IMPATTO DELLA PANDEMIA DA COVID-19 SULLE ICA: VALUTAZIONI ED OPPORTUNITA' FUTURE

GB ORSI

"Sapienza" Università di Roma

COVID 19 e MDR presentano similarità

- Impatto clinico ed economico

- Limiti nelle opzioni di trattamento

- Obbligo di modifiche di comportamenti per la prevenzione

- Entrambi obbligano ad un approccio multidisciplinare

EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA

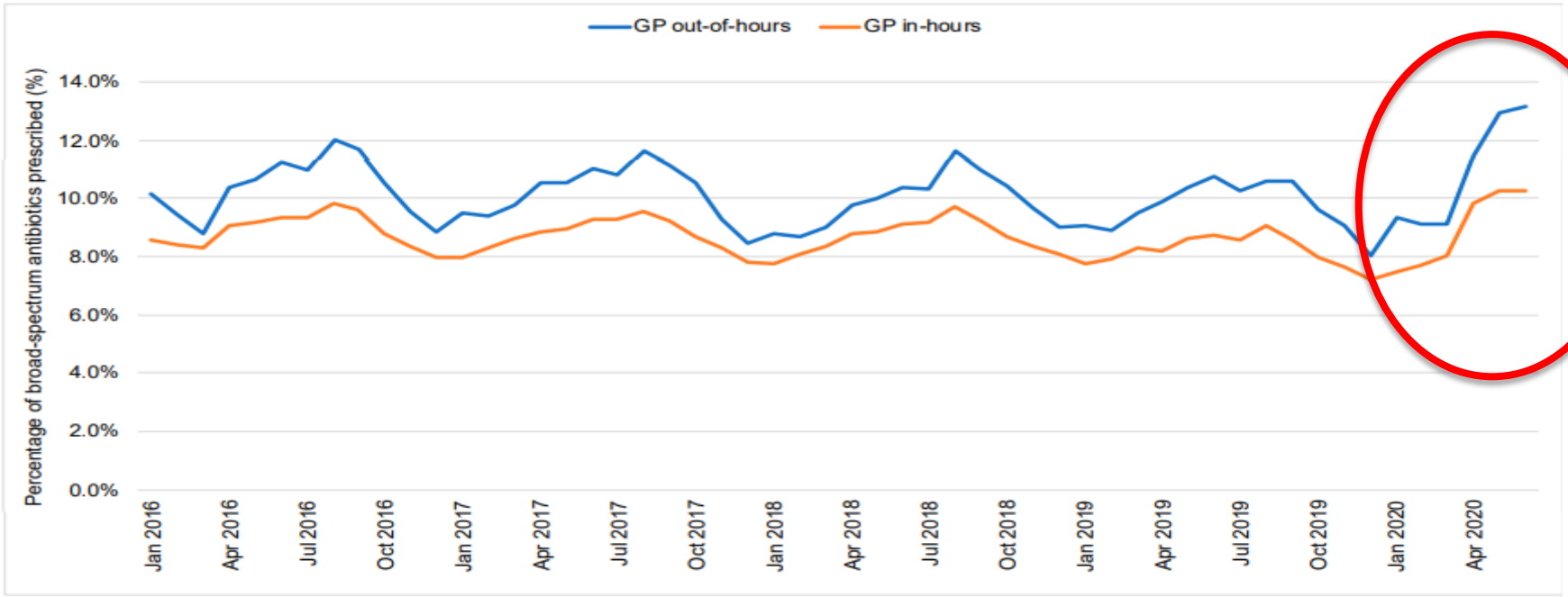


Figure 2. Percentage of broad-spectrum antibiotics prescribed (England, 2016–2020).

Zhu NJ et al. Antibiotics 2020; 1: 32

EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA

Table 1. Changes in overall and intensive care unit (ICU) consumption of anti-infectives for systemic use, 2019–2020.

		DDD/100 Bed-Days				DDD/100 Discharges			
Service	ATC Classification	2019	2020	Variation (%)	*p*	2019	2020	Variation (%)	*p*
Overall	**J01 Antibacterials for systemic use**	69.38	70.99	2.31	<0.001	407.41	424.30	4.15	<0.001
	J01C Penicillins	23.63	21.70	−8.18	<0.001	138.76	129.69	−6.53	<0.001
	J01CR Combinations of penicillins. incl. beta-lactamase inhibitors	18.26	16.80	−7.98	<0.001	107.23	100.44	−6.33	<0.001
	J01DBCDE Cephalosporins	14.10	15.19	7.78	<0.001	82.78	90.82	9.71	<0.001
	J01DD Third-generation cephalosporins	7.56	9.51	25.72	<0.001	44.40	56.82	27.97	<0.001
	J01DE Fourth-generation cephalosporins	0.64	0.65	2.05	0.03	3.75	3.89	3.87	<0.001
	J01DH Carbapenems	5.01	5.16	2.93	<0.001	29.41	30.82	4.77	<0.001
	J01DI Other cephalosporins and penems	0.29	0.37	29.00	<0.001	1.68	2.20	31.32	<0.001
	J01FA Macrolides	3.26	6.69	105.40	<0.001	19.13	40.00	109.08	<0.001
	J01G Aminoglycoside antibacterials	1.82	1.63	−10.72	<0.001	10.69	9.71	−9.12	<0.001
	J01M Quinolone antibacterials	8.48	7.20	−15.01	<0.001	49.77	43.06	−13.49	<0.001
	J01X Other antibacterials	8.89	9.39	5.72	<0.001	52.18	56.15	7.61	<0.001
	J01XA Glycopeptide antibacterials	2.56	2.75	7.43	<0.001	15.01	16.42	9.36	<0.001
	J01XB Polymyxins	0.39	0.34	−12.96	<0.001	2.28	2.02	−11.40	<0.001
	J01XX Other antibacterials	3.70	4.01	8.45	<0.001	21.72	23.98	10.39	<0.001
	J02A Antimycotics for systemic use	3.11	3.43	10.25	<0.001	18.24	20.47	12.22	<0.001
	J02AB Imidazole derivatives	0.00	0.00	−81.25	<0.001	0.03	0.01	−80.99	<0.001
	J02AC Triazole derivatives	2.61	2.81	7.85	<0.001	15.31	16.81	9.78	<0.001
	J02AX Other antimycotics for systemic use	0.39	0.44	14.62	<0.001	2.27	2.64	16.67	<0.001

Grau S et al. Antibiotics 2021; 10: 943

• EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA

Table 1. Changes in overall and intensive care unit (ICU) consumption of anti-infectives for systemic use, 2019–2020.

ICU	**J01 Antibacterials for systemic use**	114.23	112.77	−1.28	<0.001	508.18	627.21	23.42	<0.001
	J01C Penicillins	32.92	27.40	−16.78	<0.001	146.46	152.38	4.04	<0.001
	J01CR Combinations of penicillins. incl. beta-lactamase inhibitors	23.24	18.74	−19.35	<0.001	103.37	104.23	0.84	0.21
	J01DBCDE Cephalosporins	17.26	18.20	5.46	<0.001	76.80	101.26	31.84	<0.001
	J01DD Third-generation cephalosporins	12.11	13.78	13.82	<0.001	53.87	76.66	42.30	<0.001
	J01DE Fourth-generation cephalosporins	1.20	1.98	65.04	<0.001	5.35	11.03	106.35	<0.001
	J01DH Carbapenems	14.66	14.02	−4.32	<0.001	65.20	77.99	19.62	<0.001
	J01DI Other cephalosporins and penems	0.87	1.19	36.09	<0.001	3.88	6.60	70.13	<0.001
	J01FA Macrolides	7.62	13.60	78.44	<0.001	33.90	75.62	123.09	<0.001
	J01G Aminoglycoside antibacterials	4.11	3.88	−5.64	<0.001	18.30	21.58	17.97	<0.001
	J01M Quinolone antibacterials	9.33	8.18	−12.39	<0.001	41.52	45.48	9.54	<0.001
	J01X Other antibacterials	19.34	19.67	1.69	0.01	86.04	109.38	27.13	<0.001
	J01XA Glycopeptide antibacterials	5.41	5.65	4.49	<0.001	24.07	31.45	30.64	<0.001
	J01XB Polymyxins	1.17	1.64	40.27	<0.001	5.20	9.11	75.36	<0.001
	J01XX Other antibacterials	10.46	10.82	3.40	<0.001	46.55	60.18	29.28	<0.001
	J02A Antimycotics for systemic use	12.35	11.81	−4.35	<0.001	54.93	65.68	19.58	<0.001
	J02AB Imidazole derivatives	0.00	0.00	-	-	0.00	0.00	-	-
	J02AC Triazole derivatives	8.91	8.36	−6.17	<0.001	39.62	46.48	17.31	<0.001
	J02AX Other antimycotics for systemic use	3.00	2.79	−6.96	<0.001	13.36	15.54	16.33	<0.001

Grau S et al. Antibiotics 2021; 10: 943

EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA

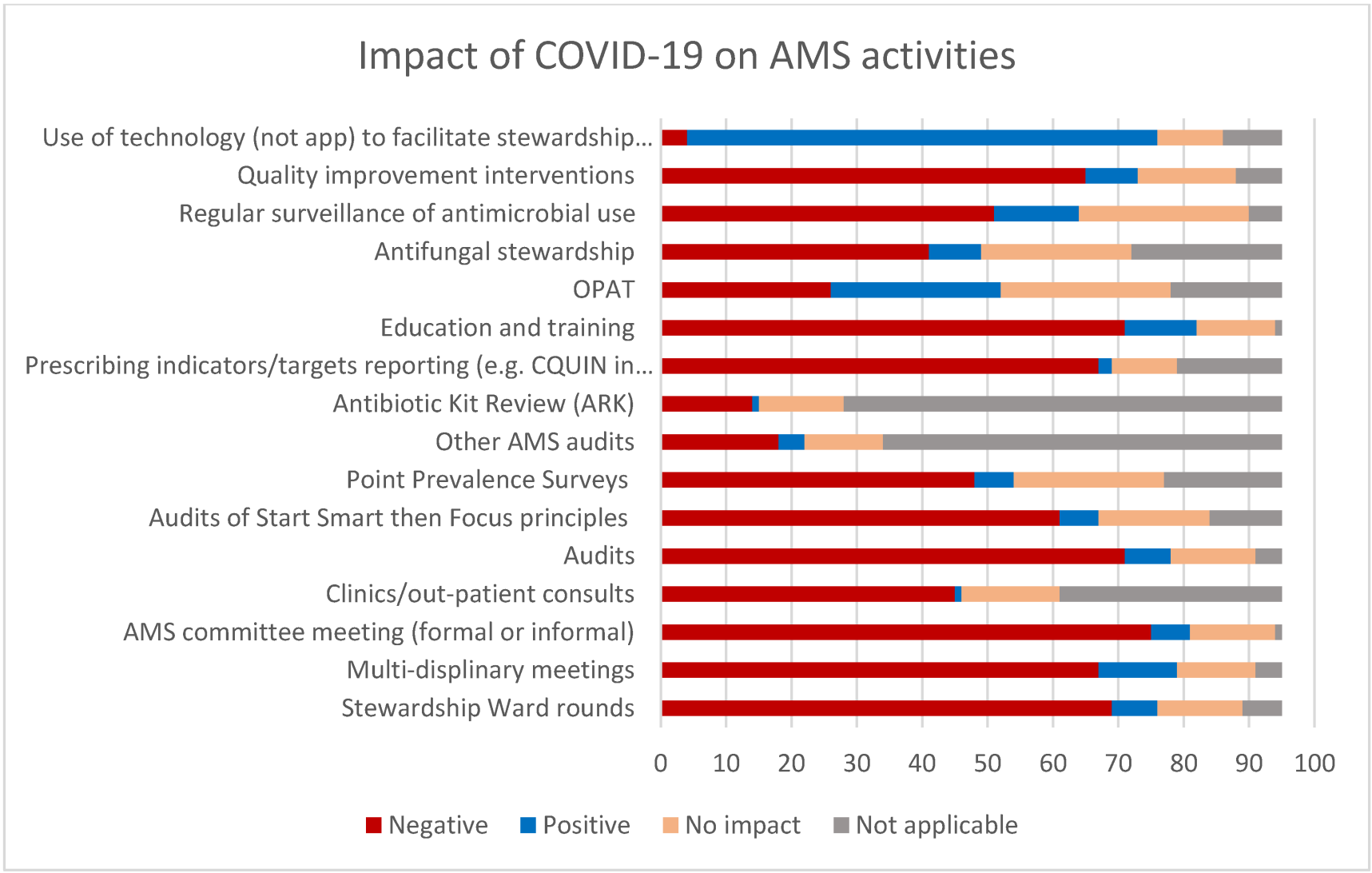
Table 2. Changes in intensive care unit (ICU) consumption of major anti-infectives for systemic use 2019–2020.

	ICU DDD/100 Bed-Days				ICU DDD/100 Discharges			
ATC Classification	**2019**	**2020**	**Variation (%)**	***p***	**2019**	**2020**	**Variation (%)**	***p***
J02AA01 Amphotericin B	0.44	0.66	50.34	<0.001	1.95	3.67	87.98	<0.001
J01GB06 Amikacin	2.12	2.22	4.91	0.02	9.43	12.37	31.16	<0.001
J01CR02 Amoxicillin and beta-lactamase inhibitor	12.94	9.13	−29.42	<0.001	57.58	50.81	−11.76	<0.001
J02AX06 Anidulafungin	1.93	1.95	1.40	0.52	8.57	10.86	26.77	<0.001
J01FA10 Azithromycin	2.77	8.32	200.01	<0.001	12.34	46.28	275.09	<0.001
J02AX04 Caspofungin	0.38	0.45	20.13	<0.001	1.68	2.52	[illegible]	<0.001
J01DE01 Cefepime	1.20	1.98	65.04	<0.001	5.35	11.03	106.35	<0.001
J01DI02 Ceftaroline fosamil	0.43	0.31	−28.21	<0.001	1.91	1.71	[illegible]	0.03
J01DD02 Ceftazidime	2.28	2.20	−3.89	0.05	10.17	12.21	20.16	<0.001
J01DD52 Ceftazidime and beta-lactamase inhibitor	0.33	0.58	77.11	<0.001	1.46	3.23	121.47	<0.001
J01DI54 Ceftolozane and beta-lactamase inhibitor	0.44	0.88	98.22	<0.001	1.97	4.89	147.81	<0.001
J01DD04 Ceftriaxone	6.61	8.19	24.07	<0.001	29.38	45.58	55.11	<0.001
J01MA02 Ciprofloxacin	3.31	3.47	4.72	0.01	14.73	19.28	30.92	<0.001
J01CF02 Cloxacillin	7.56	6.45	−14.69	<0.001	33.62	35.86	6.66	<0.001
J01XB01 Colistin	1.17	1.64	40.27	<0.001	5.20	9.11	75.36	<0.001
J01XA04 Dalbavancin	0.00	0.00	57.14	0.68	0.00	0.01	96.67	0.53
J01XX09 Daptomycin	5.26	5.53	5.13	<0.001	23.42	30.78	31.44	<0.001
J01DH03 Ertapenem	1.45	1.27	−12.83	<0.001	6.46	7.04	8.99	<0.001
J02AC01 Fluconazole	7.19	6.17	−14.12	<0.001	31.98	34.34	7.37	<0.001
J01DH51 Imipenem-cilastatin	1.02	0.70	−31.62	<0.001	4.54	3.89	−14.50	<0.001
J02AC05 Isavuconazole	0.34	0.29	−14.33	<0.001	1.52	1.63	7.10	0.20
J01XX08 Linezolid	4.81	5.06	5.01	<0.001	21.42	28.12	31.28	<0.001
J01DH02 Meropenem	12.18	12.06	−1.02	0.24	54.19	67.06	23.75	<0.001
J02AX05 Micafungin	0.70	0.39	−44.67	<0.001	3.10	2.14	−30.81	<0.001
J01CR05 Piperacillin and beta-lactamase inhibitor	10.29	9.61	−6.68	<0.001	45.79	53.43	16.68	<0.001
J02AC04 Posaconazole	0.25	0.09	−63.53	<0.001	1.12	0.51	−54.39	<0.001
J01XA01 Vancomycin	2.76	2.87	3.83	0.04	12.30	15.97	29.81	<0.001
J02AC03 Voriconazole	1.12	1.76	56.92	<0.001	4.99	9.80	96.17	<0.001

ICU: Intensive care unit; DDD: Defined daily doses; ATC: Anatomical therapeutic chemical.

