

Universal vs targeted transmission strategies

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Approaches to prevention

Vertical strategy

- Directed at specific pathogens
- Requires identification of source (screening)
- Interventions directed at specific patients

Horizontal strategy

- Directed at broad range of infections
- Applied to all patients
- Broad, universal interventions

Some examples

Vertical strategies

- Precautions for measles, TB
- Influenza vaccination of staff
- VRE screening and isolation

Horizontal strategy

- Hand hygiene
- Aseptic technique
- Environmental cleaning
- Antimicrobials stewardship

Vertical strategies effective

- Transmission based precautions for measles, TB, chickenpox
- Clonal outbreak situations
- Routine vaccinations

- Potential cases can be easily identified or risk groups defined
- Prevention tools are highly effective and easily deployed

Horizontal strategy effective

- Hand hygiene
- CLABSI bundles
- Hospital cleaning
- Staff education and training

- “All threats” approach
- Reinforcing good practice
 - Difficult to quantify effect
 - Law of diminishing returns
 - Sustainability of interventions difficult

Defining the problem

- Preventing respiratory virus transmission
- Vertical approach – staff vaccination for influenza
- Horizontal approach – reducing staff attendance while unwell, staff precautions

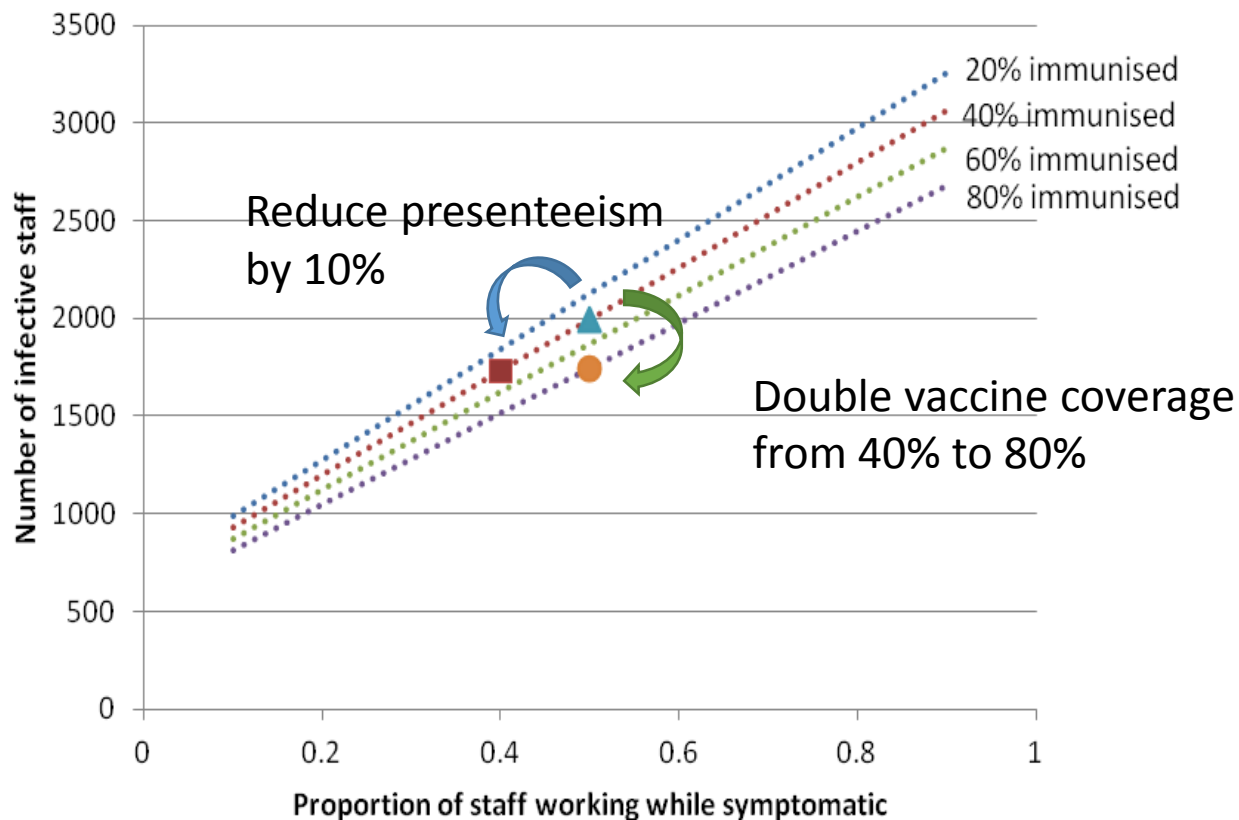
Influenza vaccination

- Influenza vaccine is ~50% effective, and depends on match between vaccine and circulating strains
- Does not protect against other respiratory viruses, which are also associated with severe disease
