

Impact of the Pandemic on Microbiology Laboratories and Antimicrobial Stewardship Diagnostics

Lisa L Steed, PhD, D(ABMM)

Director, Diagnostic Microbiology

May 21, 2021

Objectives

- Identify our responses to supply shortages affecting both specimen collection and culture-based and PCR-based testing and the changes in testing demand over time.
- Describe the effects on patient care of staffing issues created by repurposing staff to perform COVID-19 testing and self-quarantine due to exposure.
- Identify the continued impact of elevated blood culture contamination rates and increasing incidence of antibiotic-resistant organisms on patient care.

Disclosures

- Magnolia Medical Technologies: Speaker's Bureau

Medical University of South Carolina

- MUSC Health University Medical Center
 - Approx 800-bed tertiary/quaternary care hospital
 - 80,000 annual ED visits; Level 1 trauma center
 - Daily census 700 inpatients
 - Shawn Jenkins Children's Hospital and Pearl Tourville Women's Pavilion
 - National Cancer Institute designation for Hollings Cancer Center
 - Heart & Vascular Center
 - Joint Commission Certified Comprehensive Stroke Center
- ANCC Magnet Recognition Program®

Medical University of South Carolina

- Regional Health Network:
 - MUSC Health Florence Medical Center
 - MUSC Health Lancaster Medical Center
 - MUSC Health Marion Medical Center
 - MUSC Health Chester Medical Center

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Focus on COVID-19



COVID-19 PCR testing capability

7/8/20

Lab Platform	Go-live Date	Current daily capacity
Abbott m2000 (3)	3.23.2020	1034
Abbott Alinity m (1)	6.12.2020	450+
Cepheid GeneXpert (1)	4.13.2020	30-40/day (vendor allocation)
Cepheid Infinity	TBD	
ABI Quant Studio	~7.10.2020	300+
Hologic Panther	TBD	
Hamilton Processor	TBD	
Biofire	6.1.2020	Depleted supplies
Abbott ID Now (Marion ED)	5.26.2020	

COVID-19 Antibody testing

7/8/20

Lab Platform	Go-Live Date	Current daily capacity
Abbott Architect (rapid access)	4.27.2020 (6.10.2020)	1500
Abbott Alinity i	6.12.2020	2500-7700
CCT lab (confirm pos)	5.18.2020	-

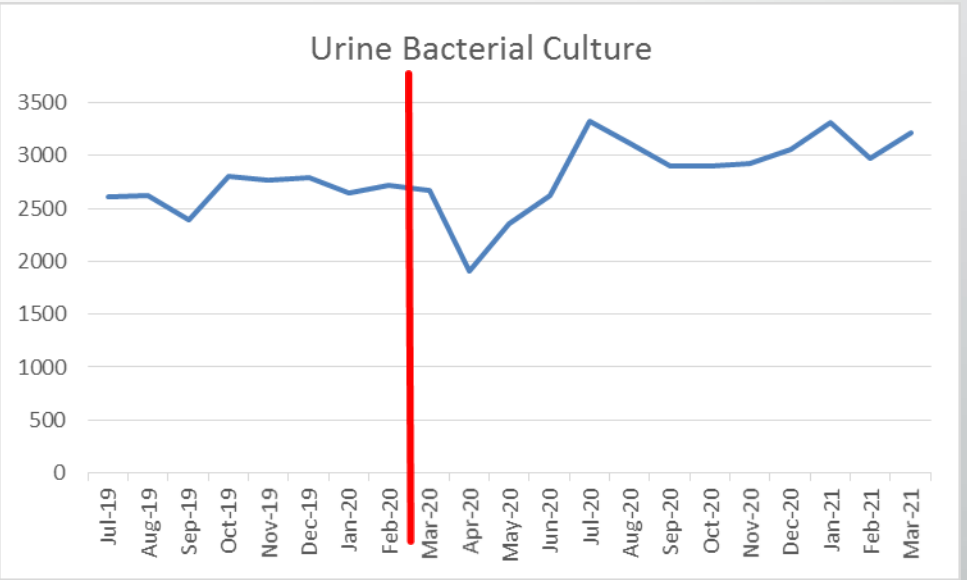
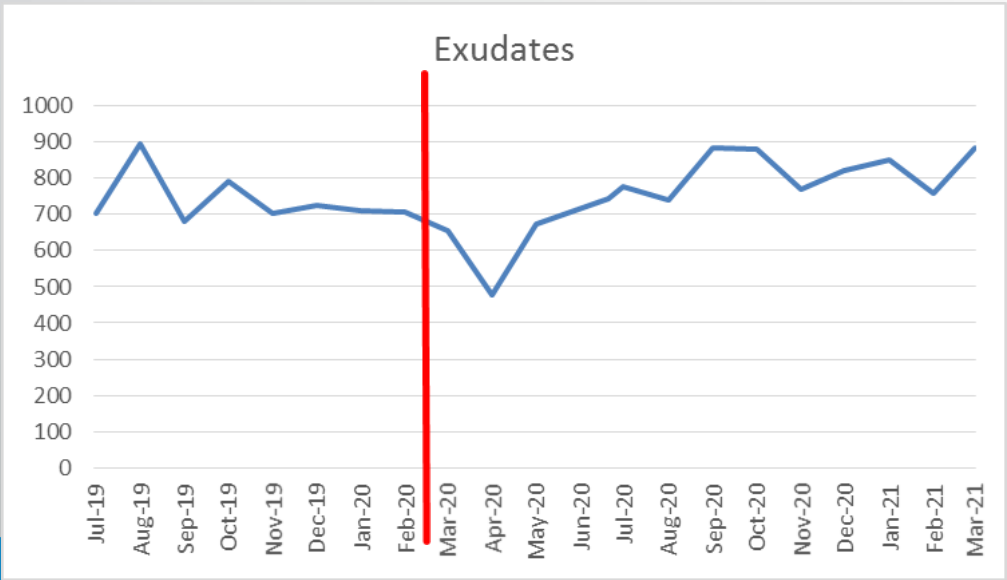
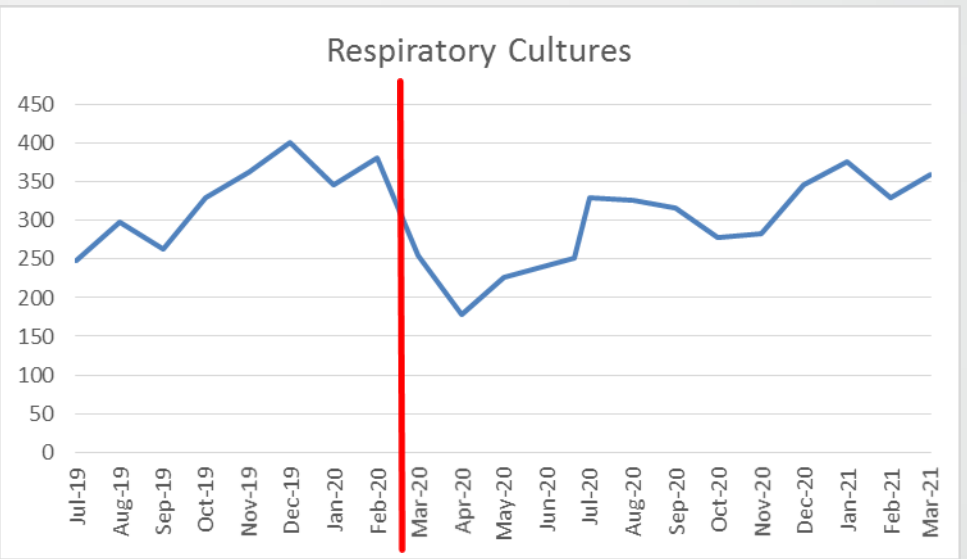
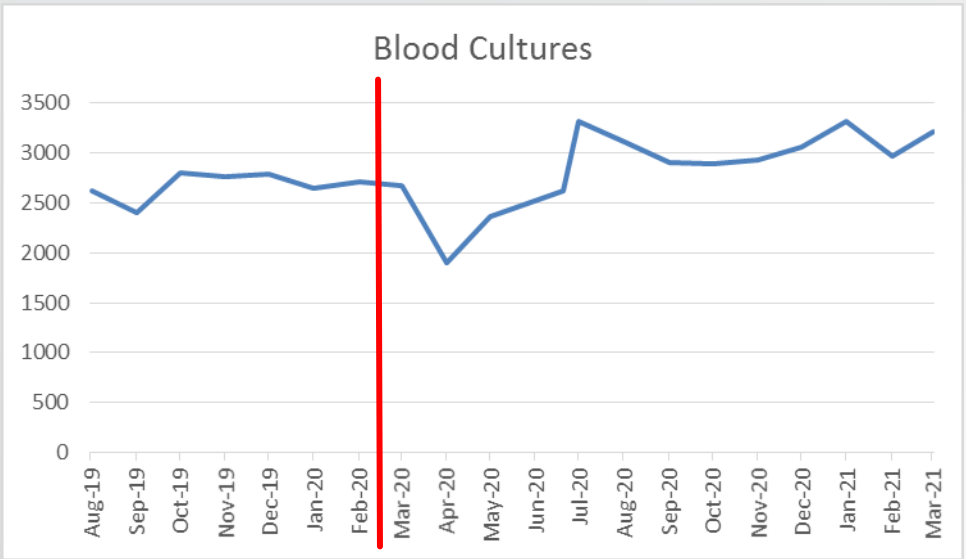
COVID-19 testing platforms – System