Grau S et al. Antibiotics 2021; 10: 943

LIMITI SULLE CONOSCENZE DELL'APPROPRIATO USO DEGLI ANTIBIOTICI



Ashiru-Oredope D et al. Antibiotics 2021; 10: 110

WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS)

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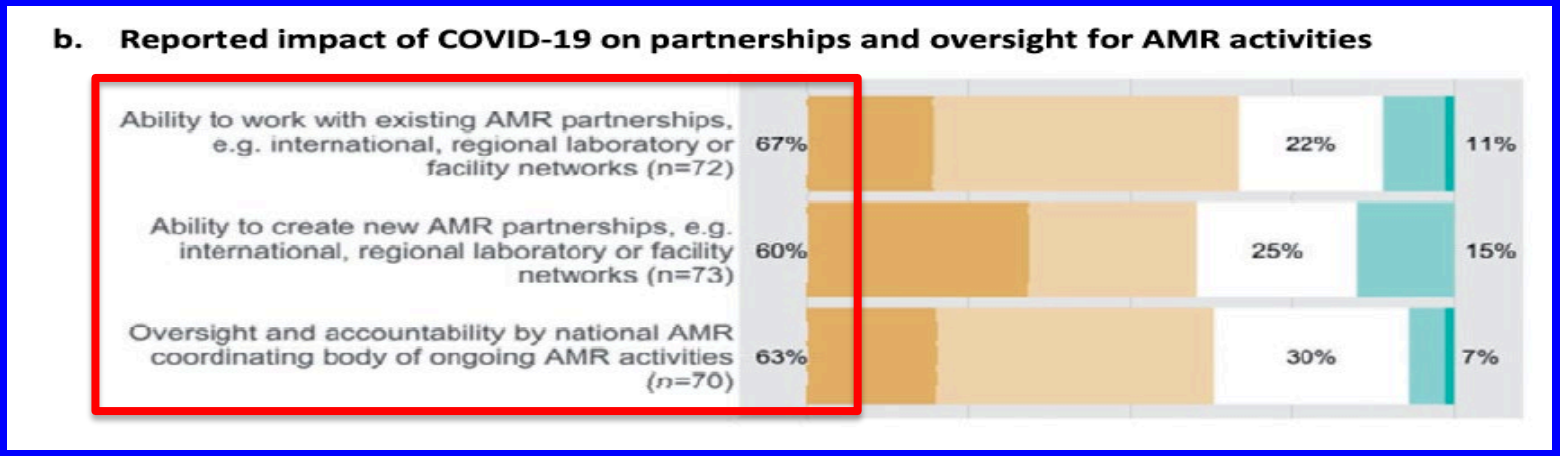
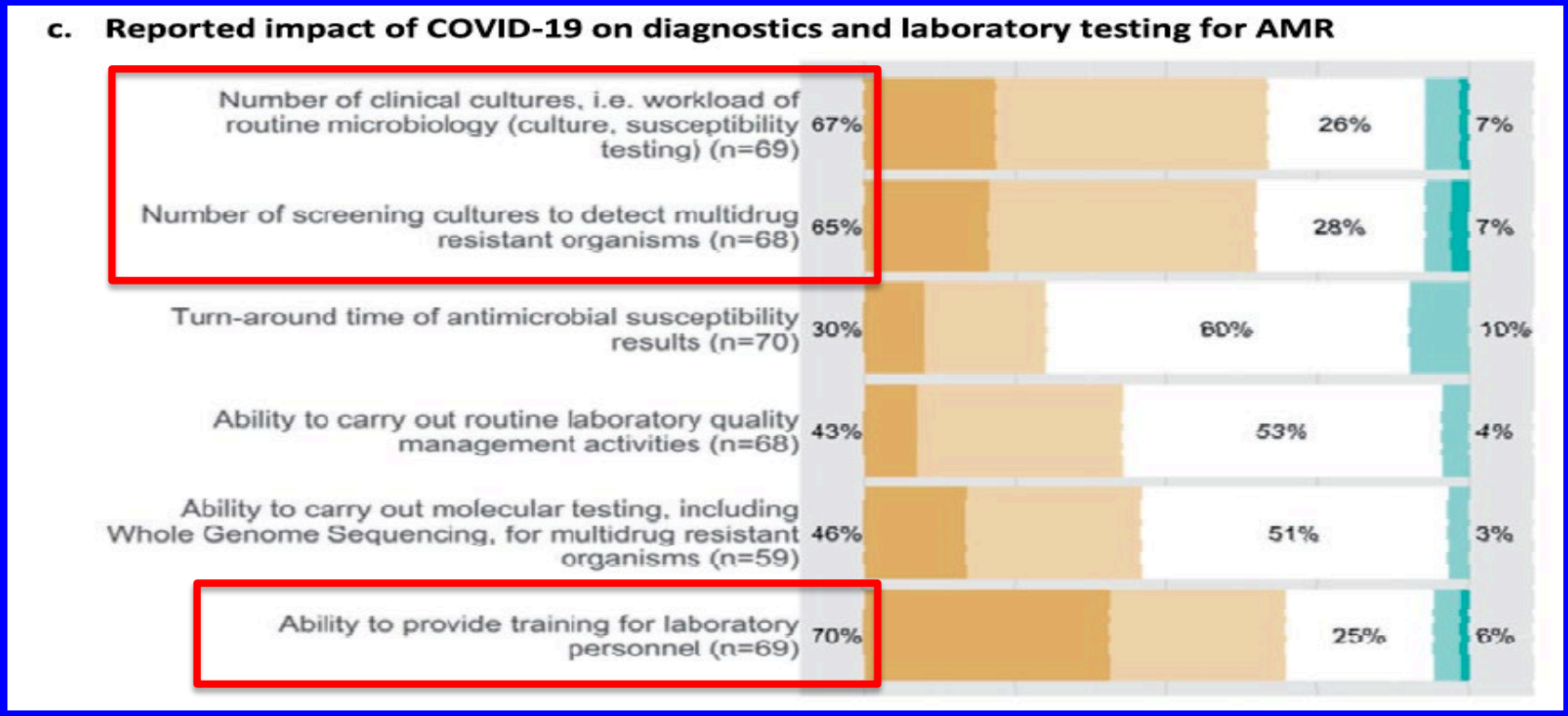
QUESTIONARIO INVIATO AI REFERENTI NAZIONALI DEI PAESI PARTECIPANTI AL GLASS DA OTTOBRE A DICEMBRE 2020 (73 NAZIONI)

Tomczyk S et al. J Antimicrob Chemother 2021





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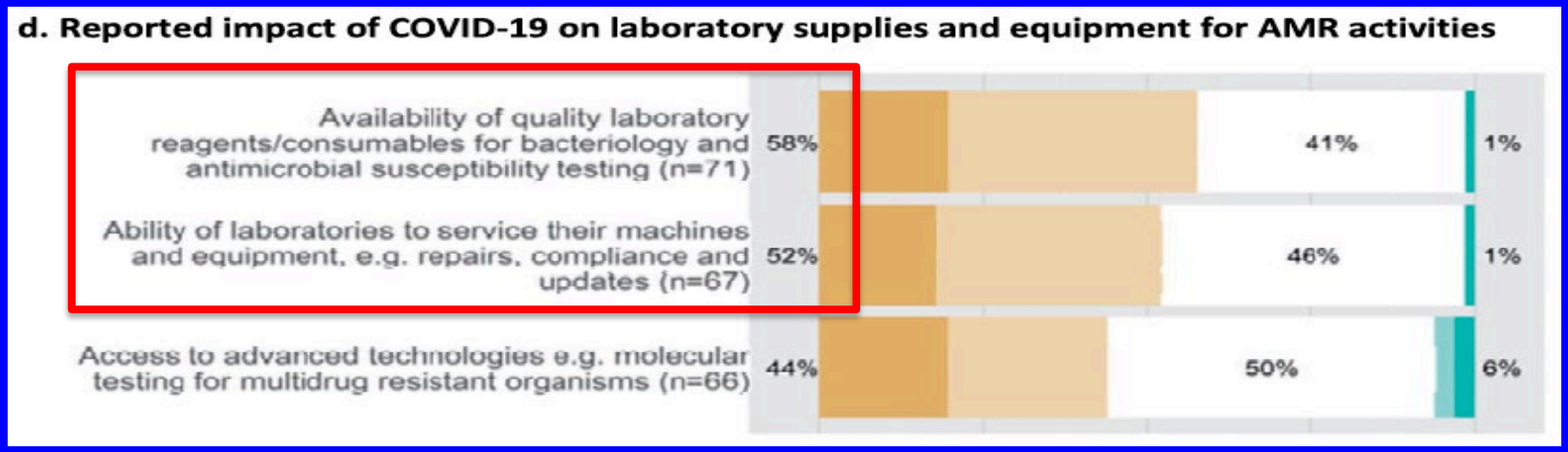

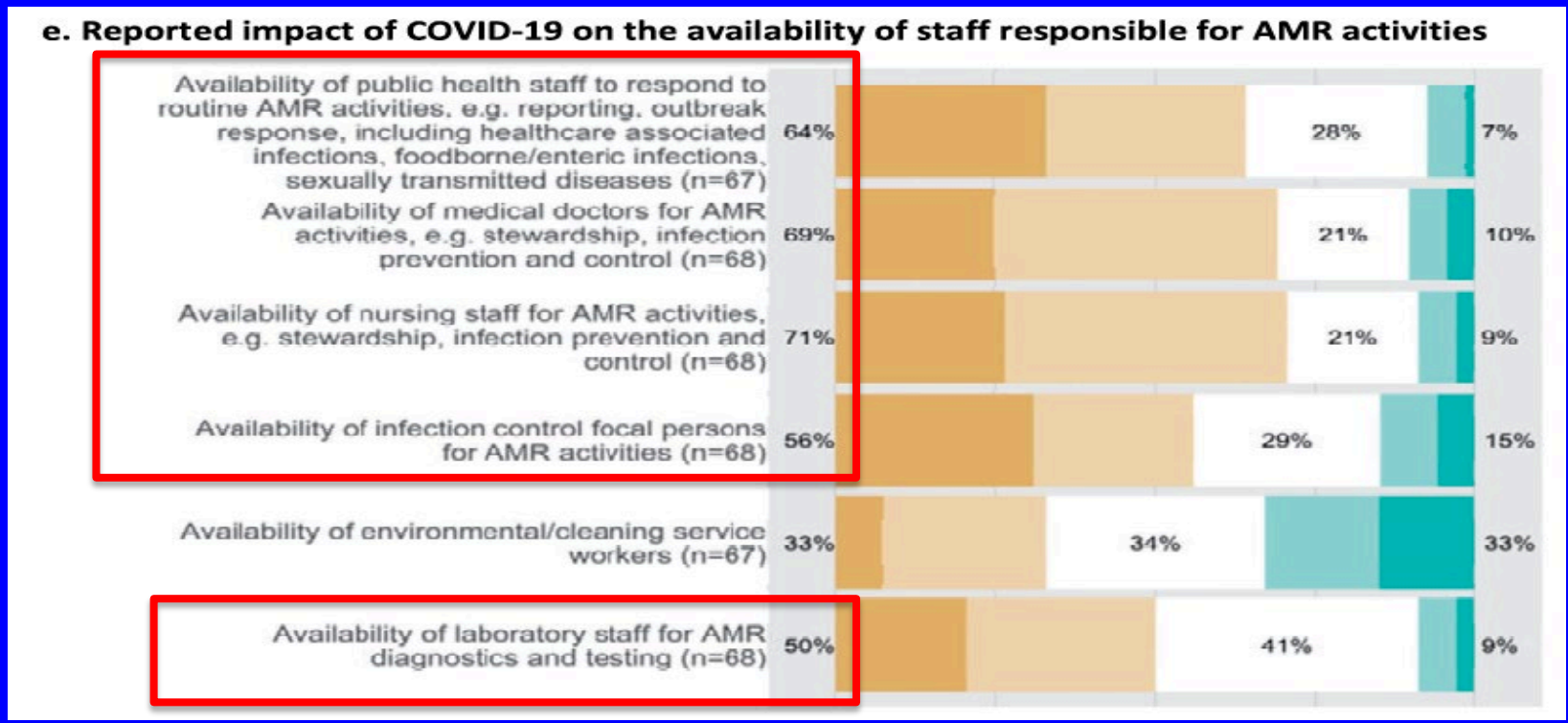

Tomczyk S et al. J Antimicrob Chemother 2021

g. Reported impact of COVID-19 on patient-case mix

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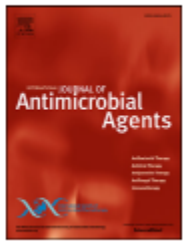

Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial ☆

Philippe Gautret[a,b,$], Jean-Christophe Lagier[a,c,$], Philippe Parola[a,b], Van Thuan Hoang[a,b,d], Line Meddeb[a], Morgane Mailhe[a], Barbara Doudier[a], Johan Courjon[e,f,g], Valérie Giordanengo[h], Vera Esteves Vieira[a], Hervé Tissot Dupont[a,c], Stéphane Honoré[i,j], Philippe Colson[a,c], Eric Chabrière[a,c], Bernard La Scola[a,c], Jean-Marc Rolain[a,c], Philippe Brouqui[a,c], Didier Raoult[a,c,*]

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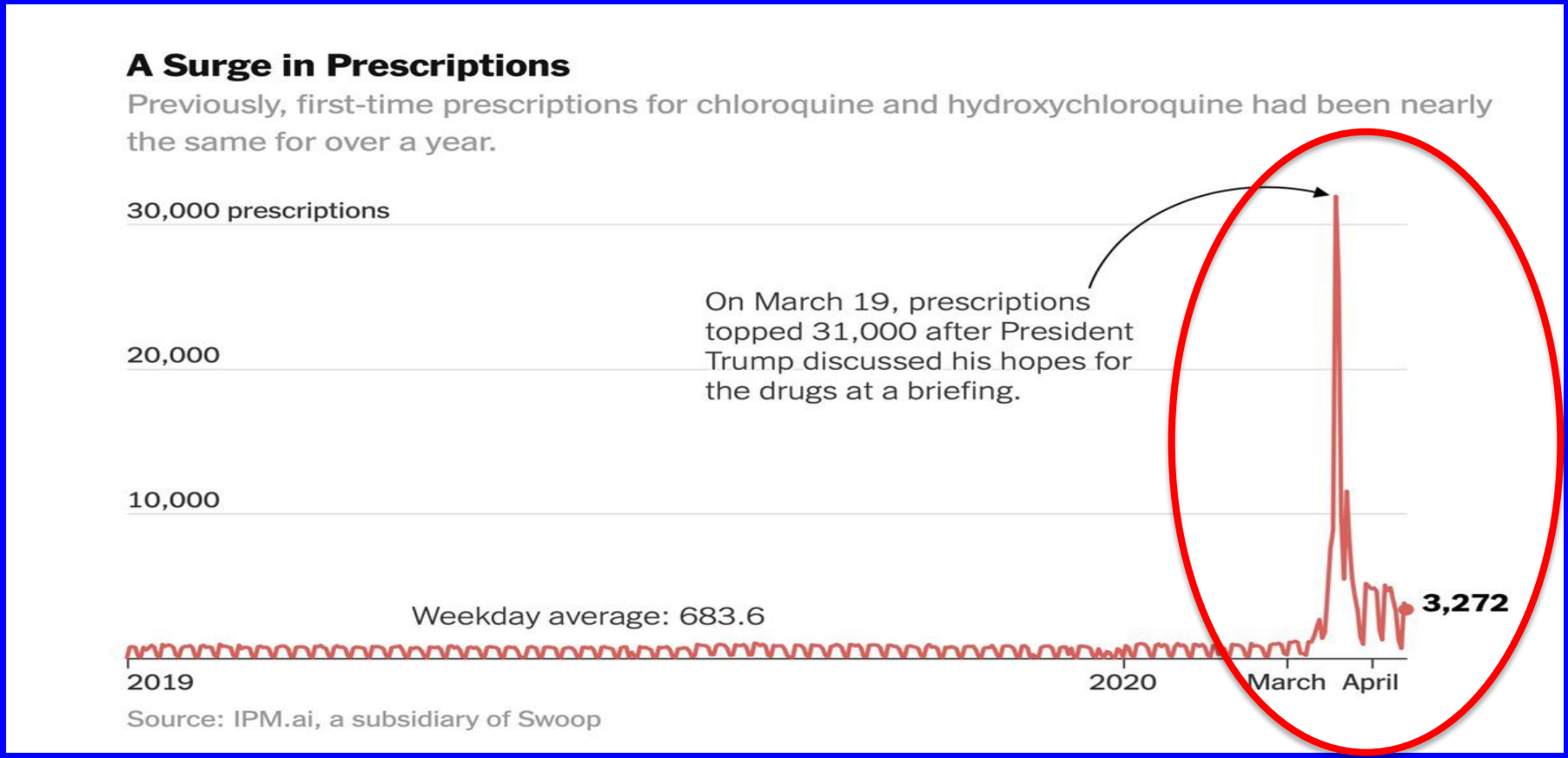
EFFETTO DEI MEDIA E DISINFORMAZIONE

