Impact of Antibiotic Stewardship Rounds in the Intensive Care Setting: a prospective cluster-randomized crossover study

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Background

Study	Setting	Intervention	Outcomes
Morris 2019[1]	4 academic ICUs in Toronto	Antibiotic stewardship (ASP) rounds with physicians and pharmacists 3 to 5 times per week supplemented with unit-based performance reports	Antibacterial use (AU) decreased from 120.90 to 110.50 defined daily dose/100 patient days (intervention effect –12.12 defined daily dose/100 patient-days; 95% CI, –16.75 to –7.49; $p < 0.001$)
Elligsen 2012[2]	3 ICUs in tertiary care center	Audit and feedback on 3rd or 10th day of broad-spectrum antibiotics	Mean monthly broad-spectrum AU decreased from 644 days of therapy (DOT)/1000 patient days to 503 DOT/100 patient days (P< 0.0001)
Rimawi 2013[3]	1 ICU in tertiary care center	ASP rounds with ICU intensivist, pharmacist, and fellow Monday to Friday	Significant decrease in DOT pre-intervention vs. post-intervention for Vancomycin (p= 0.004), extended-spectrum penicillin (p= 0.008), carbapenem (p= 0.0013), metronidazole (p= 0.0004), and penicillin (p= 0.0322)

1. Morris, A. M., et al (2019). *Critical care medicine*
2. Elligsen, M. et al (2012). *Infection Control & Hospital Epidemiology*
3. Rimawi, R. H. et al (2013). *Critical care medicine*

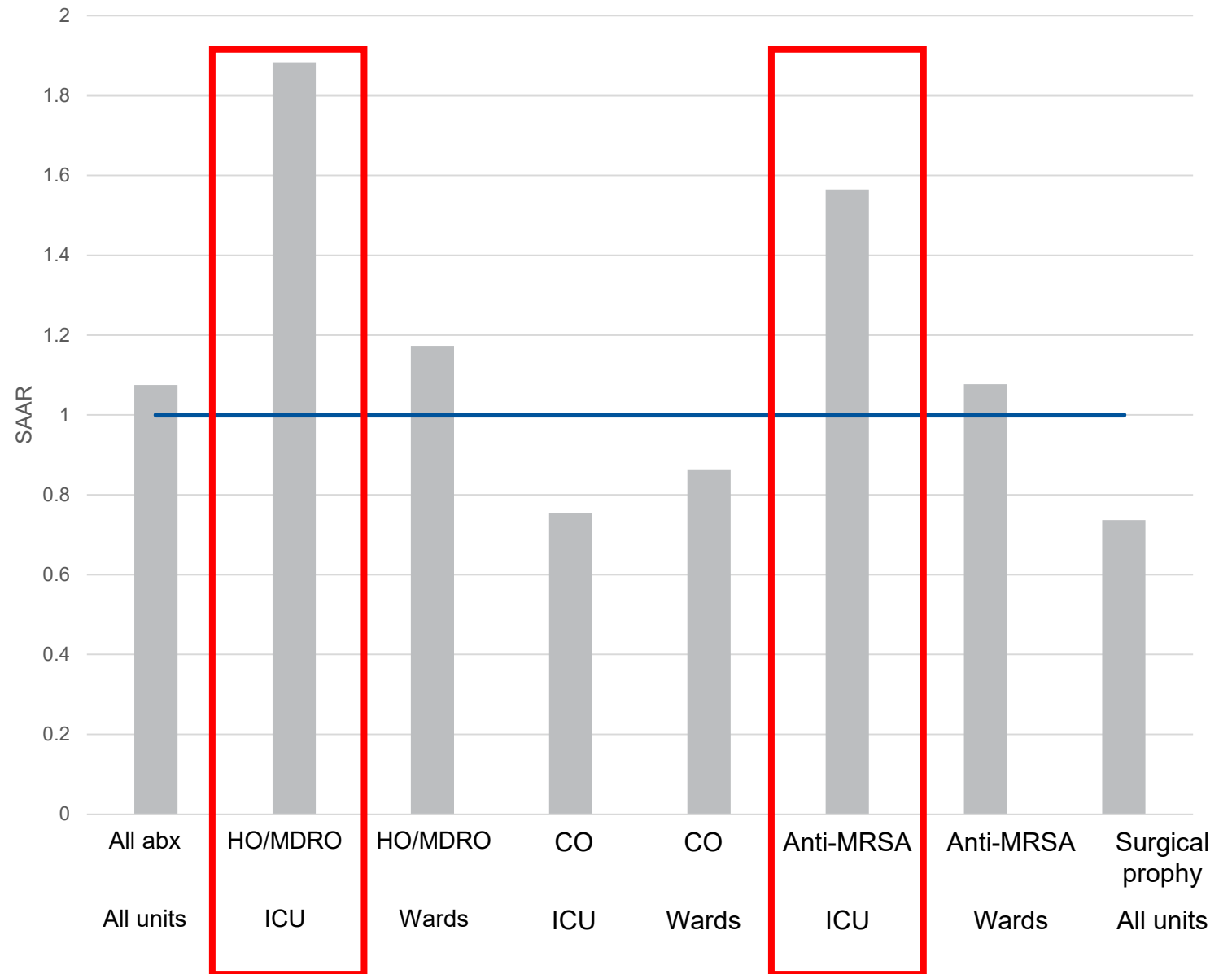**Duke Center for Antimicrobial Stewardship and Infection Prevention**

