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# Scientific Sessions

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**Orlando, Florida**  
Four Seasons Resort

# The Impact of *Clostridium difficile* Infection in Contemporary Vascular Surgery

Morgan Cox, MD, MHS; Robert Feezor, MD; Scott Robinson, MD, PhD;  
Michol Cooper, MD, PhD; Scott Berceci, MD, PhD; Zain Shahid, MD;  
Martin Back, MD, MS; Ben Jacobs, MD; Samir Shah, MD, MPH; Gilbert  
Upchurch Jr., MD; Thomas Huber, MD, PhD; Salvatore Scali, MD

Division of Vascular Surgery and Endovascular Therapy

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# Disclosures

- None

# Introduction

- Prevention of in-hospital *Clostridium difficile* (*Cdiff*) infection has been designated by the CDC to be a major health care priority and quality measure
- CMS now links payments directly to observed hospital-acquired *Cdiff* infection rates
- National efforts have focused on reducing community and inpatient rates of *Cdiff*, but little attention is directed to post-operative patients



# Impact of *Cdiff* in Vascular Patients?

- Historical and contemporaneous reports focus on alimentary tract operations
- Vascular patients are uniquely vulnerable
- Incidence and sequelae of post-operative *Cdiff* infection among vascular surgery patients is **unknown**



# Purpose

- Describe the incidence of post-operative *Cdiff* infection among patients undergoing major vascular operations
- Measure effects of post-operative *Cdiff* on in-hospital outcomes

# Methods

- VIZIENT Clinical Database Resource Manager was queried (2015-2019)
  - 95% of all non-profit teaching institutions
  - Over 1,300 acute care hospitals in the US
- All patients (n=38,378) undergoing open AAA repair (OAAA), supra-inguinal bypass (SUPRA), and infra-inguinal bypass (INFRA)
  - OAAA, n = 5,504
  - SUPRA, n = 8,489
  - INFRA, n = 24,385
- Primary exposure variable = post-operative in-hospital *Cdiff* infection

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# Methods

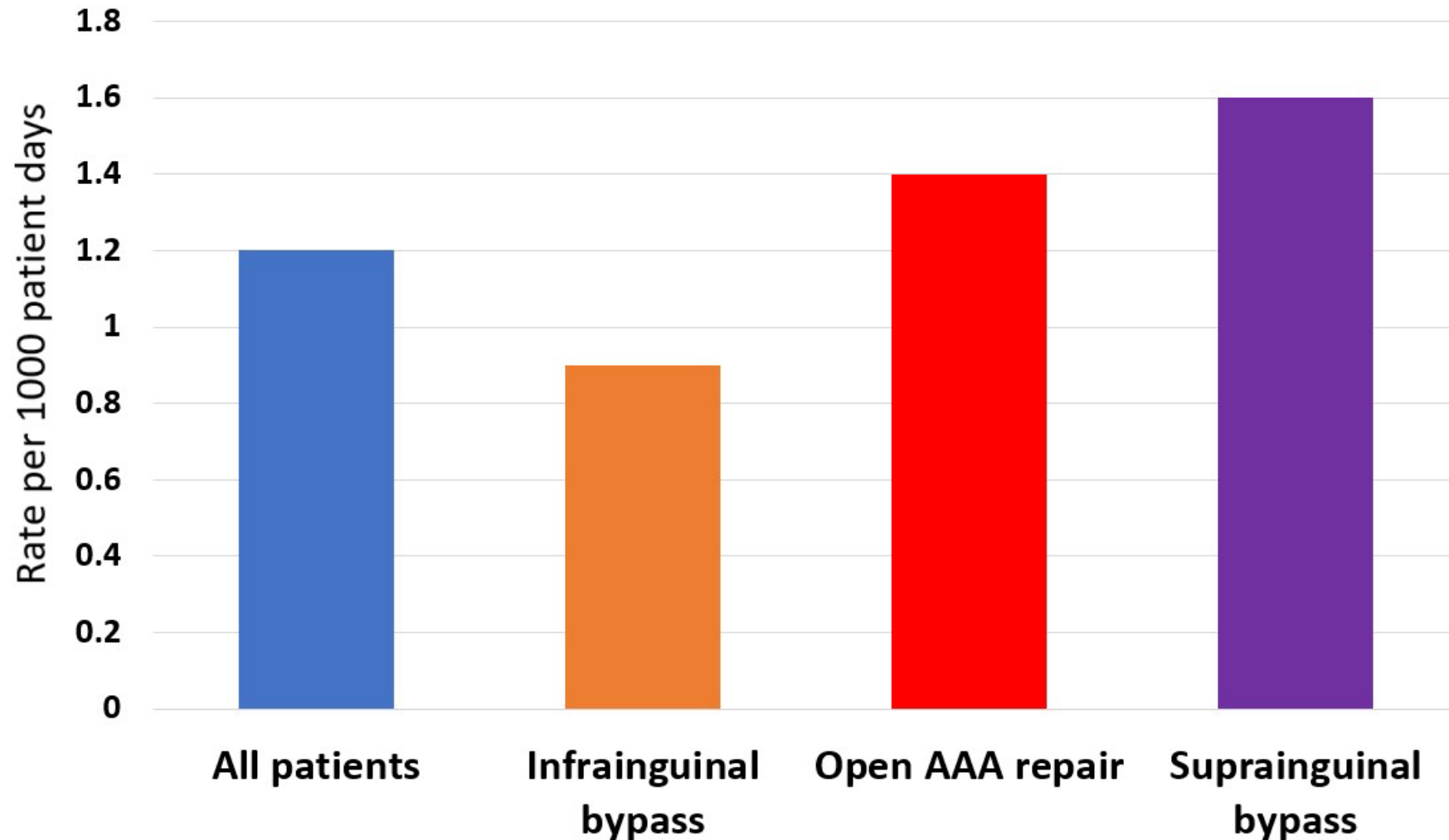
- Primary outcomes: post-operative length of stay (LoS), total hospitalization cost, in-hospital mortality
- Mixed-effects linear and logistic regression was used for risk-adjustment
  - Modeled factors included pre-operative antibiotic exposure, demographics, comorbidities, procedural urgency (elective vs. non-elective), and procedural type
- Separate models for each procedure type were generated due to patient heterogeneity