EFFETTO DEI MEDIA E DISINFORMAZIONE



The impact of coronavirus disease 2019 (COVID-19) on healthcare-associated infections in 2020: A summary of data reported to the National Healthcare Safety Network

	2020 Q1	2020 Q2	2020 Q3	2020 Q4
CLABSI	↓ −11.8%	↑ 27.9%	↑ 46.4%	↑ 47.0%
CAUTI	↓ −21.3%	No Change[1]	↑ 12.7%	↑ 18.8%
VAE	↑ 11.3%	↑ 33.7%	↑ 29.0%	↑ 14.8%
SSI: Colon surgery	↓ −9.1%	No Change[1]	↓ −6.9%	↓ −8.3%
SSI: Abdominal hysterectomy	↓ −16.0%	No Change[1]	No Change[1]	↓ −13.1%
Laboratory-identified MRSA bacteremia	↓ −7.2%	↑ 12.2%	↑ 22.5%	↑ 23.8%
Laboratory-identified CDI	↓ −17.5%	↓ −10.3%	↓ −8.8%	↓ −5.5%

Weiner-Lastinger LM et al. Infect Control Hosp Epidemiol 2021;

Table 2. Effect of an Increase In Number of COVID-19 Discharges on HAIs and Hospital-Onset Pathogens

Event	Effect	Total	Median (IQR)	Relative Rate (95% CI)	P Value
CLABSI	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	440	0 (0–1)	1.14 (1.09, 1.19)	<.001
	Beds <200			Ref	
	Beds 200–299			2.14 (1.42, 3.23)	<.001
	Beds ≥300			2.43 (1.66, 3.56)	<.001
CAUTI	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	282	0 (0–0)	1.09 (1.04, 1.15)	.001
	Beds <200			Ref	
	Beds 200–299			2.13 (1.39, 3.28)	.001
	Beds ≥300			1.84 (1.27, 2.67)	.002
CDI	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	658	0 (0–1)	0.97 (0.93, 1.02)	.247
	Beds <200			Ref	
	Beds 200–299			3.37 (2.29, 4.96)	<.001
	Beds ≥300			3.17 (2.09, 5.01)	<.001
MRSA BSI	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	298	0 (0–0)	1.09 (1.04, 1.14)	.001
	Beds <200			Ref	
	Beds 200–299			2.05 (1.28, 3.28)	.003
	Beds ≥300			2.18 (1.26, 3.76)	.005
BSI	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	2911	2 (1–5)	1.05 (1.03, 1.07)	<.001
	Beds <200			Ref	
	Beds 200–299			3.19 (2.37, 4.30)	<.001
	Beds ≥300			7.03 (5.29, 9.34)	<.001
MDRO	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	5097	5 (2–8)	1.05 (1.04, 1.07)	<.001
	Beds <200			Ref	
	Beds 200–299			3.01 (2.31, 3.93)	<.001
	Beds ≥300			5.44 (4.21, 7.03)	<.001
MRSA	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	1944	2 (0–3)	1.06 (1.04, 1.08)	<.001
	Beds <200			Ref	
	Beds 200–299			2.79 (2.02, 3.87)	<.001
	Beds ≥300			4.44 (3.25, 6.07)	<.001
VRE	Per 0.1 increase in the monthly number of COVID-19 discharges per staffed bed	583	0 (0–1)	1.04 (1.01, 1.08)	.016
	Beds <200			Ref	
	Beds 200–299			2.88 (1.75, 4.75)	<.001
	Beds ≥300			5.05 (3.13, 8.13)	<.001

Baker MA et al Clin Infect Dis 2022; 74 (10): 1748-54

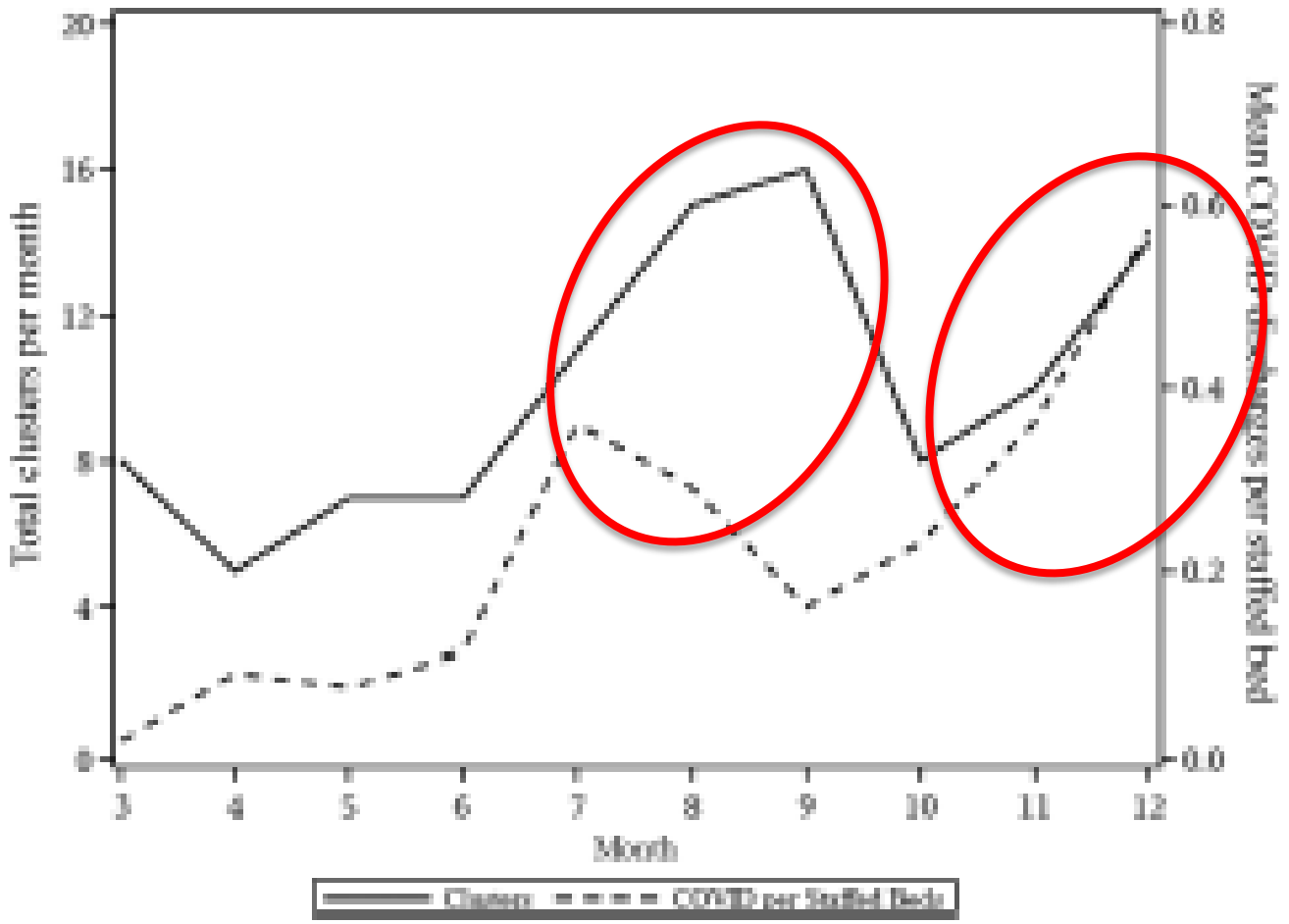


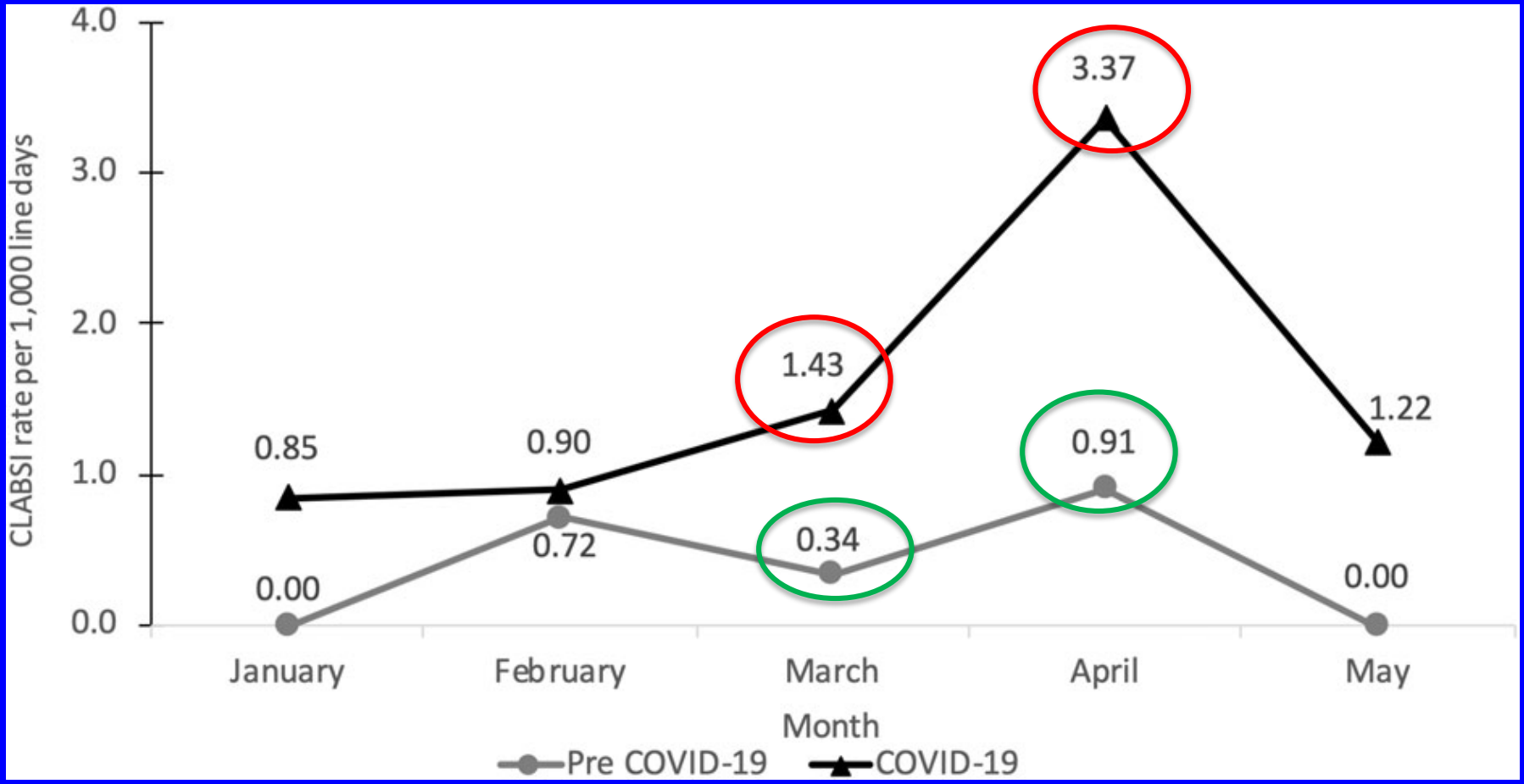
Figure 3. Monthly comparison of COVID discharges to clusters. COVID-19 discharges and the number of clusters of hospital-onset pathogens are correlated throughout the pandemic. Abbreviation: COVID-19, coronavirus disease 2019.

Baker MA et al Clin Infect Dis 2022; 74 (10): 1748-54

Characteristic	COVID (n = 20 mo)		NON-COVID (n = 60 mo)		Kruskal-Wallis
	Median	IQR	Median	IQR	*P* value
Patient d	12453	7522-21271.5	13288	7623.5-21326	.96
CLABSI per 1,000 patient d	0.24	0.13-0.36	0.13	0.049-0.18	***.0082***
CLABSI per 1,000 device d	0.82	0.57-1.68	0.62	0.20-0.93	***.020***
CLABSI SUR	0.88	0.75-1.09	0.88	0.68-0.098	.11
CAUTI per 1,000 patient d	0.17	0.10-0.34	0.13	0.046-0.18	.052
CAUTI per 1,000 device d	1.23	0.72-2.31	1.03	0.38-1.50	.11
CAUTI SUR	0.74	0.69-0.78	0.64	0.61-0.69	***.0022***
MRSA per 1,000 patient d	0.022	0-0.11	0.00	0-0.053	.46
Total Infections per 1,000 patient d	1.06	0.73-1.43	0.80	0.66-1.01	***.017***
Percent of hours that are premium pay	5.3%	3.8%-7.0%	4.1%	2.4%-5.4%	***.0022***
RN hours per adjusted patient d	27.4	24.1-31.3	23.8	22.7-25.9	***.0003***
Overtime h	273	139-462	372	138-424	.61
Agency h	204	84.5-390	138	18.2-204	***.0080***
Percent premium pay that was agency h	46.0%	35.3%-49.2%	25.4%	13.1%-32.1%	***<.0001***
CDIFF per 1,000 patient d*	0.55	0.28	0.52	0.19	.67

*t-test used means and standard deviation shown.

Halverson T et al Am J Infect Control 2022; 50: 831-33



Central-line–associated bloodstream infections per 1,000 central-line days between January through May. The pre–COVID-19 cohort had 6 central-line bloodstream infections (CLABSIs) per 15,026 central-line days, and the COVID-19 cohort had 30 CLABSIs per 18,106 central-line days. The change in the CLABSI rate was statistically significant at $P < .05$.

LeRose et Al. Infect Control Hosp Epidemiol. 2021 Aug;42(8):997-1000

Table 1
Comparison of pooled HAI rates per 1,000 device days and relative risk in ICUs of 7 INICC hospitals from LMICs in 2019 and 2020.