Purpose

Impact of weekly ASP rounds on antibiotic days of therapy and length of stay
      Unit-level

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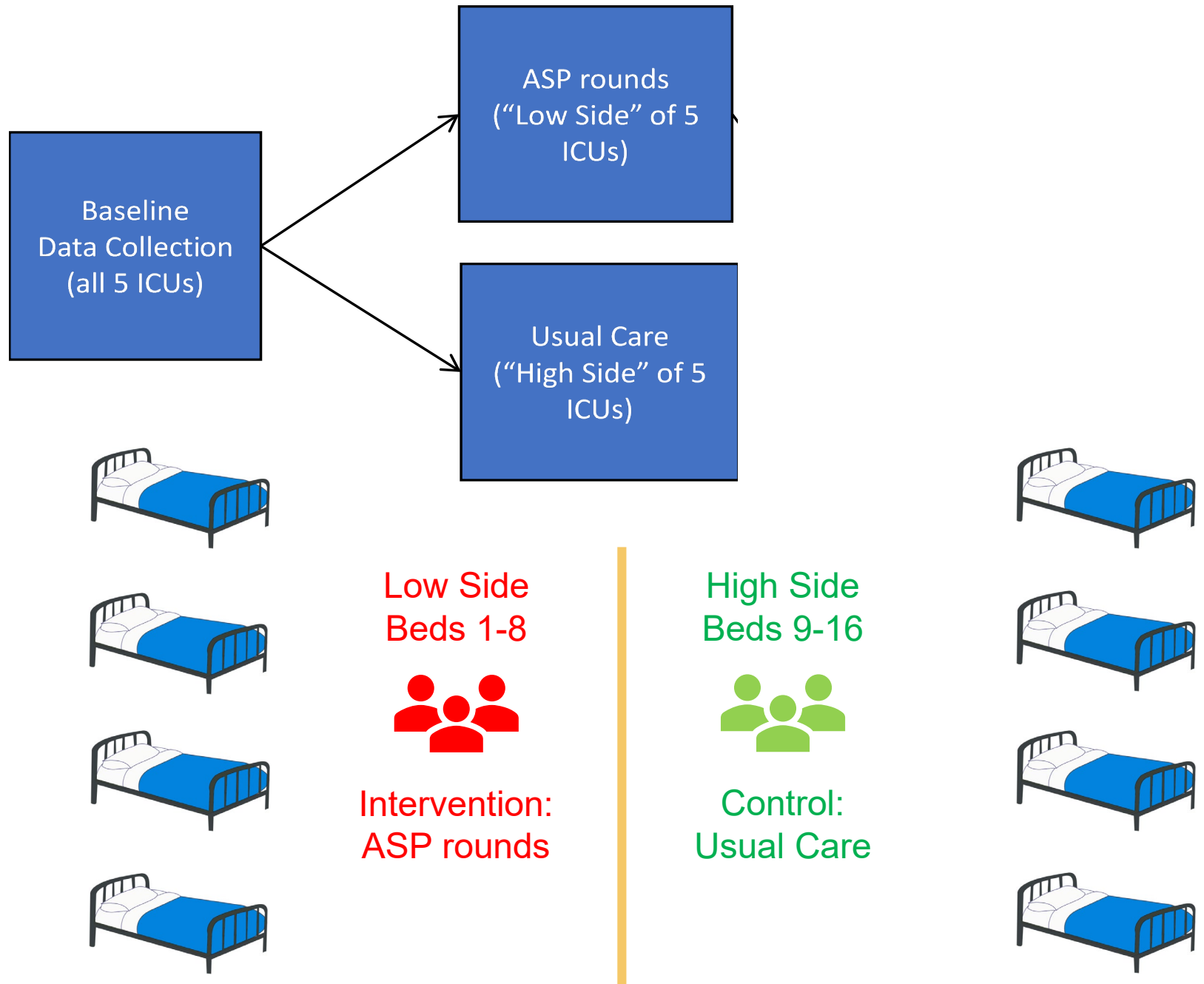