# Incidence of Post-operative *Cdiff* Infection

Cohort	No <i>Cdiff</i>	+ <i>Cdiff</i>	Incidence
All patients	37,560	818	1.2%
Infra-inguinal bypass	24,168	217	0.9%
Open AAA repair	5,052	452	1.6%
Supra-inguinal bypass	8,340	149	1.8%

# Rate of Post-operative *Cdiff* Infection



# Demographics and Comorbidities

SUPRA	No <i>Cdiff</i> (N = 8,340, 98.2%)	+ <i>Cdiff</i> (N = 149, 1.8%)	P-value
Age	63 (11)	66 (11)	.0006
Female sex	39%	42%	.5
Non-elective admission	45%	66%	<.0001
Hypertension (complicated)	10%	23%	<.0001
Coronary artery disease	26%	29%	.09
Congestive heart failure	2%	8%	<.0001
COPD	36%	36%	1
Diabetes (any type)	25%	29%	.06
Chronic kidney disease	18%	31%	.0001
Peptic ulcer disease	2%	6%	.0007



# Demographics and Comorbidities

Similar univariate patterns identified among open AAA and supra-inguinal bypass patients

Chronic kidney disease	18%	31%	.0001
Peptic ulcer disease	2%	6%	.0007

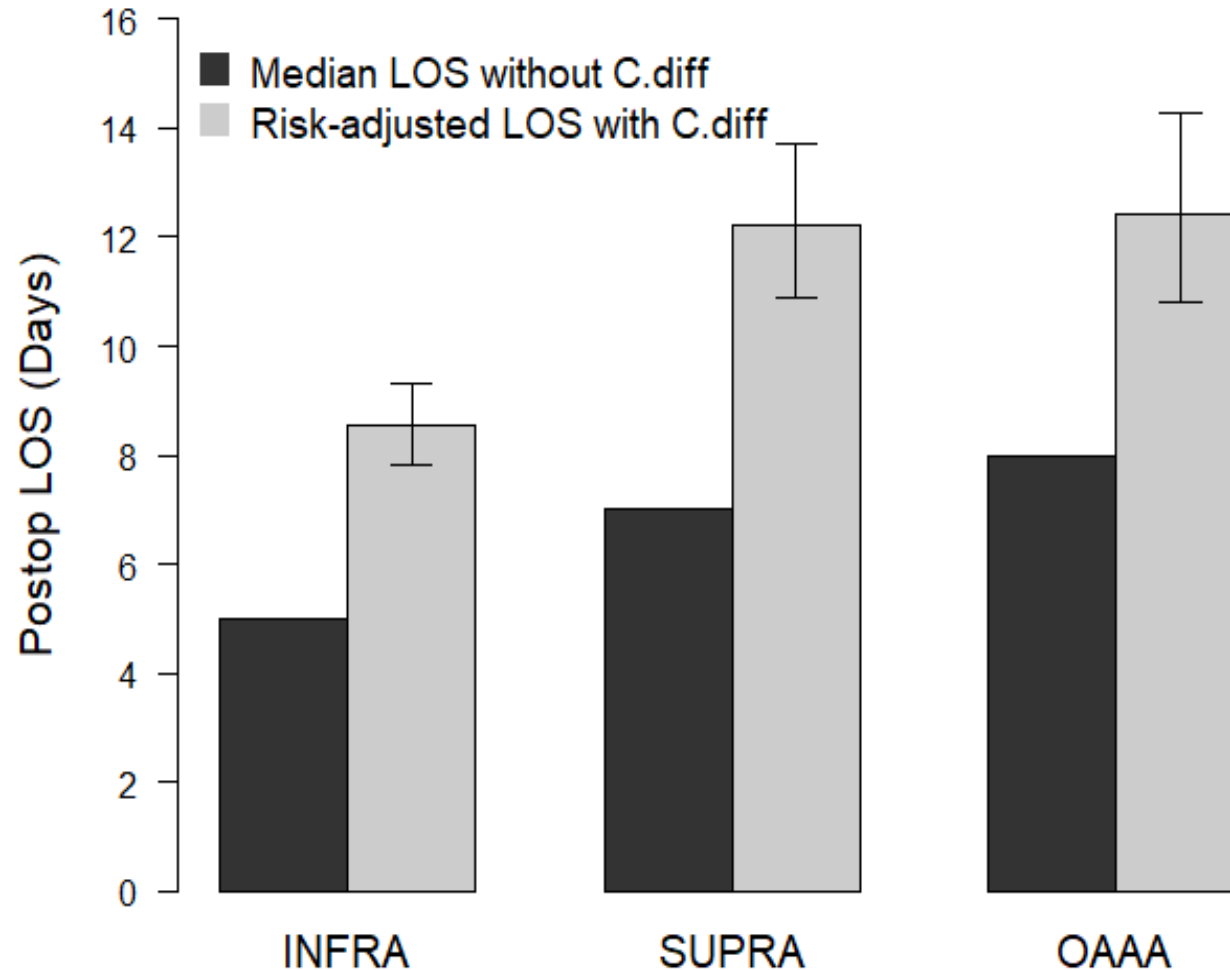


# Unadjusted Outcomes

Procedure	No Cdiff	+Cdiff	P-value
<i>Infra-inguinal bypass</i>			
-Post-operative LoS	5 [3, 8]	15 [9, 25]	<.0001
-Total cost (in \$1000s)	25 [16, 42]	67 [43, 121]	<.0001
-In-hospital mortality	3%	14%	.001
<i>Open AAA repair</i>			
-Post-operative LoS	8 [6, 12]	19 [12, 33]	<.0001
-Total cost (in \$1000s)	37 [25, 63]	86 [45, 164]	<.0001
-In-hospital mortality	8%	16%	.05
<i>Supra-inguinal bypass</i>			
-Post-operative LoS	7 [5, 11]	21 [12, 34]	<.0001
-Total cost (in \$1000s)	35 [23, 58]	98 [53, 159]	<.0001
-In-hospital mortality	8%	14%	.01

