

Pre-post implementation impact assessment of a PCR blood culture identification panel on ASP outcomes

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Disclosures

Corrie Black has no conflicts of interest or funding to disclose

This research is subject to different interpretation and is being presented solely for educational purposes

Learning Objectives

By the end of this session, listeners should be able to:

Compare and contrast the benefits and limitations of using rapid molecular diagnostic tools, such as the blood culture identification (BCID) panel

List pathogens that the BCID is most useful for in terms antibiotic and diagnostic stewardship

Providence Alaska Medical Center (PAMC)



Tertiary, non-profit,
community medical center

- Anchorage, Alaska
- 401 beds
- Antimicrobial stewardship program
 - Full time ID pharmacist
 - 40 hours weekly

Pre-test Assessment Questions

1. What clinical outcomes have been demonstrated using rapid molecular diagnostics and the BCID panel at PAMC?
 - a. Reduced mortality
 - b. Reduced time to culture identification and susceptibility results
 - c. Reduced time to definitive therapy
 - d. Reduced use of broad-spectrum antibiotics in contaminants
2. What limitations should be considered when implementing, managing, or interpreting rapid molecular diagnostics?
 - a. Local antibiogram
 - b. Cost
 - c. Turn around time
 - d. All the above
3. At PAMC, the BCID result prompted
 - a. No change in empiric antibiotics most the time
 - b. De-escalation only in infections caused by yeast
 - c. De-escalation of antibiotics about half the time
 - d. Escalation of antibiotics about half the time

Antimicrobial Stewardship Program



Rapid Diagnostic Testing



Improved Outcomes?

- **Focus on timely and appropriate:**
- Infection diagnosis
- Antibiotic selection and dose
- De-escalation
- Duration of therapy

- Highly sensitive and specific
- Rapidly identifies molecular markers
- Cautious interpretation is necessary

- Reduced time to organism identification
- Impact dependent upon interpretation and action
- Optimal utility still unknown

Blood Culture Identification (BCID)

- Implemented June 2019
 - Polymerase Chain Reaction (PCR)
- Automatic reflex test when blood cultures result positive
- Panel able to identify:
 - 21 specific pathogens
 - 3 resistance genes

Gram-Positive	Enterococcus L. monocytogenes Staphylococcus spp. Staphylococcus aureus Streptococcus spp. Streptococcus agalactiae Streptococcus pneumoniae Streptococcus pyogenes
Gram-Negative	Acinetobacter baumannii Haemophilus influenzae Neisseria meningitidis Pseudomonas aeruginosa Enterobacteriaceae Enterobacter cloacae complex Escherichia coli Klebsiella oxytoca Klebsiella pneumoniae Proteus spp. Serratia marcescens
Yeast	Candida glabrata Candida krusei Candida parapsilosis Candida tropicalis
Antimicrobial Resistance Genes	MecA – Methicillin resistance VanA/B – Vancomycin resistance KPC – Carbapenem resistance

Study Design

Pre-Post Cohort Retrospective Study

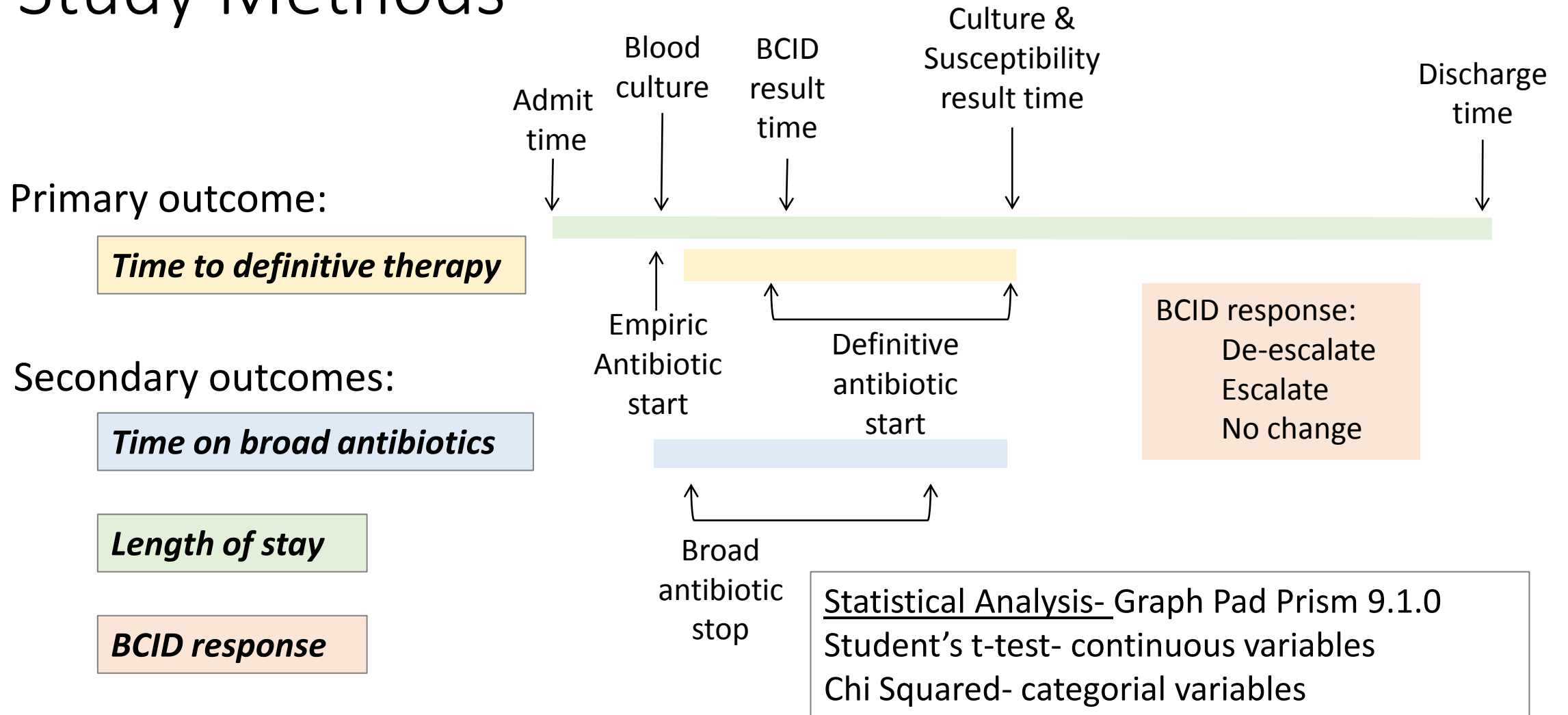
Inclusion:

- Hospital admission
 - 2018: pre-BCID
 - 2020: post-BCID
- Positive blood culture

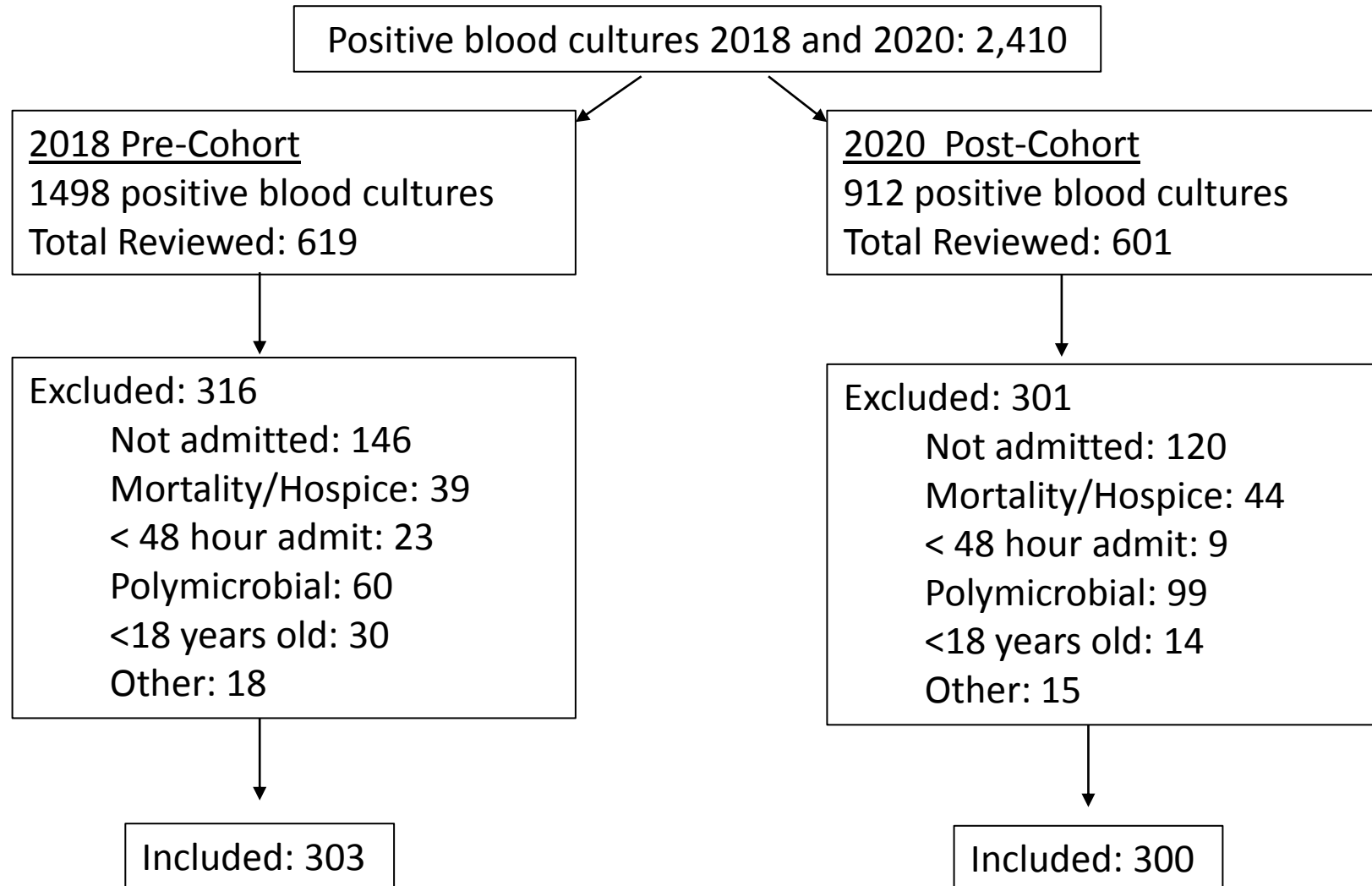
Exclusion:

- <18 years old or pregnant
- Received antibiotics prior to blood culture collection
- <48-hour admission, discharge before cultures finalized, not admitted
- Hospice prior or during admission, mortality within 5 days of admit
- Polymicrobial infection

Study Methods



Study Population



Baseline Characteristics

Morphology	2018	%	2020	%
Total	303	100.0%	300	100.0%
GNR	76	25.1%	83	27.7%
GPC	209	69.0%	214	71.3%
GPB	16	5.3%	0	0.0%
Yeast	2	0.7%	3	1.0%
Other totals				
GNR, not MDR	69	91.6%	73	88.0%
GPC, not MRSA	186	89.0%	191	89.4%
PA Coverage	131	43.2%	106	35.3%
MRSA Coverage	195	64.4%	227	75.7%

Abbreviations:

GNR- gram negative rods

GPC- gram positive cocci

GPB- gram positive bacilli

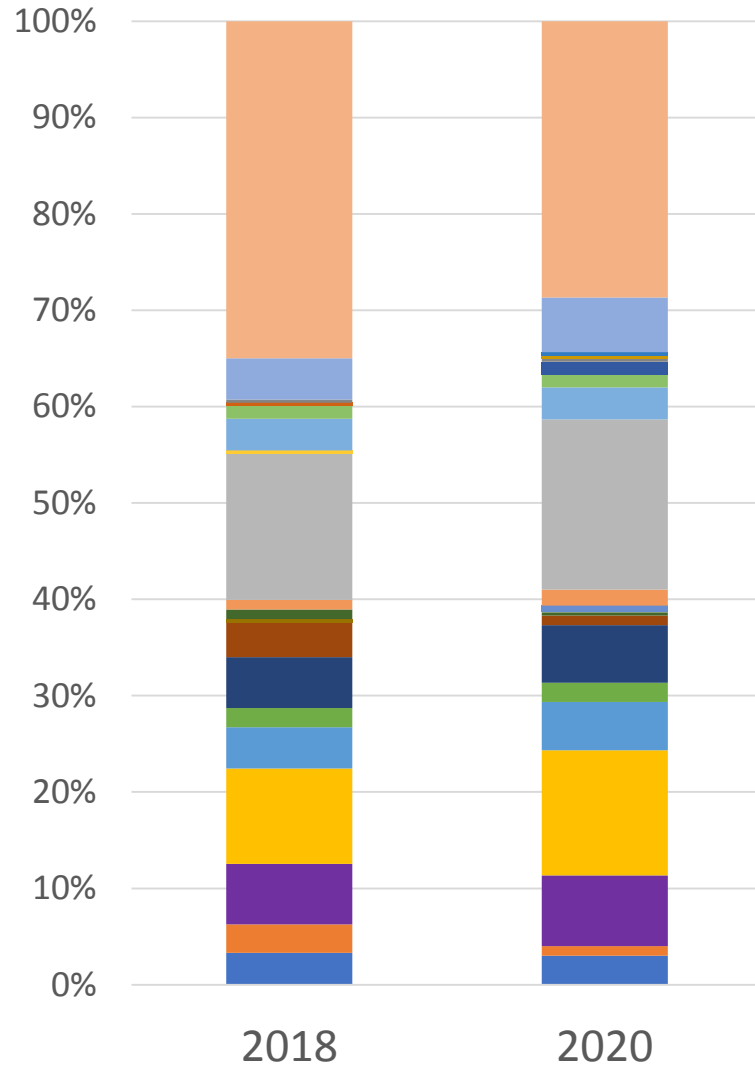
MDR- Multi-drug resistant (specifically pseudomonas or AmpC bug)

