

Antimicrobial Usage (AMU) Surveillance in Public Hospitals and Clinics - Hospital Authority Antimicrobial Dispensing Data (2020)

January 2022



Contents Outline

- Background
- Methodology
- Results
 1. Total antimicrobials dispensed in public hospitals and clinics by service type
 2. Antimicrobials dispensed in HA non-inpatient service by service
 3. Antimicrobials dispensed in HA inpatient service by specialty
- Remarks on interpretation of results
- Summary
- Recommendations



Background



Background

- The Hong Kong Strategy and Action Plan on Antimicrobial Resistance 2017-2022 was issued in July 2017
- Activity 3.2.1 suggests collecting antimicrobial dispensing data from Hospital Authority (HA) and monitoring antimicrobial usage in public hospitals and clinics
- This presentation briefly accounts the surveillance findings for year 2020



Methodology



Scope of Data

- Antimicrobials dispensing records from the following HA services during 2016 to 2020 were included:
 - Non-inpatient service
 - Primary Care (GOPC)
 - Specialist Out-patient (Clinical)
 - Accident and Emergency (A&E)
 - Inpatient service
 - Medicine
 - Surgery
 - Orthopaedics and Traumatology (O&T)
 - Intensive Care Unit/ High Dependency Unit (ICU/ HDU)
 - Others



Definitions

- Surveillance period is defined by calendar year
- Anatomical Therapeutic Chemical (ATC) classification
 - This system is developed by WHO
 - It divides drugs into different groups according to the organ or system on which they act and their therapeutic, pharmacological and chemical properties
- Defined Daily Dose (DDD)
 - A standardised unit adopted by WHO to facilitate comparison of drug usage
 - Defined as “the assumed average maintenance dose per day for a drug used for its main indication in adults”
 - Each antimicrobial was assigned a DDD constant per route of administration
 - The 2020 version of WHO ATC DDD constants was adopted in this report but as there has been no change in DDD constants for those antimicrobials dispensed in HA captured by this surveillance system. As such, the DDD constants adopted for calculation for previous years remained the same as in the last report of 2019.



Antimicrobials Monitored

- Antimicrobials fall under the following WHO ATC classification (2020) were monitored:
 - J01 – Antibacterials for systemic use
 - P01AB – Nitroimidazole derivatives, agents against amoebiasis and other protozoal diseases
 - A07AA – Antibiotics, intestinal antiinfectives
- Antimicrobials administered by the following routes were included as recommended by WHO
 - Oral
 - Parenteral
 - Rectal
 - Inhalation
- Preparations for topical use were excluded



Broad-spectrum Antimicrobials (Big Guns)

The following 15 broad-spectrum antimicrobials identified by experts in HA were examined because of their importance on treating resistant infections:

- Piperacillin/tazobactam
- Ceftazidime
- Cefoperazone/sulbactam
- Cefepime
- Ceftaroline fosamil
- Ceftolozane/tazobactam
- Ceftazidime/avibactam
- Meropenem
- Ertapenem
- Imipenem/cilastatin
- Vancomycin
- Linezolid
- Daptomycin
- Colistin
- Teicoplanin



Measurement

- The following units* were used:

Unit of Measurement	Dispensing Quantity in HA
DDD	non-inpatient + inpatient service
DDD per 1,000 attendances	non-inpatient service
DDD per 1,000 patient-days	inpatient service

- The following measurements were calculated:
 - Overall dispensing quantity from 2016 to 2020
 - The five most dispensed antimicrobial groups (ATC) in 2020
 - The ten most dispensed antimicrobials in 2020
 - Dispensing quantity of broad-spectrum antimicrobials from 2016 to 2020

*The ATC/DDD Index (2020) published by the WHO Collaborating Centre for Drug Statistics Methodology was adopted



Statistical Method

- Year 2016 was chosen as the baseline for comparison as the Hong Kong Strategy and Action Plan on Antimicrobial Resistance 2017-2022 was issued in mid-2017 and such decision was endorsed by the High Level Steering Committee (HLSC)
- Following the practice of ECDC*, we used compound annual growth rate (CAGR) to illustrate average annual rate of change when comparing antimicrobials dispensed in 2020 with that in 2016.

$$CAGR = (SU_{2020}/SU_{2016})^{(1/4)} - 1$$

- In this equation, SU_{2020} is the total amount of antimicrobials dispensed in year 2020, SU_{2016} is the total amount of antimicrobials dispensed in year 2016

*<https://www.ecdc.europa.eu/sites/default/files/documents/Antimicrobial-consumption-in-the-EU-Annual-Epidemiological-Report-2019.pdf>

