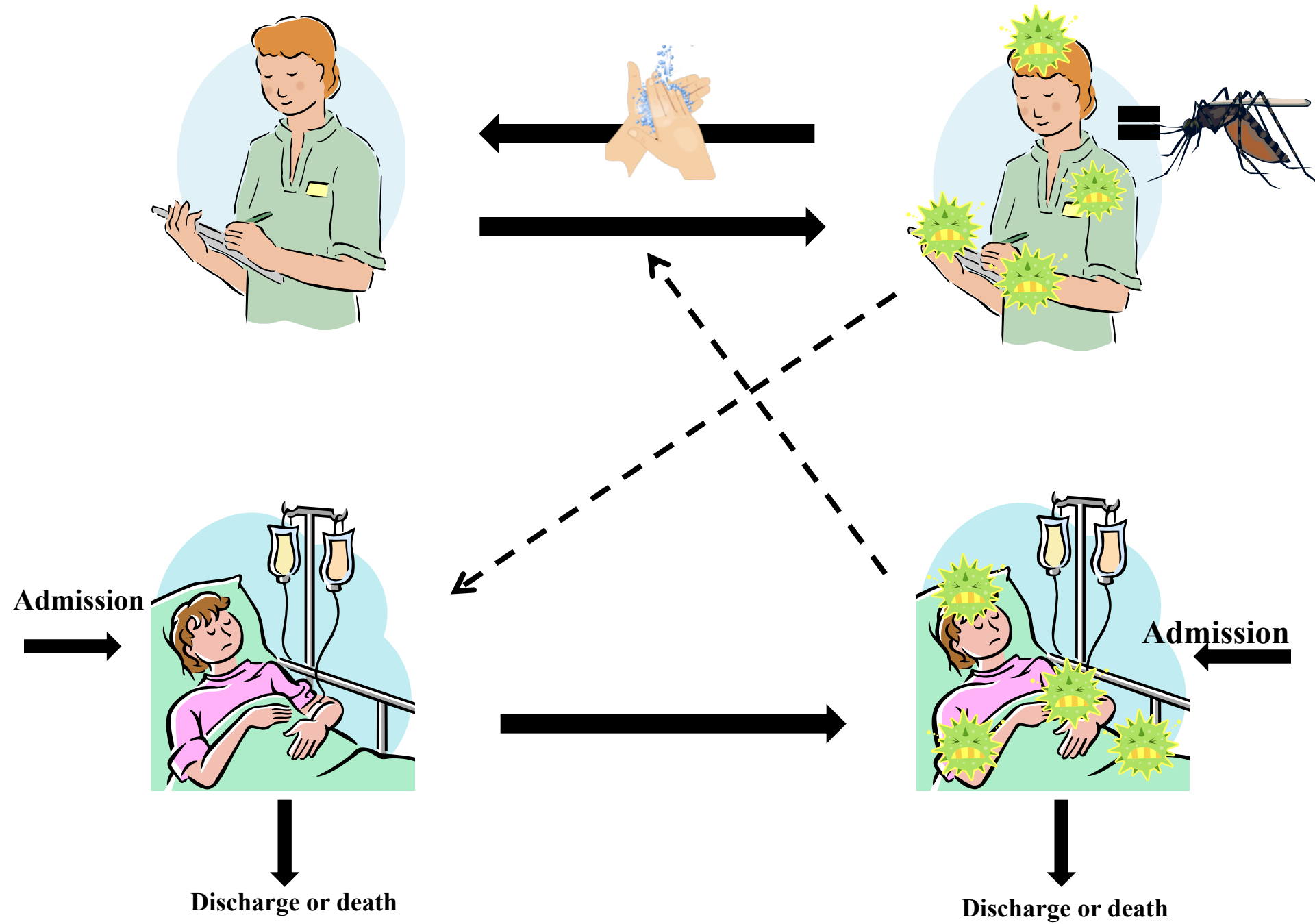
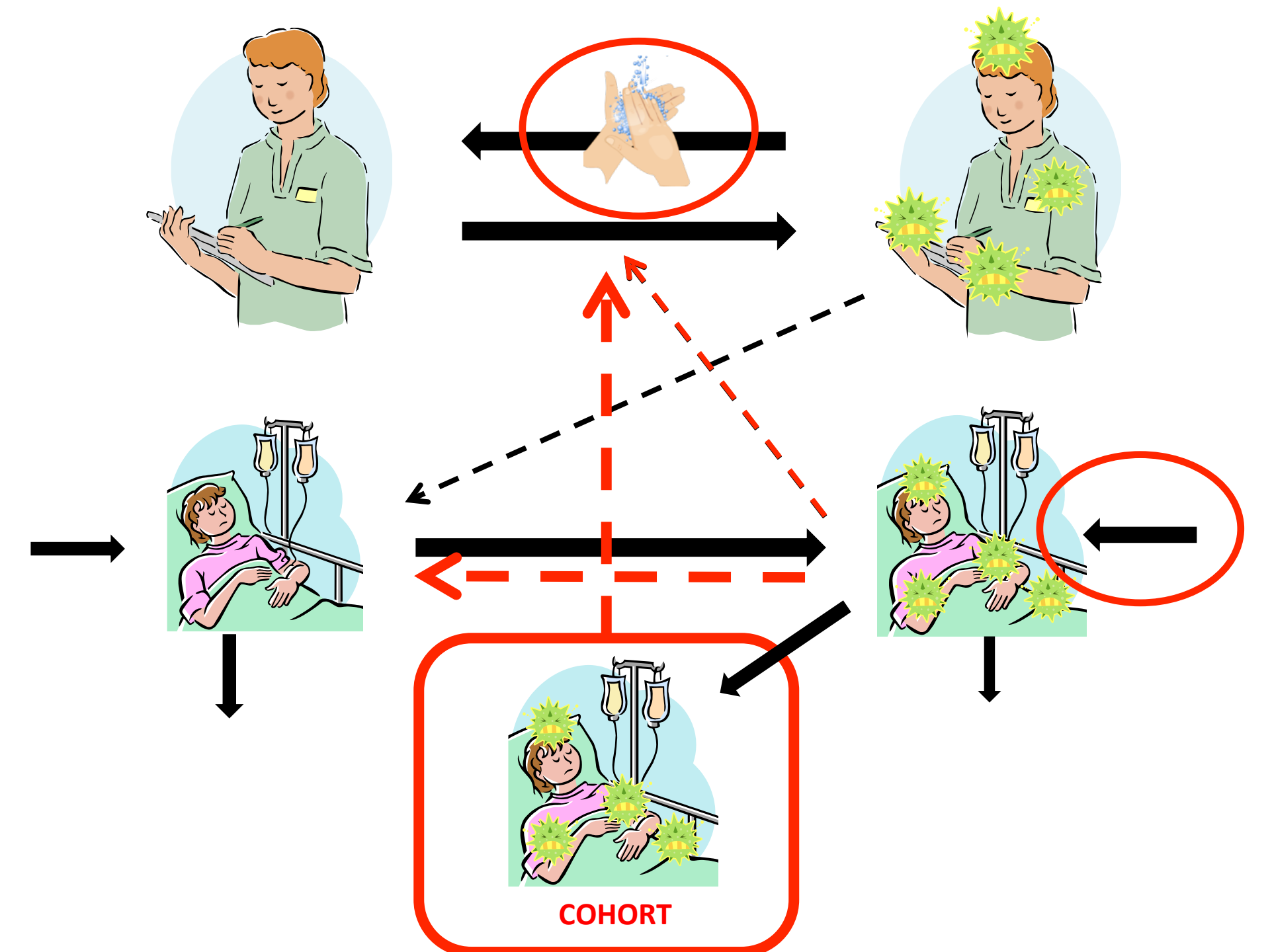
EFFECTIVE CONTROL OF RESISTANT GRAM NEGATIVE ORGANISMS REQUIRES IMPLEMENTATION OF STRINGENT CONTACT PRECAUTIONS