- Not possible to clinically distinguish between flu and other respiratory viral infection
- 50-70% of staff report working while unwell
- Influenza vaccine coverage generally poor
- Most hospitals have policy to exclude unwell staff, but not enforced

Parameters

Parameter	Value	Source
Proportion of staff vaccinated	0.4	[Bull, 2007]
Efficacy of vaccination	0.7	[Jefferson, 2007]
Influenza attack rate	0.15	[Marshall, EID]
Proportion of influenza like illness due to influenza	0.4	[Kelly, 2004][Kelly, 2009]
Proportion of duration of infectivity while asymptomatic	0.2	[Carrat, 2008]
Proportion of staff working while infective and symptomatic	0.5	[Ablah, 2008]

Modelling interventions



Preventing respiratory infections

- Framing the problem – influenza or all respiratory viruses?
 - Small decrease in presenteeism equivalent to large increase in influenza vaccination
 - Reinforcing existing policies
 - Prevents transmission from vaccine failure
 - Preventions non-influenza infection
- Not mutually exclusive interventions
 - Areas where intense controls required – respiratory, haem/onc wards

Adapting policy according to epidemiology

- VRE control
- Vertical strategy – identification and contact precautions
- Horizontal strategies – cleaning, antimicrobial stewardship

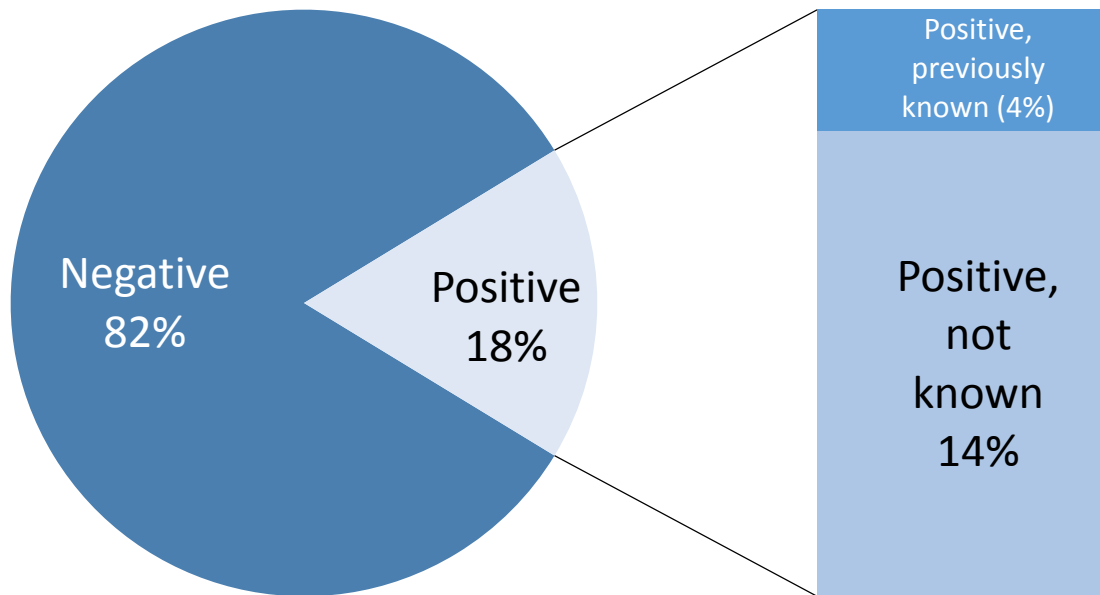
Rationale for contact precautions

- Widespread contamination of environment from carriers
- Contamination of environment linked to acquisition
- Transmission associated with co-occupancy
- Contact precautions known to terminate outbreaks and achieve control in WA
- Consistent with national and international policy