DUH Facility-wide SAARs 2016

Intervention

Weekly ASP Rounds

+

Usual post-prescription reviews

ID MD and ID pharmacist reviews eligible ICU patients

→

ID ASP team rounds with ICU team on selected patients

→

1 week later, eligible patients reviewed to see if recommendations were followed

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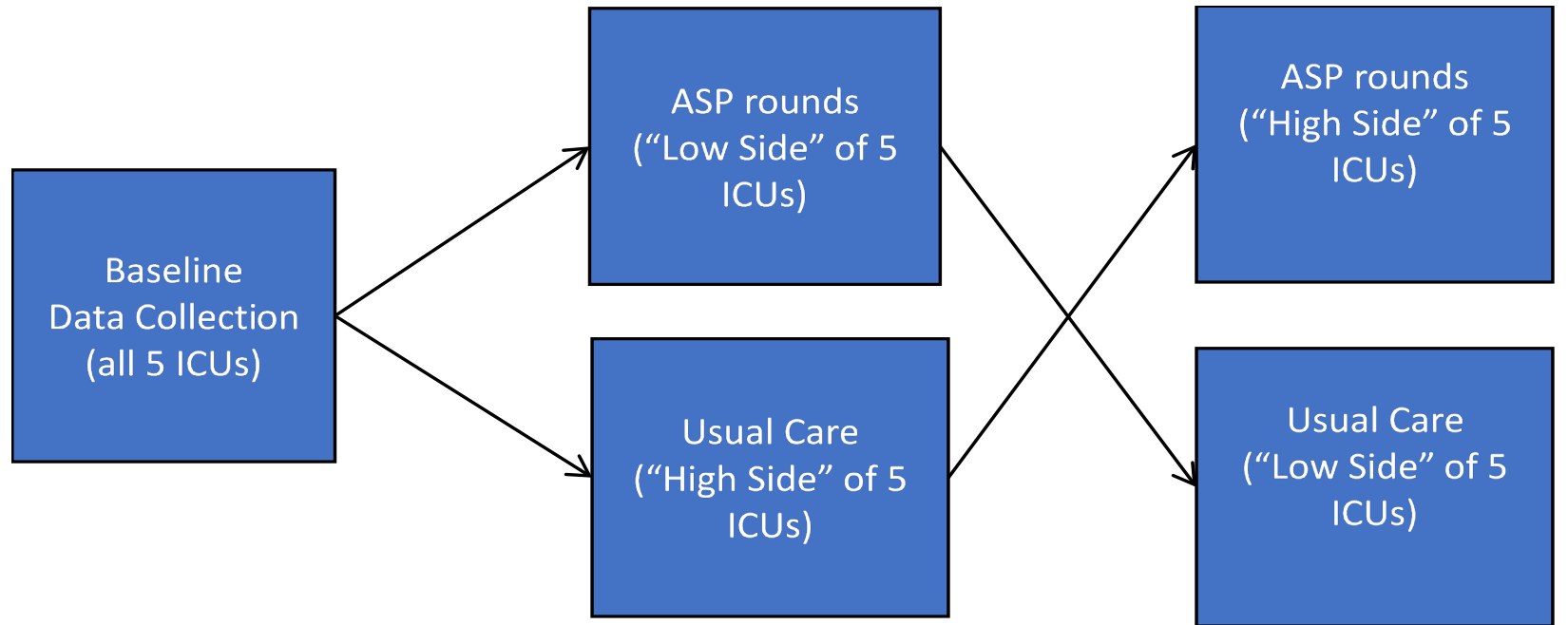and Infection Prevention**

Methods

- Two-arm, cluster-randomized, crossover quality improvement study

- 8-month period to compare the impact of weekly ICU rounds with the ASP team versus usual care

- "Half-unit"= high or low side

Baseline
Data Collection
(all 5 ICUs)

ASP rounds
("Low Side" of 5 ICUs)

Usual Care
("High Side" of 5 ICUs)