MRSA- Methicillin Resistant Staphylococcus Aureus

PA- *P. aeruginosa*

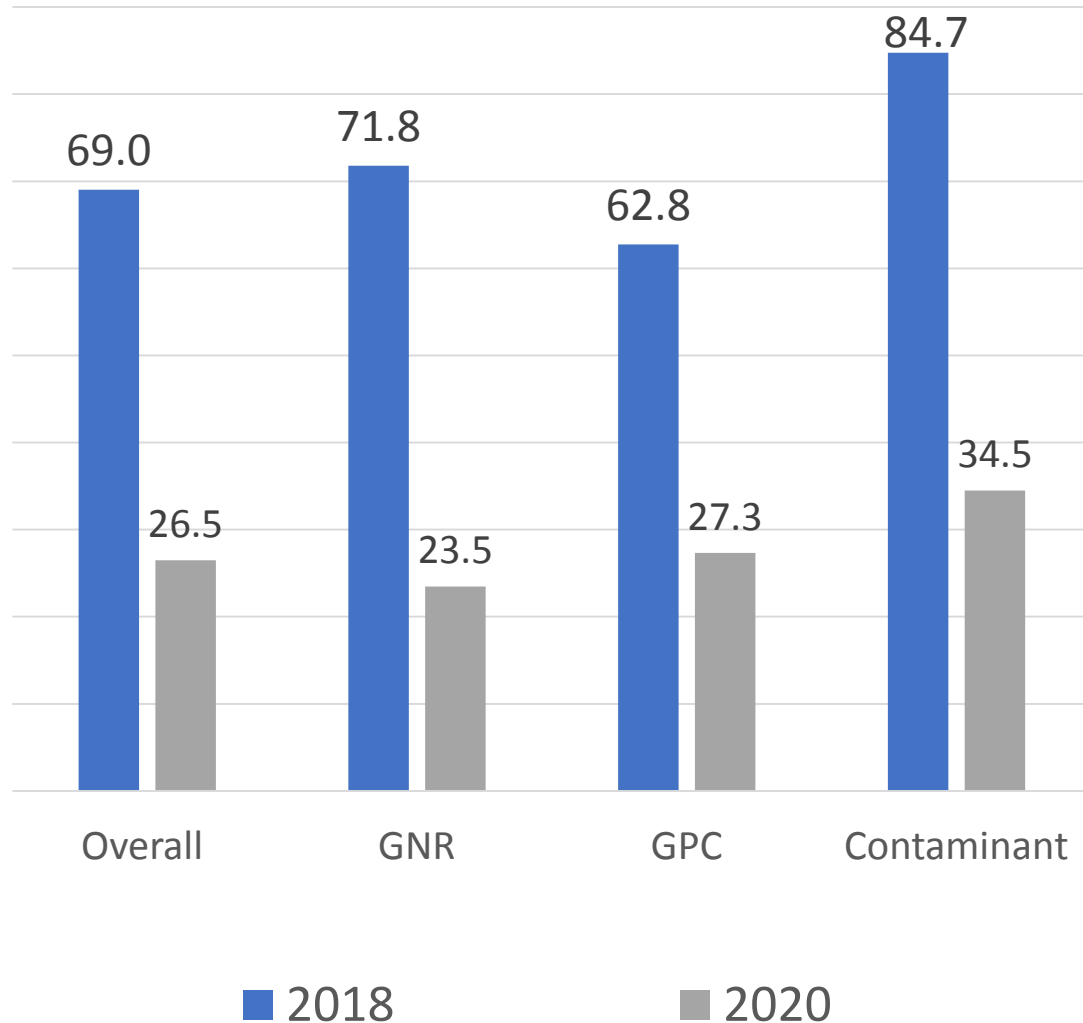
	2018	%	2020	%
Average age	62.0		59.9	
Gender, male	154	51%	129	43%
BMI category				
<20	17	6%	17	6%
20-24	77	25%	61	20%
25-29	79	26%	64	21%
30-34	53	17%	46	15%
35-39	33	11%	28	9%
40-49	28	9%	18	6%
>50	14	5%	8	3%
Suspected Source				
Central line infection	8	3%	5	2%
Diabetic foot infection	2	1%	4	1%
Intra-abdominal infection	33	11%	29	10%
Infectious endocarditis	14	5%	15	5%
Osteomyelitis	11	4%	15	5%
Pneumonia	63	21%	42	14%
Skin/Soft tissue	60	20%	41	14%
Unknown	51	17%	42	14%
Urinary tract infection	59	19%	49	16%
ID consult	107	35%	90	30%
Admitting unit: Critical Care Unit	82	27%	61	11 20%