HAI type	2019 Device days, n	2019 HAIs, n	2019 HAI rate	2020 Device days, n	2020 HAIs, n	2020 HAI rate	RR[a]	95% CI[a]	P-value
CLAB[a]	36,652 CL[a] days	93 CLABs	2.54 CLAB per 1,000 CL days	9,515 CL days	45 CLABs	4.73 CLAB per 1,000 CL days	1.85	1.30-2.65	.0006
VAE[a]	13,801 MV[a] days	134 VAEs	9.71 VAE per 1,000 MV days	4,611 MV days	58 VAEs	12.58 VAE per 1,000 MV days	1.29	0.95-1.75	.10
CAUTI[a]	24,919 UC[a] days	41 CAUTIs	1.64 CAUTI per 1,000 UC days	7,653 UC days	11 CAUTIs	1.43 CAUTI per 1,000 UC days	1.14	0.58-2.22	.69

Acute care hospitals were located in India, Mongolia, Jordan, Turkey, Egypt, Palestine, and Lebanon.
CAUTI = catheter associated urinary tract infection; CI = confidence interval; CL = central line; CLAB = central line–associated bloodstream infection; HAI = health care–associated infection; ICU = intensive care unit; INICC = International Nosocomial Infection Control Consortium; LMIC = low- and medium-income country; MV = mechanical ventilator; RR = relative risk; UC = urinary catheter; VAE = ventilator-associated event.

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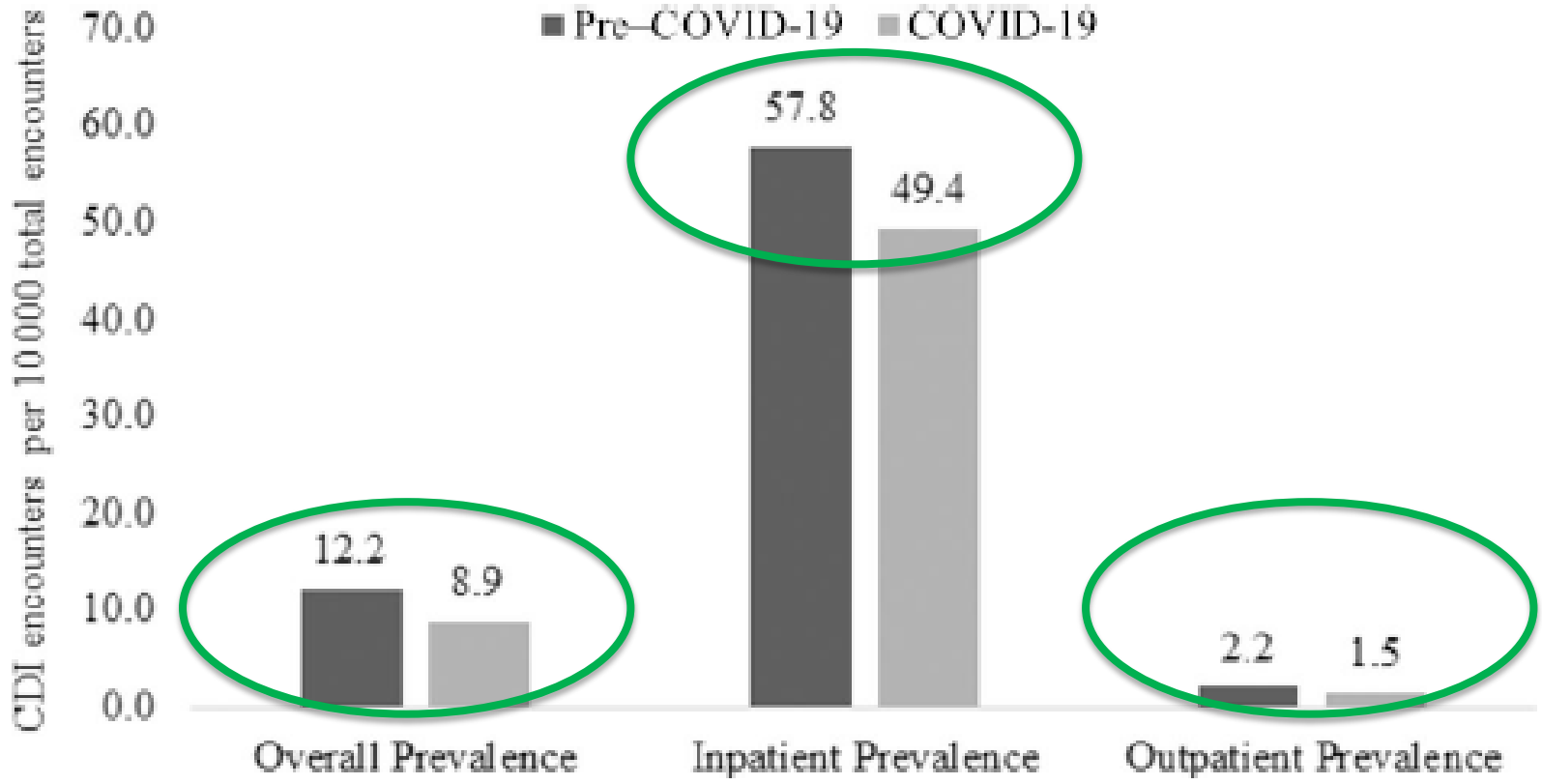
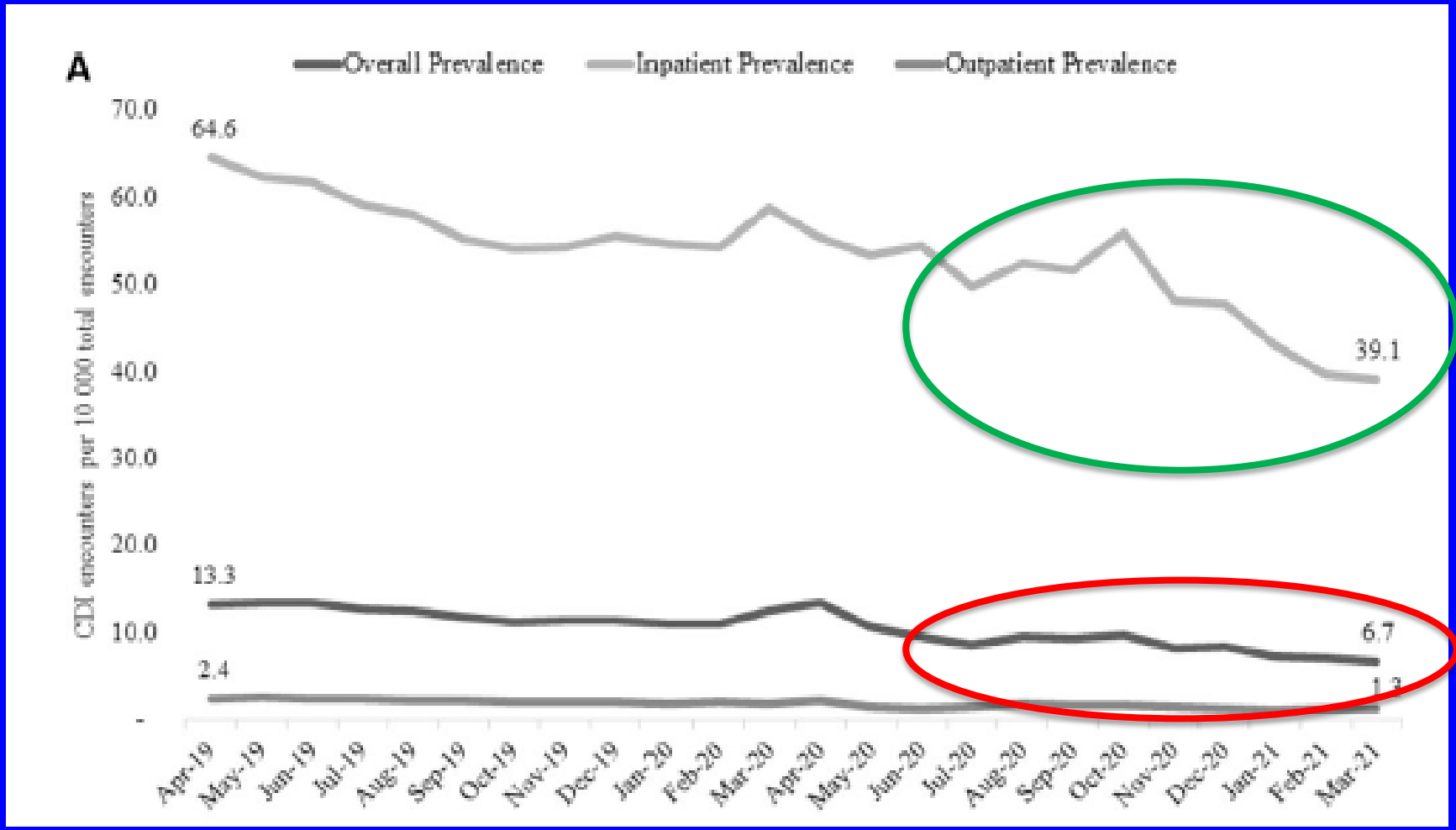


Figure 1. *Clostridioides difficile* infection (CDI) prevalence in the pre–coronavirus disease 2019 (COVID-19) and COVID-19 periods.

Reveles KR et al Open Forum Infect Dis 2022; 9 (9)



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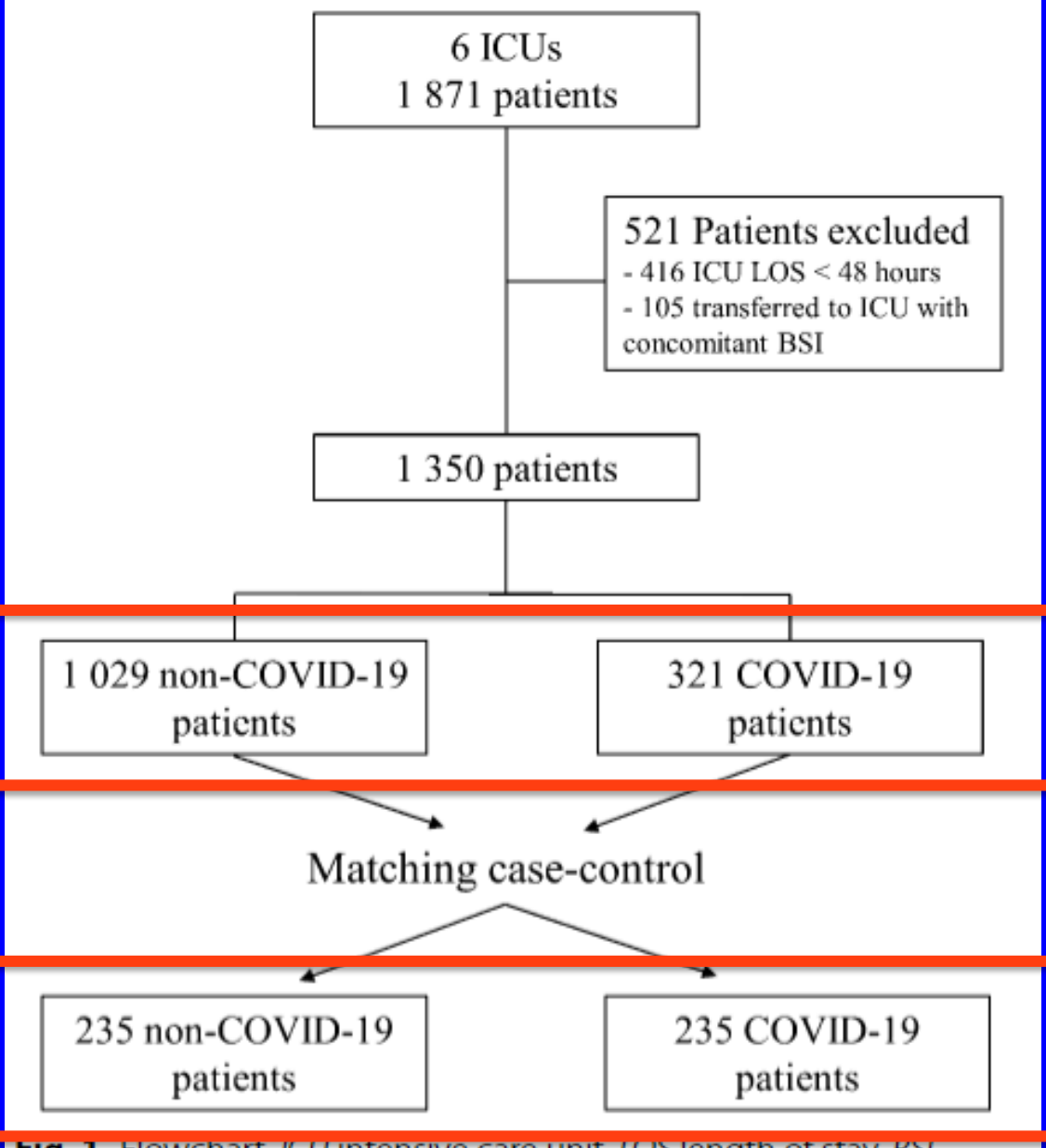

Fig. 1 Flowchart. *ICU* intensive care unit, *LOS* length of stay, *BSI* bloodstream infection

Buetti N et al. Intensive Care Med 2021; 47 (2): 180-187

Table 1 Description of unmatched and matched COVID-19 and non-COVID-19 critically ill patients

	Unmatched			Matched		
	Non-COVID-19 $n=1029$	COVID-19 $n=321$	SMD	Non-COVID-19 $n=235$	COVID-19 $n=235$	SMD
Age, mean (std)	62.2 (15.8)	60.2 (13.4)	0.141	59.8 (13.8)	59.8 (12.7)	0.001
Sex, male, %	62.2	76	0.302	80	80	0.000
Admission category, medical admission, %	84.9	99.1	0.539	98.7	98.7	0.000
SOFA score, mean (std)	5.9 (4.6)	5.4 (3.5)	0.129	5.8 (3.6)	5.7 (3.7)	0.042
SAPS II, mean (std)	43 (19.9)	35.8 (17.7)	0.380	38.2 (19.6)	37.4 (18.3)	0.042
Invasive mechanical ventilation ICU days 1–2, %	42.8	42.7	0.002	46.4	46.4	0.000
Antibiotics ICU days 1–2, %	61.7	79.4	0.396	67.7	79.1	0.262
PaO_2/FIO_2, mean (std)	222.8 (137)	252 (293.5)	0.127	260 (142.4)	245.5 (262.4)	0.069
≥ 1 chronic comorbidity, %	49.7	41.4	0.166	49.8	43	0.137
Chronic cardiac comorbidity*, %	23.9	29	0.115	22.6	31.1	0.193
Chronic respiratory failure*, %	17.6	12.1	0.153	19.1	13.2	0.162
Chronic renal failure*, %	11	9.7	0.043	9.8	10.2	0.014
Immunosuppression*, %	18.3	11.8	0.180	16.6	12.3	0.121

SMD standardized mean differences, *SOFA* Sepsis-related Organ Failure Assessment, *SAPS* Simplified Acute Physiology Score

*According to the Knaus' definitions

Table 2 Outcomes in the matched population

	Non-COVID-19 ($n=235$)	COVID-19 ($n=235$)	*p* value
Length of stay ICU, mean days [IQR]	6 [4; 11]	9 [5; 20]	<0.0001
ICU-BSI, *n* (%)	8 (3.4)	35 (14.9)	<0.0001
Time between ICU admission and BSI, median days [IQR]	6.5 [5; 12.5]	12 [9; 16]	0.086§
Mortality day-60, *n* (%)	38 (16.2)	84 (35.7)	<0.0001
Mortality day-60 among BSIs, *n* (%)	2 (25.0)	25 (71.4)	0.037§

Groups were compared using McNemar, Bowker and Wilcoxon signed rank test, as appropriate