Low Side
Beds 1-8

Intervention:
ASP rounds

High Side
Beds 9-16

Control:
Usual Care

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Methods

- Two-arm, cluster-randomized, crossover quality improvement study

- 8-month period to compare the impact of weekly ICU rounds with the ASP team versus usual care

- "Half-unit"= high or low side

- "Order" = whether the half unit went through intervention in the first time period

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Usual Care
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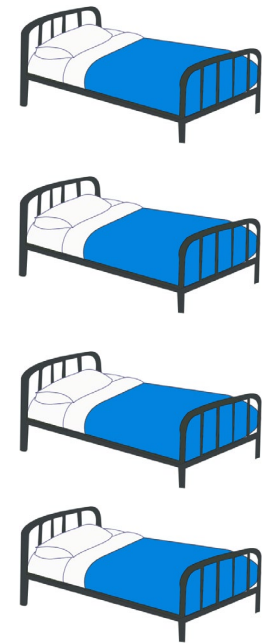("Low Side" of 5 ICUs)
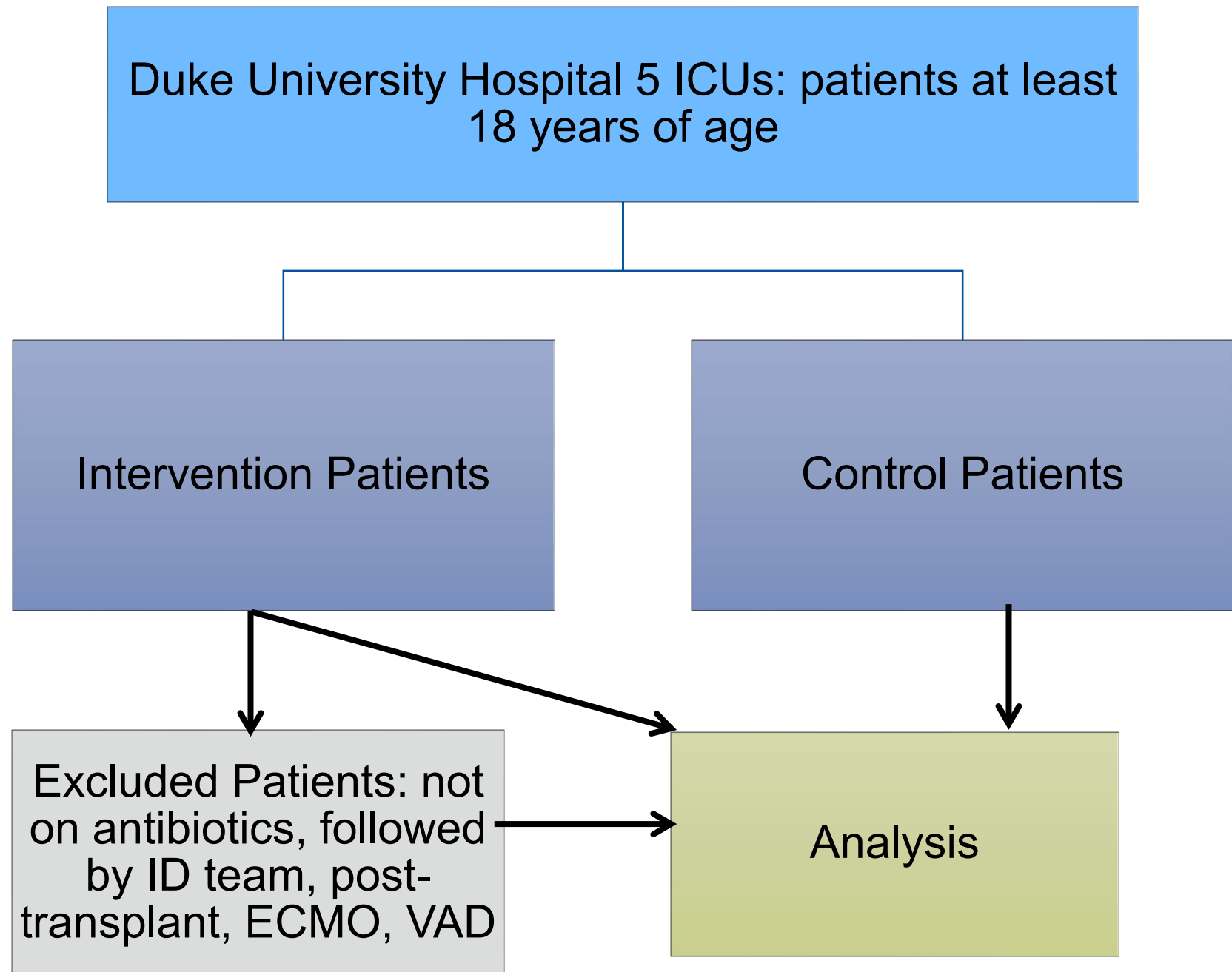
Low Side
Beds 1-8

