INTERDISCIPLINARY TEAMS ARE KEY TO SUCCESSFUL ANTIMICROBIAL STEWARDSHIP

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OUTLINE

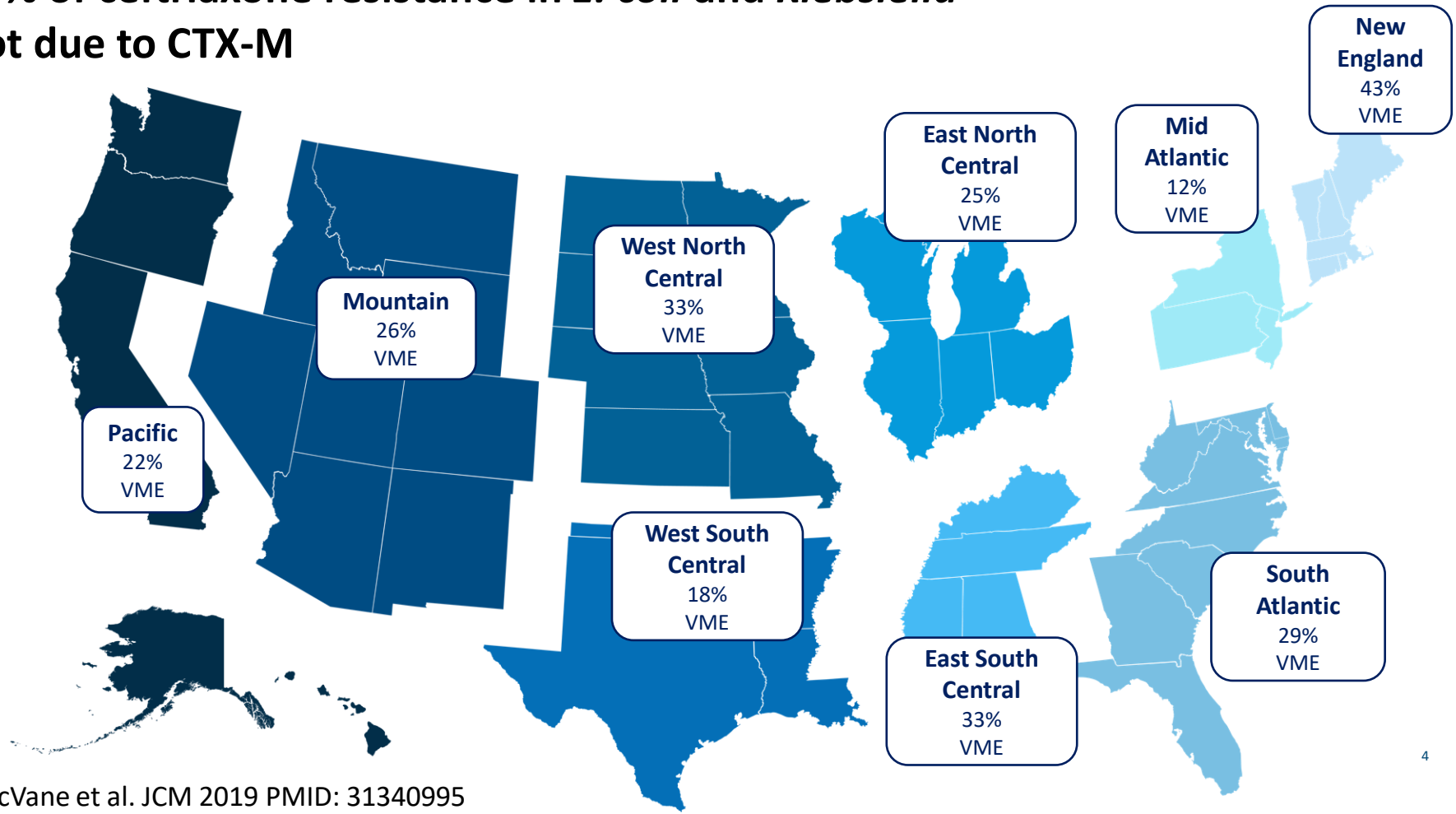
- Case
- Why do we engage in stewardship?
- What shifted during the pandemic?
- What impact will changes resulting from the pandemic have on antibiotic prescribing?
- The role of testing and the laboratory in stewardship
- What broad changes will occur in healthcare as a result of the pandemic and what impact will this have an impact on AMS?
- Some recommendations we can consider

Case 1

- 68 YO male with progressing myelofibrosis
- 46 d post BMT
  - Not engrafted
- On immunosuppression regime, neutropenic
- Feeling tired, weak and has diarrhea
- Spikes fever at home to 102.7°F
- In ER:
  - Complains of flank pain and burning on urination
  - WBC <0.1 K
  - Urine, sputum and blood grow *K. pneumoniae*
    - CTX-M not detected on blood culture PCR test

K. pneumoniae	
Ampicillin	R
Aztreonam	I
Cefazolin	R
Cefepime	S
Ceftazidime	S
Ceftriaxone	R
Ciprofloxacin	S
Gentamicin	S
Levofloxacin	S
Meropenem	S
Pip-tazo	S
Trimeth-sulfa	S

20% of ceftriaxone resistance in *E. coli* and *Klebsiella* not due to CTX-M



MacVane et al. JCM 2019 PMID: 31340995

Case 1: MIC Results

K. pneumoniae	MIC (µg/ml)	
Ampicillin	>16	R
Aztreonam	16	I
Cefazolin	>16	R
Cefepime	8	S
Ceftazidime	8	S
Ceftriaxone	8	R
Ciprofloxacin	≤0.25	S
Gentamicin	≤2	S
Levofloxacin	≤0.5	S
Meropenem	≤0.5	S
Pip-tazo	16/4	S
Trimeth-sulfa	≤0.5	S

K. pneumoniae	MIC (µg/ml)		Breakpoint Applied
Aztreonam	16	I	**Obsolete (pre-2010)**
Cefepime	8	S	**Obsolete (pre-2014)**
Ceftazidime	8	S	**Obsolete (pre-2010)**
Ceftriaxone	8	R	Current
Meropenem	≤0.5	S	Current
Pip-tazo	16/4	S	**Obsolete (pre-2022)**

Why?
Laboratory test system FDA cleared for ceftriaxone & meropenem, but not aztreonam, cefepime, ceftazidime or pip-tazo

	Current			Obsolete		
	S	**I/SDD**	**R**	**S**	**I**	**R**
Aztreonam	≤4	8	≥16	≤8	16	≥32
Cefepime	≤2	4-8	≥16	≤8	16	≥32
Ceftazidime	≤4	8	≥16	≤8	16	≥32
Ceftriaxone	≤1	2	≥4	≤8	16-32	≥64
Meropenem	≤1	2	≥4	≤4	8	≥16
Pip-tazo	≤8	16	≥32	≤16	32-64	≥128

CLSI. M100 S32, 2022. CLSI, Wayne, PA.
Humphries et al. 2019. JCM. 57(9):e00203-19

