
The current literature in Infection Prevention and Control

April 2021-March 2023

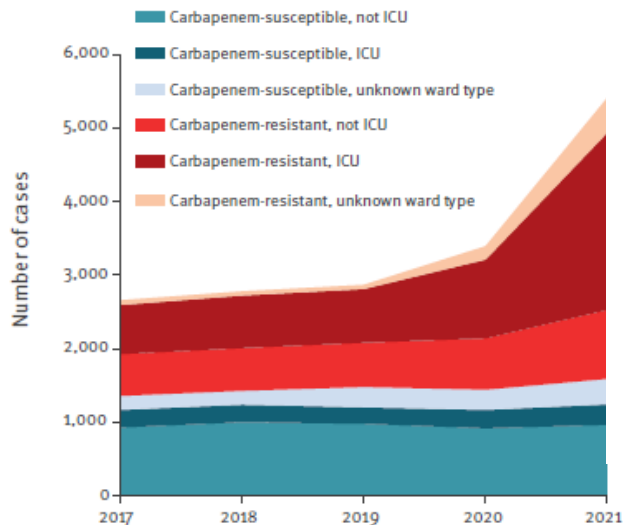
By Gabriel Birgand

27/03/2023

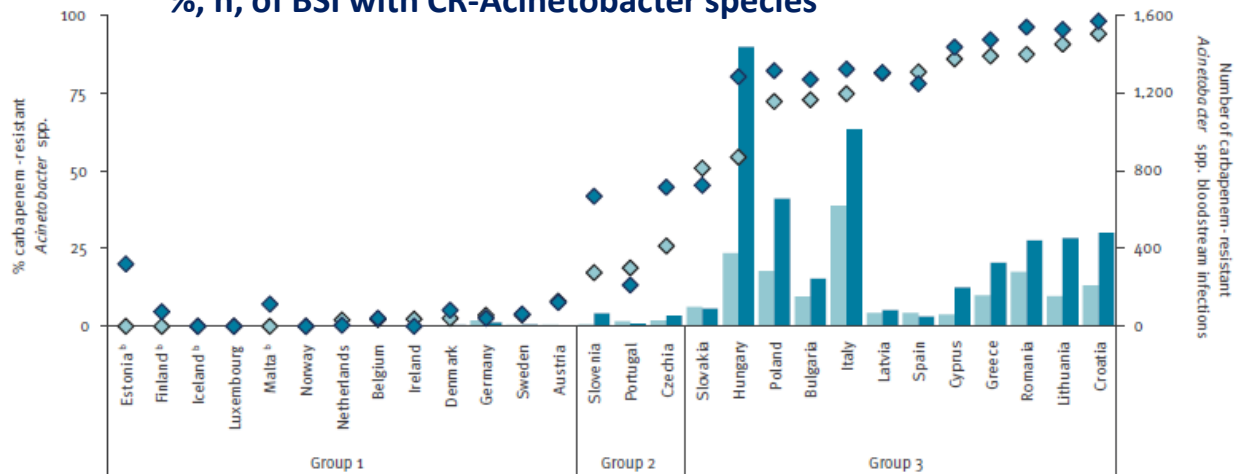
Large increase in bloodstream infections with carbapenem-resistant *Acinetobacter* species during the first 2 years of the COVID-19 pandemic, EU/EEA, 2020 and 2021

- BSIs with *Acinetobacter* spp. with carbapenem (imipenem and/or meropenem) antimicrobial susceptibility testing results in 2017 to 2021
 - 255 of 826 laboratories reporting, on average, per year

Acinetobacter species BSI



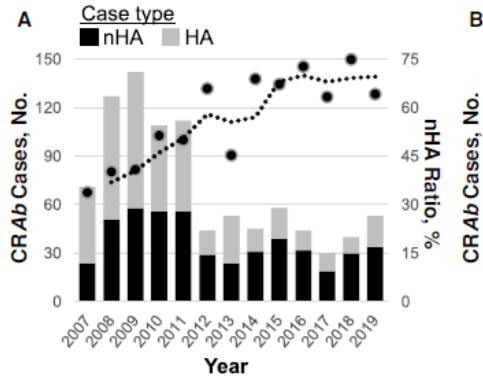
% , n, of BSI with CR-Acinetobacter species



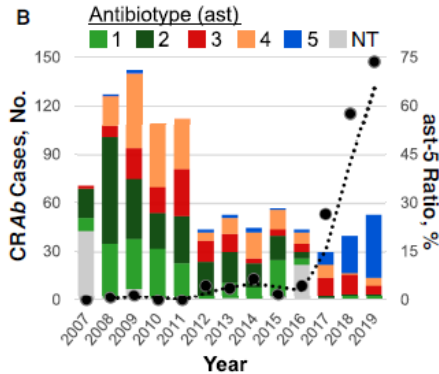
Outpatient Clonal Propagation and Rapid Regional Establishment of an Emergent Carbapenem-Resistant *Acinetobacter baumannii* Lineage Sequence Type 499Pas

- WGS of clinical isolates to describe the regional nonhospital arena

Annual CRAb cases hospital acquired (HA) or nHA



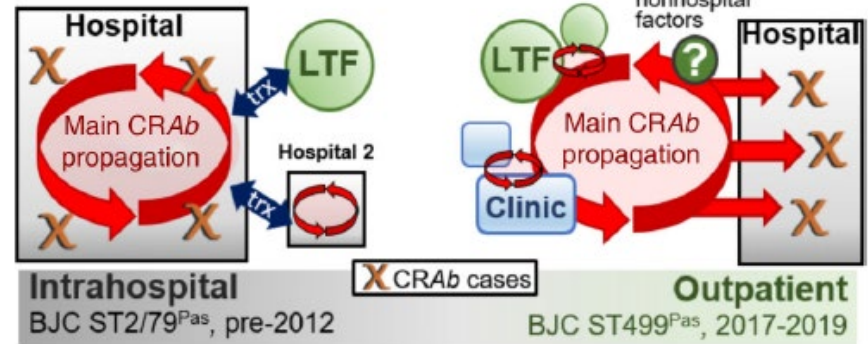
Annual number of CRAb cases associated with index isolates