Risk factors for VRE colonisation

- Cross sectional survey-October 2008
- Nested case control study
- Inclusion criteria: All patients present on hospital on 13th Oct 2008 except in psychiatry were approached
- Exclusion criteria: not able to consent, were for palliative care only, had been discharged or declined to participate.

Results

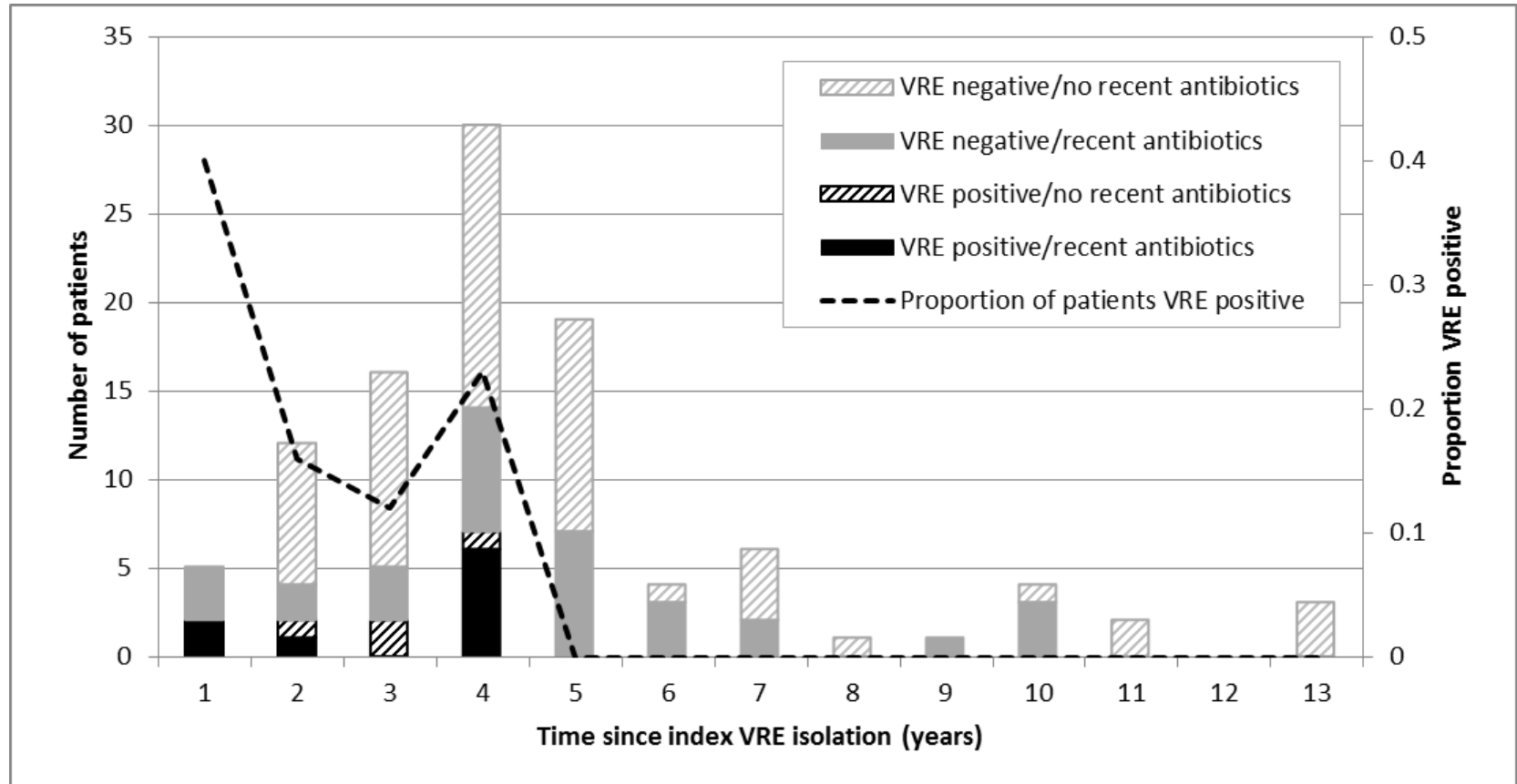


- 331 screened of 434 patients
- VRE prevalence- 17.5% (58/331)
- Proportion of VRE positive in each ward (ED and SSU, 0-3% & other wards 8-29%, $p > 0.05$)
- *E. faecium*- 57/58 (vanB)
- *E. faecalis*- 1/58 (vanB)

Duration of carriage

- Follow up stool specimen from surviving patients with VRE
 - Specimen sent by post
- Exclusions
 - Known to have died
 - Estimated age >90 years
 - Terminal illness, palliative care
