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Citation	Journal of Infection and Chemotherapy. 28(5); 616-622
Issue Date	2022-05
Published	2022-03-12
Type	Journal Article
Textversion	Author
Supplementary data	Supplementary data is available at https://doi.org/10.1016/j.jiac.2022.01.008.
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DOI	10.1016/j.jiac.2022.01.008

Imoto, W., Yamada, K., Kuwabara, G., Shibata, W., Sakurai, N., Nonose, Y., Okada, Y., Nakaie, K., Fujita, A., & Kakeya, H. (2022). Impact of coronavirus disease 2019 on infectious disease treatment and infection control at a tertiary hospital in Japan. *Journal of Infection and Chemotherapy*. 28, 616–622. https://doi.org/10.1016/j.jiac.2022.01.008

Impact of Coronavirus disease 2019 on infectious disease treatment and infection control at a tertiary hospital in Japan

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Authorship statement

All authors meet the ICMJE authorship criteria.

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ABREVIATIONS[1]

[1] Abbreviations: ABPC/SBT, ampicillin/sulbactam; AMR, antimicrobial resistance; AUD, antimicrobial use density; CFPM, cefepime; CMZ, cefmetazole; COVID-19, coronavirus disease 2019; CRE, carbapenem-resistant *Enterobacteriaceae*; CTRX, ceftriaxone; CVC, central venous catheter; DDD, defined daily doses; DOT, days of therapy; MEPM, meropenem; MIC, minimum inhibitory concentration; MRSA, methicillin-resistant *Staphylococcus aureus*; MSSA, methicillin-sensitive *Staphylococcus aureus*; TEIC, teicoplanin; VCM, vancomycin

ABSTRACT

Introduction

Coronavirus disease 2019 (COVID-19) has greatly impacted medical care practices. Although the effects on infectious disease treatment and infection control, such as antimicrobial resistance, have been specified, very few reports exist on the specific effects of COVID-19.

Methods

We investigated the effects of COVID-19 on daily medical practices at a tertiary hospital in Japan by comparing the use of hand sanitizers, the detection of bacteria from blood cultures, and the amount dose of antibacterial drugs used for one year before (April 2019 to March 2020, fiscal year 2019.) and after COVID-19 admissions began (April 2020 to March 2021, fiscal year 2020).

Results

The use of hand sanitizers increased by 1.4 to 3 times during the year after COVID-19 admissions began; the incidence of methicillin-susceptible *Staphylococcus aureus* and all *S. aureus* detected in blood cultures reduced in all departments. No decrease was observed in the usage of all antibacterial drugs; rather, the usage of all antibacterial drugs tended to increase in all departments. Therefore, no significant change was observed in the detection of drug-resistant bacteria and the trends of antibacterial drug use based on the acceptance of COVID-19 patients.

Conclusions

The prevalence of drug-resistant bacteria and trends of antibacterial drug use remained unchanged despite the increased use of hand sanitizers due to the admission of patients with COVID-19.

Keywords: antimicrobial resistance, COVID-19, hand sanitizers, infection control

INTRODUCTION

The world's first case of coronavirus disease 2019 (COVID-19) was confirmed in China in December 2019 [1], and the first case in Japan was reported in January 2020 [2,3]. Since then, the number of patients with COVID-19 has continued to increase, and the emergency department of our hospital began accepting COVID-19 patients with severe illness in April 2020. Our hospital is equipped to provide advanced medical care, including extracorporeal membrane oxygenation; therefore, the majority of patients have serious illnesses, and only a few patients have mild to moderate illnesses. The COVID-19 pandemic has had a major impact on our daily hospital practices, partly because of the distribution of medical resources and staff to patients with COVID-19. We speculated that it may also have affected antimicrobial resistance (AMR), infectious disease treatment, and infection control. An increased focus on hand hygiene during the COVID-19 pandemic may reduce the development of AMR within healthcare settings. Conversely, increased use of empirical antimicrobial therapy among COVID-19 patients may promote AMR. Several AMR outbreaks have been reported since the start of the COVID-19 pandemic [4,5]. The COVID-19 pandemic may change doctors' prescribing habits. For example, the use of antimicrobial therapy among patients with respiratory symptoms may increase [4], and increased AMR may lead to an increase in the prescriptions of broad-spectrum antibiotics. Similarly, hospital-wide antibiotic usage may change due to the COVID-19 pandemic because approximately 70% of hospitalized COVID-19 patients receive antibiotics [5–7]. Healthcare workers may focus on self-protection rather than preventing cross-transmission between patients, and the use of hand sanitizers may increase [5]. In summary, the COVID-19 pandemic may affect behavior regarding infection control, antibiotic prescription, and the detection of AMR. However, there is limited information on the specific effects of COVID-19, including its effects on AMR, infectious disease treatment, and infection control. Therefore, we conducted a study to describe our hospital's approach to admitting COVID-19 patients and the effect of the COVID-19 pandemic on infectious disease treatment and infection control.