WHY DO WE ENGAGE IN STEWARDSHIP

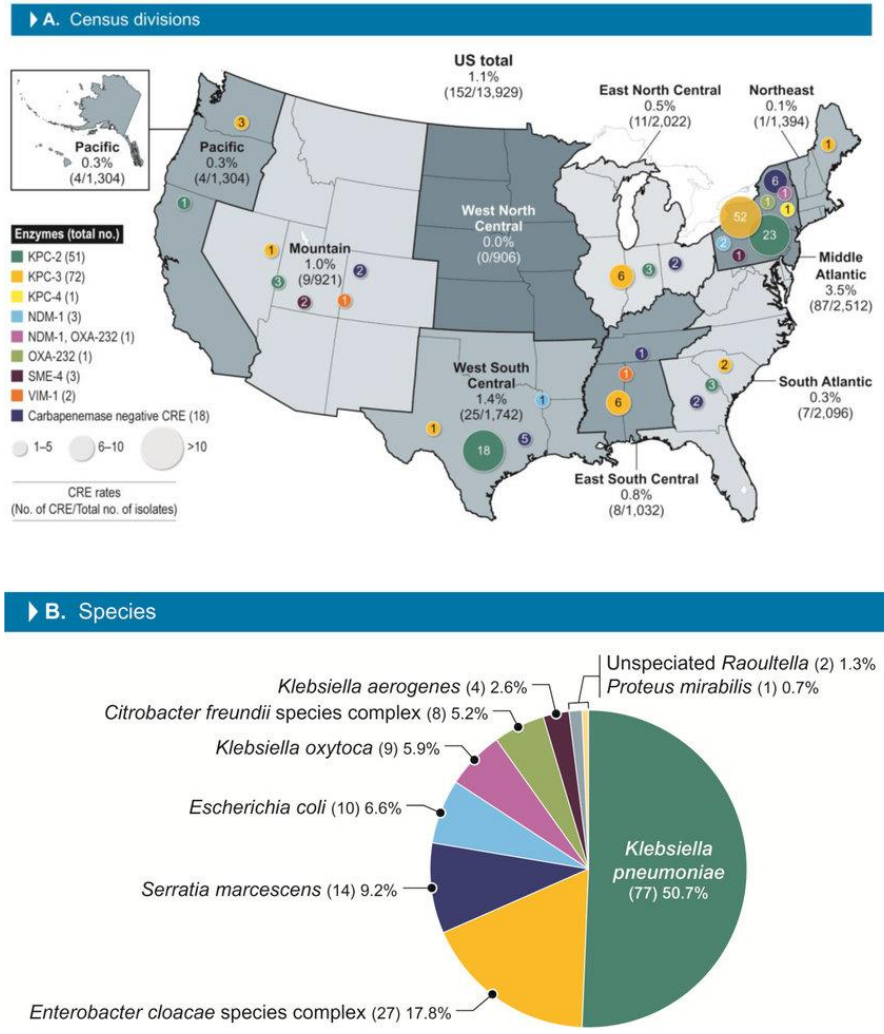
RESISTANCE IS FALLOUT OF INAPPROPRIATE USE OF ANTIMICROBIALS IN DIFFERENT SETTINGS

- In animals and plants:
  - Therapeutic and non-therapeutic (e.g. as growth promoters)
- In community acquired infections
- In hospital-associated infections

- Irrational use of antibiotics is the greatest driver of resistance
  - **50%** of antibiotics are prescribed inappropriately
  - **50%** of patients have poor compliance
  - **50%** of populations do not have access to essential antibiotics

WHO, 2011

PREVALENCE IS KEY

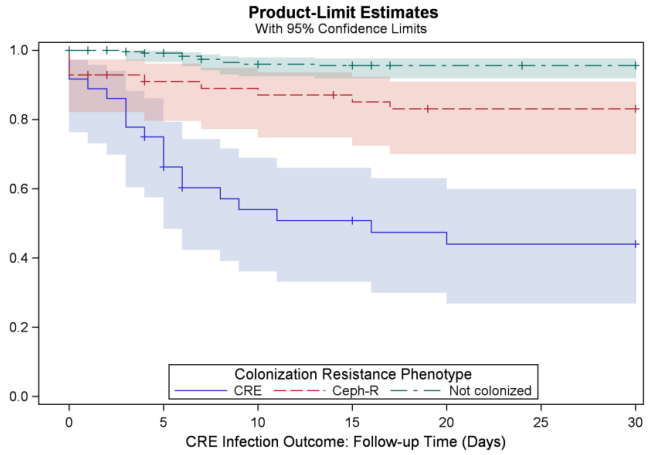


Castanheira M et al. PMID 31712207

ARE CRE MORE IMPORTANT?

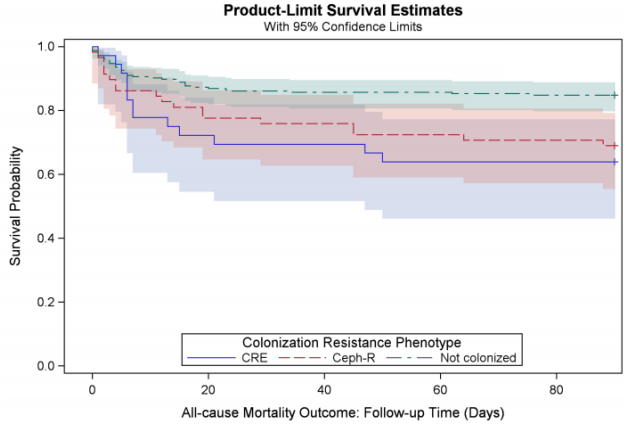
Comparing MDROs

- *CRE vs ESBL*
  - GI colonization is independent risk factor for CRE infection
  - Mortality following CRE BSI is up to 51-65%



	Not colonized (n=244)	Ceph-R (n=58)	CRE (n=36)
30-day infection	2.8% (7/244)	3.4% (2/58)	47% (17/36)
90-day mortality	15% (37/244)	31% (18/58)	36% (13/36)

Risk of CRE infection if colonized OR 10.8 (2.8-41.9), p=0.0006



McConville TH et al. PLOS one 2017; 12(10):e0186195

IMPACT OF MDR INFECTIONS

- Cost to whom?
  - Institution, third party payor, individual, society

TABLE 1

Attributable Cost of a Hospital-Onset Health Care-Associated Infection[a]

Method of Measurement	Estimated Cost per Infection
Generalized linear regression model	$20,888
OLS linear regression	$19,917
OLS linear regression: total cost minus MD and procedures	$18,615
Propensity score-matched comparison	$19,251
OLS linear regression; 98% Winsorized	$15,203
LOS multiplied by mean non-HAI cost per day	$15,149
OLS linear regression; 95% Winsorized	$11,299
3S-PHM LOS multiplied by mean non-HAI cost per day	$9,310

TABLE 2

Estimates of Attributable HAI Cost Estimates From Literature Reviews

HAI Type	Zimlichman et al[15]	NORC Report[16]
Catheter-associated urinary tract infections	$924	$13,793
Central line-associated bloodstream infections	$47,254	$48,108
Surgical site infections	$21,438	$28,219
Ventilator-associated pneumonia	$41,406	$47,238
Hospital-acquired antibiotic-associated *Clostridium difficile*	$11,640	$17,260

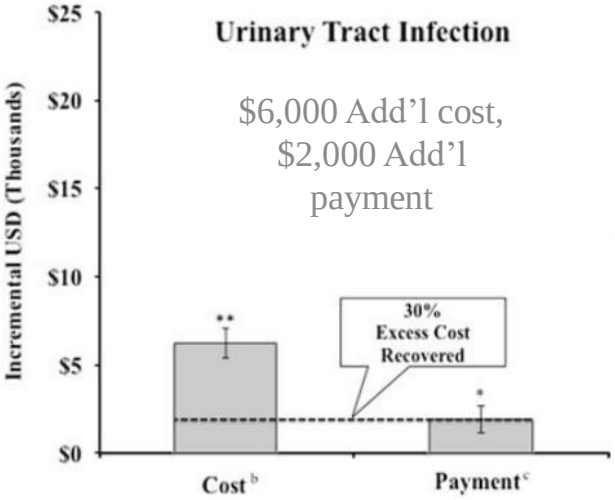
Abbreviation: HAI, health care-associated infection; NORC, the nonpartisan and objective research organization NORC at the University of Chicago.