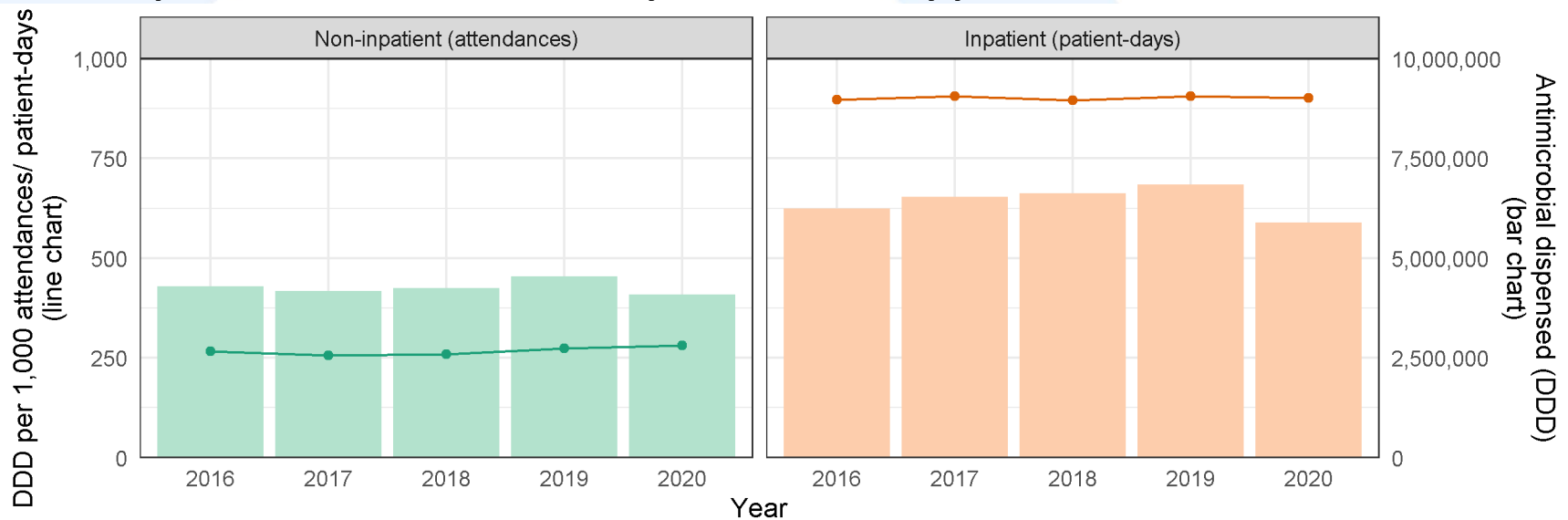


Results

1. Total antimicrobials dispensed in public hospitals and clinics by service type



Total Antimicrobials Dispensed in Public Hospitals and Clinics by Service Type



Year	Non-inpatient Service	Inpatient Service
	DDD per 1,000 attendances*	DDD per 1,000 patient-days*
2016	266.27	896.40
2017	256.16	905.35
2018	259.05	895.87
2019	274.41	906.10
2020	280.98	900.83

*Rounded to two decimal places

- Total antimicrobials dispensed showed increases for both non-inpatient service (14.71 DDD/ 1,000 attendances; CAGR: 1.35%) and inpatient service (4.42 DDD/ 1,000 patient-days; CAGR: 0.12%) in 2020 compared with that of 2016



Five Most Dispensed Antimicrobial Groups in Public Hospitals and Clinics

ATC Pharmacological Subgroup		Antimicrobial dispensed in DDD					Compound annual growth rate (16 to 20) [†]
Code	Description	Year 2016*	Year 2017*	Year 2018*	Year 2019*	Year 2020*	
J01C	Beta-lactam Antibacterials, Penicillins	6,128,000	6,223,000	6,236,000	6,451,000	5,333,000	-3.42%
J01A	Tetracyclines	643,000	747,000	873,000	1,060,000	1,112,000	14.65%
J01M	Quinolone Antibacterials	1,006,000	1,022,000	1,040,000	1,019,000	896,000	-2.85%
J01D	Other Beta-lactam Antibacterials	856,000	814,000	840,000	858,000	824,000	-0.95%
J01F	Macrolides, Lincosamides and Streptogramins	955,000	933,000	882,000	934,000	744,000	-6.06%
	Others	942,000	965,000	1,000,000	1,062,000	1,071,000	3.25%
	Total	10,531,000	10,704,000	10,873,000	11,385,000	9,979,000	-1.34%

Note:

The five most dispensed antimicrobial groups were identified from year 2020 data

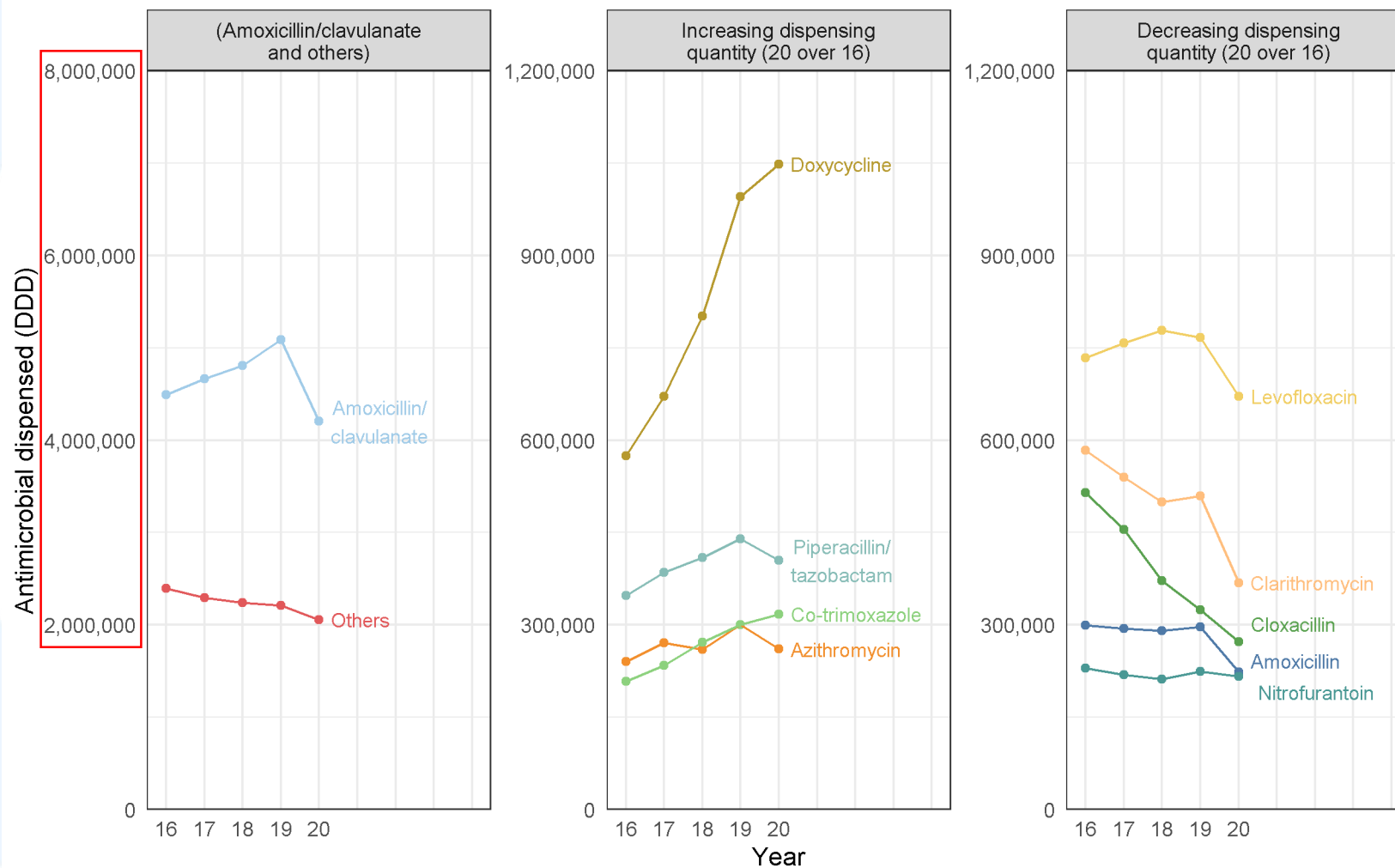
*Rounded to nearest thousand

†Rounded to two decimal places; due to rounding, percentages may not precisely reflect the absolute figures

- The overall antimicrobials dispensed in public hospitals and clinics in 2020 decreased by 12.35% when compared with that of 2019 and decreased by 5.24% when compared with that of 2016. The decrease was probably due to the adjustment of non-emergency and non-essential services at public hospitals in 2020 with COVID-19 Pandemic
- The five most dispensed antimicrobial groups contain antimicrobials commonly prescribed as empirical treatment for suspected bacterial infections
- In 2020, tetracyclines group was the one with the most obvious increase (CAGR: 14.65%)