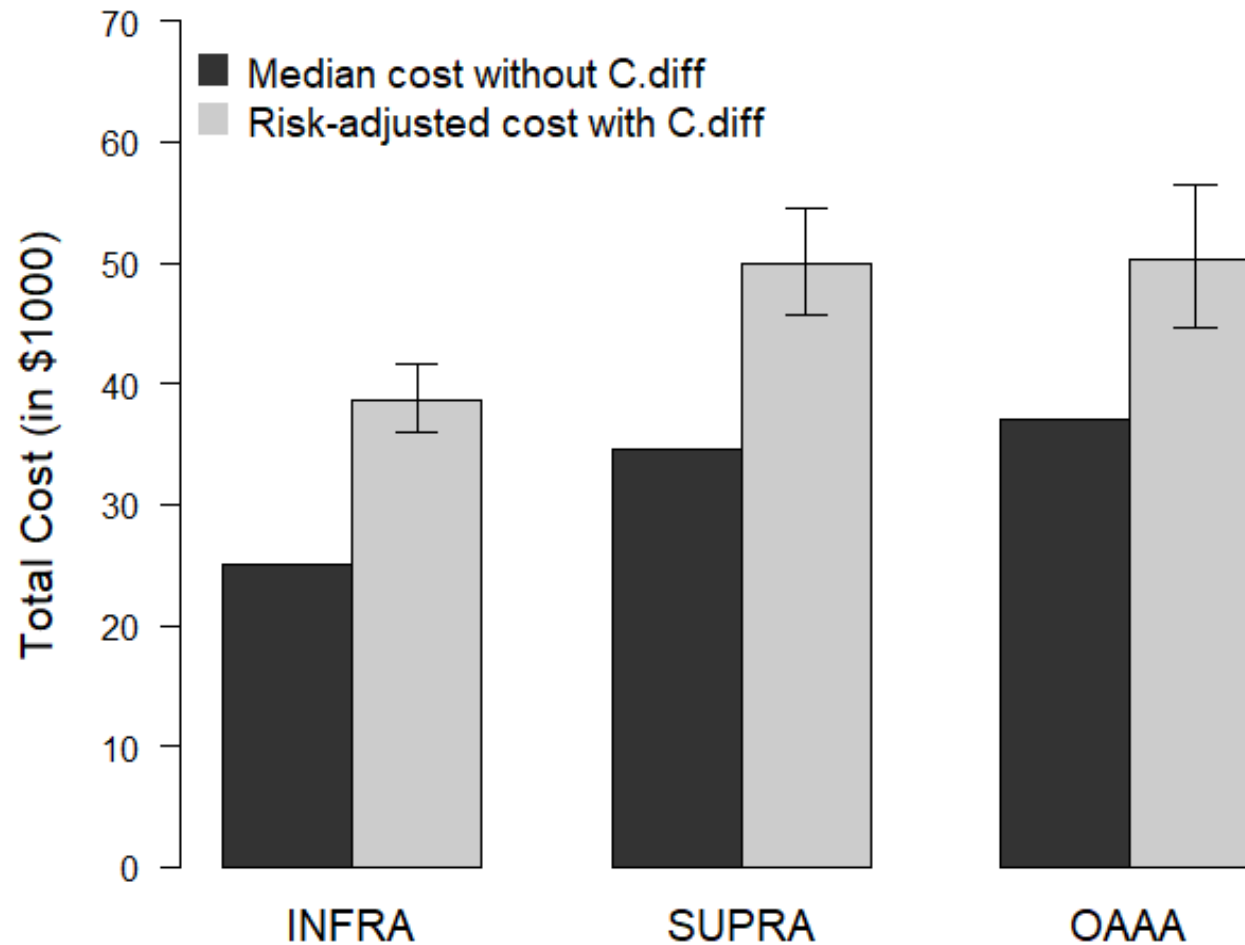


# Risk-adjusted Impact of *Cdiff* on Post-op LoS



P<0.0001 for all procedures