 - Unable to consent – language, psychiatric illness

Results

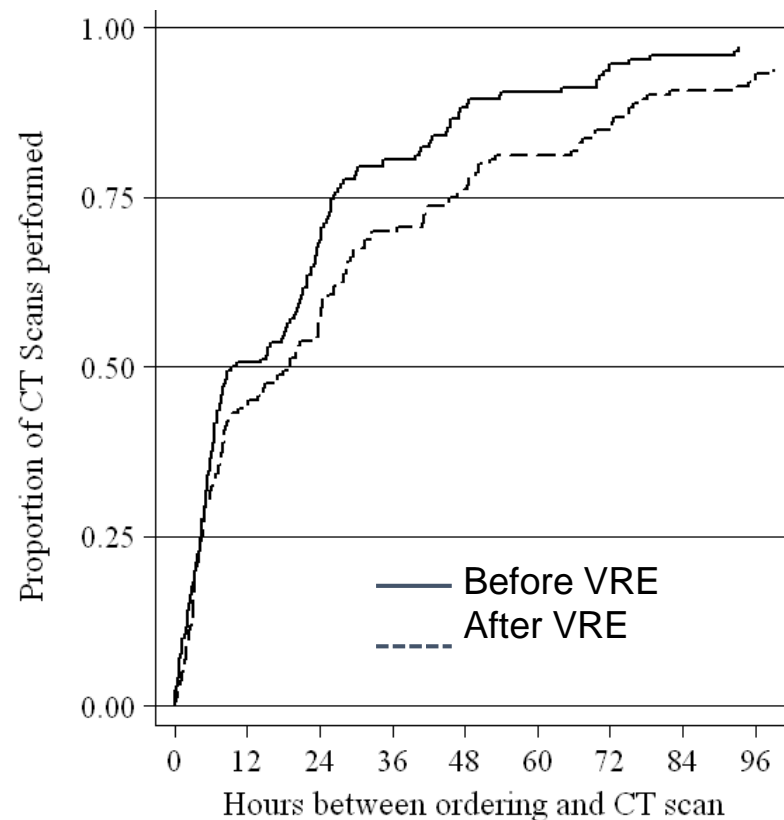


Impact on radiology access

- Time of ordering and test performance extracted from electronic requests
- Compared patients before VRE detection vs after VRE detection
 - Implicitly controls for patient specific factors
- Potential confounders: region scanned, emergency status, emergency vs main site

Results

Variable	Adjusted Poisson Coefficient (95% CI)	Interpretation
Baseline access time	3.32 (3.09 to 3.55)	27.6* (21.9 to 34.8)
VRE colonization	0.30 (0.002 to 0.60)	34.9% longer than baseline
Ordered on weekend	-	-
Performed in emergency department	-0.61 (-0.96 to -0.26)	54.3% shorter than baseline
Ordered as urgent	-0.72 (-1.09 to -0.36)	48.6% shorter than baseline