ICU intensive care unit, *BSI* bloodstream infection

§ Wilcoxon or Fisher tests, as appropriate

Buetti N et al. Intensive Care Med 2021; 47 (2): 180-187

Clostridioides difficile infection cases

	Non-COVID-19 period*	COVID-19 period**	P-value
Hospital stays	39,795	44,831	===
Age, mean (std)	64.41±21.23	66.74±17.65	P < .0001
Screened patients for C.difficile detection	203 (5,1 per 1,000 hospital stays)	209 (4,6 per 1,000 hospital stays)	===
HCFA° CDI cases	34 21 Hospital Onset-HCFA 13 Community Onset-HCFA	12 10 Hospital Onset-HCFA 2 Community Onset-HCFA	
HCFA CDI incidence density	8.54 per 10,000 patient days	2.68 per 10,000 patient days	

*control period: March 11, 2019, to May 11, 2019
**COVID-19 period: March 11, 2020, to May 11, 2020
° HealthCare Facility-Associated

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Antibiotic consumption

	Non-COVID-19 period*	COVID-19 period**
Defined Daily Doses per 100 occupied bed days (DDD per 100 BD)	79.16 DDD per 100 BD	89.73 DDD per 100 BD
Use of third-generation cephalosporins	6.34 DDD per 100 BD	19.39 DDD per 100 BD
Days of therapy (DOT) third-generation cephalosporins	6.64 DOT per 100 patient days	20.98 DOT per 100 patient days
Use of macrolides	5.76 DDD per 100 BD	25.49 DDD per 100 BD
Days of therapy (DOT) macrolides	3.97 DOT per 100 patient days	15.97 DOT per 100 patient days

*control period: March 11, 2019, to May 11, 2019
**COVID-19 period: March 11, 2020, to May 11, 2020

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Antibiotic consumption

	Non-COVID-19 period*	COVID-19 period**
Use of quinolones	8,68 DDD per 100 BD	4,61 DDD per 100 BD
Use of inhibitor-penicillin combinations	25,70 DDD per 100 BD	16,60 DDD per 100 BD
Days of therapy (DOT) quinolones	8,14 DOT per 100 patient days	3,98 DOT per 100 patient days
Days of therapy (DOT) inhibitor-penicillin combinations	27,94 DOT per 100 patient days	17,95 DOT per 100 patient days
Use of carbapenems	7,42 DDD per 100 BD	6,34 DDD per 100 BD
Days of therapy (DOT) carbapenems	8,06 DOT per 100 patient days	6,93 DOT per 100 patient days
*control period: March 11, 2019, to May 11, 2019 **COVID-19 period: March 11, 2020, to May 11, 2020		

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Tab.2 Type and frequency of all healthcare-associated infections (HAIs) registered by the active surveillance system among the patients admitted to the main Intensive Care Unit (ICU) of Umberto I teaching hospital of Rome between 1st March and 4th April 2019 and 1st March and 4th April 2020. Results are expressed as number (percentage)

	2019 cohort	2020 cohort
HAI	14 (100)	45 (100)
Device-related HAI		
VAP	0 (0.0)	17 (37.8)
CRBSI	1 (7.1)	0 (0.0)
CAUTI	1 (7.1)	10 (22.2)
BUO	12 (85.8)	14 (31.1)
Clostridium difficile infection	0 (0.0)	2 (4.4)
Surgical site infection	0 (0.0)	1 (2.2)
Healthcare-associated pneumonia	0 (0.0)	1 (2.2)
Microorganism	19 (100)	62 (100)
Acinetobacter baumannii	6 (31.6)	18 (29.0)
Candida albicans or *parapsilosis*	0 (0.0)	6 (9.7)
Clostridium difficile	0 (0.0)	2 (3.2)
Enterobateriaceae	3 (15.8)	9 (14.5)
Enterococci	6 (31.6)	3 (4.8)
Klebsiella pneumoniae	3 (15.8)	9 (14.5)
Pseudomonas aeruginosa	1 (5.3)	5 (8.1)
Staphylococcus aureus	0 (0.0)	2 (3.2)
Coagulase Negative *Staphylococci*	0 (0.0)	8 (12.9)

VAP Ventilator-Associated Pneumonia, *CRBSI* Catheter-Related Blood Stream Infection, *CAUTI* Catheter-Associated Urinary Tract Infection, *BUO* Bloodstream infections of Unknown Origin

Baccolini V et al. Antimicrob Resist Infect Control 2021; 10(1): 87

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VAP Ventilator-Associated Pneumonia, *CRBSI* Catheter-Related Blood Stream Infection, *CAUTI* Catheter-Associated Urinary Tract Infection, *BUO* Bloodstream infections of Unknown Origin

Baccolini V. et al. Antimicrob Resist Infect Control. 2021;10(1):87

Data from medical departments between March, 1 and June, 30

	Discharges	Number of HD-CDI	HA-CDI incidence
2017	422	39	0.092
2018	348	25	0.072
2019	364	24	0.066
2020 (Covid-19 free)	333	11	0.033*
2020 (Covid-19)	150	7	0.047

During 2020 Covid-19-free departments shown lower incidence of HA-CDI compared to the previously years (*$P < .05$). Covid-19 departments shown higher HA-CDI incidence than Covid-19-free departments of the same year (not significative).

Bentivegna E et al. AJIC 2020; 49, 5. p 640-642

Campus-wide multimodal IPC bundle for Covid-19 at Singapore General Hospital

PATOGENO	PRE-PANDEMIC 10.000 patient days	COVID-19 PANDEMIC 10.000 patient days	p
Virus respiratori	9,69 casi	0,83 casi	<0,01
MRSA	11,7 casi	6,4 casi	<0,05
Enterobatteri CR	11,2 casi	10,2 casi	
Pseudomonas MDR/XDR	4,00 casi	4,34 casi	
Clostridium difficile	3,65 casi	3,47 casi	

Liang En IW et al. Am J Infect Control. 2021; 49(4): 469-477

Campus-wide multimodal IPC bundle for Covid-19 at Singapore General Hospital

PATOGENO	PRE-PANDEMIC 1.000 device days	COVID-19 PANDEMIC 1.000 device days	p
Sepsi associate a CVC	0,83 casi	0,20 casi	<0,05
IVU associate a catetere	1,8 casi	1,7 casi	--

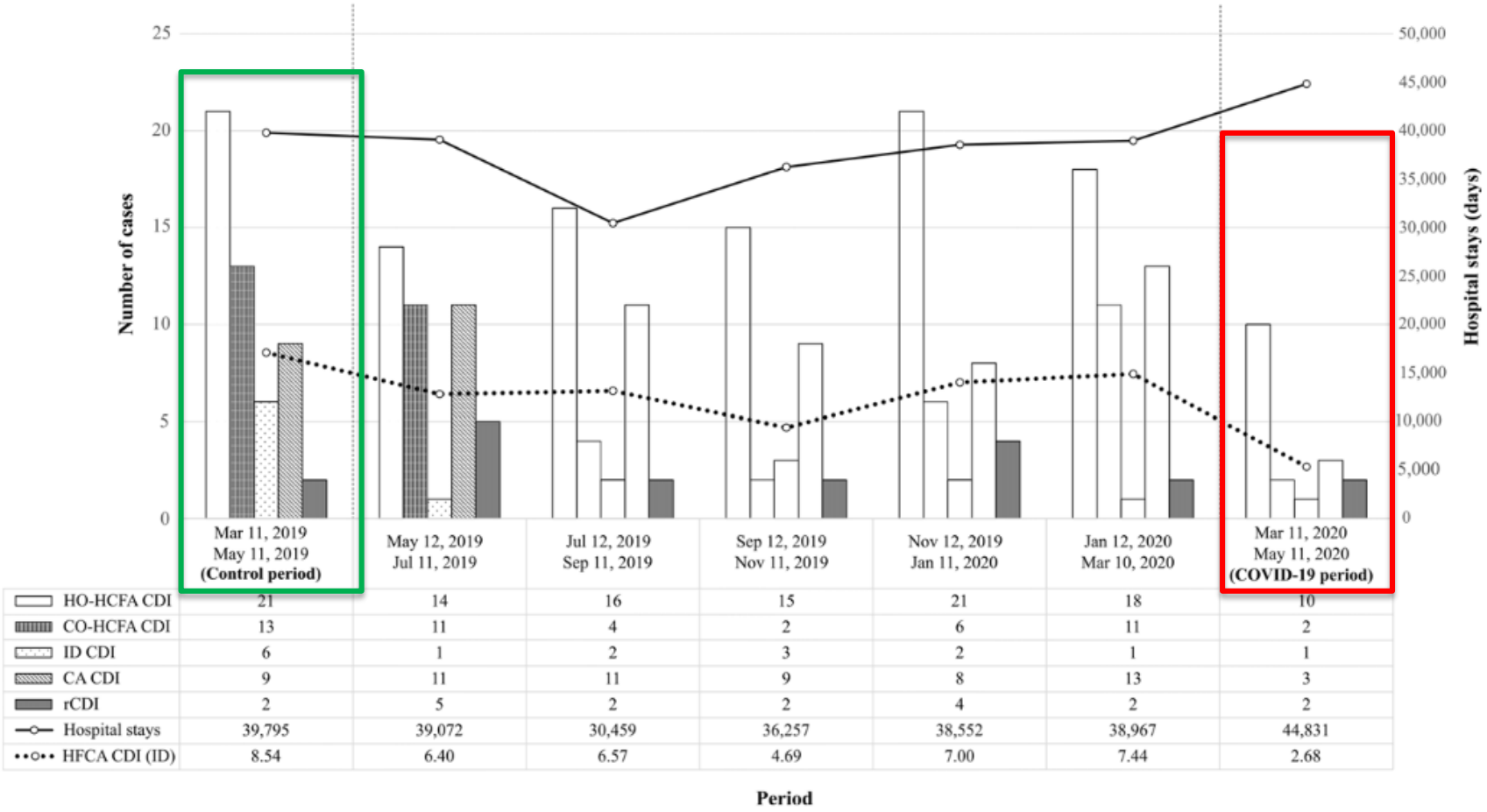
Liang En IW et al. Am J Infect Control. 2021; 49(4): 469-477

Liang En IW et al. Am J Infect Control. 2021; 49(4): 469-477

Campus-wide multimodal IPC bundle for Covid-19 at Singapore General Hospital

- Improved segregation : Patien with respiratory symptoms were segregated in designated clinical areas (RSW respiratory surveillance wards)
- Staff in the RSWs used N95 respirators, faceshields, gowns anche gloves.
- Confirmed COVID-19 cases were housed in dedicated airborne-infection-isolation-rooms (AIIRs)-> Isolation ward (IW)
- In the IW and RSW cleaning was done using 1:1000 hypochlorite based disinfectant 3 times a day.
- UV-C disinfections was also utilized postdischarge in area housing COVID-19 cases
- Cleaners in these areas were required to wear PPE (N95 respirators, eye protection and disposable gown and gloves).
- Universal masking policy for all HCWs
- Hand hygiene with alcohol hand-drub was also re-emphasized.
- Cleaning practice were reinforced and regular enviromental cleaning audit using fluorescent markers (Glogerm) was mantained
- UV-C disinfection was in use since 2017 for postdischarge cleaning even in the general wards

Liang En IW et al. Am J Infect Control. 2021; 49(4): 469-477



	Mar 11, 2019 May 11, 2019 (Control period)	May 12, 2019 Jul 11, 2019	Jul 12, 2019 Sep 11, 2019	Sep 12, 2019 Nov 11, 2019	Nov 12, 2019 Jan 11, 2020	Jan 12, 2020 Mar 10, 2020	Mar 11, 2020 May 11, 2020 (COVID-19 period)
HO-HCFA CDI	21	14	16	15	21	18	10
CO-HCFA CDI	13	11	4	2	6	11	2
ID CDI	6	1	2	3	2	1	1
CA CDI	9	11	11	9	8	13	3
rCDI	2	5	2	2	4	2	2
Hospital stays	39,795	39,072	30,459	36,257	38,552	38,967	44,831
HFCA CDI (ID)	8.54	6.40	6.57	4.69	7.00	7.44	2.68

Fig. 1. Evolution of *C. difficile* infection (CDI) over time, from control period (left) to COVID-19 period (right). The bar chart shows the total CDI case count, grouped by epidemiological definition. The solid line represents total hospital stays during each period (in days), which were used to calculate the incidence density of nosocomial CDI cases (dashed line). Note. HO-HCFA CDI, hospital-onset healthcare facility-associated *C. difficile* infection; CO-HCFA CDI, community-onset healthcare facility-associated *C. difficile* infection; ID CDI, indeterminate-onset *C. difficile* infection; CA CDI, community-acquired *C. difficile* infection; rCDI, recurrent *C. difficile* infection; HCFA CDI (ID), incidence density of healthcare facility-associated *C. difficile* infection.

Ponce-Alonso M et al Infect Control Hosp Epidemiol. 2021;42(4):406-410

Tab 3.1 Implemented Bundle to Prevent the Spread of SARS-CoV-2 in our Hospital During the COVID-19 Pandemic

Bundle Element	Description
Personal protective equipment (PPE)	All healthcare workers wore PPE (masks, gloves, goggles, caps and waterproof gowns) to care for patients with COVID-19
	Training healthcare workers on the proper use of PPE
Patient location	Individual rooms/grouping of cases
Isolation precautions	Design and diffusion of specific posters
	Isolation precautions for almost all hospitalized patients
	Isolation of a confirmed/suspected patient in <24 h through an *ad hoc* alert system
	Isolation measures placed very visibly in the patient's medical chart
	Increased availability of infection control staff for information and incident resolution
Patient environment (rooms, common areas and transit areas)	Reinforcement of the daily communication between infection control staff, cleaning staff and management team
	Reinforcement of the cleaning staff in all hospitalization areas
	Operation check of chlorinated product dispensing pumps to ensure adequate concentrations (3,000 ppm)
	Training reinforcement for cleaning staff
	Adaptation of the usual cleaning procedures and creation of specific protocols for SARS-CoV-2 eradication
	Design of a poster with the most relevant points of each cleaning procedure and placement in visible areas
	Acquisition of additional cleaning material to prevent its reuse
	Daily audit of scheduled cleaning by the preventive medicine department
	Schedule of special cleaning adapted to the needs detected in the audits
	Reinforcement of the cleaning of common areas with sodium hypochlorite sprays by the military emergency unit

Ponce-Alonso M et al Infect Control Hosp Epidemiol. 2021;42(4):406-410

Tab 3.2 Implemented Bundle to Prevent the Spread of SARS-CoV-2 in our Hospital During the COVID-19 Pandemic

Bundle Element	Description
Sanitary material	Training healthcare workers on disinfection procedures of sanitary material
	Increased availability of disinfectant products
	Audit of the proper use of cleaning products and disinfection procedures
Health worker environment	Training healthcare workers on the need to disinfect counters, computer equipment, and personal items after use
	Cleaning of the common and rest areas of health personnel after each work shift
Patient movements	Transfers limited to what is strictly essential (diagnostic or therapeutic procedures)
Visits	Extension of the prohibition of visits and companions to almost all situations
Waste management	Reduction of waste movement by installing class III waste containers inside all rooms
Hand hygiene	Training reinforcement on hand hygiene practices

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Table IV

Healthcare costs for healthcare personnel (HCP) overall and stratified by group of HCP [exposed HCP vs HCP with coronavirus disease 2019 (COVID-19)]

	Total (N=3586)	Exposed (N=3332)	COVID-19 (N=254)
Direct costs			
Hospitalization	€113,200	NA	€113,200
RT-PCR for SARS-CoV-2	€178,080	€106,960	€71,120
ICU stay	€24,000	NA	€24,000
Healthcare seeking (outpatient)	€5100	€1550	€3550
Chest radiograph and CT	€2680	NA	€2680
Treatment			
Hospitalization	€2020	NA	€2020
Outpatient	€760	€610	€150
Post-discharge	€100	NA	€100
Biochemistry, complete blood count and urine tests	€170	NA	€170
Indirect costs			
Absenteeism	€1,395,770	€843,270	€552,500
Presenteeism	€13,950	€10,550	€3400
Total	€1,735,830	€962,940	€772,890

NA, not applicable; RT-PCR, reverse transcriptase polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2; ICU, intensive care unit; CT, computed tomography.