METHODS

Setting and study design

This study was conducted at the Osaka City University Hospital, a 965-bed tertiary-care hospital in Osaka, Japan. We considered two periods: the year before the admission of COVID-19 patients began (April 2019 to March 2020, fiscal year 2019), and the year after the admission of COVID-19 patients began (April 2020 to March 2021, fiscal year 2020). We compared the following factors between the emergency department and clinical departments other than the emergency department: number of inpatients, amount of hand sanitizer used, bacteria detected in blood cultures, drug-resistance of *Pseudomonas* spp., and the amount of antibacterial agents used (expressed as antimicrobial use density [AUD] and days of therapy [DOT]). All bacteria detected by blood culture were included in the results, and the possibility of contamination could not be excluded. Defined daily doses (DDD), set by the World Health Organization, were used for calculating the AUD. The AUD was calculated as the total antimicrobial use in DDD per 1000 patient-days. The DOT was calculated as the number of antimicrobial therapy days per 1000 patient-days. Due to the instability of the antibacterial drug supply [8], the AUD and DOT in the fiscal year 2020 were compared to those of fiscal years 2015–2019 combined.

Variables and definitions

Each patient was included in the study only once during the observation period for each sample. The number of hand sanitizer units used per patient daily was calculated by dividing the total number of hand sanitizer units used in the hospital (or ward) by the total number of inpatients in the hospital (or ward). Because our hospital uses several different types of hand sanitizer, we obtained the total volume of each type of hand sanitizer used (mL) in the hospital (or ward) from the department that manages the purchase of hand sanitizers in our hospital. We calculated the total number of units of hand sanitizer used for each hand sanitizer by dividing the total volume of each sanitizer used (mL) by the recommended single-use amount (mL). The total number of units of hand sanitizer used was calculated by adding the number of units of all the different types of hand sanitizer used. To compare the amount of antibacterial drugs used, the AUD and DOT for each month of each period were calculated and compared between the two periods.

Microbiological analysis

All bacterial isolates were identified using colony morphologic analysis and Gram staining. Isolate identification and antimicrobial susceptibility were confirmed using the MicroScan WalkAway-96 SI system (Beckman Coulter, Inc., Brea, CA, USA). Results were interpreted according to the 2018 Clinical and Laboratory Standards Institute guidelines [9]. After screening for drug susceptibility, the presence of extended-spectrum β-lactamase (ESBL)-producing bacteria was confirmed by the disk diffusion method using clavulanate [9]; in contrast, the presence of AmpC-producing bacteria was confirmed by the disk diffusion method using boronic acid [10]. Carbapenem-resistant *Enterobacteriaceae* (CRE) were determined according to the standards of the Ministry of Health, Labour, and Welfare of Japan [11] for meropenem (minimum inhibitory concentration [MIC] of meropenem: ≥2 μg/mL), imipenem (MIC of imipenem: ≥2 μg/mL), and cefmetazole (MIC of cefmetazole: ≥64 μg/mL) susceptibility.

Statistical analysis

Fisher's exact test was used for univariate comparisons of categorical data, and the Mann–Whitney U test was used to compare continuous variables using EZR software (Saitama Medical Center, Jichi Medical University, Saitama, Japan) [12], which is a modified version of the R commander (version 2.4) that includes statistical functions frequently used in biostatistics. Statistical significance was set at $p < 0.05$.

Ethics statement

The Ethics Committee of the Osaka City University Graduate School of Medicine approved this study (No. 2021-093). The need for written informed consent was waived owing to the retrospective nature of the study.

RESULTS

The number of inpatients in the fiscal year 2020 was lower than that in the fiscal year 2019 in the emergency department and other departments. While 81 patients with severe COVID-19 were admitted to the emergency department in the fiscal year 2020, the other departments admitted only 18 patients during this period. Nevertheless, it was confirmed that the amount of hand sanitizer used increased in the emergency department, the intensive care unit, and all wards in our hospital, with consumption in the emergency department increasing by approximately three-fold (Table 1).