Spectrum of CRAb propagation habits

ranging from stable intrahospital pools

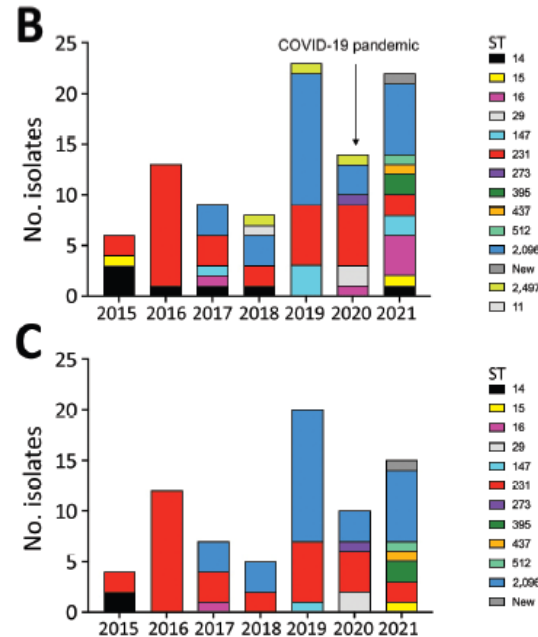
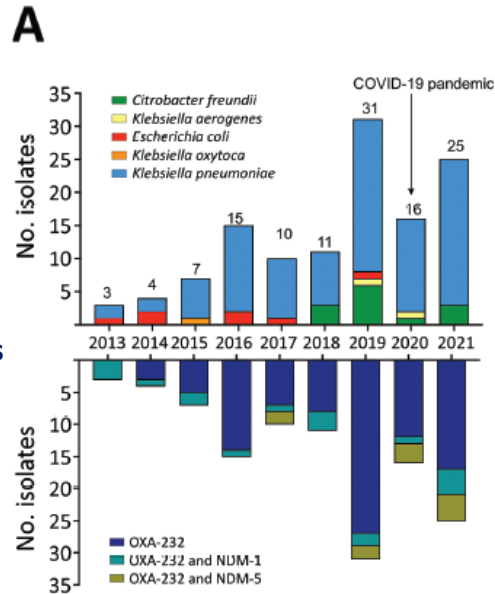
Centering around outpatient environments



- CRAb can rapidly establish a regional presence even without gains in breadth of antibiotic resistance and negligible contribution from sustained intrahospital transmission.
- As CRAb lineages may sidestep control efforts via outpatient epidemiological niches, our approach can be implemented to investigate outpatient CRAb propagation and inform subsequent local surveillance outside hospital settings.

Polyclonal Dissemination of OXA-232 Carbapenemase-Producing *Klebsiella pneumoniae*, France, 2013–2021

Evolution of several OXA-232–producing Enterobacteriales, by species (top of panel) and carbapenemase variant (bottom).



Evolution of distribution of ST among all OXA-232–producing *K. pneumoniae*

Evolution of distribution of ST among NDM and OXA-232–coproducing *K. pneumoniae*. NDM, New Delhi metallo- β -lactamase

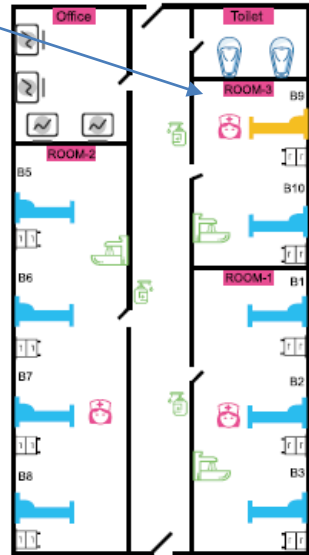
- During 2013–2021, increased prevalence of oxacillinase 232–producing Enterobacteriales was observed in France, mostly driven by its emergence in *Klebsiella pneumoniae*.
- WGS identified that oxacillinase 232–producing *K. pneumoniae* belonged to 14 sequence types (STs), among which 2 polyclonal highrisk clones, ST-231 and ST-2096, were overrepresented.

Small wards in the ICU: a favorable measure for controlling the transmission of carbapenem-resistant *Klebsiella pneumoniae*

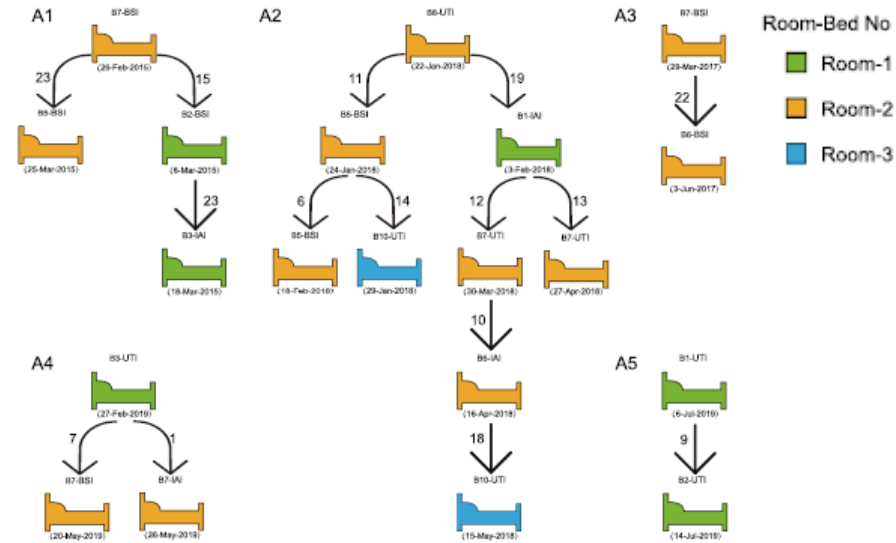
- **Objective:** To clarify the role of separate, small wards within the ICU in controlling the transmission of CRKP, from 2015 to 2019.

patient with CRKP (Room-3-B9)

- 65 CRKP-HAI cases during the investigation period.
- 7 CRKP-HAI outbreaks
- Total of 95 nonrepetitive CRKP isolates, including 32 strains from the Patient in the separate small ward.



Clonal transmission and outbreaks occurred in the ICU.