Maltezou HC. et al. J Hosp Infect 2021; 114: 126-133

Total HAI per 1000 patient days	Illinois level			County level		
	Beta coefficient	95% CI	*P* value	Beta coefficient	95% CI	*P* value
Intercept	0.19	−0.49-0.88	.56	0.22	−0.42-0.86	.47
Percent of hours worked that were premium pay	0.13	0.02-0.24	**.023**	0.13	0.03-0.22	**.015**
Cases per 100,000 people	−0.00019	−0.00048-0.000099	.18	−0.00019	−0.00056-0.00019	.31
Deaths per 100,000 people	0.012	−0.024-0.049	.48	0.024	−0.038-0.087	.42
Percent of patients that were COVID+	0.012	−0.021 0.045	.44	0.0061	−0.04-0.05	.79

NOTE. Bold values are statistically significant ($P < .05$).

Halverson T et al Am J Infect Control 2022; 50: 831-33

Table 2
Pooled means and relative risk of the crude mortality of patients admitted to the ICU in 2019 and 2020.

	2019			2020				
Number of patients, n	Number of deaths, n	Mortality rate, %	Number of patients, n	Number of deaths, n	Mortality rate, %	RR[a]	95% CI[a]	P-value
5,997	916	15.2	1,778	413	23.2	1.42	1.27-1.58	<.0001

CI = confidence interval; ICU = intensive care unit; RR = relative risk.

Table 3
Pooled means and relative risk of the ALOS of patients admitted to the ICU in 2019 and 2020.

	2019			2020				
Number of patients, n	Bed days, n	ALOS, n	Number of patients, n	Bed days, n	ALOS, n	RR[a]	95% CI[a]	P-value
5,997	36,106	6.02	1,778	13,400	7.54	1.21	1.15-1.27	<.001

ALOS = average length of stay; CI = confidence interval; ICU = intensive care unit; RR = relative risk.

Rosenthal VD et al Int J Infect Dis 2022; 118: 83-88

Table 4
Confounding variables.

Patient characteristics	2019	2020			p-Value	Test
Age	Mean 44.49911	Mean 35.31041	Mean difference 9.1887	95% CI 7.9617-10.4157	.0	t statistic = 14.682 degrees of freedom = 3994
Mechanical ventilator days, average use,	Mean 4.637427	Mean 6.024773	Mean difference 1.3874	95% CI 0.9298-1.845	.0	t statistic = −5.9463 degrees of freedom= 1711.5
Central line days, average use,	Mean 8.150607	Mean 8.301244	Mean difference 0.1506	95% CI 0.3438-0.6451	.5503	t statistic = −0.59733 degrees of freedom= 2928.4
Urinary catheter days, average use,	Mean 5.162639	Mean 5.624106	Mean difference 0.4614	95% CI 0.1485-0.7745	.0039	t statistic = −2.8908 degrees of freedom = 2877.2
Peripheral catheter days, average use,	Mean 5.713647	Mean 5.79456	Mean difference 0.0809	95% CI 0.3232-0.485	.6947	t statistic = −0.39259 degrees of freedom = 2711.4
Hospitalization type						
Medical	51.8%	51.8%				
Surgical	48.2%	48.2%			.9806	χ^2 = 0.00058997 degrees of freedom = 1
Gender						
Female	37.7%	38.02%				
Male	62.3%	61.98%			.8469	χ^2 = 0.037295 degrees of freedom = 1

CI = confidence interval.

Rosenthal VD et al Int J Infect Dis 2022; 118: 83-88

- **EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA**

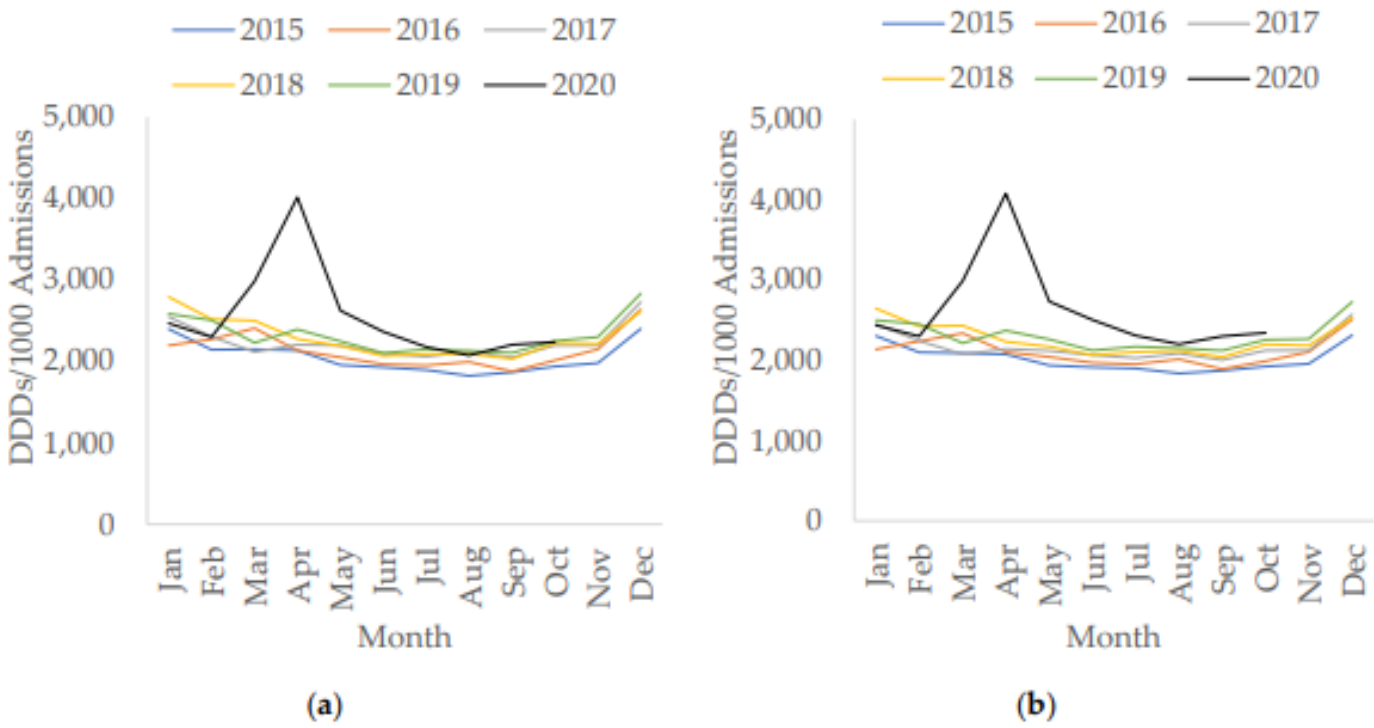


Figure 4. All antibacterials for treatment of (**a**) community-acquired pneumonia (CAP); (**b**) hospital-acquired pneumonia (HAP), per 1000 admissions in secondary care by month, 2015–2020.

Andrews A et al. Antibiotics 2021; 10: 841

EFFETTI SULLA PRESCRIZIONE ANTIBIOTICA

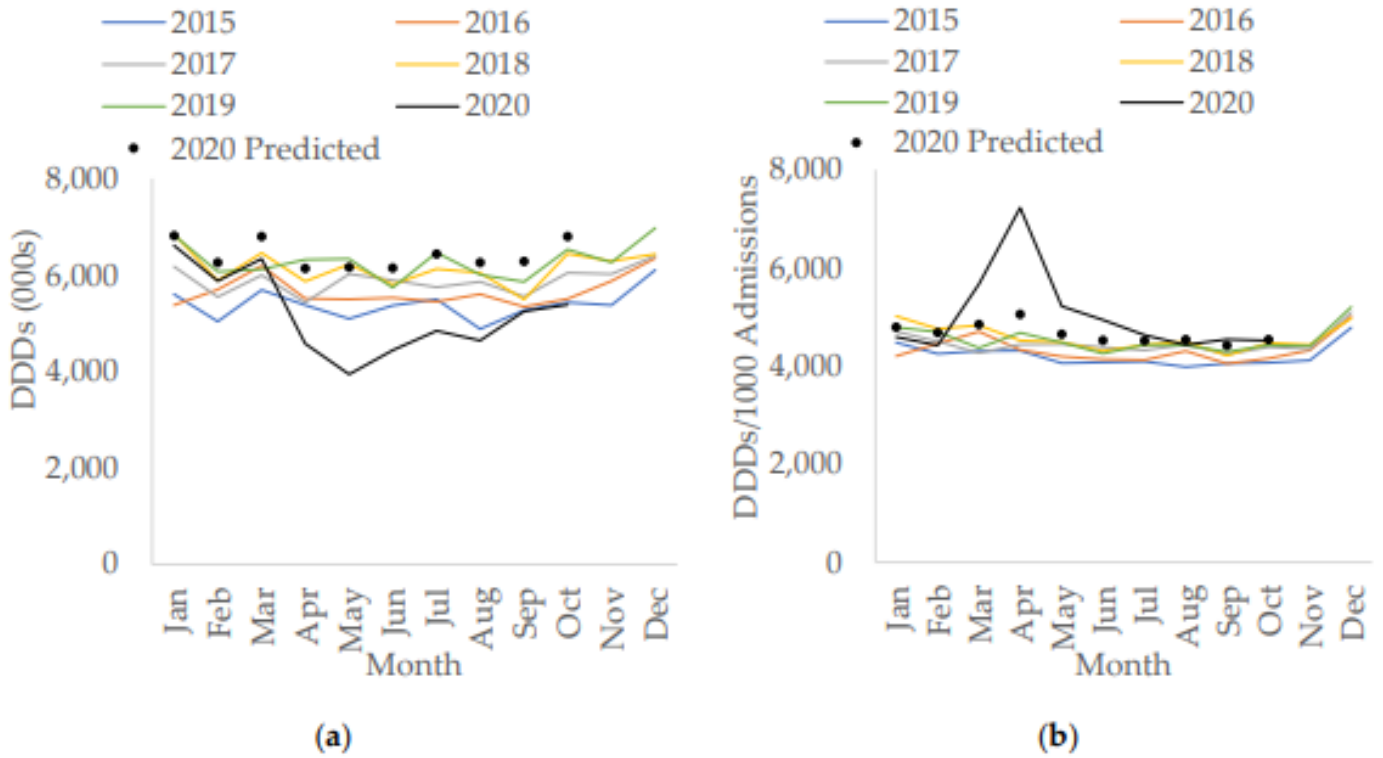
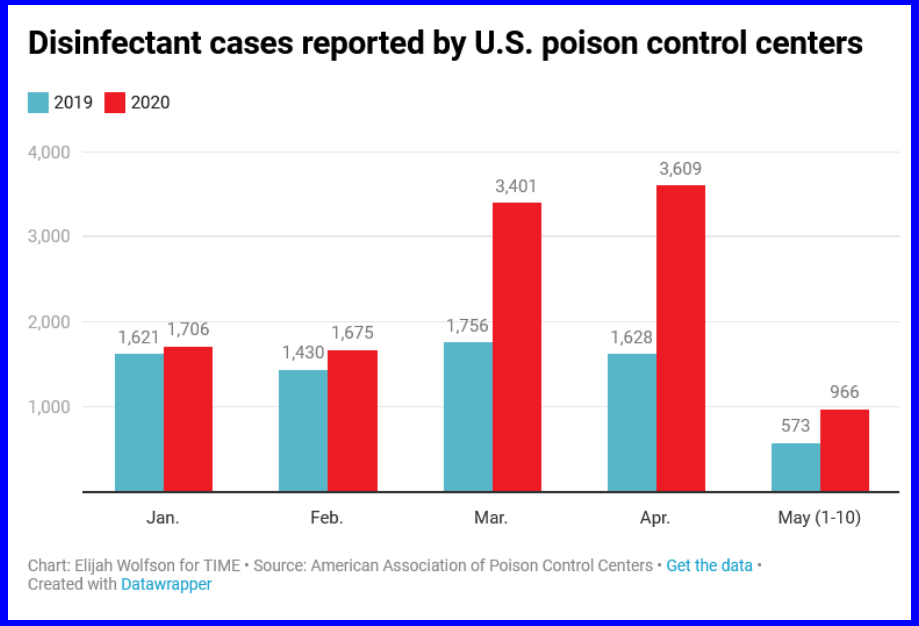


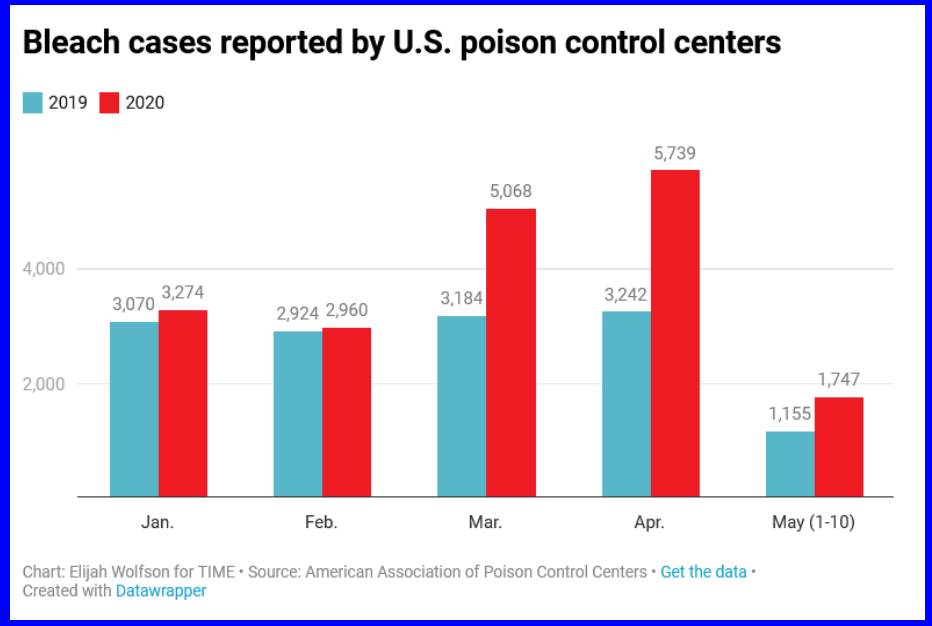
Figure 3. Interrupted time-series analysis for total antibacterial use in (**a**) Defined Daily Doses (DDDs); (**b**) DDDs per 1000 admissions, adjusted for seasonality, showing the counterfactual scenario (in black dots), in secondary care by month, 2015–2020.