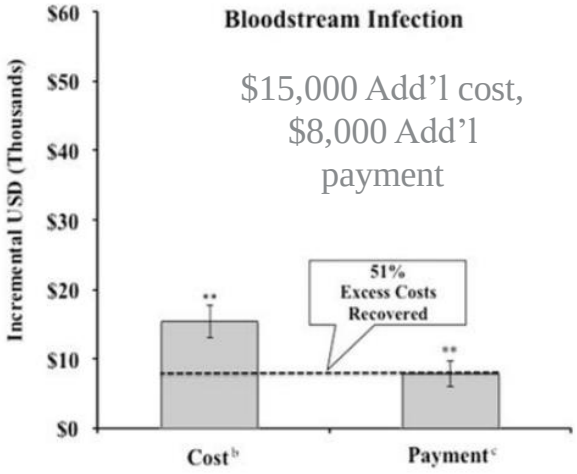
IMPACT OF MDR INFECTIONS

- Cost to whom?
  - Institution, third party payor, individual, society

Part A (hospital cost) reimbursement for HAIs has been limited since 2008

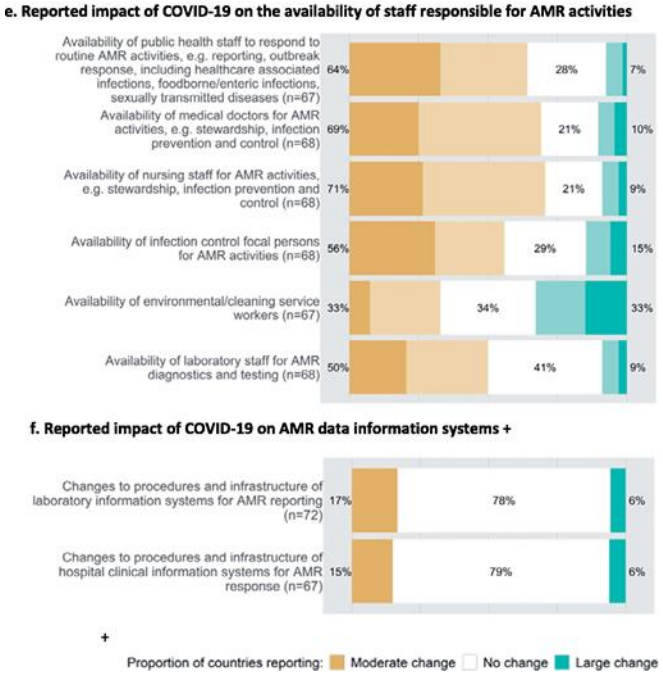
Cost

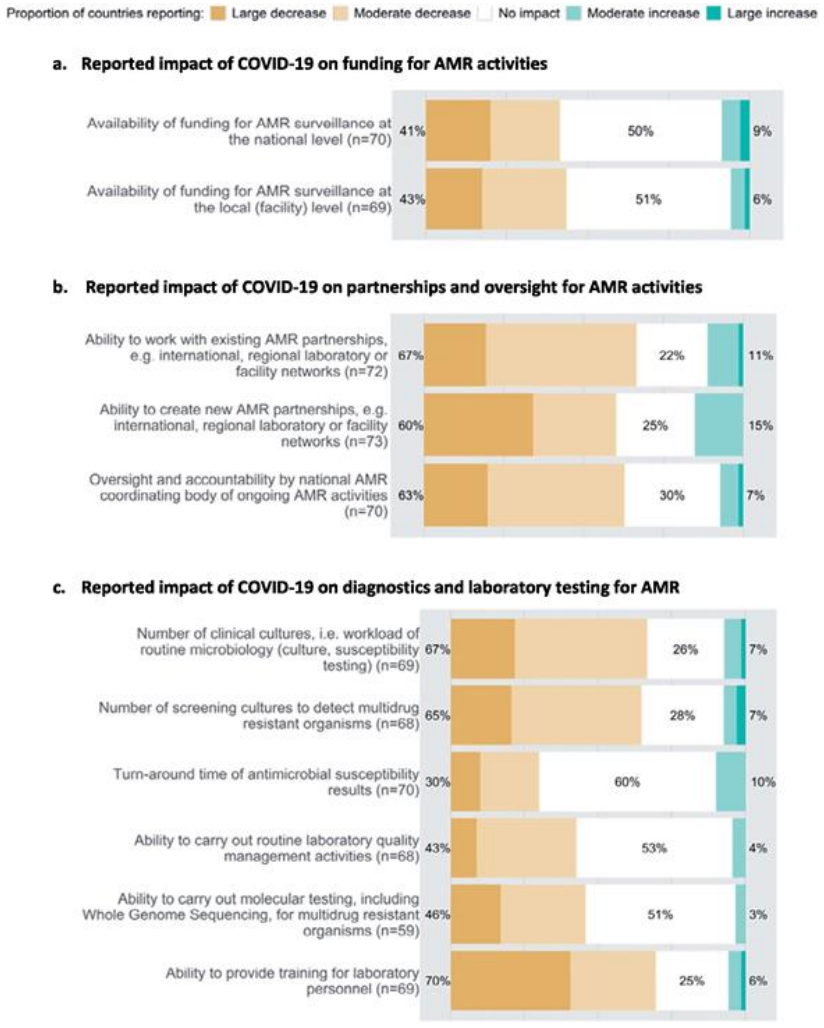




WHAT SHIFTED DURING THE PANDEMIC?

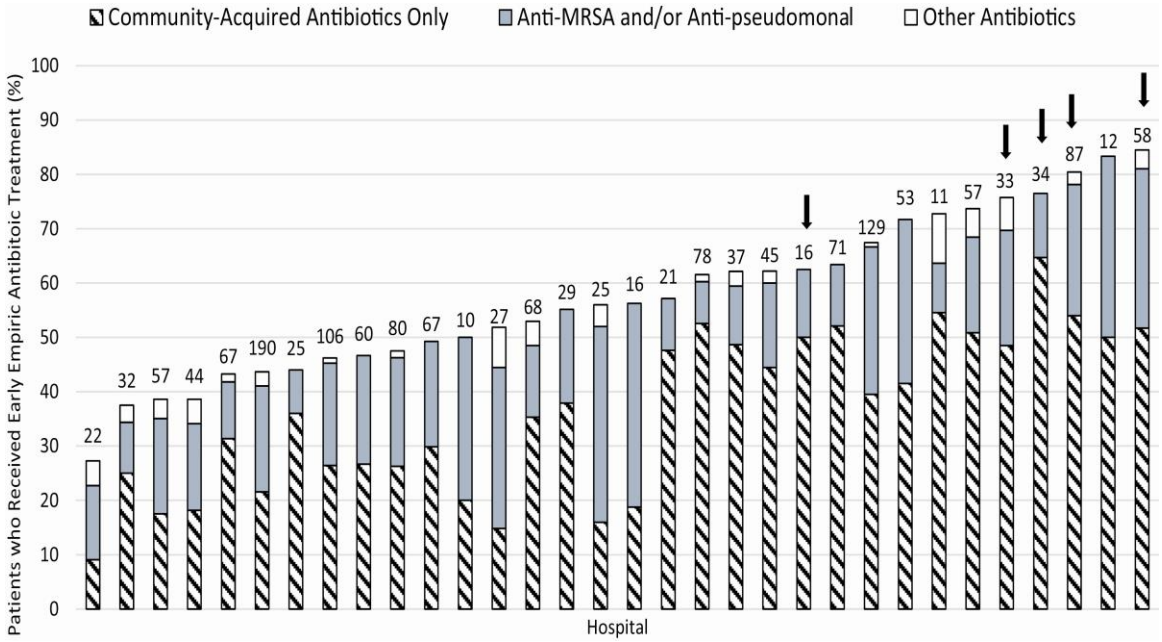
THE IMPACT ON STAFFING – DATA FROM THE WHO GLOBAL AMR AND USE SURVEILLANCE SYSTEM (GLASS)