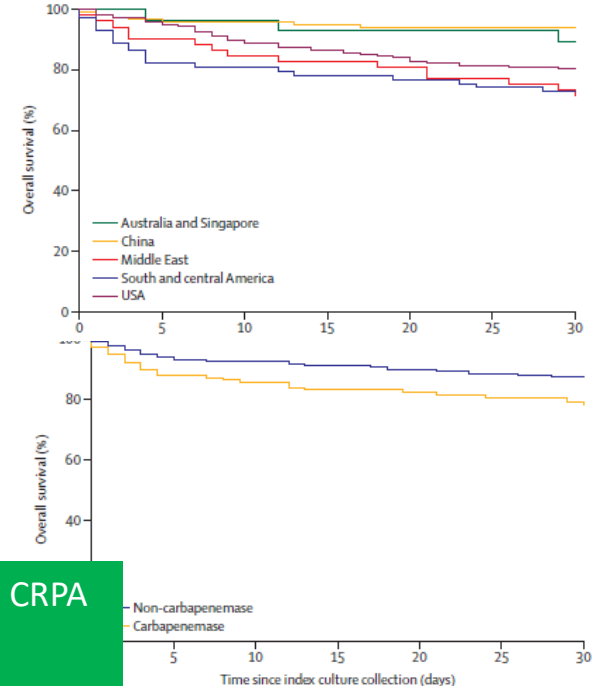
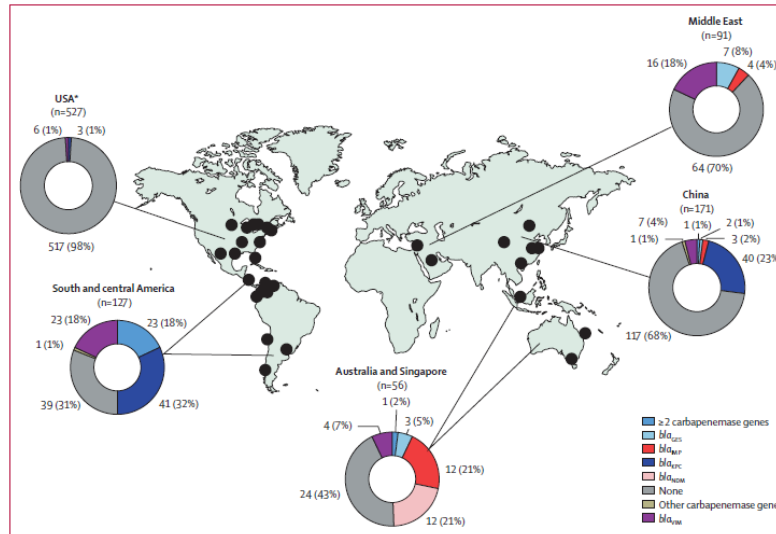
- a patient carrying CRKP hospitalized in a separate, small ward for the entire study period did not spread

Global epidemiology and clinical outcomes of carbapenem-R *Pseudomonas aeruginosa*: a prospective cohort study

Jinnethe Reyes, *Lancet Microbe*

- Objective:** to define characteristics and outcomes of CRPA infections and the global frequency and clinical impact of carbapenemases harboured by CRPA.

Methods: CRPA isolated from bloodstream, respiratory, urine, or wound cultures of patients at 44 hospitals (10 countries) between Dec 1, 2018, and Nov 30, 2019.



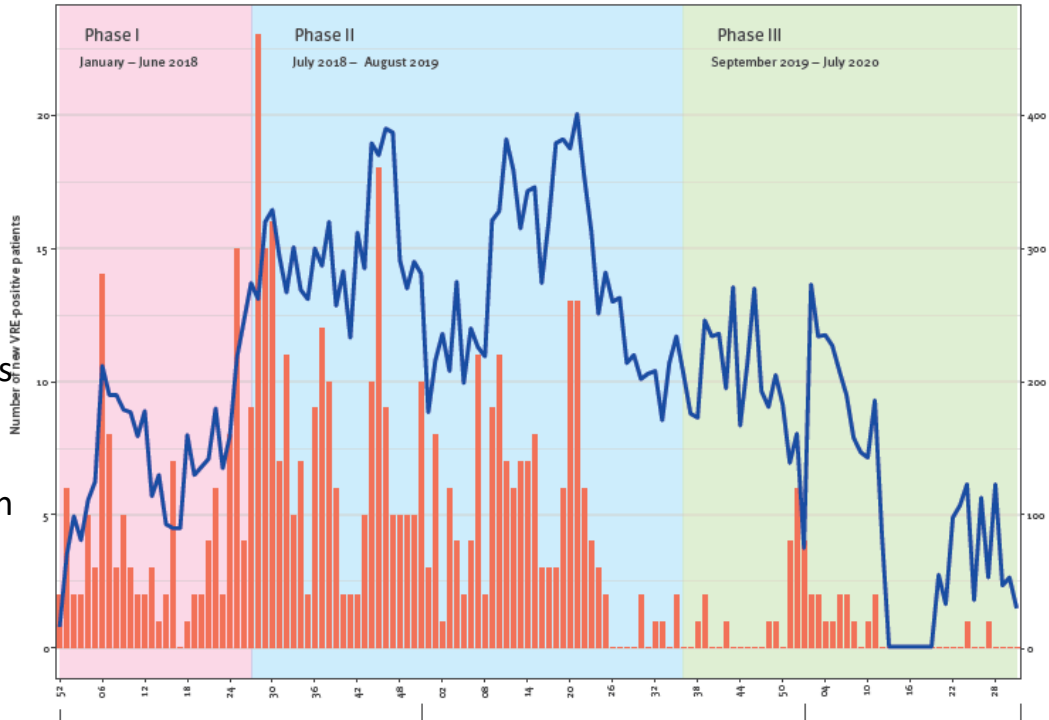
differences in the clinical characteristics and outcomes of patients infected with CRPA across geographical regions.

patients with carbapenemase-producing CRPA infection had a higher

Nosocomial outbreak of vancomycin-resistant *Enterococcus faecium* (VRE) ST796, Switzerland, 2017 to 2020

- Characteristics of the outbreak and the bundle of infection prevention and control (IPC) measures implemented

Phase I: contact precautions for VRE-PP und VRE-CP, admission screenings for all patients on affected wards, weekly ward screenings and temporary admission stops



Phase II: raise awareness and foster accountability. Daily environmental disinfectant cleaning was implemented and intensified where VRE Transmissions PCR Xpert vanA/vanB with a previous incubation step in an enrichment broth was introduced

The impact of non-antimicrobial drug agents on the acquisition of ESBL-producing Enterobacterales in non-critical care wards in a German university hospital

- **Matched case–control** study based on rectal surveillance screening between 2014 and 2016 in eight non-ICU wards.
- 232 Patients with ward-acquired ESBL-E (cases) matched to 232 non-ESBL-E carriers (controls) on ward, number of screening samples, days at risk and Charlson comorbidity index

Drug (ATC code)	Drug name	Number of patients with drug prescription (%)	OR	95% CI	P value
Model with drug therapy days (chemical subgroups ATC code 5 digits)					
Model with all drug prescriptions					
H02AB	glucocorticoids	170 (36.6)	1.07	1.001–1.13	0.047
N02AA	opium alkaloids	102 (22)	1.06	1.007–1.12	0.0275
R03AC	selective β -2-adrenoreceptor agonists	29 (6.3)	1.31	1.105–1.55	0.0018
A04AB	antihistamines	38 (8.2)	0.61	0.39–0.97	0.0348
Model with drug prescriptions to $N \geq 50$ patients (sensitivity analysis)					
A02BC	PPIs	361 (77.8)	1.05	1.001–1.100	0.0476

Drugs other than antimicrobials associated with the colonization of ESBL-E in a non-ICU setting. Specifically, opioids, glucocorticoids and b-2-adrenoreceptor agonists, for which prescription rates were low, were risk factors for an ESBL-E acquisition.