During the 2015–2019 fiscal years, the baseline detection of the proportion of methicillin-resistant *S. aureus* (MRSA) among *S. aureus* detected in the blood culture was 22.2%, and the proportion of ESBL among *Escherichia coli* and *Klebsiella pneumoniae* was

25.5% and 12.1%, respectively. Although CRE were detected in 22 cases in the fiscal year 2015–2019, none of them was carbapenemase-producing *Enterobacteriaceae*. The numbers of patients with methicillin-susceptible *S. aureus* (MSSA) and overall *S. aureus* bacteremia significantly reduced in the fiscal year 2020 compared with the fiscal year 2019 in all departments. In clinical departments other than the emergency department, there was an increase in the number of patients with *Pseudomonas* spp. bacteremia detected. There were no changes in the number of patients with other bacteria and fungi detected in blood cultures between the two periods (Table 2).

Further, the changes in susceptibility of *Pseudomonas* spp. in blood culture, sputum, urine, and skin to antibacterial agents were investigated because there was a rise in the detection of *Pseudomonas* spp. in blood culture samples obtained from clinical departments other than the emergency department. However, no significant change was observed (Supplementary material).

Additionally, we investigated the changes in the amount of antibacterial drugs used by calculating the AUD and DOT. In the emergency department, the AUD/DOT of ceftriaxone (CTRX) and ampicillin/sulbactam (ABPC/SBT) increased, and the AUD of piperacillin/tazobactam (PIPC/TAZ) similarly increased (Figure 1 (a), (b)). The AUD/DOT of cefmetazole (CMZ), CTRX, cefepime (CFPM), ABPC/SBT, PIPC/TAZ, and vancomycin (VCM) increased in the clinical departments other than the emergency department, and the AUD of meropenem (MEPM) and teicoplanin (TEIC) similarly increased (Figure 1 (a), (b)).

DISCUSSION

COVID-19 has affected various factors influencing daily medical practice and can potentially affect AMR; thus, it influences infectious disease treatment and control. One of the effects is an increased incidence of infections caused by multidrug-resistant bacteria [5,13–15]. This may be due to poor adherence to infection control measures because of staff shortages [13] and improper use of hand sanitizers and personal protective equipment [5,16]. Moreover, the number of antibacterial agents used in the empiric treatment of patients with COVID-19 and the incidence of infection due to drug-resistant bacteria may increase [17]. However, previous reports showed that the COVID-19 pandemic did not affect the incidence of infection due to multidrug-resistant bacteria [5]. This difference in study findings may be attributed to the differences in the nature of the COVID-19 pandemic among countries and the use of infection control measures. The incidence of COVID-19 in Japan has been lower than that of many other countries, with 1,687,422 cases among a total population of over 100 million as of September 24, 2021 [18]. In contrast, the epidemic has been more extensive in North America and Europe, with 43,734,666 cases in the United States of America, 6,994,319 cases in France, 7,664,230 cases in the United Kingdom, 4,660,314 cases in Italy, and 4,203,411 cases in Germany reported as of September 24, 2021 [18].

To the best of our knowledge, this is the first study to investigate the impact of COVID-19 on infection control and infectious disease treatment in Japan. We observed that the use of hand sanitizers increased despite a reduced number of inpatients; however, there were no obvious changes in the detection of drug-resistant bacteria or the amount of antibacterial drugs used.

A previous study showed that the COVID-19 pandemic may increase the use of hand sanitizers [4], and we observed an increase in the use of hand sanitizers in the clinical departments where COVID-19 is directly treated and in those where it is not. This may be related to the rising awareness regarding infection control when admitting COVID-19 patients. Reportedly, proper hand sanitization reduces the incidence of infection caused by resistant bacteria, such as MRSA and ESBL-producing bacteria [19,20]. However, we detected no reduction in the incidence of drug-resistant bacterial infections during the study period. This could be because of the relatively short observation period, and there could be a decrease in the incidence of drug-resistant bacterial infection because of increased hand sanitizer use if a longer observation period is considered. However, factors other than the observation period may be involved, such as inappropriate timing and method of hand sanitization. Other studies with an observation period of less than one year found a decreased incidence of MRSA infection due to the appropriate use of hand sanitizers [21,22]. Therefore, monitoring by the infection control team should focus on increased hand sanitizer use and the method and timing of hand sanitizer use, and appropriate changes should be made to the timing and method of hand sanitizer use by medical staff.