Included Organisms

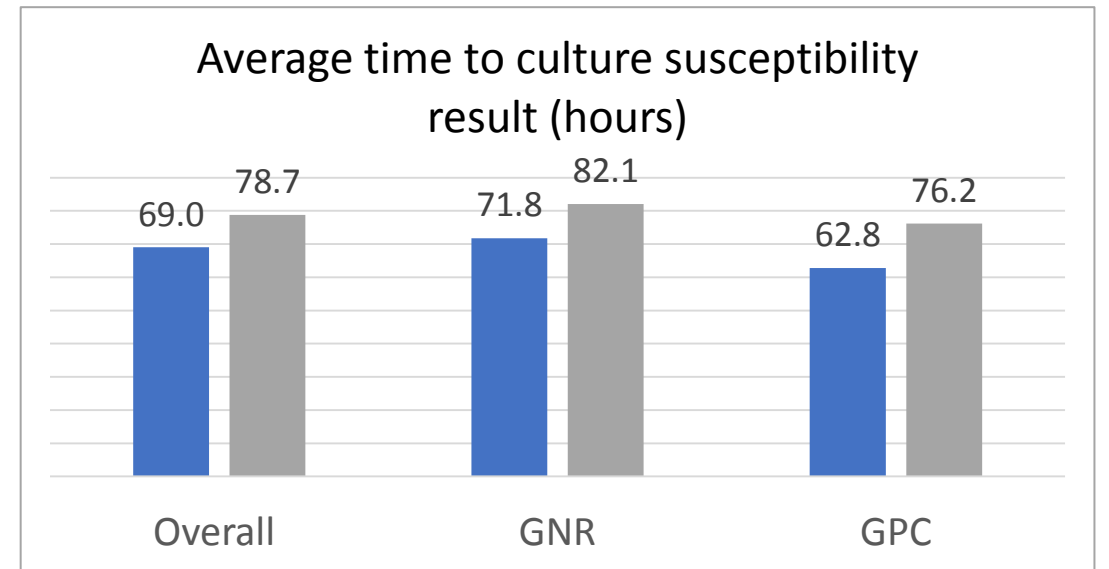


	2018	2020
Contaminant	106	86
Other	13	17
Candida tropicalis	0	0
Candida parapsilosis	0	1
Candida krusei	0	1
Candida glabrata	1	1
Candida albicans	1	0
Serratia marcescens	0	4
Proteus spp	4	4
Klebsiella pneumoniae	10	10
Klebsiella oxytoca	1	0
Escherichia coli	46	53
Enterobacter cloacae complex	3	5
Enterobacteriaceae	0	2
Pseudomonas aeruginosa	3	1
Neisseria meningitidis	0	0
Haemophilus influenzae	1	0
Acinetobacter baumannii	0	0
GAS	11	3
Streptococcus pneumoniae	16	18
GBS	6	6
Streptococcus spp	13	15
MSSA	30	39
MRSA	19	22
CoNS	9	3
Enterococcus spp	10	9

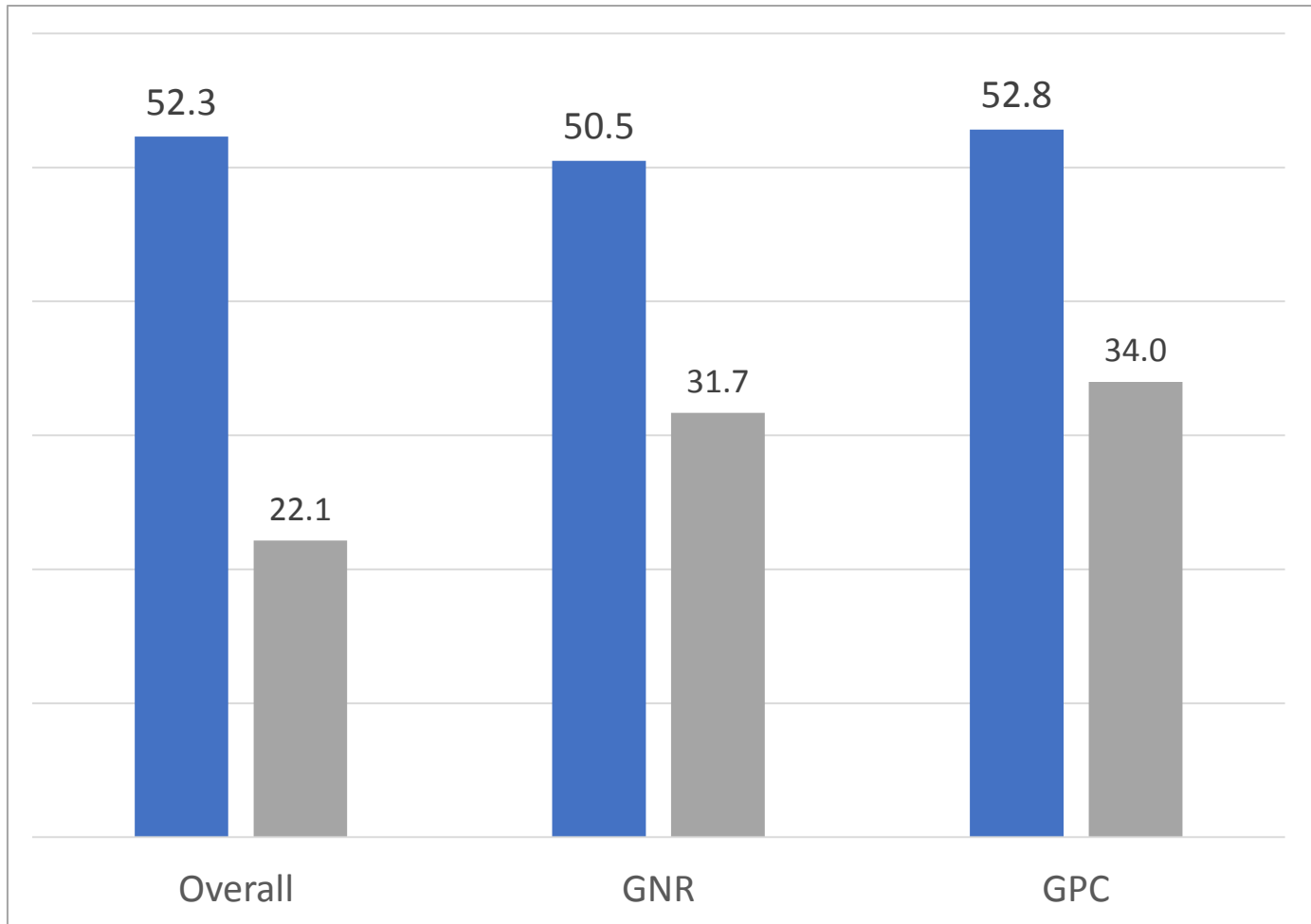
Average Time to Organism Identification (hours)