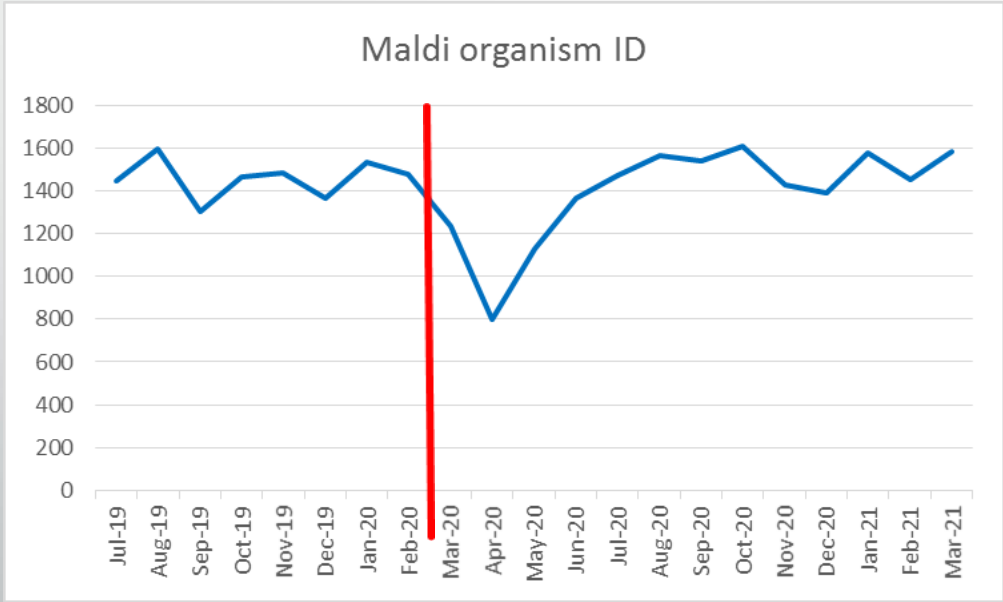
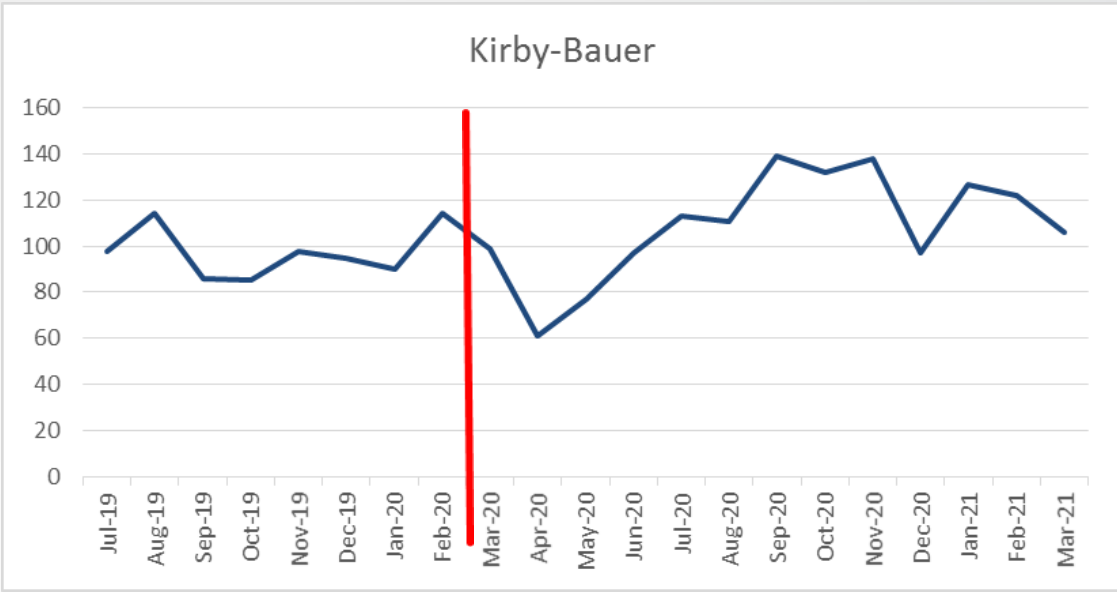
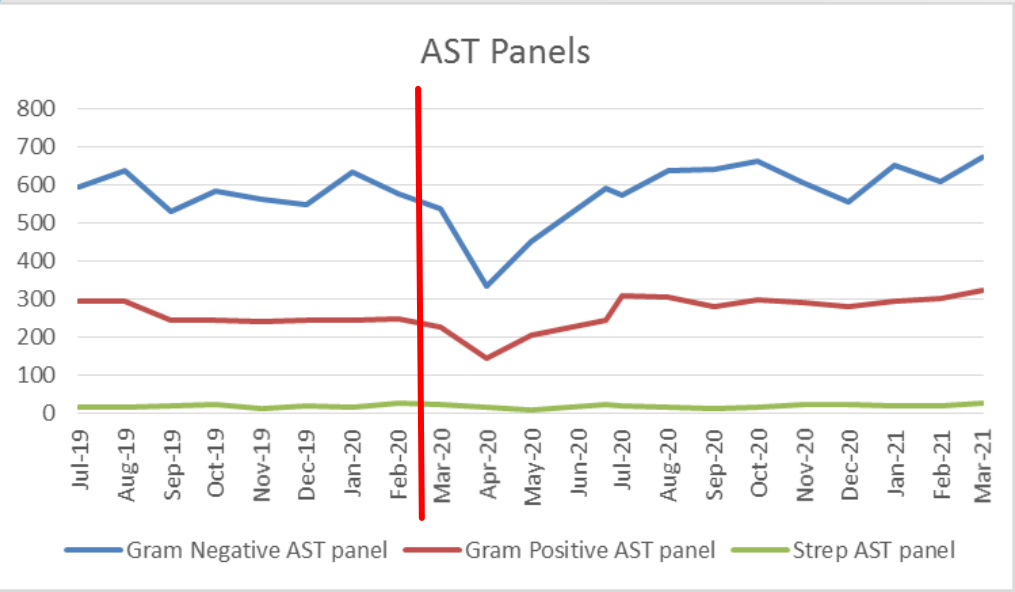
4/14/21