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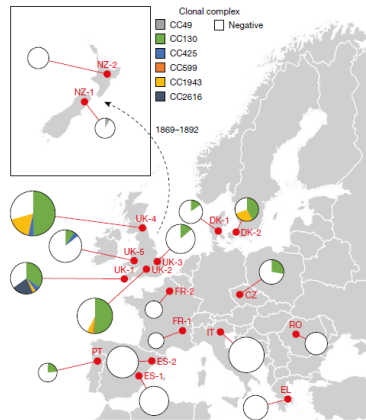
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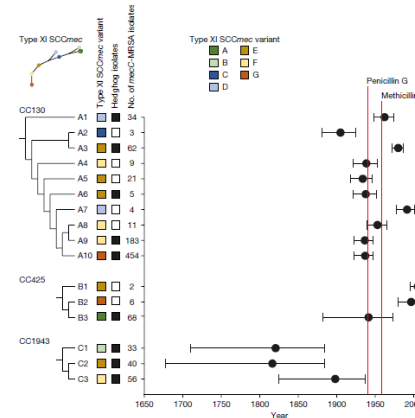
Emergence of methicillin resistance predates the clinical use of antibiotics

- Particular lineages of methicillin-resistant *Staphylococcus aureus* appeared in European hedgehogs in the pre-antibiotic era.
 - These lineages spread within the local hedgehog populations and between hedgehogs and secondary hosts, including livestock and humans
 - hedgehog dermatophyte *Trichophyton erinacei* produces two β -lactam antibiotics that provide a natural selective environment in which methicillin-resistant *S. aureus* isolates have an advantage over susceptible isolates

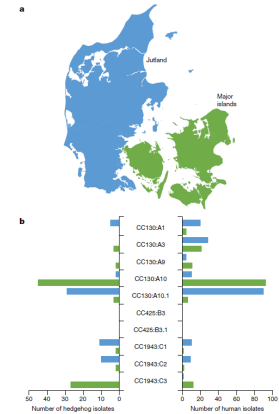
Distribution of *mecC*-MRSA clones in European and New Zealand hedgehog samples



Timeline of *mecC*-MRSA CC130, CC425 and CC1943 evolution in Europe.



Population structures of Danish *mecC*-MRSA isolates from hedgehogs and humans



Methicillin resistance emerged in the pre-antibiotic era as a co-evolutionary adaptation of *S. aureus* to the colonization of dermatophyte-infected hedgehogs

Evaluation of Patients' Adverse Events During Contact Isolation for Vancomycin-Resistant Enterococci Using a Matched Cohort Study With Propensity Score

- Objectives:** To compare adverse events between a contact isolation group with VRE and a matched comparison group using a relatively large data set from full electronic medical records (EMR) and propensity score–matching methods
 - Seoul National University Bundang Hospital (SNUBH) in Korea, a tertiary, university-affiliated hospital that has 1337 inpatient beds.

Table 2. Incidence Results for Adverse Events Between VRE Contact Isolation Group vs Matched Comparison Group

Adverse events	Group	FSW PSM				1:10 nearest neighbor PSM			
		No. of events	Cumulative patient-days	1000 Patient-day incidence (95% CI)	Incidence rate ratio	No. of events	Cumulative patient-days	1000 Patient-day incidence (95% CI)	Incidence rate ratio
Pressure ulcer	VRE contact isolation	8	3157	2.53 (1.09-4.99)	1.53 (0.76-3.07)	8	3146	2.54 (1.10-5.01)	2.09 (0.89-4.92)
	Matched comparison	879	531 465	1.65 (1.55-1.77)		15	12 344	1.22 (0.68-2.00)	
Fall	VRE contact isolation	3	3446	0.87 (0.18-2.54)	0.68 (0.22-2.10)	3	3435	0.87 (0.18-2.55)	0.57 (0.17-1.92)
	Matched comparison	698	542 294	1.29 (1.19-1.39)		19	12 355	1.54 (0.93-2.40)	
All	VRE contact isolation	11	3068	3.59 (1.79-6.42)	1.21 (0.67-2.20)	11	3057	3.60 (1.80-6.44)	1.29 (0.65-2.54)
	Matched comparison	1548	524 803	2.95 (2.80-3.10)		34	12 191	2.79 (1.93-3.90)	

Abbreviations: FSW, fine stratification and weighting; PSM, propensity score matching; VRE, vancomycin-resistant *Enterococci*.

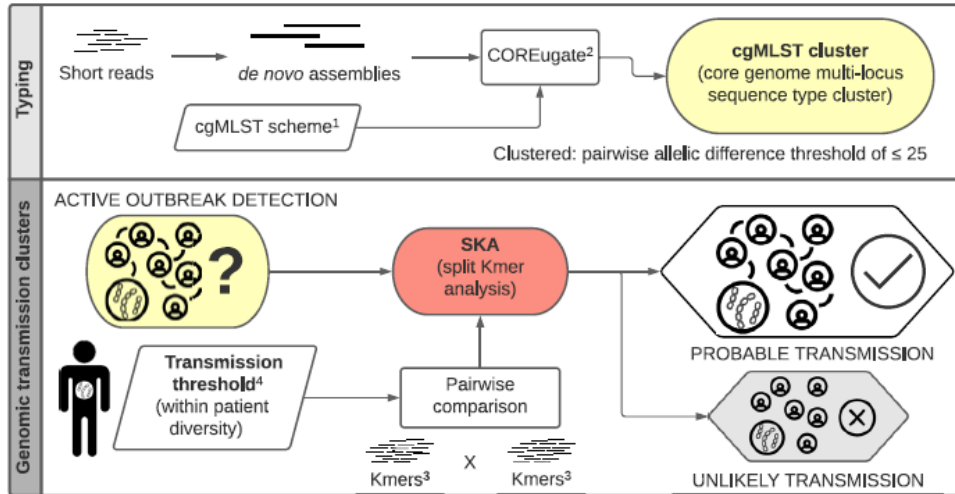
Table 3. Cox Proportional Hazard Model Results for Adverse Events between VRE Contact Isolation Group vs Matched Comparison Group

