Discontinuing Routine MRSA and VRE Contact Precautions in a Large Health System

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Disclosures

- I have no relevant disclosures.
- Views are my own, not the view of VA.

- But I have worn a lot of gowns…

Outline

- Background
- Data supporting contact precautions
- Drawbacks of contract precautions
- Impacts of discontinuing in my health system systems
- Conclusions
- Next Steps

Contact Precautions for MRSA

TABLE 1A. Literature Review of Articles From 2004 to 2013 That Examined the Effect of CP (With or Without Other Measures) on MRSA

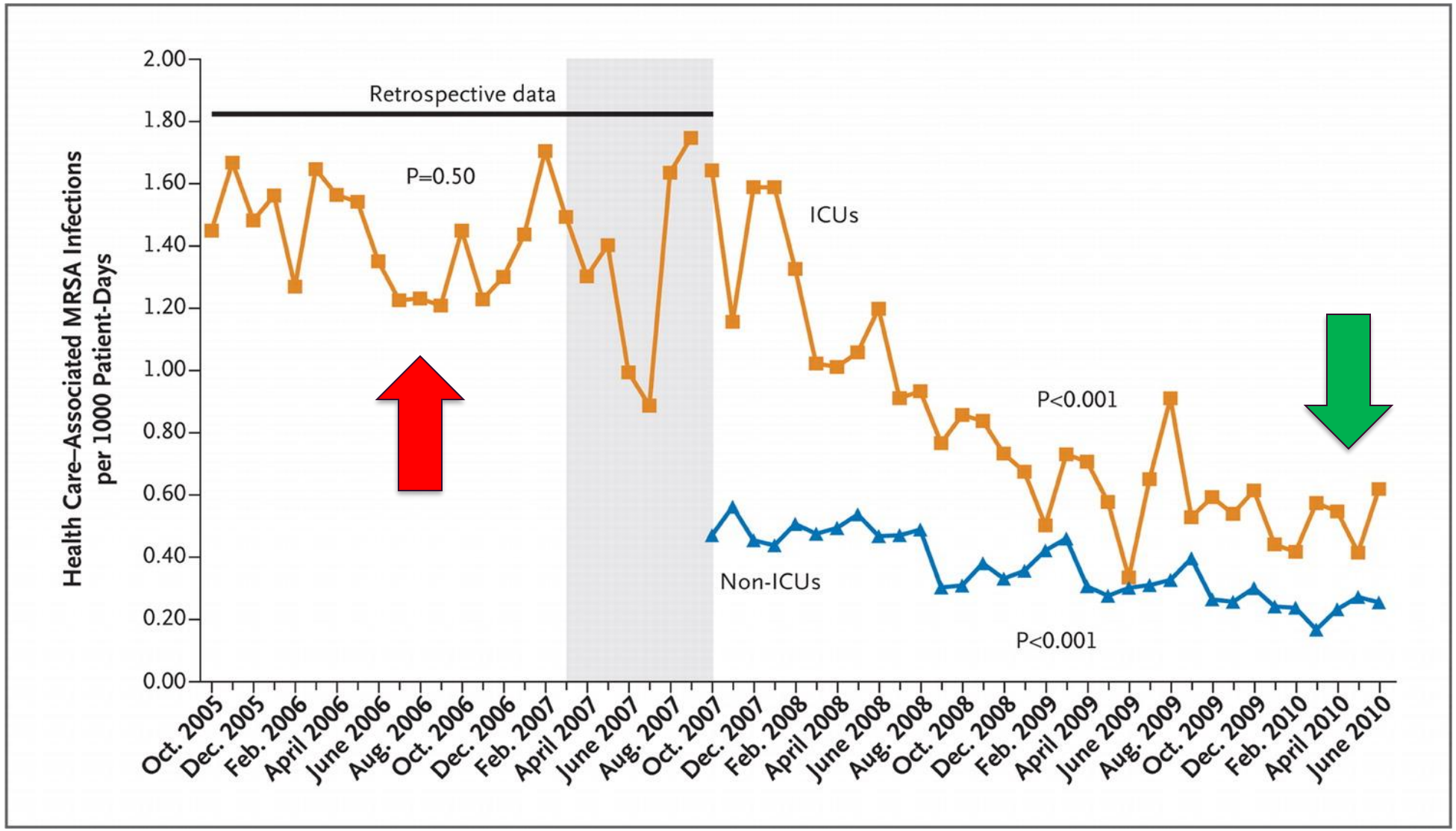
			Interventions used						
Lead author	Trial design	Setting	Gowns	Gloves	Surveillance Culturing	HH	Universal decolonization	Targeted decolonization	Main findings
Trick et al[8]	RCT	SNFs	√	√	–	–	–	–	UG use was equivalent to CP in SNFs that did not limit patient activities
Lucet et al[14]	Before-after	ICUs	√	√	√	–	–	–	Surveillance cultures to guide CP led to a decrease in MRSA acquisition rates
Huang et al[13]	Quasi-experimental	ICUs	√	√	√	–	–	–	Surveillance cultures to guide CP decreased MRSA acquisition rates and BSI rates; same decrease in BSI rates observed hospital-wide
Robicsek et al[15]	Before-after	Hospital-wide	√	√	√	–	–	√	Surveillance cultures to guide CP and targeted colonization resulted in a decrease in invasive MRSA infection rates
Harbarth et al[9]	Cross-over quasi-experimental	Surgical patients	√	√	√	–	–	√	Surveillance cultures to guide CP and targeted decolonization did not reduce nosocomial MRSA infection rates with endemic MRSA prevalence
Bearman et al[34]	Before-after	ICUs	–	√	–	√	–	–	UG use was equivalent to CP for prevention of MRSA acquisition
Huskins et al[12]	RCT	ICUs	√	√	√	–	–	–	Surveillance cultures to guide CP vs standard CP alone resulted in equivalent MRSA acquisition or infection rates
Jain et al[17]	Before-after	Hospital-wide	√	√	√	√	–	–	Bundle of surveillance cultures to guide CP, HH, and institutional culture change was associated with a decrease in MRSA colonization and infection rates
Derde et al[68]	RCT	ICUs	√	√	√	√	√	√	No impact of surveillance cultures to guide CP
Harris et al[16]	RCT	ICUs	√	√	√	–	–	–	Universal CP use significantly reduced MRSA acquisition
Marshall et al[10]	Before-after	ICUs	√	√	√	–	–	–	Surveillance cultures to guide CP resulted in a decrease in MRSA acquisition rates

NOTE. BSI, bloodstream infection; CP, contact precautions; HH, hand hygiene; ICU, intensive care unit; MRSA, methicillin-resistant *Staphylococcus aureus*; RCT, randomized controlled trial; SNF, skilled nursing facility; UG, universal gloving.

- Data supporting contact precautions was combined with other interventions
- No data on gowns and gloves alone

Morgan DJ, et al. Infect Control Hosp Epidemiol. 2015;36(10):1163-72.

Nationwide Rates of Health Care–Associated Infections with MRSA in Veterans Affairs Facilities



Jain R et al. N Engl J Med 2011;364:1419-1430.

Contact Precautions for VRE

TABLE 1B. Literature Review of Articles From 2004 to 2013 That Examined the Effect of CP (With or Without Other Measures) on VRE

			Interventions used						
Lead author	Trial design	Setting	Gowns	Gloves	Surveillance cultures	HH	Universal decolonization	Targeted decolonization	Main findings
Bearman et al[6]	Before-after	MICU	Before	√	√	√	No	No	★ No difference in VRE acquisition risk between CP and UG use
Bearman et al[34]	Before-after	SICU	Before	√	√	√	No	No	★ No difference in VRE acquisition risk between CP and UG use
Huskins et al[12]	RCT of 18 ICUs	ICU	√	√	√	√	No	No	★ No impact of surveillance culturing and isolation for MDROs
Harris et al[16]	RCT of 20 ICUs	ICUs	√	√	–	–	–	–	★ Universal CP use had no effect on VRE acquisition but was associated with less MRSA acquisition
Derde et al[11]	Before-after	ICU	√	√	√	√	√	No	★ No impact of surveillance culturing and isolation for MDROs

NOTE. CP, contact precautions; HH, hand hygiene; ICU, intensive care unit; MDRO, multidrug-resistant organism; MICU, medical intensive care unit; MRSA, methicillin-resistant *Staphylococcus aureus*; RCT, randomized controlled trial; SICU, surgical intensive care unit; UG, universal gloving; VRE, vancomycin-resistant *Enterococcus*.

- Very limited data in non-outbreak settings

Morgan DJ, et al.. Infect Control Hosp Epidemiol. 2015;36(10):1163-72.