The incidence of MSSA bacteremia was similar in the samples obtained from the clinical departments that admitted many COVID-19 patients and in those that did not; therefore, the decreased incidence of MSSA bacteremia may not be an effect of COVID-19. The amount of antibacterial drugs used in the fiscal year 2020 was compared to that in fiscal years 2015–2019. This is because of the instablity in the supply of some antibacterial drugs from the year 2017 [8], which is likely to have a greater effect on the results of the yearly comparisons (fiscal years 2019 and 2020). Increased CTRX and ABPC/SBT usage (based on both AUD and DOT) was confirmed in the emergency department and all other departments, and this may have contributed to the reduced incidence of MSSA bacteremia. Overall, no decrease was observed in the usage of any antibacterial drugs, and the usage of all antibacterial drugs tended to increase in the fiscal year 2020. Additionally, CTRX and ABPC/SBT usage increased based on the AUD and DOT, while PIPC/TAZ usage in the emergency department increased based on the AUD. In contrast, there was increased usage of CTRX, ABPC/SBT, and PIPC/TAZ in clinical departments other than the emergency department. Therefore, it is unlikely that COVID-19 affected the usage of these drugs. Further, the usage of all antibacterial drugs tended to increase in all departments other than the emergency department. As no reduction in usage was observed for all antibacterial drugs, even in the emergency department, it is likely that the changes in the amount of antibacterial agents used (other than CTRX and ABPC/SBT) were similar. Notably, a significant increase was observed only in the amount of antibiotics used in clinical departments other than the emergency department. This was because there was less antibiotic usage in the emergency department, making it difficult to detect a significant difference. The incidence of *Pseudomonas* spp. infections increased only in clinical departments other than the emergency department. This may have been caused by breakthrough infections due to increased antibiotic usage, especially CMZ, CTRX, and ABPC/SBT, which are ineffective against *Pseudomonas* spp. The difference in the incidence of *Pseudomonas* spp. bacteremia may be a possible effect of COVID-19 because the incidence of bacteremia differed between the COVID-19 ward (emergency department) and the other wards; however, the incidence in the emergency department was too low to perform statistical analysis. Studies that have shown an increased incidence of drug-resistant bacterial infections since the onset of the COVID-19 pandemic have been conducted in Germany [13], the United States of America [14], and Italy [15], where the incidence of COVID-19 is several times higher than that in Japan, and, the influence of COVID-19 may, therefore, be more marked. Additionally, our hospital mainly accepts patients with severe COVID-19, and only a few patients have mild to moderate symptoms. Thus, most of the COVID-19 patients were intubated and received mechanical ventilation, which may have aided in infection control.

Our study has several limitations. First, it was a single-center study conducted only in Japan. The COVID-19 situation varies greatly not only between countries but also between different regions within the same country. Furthermore, the process of admission of COVID-19 patients with mild, moderate, or severe disease varies between hospitals. Studies conducted in different hospitals could yield diverse results; therefore, it is necessary to investigate the effect of COVID-19 in different settings. Second, our observation period was relatively short. The relationship between the use of hand sanitizers and detection of resistant bacteria varies according to the observation period, and these findings vary between different reports [19–22]. Furthermore, the use of antibacterial drugs can change significantly in a single year, depending on the supply. The most significant limitation of this study is that we could not investigate the method and timing of hand sanitizer use. Therefore, this needs to be clarified in a future prospective study.

In conclusion, admission of patients with COVID-19 may not affect the detection of drug-resistant bacteria and the use of antimicrobial agents. Nevertheless, increasing the awareness of healthcare staff toward the use of hand sanitizers and sufficient infection control education is needed for the increased use of hand sanitizers to have a positive effect, despite the COVID-19 pandemic.

DECLARATIONS OF INTEREST

None.

FUNDING

This research was supported by the Research Program on Emerging and Re-emerging Infectious Diseases from the Japan Agency Development, AMED [Grant number JP21fk0108094 and JP21fk0108133] and JSPS KAKENHI [Grant number 18K16185, 19K08958].

ACKNOWLEDGMENTS

We would like to thank Editage (www.editage.jp) for English language editing.