J Antimicrob Chemother, Volume 76, Issue 11, November 2021, Pages 3045–3058, https://doi.org/10.1093/jac/dkab300

EARLY EMPIRIC ANTIBIOTIC TREATMENT IN HOSPITALIZED PATIENTS WITH COVID-19, BY HOSPITAL IN MICHIGAN

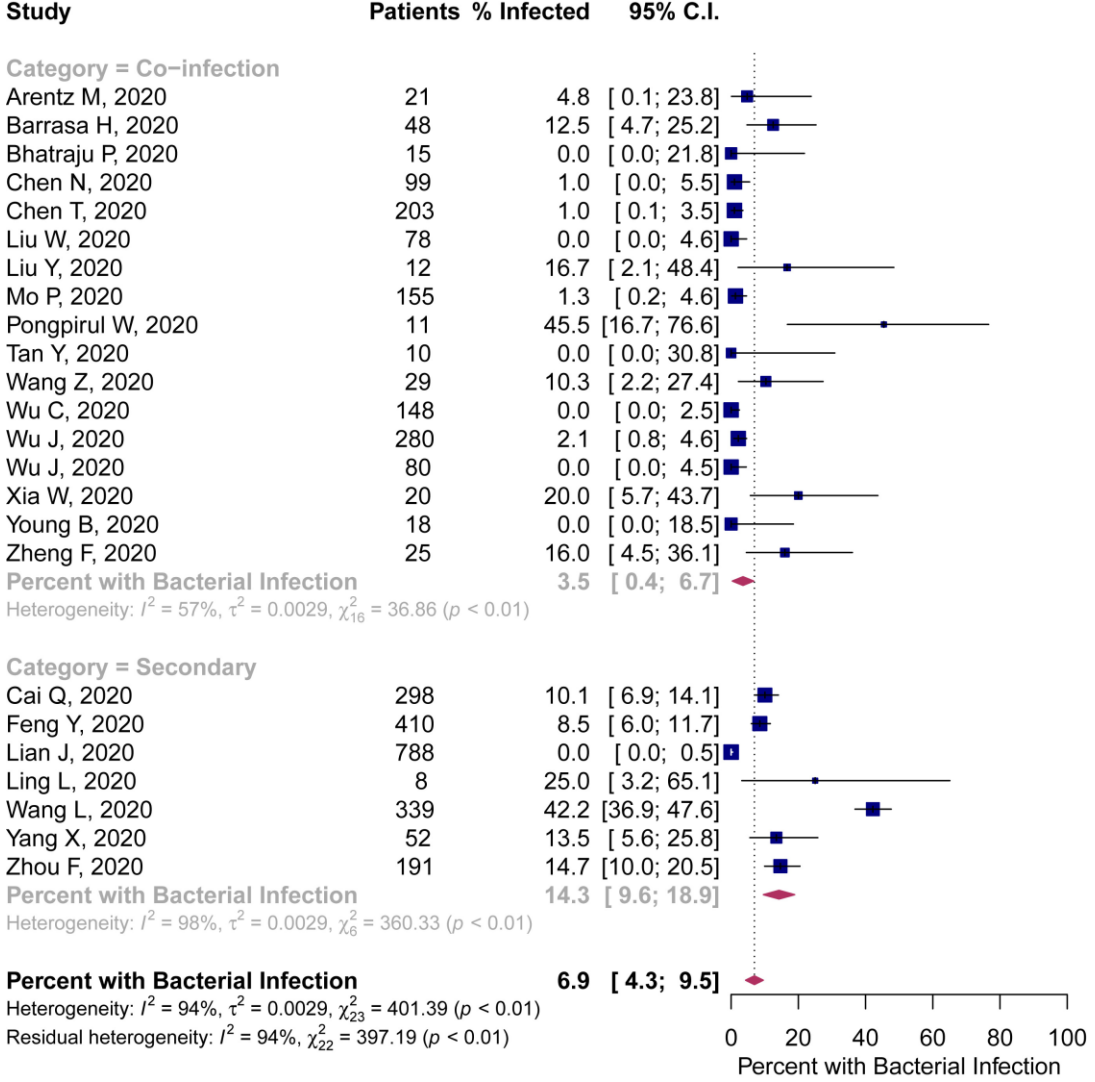


56.6% OF PATIENTS RECEIVE EMPERIC ABX DESPITE 3.5% HAVING DOCUMENTED COMMUNITY-ONSET BACTERIAL CO INFECTION

Vaughn VM et al. *Clin Infect Dis*, Volume 72, Issue 10, 15 May 2021, Pages e533–e541, https://doi.org/10.1093/cid/ciaa1239

COINFECTIONS AND SECONDARY INFECTIONS

- 71.8% of patients received ABX
- 3.5% Co-infections
- 14.3% Secondary infections



Langford BJ et al. PMID 32711058

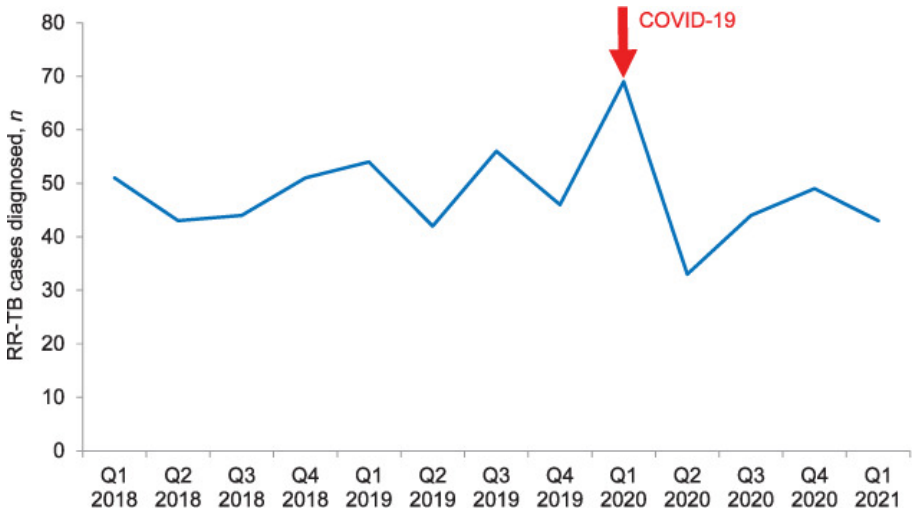
COMMON EMPIRIC AGENTS GIVEN DURING PANDEMIC

Antibiotic Class	**Patients receiving antibiotics with antibiotic class reported (total=153)** **(n, % of total)**
Fluoroquinolones	83 (54.2)
2nd or 3rd Generation Cephalosporins	30 (19.6)
Beta-Lactams	15 (9.8)
Linezolid	9 (5.9)
Macrolides	10 (6.5)
Beta-Lactam/Beta-Lactamase Inhibitors	4 (2.6)
Carbapenems	2 (1.3)