Potential Harms Data

- **There is evidence of patient harms associated with contact precautions**
  - **Fewer healthcare worker interactions**
    - Fewer bedside visits
    - Shorter contact time with providers
    - Fewer physical examinations by an attending physician
  - **Inappropriate healthcare worker documentation**
    - Vital signs
    - Lack of HCW notes
  - **Patient flow**
    - Delays in admission from ER
    - Delays in discharge to SNF
  - **Increased depression and anxiety**
  - **Lower satisfaction**
  - **Adverse events**
    - Data is conflicting

Dashiell-Earp CN, Bell DS, Ang AO, Uslan DZ. *JAMA Intern Med* 2014;174:814-815.
Evans HL, Shaffer MM, Hughes MG, et al. *Surgery* 2003;134:180-188.
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Morgan DJ, Pineles L, Shardell M, et al. *Infect Control Hosp Epidemiol* 2013;34:69-73.
Saint S, Higgins LA, Nallamothu BK, Chenoweth C. *Am J Infect Control* 2003;31:354-356.
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Goldszer RCTE, Yokoe DS, Shadick N, Bardon CG, Johnson PA, Hogan J, Kahlert T, Whittermore A. *Journal of Clinical Outcomes Management* 2002;9:553-556.
Catalano G, Houston SH, Catalano MC, et al. *South Med J* 2003;96:141-145.
Day HR, Morgan DJ, Himelhoch S, Young A, Perencevich EN. *Am J Infect Control* 2011;39:163-165.
Karki S, Leder K, Cheng AC. *Infect Control Hosp Epidemiol* 2013;34:1118-1120.
Croft LD, Liquori M, Ladd J, et al. *Infect Control Hosp Epidemiol* 2015;36:1268-1274.

Increased Adverse Events

Table 3. General Nature and Severity of Adverse Events

Measures	General Cohort		Congestive Heart Failure Cohort		Isolated Patients vs Control Patients*	
	Isolated Patients (n = 78)	Control Patients (n = 156)	Isolated Patients (n = 72)	Control Patients (n = 144)	Rate Ratio (95% CI)	*P* Value
Length of stay, median (IQR), d	31 (10-69)	12 (7-24)	8 (4-13)	6 (4-9)	NA	<.001†
Adverse events, No. (rate per 1000 d)						
Any	70 (17.0)	25 (7.0)	38 (47.3)	28 (24.5)	2.20 (1.47-3.30)	<.001
Nonpreventable	19 (4.6)	16 (4.5)	15 (18.7)	23 (20.1)	0.99 (0.54-1.81)	.98
Preventable	51 (12.4)	9 (2.5)	23 (28.6)	5 (4.4)	6.96 (3.38-14.3)	<.001
[illegible]						
Operative	13 (3.2)	12 (3.4)	4 (5.0)	8 (7.0)	0.79 (0.37-1.68)	.55
Medical procedure–related	10 (2.4)	3 (0.8)	3 (3.7)	4 (3.5)	1.80 (0.64-5.06)	.27
Drug-related	10 (2.4)	7 (2.0)	16 (19.9)	12 (10.5)	1.47 (0.78-2.78)	.23
Supportive care failure	25 (6.1)	3 (0.8)	13 (16.2)	2 (1.8)	8.27 (3.09-22.1)	<.001
Diagnostic error	7 (1.7)	0	2 (2.5)	2 (1.7)	NA	.06‡
Anesthesia-related	1 (0.2)	0	0	0	NA	.51‡
Miscellaneous	4 (1.0)	0	0	0	NA	.07‡
Overall injury severity due to adverse events, No. (%) of patients‖					NA	.51§
Symptoms¶	15 (33)	7 (32)	11 (39)	14 (54)		
Disability	18 (40)	11 (50)	11 (39)	8 (31)		
Death	12 (27)	4 (18)	6 (21)	4 (15)		

Abbreviations: CI, confidence interval; IQR, interquartile range; NA, not applicable.
*Comparisons between isolated and control patients are adjusted for study cohort and patient demographic, hospital, and clinical characteristics.
†*P* value calculated by Wilcoxon rank-sum test.
‡Unadjusted *P* values calculated by Fisher exact test due to small number of events.
§A single *P* value for a test of proportions comparing isolated and control patients is reported for overall injury severity.
‖Data do not necessarily sum to 100 (rounding error).
¶Includes asymptomatic patients with laboratory abnormalities.

Stelfox HT, Bates DW, Redelmeier DA. Safety of patients isolated for infection control. *JAMA* 2003;290:1899-1905.

Fewer Adverse Events

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

Type of Adverse Event	R_tR (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_tR, rate ratio; CI, confidence interval.
[a]Adjusted for matching by unit of enrollment (surgery/transplant; oncology; general medicine).

Croft LD, Liquori M, Ladd J, et al. The Effect of Contact Precautions on Frequency of Hospital Adverse Events. *Infect Control Hosp Epidemiol* 2015;36:1268-1274.

What Happens If You Stop?

- **Some institutions have removed contact precautions for MRSA and/or VRE with no increase in:**
  - Healthcare associated infections (HAI) with MRSA or VRE
  - Device associated infections
  - MRSA acquisition
  - MRSA environmental contamination
- **Can I do this in my hospital?**

Martin EM, Russell D, Rubin Z, et al. *Infect Control Hosp Epidemiol* 2016;37:1323–1330.
Edmond MB, Masroor N, Stevens MP, et al. *Infect Control Hosp Epidemiol* 2015;36:978–980.
McKinnell JA, Eells SJ, Clark E, et al. *Epidemiol Infect* 2017;145:2575–2581

What did we do in our large health system?

Nonrandomized, observational, quasi-experimental study before and after a change in contact precautions policy

- **Intervention**
  - Contact precautions for MRSA and VRE were discontinued on 2/15/18
  - Included colonization, infection, and history of infection
  - Health system policy change – decision to implement was based on local infection prevention recommendation
    - Contact precautions continued in all NICUs and Burn Units
- **Population – UPMC Health System**

  Intervention: 12 hospitals

  Control: 3 hospitals

- **Study Period**
  - Policy Change – February 15, 2018
  - Pre-intervention: 2/2017 to 1/2018
  - Post-intervention: 3/2018 to 2/2019
  - Excluded 2/2018 – wash in period
- **Outcomes**

  Primary:
  - MRSA and VRE HAI by NHSN per 1000 patient days

  Secondary:
  - Assessment of factors associated with successful or failure
  - Cost of isolation gowns

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

Intervention Hospitals:

Hospital	Beds	% ICU Beds	Hospital Type	Transplant	Specialized Unit
1	495	13%	Tertiary		Burn & NICU
2	423	16%	Tertiary	✓	NICU
3	374	11%	Community		
4	363	27%	Tertiary		NICU
5	306	10%	Tertiary		
6	208	7%	Community		
7	195	6%	Community		
8	158	7%	Community		
9	155	10%	Community		
10	148	10%	Community		
11	133	9%	Community		
12	40	10%	Community		

Control Hospitals:

Hospital	Beds	% ICU Beds	Hospital Type	Transplant	Specialized Unit
13	745	19%	Tertiary	✓	
14	484	13%	Tertiary	✓	
15	315	33%	Tertiary	✓	NICU

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

Intervention Hospitals:

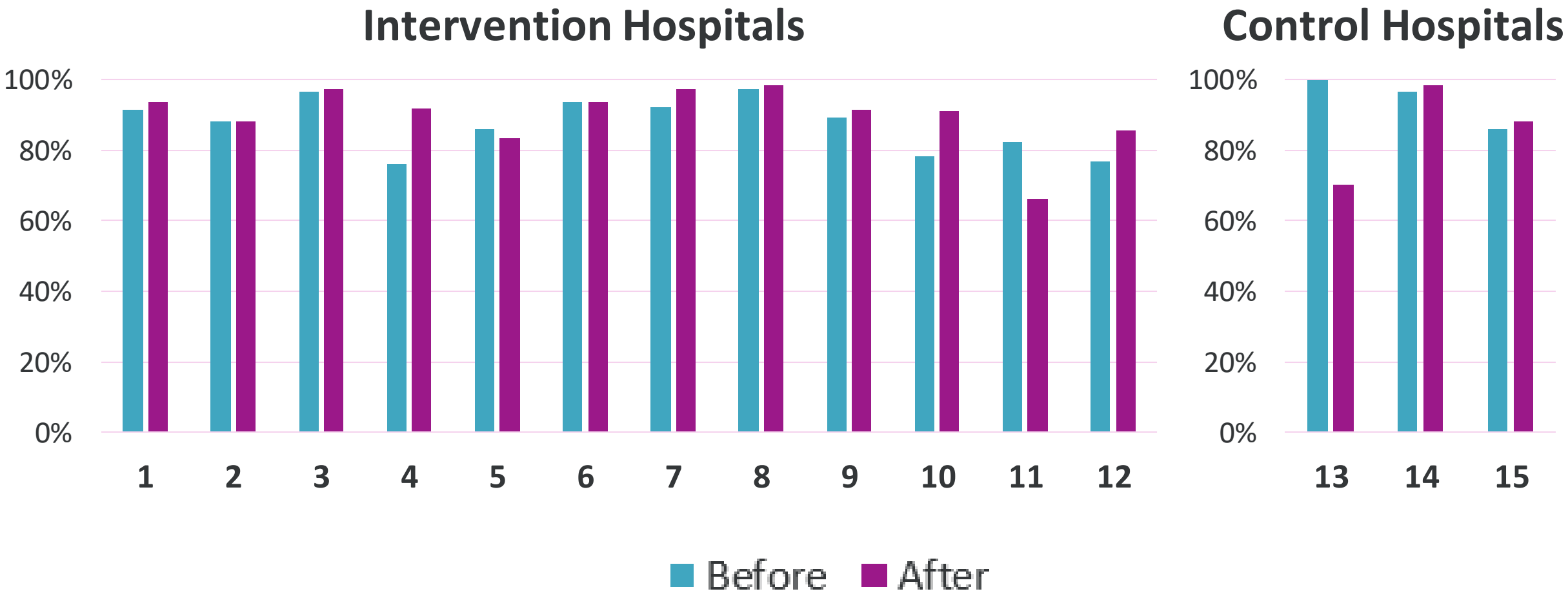
Hospital	CHG Bathing	% Private Rooms	UV Disinfection	Active Surveillance Testing	
				MRSA	VRE
1	All	*****	✓	✓	
2	Select	**********	✓	✓	
3	Select	**	✓	✓	
4	Select	**********	✓	✓	
5	Select	********	✓	✓	
6	Select	**********		✓	
7	Select	*********		✓	
8	Select	**********		✓	
9	All	**********		✓	
10	Select	*		✓	
11	✗	*		✓	
12	Select	**********	✓	✓	