Andrews A et al. Antibiotics 2021; 10: 841

HEALTH • COVID-19

Accidental Poisonings Increased After President Trump's Disinfectant Comments





Kluger J, 2020, May 12 https://time.com/5835244/accidental-poisonings-trump/

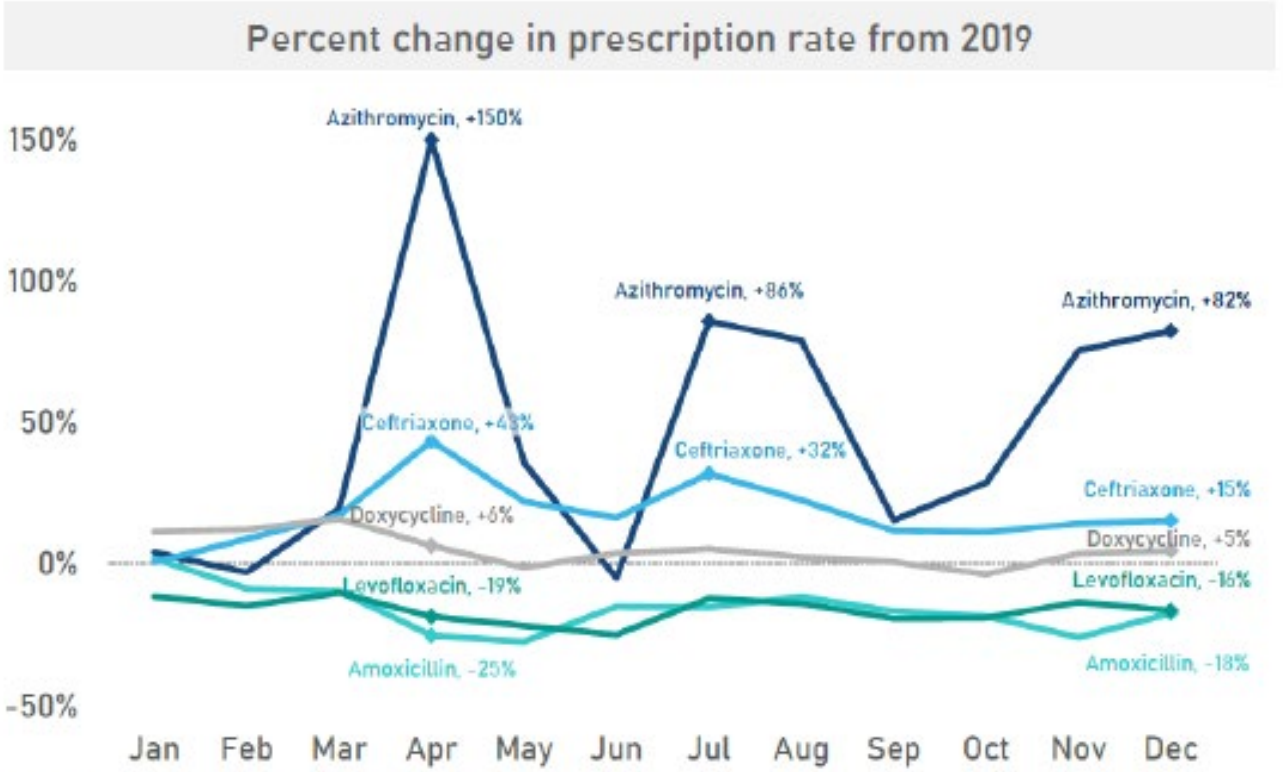
Higher Rates of Antibiotics Commonly Used for Respiratory Infections in Nursing Homes

Antibiotics higher in 2020 than 2019

- Azithromycin
- Ceftriaxone
- Doxycycline

Antibiotics lower in 2020 than 2019

- Levofloxacin
- Amoxicillin



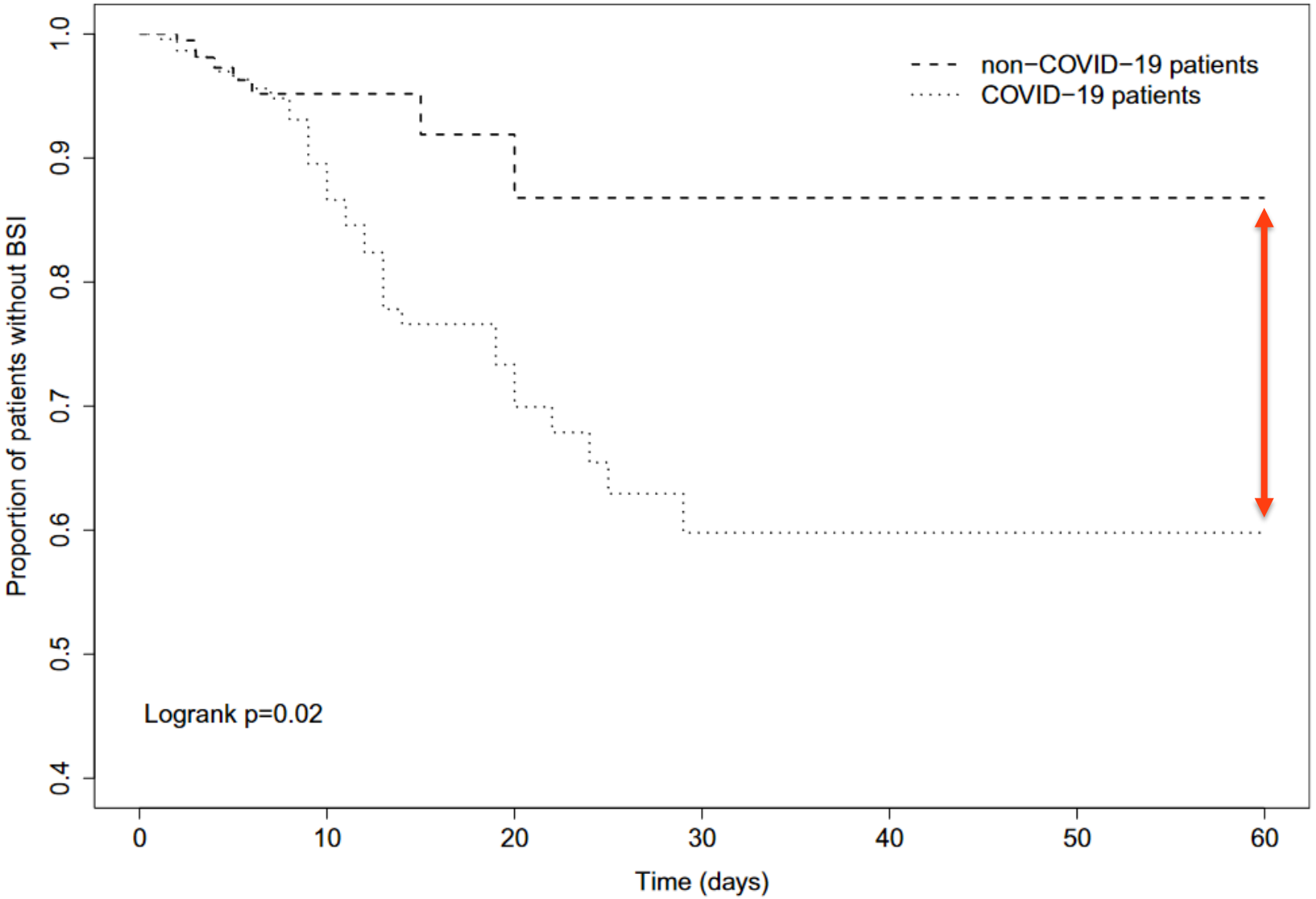


Fig. 2 Kaplan–Meier with the time to bloodstream infection in COVID-19 and non-COVID-19 patients. *BSI* bloodstream infection, *T0* is the day of ICU admission

Buetti N et al.Intensive Care Med. 2021; 47 (2): 180-187

Table 3 Distribution of microorganisms in ICU bloodstream infections (BSI, $n=48$) and sources of infection ($n=46$) among COVID-19 and non-COVID-19 patients

	Non-COVID-19	COVID-19
Microorganisms identified (n = 48)*		
Coagulase-negative Staphylococci	2 (22.2)	14 (35.9)
Staphylococcus aureus	1 (11.1)	3 (7.7)
Enterococcus spp	0 (0)	4 (10.3)
Other Gram-positive	3 (33.3)	3 (7.7)
Enterobacterales	2 (22.2)	5 (12.8)
Pseudomonas aeruginosa	1 (11.1)	5 (12.8)
Anaerobic bacteria	0 (0)	1 (2.6)
Candida albicans	0 (0)	4 (10.3)
Source of infection (n = 46)*		
Intra-abdominal	1 (12.5)	1 (2.6)
Skin/soft tissue	0 (0)	2 (5.3)
CRBSI	2 (25)	8 (21.1)
Pulmonary	3 (37.5)	8 (21.1)
Urinary tract	0 (0)	1 (2.6)
Unknown	2 (25)	18 (47.4)

Values were expressed as number and percentage. The total number of ICU-BSI was 43

Spp species, *CRBSI* catheter-related bloodstream infection

*There were one polymicrobial ICU-BSI in the non-COVID-19 group and three polymicrobial ICU-BSIs in the COVID-19 group

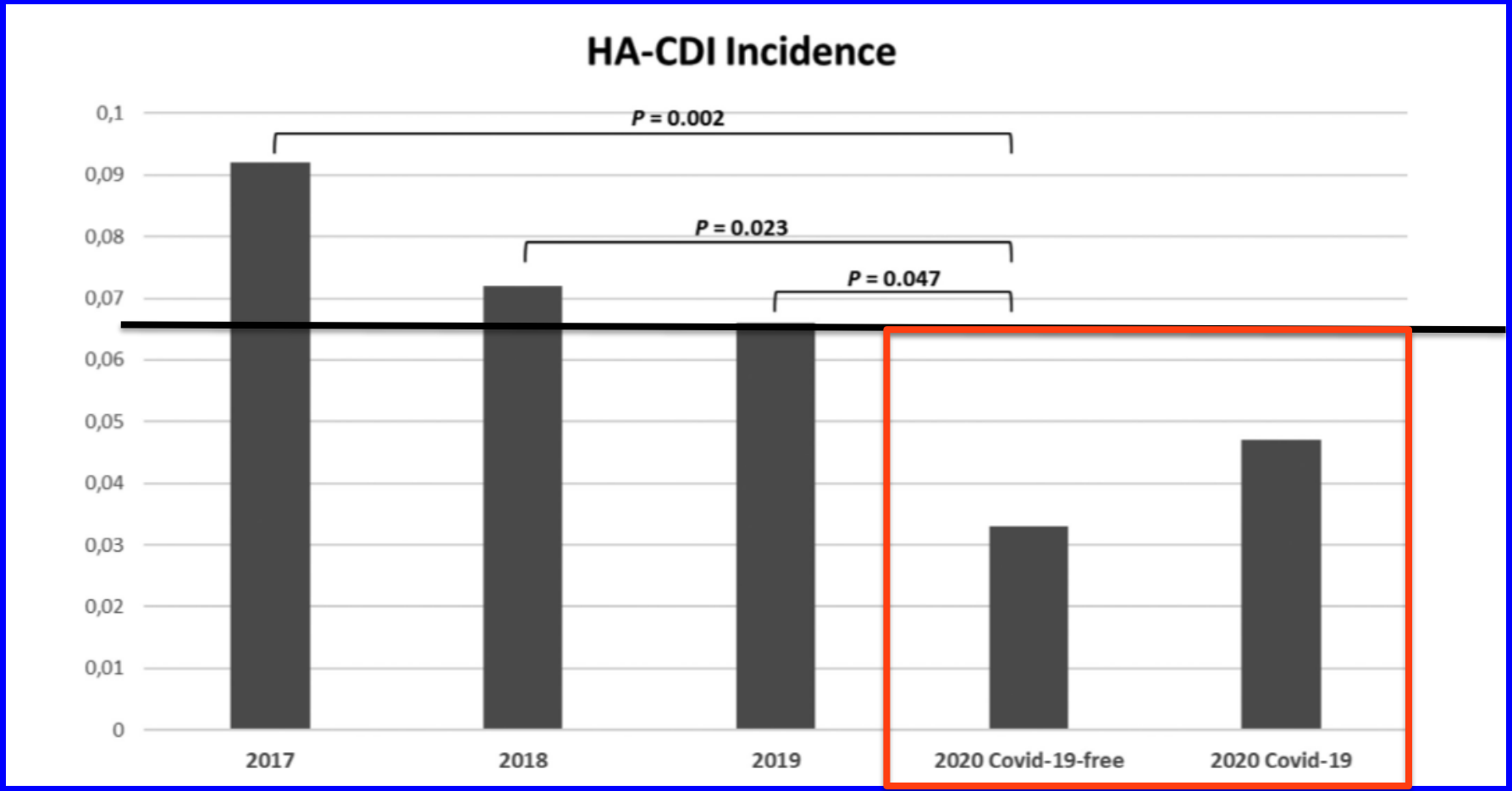
**Three patients had multiple sources of infection

Buetti N et al.Intensive Care Med. 2021; 47 (2): 180-187

Campus-wide multimodal IPC bundle for Covid-19 at Singapore General Hospital

- Improved segregation : Patien with respiratory symptoms were segregated in designated clinical areas (RSW respiratory surveillance wards)
- Staff in the RSWs used N95 respirators, faceshields, gowns anche gloves.
- Confirmed COVID-19 cases were housed in dedicated airborne-infection-isolation-rooms (AIIRs)-> Isolation ward (IW)
- In the IW and RSW cleaning was done using 1:1000 hypochlorite based disinfectant 3 times a day.
- UV-C disinfections was also utilized postdischarge in area housing COVID-19 cases
- Cleaners in these areas were required to wear PPE (N95 respirators, eye protection and disposable gown and gloves).
- Universal masking policy for all HCWs
- Hand hygiene with alcohol hand-drub was also re-emphasized.
- Cleaning practice were reinforced and regular enviromental cleaning audit using fluorescent markers (Glogerm) was mantained
- UV-C disinfection was in use since 2017 for postdischarge cleaning even in the general wards

Liang En IW et al. Am J Infect Control. 2021; 49(4): 469-477



Data from medical departments between March, 1 and June, 30, 2020. During 2020 Covid-19-free departments shown lower incidence of HA-CDI compared to the previously years (* = P <.05). Covid-19 departments shown higher HA-CDI incidence than Covid-19-free departments of the same year (not significative).

Bentivegna E et al. AJIC 2020; 49, 5. p 640-642

Table 1. Details of Patients With Hospital-Acquired C. difficile Infection (HA-CDI), March 1 to May 31, 2018–2020: Hospital Activity, Antimicrobial Consumption and Hand Hygiene Compliance

Variable	2018 (n=14), No. (%)	2019 (n=27), No. (%)	2020 (n=9), No. (%)
CDI rate per 10,000 BDU	2.24	4.24	2.15
COVID-19 infection	0	0	4
Sex, male	5 (35.7)	16 (59.3)	7 (77.8)
Age, mean y (range)	71 (17–93)	68 (31–89)	67 (33–87)
Admitting specialty, medical	10 (71.4)	14 (51.9)	6 (66.7)
Admitting specialty, surgical	2 (14.3)	9 (33.3)	2 (22.2)
Critical care admission[1]	2 (14.3)	4 (14.8)	1 (11.1)
Concurrent/recent antimicrobials[2]	3 (21.4)	22 (81.5)	7 (77.8)
Hospital data			
Hospital admissions	6,368	6,519	4,781
Average length-of-stay, d	9.79	9.73	8.41
Hand hygiene compliance	85	86	90.3
Hospital antimicrobial consumption, DDD/100 BDU	94.5	93	95

Note. BDU, bed days used; DDD, defined daily dose

1. *Patient an inpatient in the critical care unit at time of diagnosis of CDI.*
2. *Antimicrobial therapy during current admission*