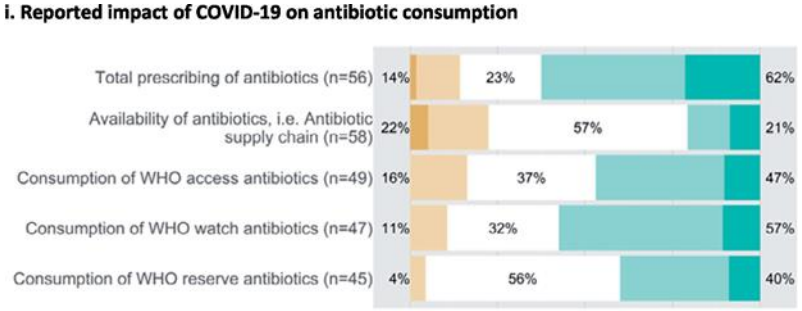
Langford BJ et al. PMID 32711058

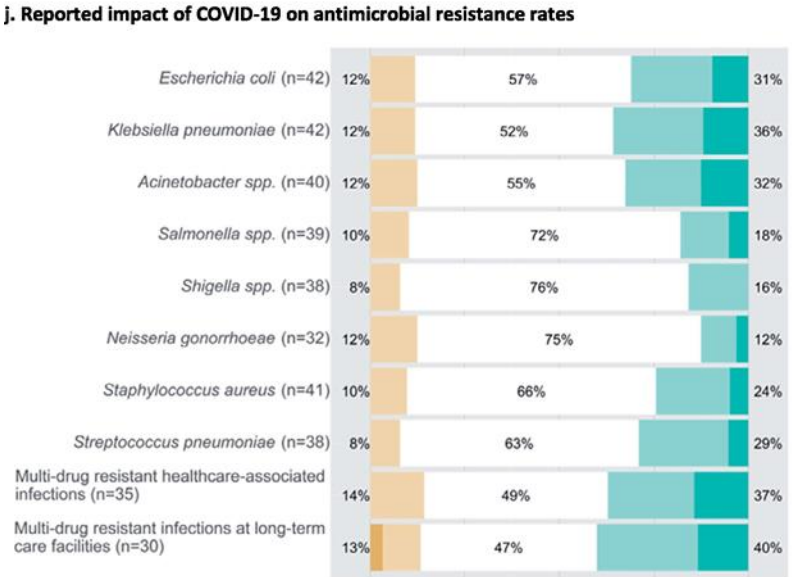
WHAT IMPACT WILL CHANGES RESULTING FROM THE PANDEMIC HAVE ON ABX USAGE?

ABX RESISTANCE RATES



Mohr-Holland E et al. PMID 34802503





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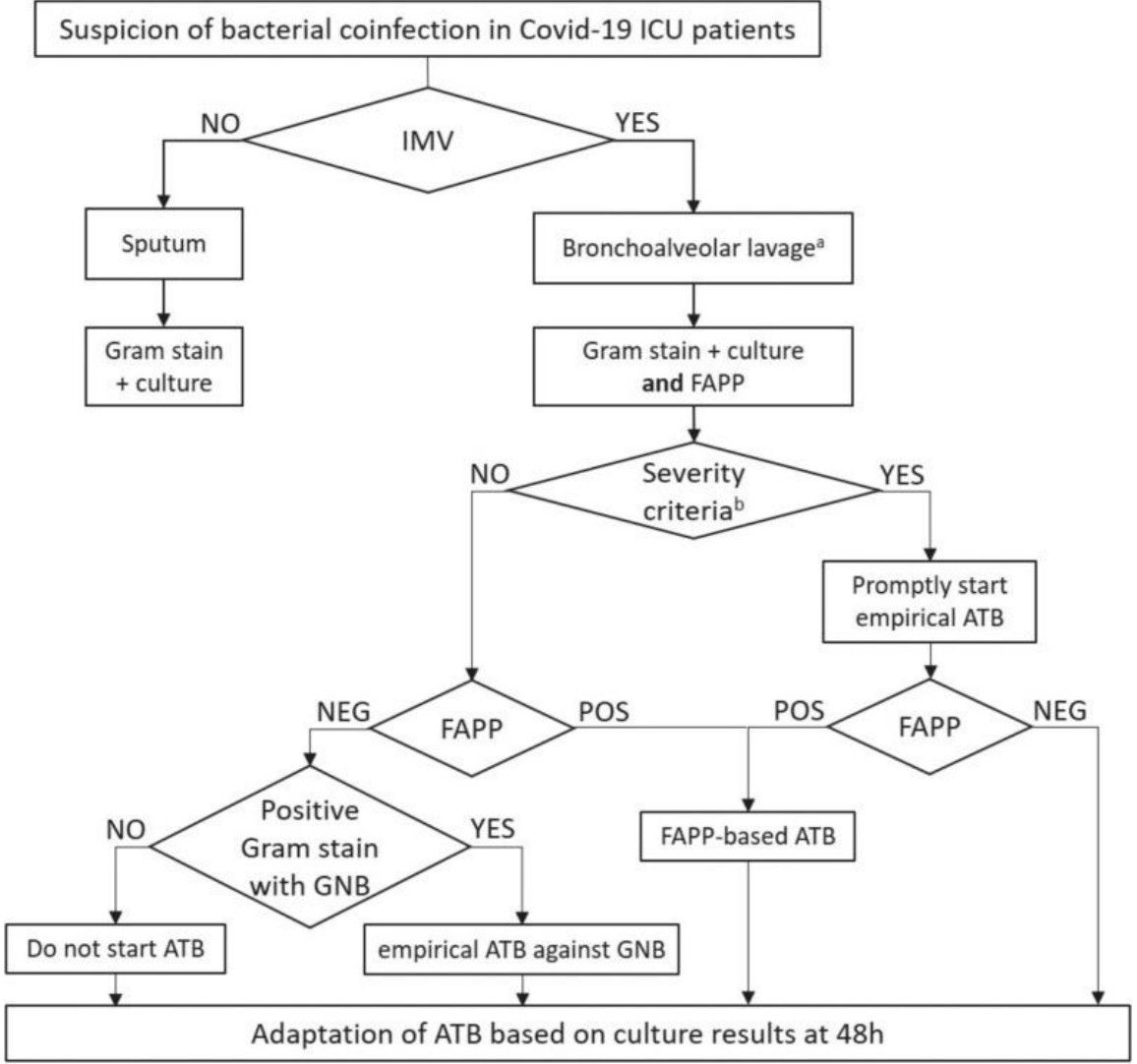
RAPID DIAGNOSTICS AND AMS



Novy E et al. PMID 34364096

DIAGNOSTICS ARE CRITICAL TO STEWARDSHIP, BUT LABORATORY EXPERTISE IS ESSENTIAL FOR INTERPRETATION, AN EXAMPLE

CULTURE-BASED SCREENING

Broth enrichment, direct plating, antibiotic, chromogenic medium?

TSB + Erta
18-24 h

Mac + Erta
18-24 h

TSB + Mero
4 h

MHA+ Mero
18-24 h

Sensitive Broth enrichment w/ Erta

Specific Broth enrichment w/ Mero (mCIM)

48 h for prelim CRE screen, 72 h for confirmatory CP-CRE result

AN IMPORTANT CONSIDERATION TO CULTURE

TABLE 2 Performance characteristics of the various methods to detect carbapenem-resistant organisms and KPC-producing organisms from rectal swabs

Performance characteristic[a]	% (95% CI) by[b]: CDC	Direct MAC	chromID CARBA	Check-Direct CPE screen
Sensitivity				
CROs	55.0 (32.0–76.2)	95.0 (73.1–99.7)	75.0 (50.6–90.4)	
CPOs	40.0 (7.3–83.0)	80.0 (29.9–98.9)	100 (46.3–100)	100 (46.3–100)
Specificity				
CROs	91.7 (86.7–95.0)	91.2 (86.0–94.6)	94.3 (89.8–97.0)	
CPOs	88.0 (82.3–91.9)	84.6 (78.8–89.1)	89.9 (84.8–93.5)	97.6 (94.2–99.1)
PPV				
CROs	40.7 (23.0–61.0)	52.7 (35.7–69.2)	57.7 (37.2–76.0)	
CPOs	7.4 (1.3–25.8)	11.1 (3.6–27.0)	19.2 (7.3–40.0)	50.0 (20.1–79.9)
NPV				
CROs	95.2 (90.7–97.6)	99.4 (96.4–100)	97.3 (93.5–99.0)	
CPOs	98.9 (95.0–99.6)	99.4 (96.4–100)	100 (97.5–100)	100 (97.7–100)