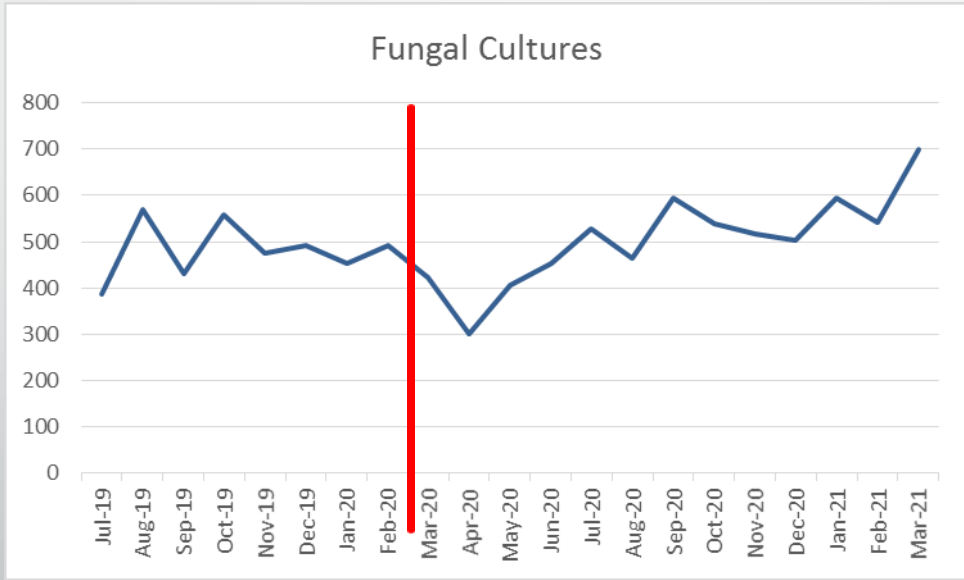
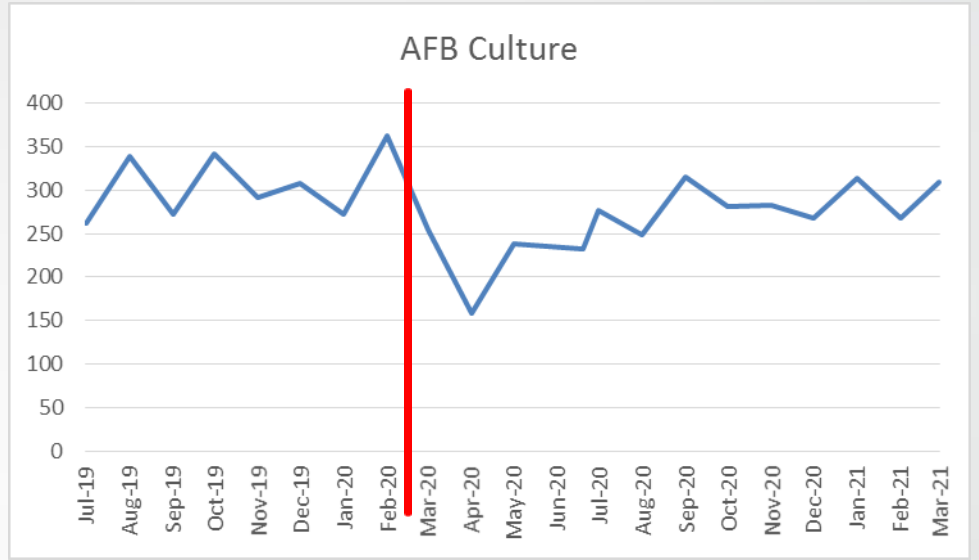
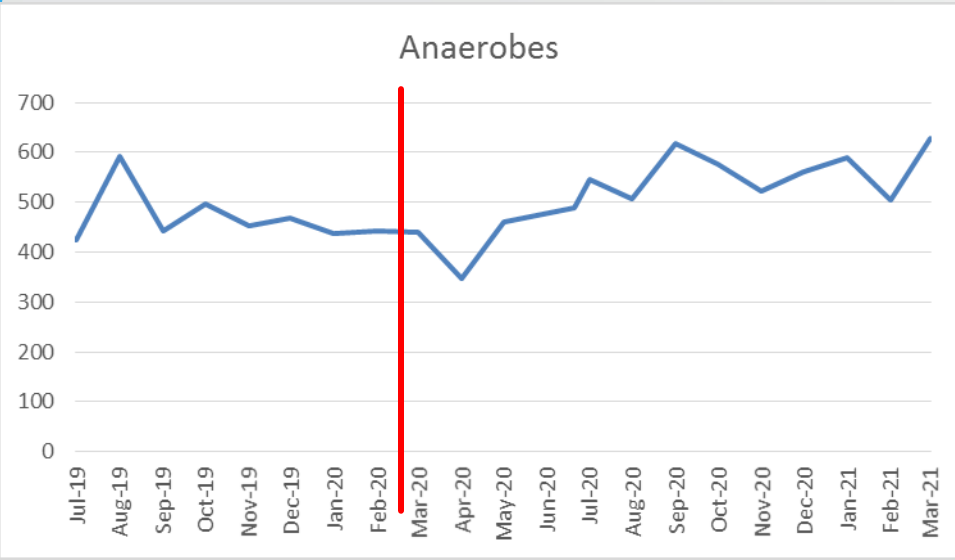
Lab Platform	Go-live Date	Current daily capacity	Divisions
Abbott m2000 (3) - PCR	3.23.2020	300-500	Chs
Abbott Alinity m (2) - PCR	6.12.2020 & 9.2020	800-1200	Chs
Cepheid GeneXpert- COVID PCR	4.13.2020	Depleted supplies	Single test no longer in use
Cepheid Infinity – Quad PCR	9.2020	33 (RHN 9/day/acute hosp)	Chs
ABI Quant Studio - PCR	7.2020	0 Depleted supplies	Chs, 9 th fl CSB Lab
Hologic Panther - PCR	12.2020	300	Chs
Biofire	6.1.2020	Depleted supplies	No longer in use
Illumina - NGS	12.21.2020		
Point of Care Platform			
Abbott ID Now	5.26.2020	240	Chs, Flo, Lan hosp (ED) & clinics
Cepheid Xpress	11.2020	100	Chs AHCs & Bee St, Flo, Lan clinics, Lake City

*Send-outs to LabCorp, Precision Genetics & Mayo Clinical Lab to support additional testing volume needs

Data provided by Frederick S Nolte, PhD, D(ABMM), F(AAM), Director, Molecular Pathology, MUSC Health