Hazel MB et al. Infect Control Hosp Epidemiol.2021;13:1–2

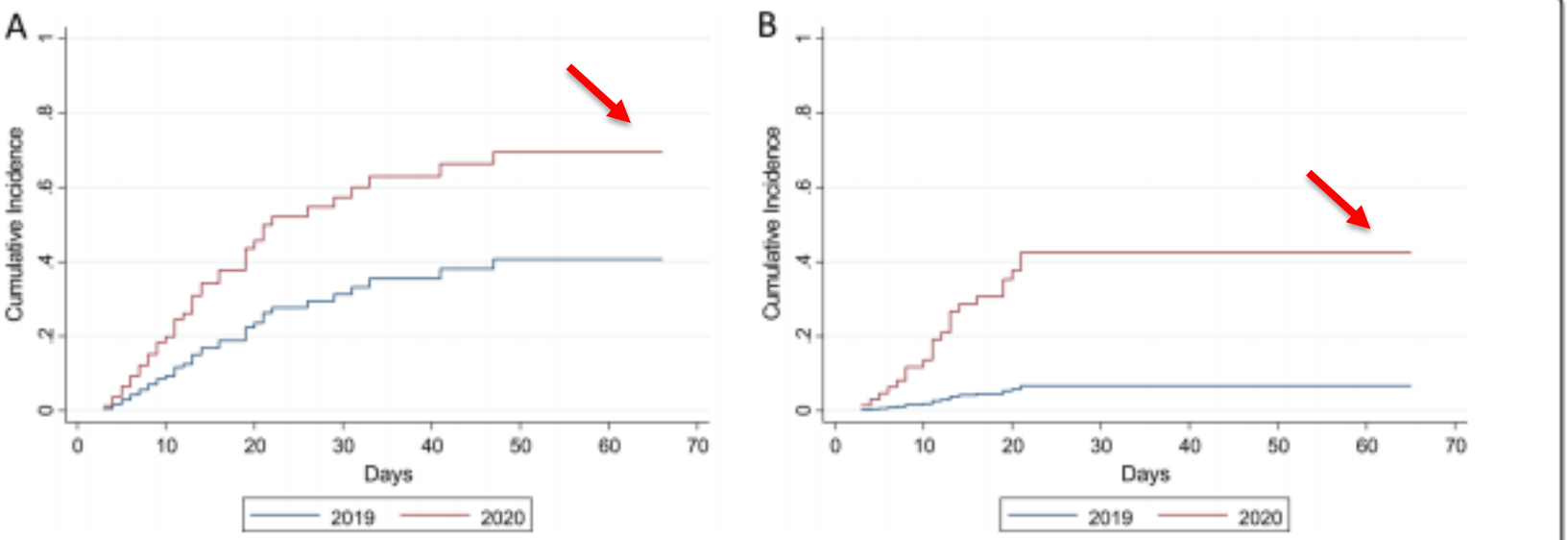


Fig. 1 Cumulative incidence function for first healthcare-associated infection (**a**) or first device-related healthcare-associated infection (**b**) among the patients admitted to the main Intensive Care Unit (ICU) of Umberto I teaching hospital of Rome between 1st March and 4th April 2019 and 1st March and 4th April 2020

Baccolini V. et al. Antimicrob Resist Infect Control. 2021;10(1):87

Table 3 Multivariable competing risk Fine-Gray regression models for first healthcare-associated infection (HAI, Model 1) or frst device-related healthcare-associated infection (first dr-HAI, Model 2) among the patients admitted to the main Intensive Care Unit (ICU) of Umberto I teaching hospital of Rome between 1st March and 4th April 2019 and 1st March and 4th April 2020

	HAI (model 1)		dr-HAI (model 2)	
	SHR (95% CI)	*p* value	SHR (95% CI)	*p* value
Year of admission to the ICU (2020)	2.66 (1.31–5.38)	0.007	10.0 (1.84–54.41)	0.008
Sex (female)	0.93 (0.47–1.85)	0.835	0.77 (0.30–1.99)	0.585
Age (years)	0.97 (0.96–0.99)	0.006	0.97 (0.94–0.99)	0.016
Hypertension (yes)	2.83 (1.37–5.82)	0.005	1.63 (0.73–3.61)	0.184
Diabetes mellitus (yes)	1.88 (0.76–4.64)	0.169	1.51 (0.43–5.29)	0.522
Mechanical ventilation (days)	0.89 (0.84–0.94)	<0.001	0.78 (0.65–0.93)	0.006
Mechanical ventilation*time	1.00 (1.002–1.006)	<0.001	1.01 (1.003–1.025)	0.007

SHR sub-distribution hazard ratio, *CI* confidence interval, * interaction term

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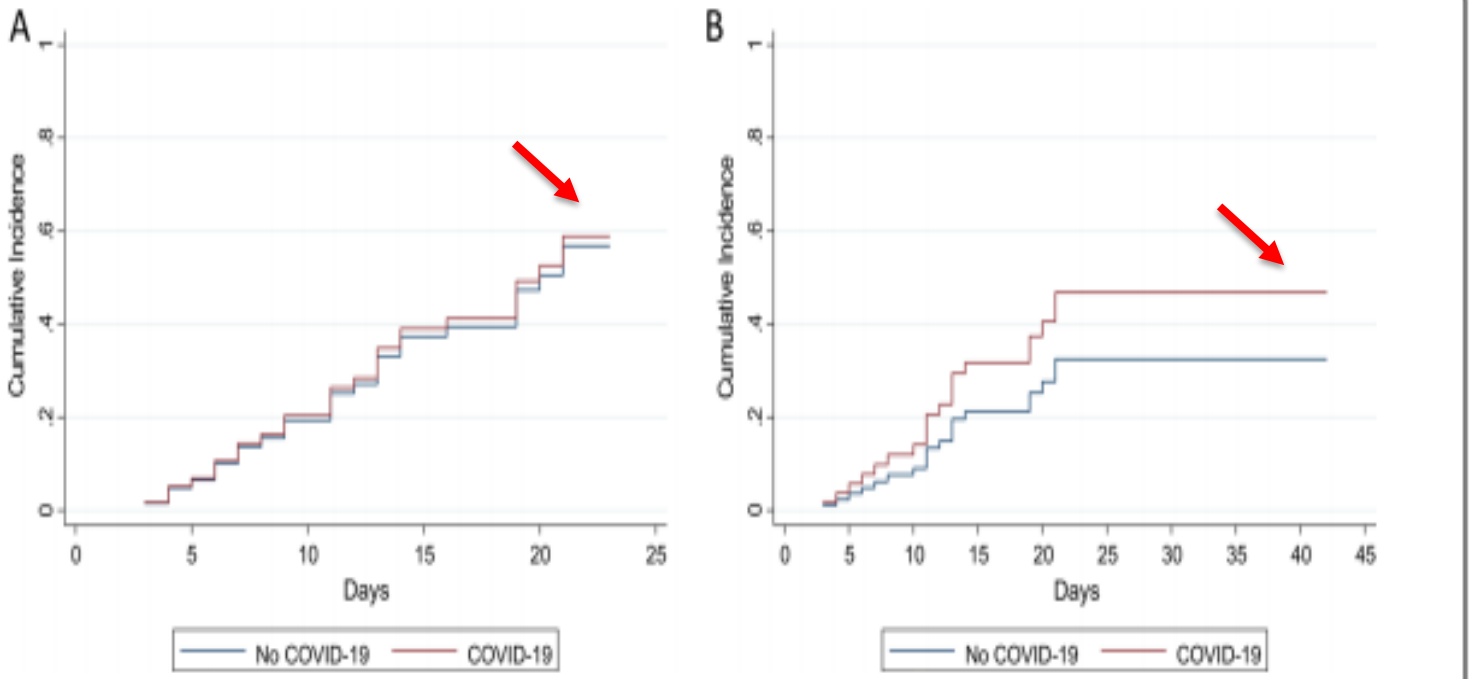

Fig. 2 Cumulative incidence function for first healthcare-associated infection (**a**) or first device-related healthcare-associated infection (**b**) among the patients admitted to the main intensive care unit of Umberto I teaching hospital of Rome between 1st March and 4th April 2020

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LIMITI SULLE CONOSCENZE DELL'APPROPRIATO USO DEGLI ANTIBIOTICI

Factors that may influence levels of antimicrobial resistance during the COVID-19 pandemic

Type of factor	Factors that may favour an Increase In AMR	Factors that may favour a decrease In AMR
Antibiotic use in hospitals	• About 70% of hospitalised COVID-19 patients receive antibiotics [33,34] • COVID-19 patients often receive empiric broad-spectrum antibiotic therapy [34-36] • 16% of hospitalised COVID-19 patients develop a secondary bacterial infection [34], which will necessitate antibiotic therapy • Possible increased use of azithromycin and teicoplanin (because of the initial absence of clear guidelines for the treatment of COVID-19 patients) [4,6,8] • Difficulties in accessing advice from experts before prescribing antimicrobial agents [4] • Antimicrobial stewardship efforts may be undermined because of high workloads and shifting priorities related to COVID-19 [37,38] • Possible aggravation of existing shortages of certain narrow-spectrum antimicrobial agents [39,40]	• Bacterial co-infection (estimated on presentation) in only 3.5% (95% CI: 1–7%) of COVID-19 patients [33] • Bacterial/fungal infection in only 8% of hospitalised COVID-19 patients vs 11% in non-COVID-19 patients [34]; the percentage for COVID-19 patients may be underestimated because many may have received empiric antimicrobial therapy [41] • Only 1.3% of COVID-19 patients in ICUs, and apparently no patients in other units, developed a healthcare-associated superinfection with antimicrobial-resistant bacteria [19] • Postponed planned surgical interventions result in fewer antibiotic courses for surgical prophylaxis [42] • Fewer emergency and planned hospital admissions [43,44], including chronically ill patients (e.g. oncology patients, diabetic patients, transplant patients), resulting in fewer antibiotic prescriptions

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LIMITI SULLE CONOSCENZE DELL'APPROPRIATO USO DEGLI ANTIBIOTICI

Factors that may influence levels of antimicrobial resistance during the COVID-19 pandemic

Type of factor	Factors that may favour an Increase In AMR	Factors that may favour a decrease In AMR
Infection prevention and control in hospitals	• Difficulties for HCWs in adhering to standard IPC precautions because of long shifts wearing the same PPE [45] and possible shortages of certain equipment [5] • Focus of HCWs on self-protection (e.g. universal gloving practices) rather than on preventing cross-transmission between patients • In COVID-19 cohort units and ICUs, sessional use of PPE, e.g. long-sleeved gowns that prevent effective hand hygiene [46] and gloves that may not be changed between patients [45] • Overcrowded facilities and possible staff shortages leading to low HCW-to-patient ratios [5] • Shortages of HCWs with appropriate IPC training [4] • Longer hospital stays for COVID-19 patients [5] • Traditional IPC efforts may be temporarily discontinued, including those targeting antibiotic-resistant bacteria, e.g. decreased frequency of screening for carriage of MDROs and difficulties in isolating or cohorting MDRO-positive patients [4,47] • Decreased laboratory capacity to detect AMR carriage, e.g. for processing rapid tests for MDROs, because resources are focused on SARS-CoV-2 diagnosis [4]	• Isolation of COVID-19 patients with enhanced standard precautions, e.g. increased hand hygiene and use of PPE, plus universal chlorhexidine bathing protocols for patients in ICUs [5] • Increased disinfection of the environment [4,5] • COVID-19 patients are often cohorted in one single unit and cared for by the same group of HCWs [5] • Fewer emergency and planned hospital admissions [43,44], including chronically ill patients (e.g. oncology patients, diabetic patients, transplant patients), resulting in lower colonisation pressure by fewer carriers of MDROs • Fewer transfers from long-term care facilities may lead to fewer cycles between long-term care facilities and hospitals [5] • Construction of new COVID-19 facilities without an established reservoir of MDROs [5]

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LIMITI SULLE CONOSCENZE DELL'APPROPRIATO USO DEGLI ANTIBIOTICI

Factors that may influence levels of antimicrobial resistance during the COVID-19 pandemic

Type of factor	Factors that may favour an Increase In AMR	Factors that may favour a decrease In AMR
Antibiotic use in the community	• Likely increased antibiotic use in nursing homes and other long-term care facilities • Possible increased self-medication with antibiotics in some countries or regions of the world [48]	• Possible decreased antibiotic consumption because of fewer patient consultations, e.g. for self-limiting infections that would otherwise have resulted in an antibiotic prescription [4] • Possible decreased incidence of respiratory tract infections as a consequence of decreased person-to-person transmission because of lockdowns, resulting in decreased antibiotic consumption • Possible increased awareness of the difference between viruses and bacteria, and the fact that there are different types of medicines, i.e. antivirals and antibiotics, respectively, for different types of infections [8] • Increased influenza vaccine uptake may decrease the incidence of bacterial superinfections after influenza
Hygiene practices in the community	• Increased use of sanitisers and other biocidal agents and their release in the environment [3,6,8,49]	• Increased hand hygiene practices and compliance in the community • Increased physical distancing and use of face masks • Increased disinfection of the environment

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LIMITI SULLE CONOSCENZE DELL'APPROPRIATO USO DEGLI ANTIBIOTICI

Factors that may influence levels of antimicrobial resistance during the COVID-19 pandemic

Type of factor	Factors that may favour an Increase In AMR	Factors that may favour a decrease In AMR
Cross-border spread		• Fewer patient transfers of seriously ill patients between countries, resulting in less frequent cross-border spread of MDROs • Large decrease in international air travel, resulting in decreasing risk of global dissemination of antimicrobial-resistant bacteria and genes from highly endemic regions [8,50]
Public health policy making, including One Health	• Shift in high-level policy making towards viral diseases and preparedness for emerging viruses • National plans and other initiatives to fight AMR are likely to have been slowed down, temporarily discontinued or even postponed because of COVID-19 public health emergencies and duties (similar to the WHO Global Strategy for Containment of Antimicrobial Resistance, which was launched on 11 September 2001 and went largely unnoticed by the global community, without any major impact on AMR activities for almost a decade, because of the disproportional focus on biosecurity issues) • Potential One Health impact of increased volumes of antibiotics from prescriptions in humans being released in the environment [3,51]	• Gain in public and political attention for all threats related to communicable diseases, including already endemic issues such as AMR • Possible decrease in antimicrobial consumption in animals because of reduction in the size of livestock herds [52], possibly combined with difficulties in obtaining antibiotics

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Study Setting/Study Type/Time Comparison	Infection Being Reported	Rate/Baseline Rate	Comments
Outram campus of the Singapore Health Services group (includes the 1,785-bed Singapore General Hospital and other specialist centers in same system)[2] Retrospective cohort study. Compared Feb 1, 2020–Aug 31, 2020 (COVID period cohort) vs Jan 2018–Jan 2020 (pre-COVID cohort)	CLABSI, CAUTI, CDI	CLABSI: COVID-period cohort with 0.20 incidents/1,000 device days (down from 0.83/1,000 device days; IRR, 0.24; 95% CI, 0.07–0.57; $P < .05$) CAUTI: No significant change in hospitalwide CAUTI rate CDI: Healthcare-facility–associated CDI did not significantly increase (3.47/10,000 patient days vs 3.65/10,000 patient days pre-pandemic, IRR, 0.95; 95% CI, 0.75–1.20; $P = .66$)	Prior experience with SARS in 2003 led to the early adoption of aggressive infection prevention bundles including universal masking, adequate PPE access. Increased CLABSI and CAUTI bundle adherence noted
Academic tertiary center in Detroit, Michigan[3] Retrospective cohort study; Jan–May 2019 (pre-COVID cohort) vs Jan–May 2020 (COVID period cohort included patients with and without COVID-19)	CLABSI	Average monthly CLABSI rate increased to 1.7 per 1,000 central-line days (from 0.4 per 1,000 central-line days; represents a 325% increase; $P < .01$).	
Large French ICU cohort[4] Matched case-cohort study of ICU patients; 235 patients with COVID-19 matched to 235 control patients; patients with COVID-19 included who were admitted betrween Jan 29, 2020, and Oct 3, 2020	BSI, CLABSI	35 (14.9%) ICU BSIs in COVID-19 group vs 8 (3.4%) in control group ($P \leq .0001$) Only 10 total catheter-related BSIs detected: 8 (3.4%) in COVID-19 group vs 2 (0.9%) in non–COVID-19 group (HR, 2.5; 95% CI, 0.71–8.83; $P = .15$)	
Medical wards in hospital from Rome[5] Retrospective analysis; Mar 1–Jun 30, 2020 compared to 2017, 2018, and 2019	CDI	COVID-19–free wards in 2020 with significantly decreased odds of healthcare-associated CDI (incidence per 100 discharges, 0.033 in 2020 compared to 0.066 in 2019; OR, 2.07; $P = .047$)	
Tertiary-care hospital in Madrid, Spain[6] Retrospective cohort study; Mar 11–May 11, 2020, compared to same period in 2019	CDI	Incidence density of healthcare-facility–associated CDI: 2.68 per 10,000 patient days compared to 8.54 per 10,000 patient days in control period ($P = .000257$)	