CDC "Broth enriched"

* *Lower sensitivity* than direct plating to MAC or Chromogenic

Overgrowth of *Pseudomonas*, and other erta-R NLFs

Specificity

* Similar between methods (90%)

Low prevalence population (screening)

* PPV for CP-CRE <10%

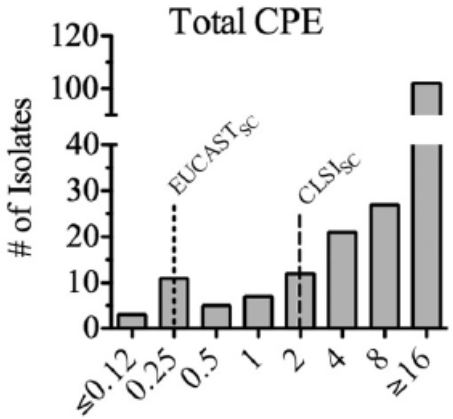
Unnecessary isolation, materials

Simner PJ et al. J Clin Microbiol 2013 (54)6:1664-1667

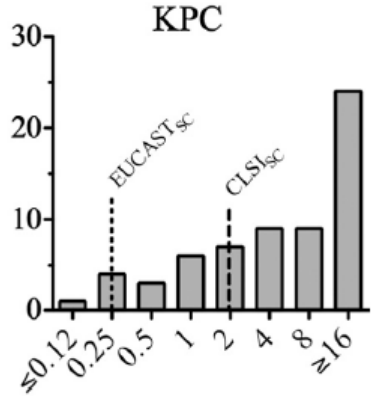
CULTURE-BASED SCREENING

Why do culture methods come up short for detection of KPC and CP-CRE?

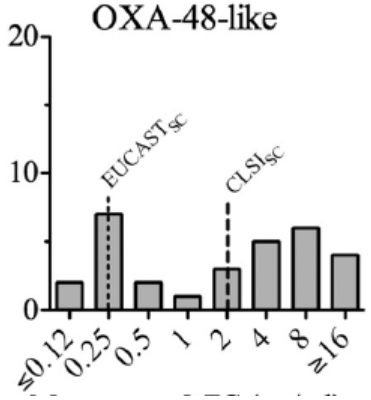
- *Variable expression!*
  - *189 isolates CP Enterbacterales*



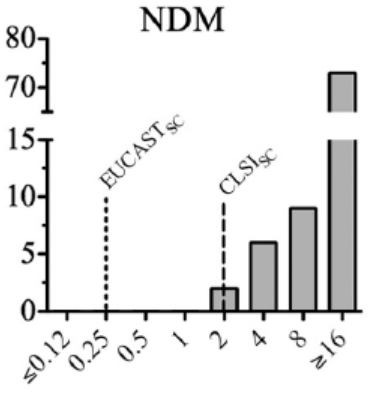
20% of all CP-CRE have MIC categorizing them as **meropenem-susceptible**



25% of all KPC-CRE



40% of all OXA-CRE



0% of all NDM-CRE

DOES A MOLECULAR APPROACH MAKE SENSE?

Strengths and considerations for a molecular approach to screening

- *Speed → On-demand and batch platforms → Result in as little as 2 h*
- *Comprehensive → Molecular multiplexing for major carbapenemase genes*
- *Sensitive → LoD superior to culture*

FDA-cleared

KPC
NDM
VIM
IMP
OXA-48

Xpert vs. Enriched culture: n=633 (383 clinical + 250 contrived)

Target gene	Sensitivity (% [95% CI])	Specificity (% [95% CI])	PPV (%)	NPV (%)
IMP-1	96.3 (81.0–99.9)	100 (99.4–100)	100	99.8
VIM	93.5 (78.6–99.2)	99.8 (99.1–100)	96.7	99.7
NDM	100 (86.8–100)	99.8 (99.1–100)	96.3	100
KPC	96.7 (82.8–99.9)	99.3 (98.3–99.8)	87.9	99.8
OXA-48	95.0 (83.1–99.4)	99.8 (99.1–100)	97.4	99.7

Tato M et al. J Clin Microbiol 2016 54:1814-1819

DOES A MOLECULAR APPROACH MAKE SENSE?

Strengths and considerations for a molecular approach to screening

- *Cost and throughput?*
  - *Lower cost S-R "batch" and manual tests available*

FDA-cleared CPO

KPC
NDM
VIM/IMP
OXA-48

(12/run, 2.5 h)

RUO MDRO panel

KPC
NDM
VIM
IMP
OXA-48

CTX-M
vanA
mcr-1

(3 h)

DOES A MOLECULAR APPROACH MAKE SENSE?

Additional benefits to a molecular approach

- *Rapid differentiation of resistance targets*
  - *Epidemiology*
    - *Surveillance – what resistance is circulating?*
    - *Early recognition of potential outbreak – introduction of uncommon gene e.g. NDM*
  - *Treatment*
    - *Enzyme specificity of "novel" B-lactam/B-lactamase antibiotics*
    - *Metallo vs serine*
  - *May also be used for rapid testing of clinical isolates*

DOES AN ACCURATE MIC CONTRIBUTE TO LAB/ANTIMICROBIAL STEWARDSHIP?

CORRELATION OF ETEST AND BMD

Table 1. Colistin (COL) and Polymyxin B (PB) Isolates (n=143) Found Nonsusceptible (NS) by Etest and Broth Microdilution (BMD) and Essential and Categorical Agreement Between Minimal Inhibitory Concentrations by Organism for Each Method

Organism	# COL-NS by Etest (% R)	# COL-NS by BMD (% R)	Essential Agreement (%)	Categorical Agreement (%)	# PB-NS by Etest (% I or R)	# PB-NS by BMD (% R)	Essential Agreement	Categorical Agreement
Enterobacteriaceae (n=39)	1/39 (3) R	7/39 (18) R	22/39 (56)	33/39 (85)	1/39 (3) R	7/39 (18) R	17/39 (44)	33/39 (85)
Pseudomonas aeruginosa (n=44)	2/44 (5) R	0/44 (0)	21/44 (48)	42/44 (95)	6/44 (14) I/R	0/44 (0)	26/44 (59)	38/44 (86)
Acinetobacter baumannii (n=60)	1/60 (2) R	9/60 (15) R	41/60 (68)	52/60 (87)	0/60 (0)	5/60 (8) R	44/60 (73)	55/60 (92)

I, intermediate; R, resistant.