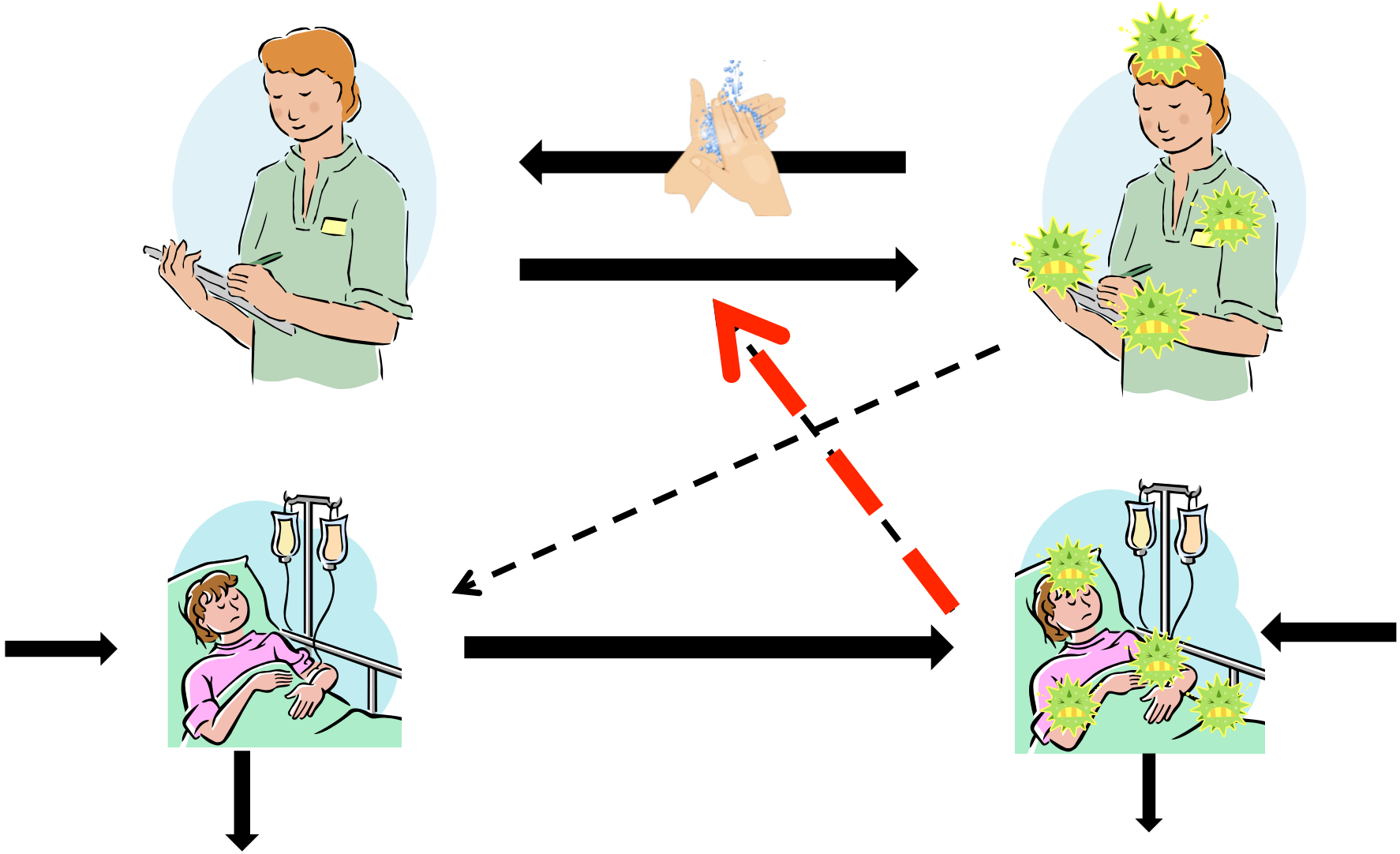
YES

Mirian de F. Dal Ben, MD, MSc
Hospital Sírio Libanês – São Paulo

- No disclosures


Admission
Admission
Discharge or death
Discharge or death


COHORT



- Surveillance cultures (1/3 of colonized detected by clinical cultures)

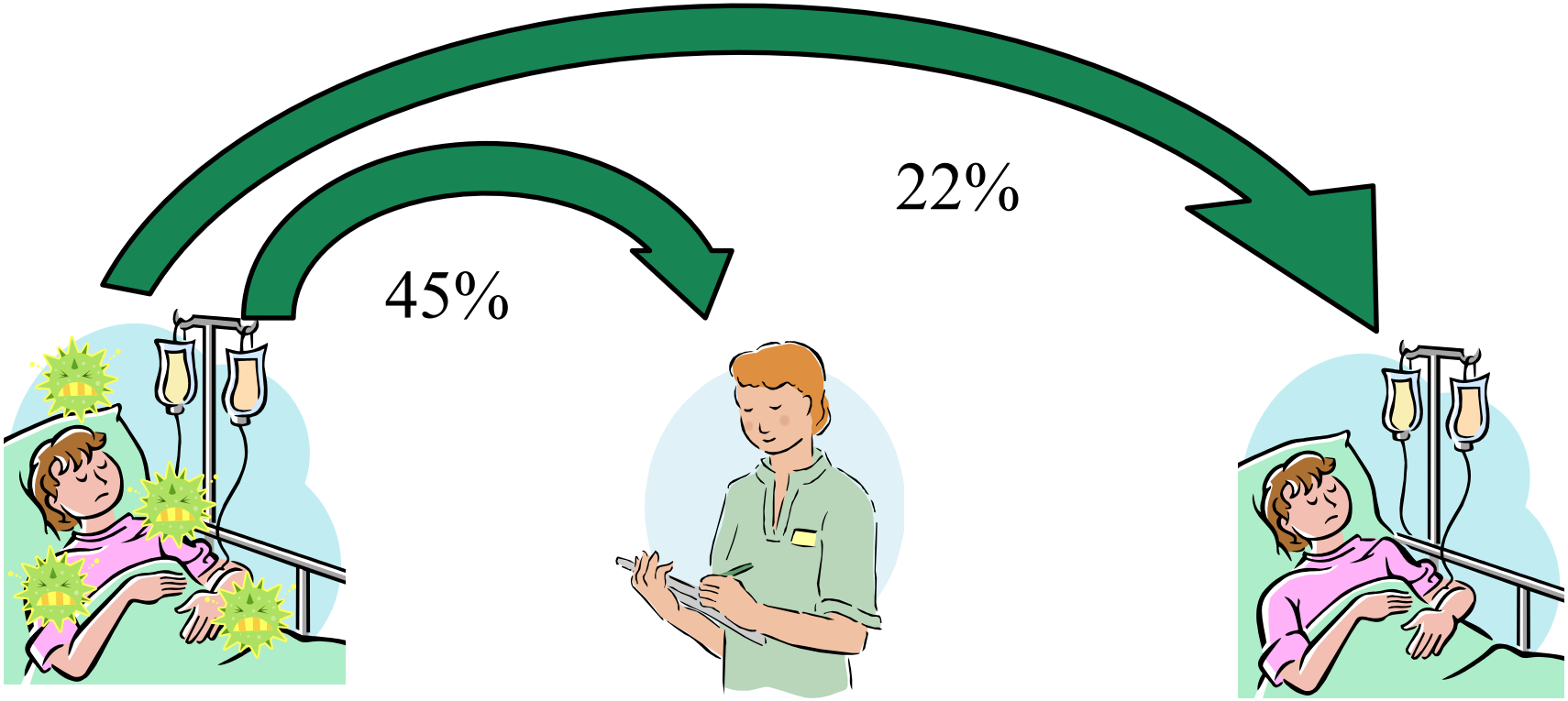
Eur J Clin Microbiol Infect Dis (2012) 31:1811–1817