	p value	difference	95%CI
Overall	<0.0001	-42.53	-47.24 to -37.82
GNR	<0.0001	-48.30	-56.17 to -40.43
GPC	<0.0001	-35.44	-39.58 to -31.30
Contaminant	<0.0001	-50.26	-60.01 to -40.50



Average Time to Definitive Therapy (hours)

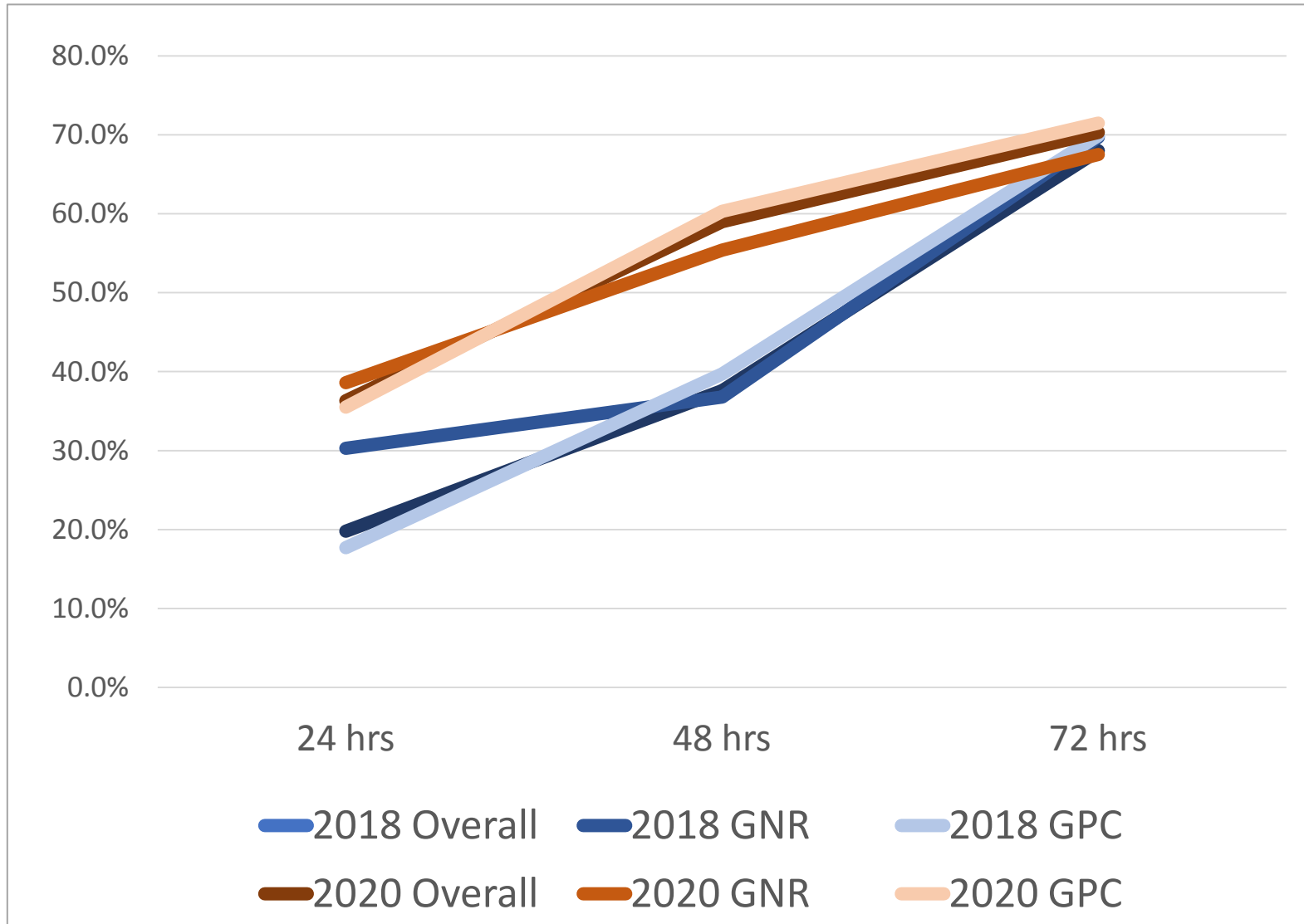


	p value	difference	95%CI
Overall	<0.0001	-19.04	-25.15 to -12.92
GNR	0.0027	-18.81	-30.98 to -6.639
GPC	<0.0001	-18.85	-25.92 to -11.78