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TABLES

Table 1. Number of inpatients and central venous catheter and hand sanitizer usage

	Fiscal year 2019	Fiscal year 2020
Number of inpatients		
Number of inpatients in the emergency department (person)	556	473
Number of inpatients in departments other than the emergency department (person)	21,725	18,974
Total number of inpatients (36 clinical departments) (person)	22,281	19,447
Hand sanitizer usage		
Emergency department*	48.8	149.9
Intensive care unit*	59.7	76.8
Other than emergency department, ICU, and NICU*	11.6	17
All wards*	14.1	19.8

*Number of units of hand sanitizer per patient daily = Total number of hand sanitizer units used in our hospital (or ward) / Total number of inpatients in the hospital (or ward)

Table 2. Changes in the number of isolates of bacteria and fungi detected in blood culture

		Fiscal year 2019	Fiscal year 2020	
Emergency department		n=86	n=95	p-value*
GPC		58 (67.4%)	61 (64.2)	0.75
	Staphylococcus aureus	15 (17.4%)	7 (7.4%)	0.04
	MSSA	10 (11.6%)	3 (3.2%)	0.04
	MRSA	5 (5.8%)	4 (4.2%)	0.74
	CNS	22 (25.6%)	32 (33.7%)	0.26
	MRCNS	16 (18.6%)	26 (27.4%)	0.22
GPR		19 (22.1%)	20 (21.1%)	>0.99
GNC		0 (0%)	0 (0%)	>0.99
GNR		23 (26.7%)	19 (20.0%)	0.3
	ESBL (+)	3 (3.5%)	2 (2.1%)	0.67
	AmpC (+)	2 (2.3%)	2 (2.1%)	>0.99
	CRE	0 (0%)	1 (1.1%)	>0.99
	Pseudomonas spp.	2 (2.3%)	2 (2.1%)	>0.99
	Fungi	1 (1.2%)	2 (2.1%)	>0.99
Clinical departments other than the emergency department		n=343	n=287	p-value*
GPC		197 (57.4%)	149 (51.9%)	0.17
	Staphylococcus aureus	48 (14.0%)	23 (8.0%)	0.02
	MSSA	35 (10.2%)	12 (4.2%)	< 0.01
	MRSA	13 (3.8%)	11 (3.8%)	>0.99
	CNS	31 (9.0%)	27 (9.4%)	0.89
	MRCNS	68 (19.8%)	55 (19.2%)	0.84
GPR		45 (13.1%)	30 (10.5%)	0.33
GNC		2 (0.6%)	2 (0.7%)	>0.99
GNR		128 (37.3%)	123 (42.9%)	0.17
	ESBL (+)	16 (4.7%)	10 (3.5%)	0.55
	AmpC (+)	17 (5.0%)	9 (3.1%)	0.32
	CRE	3 (0.9%)	3 (1.0%)	>0.99
	Pseudomonas spp.	9 (2.6%)	21 (7.3%)	< 0.01
	Fungi	2 (0.6%)	6 (2.1%)	0.15

*Fisher's exact test
CNS, coagulase-negative staphylococci; CRE, carbapenem-resistant *Enterobacteriaceae*; ESBL, extended spectrum beta-lactamase; GNC, gram negative cocci; GNR, gram negative rod; GPC, gram positive cocci; GPR, gram positive rod; MRCNS, methicillin-resistant coagulase-negative staphylococci; MRSA, methicillin-resistant *Staphylococcus aureus*; MSSA, methicillin-sensitive *Staphylococcus aureus.*;

Supplementary material

Changes in susceptibility of *Pseudomonas* spp. to each antibacterial drug.

	Fiscal year 2019	Fiscal year 2020	
Susceptibility of *Pseudomonas* spp. in blood culture	n=11	n=23	p-value*
CAZ	11 (100%)	22 (95.7%)	>0.99
CFPM	10 (90.9%)	21 (91.3%)	>0.99
CZOP	11 (100%)	22 (95.7%)	>0.99
PIPC	11 (100%)	21 (91.3%)	>0.99
PIPC/TAZ	11 (100%)	22 (95.7%)	>0.99
IPM/CS	8 (72.7%)	19 (82.6%)	0.66
MEPM	10 (90.9%)	23 (100%)	0.32
DRPM	11 (100%)	23 (100%)	>0.99
AMK	11 (100%)	23 (100%)	>0.99
LVFX	10 (90.9%)	22 (95.7%)	>0.99
CPFX	10 (90.9%)	22 (95.7%)	>0.99
AZT	10 (90.9%)	19 (82.6%)	>0.99
FOM	2 (18.2%)	2 (8.7%)	0.58
Susceptibility of *Pseudomonas* spp. in sputum culture	n=169	n=126	p-value*
CAZ	162 (95.9%)	119 (94.4%)	0.59
CFPM	161 (95.3%)	120 (95.2%)	>0.99
CZOP	165 (97.6%)	121 (96.0%)	0.5
PIPC	155 (91.7%)	118 (93.7%)	0.66
PIPC/TAZ	162 (95.9%)	120 (95.2%)	0.78
IPM/CS	147 (87.0%)	114 (90.5%)	0.46
MEPM	163 (96.4%)	123 (97.6%)	0.74
DRPM	166 (98.2%)	124 (98.4%)	>0.99
AMK	165 (97.6%)	122 (96.8%)	0.73
LVFX	155 (91.7%)	115 (91.3%)	>0.99
CPFX	155 (91.7%)	114 (90.5%)	0.84
AZT	144 (85.2%)	111 (88.1%)	0.5
FOM	4 (2.4%)	2 (1.6%)	>0.99