Control Hospitals:

Hospital	CHG Bathing	% Private Rooms	UV Disinfection	Active Surveillance Testing	
				MRSA	VRE
13	All	******	✓	✓	✓
14	All	*********	✓	✓	✓
15	Select	**	✓	✓	✓

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

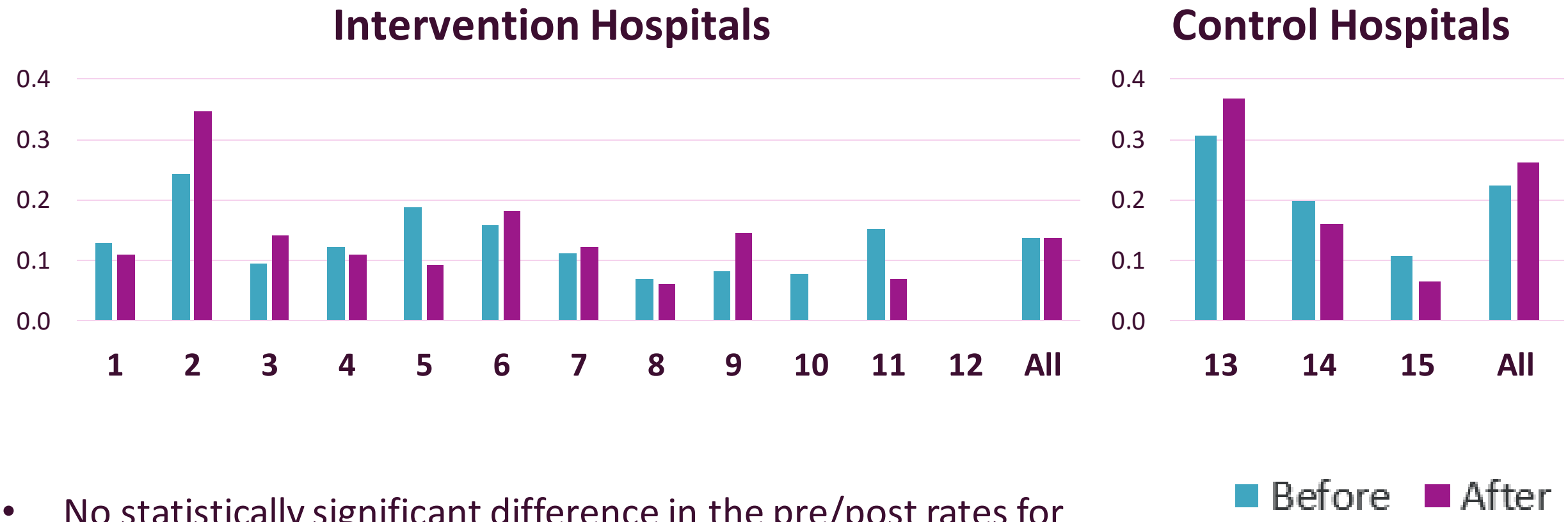
Relatively High Hand Hygiene Rates



*HH post period from 3/2018 to 9/2019

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

MRSA HAI per 1000 Patient Days

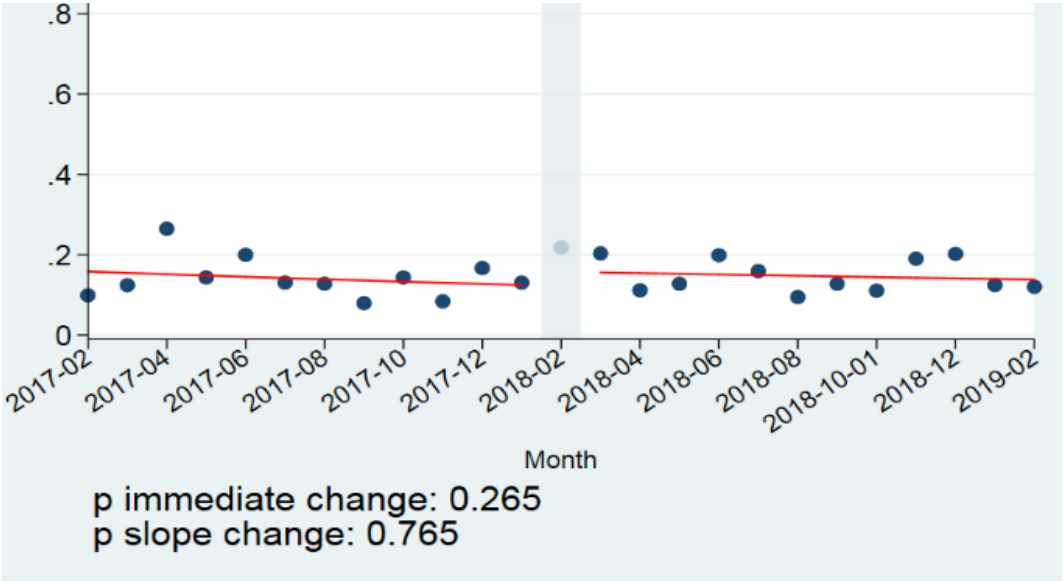


- No statistically significant difference in the pre/post rates for individual hospitals

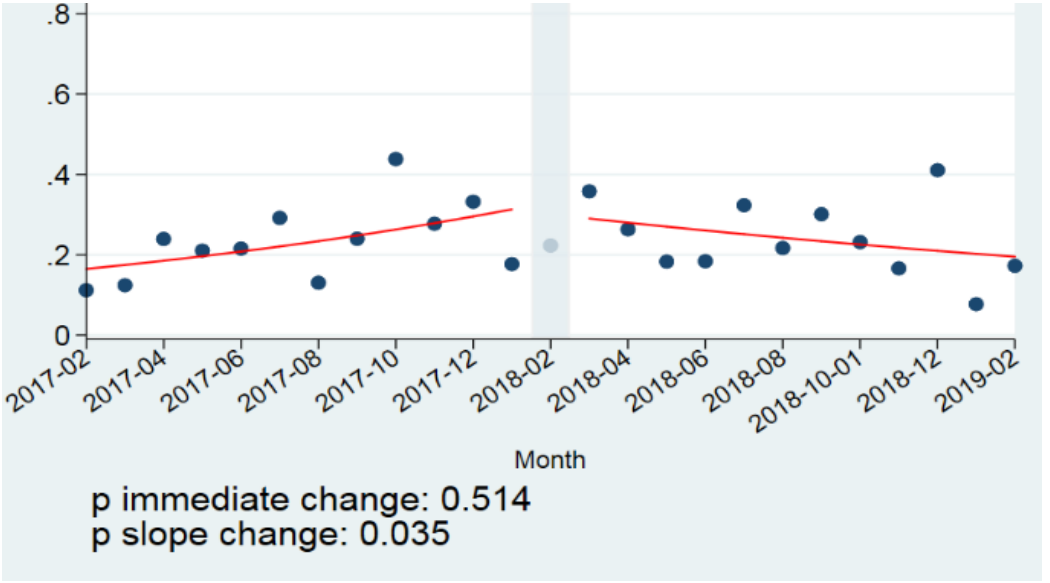
Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