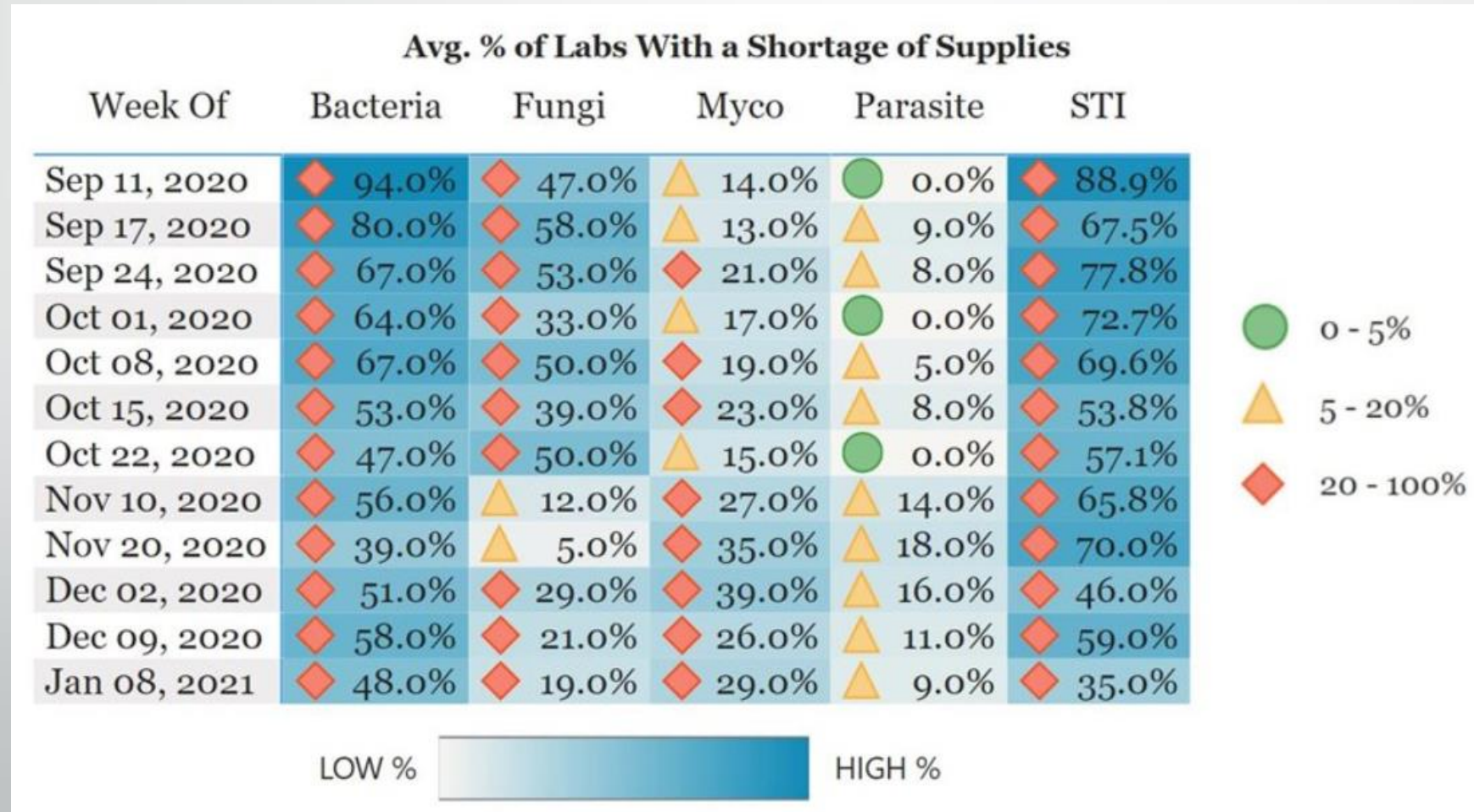
Help from outside the lab

- Infection Control agreed to suspend the universal MRSA and focused VRE surveillance testing

Clinical Microbiology Supply Shortage Collection (CMSSC) tool

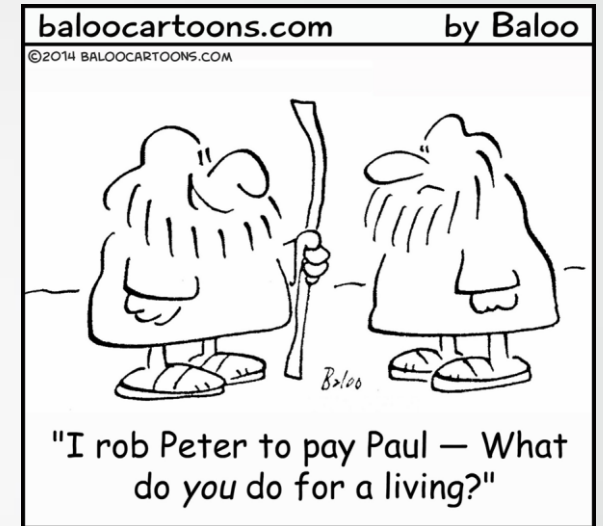
- Non-COVID-19 shortages for the week of Jan. 8-15, 2021:
 - 35.1% of labs have a shortage of supplies for the molecular detection of sexually transmitted infections.
 - 47.5% of labs have a shortage of supplies for detection of routine bacteria (including the bacteria causing strep throat, pneumonia, bronchitis and urinary tract infections).
 - 29.4% of labs have a shortage of supplies for mycobacteria testing (including supplies for tuberculosis (TB) and pulmonary nontuberculous mycobacterial disease testing).
 - 8.8% of labs have a shortage of supplies for routine parasite testing.
 - 19.4% of labs have a shortage of supplies for routine fungal testing.

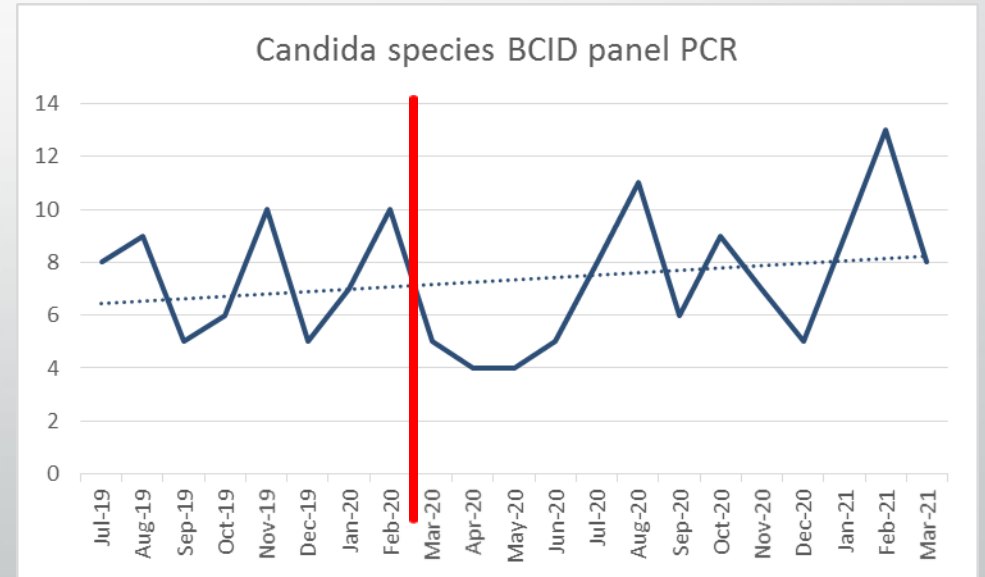
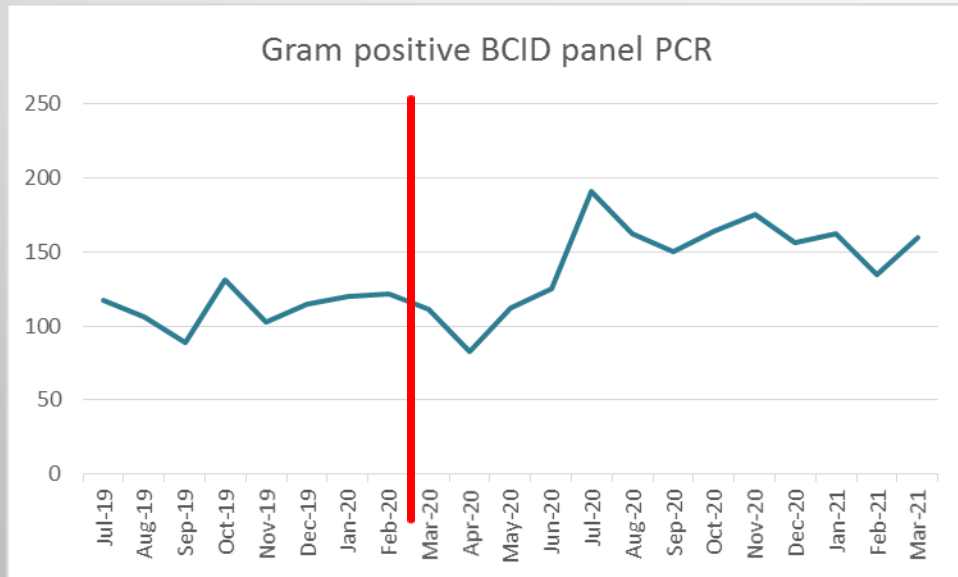
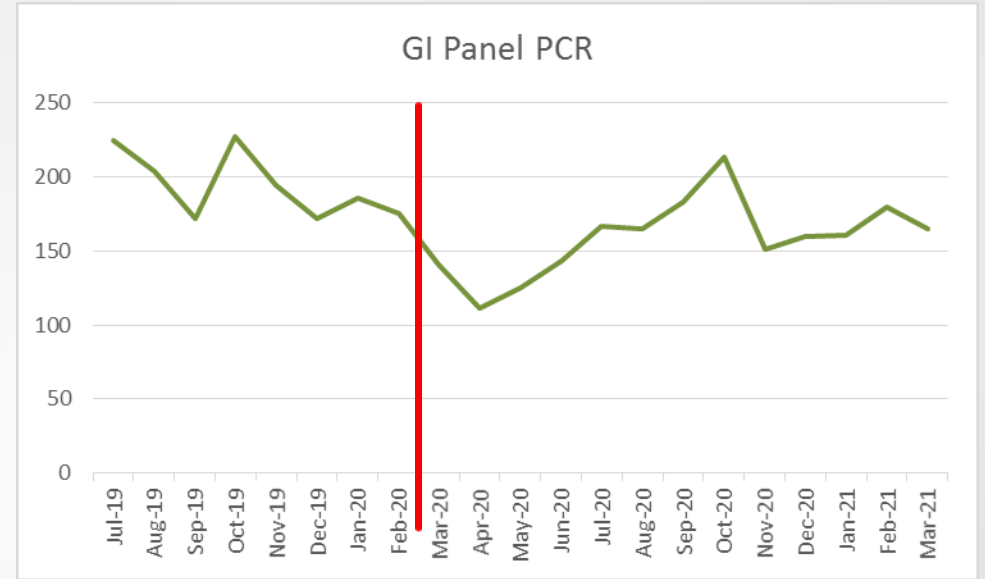
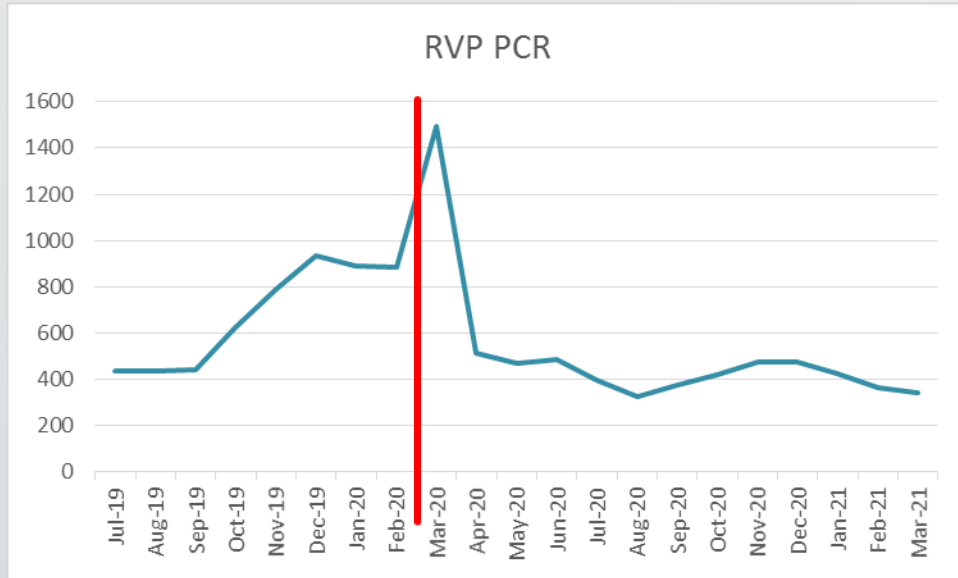
Clinical Microbiology Supply Shortage Collection (CMSSC) tool



