et al. ICHE 2010; 31(8):822-827

The hospital in the era of antimicrobial resistance and infection control performance measures

Metagenomics approaches for analysis of hospital environment contamination



#S581 *John Rossen*

Metagenomics approaches for analysis of hospital environment contamination

Pitfalls ?

- Data analyses
- Speed
- Batch-wise
- Nucleic acids or “real” microorganisms ?

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#S581 *John Rossen*

Metagenomics approaches for analysis of hospital environment contamination

NGS in clinical microbiology and infection control

- clinical and environmental samples
- identification of pathogens
- standardized typing of pathogens
- determining (antibiotic) resistance and virulence
- improving workflows
- reducing costs
- guiding patient and infection control management

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#S581 *John Rossen*

Automated monitoring of nosocomial infections

Data sources

- Routine care data:
  - collected during routine process of care
  - stored in EHR
  - extracted through clinical data warehouses

- ✓ Availability in a standardized format differs
- ✓ Depends on clinical practice and documentation
- ✓ Additional registration burden?

Microbiology results Laboratory results Device use Physician narratives* Other diagnostics (radiology)*	Medication use Procedure codes Diagnosis codes Billing data

*often free text

de Bruin *JAMIA 2014*

#S582 *Maaike S.M. van Mourik*

Automated monitoring of nosocomial infections

Key characteristics of surveillance systems

	Research	QI (in hosp)	QI (national)	Publ rep/P4P
Clinical relevance*	■	■		
Actionable (specific)*	■			
Large-scale standardization (robustness)*			■	■
Reliable over time		■	■	■
Robust to financial incentives				■
Timely		■		
Risk adjustment	■		■	■

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Automated monitoring of nosocomial infections

Semi- or fully automated

Semi-automated	Fully automated
Source data standardization	Source data standardization
Standardize definition*	Adapt definitions as HAI metric*
Need for chart review (advantage?)	Subjective interpretation impossible
Clinical acceptance	Clinical buy-in?
More timely data within hospitals?	Trade specificity for robustness?
...	...

*: depending on type of HAI

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Semi-automated SSI surveillance in practice

- **Aim:** in-hospital surveillance of clinically relevant infections
- **Definitions:** national surveillance
- **Data sources:** clinical, selected in collaboration with clinicians
- Sources of **variation** in practice, documentation
- **Validation:** time, place

- **Facilitating factors**
  - Existing infrastructure: clinical datawarehouse
  - Multidisciplinary IT <> Infection Control
  - Prioritized by hospital governance

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Automated monitoring of nosocomial infections

Challenges with automated surveillance

- Availability of high-quality, standardized, data
  - Patient population (devices!), indicators of infection
- Knowledge about automation within infection control
- Comparability is not guaranteed by automated methods
  - Data-generating mechanism, implementation
  - Case-mix correction
- Heterogeneity remains: independent system development efforts
- Transition from manual to automated methods: loss of comparative data?

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Monitoring of processes of care: do we need a big brother

6 Criteria for Reporting Measures

1) Impact (Disability, Mortality, Economic)
2) Improvability – a gap that can be closed
3) Inclusiveness – relevant to many populations
4) Frequency – avoid rare events, improves accuracy
5) Feasibility – easily collected, clear definitions
6) **Functionality – helpful in improving quality**

Outcomes measures should be risk-adjusted

FOR MORE INFO...

Maryland Health Care Commission, 2008, http://mhcc.maryland.gov

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#S583 *Eli Perencevich*

Monitoring of processes of care: do we need a big brother

Conclusion: Do we need big brother?