- 19-hour reduction in time to definitive therapy in 2020 (post-BCID)
- Similar difference seen between GNR and GPC
 - Narrower 95% CI for GPC

■ 2018 ■ 2020

Percentage on Definitive Therapy at 24/48/72 Hours



Overall:

24 hrs: OR 2.3 (95% CI 1.6 to 3.3)

48 hrs: OR 2.4 (95% CI 1.7 to 3.3)

72 hrs: OR 1.1 (95% CI 0.7 to 1.6)

GNR:

24 hrs: OR 1.4 (95% CI 0.7 to 2.7)

48 hrs: OR 2.1 (95% CI 1.1 to 4.1)

72 hrs: 0.9 (95% CI 0.47 to 1.7)

GPC:

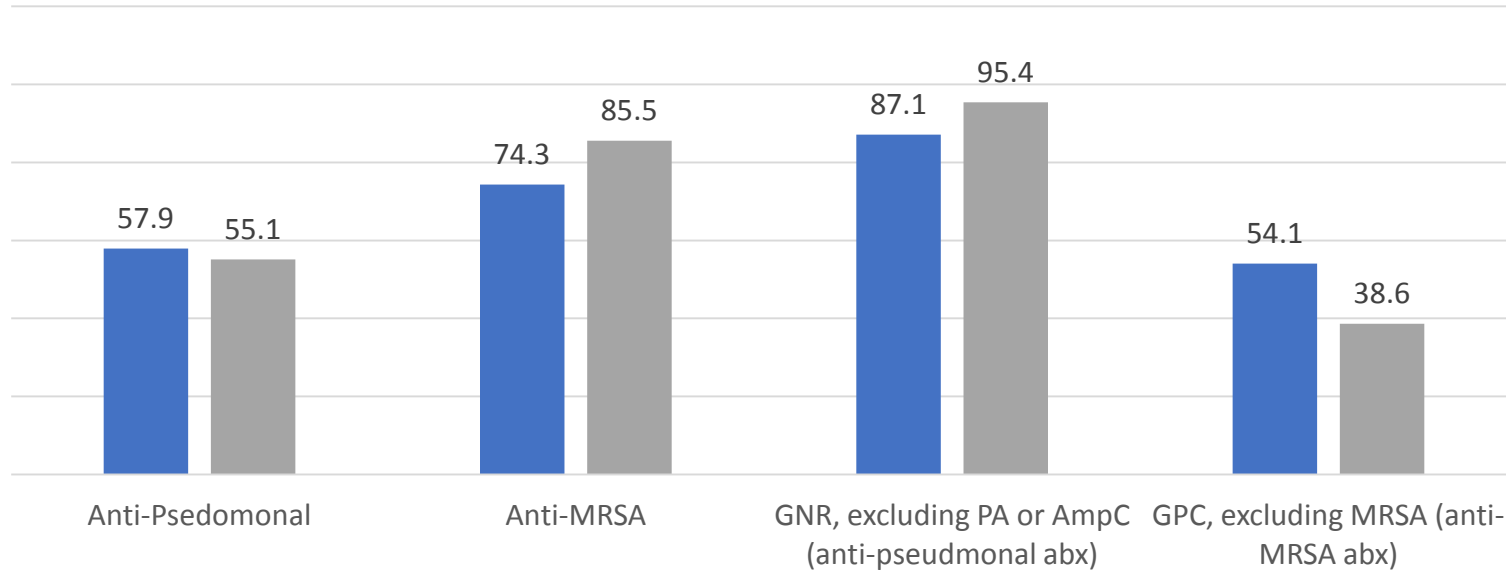
24 hrs: OR 2.6 (95% CI 1.6 to 4.0)

48 hrs: OR 2.3 (95% CI 1.6 to 3.4)

72 hrs: OR 1.1 (95% CI 0.7 to 1.6)

Secondary Outcomes ■ 2018 ■ 2020

Average duration of broad spectrum agents (hours)