Media and supply shortages

- Backordered media
 - Blood agar plates
 - Mueller Hinton plates—validated *P. aeruginosa* on Phoenix panels
- Expired media
 - Specialty media—inoculated QC when specimen set up
- E test strips
- GI PCR panels





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Staffing shortages

- Repurposed staff
 - New Hires
 - Staff that left MUSC
 - Staff that left Micro for another section of the Lab
- Quarantined staff
- Traveler techs
- Database coordinator focused on Beaker conversion

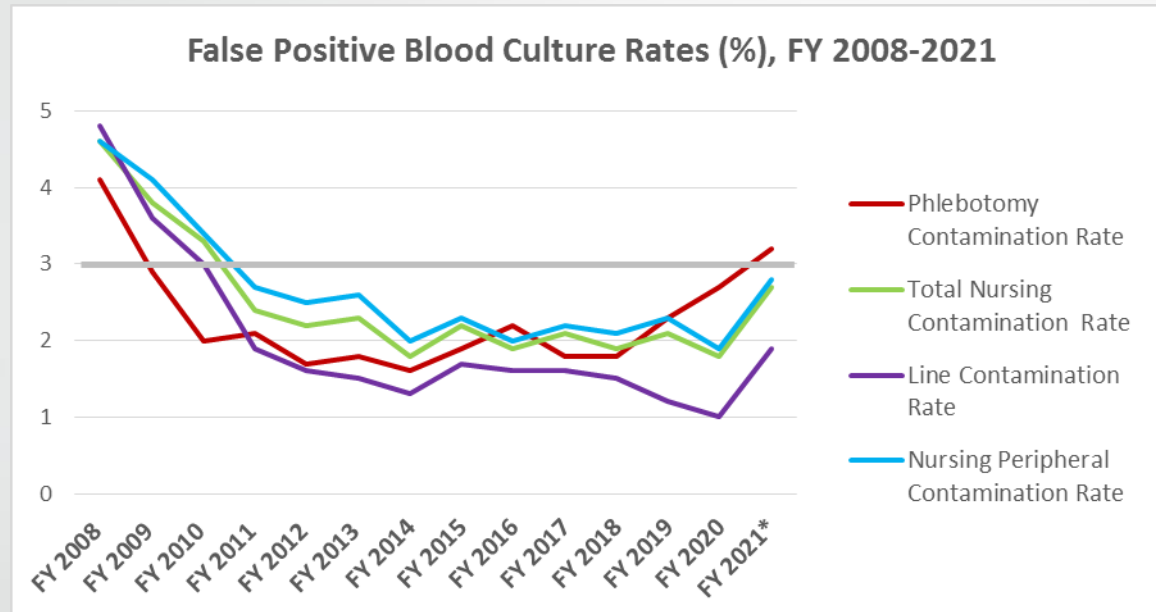
Staffing Shortages

- Not just at MUSC—a general clinical microbiology & molecular laboratory workforce shortage
 - 2015 survey: % employees anticipated to retire in the next 5 years: chemistry 23.6%, hematology 19.51%, microbiology 19.48%, blood bank 19.19%
 - Average age of a laboratorian is early 50s
 - Hospitals don't understand the return on investment of the lab
 - Who were the heroes of COVID-19?
 - Medical lab scientist & medical technologist programs closing or have closed
 - Difficulty in finding labs that will accept trainees for clinical rotations