MRSA HAI per 1000 Patient Days

Intervention Hospitals



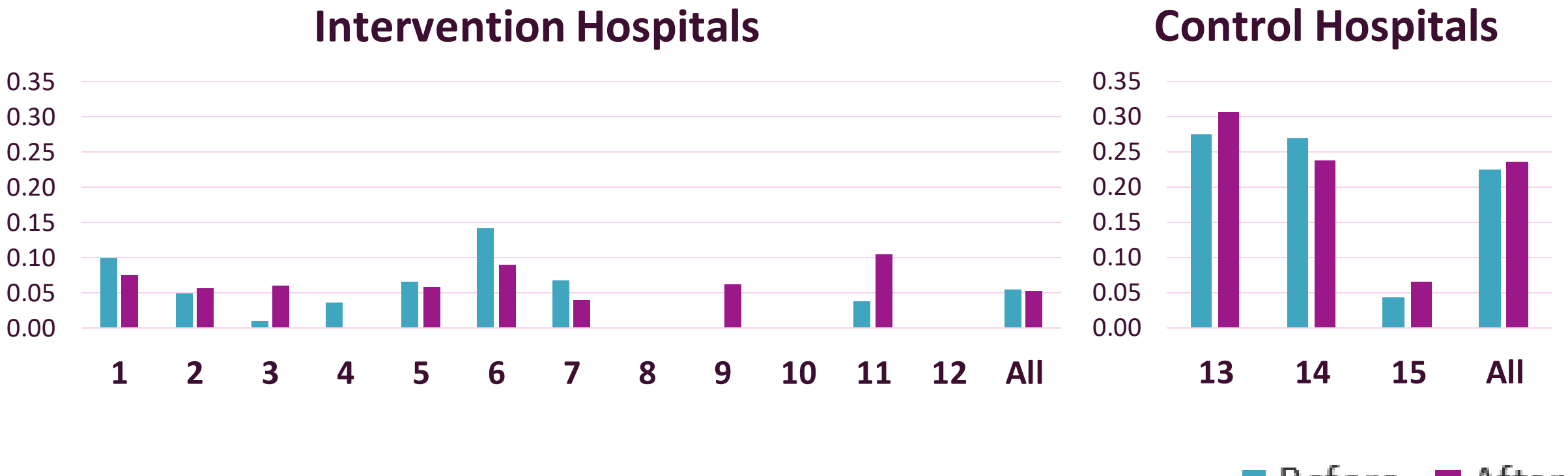
Control Hospitals



- **No statistically significant difference:**
  - Pre/post rates for aggregated intervention (p=0.742)
  - Pre/post rates for aggregated control hospitals (p=0.776)
  - Between aggregated intervention and control hospitals (p=0.943)

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

VRE HAI per 1000 Patient Days

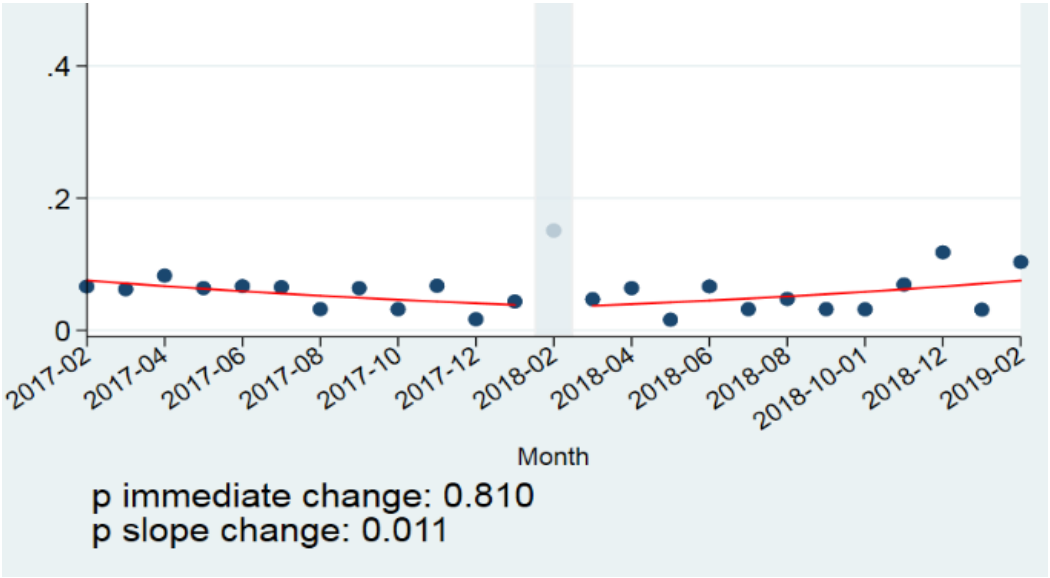


- No statistically significant difference in the pre/post rates for individual hospitals

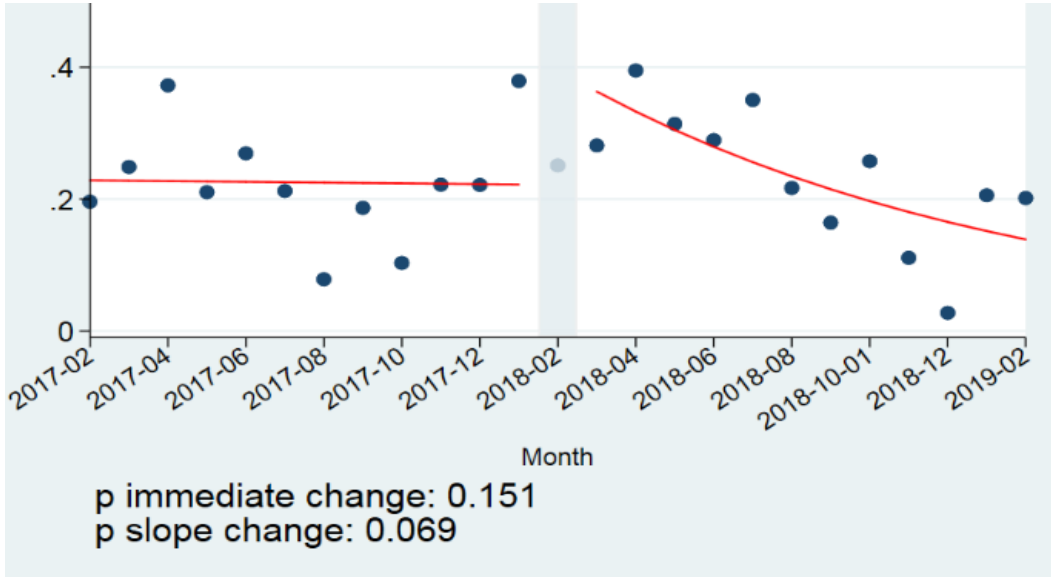
Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

VRE HAI per 1000 Patient Days

Intervention Hospitals



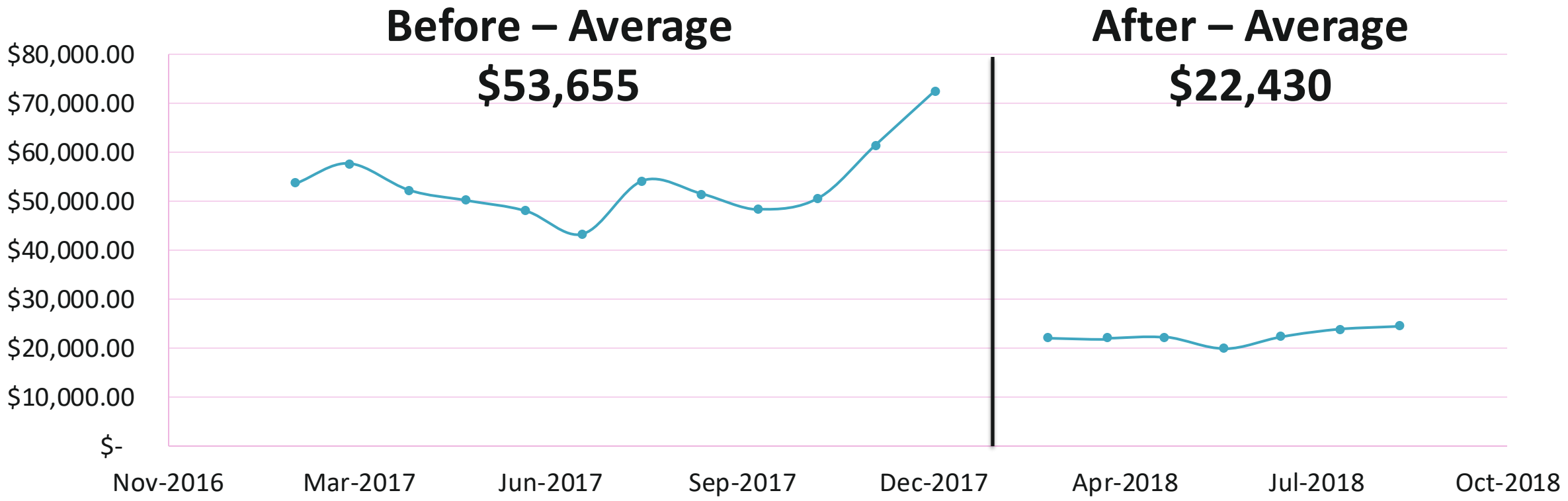
Control Hospitals



- **No statistically significant difference:**
  - Pre/post rates for aggregated intervention hospitals (p=0.956)
  - Pre/post rates for aggregated control hospitals (p=0.733)
  - Between aggregated intervention and control hospitals (p=0.735)