Matching methods	Characteristics	Pressure ulcer		Fall		All	
		HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Unmatched	VRE (yes)	2.06 (1.00-4.26)	.05	0.69 (0.22-2.17)	.52	1.48 (0.81-2.73)	.20
FSW	VRE (yes)	1.42 (0.67-2.99)	.36	0.66 (0.20-2.13)	.48	1.14 (0.61-2.12)	.68
1:10	VRE (yes)	2.07 (0.85-5.01)	.11	0.60 (0.17-2.13)	.43	1.28 (0.63-2.60)	.49

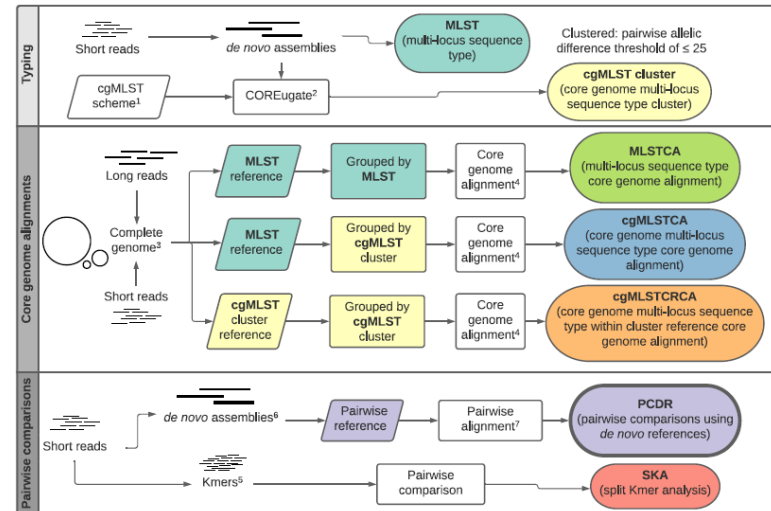
No association was found between the likelihood of adverse events and contact isolation using propensity score–matching methods and closely related covariates for adverse events.

Optimising genomic approaches for identifying vancomycin-resistant *Enterococcus faecium* transmission in healthcare settings

- To develop a standardized genomic method for identifying putative VREfm transmission links.



Proposed genomic analysis pipeline for identifying potential vancomycin-resistant *Enterococcus faecium* transmission



Methods for investigating the genomic diversity of vancomycin-resistant *E. faecium*

Impact of single-room contact precautions on acquisition and transmission of VRE on haematological and oncological wards

- **Prospective, multicenter cohort study in German haematological/oncological departments during 2016.**
 - 1 performed SCP for VRE patients (n= 1,397) and two did not (NCP, n= 1,531).

Variable	Univariate analysis			Multivariate analysis ^b		
	SHR ^c	95% CI	p value	SHR ^c	95% CI	p value
Site group						
SCP	Ref	NA	NA	Ref	NA	NA
NCP	1.71	1.35–2.17	<0.001	1.60	1.14–2.25	0.007
Age group						
≤40 years	Ref	NA	NA	Ref	NA	NA
41–60 years	1.28	0.87–1.88	0.215	1.22	0.82–1.82	0.321
>60 years	1.27	0.88–1.82	0.199	1.31	0.91–1.91	0.151
Sex						
Female	Ref	NA	NA	Ref	NA	NA
Male	1.22	0.96–1.55	0.112	0.079	0.98–1.58	0.079
Underlying haematological disease in categories						
Solid tumour	Ref	NA	NA	Ref	NA	NA
Acute leukaemia	4.80	3.09–7.46	<0.001	2.34	1.46–3.75	<0.001
Lymphoma	2.39	1.55–3.70	<0.001	1.37	0.87–2.14	0.172
Other	1.25	0.77–2.04	0.368	1.22	0.75–1.99	0.417
Exposure to antimicrobials^d						
Active against VRE	1.53	0.98–2.37	0.059	0.68	0.42–1.12	0.130
Cephalosporins	3.34	2.55–4.36	<0.001	1.73	1.26–2.38	0.001
Fluoroquinolones	2.27	1.78–2.90	<0.001	1.48	1.12–1.96	0.006
Glycopeptides	3.41	2.60–4.48	<0.001	1.61	1.19–2.18	0.002
Other antimicrobials	6.85	4.66–10.06	<0.001	4.35	2.84–6.68	<0.001
Compliance with hand hygiene at respective site during this hospitalisation^d						
>75%	Ref	NA	NA	Ref	NA	NA
≤75%	1.42	1.13–1.80	0.003	1.03	0.74–1.43	0.883

Certain protective effect of SCP for haVRE in patients hospitalised on haematological and oncological wards. More importantly, our study adds to the available evidence underlining the exposure to antimicrobials as an important and modifiable factor for the acquisition of VRE.