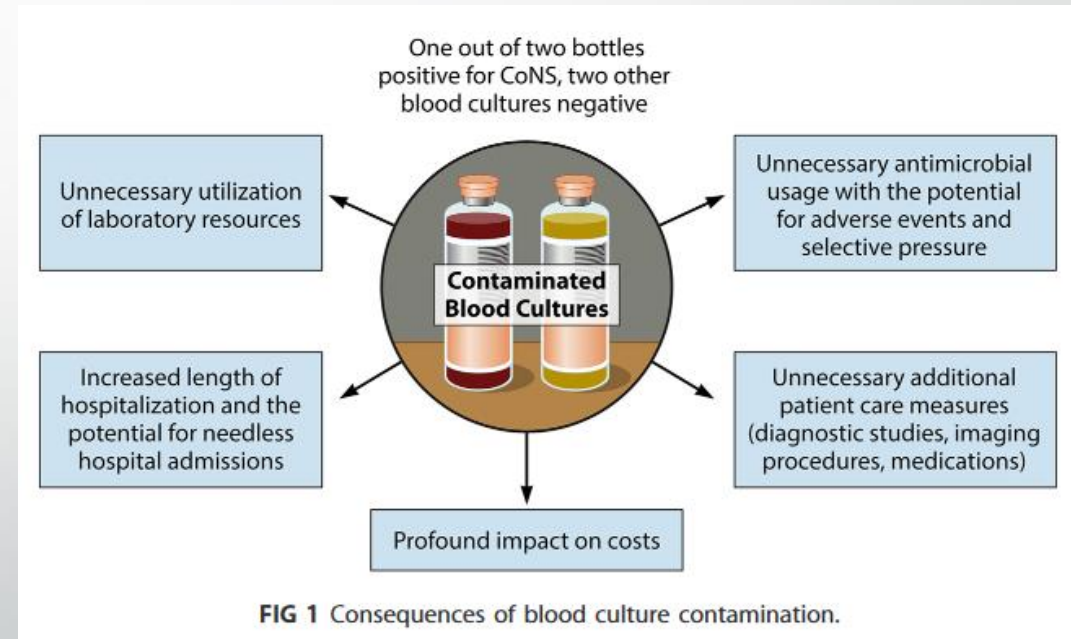
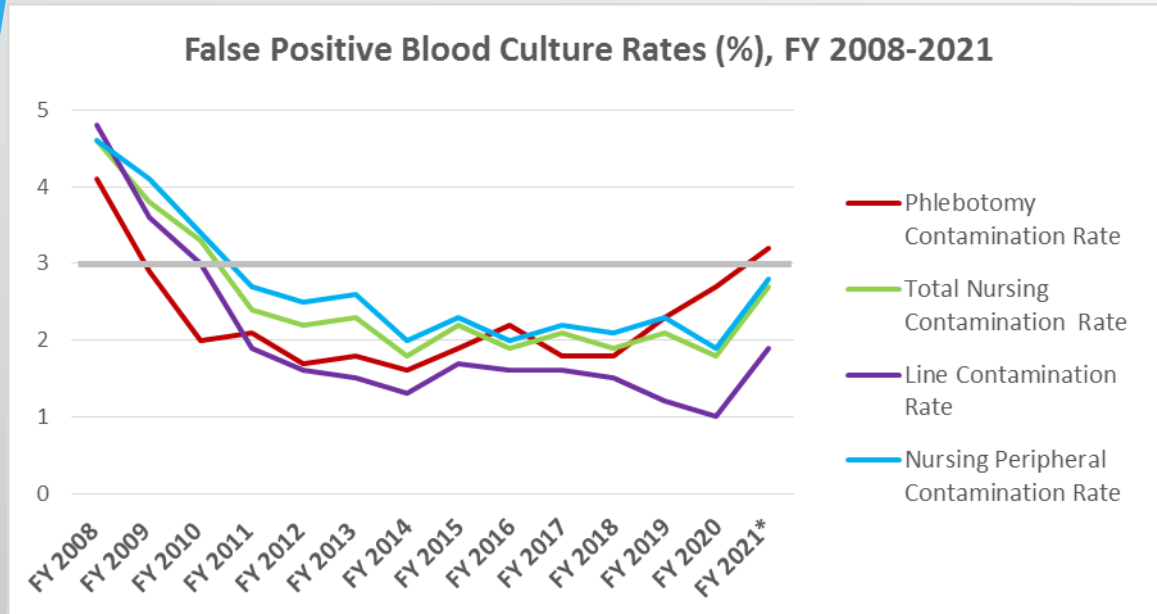
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Blood culture contamination rates



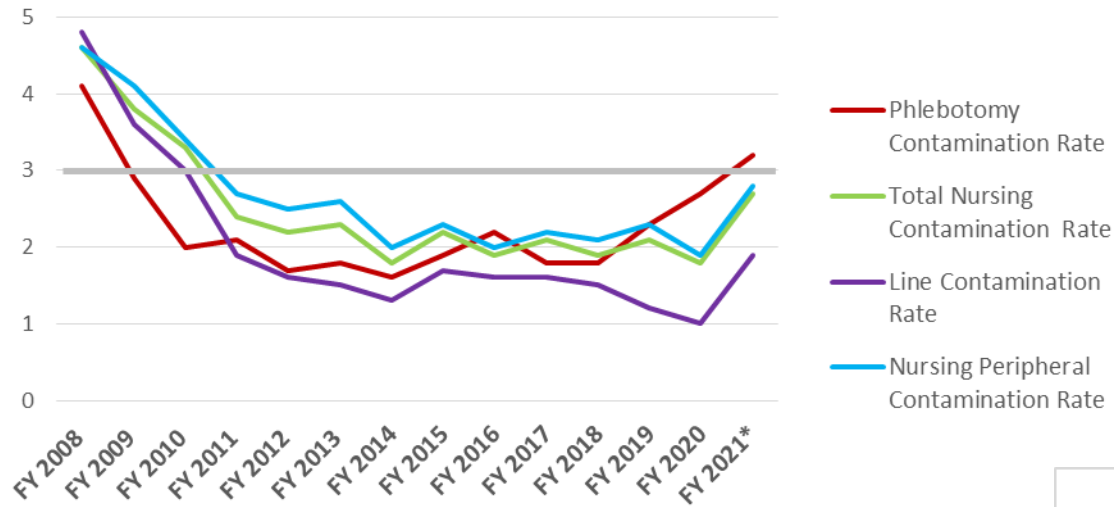
Blood culture contamination rates



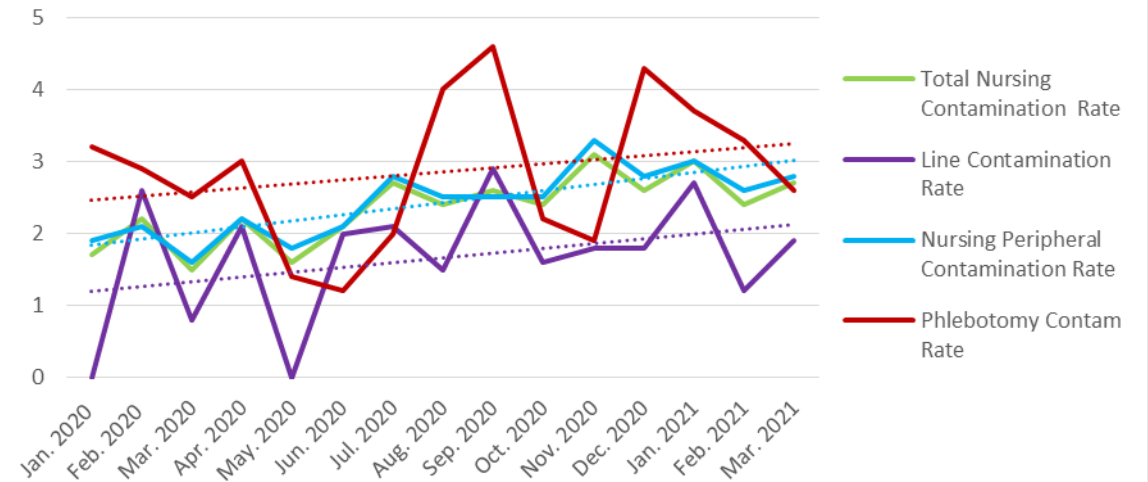
Practical Guidance for Clinical Microbiology Laboratories: A Comprehensive Update on the Problem of Blood Culture Contamination and a Discussion of Methods for Addressing the Problem. Jan 2020 Clin Micro Rev. Doern et al