	Before	After
Median time to access in hours	9.2	18.9
Time taken to perform 75% of scans	26.2	45.3

*Estimated mean time (hours) taken to perform non-urgent scan in patient prior to detection of VRE

Adverse effects of isolation

- Medical errors and safety events
- Riskman reports
- Incidence rate before VRE detection vs after VRE detection
 - Implicitly controls for patient specific factors
- 10 domains
- Denominator – cumulative hospital stay

Results

Adverse event domain	Before contact precautions (incidence rate per 1000 patient days)	During contact precautions (incidence rate per 1000 patient days)	Incidence rate ratio (95% CI)	P value
Total adverse events	186 (32.26)	214 (33.44)	1.04 (0.85, 1.27)	0.7
Pressure injury during stay	9 (1.56)	19 (2.97)	1.91 (0.82, 4.77)	0.1
Pressure injury on admission/historical	4 (0.69)	6 (0.94)	1.35 (0.32, 6.51)	0.6
Non-pressure injury	5 (0.87)	18 (2.81)	3.24 (1.16, 11.17)	0.013
Uncomplicated falls whilst alone	24 (4.16)	25 (3.91)	0.94 (0.51, 1.71)	0.8
Uncomplicated falls whilst accompanied	9 (1.56)	6 (0.94)	0.61(0.17, 1.88)	0.3
Medication administration errors	36 (6.24)	62 (9.69)	1.55 (1.01, 2.41)	0.03
Prescription/Pharmacy related errors	22 (3.82)	12 (1.88)	0.49 (0.22, 1.03)	0.05
Diagnosis related errors	9 (1.56)	5 (0.78)	0.50 (0.13, 1.66)	0.2
Patient aggression/non-compliance	5 (0.87)	8 (1.25)	1.44 (0.41, 5.61)	0.5
Clinical management errors	48 (8.33)	38 (5.94)	0.71 (0.45, 1.11)	0.1
Patient support failures	11 (1.91)	10 (1.56)	0.82 (0.31, 2.12)	0.6
Clinical infection by MDROs	4 (0.69)	5 (0.78)	1.12 (0.24, 5.67)	0.8



CHG washcloths – systematic review

Outcomes

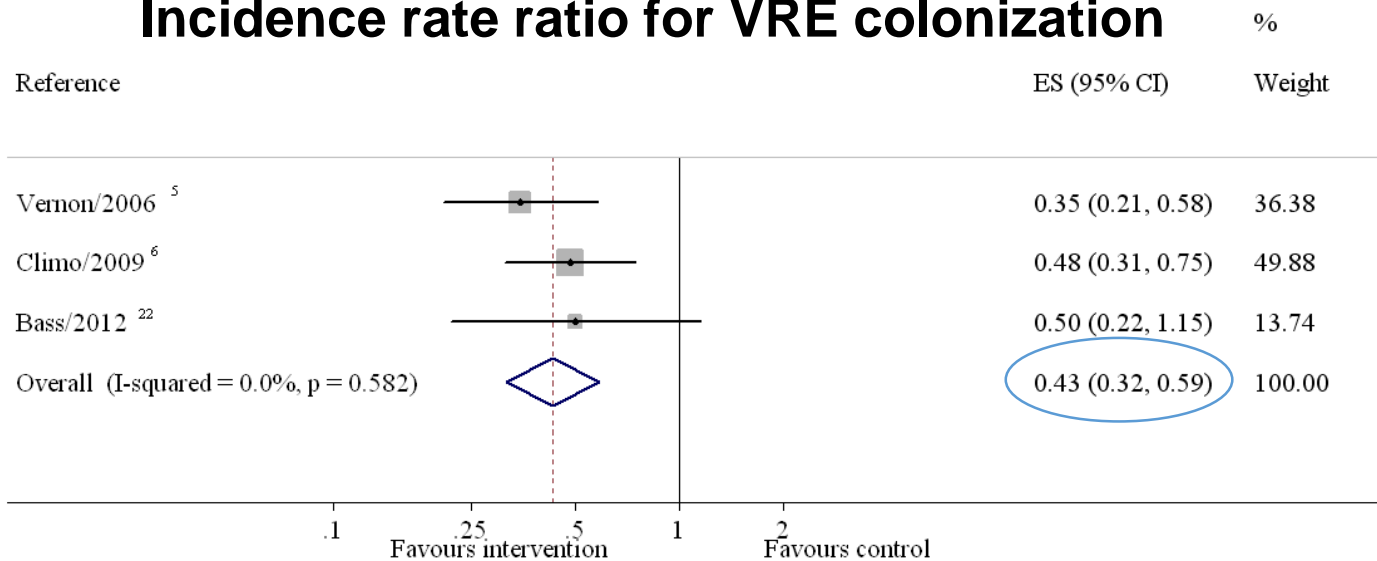
- Central line associated blood stream infection
- Surgical site infection
- VRE colonization
- Methicillin-resistant *Staphylococcus aureus* (MRSA) colonization
- VRE infection
- MRSA infection