Simar et al. 2017. Ochsner J. 17:239-242

BMD VERSUS EVERYTHING ELSE

Colistin MIC distributions with reference broth microdilution for 75 Gram-negative bacterial isolates

Organism	Number of isolates	Colistin reference MIC (mg/L)									
		0.25	0.5	1	2	4	8	16	32	64	128
Escherichia coli	14	1	3	1		8	1				
Klebsiella pneumoniae	18		4	2	2		4	4	2		
Pseudomonas aeruginosa	21	1	2	7	2	2	2	3	1		1
Acinetobacter spp.	22		5	6	3			6	2		
Total	75	2	14	16	7	10	7	13	5	0	1

Colistin quality control results per MIC method

Colistin MIC method	Colistin MIC (mg/L)											
	Escherichia coli ATCC 25922					*Pseudomonas aeruginosa* ATCC 27853					*Escherichia coli* NCTC 13846[a]		
	0.125	0.25	0.5	1	2	0.25	0.5	1	2	4	2	4	8
Broth microdilution													
Reference frozen panel			**7**	**1**			**8**				1	7	
Sensititre custom plate		4[b]	**4**			1	**7**					8	
MICRONAUT-S		5	**3**				**4**	**4**				7	1
MICRONAUT MIC-Strip	1	6	**1**				**8**				2	6	
SensiTest			**5**	**1**			**7**					7	
UMIC	3	3	**2**				**5**	**1**			2	7	
Gradient tests													
Etest, Oxoid MH		2	**5**				**7**					8	
Etest, BBL MH	12					4	**8**					8	
Etest, MHE	7				3	4					5	3	
MTS, Oxoid MH				**6**	**1**		**2**	**5**				8	
MTS, BBL MH			**1**	**6**			**4**	**3**				8	

Acceptable ranges are highlighted in grey and results on target values are bold.

[a] *mcr-1* positive.

[b] All four values at ≤0.25 mg/L.

Matuschek et al. 2018. CMI. 24:865-870

EA AND CA FOR COLISTIN MICS

Table 2
Essential and categorical agreements for colistin MIC tests for 75 Gram-negative bacteria with MICs on frozen broth microdilution panels as reference

	Organism	*E. coli* and *K. pneumoniae* (*n*=32)	*P. aeruginosa* (*n*=21)	*Acinetobacter* spp. (*n*=22)	All isolates (*n*=75)
	Colistin reference MIC range (mg/L)	0.25–32	0.25–128	0.5–32	0.25–128
% Essential agreement (EA)[a]	Sensititre custom plate[b]	96	100	91	96
	MICRONAUT-S	97	100	91	96
	MICRONAUT MIC-Strip	97	100	100	99
	SensiTest[c]	96	93	71	88
	UMIC[d]	91	75	77	82
	Etest, Oxoid MH	84	62	59	71
	Etest, BBL MH	63	52	4.5	43
	Etest, MHE	75	43	9.1	47
	MTS, Oxoid MH	59	57	41	53
	MTS, BBL MH	75	57	59	65
% Categorical agreement (CA)[e]	Sensititre custom plate	97	95	91	95
	MICRONAUT-S	94	86	86	89
	MICRONAUT MIC-Strip	94	91	86	91
	SensiTest	94	91	82	89
	UMIC	94	91	91	92
	Etest, Oxoid MH	94	71	73	81
	Etest, BBL MH	94	67	68	79
	Etest, MHE	94	76	82	85
	MTS, Oxoid MH	81	71	82	79
	MTS, BBL MH	84	71	68	76
Number of major errors (ME)[f]	Sensititre custom plate	1	1	2	4
	MICRONAUT-S	2	1	3	6
	MICRONAUT MIC-Strip	2	0	3	5
	SensiTest	2	1	4	7
	UMIC	2	1	0	3
	Etest, Oxoid MH	2	0	0	2
	Etest, BBL MH	1	0	0	1
	Etest, MHE	2	0	0	2
	MTS, Oxoid MH	0	0	0	0
	MTS, BBL MH	0	0	0	0
Number of very major errors (VME)[g]	Sensititre custom plate	0	0	0	0
	MICRONAUT-S	0	2	0	2
	MICRONAUT MIC-Strip	0	2	0	2
	SensiTest	0	1	0	1
	UMIC	0	1	2	3
	Etest, Oxoid MH	0	6	6	12
	Etest, BBL MH	1	7	7	15
	Etest, MHE	0	5	4	9
	MTS, Oxoid MH	6	6	4	16
	MTS, BBL MH	5	6	7	18

[a] MICs being within ± 1 dilution of reference MICs.
[b] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 28 for *E. coli*/*K. pneumoniae* and 19 for *P. aeruginosa*.
[c] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 26 for *E. coli*/*K. pneumoniae*, 15 for *P. aeruginosa* and 17 for *Acinetobacter* spp.
[d] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 20 for *P. aeruginosa*.
[e] Test results with correct susceptibility categorization.
[f] Resistant with test method, susceptible with reference method = false resistant.
[g] Susceptible with test method, resistant with reference method = false susceptible.

Matuschek et al. 2018. CMI. 24:865-870

CEFTAZIDIME-AVIBACTAM AND CEFTOLOZANE-TAZOBACTAM – P. AERUGINOSA AND ENTEROBACTERICEAE

TABLE 2 Essential and categorical agreement between BMD and Etest or disk diffusion for testing susceptibility to ceftazidime-avibactam and ceftolozane-tazobactam[a]

Drug, pathogen (no. of isolates)	BMD			Etest			Disk diffusion	
	Median MIC (μg/ml)[b]	Range of MIC (μg/ml)[b]	No. (%) of resistant isolates	No. (%) of isolates with EA	No. (%) of isolates with CA	No. of errors	No. (%) of isolate with CA	No. of errors
Ceftazidime-avibactam, CRE ($n = 74$)	2	0.25–512	13 (18)	66 (89)	72 (97)	2 (VME)	56 (76)	18 (ME)
Ceftolozane-tazobactam, CRP ($n = 72$)	1	0.5–256	6 (8)	57 (79)	69 (96)	3 (minor)	68 (94)	4 (minor)

[a]BMD, broth microdilution; CA, categorical agreement; CRE, carbapenem-resistant *Enterobacteriaceae*; CRP, carbapenem-resistant *Pseudomonas aeruginosa*; EA, essential agreement; ME, major error; VME, very major error. Minor errors were identified as BMD results that were categorized as resistant or susceptible and Etest/disk diffusion results that were categorized as intermediate. Major errors were identified as BMD results that were categorized as susceptible and Etest/disk diffusion results that were categorized as resistant. Very major errors were identified as BMD results that were categorized as resistant and Etest/disk diffusion results that were categorized as susceptible.

[b]The median ceftazidime-avibactam MIC for *E. coli* ATCC 25922 was 0.25 μg/ml (CLSI reference range, 0.06 to 0.5 μg/ml), and the median ceftolozane-tazobactam MIC for *P. aeruginosa* ATCC 27853 was 0.5 μg/ml (CLSI reference range, 0.25 to 1 μg/ml).

Shields RK et al. 2018. JCM. 56(2).

TIGECYCLINE AND THE PENEMS

Table 1 – Comparison of interpretative results and MIC50 and MIC90 for antimicrobial agents and susceptibility testing methods.

Antimicrobial and method	N° (%) of KPC-producing *Enterobacter* spp. isolates			MIC (μg/mL)	
	Susceptible	Intermediate	Resistant	50	90
Polymyxin B					
Broth microdilution[a]	36 (90)	1 (2.5)	3 (7.5)	0.5	1
Etest® [d]	NA	NA	NA	NA	NA
Vitek 2® automated system[d]	NA	NA	NA	NA	NA
Disc diffusion[c]	39 (97.5)	0 (0)	1 (2.5)	NA[d]	NA[d]
Tigecycline					
Broth microdilution[a]	1 (2.5)	2 (5)	37 (92.5)	4	8
Etest® [a]	8 (20)	26 (65)	6 (15)	1.5	4
Vitek 2® automated system[a]	5 (12.5)	8 (20)	27 (67.5)	4	≥8
Disc diffusion[a]	11 (27.5)	25 (62.5)	4 (10)	NA[d]	NA[d]
Ertapenem					
Broth microdilution[a]	0 (0)	1 (2.5)	39 (97.5)	32	256
Etest® [d]	NA	NA	NA	NA	NA
Vitek 2® automated system[a]	0 (0)	1 (2.5)	39 (97.5)	≥8	≥8
Disc diffusion[a]	0 (0)	0 (0)	40 (100)	NA[d]	NA[d]
Imipenem					
Broth microdilution[b]	4 (10)	2 (5)	34 (85)	16	64
Etest® [d]	NA	NA	NA	NA	NA
Vitek 2® automated system[b]	4 (10)	3 (7.5)	33 (82.5)	≥16	≥16
Disc diffusion[b]	0 (0)	2 (5)	38 (95)	NA[d]	NA[d]
Meropenem					
Broth microdilution[b]	10 (25)	0 (0)	30 (75)	8	32
Etest® [d]	NA	NA	NA	NA	NA
Vitek 2® automated system[b]	10 (25)	0 (0)	30 (75)	8	≥16
Disc diffusion[b]	0 (0)	2 (5)	38 (95)	NA[d]	NA[d]

Note: For the interpretation of antimicrobial susceptibility testing, was used recommendation of the Agência Nacional de Vigilância Sanitária (ANVISA), in Technical Note N° 01/2010.