Susceptibility of *Pseudomonas* spp.in urine culture	n=71	n=63	p-value*
CAZ	68 (95.8%)	62 (98.4%)	0.62
CFPM	67 (94.4%)	62 (98.4%)	0.37
CZOP	69 (97.2%)	63 (100%)	0.5
PIPC	64 (90.1%)	60 (95.2%)	0.33
PIPC/TAZ	67 (94.4%)	62 (98.4%)	0.37
IPM/CS	63 (88.7%)	59 (93.7%)	0.38
MEPM	67 (94.4%)	61 (96.8%)	0.68
DRPM	68 (95.8%)	61 (96.8%)	>0.99
AMK	70 (98.6%)	63 (100%)	>0.99
LVFX	67 (94.4%)	61 (96.8%)	0.68
CPFX	68 (95.8%)	62 (98.4%)	0.62
AZT	63 (88.7%)	59 (93.7%)	0.38
FOM	5 (7.0%)	3 (4.8%)	0.72

Susceptibility of *Pseudomonas* spp. in skin and soft tissue culture	n=46	n=36	p-value*
CAZ	44 (95.7%)	34 (94.4%)	>0.99
CFPM	44 (95.7%)	35 (97.2%)	>0.99
CZOP	44 (95.7%)	35 (97.2%)	>0.99
PIPC	43 (93.5%)	34 (94.4%)	>0.99
PIPC/TAZ	44 (95.7%)	34 (94.4%)	>0.99
IPM/CS	42 (91.3%)	33 (91.7%)	>0.99
MEPM	44 (95.7%)	34 (94.4%)	>0.99
DRPM	45 (97.8%)	34 (94.4%)	0.58
AMK	44 (95.7%)	36 (100%)	0.5
LVFX	43 (93.5%)	30 (83.3%)	0.17
CPFX	44 (95.7%)	32 (88.9%)	0.4
AZT	41 (89.1%)	26 (72.2%)	0.08
FOM	2 (4.3%)	2 (5.6%)	>0.99

*Fisher's exact test
AMK, amikacin; AZT, aztreonam; CAZ, ceftazidime; CFPM, cefepime; CPFX, ciprofloxacin; CZOP, cefozopran; DRPM, doripenem; FOM, fosfomycin; IPM/CS, imipenem/cilastatin; LVFX, levofloxacin; MEPM, meropenem; PIPC, piperacillin; TAZ, tazobactam.