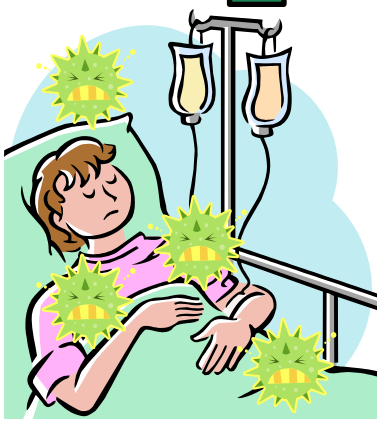
JOURNAL OF CLINICAL MICROBIOLOGY, Sept. 1980, p. 355–360
0095-1137/80/09-0355/06$02.00/0

Vol. 12, No. 3

Analysis of Three Variables in Sampling Solutions Used to Assay Bacteria of Hands: Type of Solution, Use of Antiseptic Neutralizers, and Solution Temperature

ELAINE L. LARSON,[1]* MARK S. STROM,[2] AND CHARLES A. EVANS[2]





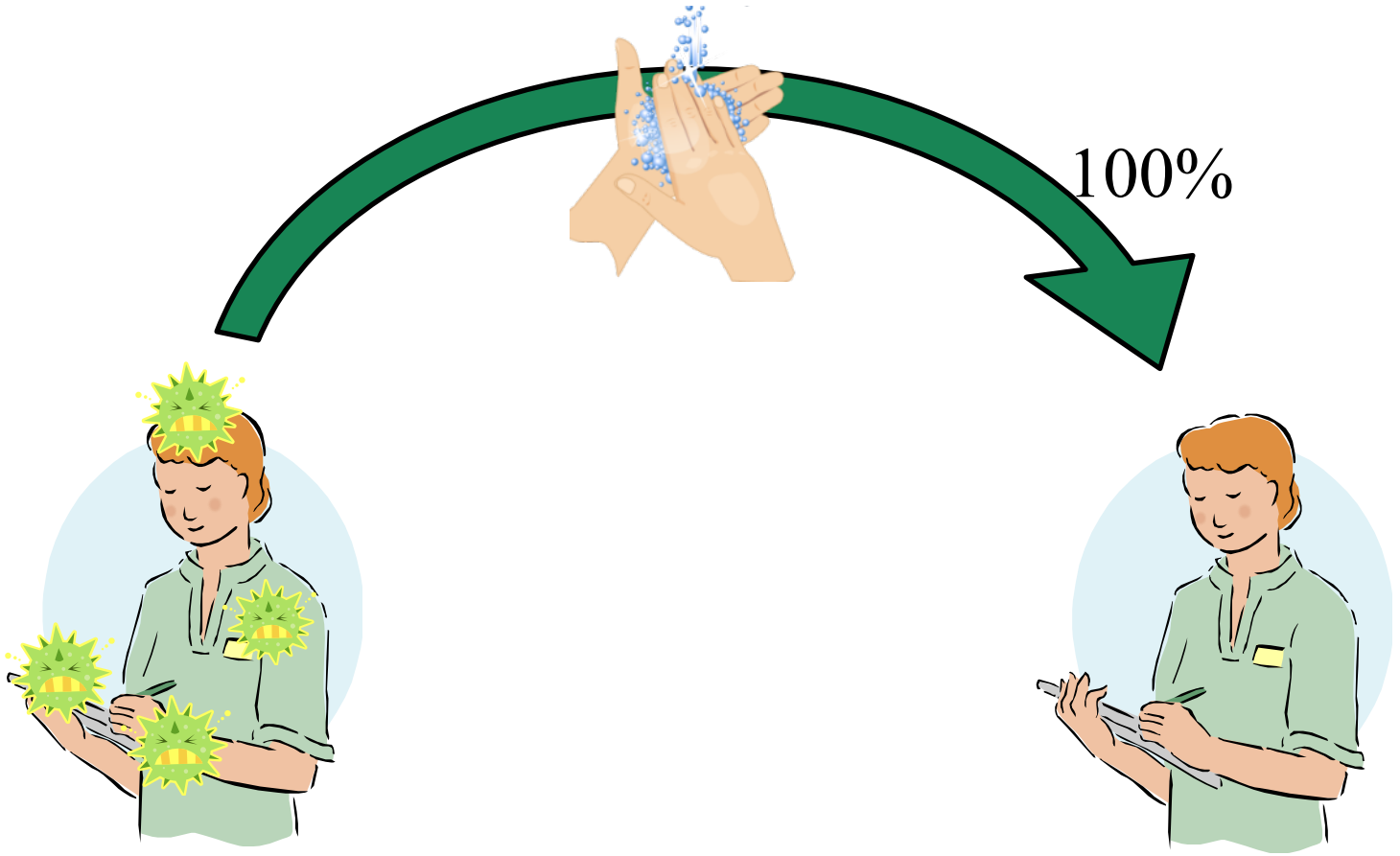
4.5 times

Infect Control Hosp Epidemiol 2016;37:1315–1322

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY NOVEMBER 2016, VOL. 37, NO. 11