[a] EUCAST breakpoints.

[b] CLSI breakpoints.

[c] Breakpoints for *Pseudomonas aeruginosa*.

[d] NA, not applicable.

Rechenchoski DZ et al. 2017. BJM. 509-514

TIGECYCLINE, MDR ACINETOBACTER AND THREE METHODS

- Study enrolled 85 MDR *A. baumanii* isolates and compared three methods
  - NO GOLD STANDARD – AT LEAST NOT WELL DESCRIBED
    - 95.2% susceptible by "BMD"
  - BREAKPOINTS USED ARE NOT CLEARLY EXPLAINED – likely using FDA/EMA for *Enterobactericeae*
- Found substantial differences in S vs R call rates based on method

TABLE 1 - *Percentage of susceptible and resistant strains and MIC50 and MIC90 of Tigecycline using the three methods.*

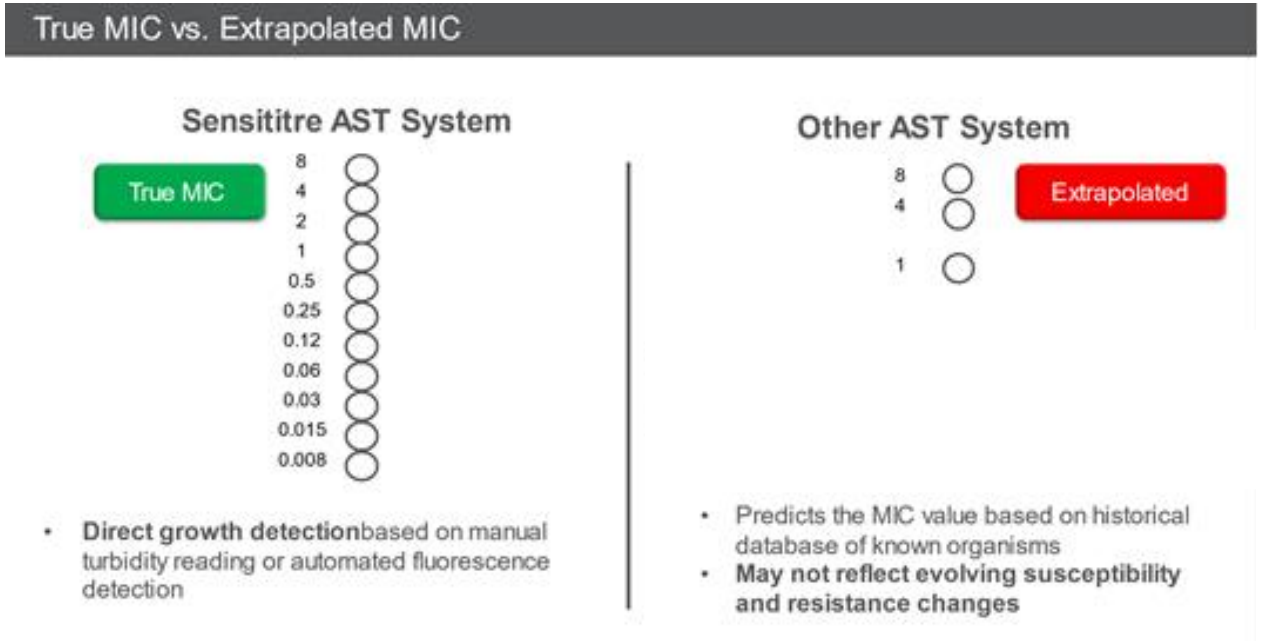
	% of isolates		*MIC (mg/L)*	
	Susceptible	*Resistant*	*50%*	*90%*
Sensititre	95,2	4,8	0,25	1,00
Vitek2	63,0	37,0	1,00	8,00
Etest	10,7	89,3	2,00	16,00

TABLE 2 - *MICs of Tigecycline using the three methods.*

MIC (mg/L)	*Sensititre*	*Vitek2*	*E-test*
0.12	11		
0.25	39		2
0.50	14	22	
1.00	16	31	7
2.00	4	10	41
4.00		2	15
8.00		19	1
16.00			13
32.00			1
128.00			2
256.00			2

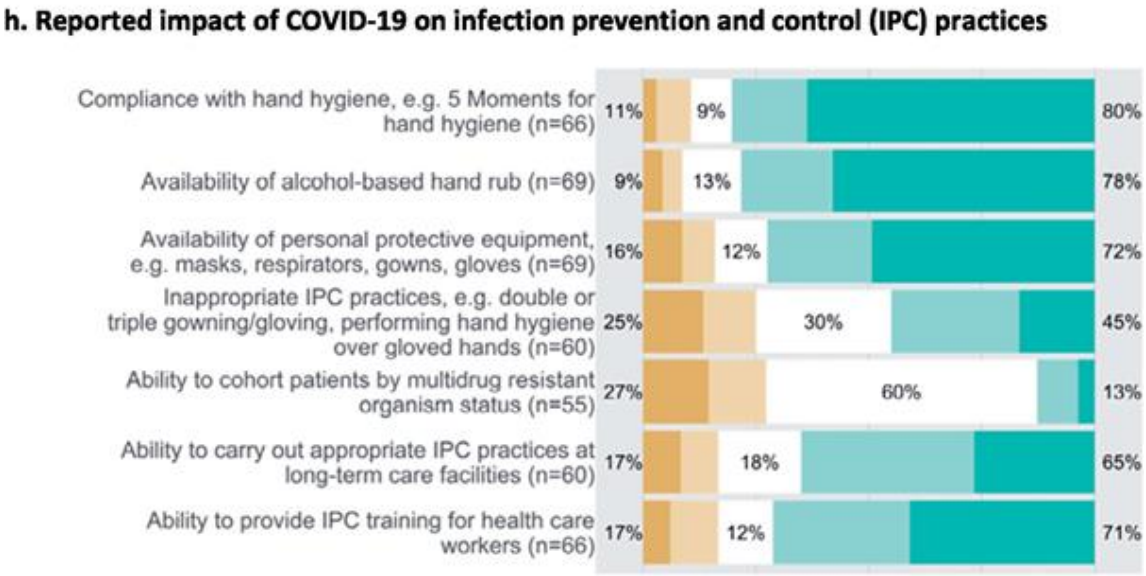
Grandesso S et al. 2014. New Microbiol 37(4):503-508

RANGE OF DILUTIONS MATTERS IN DOSING



BROAD CHANGE AS A RESULT OF THE PANDEMIC WILL TRANSFORM HEALTHCARE AND HAVE AN IMPACT ON AMS

HAVE WE FINALLY CRACKED THE INFECTION CONTROL CHALLENGE?



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AN OPPORTUNITY TO REIMAGINE OURSELVES

Knobloch MJ et al. PMID 33524453