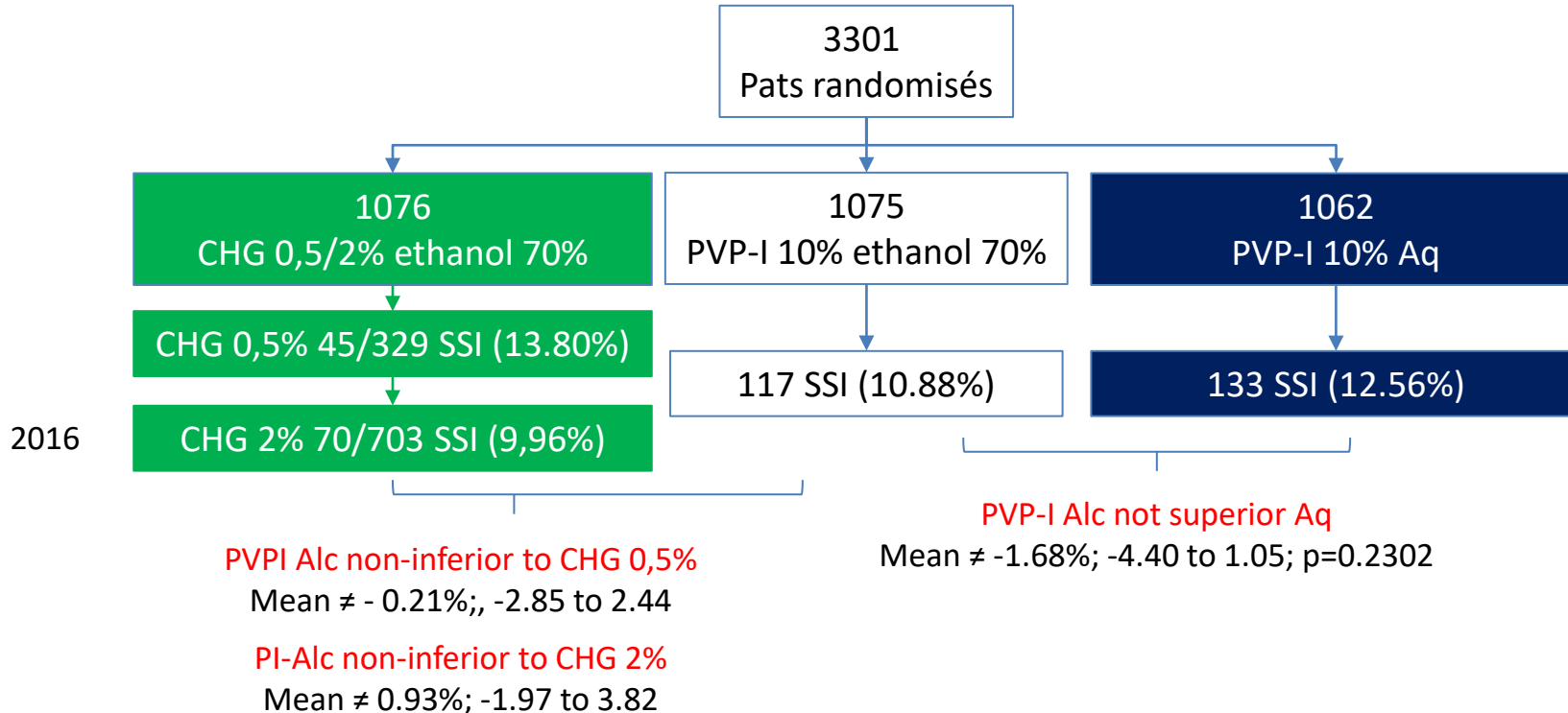


Antiseptic skin agents to prevent surgical site infection after incisional surgery

- Bicenter, prospective, combined **non-inferiority (PI-Alc v Calc) and superiority (PI-Alc v PI-Aq) RCT**
 - Non-inferiority of PI-Alc compared with Calc
 - Superiority of PI-Alc compared with PI-Aq.
- Participants: adults undergoing elective or semi-urgent incisional surgery
 - Stratification by CDC incision category
- Outcomes:
 - SSI within 30 days and 90 days for implants,
 - Total surgical complication rates, LOS, readmission rates and adverse reactions



Antiseptic skin agents to prevent surgical site infection after incisional surgery





Antiseptic skin agents to prevent surgical site infection after incisional surgery

- Current guidelines
 - NICE: first choice solution **should be alcohol based CHG**
 - CDC: **alcohol based** antiseptic agents
 - WHO: **CHG alcohol**, rather than aqueous PVP-I Alc
 - Repeat meta-analysis excluding trials with unknown concentrations indicated no advantage with chlorhexidine (OR 0.84; 95% CI 0.68-1.04)
- Limitations
 - Two major institutions but in a single city
 - Inherent inability to blind participants (colour of the agents)

Study free of any industry involvement
Skin preparation with PVP-I Alc not inferior to CHG Alc with respect to SSI rates, complication rates, length of hospital stay and readmission rates

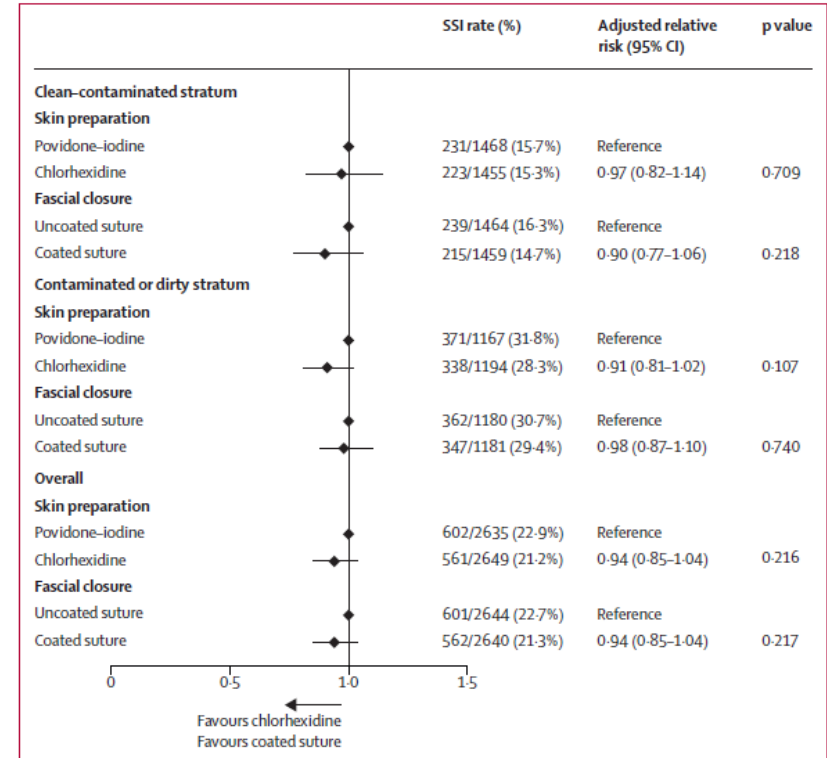


Reducing surgical site infections in low-income and middleincome countries (FALCON)

- 2 × 2 factorial, RCT by **clean-contaminated, or contaminated or dirty**, abdominal surgery with a skin incision
- 54 hospitals in seven **LMICs countries**

2% Alc CHG	Non-coated suture
	Triclosan-coated suture
10% Aq PVPI	Non-coated suture
	Triclosan-coated suture