ORIGINAL ARTICLE

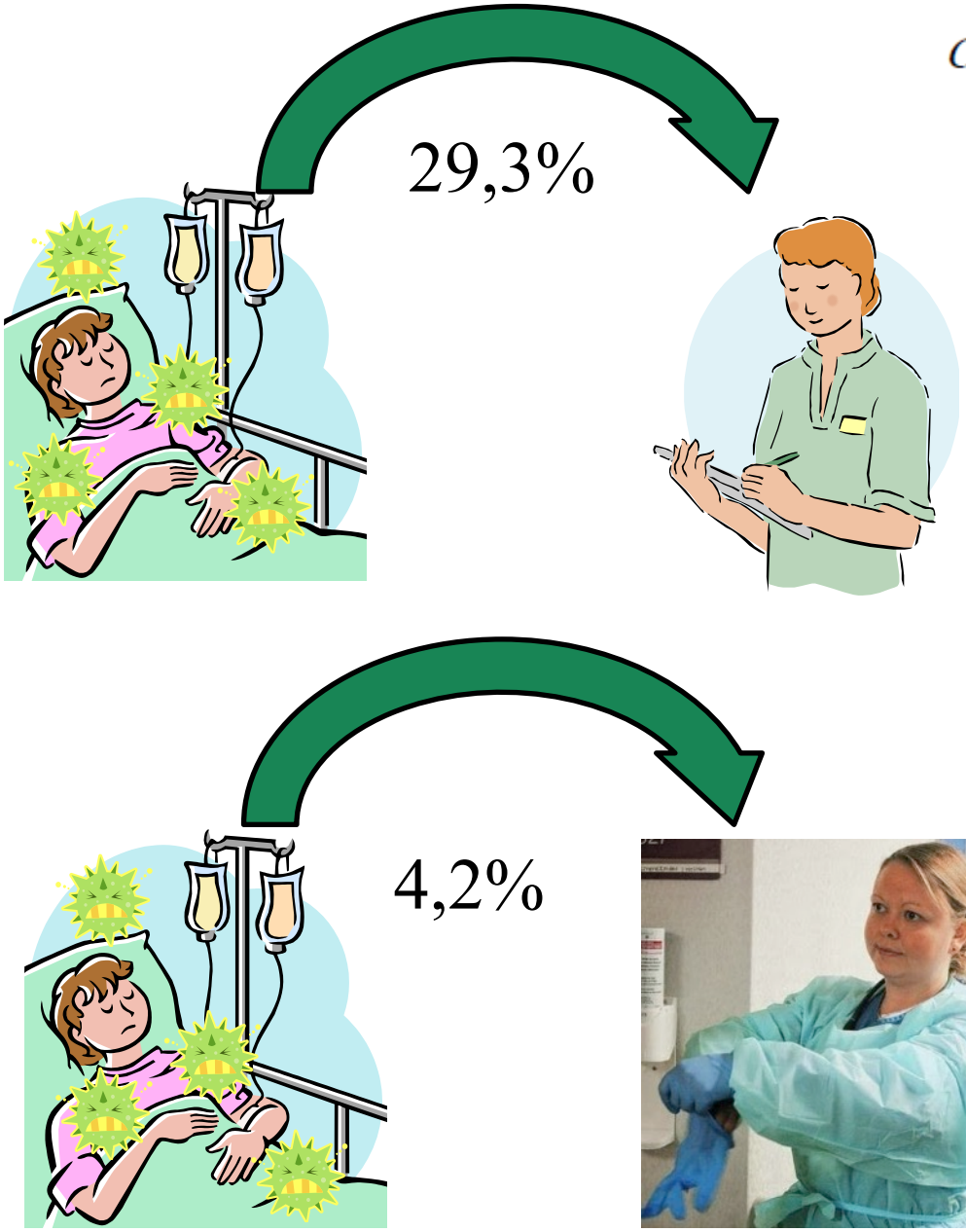
A Model-Based Strategy to Control the Spread of Carbapenem-Resistant Enterobacteriaceae: Simulate and Implement



Infect Control Hosp Epidemiol 2016;37:1315–1322

Acinetobacter spp. MR

Crit Care Med. 2012 April ; 40(4): 1045–1051

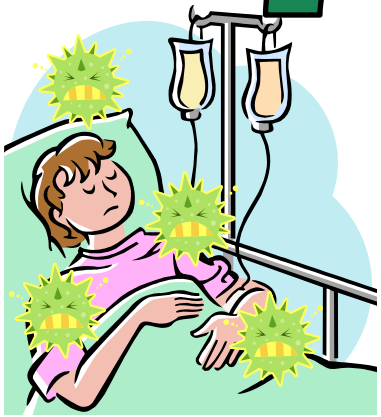


7 times

Pseudomonas aeruginosa spp. MR

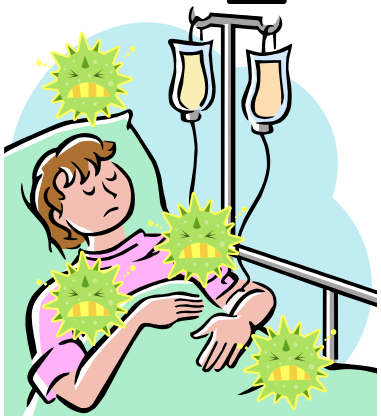
Crit Care Med. 2012 April ; 40(4): 1045–1051

17,4%



5 times

3,5%



Nursing and physician attire as possible source of nosocomial infections

Yonit Wiener-Well, MD,[a] Margalit Galuty, RN, MSc,[a,b] Bernard Rudensky, PhD,[c] Yechiel Schlesinger, MD,[a] Denise Attias, BSc,[c] and Amos M. Yinnon, MD[a]
Jerusalem, Israel

Am J Infect Control 2011;39:555-9.

- 135 nurses and physicians e 4 controles
- Physicians: white coat
- Nurses: 2-piece Uniform
- Operating room: 2-piece scrub
- 100% skin pathogens
- 63% with pathogens (*Pseudomonas*, *Acinetobacter*, MRSA and *Enterobacteriaceae*): 79% one pathogen

18% 2 pathogens

3% 3 pathogens

11% MDRO

Frequent Multidrug-Resistant *Acinetobacter baumannii* Contamination of Gloves, Gowns, and Hands of Healthcare Workers

Infect Control Hosp Epidemiol. 2010 July ; 31(7): 716–721.

Frequency of Contamination of Gowns, Gloves, and Hands of Healthcare Workers (HCWs) after Caring for Patients Colonized or Infected with Specified Bacteria

	No. (% [95% CI]) of observations	
Source of culture-positive sample	Patients with MDR *Acinetobacter baumannii* carriage (n = 199)	Patients with MDR *Pseudomonas aeruginosa* carriage (n = 134)
Gloves	72 (36.2 [29.5–42.9])	9 (6.7 [2.5–11.0])
Gown	22 (11.1 [6.7–15.4])	6 (4.5 [1.0–8.0])
Gloves and/or gown	77 (38.7 [31.9–45.5])	11 (8.2 [3.6–12.9])
Hands[a]	9 (4.5 [1.6–7.4])	1 (0.7 [0–2.2])

NOTE. CI, confidence interval; MDR, multidrug-resistant.

[a] After removal of gloves and gown and before hand hygiene.