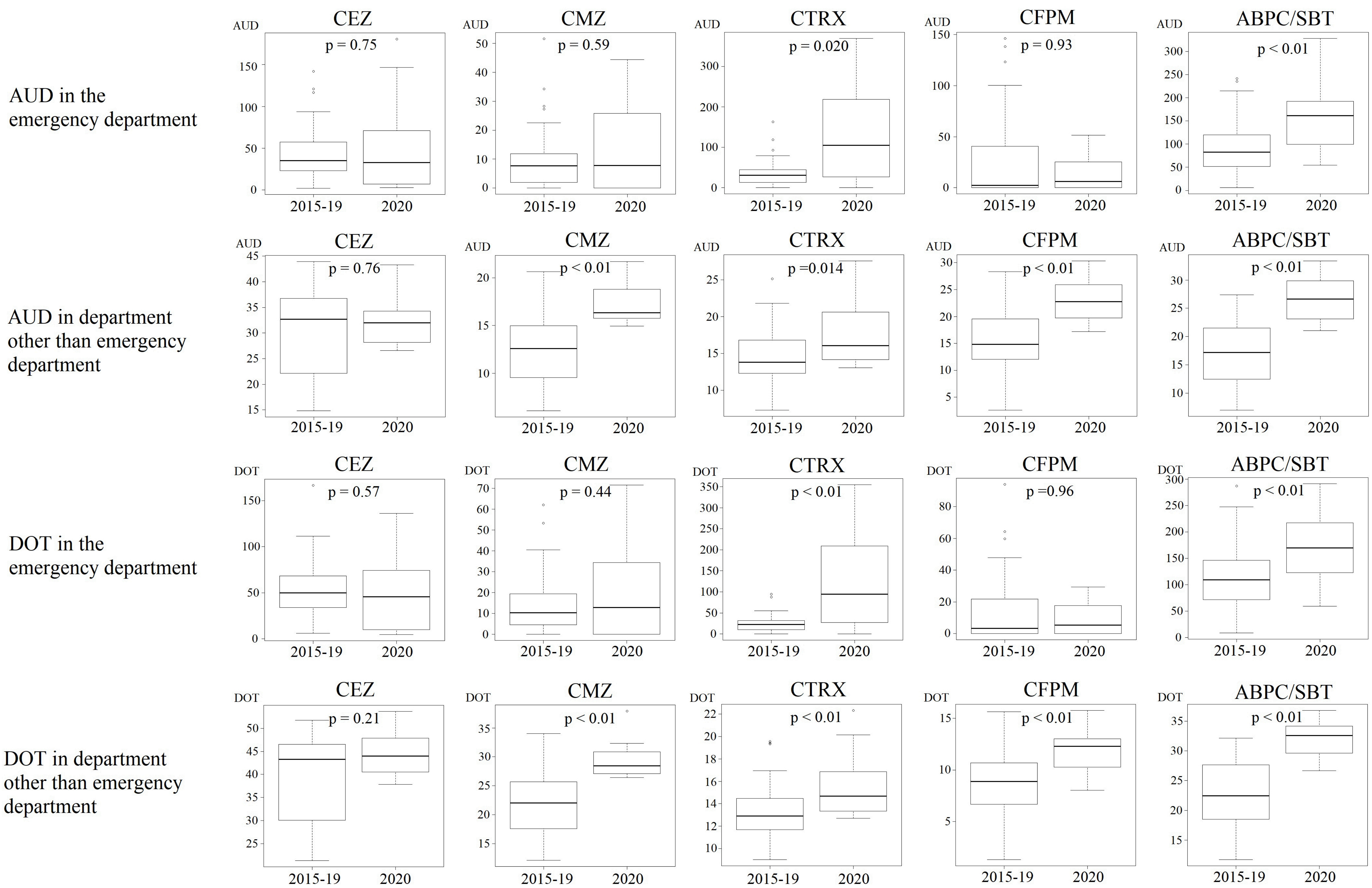
Figure legends

Figure 1. Box-and-whisker plots showing antimicrobial use density (AUD) and days of therapy (DOT) in fiscal years 2015–2019 and 2020

(a) Comparison of AUD/DOT between fiscal years 2015–2019 and 2020 in the emergency department and departments other than the emergency department; CEZ, CMZ, CTRX, CFPM, and ABPC/SBT. (b) Comparison of AUD/DOT between fiscal years 2015–2019 and 2020 in the emergency department and departments other than the emergency department; PIPC/TAZ, MEPM, LVFX, VCM, and TEIC.