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

Average Spending on Gowns Decreased

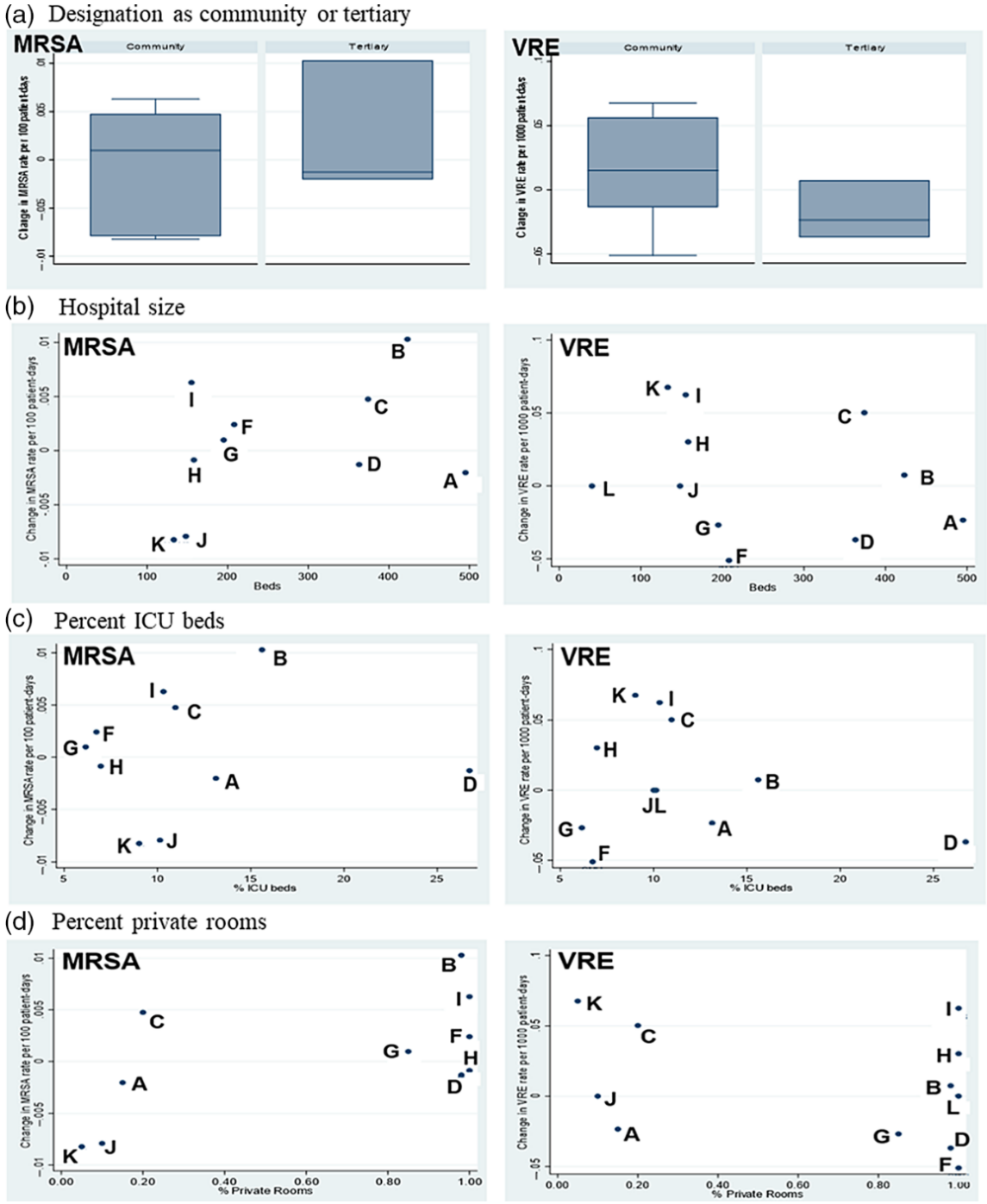


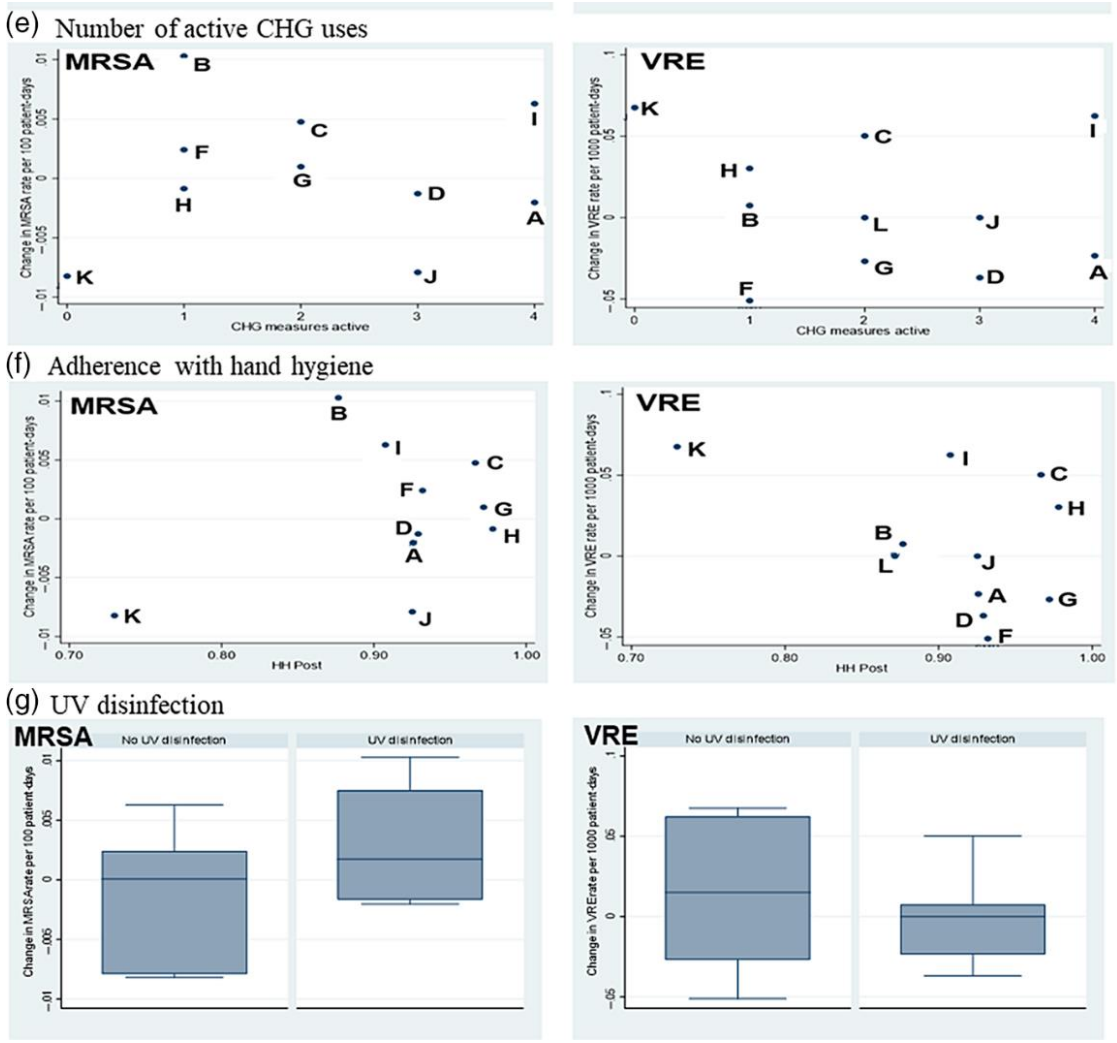
- **Projected yearly cost savings of $374,696 over 1 year**

*Hospital 3 exclude for insufficient data

Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

Did any specific hospital factors matter?





Martin, E., et al. (2022). *Infection Control & Hospital Epidemiology, 43*(11), 1595-1602.

What have other hospitals found?