Control:
usual care

High Side
Beds 9-16

Intervention:
ASP rounds

6

Methods

- Inclusion and Exclusion Criteria for ASP rounds

- Patients could be reviewed multiple times

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Duke University Hospital 5 ICUs: patients at least 18 years of age

Intervention Patients

Control Patients

Excluded Patients: not on antibiotics, followed by ID team, post-transplant, ECMO, VAD

Analysis

Methods

- Model: multivariable negative binomial regression

- Antibiotic use over before, during and after the study

Primary Exposure	Adjusted For	Primary Outcome
• ASP rounds	• Order • Half unit	• AU (days)/ 1000 days present during ICU stay and following transfer

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Results

4,683 ICU-exposed patients

ICU type	Unique Patients N	RR (95% CI)	Excluded from weekly rounds (no antibiotics) N (%)	Excluded from weekly rounds (other) N(%)
Surgical	992	0.87 (0.81-0.94)	254 (37.9)	202 (30.0)
Cardiac	1037	0.91 (0.86-0.97)	553 (53.3)	138 (13.3)
Medical	686	0.94 (0.92-0.96)	192 (28.0)	165 (24.1)
Neurologic	1047	1.05 (0.93-1.18)	553 (52.8)	89 (8.5)
Cardiothoracic	921	1.11 (1.04-1.19)	243 (26.4)	566 (61.5)
Total	4683	0.97 (0.91-1.04)	1795 (38.3)	1160 (24.8)

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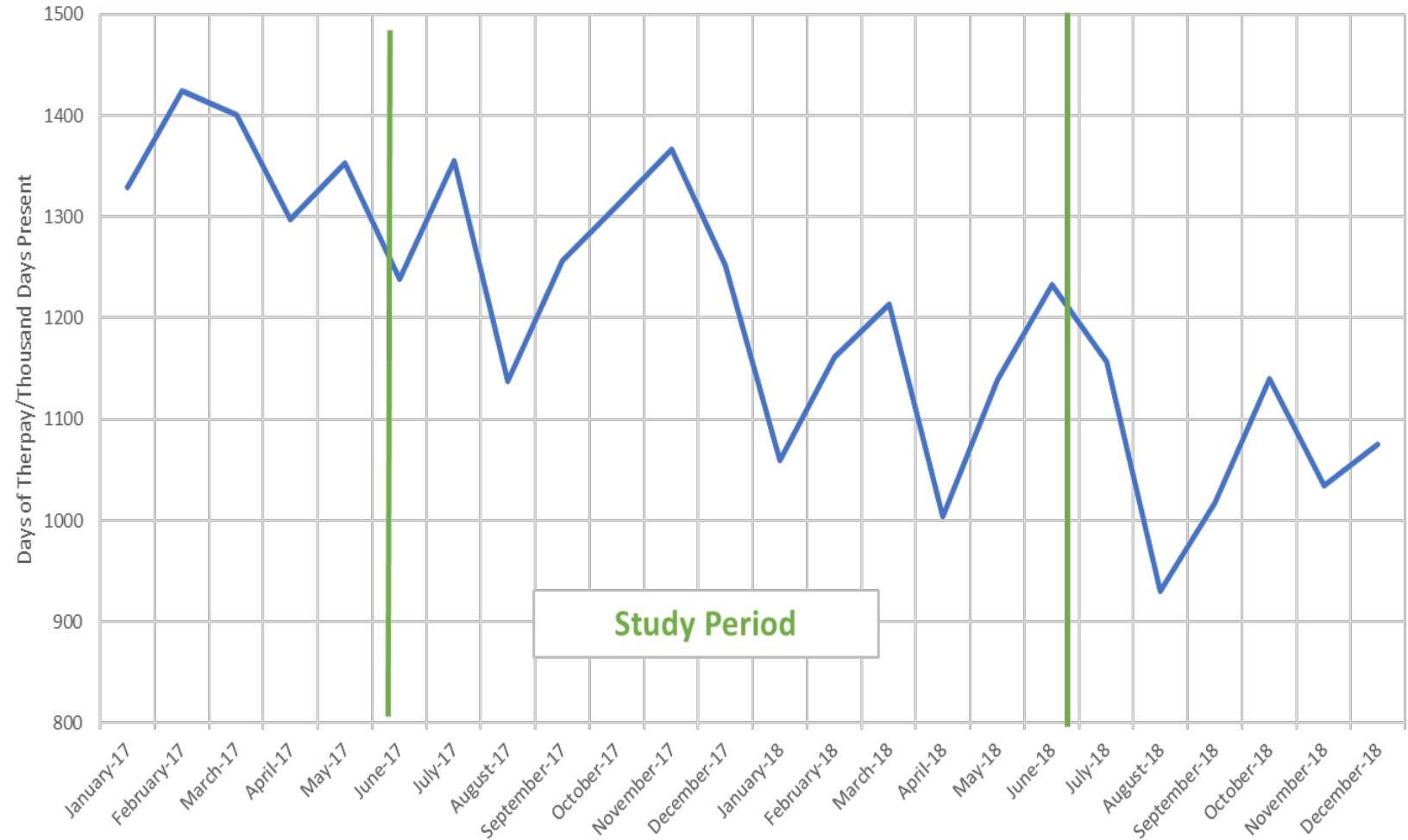# Results