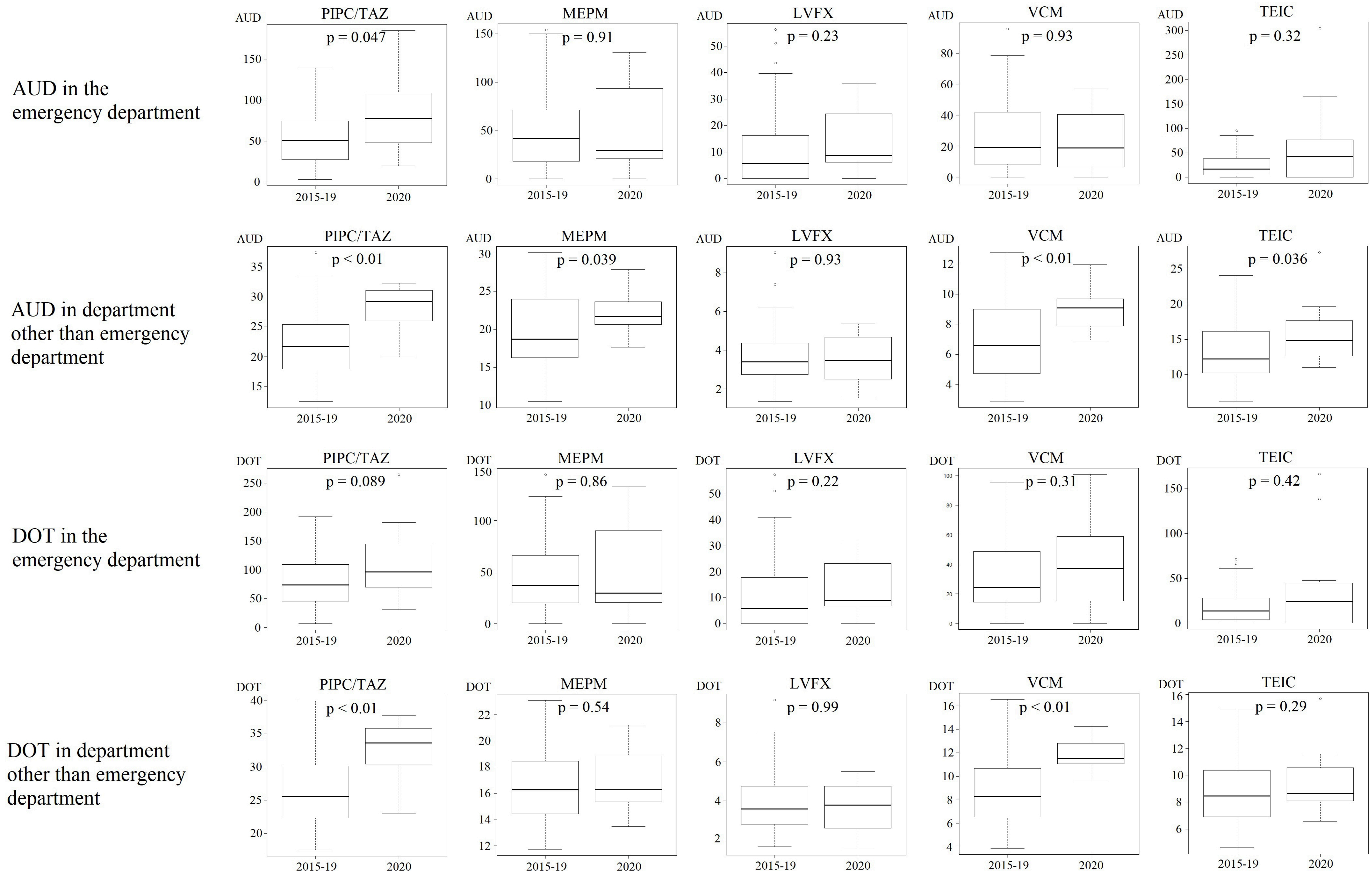
ABPC/SBT, ampicillin/sulbactam; AUD, antimicrobial use density; CAZ, ceftazidime; CEZ, cefazolin; CFPM, cefepime; CMZ, cefmetazole; CTRX, ceftriaxone; LVFX, levofloxacin; MEPM, meropenem; PIPC/TAZ, piperacillin/tazobactam; TEIC, teicoplanin; VCM, vancomycin

Figure_1_a



AUD in the emergency department
CEZ
AUD
p = 0.75
CMZ
AUD
p = 0.59
CTRX
AUD
p = 0.020
CFPM
AUD
p = 0.93
ABPC/SBT
AUD
p < 0.01
AUD in department other than emergency department
CEZ
AUD
p = 0.76
CMZ
AUD
p < 0.01
CTRX
AUD
p =0.014
CFPM
AUD
p < 0.01
ABPC/SBT
AUD
p < 0.01
DOT in the emergency department
CEZ
DOT
p = 0.57
CMZ
DOT
p = 0.44
CTRX
DOT
p < 0.01
CFPM
DOT
p =0.96
ABPC/SBT
DOT
p < 0.01
DOT in department other than emergency department
CEZ
DOT
p = 0.21
CMZ
DOT
p < 0.01
CTRX
DOT
p < 0.01
CFPM
DOT
p < 0.01
ABPC/SBT
DOT
p < 0.01
2015-19
2020

Fihure_1_b


AUD in the emergency department
PIPC/TAZ p = 0.047
MEPM p = 0.91
LVFX p = 0.23
VCM p = 0.93
TEIC p = 0.32
AUD in department other than emergency department
PIPC/TAZ p < 0.01
MEPM p = 0.039
LVFX p = 0.93
VCM p < 0.01
TEIC p = 0.036
DOT in the emergency department
PIPC/TAZ p = 0.089
MEPM p = 0.86
LVFX p = 0.22
VCM p = 0.31
TEIC p = 0.42
DOT in department other than emergency department
PIPC/TAZ p < 0.01
MEPM p = 0.54
LVFX p = 0.99
VCM p < 0.01
TEIC p = 0.29
AUD
DOT
2015-19
2020