Blood culture contamination rates

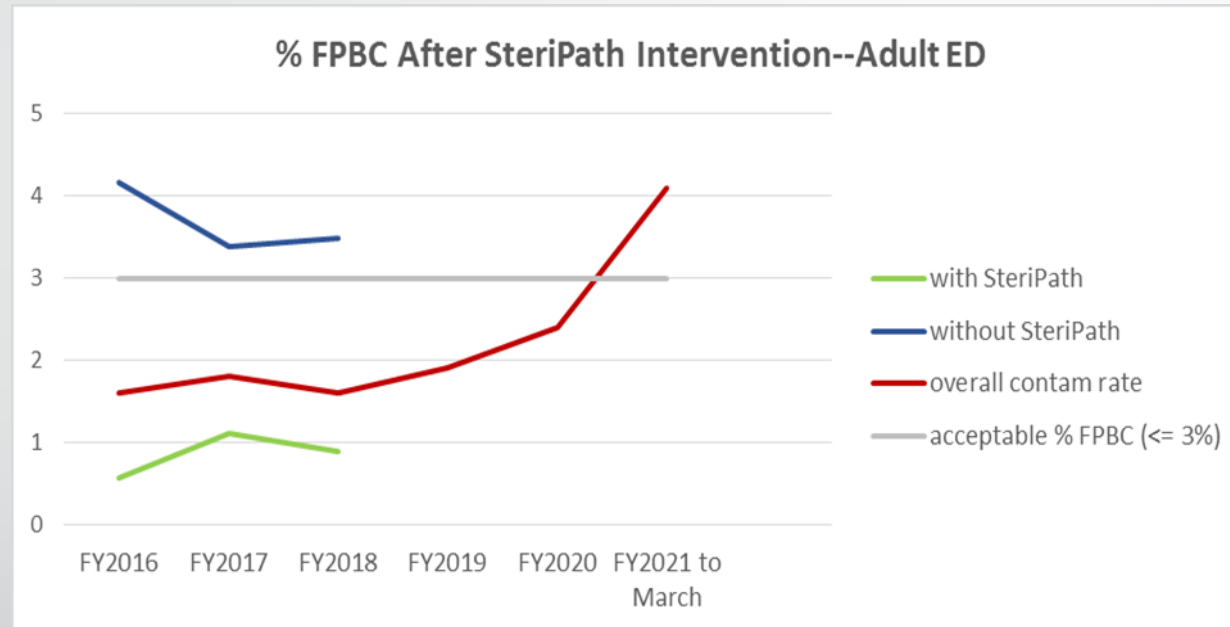
False Positive Blood Culture Rates (%), FY 2008-2021



% FPBC for Phlebotomy vs Nursing Service, Jan 2020 - Mar 2021

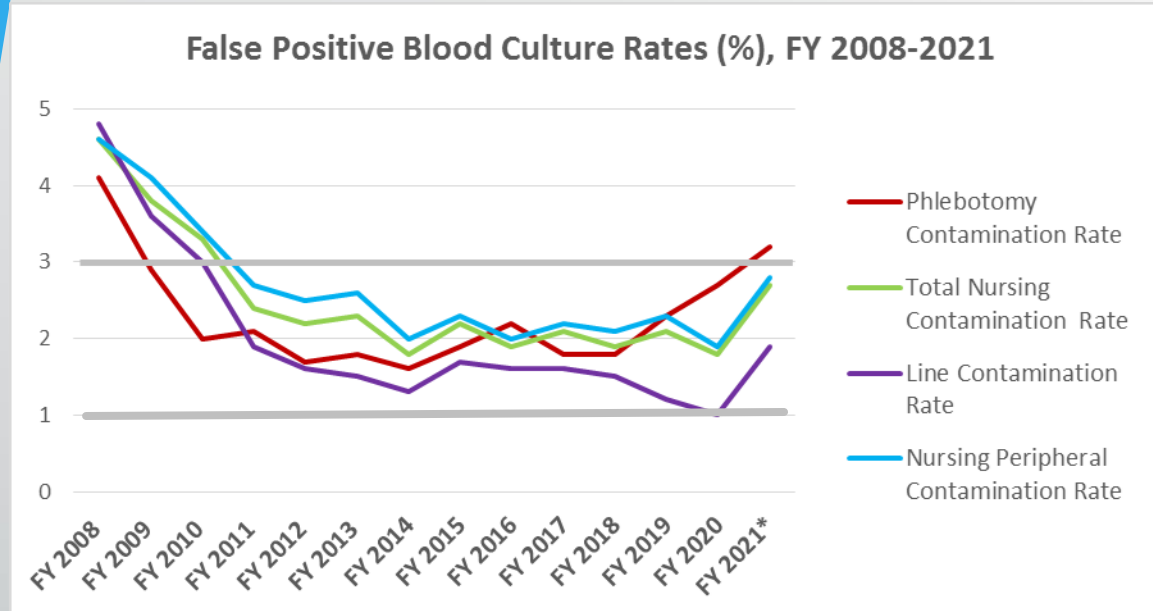


Blood culture contamination rates



SteriPath

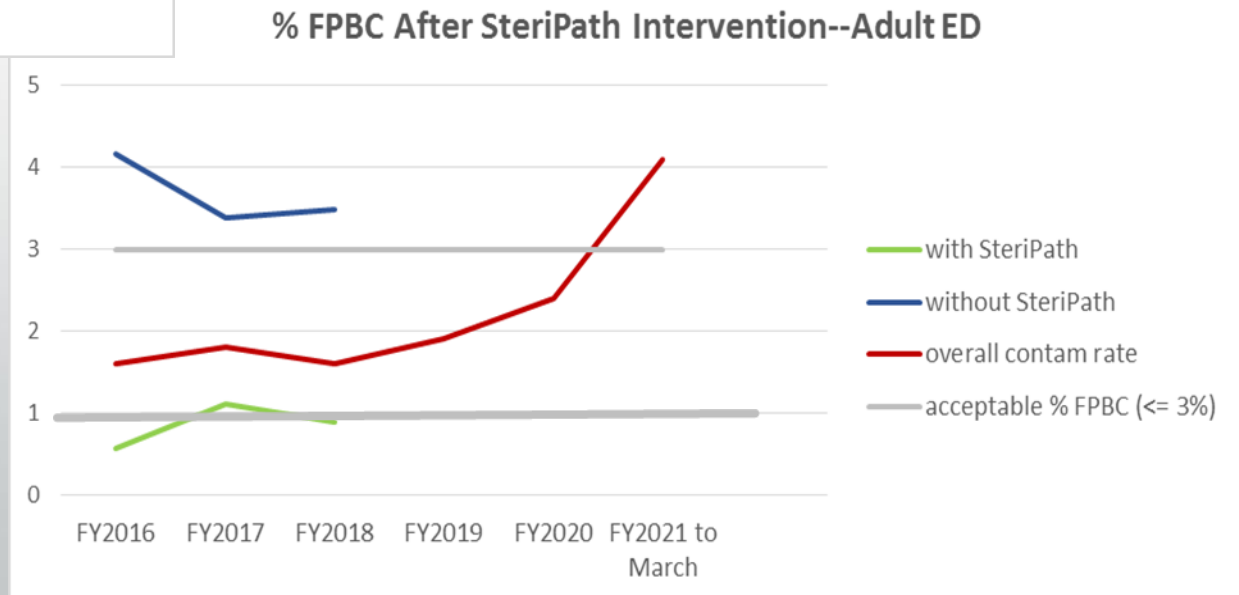
Blood culture contamination rates



“overall institutional contamination rates of $\leq 1.0\%$ are now achievable, and therefore, consideration should be given to the establishment of a new universal threshold value of $\leq 1.0\%$ ”