Ten Most Dispensed Antimicrobials in Public Hospitals and Clinics



Ten Most Dispensed Antimicrobials in Public Hospitals and Clinics

ATC Chemical Substance		Antimicrobial dispensed in DDD					Compound annual growth rate (16 to 20) [†]
Code	Description	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
J01CR02	Amoxicillin/clavulanate	4,493,000	4,664,000	4,807,000	5,087,000	4,203,000	-1.65%
J01AA02	Doxycycline	575,000	671,000	801,000	996,000	1,048,000	16.20%
J01MA12	Levofloxacin	734,000	758,000	779,000	767,000	671,000	-2.19%
J01CR05	Piperacillin/tazobactam	347,000	385,000	409,000	439,000	405,000	3.89%
J01FA09	Clarithromycin	583,000	540,000	500,000	509,000	368,000	-10.85%
J01EE01	Co-trimoxazole	208,000	234,000	271,000	300,000	317,000	11.07%
J01CF02	Cloxacillin	515,000	455,000	372,000	324,000	272,000	-14.74%
J01FA10	Azithromycin	240,000	270,000	260,000	300,000	261,000	2.06%
J01CA04	Amoxicillin	299,000	294,000	290,000	297,000	223,000	-7.12%
J01XE01	Nitrofurantoin	230,000	219,000	212,000	224,000	217,000	-1.45%
	Others	2,306,000	2,215,000	2,172,000	2,140,000	1,993,000	-3.58%
	Total	10,531,000	10,704,000	10,873,000	11,385,000	9,979,000	-1.34%

Note:

The ten most dispensed antimicrobials were identified from year 2020 data

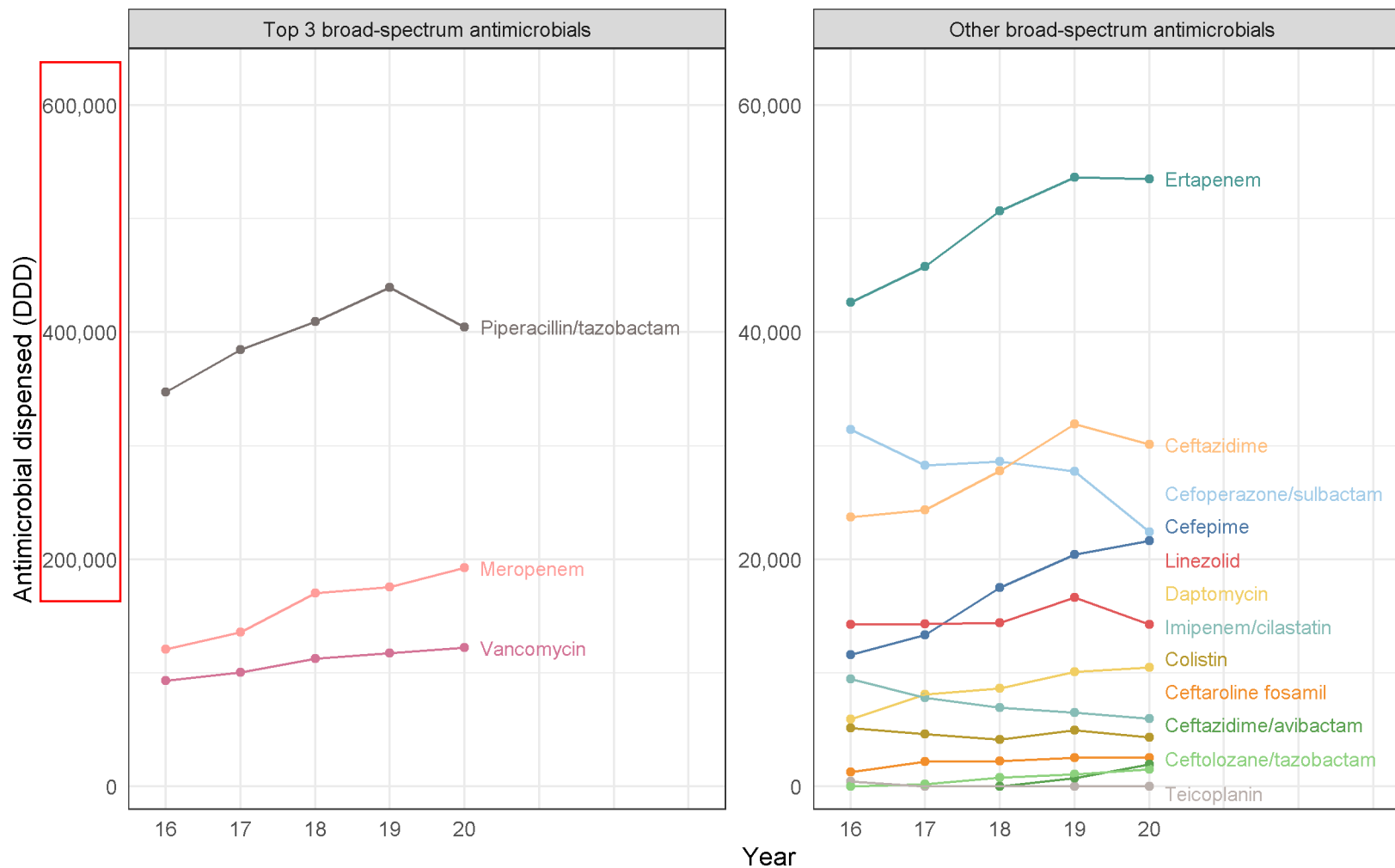
^{*}Rounded to the nearest thousand

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- Almost all top 10 most dispensed antimicrobials registered a decrease in 2020 in DDD when compared with that of 2019, except doxycycline and co-trimoxazole
- Amoxicillin/clavulanate was the most dispensed antimicrobial from 2016 to 2020
- Doxycycline showed the largest increase in dispensing quantity from 2016 to 2020 (CAGR: 16.20%), followed by co-trimoxazole (CAGR: 11.07%), piperacillin/tazobactam (CAGR: 3.89%) and azithromycin (CAGR: 2.06%)
- Cloxacillin showed the largest decrease in dispensing quantity from 2016 to 2020 (CAGR: 14.74%), followed by clarithromycin (CAGR: -10.85%)



Broad-spectrum Antimicrobials Dispensed in Public Hospitals and Clinics



Broad-spectrum Antimicrobials Dispensed in Public Hospitals and Clinics

	ATC Chemical Substance		Antimicrobial Dispensed in DDD					Compound annual growth rate (16 to 20) [†]
	Code	Description	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
Beta-lactam Antibacterials, Penicillins	J01CR05	Piperacillin/tazobactam	347,000	385,000	409,000	439,000	405,000	3.89%
Other Beta-lactam Antibacterials (Cephalosporins) [‡]	J01DD02	Ceftazidime	24,000	24,000	28,000	32,000	30,000	6.16%
	J01DD62	Cefoperazone/sulbactam	31,000	28,000	29,000	28,000	22,000	-8.09%
	J01DE01	Cefepime	12,000	13,000	18,000	20,000	22,000	16.84%
	J01DI02	Ceftaroline fosamil	1,000	2,000	2,000	3,000	3,000	18.74%
	J01DD52	Ceftazidime/avibactam	-	-	<500	1,000	2,000	-