Derived Hypothetical Rate of Multidrug-Resistant (MDR) *Acinetobacter baumannii* Contamination of the Hands of Healthcare Workers (HCWs) per Patient Visit, Adjusting for Adherence to Hand Hygiene and Use of Gloves as Part of Contact Precautions

	Percentage chance of contamination per patient visit, by rate of adherence to use of gloves						
Rate of adherence to hand hygiene, % of opportunities	**0%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
0%	36.2	20.4	17.2	14.0	10.9	7.6	4.5
50%	18.1	10.2	8.6	7.0	5.4	3.8	2.3
60%	14.5	8.1	6.9	5.6	4.3	3.1	1.8
70%	10.8	6.1	5.2	4.2	3.3	2.3	1.4
80%	7.2	4.1	3.4	2.8	2.2	1.5	0.9
90%	3.6	2.0	1.7	1.4	1.1	0.8	0.5
100%	0	0	0	0	0	0	0

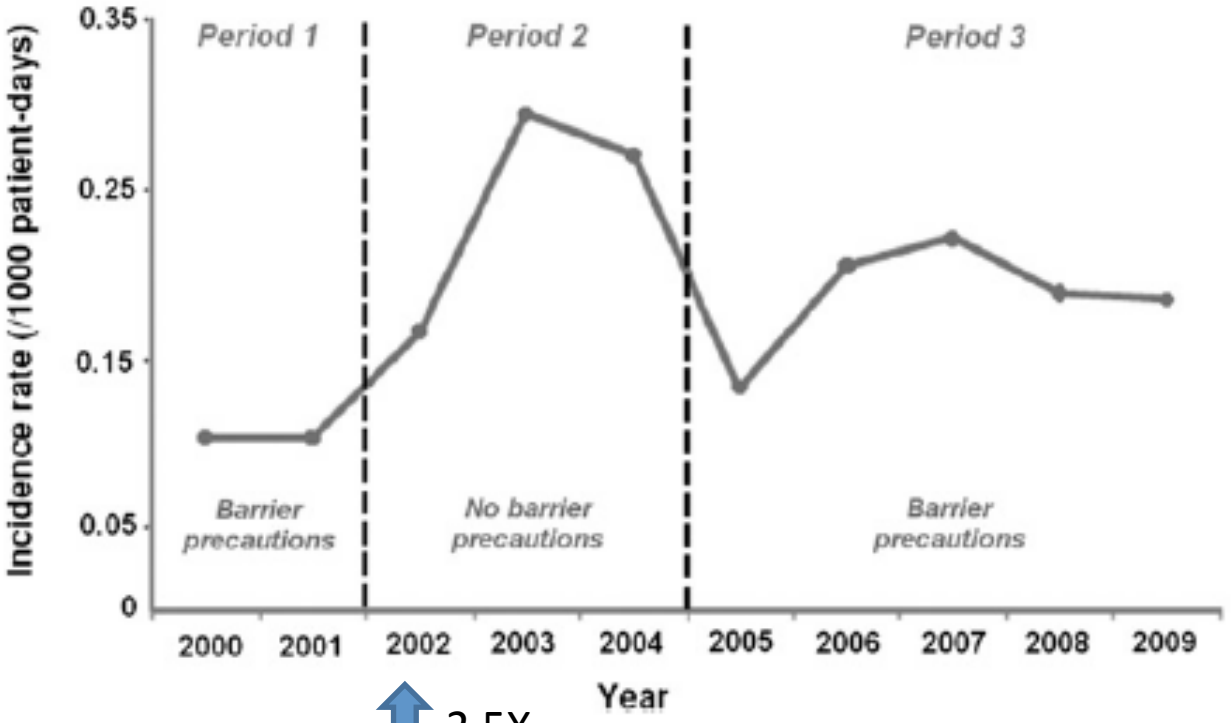
Infect Control Hosp Epidemiol. 2010 July ; 31(7): 716–721.

Evaluating the outcomes:
Bundled interventions

Impact of barrier precautions and antibiotic consumption on the incidence rate of acquired cases of infection or colonization with *Acinetobacter baumannii*: A 10-year multi-department study

Annick Lefebvre, MD, MSc,[a] Houssein Gbaguidi-Haore, PharmD, PhD,[a,b,c] Xavier Bertrand, PharmD, PhD,[a,b,c] Michelle Thouverez, PhD,[a,b,c] and Daniel Talon, PharmD, PhD[a,b,c]
Besançon, France

(Am J Infect Control 2011;39:891-4.



2,5X
p<0,001

TABLE 2. Relative risk (RR) Estimates for Patients Colonized or Infected With *Acinetobacter baumannii*, Calculated Using Univariate and Multivariate Poisson Regression Models

	Univariate analysis		Multivariate analysis	
Variable	RR (95% CI)	*P*	RR (95% CI)	*P*
Age >60 years	0.96 (0.81–1.14)	.641		
Male sex	1.14 (0.95–1.36)	.157	0.78 (0.59–1.03)	.077
McCabe score of 1 or 2	1.28 (1.07–1.54)	.008	1.29 (0.99–1.70)	.063
Immunocompromised status	0.75 (0.64–0.89)	.001	1.02 (0.80–1.31)	.856
Greater antibiotic selective pressure	1.71 (1.40–2.09)	<.001	0.86 (0.57–1.31)	.489
Isolation precautions implemented	0.59 (0.51–0.69)	<.001	0.50 (0.40–0.64)	<.001
Year	1.10 (1.07–1.14)	<.001	1.08 (0.99–1.17)	.061

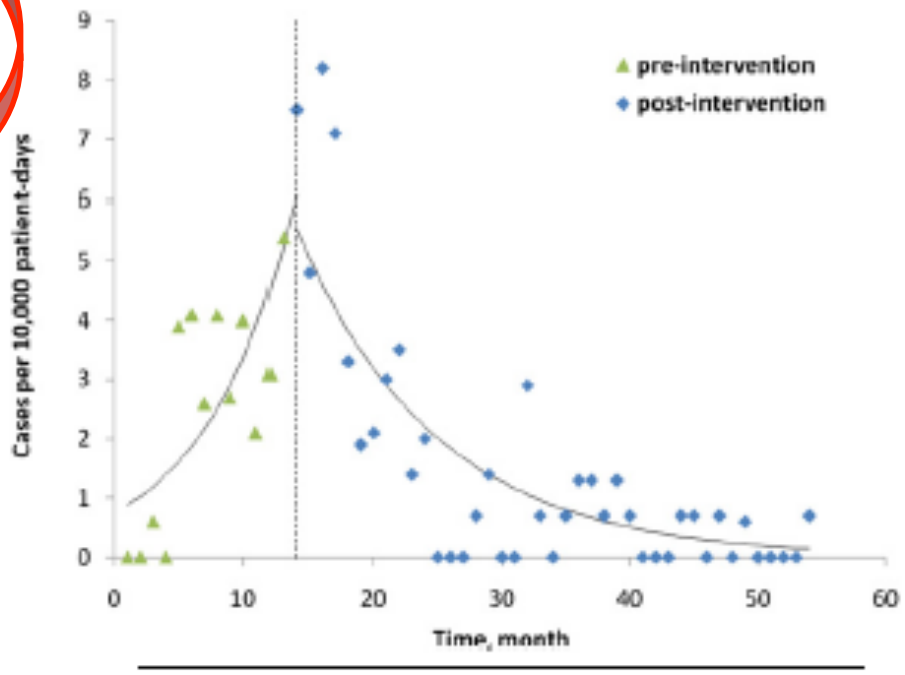
NOTE. RR estimates are reported for upper quartiles, using the lowest quartiles as the control group. CI, confidence interval; DDDs, defined daily doses.