4,683 ICU-exposed patients

3,762 ICU-exposed patients

ICU type	Unique Patients N	RR (95% CI)	Excluded from weekly rounds (no antibiotics) N (%)	Excluded from weekly rounds (other) N(%)
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All	4683	0.97 (0.91-1.04)	1795 (38.3)	1160 (24.8)
All except Cardiothoracic	3762	0.93 (0.89-0.98)	1552 (41.3)	594 (15.8)

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Results

Unit-level antibiotic use before, during and after the study

Antibiotic Use for All Units from 1/2017 to 12/2018

% change in AU over 2 years: -29

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Results

Antibiotic Use by Unit from 1/2017 to 12/2018
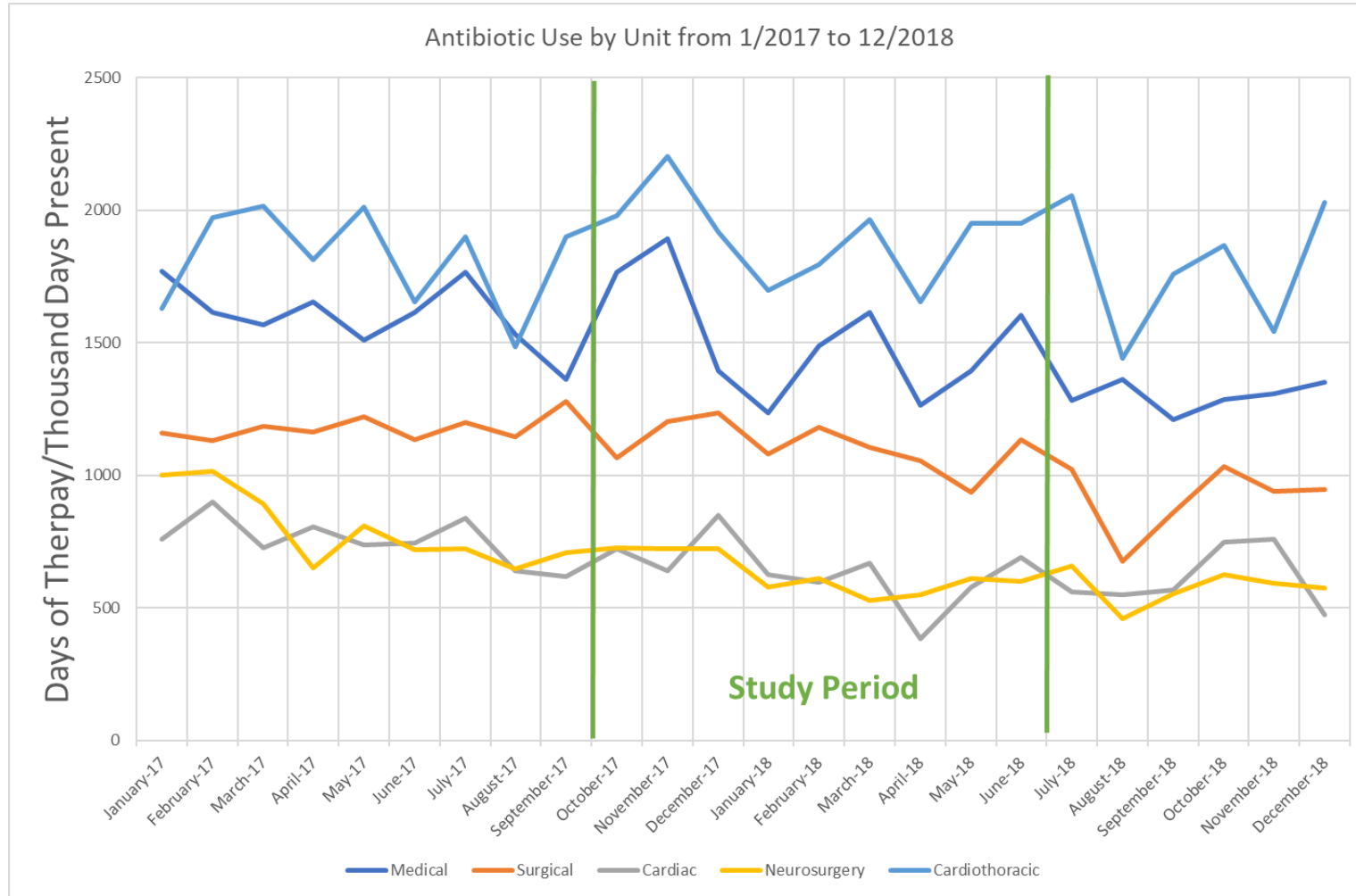
Unit	% Change AU over 2 years
Surgical	-18
Medical	-37
Cardiac	-24
Neuro	-43
Cardiothoracic	+25