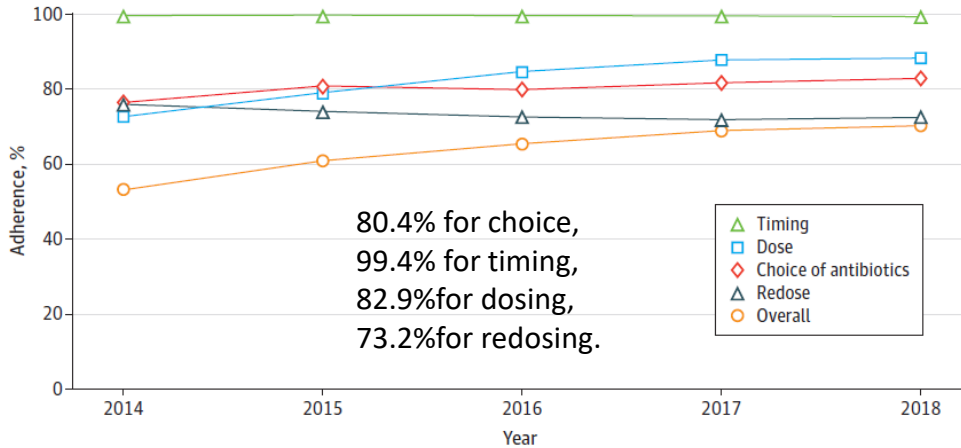
No evidence to support the superiority of either alcoholic chlorhexidine skin preparation or triclosan-coated sutures in LMICs for clean-contaminated surgery, and contaminated or dirty surgery





Effect of Antimicrobial Prophylaxis Duration on Health Care–Associated Infections After Clean Orthopedic Surgery

- Cohort of 414 851 encounters across 31 institutions
 - Overall rates of adherence: 64.1%



Factors Associated With Nonadherence

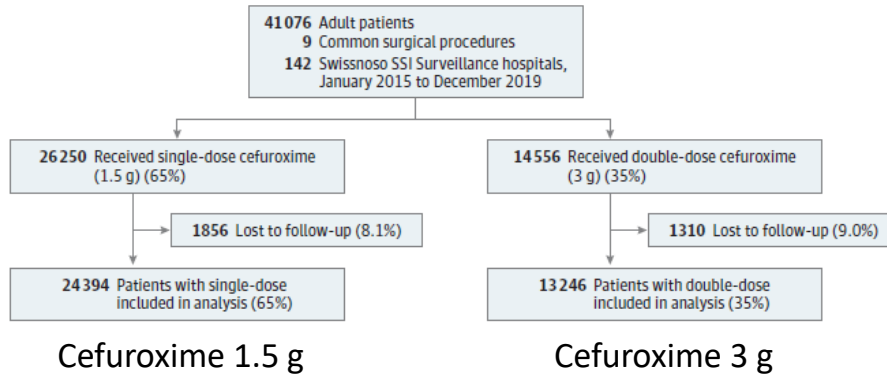
	OR
Emergency	1.35, 1.29-1.41
Off-hour shifts	1.08, 1.04-1.13
Blood transfusions	1.30, 1.25-1.36
orthopedic	0.26, 0.25-0.26
gynecology	0.38, 0.37-0.39
urology	0.74, 0.73-0.76
solo anesthesiologists, residents	0.90, 0.87-0.92

More comprehensive approach to evaluate guideline adherence beyond SCIP for the optimal management of perioperative antibiotic prophylaxis is needed.



Association Between Antimicrobial Prophylaxis With Double-Dose Cefuroxime and Surgical Site Infections in Patients Weighing 80 kg or More

- Objective: To assess whether double-dose cefuroxime SAP was associated with a decreased SSI rate in patients weighing at least 80 kg
 - Cohort study, adult patients weighing at least 80, 9 major surgical procedures



Variable	aOR (95% CI)	P value
Cefuroxime dose		
Single	1 [Reference]	NA
Double	0.89 (0.78-1.02)	.10
Weight category, kg		
80 to <90	0.76 (0.61-0.97)	.02
90 to <100	1.12 (0.87-1.47)	.37
100 to <120	0.99 (0.76-1.30)	.96
≥120	0.65 (0.42-1.01)	.06

Double-dose cefuroxime SAP in patients weighing ≥80 kg was not consistently associated with a lower SSI rate.



The Effect of Beta-lactam Allergy Status on the Rate of Surgical Site Infections

- Due to over-reporting of BL allergies, many patients may not receive guideline directed cephalosporin-based prophylaxis
 - Single-center retrospective cohort design study: C-section, vaginal, abdominal hysterectomy, colon, laminectomy, and spinal fusion

Procedure	Reported BL Allergic	Reported NBL Allergic	P-value
Overall*	14/454 (3.1%) [†]	34/2222 (1.5%) [†]	<i>P</i> = 0.023
Cesarean Section*	6/150 (4%) [†]	12/842 (1.4%) [†]	<i>P</i> = 0.042
Abdominal Hyst	1/61 (1.6%) [†]	2/285 (0.7%) [†]	<i>P</i> = 0.442
Vaginal Hyst*	4/34 (11.8%) [†]	1/150 (0.7%) [†]	<i>P</i> = 0.004
Colon	0/47 (0.0%) [†]	8/229 (3.5%) [†]	<i>P</i> = 0.359
Laminectomy	2/84 (2.4%) [†]	3/382 (0.8%) [†]	<i>P</i> = 0.222
Spinal Fusion	1/78 (1.3%) [†]	8/334 (2.4%) [†]	<i>P</i> = 1

Antibiotic	Rate
Cefazolin	82/454 (18.1%)
Other Beta-lactams	17/454 (3.7%)
Vancomycin	136/454 (30.0%)
Clindamycin	197/454 (43.4%)
Fluoroquinolone	16/454 (3.5%)
Other	6/454 (1.3%)