An effective intervention to limit the spread of an epidemic carbapenem-resistant *Klebsiella pneumoniae* strain in an acute care setting: From theory to practice

Am J Infect Control 2011;39:671-7

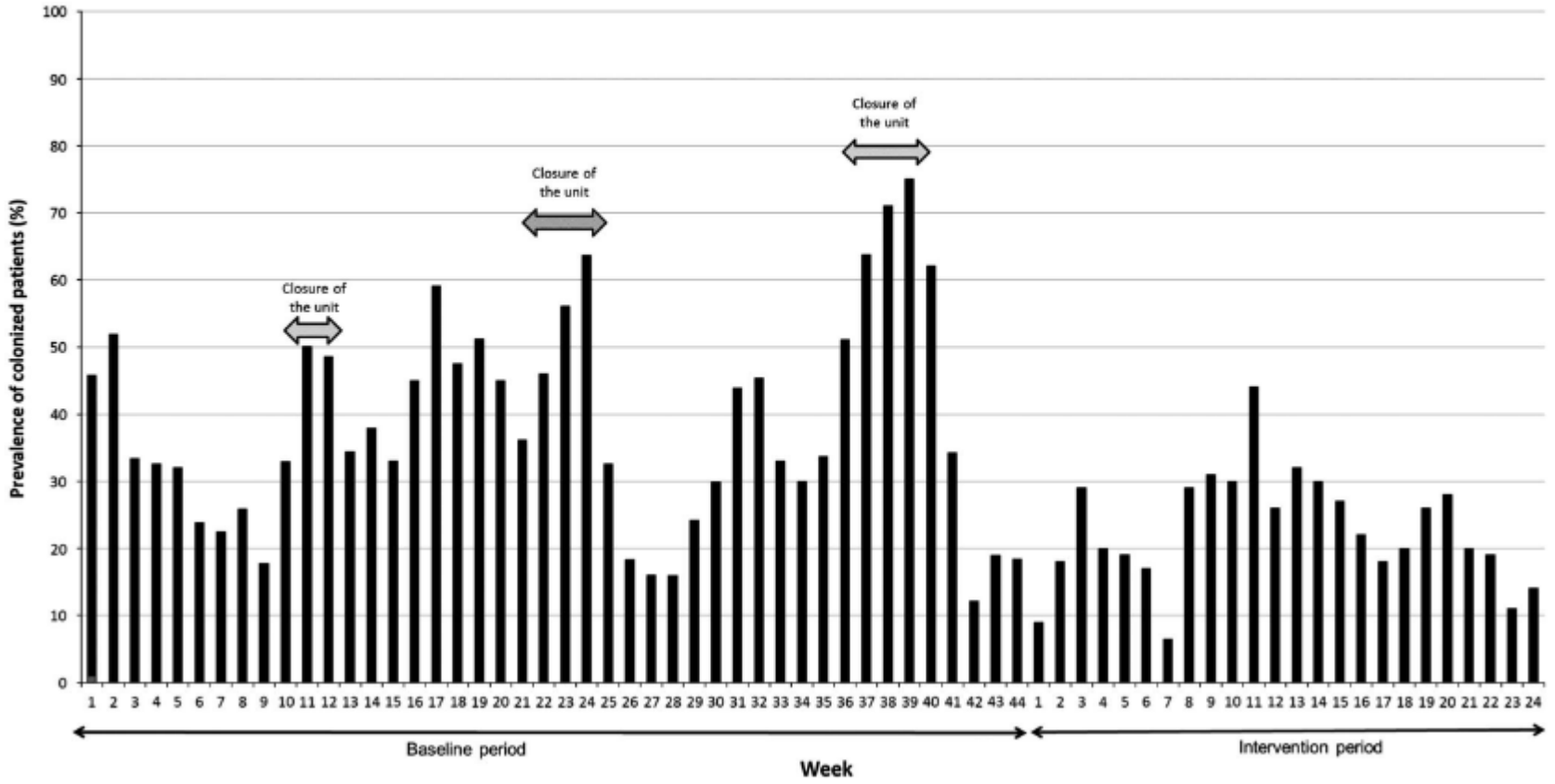
- Screening of every roommate of a newly diagnosed CRKP and of patients at high risk for carriage
- Intervention: “Strict contact precaution”, education (Written, verbal, feedback)

personnel. Consultant staff and assistant staff (ie, the “nondedicated” house staff that treated CRKP cases/carriers) were considered possible mediators of CRKP transmission, and thus their contact precautions had to be approved by the dedicated nurse before their entrance into the separate area. Detailed instructions for



ORIGINAL ARTICLE

A Model-Based Strategy to Control the Spread of Carbapenem-Resistant Enterobacteriaceae: Simulate and Implement