Limitations

- Analysis addressed whole ICU population (i.e. included excluded patients)
  - Ineligible patients
  - Exposures after ICU stay
  - Lack of blinding
  - Contamination of intervention and control arms
- Sustainability due to resource-intensive intervention
- Generalizability

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Conclusions

- Effect size < 10% decline in AU
- Impact varied across units
- Difficult population
- Validated findings from prior studies

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Lessons Learned

- Unique culture of ICUs
- Difficult to coordinate timing of rounds
- Labor-intensive process
- Many antibiotics used as part of order sets/algorithms
- Transplant patients

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Next Steps

- Increased frequency of rounds in ICUs whose culture is more receptive to ASP rounds

- Pharmacist vs. physician roles

- Integration of ICU pharmacists

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Thank you

- Rebekah Wrenn
- Christina Sarubbi
- Nicholas Turner
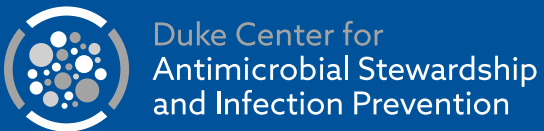- Deverick Anderson
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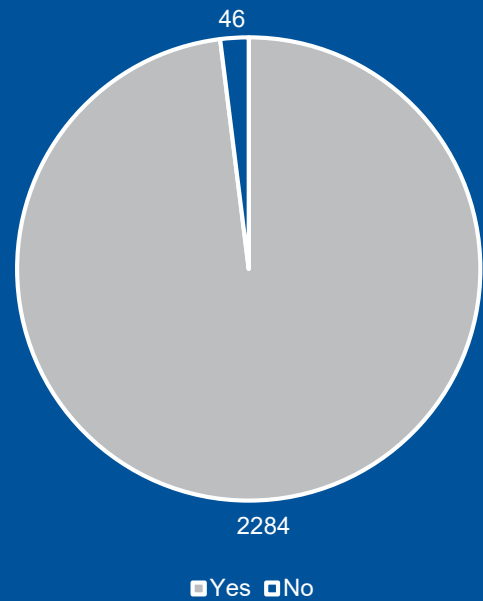**Antimicrobial Stewardship
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Questions

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Extra Slides

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Secondary Outcomes

	Control N= 2353	Intervention N= 2330	x^2-test
Post-ICU CDIFF (N)	24	23	0.91
Mortality (N)	266	297	0.14

Recommendations made by ASP

Recommendations Made by ASP Team

Pie chart: Yes 46, No 2284

Legend: ■Yes ■No

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Antibiotic Recommendations Followed by Day 7 Stratified by Recommendation

Recommendation	Yes	No
Antibiotic Recommendation	1083	354
ID consult	33	33
Catheter Removal	36	8
Additional Microbiology Studies	60	60
Procedure Intervention	12	8
Additional Imaging	10	10