MRSA:

Major Article

Discontinuing contact precautions for multidrug-resistant organisms: A systematic literature review and meta-analysis

Alexandre R. Marra MD, MS [a,b,*], Michael B. Edmond MD, MPH, MPA [a,c], Marin L. Schweizer PhD [d,e], Grace W. Ryan MPH [f], Daniel J. Diekema MD, MS [a,c,g]

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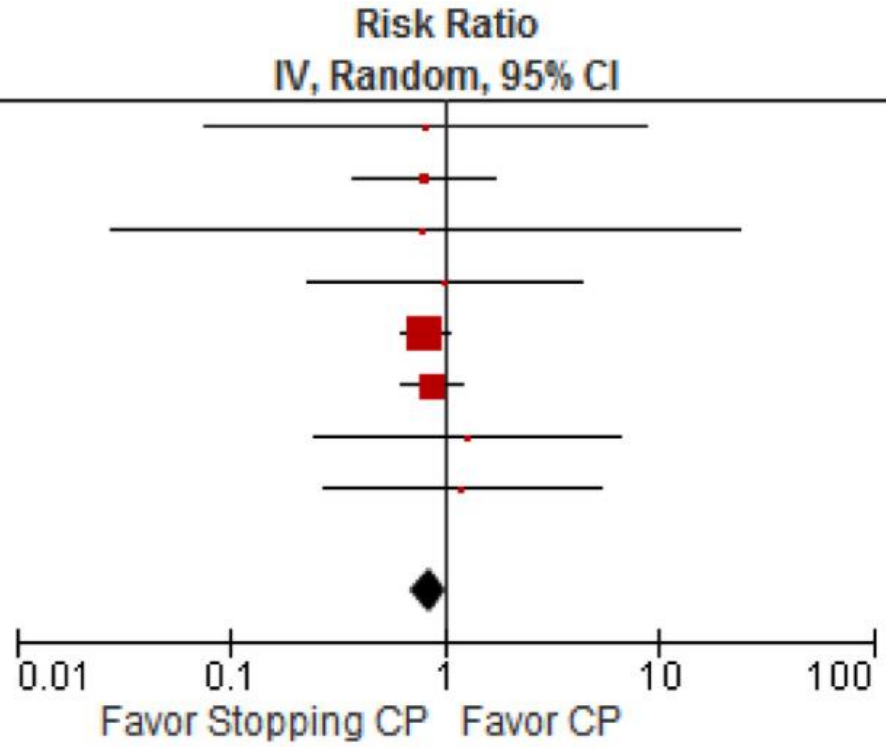
Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI
Deatherage 2016	-0.2	1.21	0.6%	0.82 [0.08, 8.77]
Edmond 2015	-0.22	0.387	6.3%	0.80 [0.38, 1.71]
Gandra 2014	-0.22	1.72	0.3%	0.80 [0.03, 23.36]
Graman 2015	0	0.75	1.7%	1.00 [0.23, 4.35]
Martin 2016	-0.22	0.132	53.8%	0.80 [0.62, 1.04]
Rupp 2016	-0.13	0.165	34.4%	0.88 [0.64, 1.21]
Spence 2012	0.24	0.837	1.3%	1.27 [0.25, 6.56]
Watkins 2014	0.187	0.765	1.6%	1.21 [0.27, 5.40]
Total (95% CI)			**100.0%**	**0.84 [0.70, 1.02]**

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.73$, df = 7 (P = 1.00); $I^2 = 0\%$

Test for overall effect: Z = 1.78 (P = 0.07)



Am J Infect Control. 2017 Oct 11. pii: S0196-6553(17)31037-4.

VRE:

Major Article

Discontinuing contact precautions for multidrug-resistant organisms: A systematic literature review and meta-analysis

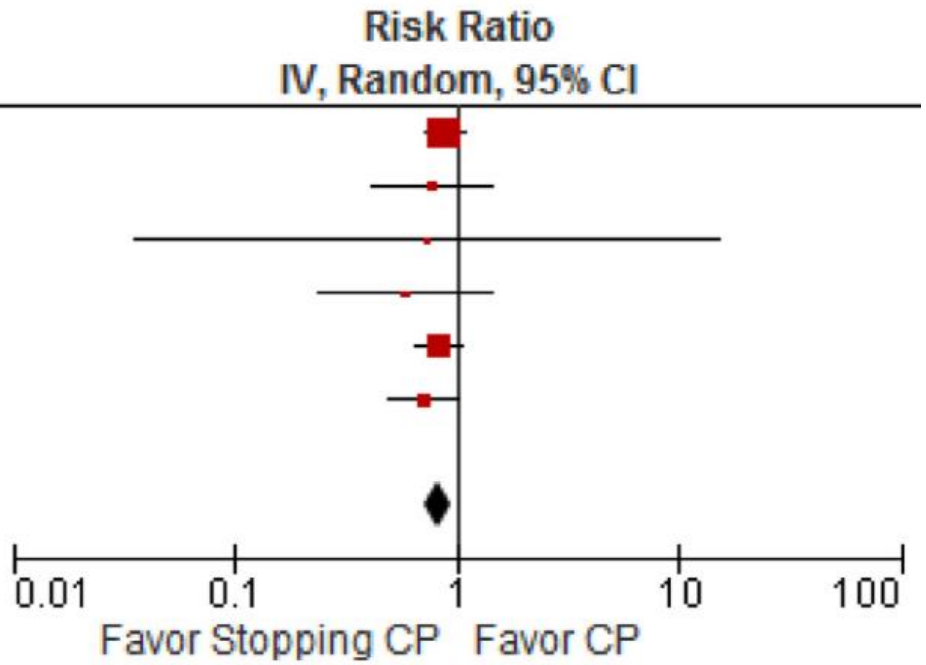
Alexandre R. Marra MD, MS [a,b,*], Michael B. Edmond MD, MPH, MPA [a,c], Marin L. Schweizer PhD [d,e], Grace W. Ryan MPH [f], Daniel J. Diekema MD, MS [a,c,g]

AJIC American Journal of Infection Control

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Random, 95% CI
Almyroudis 2016	-0.13	0.105	44.8%	0.88 [0.71, 1.08]
Edmond 2015	-0.26	0.323	4.7%	0.77 [0.41, 1.45]
Gandra 2014	-0.31	1.55	0.2%	0.73 [0.04, 15.30]
Lemieux 2016	-0.53	0.462	2.3%	0.59 [0.24, 1.46]
Martin 2016	-0.19	0.121	33.8%	0.83 [0.65, 1.05]
Rupp 2016	-0.34	0.187	14.1%	0.71 [0.49, 1.03]
Total (95% CI)			**100.0%**	**0.82 [0.72, 0.94]**

Heterogeneity: Tau² = 0.00; Chi² = 1.56, df = 5 (P = 0.91); I² = 0%

Test for overall effect: Z = 2.78 (P = 0.005)



Am J Infect Control. 2017 Oct 11. pii: S0196-6553(17)31037-4.

Will things get worse over time?

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Major Article

Stopping the routine use of contact precautions for management of MRSA and VRE at three academic medical centers: An interrupted time series analysis

Sarah Haessler MD, MS [a,*], Elise M Martin MD, MS [b], Mary Ellen Scales RN, MSN, CIC FAPIC [c], Le Kang PhD [d], Michelle Doll MD, MPH [e], Michael P. Stevens MD MPH [e], Daniel Z. Uslan MD MBA FIDSA FSHEA [f], Rachel Pryor RN, MPH [e], Michael B. Edmond MD, MPH, MPA, MBA [g], Emily Godbout DO, MPH [h], Salma Abbas MBBS, MPH [i], Gonzalo Bearman MD, MPH [e]

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Key Words:
Contact precautions
VRE
Horizontal infection control

Background: Contact precautions (CP) are a widely adopted strategy to prevent cross-transmission of organisms, commonly methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE). Some hospitals have discontinued CP for patients with MRSA or VRE; however, the impact on hospital-acquired infection rates (HAI) has not been assessed systematically.

Methods: Retrospective multicenter interrupted time series between 2002 and 2017 at three academic hospitals. Participating hospitals discontinued CP for patients with contained body fluids who were colonized or infected with MRSA or VRE. The primary intervention was stopping the use of CP. Secondary interventions were horizontal infection prevention strategies. The primary outcomes were rates of central line-associated bloodstream infections, catheter-associated urinary tract infections, mediastinal surgical site infection, and ventilator-associated pneumonia due to MRSA, VRE, or any organism using Centers for Disease Control and Prevention National Healthcare Safety Network surveillance definitions.

Results: Central line-associated bloodstream infections, catheter-associated urinary tract infections, mediastinal surgical site infection, and ventilator-associated pneumonia rates trended down at each institution. There were no statistically significant increases in these infections associated with discontinuing CP. Individual horizontal infection prevention strategies variably impacted HAI outcomes.

Conclusions: Stopping the routine use of CP for patients with contained body fluids who are colonized or infected with MRSA or VRE did not result in increased HAIs. Bundled horizontal infection prevention strategies resulted in sustained HAI reductions.

Highlights:

- Long follow up – 2002 to 2017
- Included 3 different institutions

Findings:

- Non-use of contact precautions for MRSA or VRE did not increase HAI.
- HAI decreased over time associated with horizontal infection prevention strategies.
- Outcomes were consistent across hospitals of varying size and percent single rooms.

What did staff think?