Other Beta-lactam Antibacterials (Carbapenems) [‡]	J01DI54	Ceftolozane/tazobactam	<500	<500	1,000	1,000	2,000	Not applicable [§]
	J01DH02	Meropenem	121,000	136,000	170,000	176,000	193,000	12.28%
	J01DH03	Ertapenem	43,000	46,000	51,000	54,000	54,000	5.84%
Other Antibacterials	J01DH51	Imipenem/cilastatin	9,000	8,000	7,000	7,000	6,000	-10.92%
	J01XA01	Vancomycin	93,000	101,000	113,000	118,000	122,000	7.04%
	J01XX08	Linezolid	14,000	14,000	14,000	17,000	14,000	-0.02%
	J01XX09	Daptomycin	6,000	8,000	9,000	10,000	10,000	15.33%
	J01XB01	Colistin	5,000	5,000	4,000	5,000	4,000	-4.17%
	J01XA02	Teicoplanin	<500	<500	<500	<500	<500	-71.61%
		Total	708,000	770,000	854,000	910,000	888,000	5.85%

^{*} Rounded to the nearest thousand

[†] Rounded to two decimal places

[‡] WHO ATC Pharmacological subgroup "Other Beta-lactam Antibacterials (J01D)" is further categorized into Cephalosporins and Carbapenems groups

[§] Ceftolozane/ tazobactam was listed in the HA drug formulary since April 2019, it was supplied on named patient basis before enlistment

- The 15 broad-spectrum antimicrobials accounted for about 8.90% of total antimicrobials dispensed in HA in 2020 and showed an increase in CAGR of 5.85% from 2016 to 2020
- Increased dispensed quantities were observed with meropenem, vancomycin, cefepime, ceftazidime/avibactam, ceftolozane/tazobactam and daptomycin from 2019 to 2020
- Majority of broad-spectrum antimicrobials were dispensed in inpatient services
- The most dispensed broad-spectrum antimicrobial from 2016 to 2020 was piperacillin/tazobactam, contributed to 45.56% of all broad-spectrum antimicrobials dispensed in 2020, followed by meropenem and then vancomycin