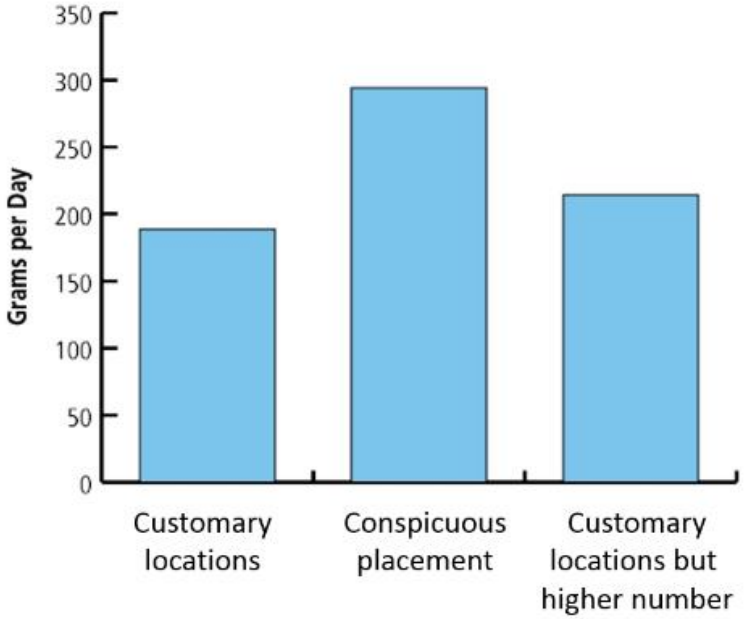
- "This is a tide that will not be turned"
- Favor outcome over process
  - What public and politicians want
  - Mandated processes hinders local response
  - However, need to avoid adjudication, subjectivity
- New outcome measures
  - Hospital onset bacteremia, foley utilization

cadre

#S583 *Eli Perencevich*

Smart design enhances compliance

Hand hygiene



NCBA; single centre

Three periods:

1. Customary handrub locations
2. Conspicuous placement
3. Customary locations but in higher number

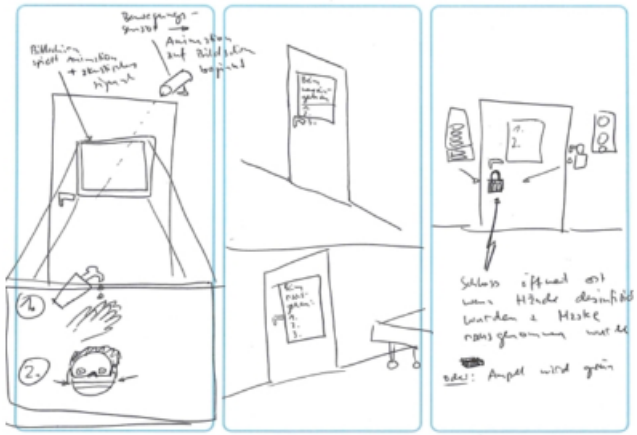
Thomas BW *J Am Osteopath Assoc* 2009

#S584 *Walter Zingg*

Smart design enhances compliance

Isolation precaution measures – visual cues

Mental models: Systems ambiguity
Design workshops



Clack L *AHFE conference* 2015

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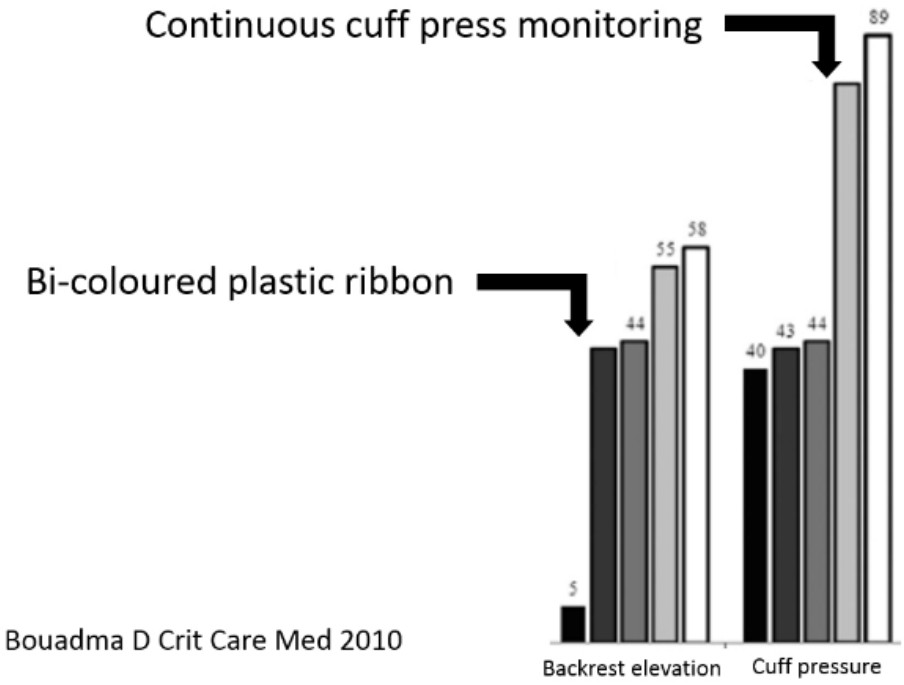
Ventilator-associated pneumonia