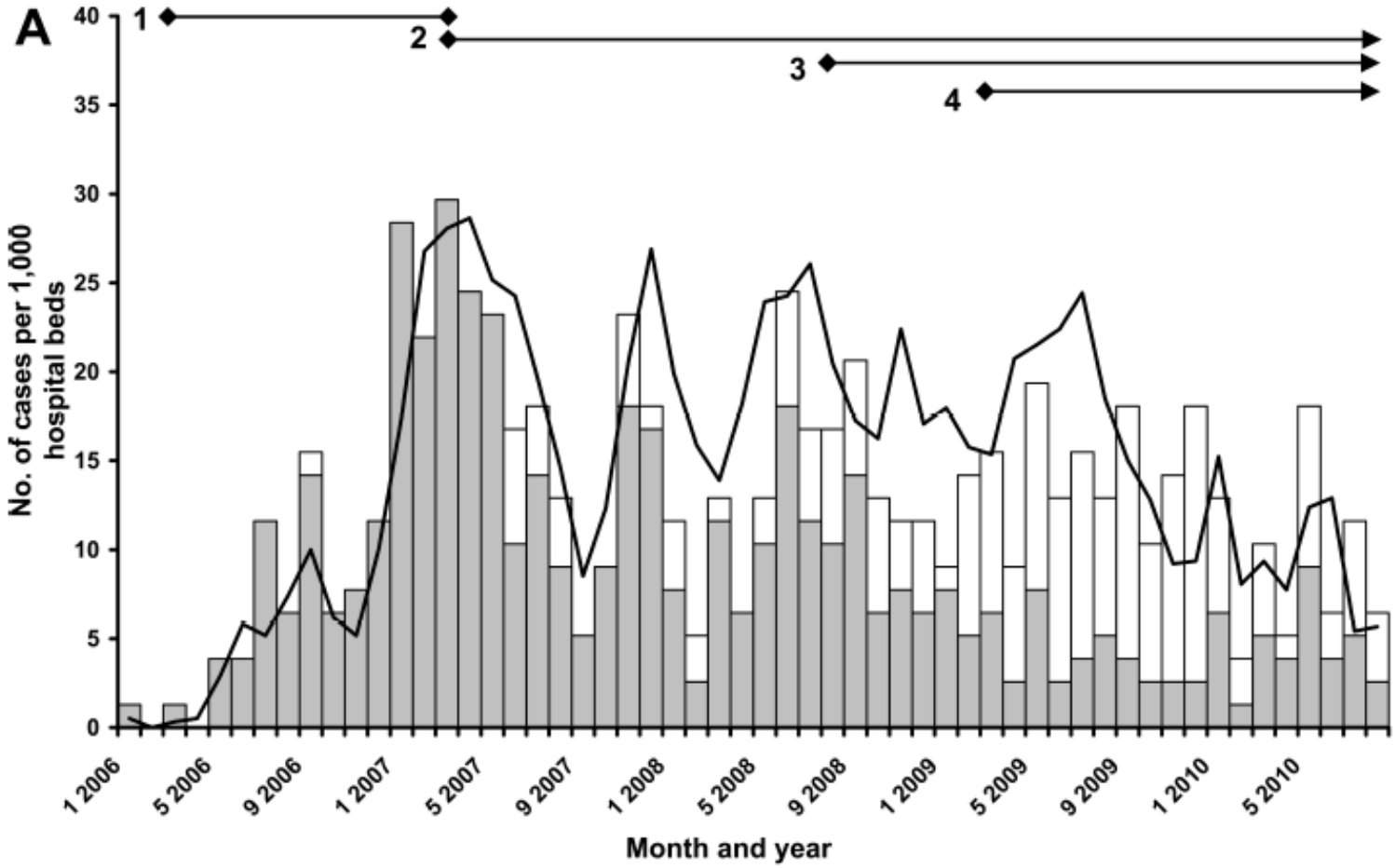


Prevalence= 34% (12-75%)
R = 11

Prevalence= 21% (10-45%)
R = 0,42 (0-2,1)

Institutional Control Measures to Curtail the Epidemic Spread of Carbapenem-Resistant *Klebsiella pneumoniae:* A 4-Year Perspective

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JULY 2011, VOL. 32, NO. 7

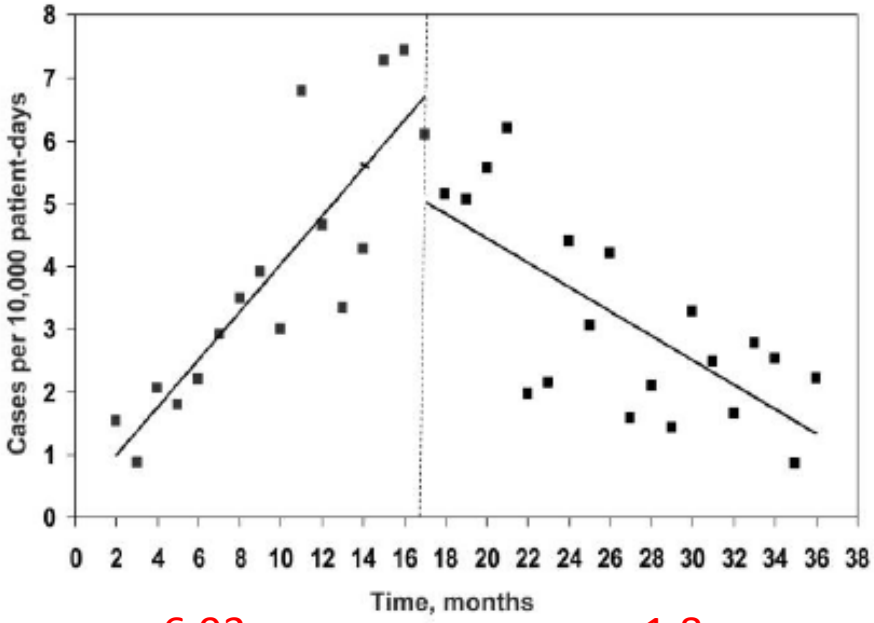


Potential Role of Active Surveillance in the Control of a Hospital-Wide Outbreak of Carbapenem-Resistant *Klebsiella pneumoniae* Infection

Debby Ben-David, MD; Yasmin Maor, MD; Nathan Keller, MD; Gili Regev-Yochay, MD; Ilana Tal, MS; Dalit Shachar, RN; Amir Zlotkin, PhD; Gill Smollan, MD; Galia Rahav, MD

Isolation by clinical cultures

Isolation and active surveillance



6.93

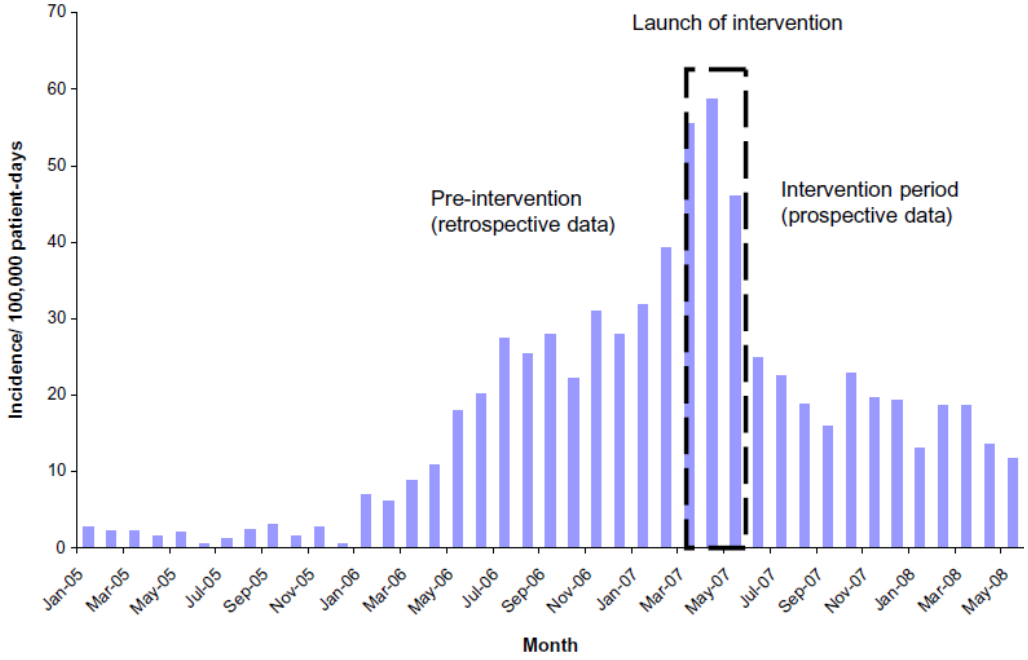
1.8

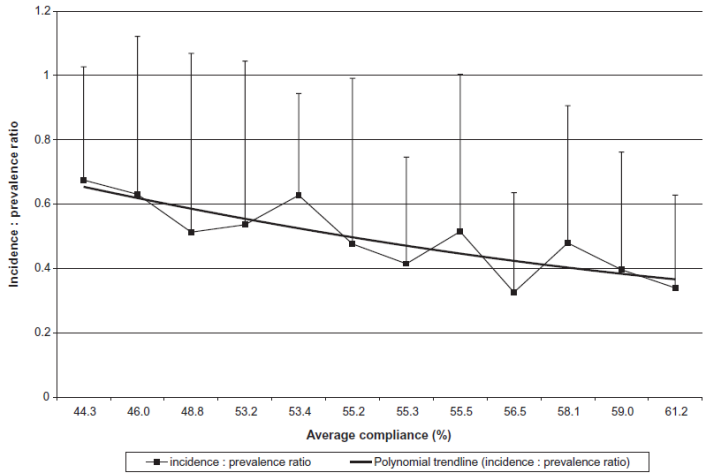
FIGURE 1. Scatterplots showing the change in the number of clinical cases of infection with carbapenem-resistant *Klebsiella pneumoniae* per 10,000 patient-days, before and after the intervention, implemented in month 17. Solid lines represent the linear regression fits across all cases.