Nursing Time Saved

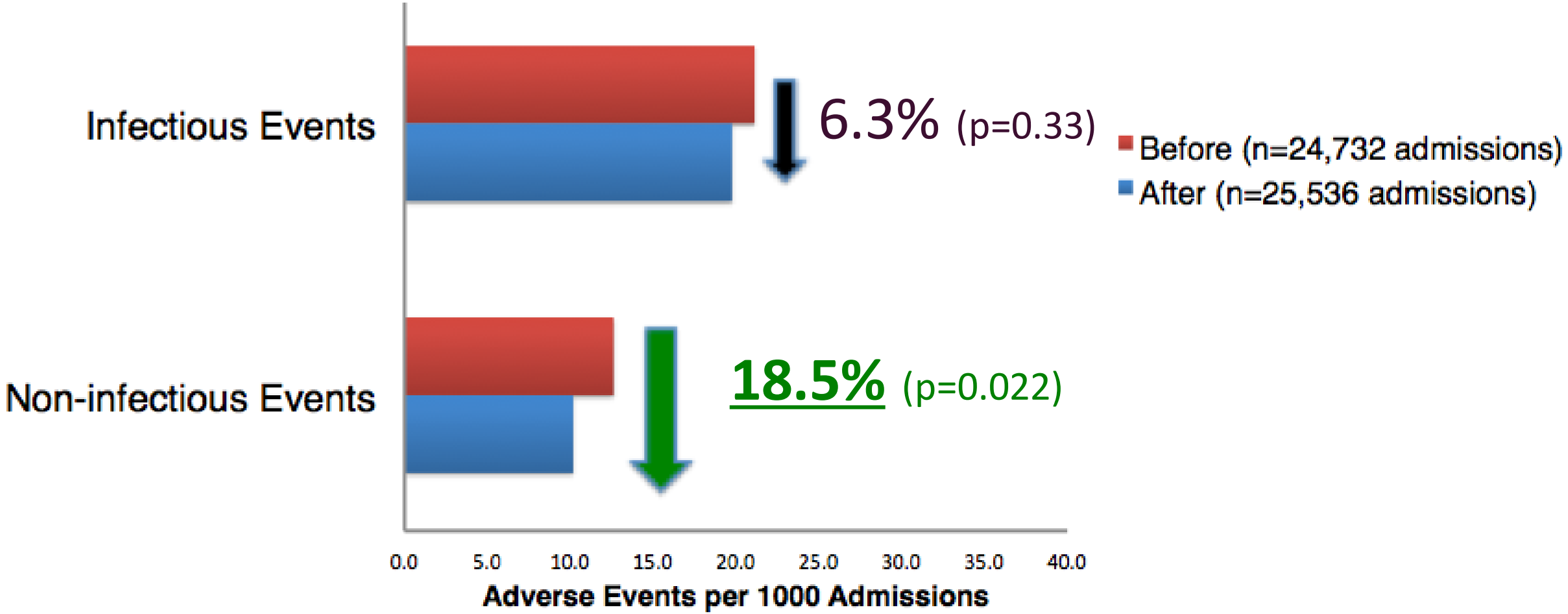
	Total Beds	% on CP Before *	% on CP After *	Nursing Room Entries per Hour	Average Entry Time (sec)	Total Hours per year	Nursing Cost per Hour	Total Sunk Cost
ICU	176	28.5%	0%	5.68	38	26,333	$99.60	$2,622,727
Med/Surg Floors	629	19%	0%	1.71	38	18,944	$105.00	$1,989,124
Total	805					**45,277**		**$4,611,851**

*For MRSA and VRE only. Does not include *C. difficile* or multidrug resistant gram-negative organisms.

Martin EM, et al. *Infect Control Hosp Epidemiol* 2016;37:1323–1330.

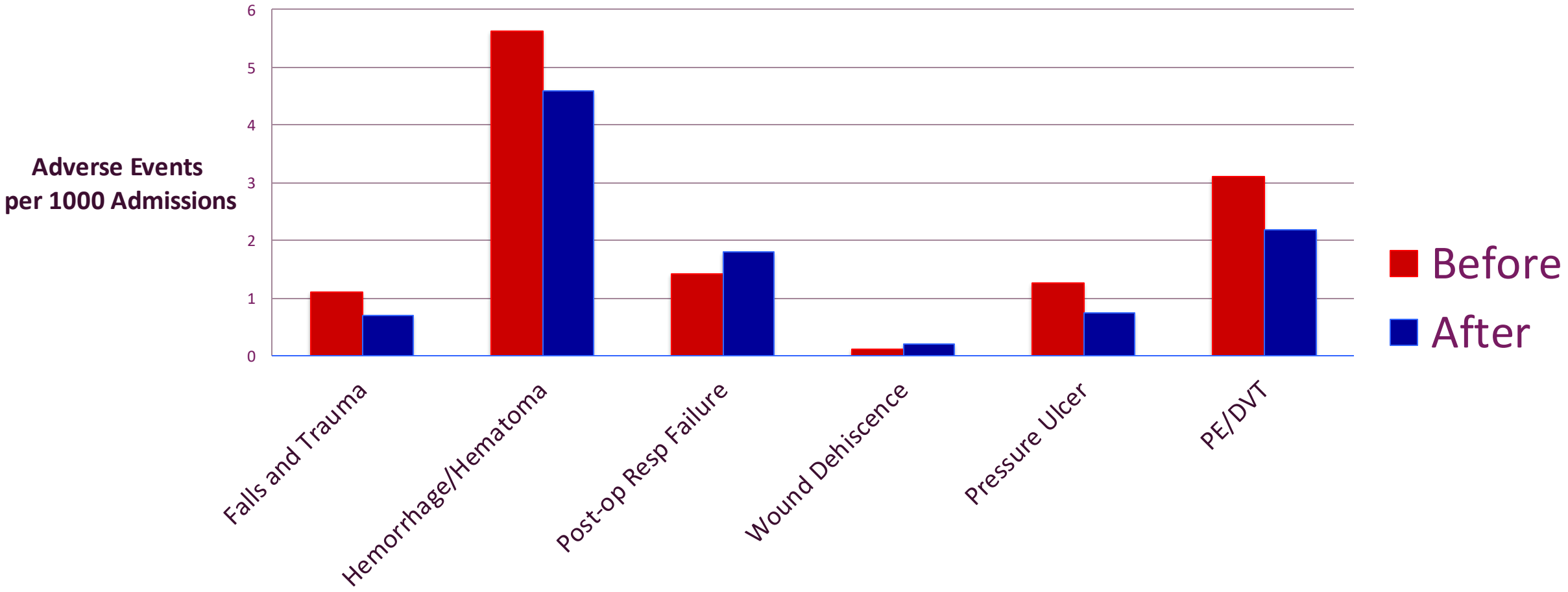
What about Adverse Events?

Impact on Adverse Events



Martin EM, et al. *Infect Control Hosp Epidemiol* 2018;39:788-796.

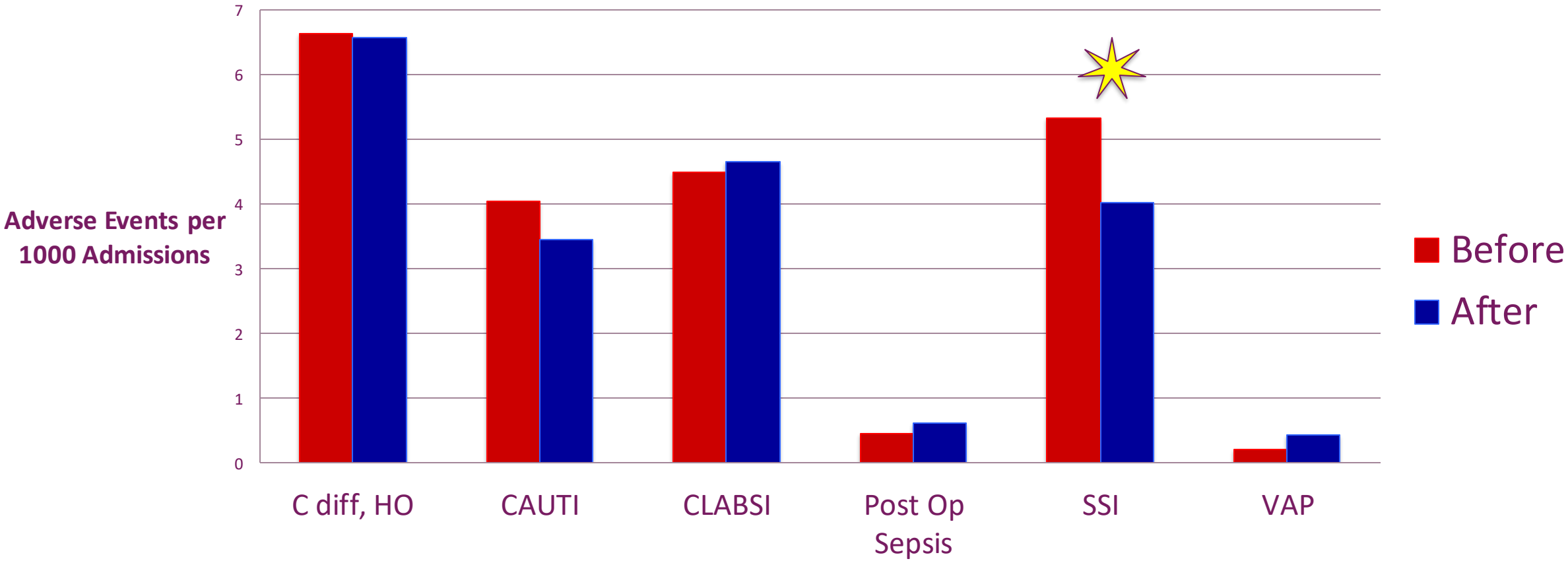
Non-infectious Adverse Events



- **Trends toward decrease, but not statistically significant**

Martin EM, et al. *Infect Control Hosp Epidemiol* 2018;39:788-796.