Bouadma D Crit Care Med 2010

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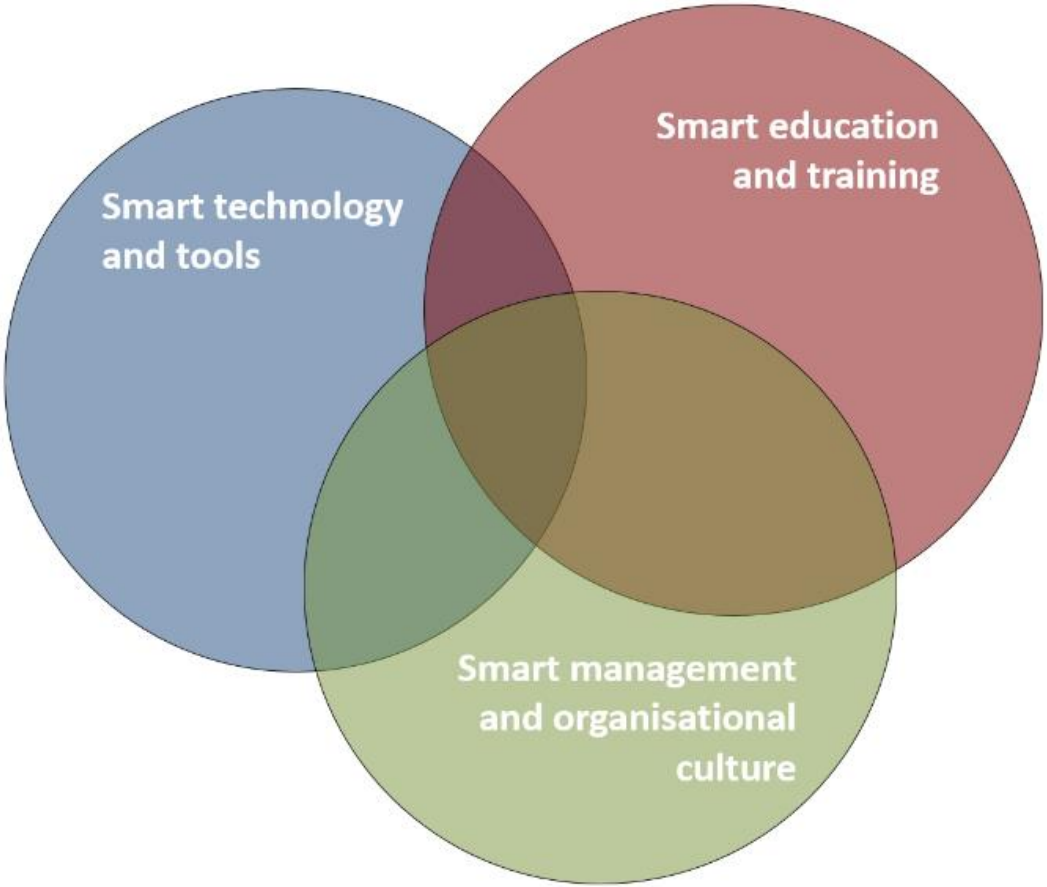

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The role of champions

Qualitative analysis by telephone interviews with 38 individuals at 14 purposively selected hospitals and site visits at six hospitals

It was possible for a single well-placed champion to implement a new technology, but more than one champion was needed when an improvement required people to change behaviours

Damschroder LJ *Qual Saf Health Care* 2009

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