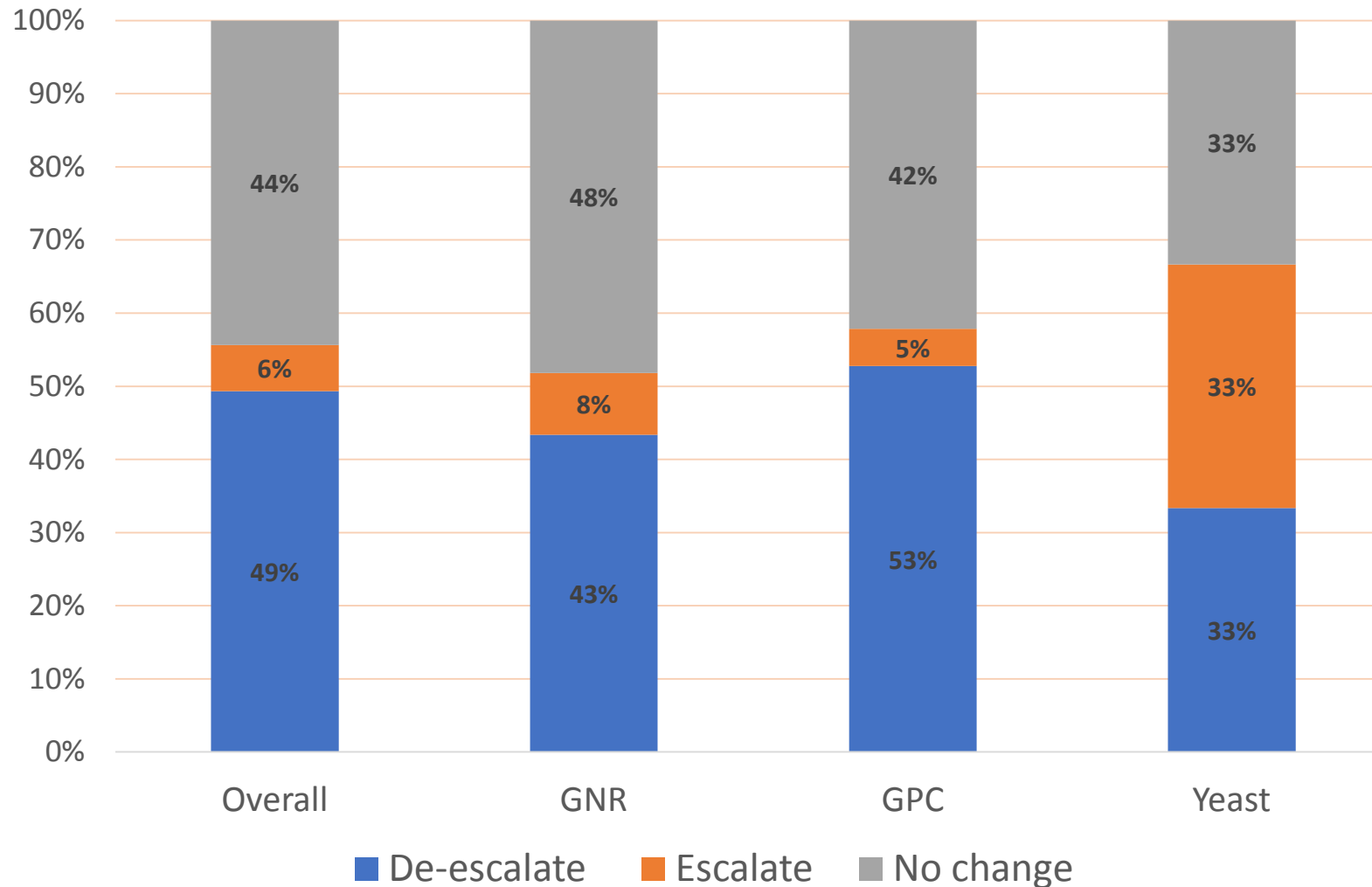
Broad Spectrum Abx	p value	difference	95%CI
Anti-Pseudomonal	0.7891	-2.389	-19.97 to 15.19
Anti-MRSA	0.691	-6.209	-36.89 to 24.47
Unnecessary use			
GNR, excluding PA or AmpC	0.7533	7.478	-39.78 to 54.73
GPC, excluding MRSA	0.0032	-15.76	-26.20 to -5.314

Length of stay (days)

	2018	2020	P value
Overall	9.8	11.2	0.269
GNR	8.0	8.3	0.878
GPC	10.8	12.3	0.305

- No difference in average anti-pseudomonal or anti-MRSA hours of therapy with BCID
 - Overall population
 - GNR (excluding MDR)
- In GPC (excluding MRSA), 15-hour reduction in anti-MRSA antibiotic use in 2020 (post-BCID)

Response to BCID Result



Discussion and Conclusions

BCID consistently demonstrated:

- Reduced time to organism identification
- Reduced time to definitive therapy
 - Greatest impact within the first 48 hrs
- Reduced unnecessary use of anti-MRSA antibiotics
- BCID result prompted de-escalation about half the time

Limitations:

- Number included within each morphology (GMR)

Future implications:

- Diagnostic stewardship decisions

Post-test Assessment Questions

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