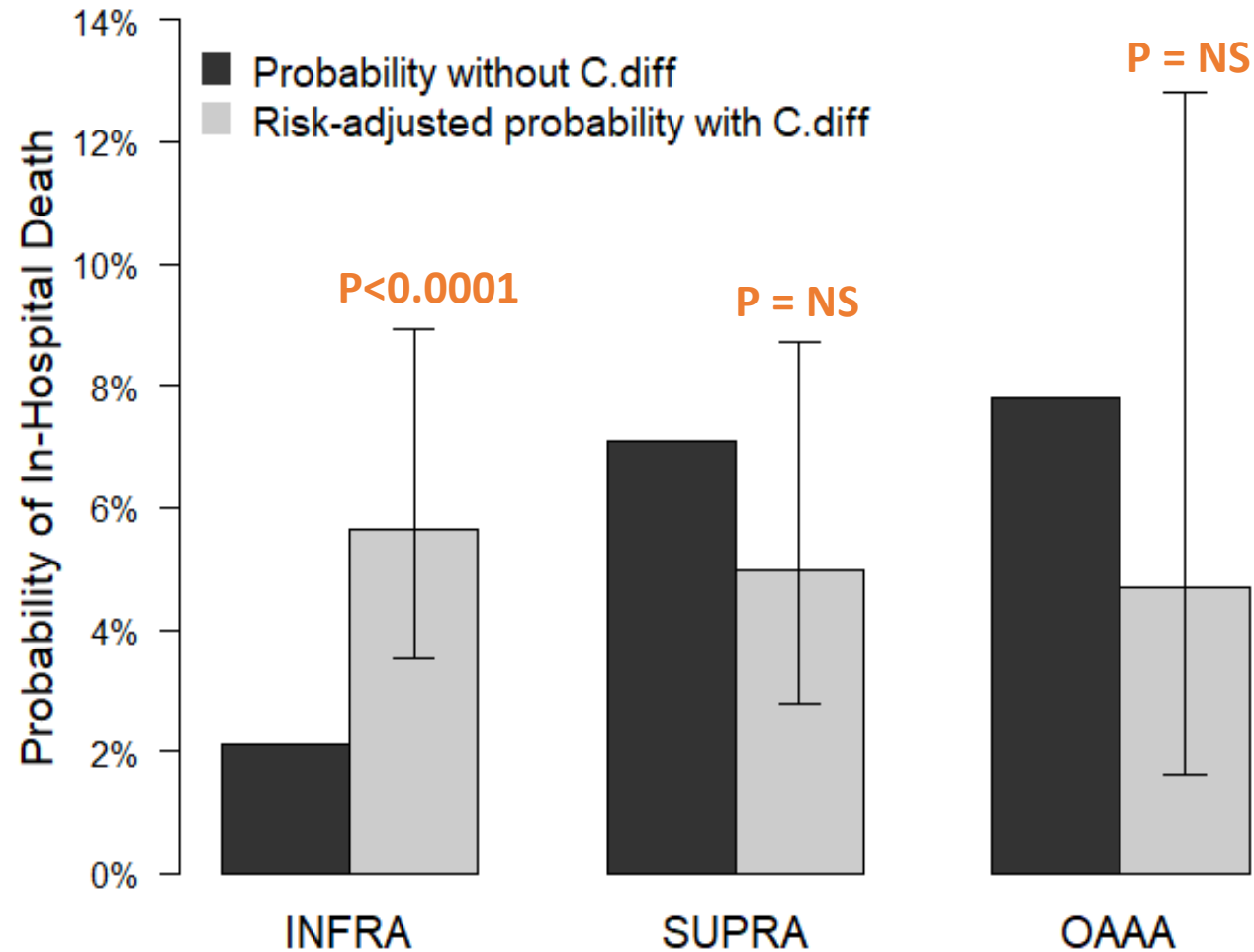
# Risk-adjusted Impact of *Cdiff* on Total Cost