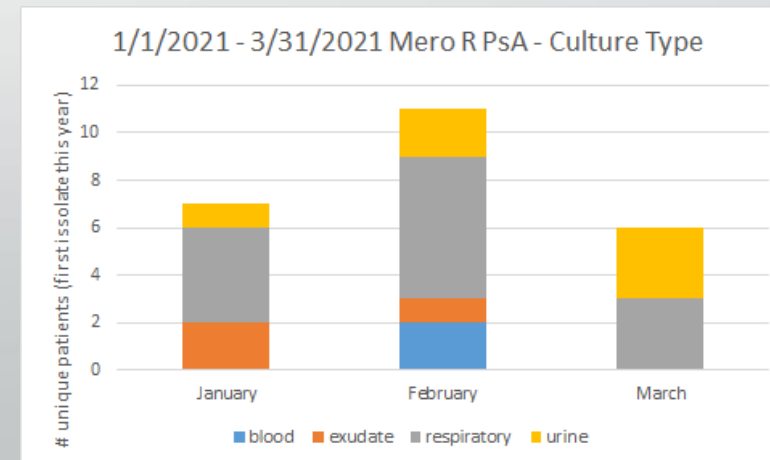
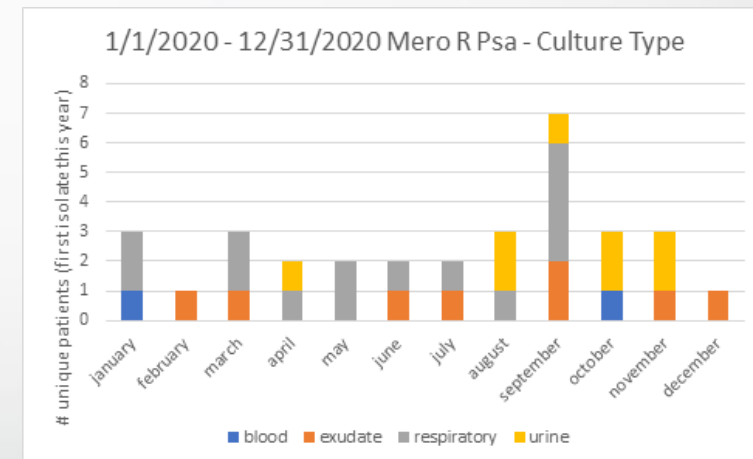
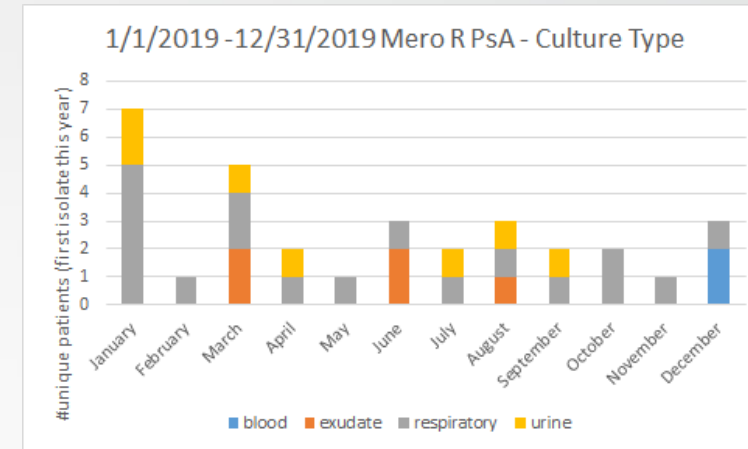
“in settings in which overall contamination rates rise above 1%...objective, stepwise quality improvement programs designed to improve patient care and reduce unnecessary costs [should] be implemented”

Practical Guidance for Clinical Microbiology Laboratories: A Comprehensive Update on the Problem of Blood Culture Contamination and a Discussion of Methods for Addressing the Problem. Jan 2020 Clin Micro Rev. Doern et al



Meropenem = R *P aeruginosa*

- # CRPA
 - Calendar year 2019 = 36
 - Calendar year 2020 = 35
 - Jan-Mar 2021 = 41
- # pts with CRPA (no duplicates)
 - Calendar year 2019 = 32
 - Calendar year 2020 = 32
 - Jan-Mar 2021 = 24



Data, graphs, & analysis provided by Brian Raux, PharmD, BCPS, BCIDP, MUSC Infectious Diseases/ Antimicrobial Stewardship

Meropenem = R *P aeruginosa*

- Testing/treatment options:
 - Ceftolozane/tazobactam (C/T)
 - Ceftazidime/avibactam (CZA)
 - Meropenem/vaborbactam
 - Imipenem/cilastin/relebactam
 - Cefiderocol
 - Colistin

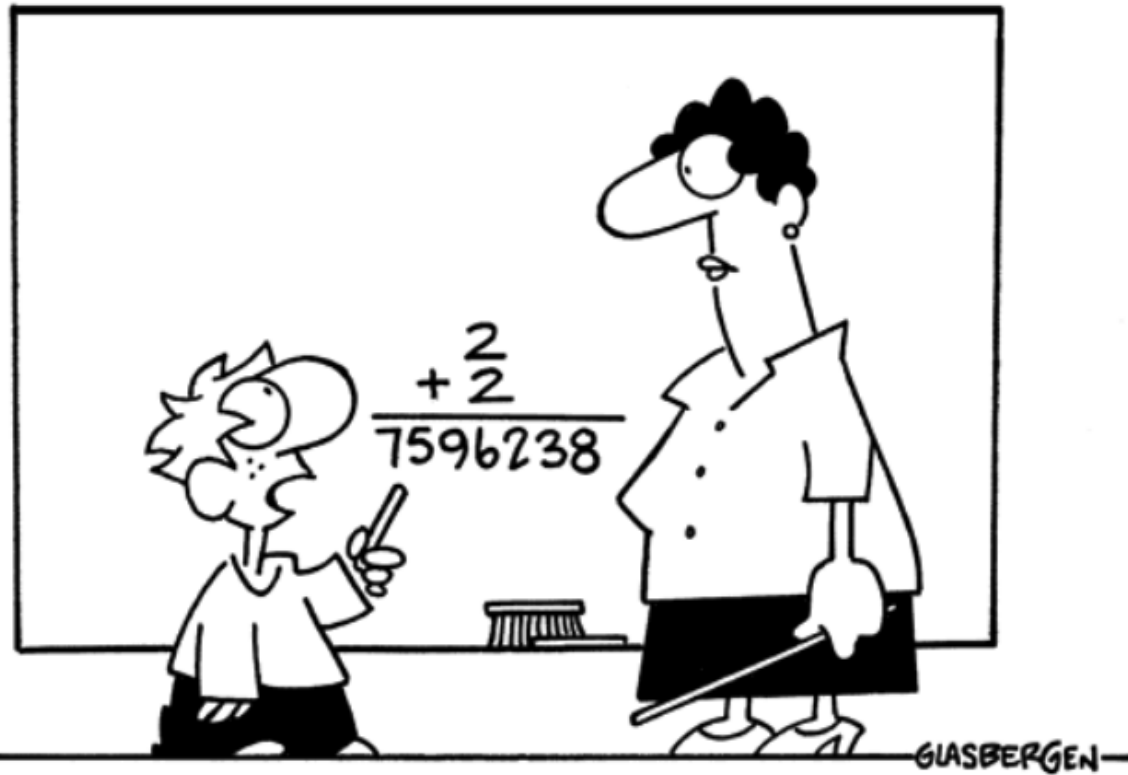
C/T <= 4 & >= 16	C/T interp	C/T mm >= 21 & <= 16	C/T interp	interp cat error?
4	S	25	S	
4	S	23	S	
2	S	25	S	
8	I	25	S	minor
0.5	S	25	S	
8	I	22	S	minor
8	I	19	I	
2	S	27	S	
4	S	22	S	
16	R	16	R	
8	I	25	S	minor
1	S	23	S	
2	S	26	S	
4	S	26	S	

CZA <= 8 & >= 16	CZA interp	CZA mm >= 21 & <= 20	CZA interp	interp cat error?
16	R	22	S	VM
>32	R	6	R	
16	R	21	S	VM
8	S	18	R	ME
16	R	20	R	
8	S	21	S	
1	S	32	S	
16	R	19	R	
16	R	21	S	VM
32	R	48	R	
16	R	20	R	
16	R	21	S	VM
8	S	21	S	
8	S	21	S	

CZA from NMIC306	CZA zones (mm)
8/4 S	18
>8/4 R	6
8/4 S	16
2/4 S	25
>8/4 R	6
>8/4 R	6
>8/4 R	6
>8/4 R	6
2/4 S	25
>8/4 R	6
>8/4 R	14
>8/4 R	6

Questions?

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“In an increasingly complex world, sometimes old questions require new answers.”