Legend: ■Yes ■No

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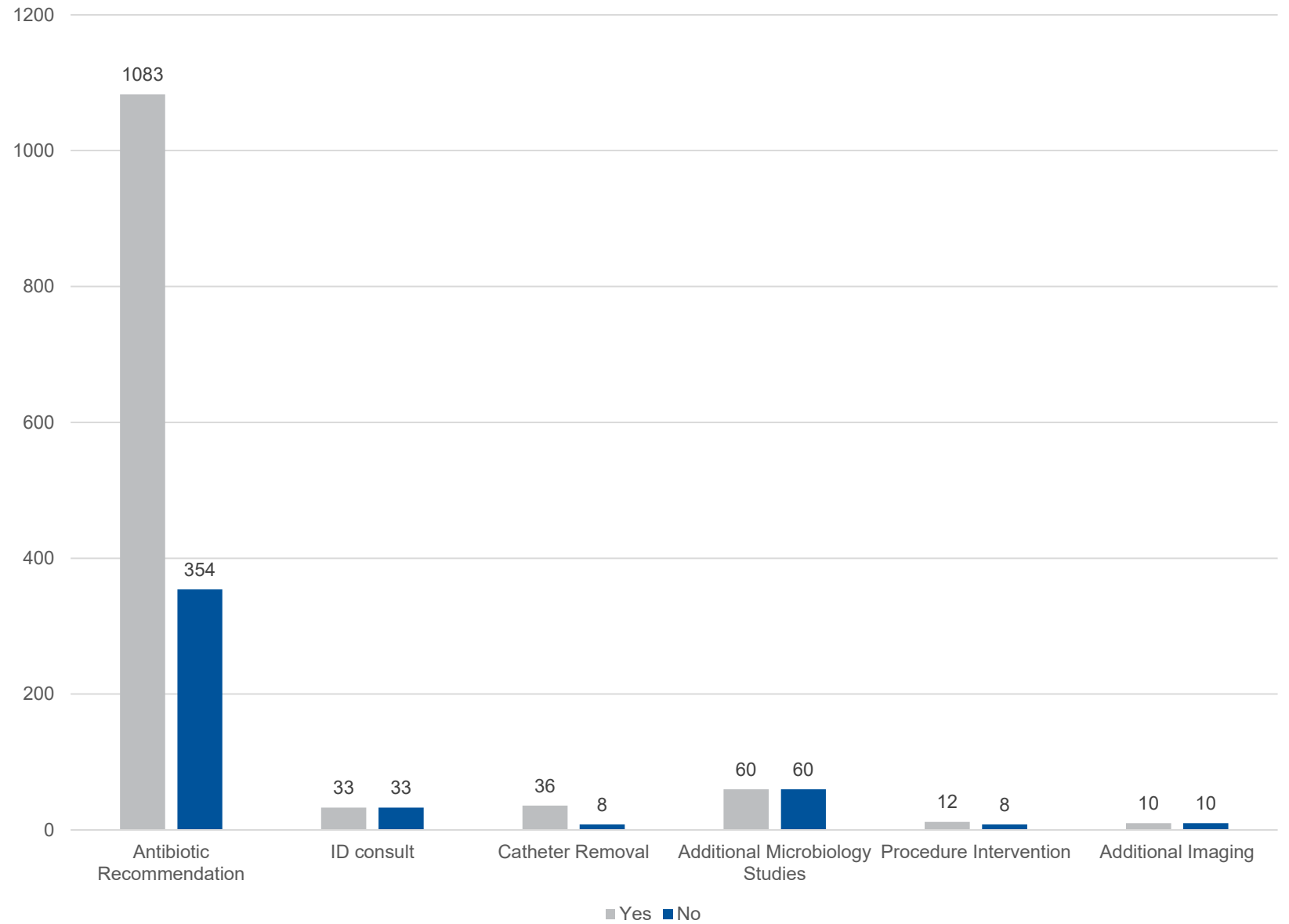
Secondary Outcomes

	Control N= 2353	Intervention N= 2330
ICU-DOT (mean, STD)	6.20, 13.24	6.27, 14.16
DOT (mean, STD)	16.39, 42.56	16.49, 44.97
Length of Stay (LOS)		
Total LOS (ICU + post ICU) (mean, STD)	15.02, 14.28	14.90, 19.72
ICU LOS (mean, STD)	6.61, 10.48	6.51, 10.30
ICU Readmission (y/n)		
Yes	62	60
No	2291	2270