Infectious Adverse Events

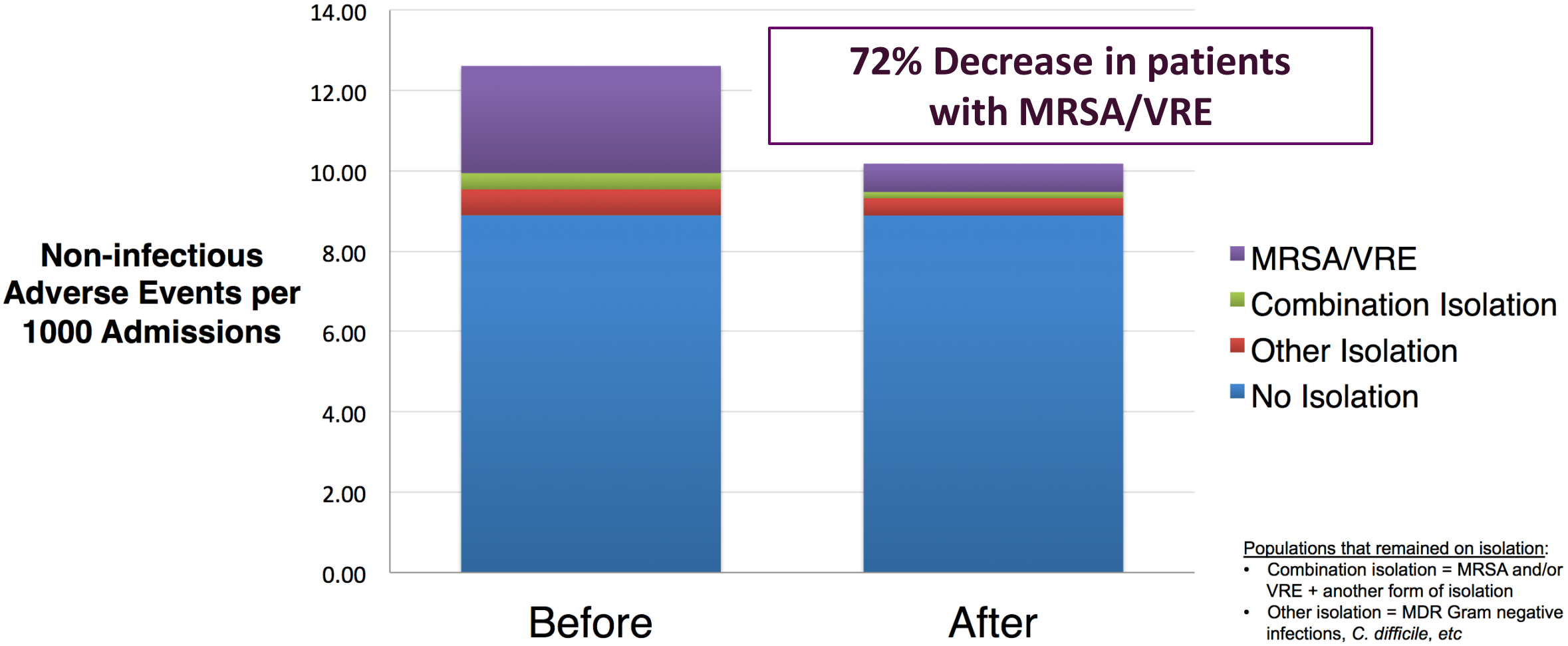


- No change in overall infectious adverse events
- **Surgical Site Infections** – decrease by **24.3%** (p value=0.03)

Martin EM, et al. *Infect Control Hosp Epidemiol* 2018;39:788-796.

Was It Contact Precautions?

Who Was Most Affected?



Populations that remained on isolation:

- Combination isolation = MRSA and/or VRE + another form of isolation
- Other isolation = MDR Gram negative infections, *C. difficile*, *etc*

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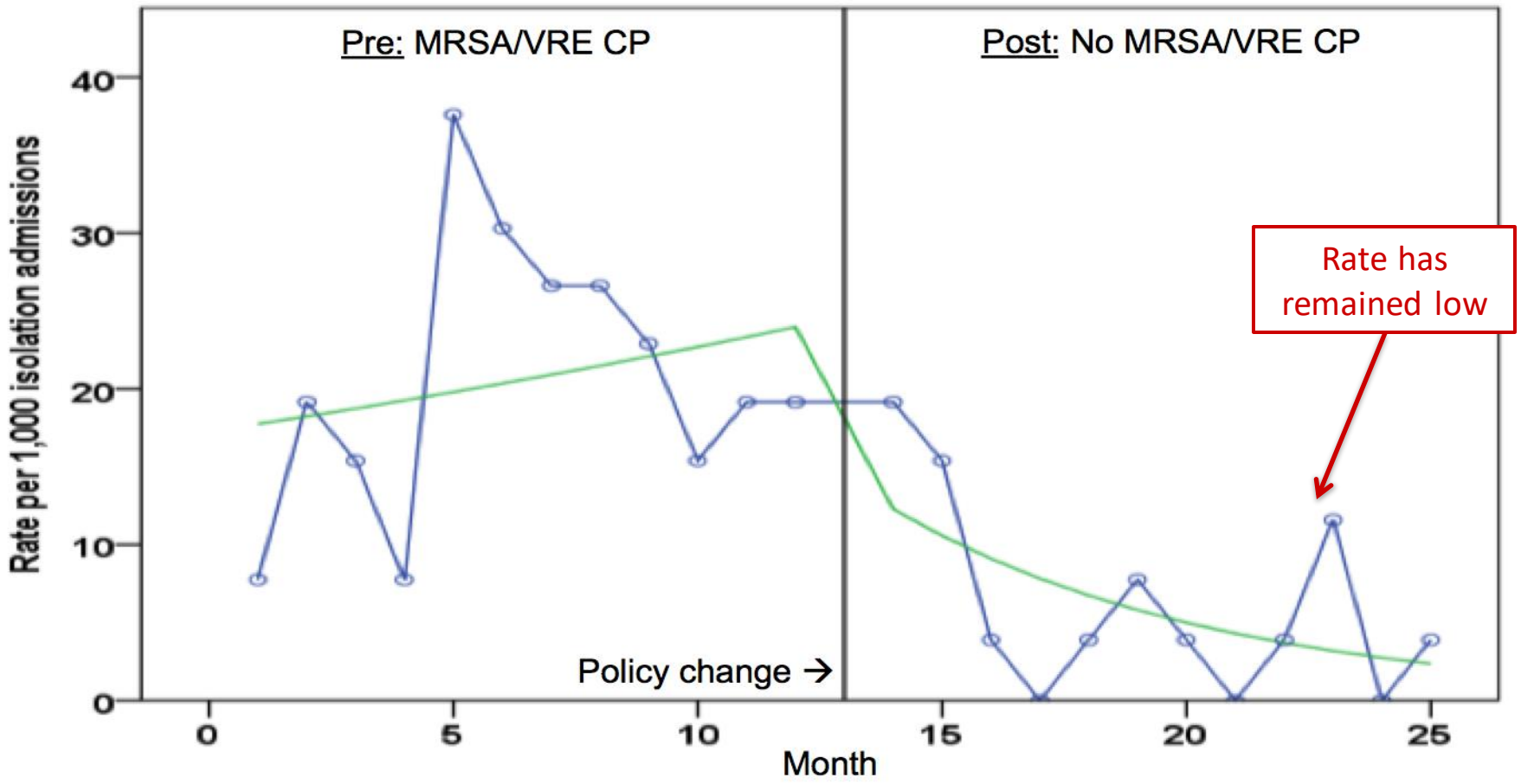
MRSA & VRE Patients



Martin EM, et al. *Infect Control Hosp Epidemiol* 2018;39:788-796.

My Facilities Experiences

- **Notable positives:**
  - Multiple studies with no increase in HAI rates after removing contact precautions for MRSA and VRE
  - Positive healthcare worker experience
  - No facility I have worked in has had to return to contact precautions for increased rates of MRSA/VRE HAIs after discontinuation
  - Significant savings
    - Isolation gown costs
    - Healthcare worker time
  - Improvement in noninfectious adverse events
    - Largest decrease in patients with MRSA and VRE
    - Decrease in surgical site infections

My Facilities Experiences

- **Limitations**
  - No randomized clinical trials
  - Unable to assess for impacts of different infection prevention practices
  - Hospitals were able to assess their own readiness for most published studies

- **Take home message:**
  - Assess your facilities characteristics before considering a change
  - Make sure horizontal infection prevention strategies are optimal
  - Make sure MRSA/VRE HAIs are under control
  - May be a reasonable option if the setting is right

Questions?

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