Infect Control Hosp Epidemiol 2010; 31(6):620-626

Containment of a Country-wide Outbreak of Carbapenem-Resistant *Klebsiella pneumoniae* in Israeli Hospitals via a Nationally Implemented Intervention

Clinical Infectious Diseases 2011;52(7):1–8





TECHNICAL REPORT

Systematic review of the effectiveness of infection control measures to prevent the transmission of carbapenemase-producing Enterobacteriaceae through cross-border transfer of patients

www.ecdc.europa.eu

Table 2: Summary of components included in studies of multi-faceted interventions

Study reference (first author, year)	Active screening on admission to hospital	Active screening on admission to specific ward/unit	Pre-emptive isolation of patients on admission	Contact tracing	Active surveillance during the outbreak	Patient cohorting	Patient isolation	Nursing (or staff) cohorting	Dedicated nursing or other types of dedicated care by staff members	Bathing in anti-septic	Contact pre-cautions	Hand hygiene	Ward closure	Hospital closure	Patient record flagging	Other[2]	Further details
Borer 2011	✓	✓	✓	✓	✓	✓	✓	x	✓	x	✓	✓	x	x	✓	✓	
Chitnis 2012 [96] (Staged four-phase intervention)	✓	✓	x	x	✓	x	x	x	x	x	✓	✓	x	x	x	✓	Other infection control measures: urine and sputum surveillance.
	✓	✓	x	x	✓	✓	x	✓	x	x	✓	✓	x	x	x	✓	
	✓	✓	x	x	✓	✓	x	✓	✓	x	✓	✓	x	x	x	✓	
	✓	✓	x	x	✓	✓	x	✓	✓	x	✓	✓	x	x	x	✓	
Ciobotaro 2011 [97]	✓	✓	x	x	✓	✓	✓	x	✓	x	✓	✓	x	x	✓	✓	
Cohen 2011 [98] (Staged four-phase intervention)	x	x	x	x	x	x	✓	x	x	x	✓	x	x	x	x	x	Mar 2006: Single-room isolation and contact precautions
	x	x	x	✓	✓	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	Mar 2007: Cohorting of patients and staff; 'snow ball' active surveillance sampling[1]
	x	✓	x	✓	✓	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	Aug 2008: Weekly active surveillance of ICU
	x	✓	x	✓	✓	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	Mar 2009: Active surveillance of patients on admission to ER
Poulou 2012 [99] (Staged three-phase intervention)	x	x	x	x	x	x	x	x	x	x	✓	✓	x	x	✓	✓	Phase 1 (2009–)
	x	x	x	x	x	✓	✓	x	x	x	✓	✓	x	x	✓	✓	Phase 2 (Jan 2010–)
	x	x	x	x	x	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	Phase 3 (2011–)
Schwaber 2014 [50,100] and 2014 [100]	x	x	X	x	X	✓	✓	✓	✓	x	✓	✓	x	x	✓	✓	

6.5.6 Contact precautions

The original ECDC 2011 review [1] included four studies [81,82,85,86] examining the use of contact precautions as part of what appeared to be successful infection control bundles for CPE.

In this updated review, all six studies included contact precautions. Only one of the studies assessed compliance with this specific intervention (Chitnis 2012 [96]); glove use was 77% and gown use 89%, but suboptimal practices were noted for hand hygiene and invasive devices. None of the studies assessed the effects of contact precautions in isolation from the other components in the infection control bundles. Borer 2011 [101] and Ciobotaro 2011 [97] reported significant reductions in CPE levels during CKRP outbreaks, and Schwaber 2014 [50,100] reported lower CRE levels (including *Klebsiella* spp., *Enterobacter* spp., *E. coli*, *Proteus* spp. and *Providencia* spp.) under non-outbreak conditions. CRE carriage among patients not previously known to carry CRE was also reported (Schwaber 2014 [100]).

The remaining three studies introduced bundles of interventions in phases. One study (Chitnis 2012 [96]) reported significant decreases for overall CRE prevalence (including carbapenemase-producing *K. pneumoniae*, *Enterobacter aerogenes*, and other *Enterobacter* spp.) and a lower number of newly detected cases in an outbreak in a US LTCF. Poulou 2012 [99] associates declining numbers of new KPC-2 and VIM-1 producing *K. pneumoniae* infections with reinforced infection control measures, including gown and glove use. However, one study (Cohen 2011 [98]) reported that the first phase of measures (single-room isolation and contact precautions) failed as CRKP rates increased.

In summary, there is evidence to suggest that contact precautions is effective for limiting and preventing the spread of CPE (evidence level ++).

In summary, there is evidence to suggest that contact precautions is effective for limiting and preventing the spread of CPE (evidence level ++).

ESCMID guidelines for the management of the infection control measures to reduce transmission of multidrug-resistant Gram-negative bacteria in hospitalized patients

E. Tacconelli[1], M. A. Cataldo[2], S. J. Dancer[3], G. De Angelis[4], M. Falcone[5], U. Frank[6], G. Kahlmeter[7], A. Pan[8,9], N. Petrosillo[2], J. Rodríguez-Baño[10,11,12], N. Singh[13], M. Venditti[5], D. S. Yokoe[14] and B. Cookson[15]

Clin Microbiol Infect 2014; **20 (Suppl. 1)**: 1–55

Recommendations

Epidemic setting

Strong recommendation: Implement contact precautions (CP) for all patients colonized and/or infected with extended-spectrum β-lactamase (ESBL)-producing Enterobacteriaceae, multidrug-resistant (MDR)-*Klebsiella pneumoniae*, MDR-*Acinetobacter baumannii* (moderate level of evidence); and *Pseudomonas aeruginosa* (very low level of evidence)

Strong recommendation: Use alert code to identify promptly patients already known as colonized with ESBL-producing Enterobacteriaceae and MDR-*K. pneumoniae* at hospital/ward admission and perform screening and pre-emptive CP (moderate level of evidence)

Strong recommendation: Isolate colonized and infected patients in a single room to reduce the risk of acquisition of ESBL-producing Enterobacteriaceae, MDR-*K. pneumoniae* (moderate level of evidence); MDR-*A. baumannii* and MDR-*P. aeruginosa* (low level of evidence)

Strong recommendation: Cohort staff to reduce the risk of acquisition of MDR-*K. pneumoniae* (moderate level of evidence)

Recommendations

Endemic setting

Strong recommendation: Implement contact precautions (CP) for all patients colonized with extended-spectrum β-lactamase (ESBL)-Enterobacteriaceae (with the exception of *Escherichia coli*), multidrug-resistant (MDR)–*Klebsiella pneumoniae*, MDR-*Acinetobacter baumannii*, and MDR-*Pseudomonas aeruginosa* (moderate level of evidence)

Strong recommendation: Use alert code to identify promptly patients already known as colonized with MDR-*A. baumannii* at hospital/ward admission and perform screening and pre-emptive CP (moderate level of evidence)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