Inclusion/Exclusion

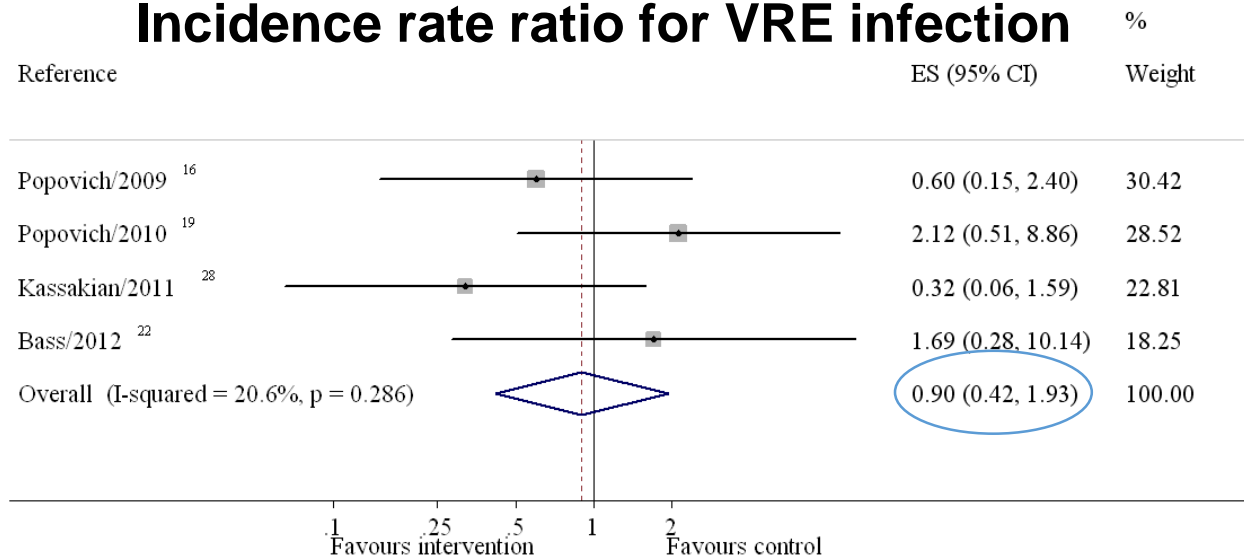
Studies: RCT, Observational studies
Inclusion: CHG washcloths (impregnated or saturated) vs. soap-and-water bathing, routine advice, no intervention.