**P<0.0001 for all procedures**

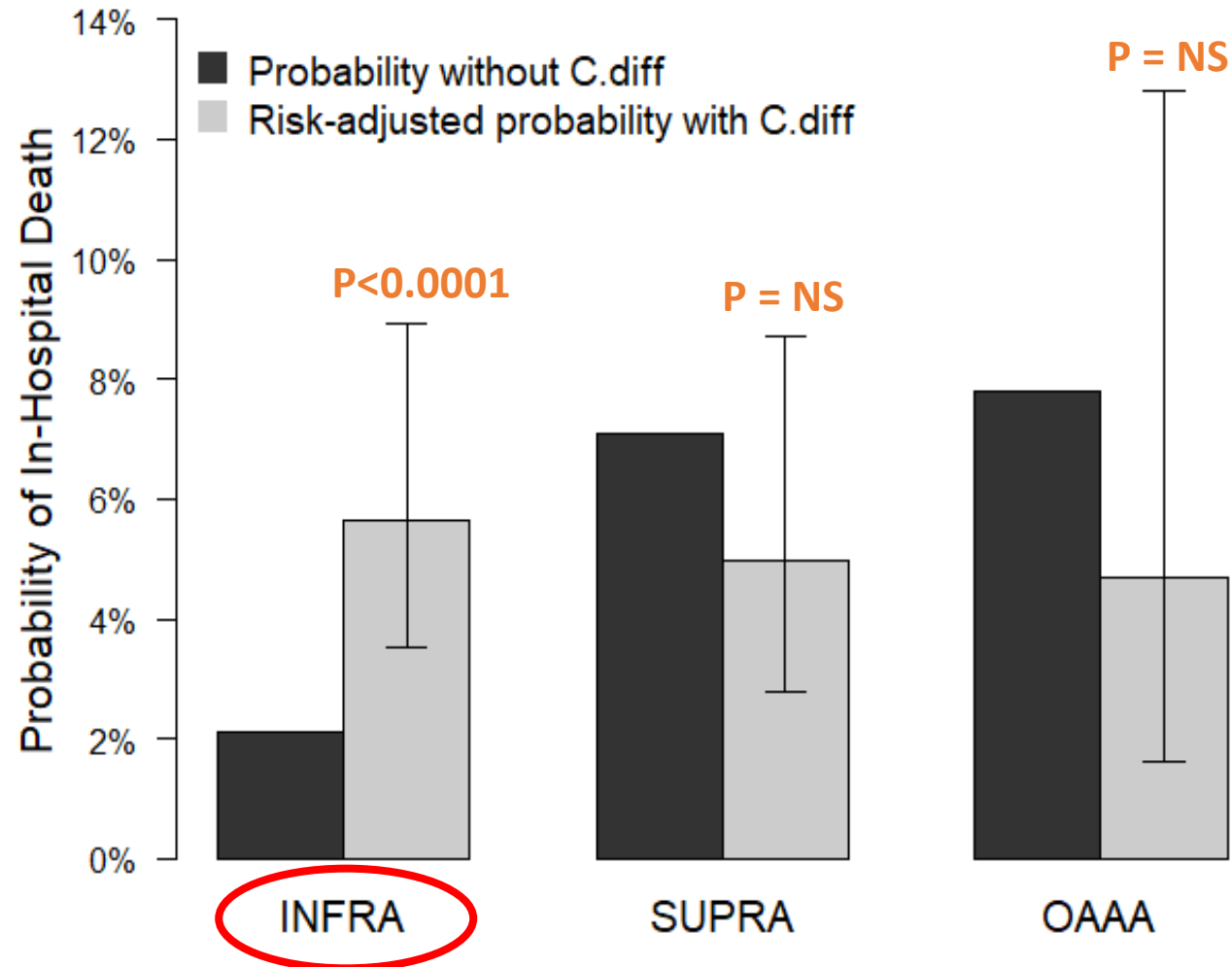


# Risk-adjusted Impact of *Cdiff* on In-hospital Mortality





# Risk-adjusted Impact of *Cdiff* on In-hospital Mortality



# Limitations

- Retrospective, observational analysis with selection and ascertainment bias
- Granularity surrounding clinical presentation and operative details is limited due to use of claims data
- Analysis only performed on in-hospital events so unable to comment on longer term outcomes

# Conclusions

- Post-operative *Cdiff* infection after major vascular surgery was associated with >50% increase in both median LoS and total cost
- *Cdiff* infection is associated with increased in-hospital mortality after infra-inguinal bypass but not open AAA and supra-inguinal bypass
- Hospital-led efforts to mitigate risk of post-operative *Cdiff* in vascular surgery are a justifiable priority given the impact on resource utilization and outcomes

# Thank You