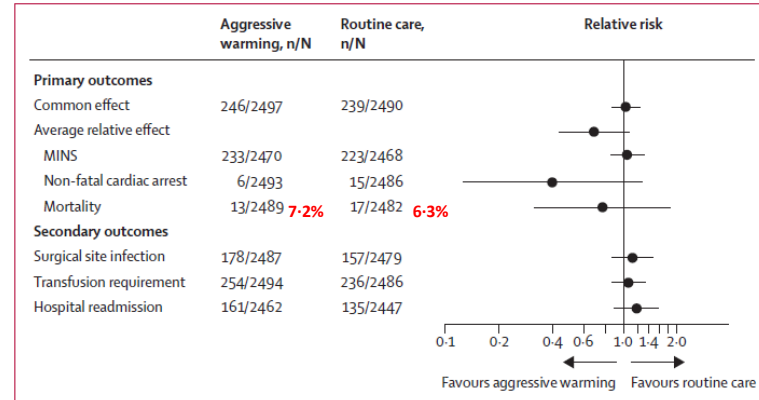
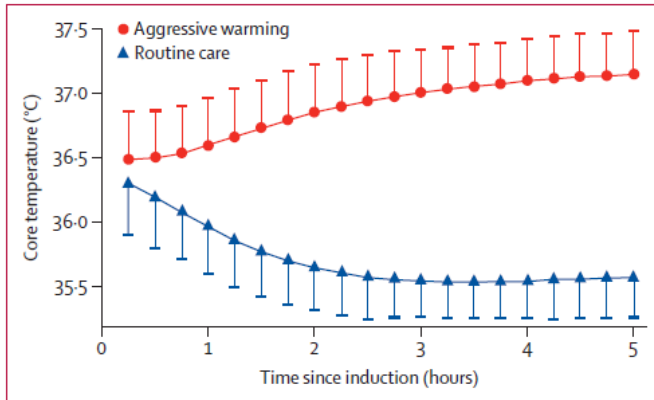
Multivariate logistic regression model:
BL allergy associated with SSI: OR, 2.1, 1.1–3.9

Considering the 139 patients without a documented allergy reaction who did not receive a BL antibiotic, 298 patients potentially could have received a cefazolin-based regimen.



The Effect of Beta-lactam Allergy Status on the Rate of Surgical Site Infections

- Hypothermia potentially promotes SSI
 - Constriction, \searrow delivery of immune cells; \searrow tissue oxygenation & oxidative killing; \searrow macrophage motility & antibody prod.
- Multicentre, parallel group, superiority trial, 12 sites in China and Cleveland Clinic
- 2507 patients in aggressively warmed (37°C) vs 2506 in routine thermal group (35.5°C)



The incidence of a 30-day composite of major cardiovascular outcomes was similar in patients allocated to routine care (35.5°C) or aggressive warming (37°C).

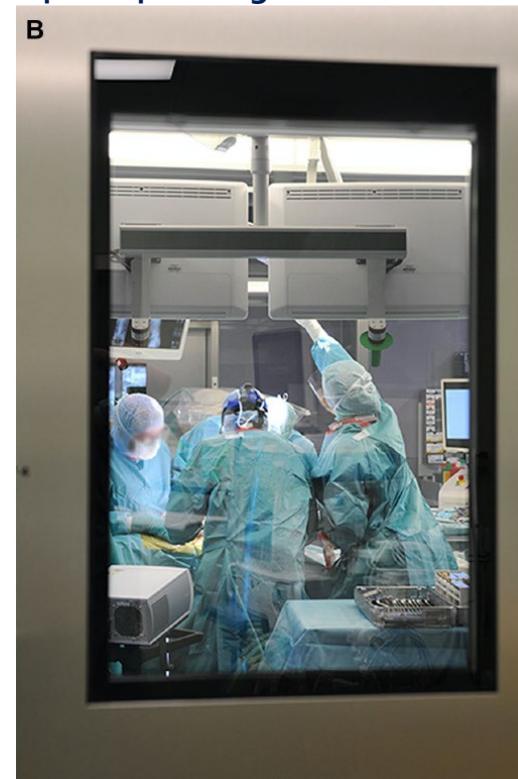


The Effect of Beta-lactam Allergy Status on the Rate of Surgical Site Infections

Open-plan operating room architecture until 2016



Closed-plan operating room architecture

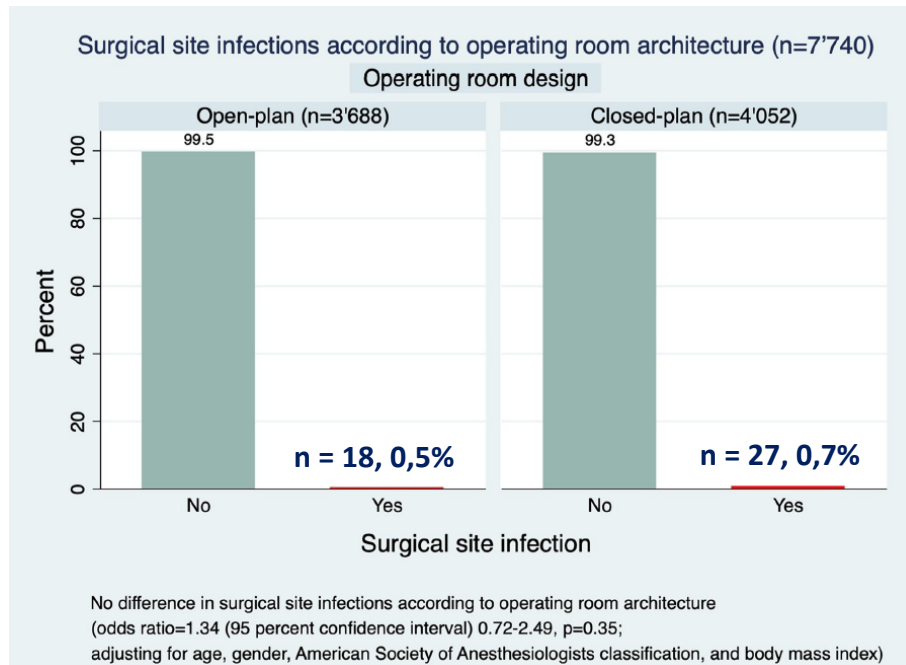


Vs



The Effect of Beta-lactam Allergy Status on the Rate of Surgical Site Infections

Broad spectrum of orthopedic surgeries between 2016–2017



Assumptions:

- ↗ SSI in open-plan OR due to higher door traffic
 - ↗ SSI in closed-plan OR due to smaller room size with less room around the sterile area
- Authors: Architecture does not appear to play a major role for the risk of SSI

Limitations:

1. Outcome = revision for SSI
2. SAP was changed
3. Automatic data retrieval using keywords “infection*” and (delayed) “wound healing”
4. risk of a type II error due to limited power
5. study focused only on a few variables
6. Not able to control on surgeon experience
7. Other modifiable risk factors not investigated



EUCIC EUROPEAN COMMITTEE ON
INFECTION CONTROL

European Society of Clinical Microbiology and Infectious Diseases



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EUCIC @escmid aims to strengthen infection control and preventive measures in European countries to reduce the burden of healthcare-associated infections