20 studies identified
Most before and after studies

Incidence rate ratio for VRE colonization



Incidence rate ratio for VRE infection



Summary

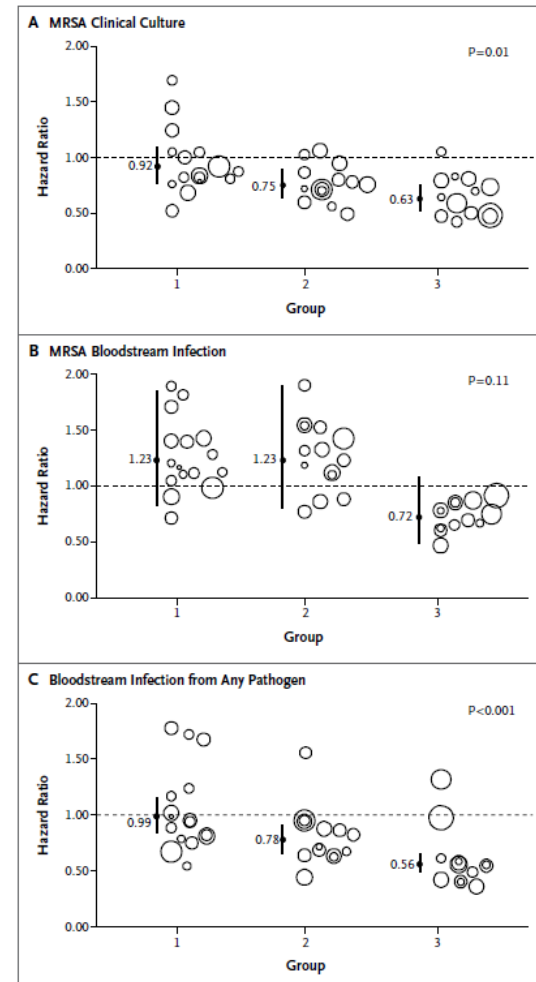
- VRE is transmitted between patients, but also acquired under the selection pressure of antibiotics
- Many patients that have VRE aren't identified unless we screen to detect them
- Many patients that used to have VRE appear to clear carriage over time
- Contact precautions are associated with adverse effects on patient care
- “Horizontal” interventions (eg CHG washcloths) are effective in reducing VRE transmission and impact on other infections

Risk based precautions

- Low risk of transmission/
low consequence
 - Usual cleaning
 - No contact isolation
 - Consider placement of highly infective patients
 - (Isolation of patients with diarrhoea)
- High risk of transmission/
high consequence
 - Isolation of highly infective patients
 - Enhanced cleaning
 - Routine use of chlorhexidine washcloths

Horizontal vs vertical strategies to prevent MRSA infection

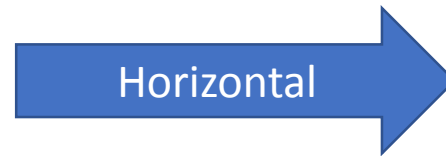
- Cluster RCT
- 74 ICUs; 74,256 patients
- Vertical vs horizontal strategies
 - Group 1: Screen and isolate
 - Group 2: Targeted decolonisation
 - Group 3: Universal decolonisation
- NNT 54



Summary: Which strategy to choose?

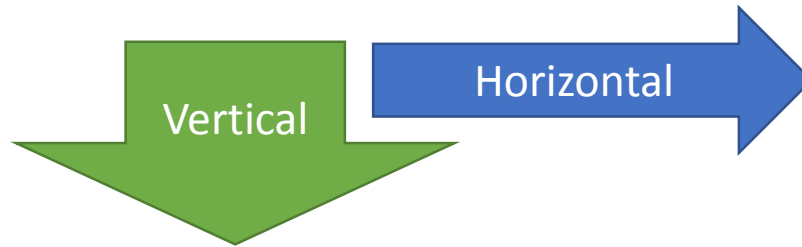


Not very common
Cases can be identified
Intervention not worse than disease
Transmission is mode of acquisition



Too common to feasibly isolate
Cases can't be easily identified
Multiple pathogens involved
Multiple modes of acquisition
Probably should be doing them anyway

Flexibility in policies



Multiple interventions may be required
Different policies based in different risk areas
May need to change as pathogen becomes endemic
May need to reassess evolving evidence

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