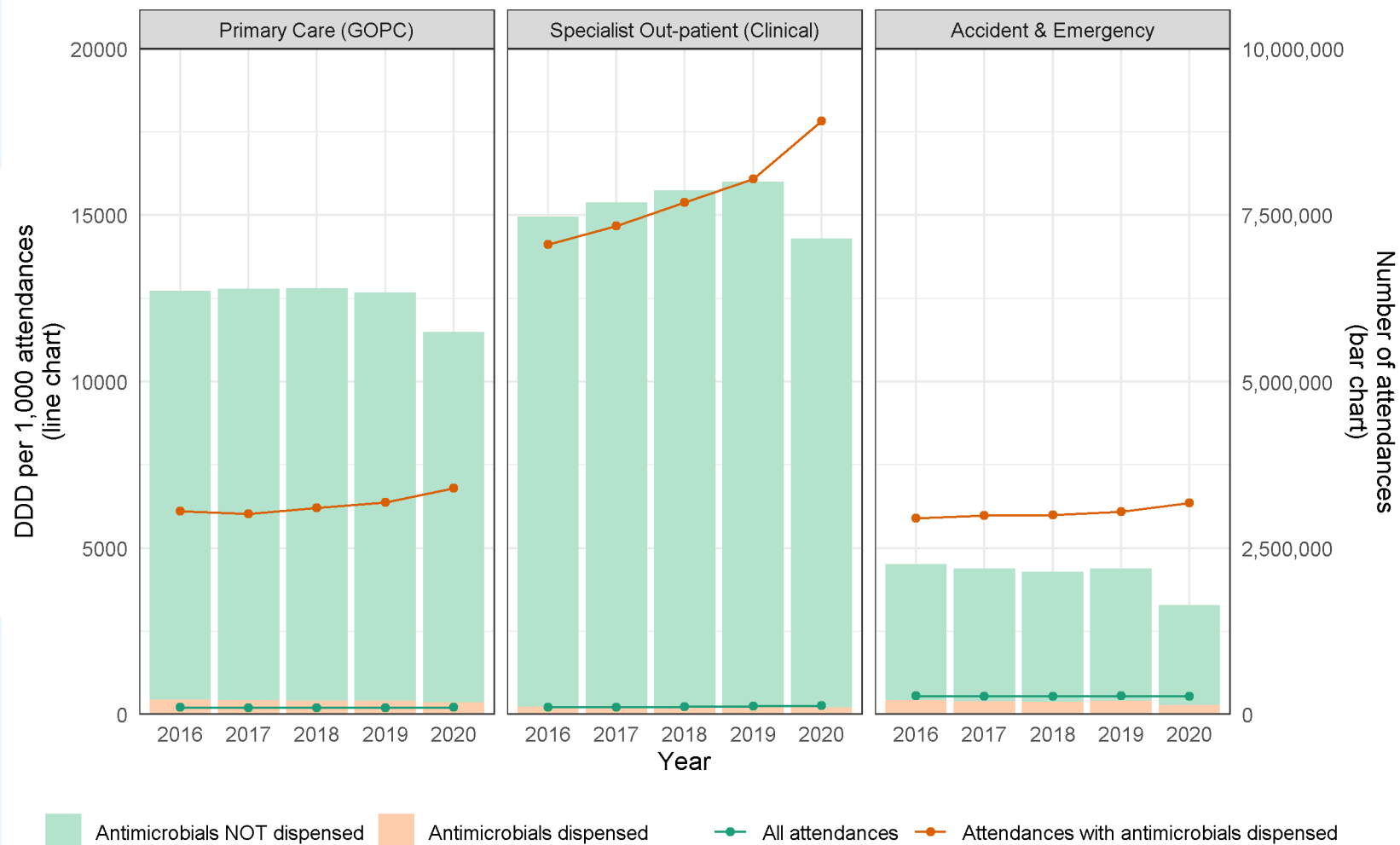


Results

2. Antimicrobials dispensed in HA non-inpatient service by service



Total Antimicrobials Dispensed in HA Non-inpatient Service by Service



Non-inpatient Service by Specialty

Year		Primary Care (GOPC)	Specialist Out-patient (Clinical)	Accident & Emergency	All Non-inpatient Services
2016	Percentage of attendance with antimicrobials dispensed ^{‡§}	3.48%	1.57%	9.57%	3.45%
	DDD per 1,000 attendances (all attendances) [‡]	212.76	221.72	564.30	266.27
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	6108.59	14116.11	5897.26	7720.07
2017	Percentage of attendance with antimicrobials dispensed ^{‡§}	3.33%	1.51%	9.03%	3.24%
	DDD per 1,000 attendances (all attendances) [‡]	200.68	221.27	540.03	256.16
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	6032.00	14673.67	5981.24	7914.66
2018	Percentage of attendance with antimicrobials dispensed ^{‡§}	3.21%	1.49%	9.13%	3.16%
	DDD per 1,000 attendances (all attendances) [‡]	199.31	229.10	547.12	259.05
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	6218.19	15388.93	5994.59	8207.22
2019	Percentage of attendance with antimicrobials dispensed ^{‡§}	3.26%	1.53%	9.31%	3.23%
	DDD per 1,000 attendances (all attendances) [‡]	207.26	246.90	568.23	274.41
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	6367.35	16090.61	6102.49	8503.40
2020	Percentage of attendance with antimicrobials dispensed ^{‡§}	3.13%	1.54%	8.64%	2.97%
	DDD per 1,000 attendances (all attendances) [‡]	212.70	274.29	549.01	280.98
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	6801.53	17835.04	6357.23	9467.20
CAGR (16 to 20)	Percentage of attendance with antimicrobials dispensed [‡]	-2.66%	-0.53%	-2.53%	-3.69%
	DDD per 1,000 attendances (all attendances) [‡]	-0.01%	5.46%	-0.68%	1.35%
	DDD per 1,000 attendances (attendances with antimicrobial dispensed) [‡]	2.72%	6.02%	1.90%	5.23%

[‡]Rounded to two decimal places

[§]Due to rounding, figures may not precisely reflect the absolute figures

- Total antimicrobials dispensed in all HA non-inpatient service showed an increase in CAGR of 1.35% from 2016 to 2020 when all attendances were considered. However, if only considered those attendances with antimicrobial dispensed, CAGR reached 5.23%
- Overall 3.69% decrease in CAGR of attendance with antimicrobials dispensed was observed from 2016 to 2020 and decreases were observed among all non-inpatient services
- By specialty, Specialist Out-patient (Clinical) showed an increase in CAGR of 6.02% while Primary Care (GOPC) and Accident & Emergency showed increase of 2.72% and 1.90% respectively from 2016 to 2020 (only considered those attendances with antimicrobial dispensed)



Five Most Dispensed Antimicrobial Groups in Non-inpatient Service

ATC Pharmacological Subgroup		DDD per 1,000 attendances					CAGR (16 to 20) [†]
Code	Description	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
J01C	Beta-lactam Antibacterials, Penicillins	151.73	144.14	144.56	151.39	142.48	-1.56%
J01A	Tetracyclines	22.36	23.23	26.15	30.09	40.00	15.66%
J01F	Macrolides, Lincosamides and Streptogramins	36.63	35.00	33.95	36.20	34.03	-1.82%
J01M	Quinolone Antibacterials	22.14	21.34	21.53	21.48	22.90	0.85%
J01E	Sulfonamides and Trimethoprim	8.32	8.97	10.25	11.12	13.85	13.58%
	Others	25.10	23.48	22.61	24.12	27.72	2.52%
	Total	266.27	256.16	259.05	274.41	280.98	1.35%

Note:

The five most dispensed antimicrobial groups were identified from year 2020 data

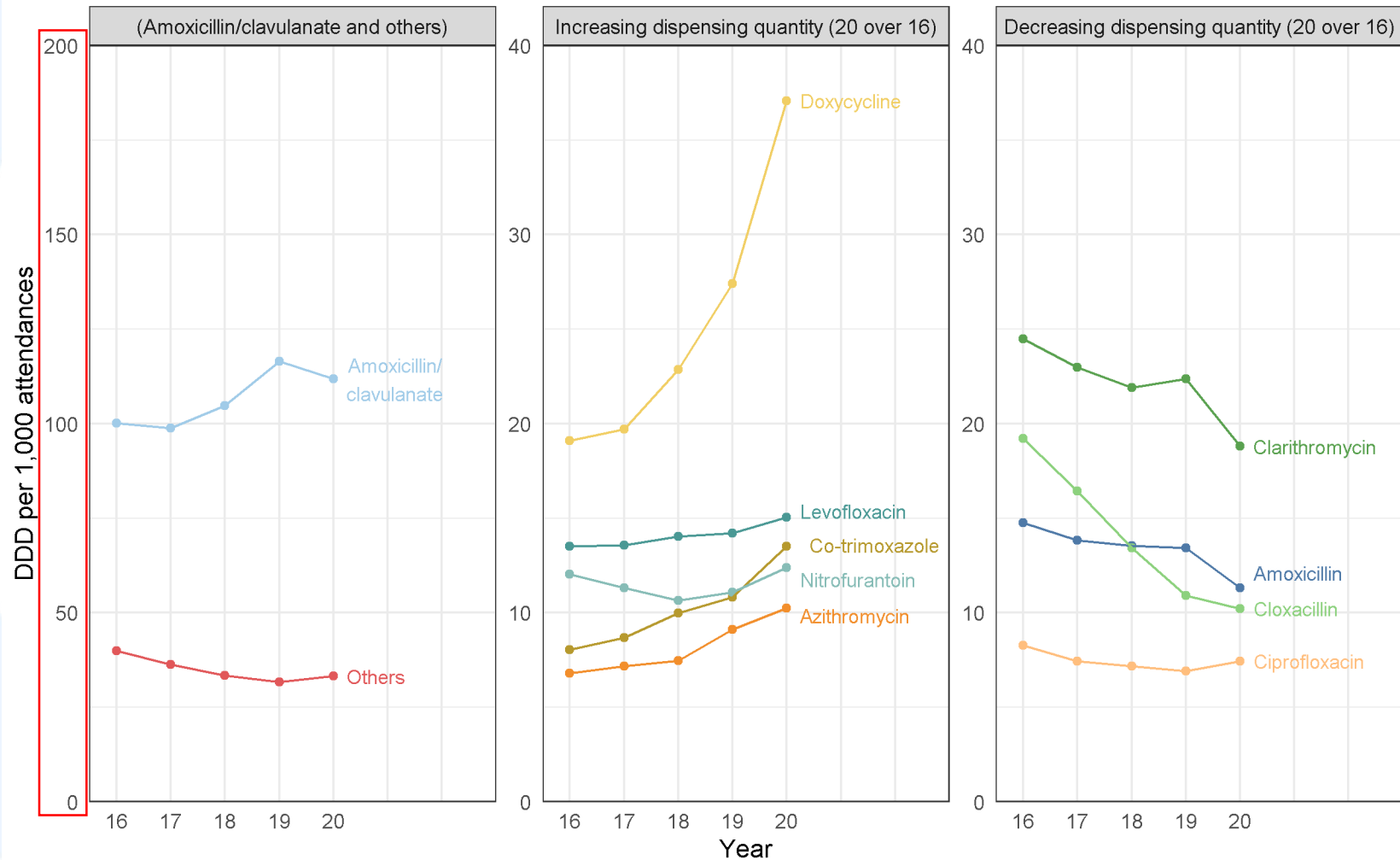
^{*}Rounded to two decimal places

[†]Due to rounding, percentages may not precisely reflect the absolute figures

- Beta-lactam Antibacterials, Penicillins group was the most dispensed group from 2016 to 2020
- Tetracyclines group showed the largest increase in CAGR of 15.66% from 2016 to 2020, followed by sulfonamides and trimethoprim group (13.58% in CAGR)



Ten Most Dispensed Antimicrobials in Non-inpatient Service



Ten Most Dispensed Antimicrobials in Non-inpatient Service

ATC Chemical Substance		DDD per 1,000 attendances					Compound annual growth rate (16 to 20) ^{*†}
Code	Description	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
J01CR02	Amoxicillin/clavulanate	100.13	98.74	104.72	116.51	111.78	2.79%
J01AA02	Doxycycline	19.10	19.70	22.86	27.41	37.08	18.05%
J01FA09	Clarithromycin	24.48	22.98	21.90	22.37	18.80	-6.39%
J01MA12	Levofloxacin	13.50	13.58	14.02	14.21	15.03	2.72%
J01EE01	Co-trimoxazole	8.04	8.68	9.98	10.81	13.50	13.85%
J01XE01	Nitrofurantoin	12.05	11.31	10.64	11.08	12.38	0.68%
J01CA04	Amoxicillin	14.74	13.82	13.53	13.43	11.31	-6.42%
J01FA10	Azithromycin	6.80	7.16	7.46	9.12	10.22	10.73%
J01CF02	Cloxacillin	19.22	16.42	13.43	10.89	10.21	-14.62%
J01MA02	Ciprofloxacin	8.27	7.44	7.18	6.92	7.44	-2.62%
	Others	39.95	36.32	33.33	31.66	33.23	-4.50%
	Total	266.27	256.16	259.05	274.41	280.98	1.35%

Note:

The ten most dispensed antimicrobials were identified from year 2020 data

^{*}Rounded to two decimal places

[†]Due to rounding, percentages may not precisely reflect the absolute figures

- Amoxicillin/clavulanate was the most dispensed antimicrobial from 2016 to 2020
- Doxycycline showed the largest increase in CAGR of 18.05% from 2016 to 2020, followed by co-trimoxazole (CAGR: 13.85%), azithromycin (CAGR: 10.73%), amoxicillin/clavulanate (CAGR: 2.79%) and levofloxacin (CAGR: 2.72%)
- Cloxacillin showed the largest decrease in CAGR of -14.62% from 2016 to 2020, followed by amoxicillin (CAGR: -6.42%)

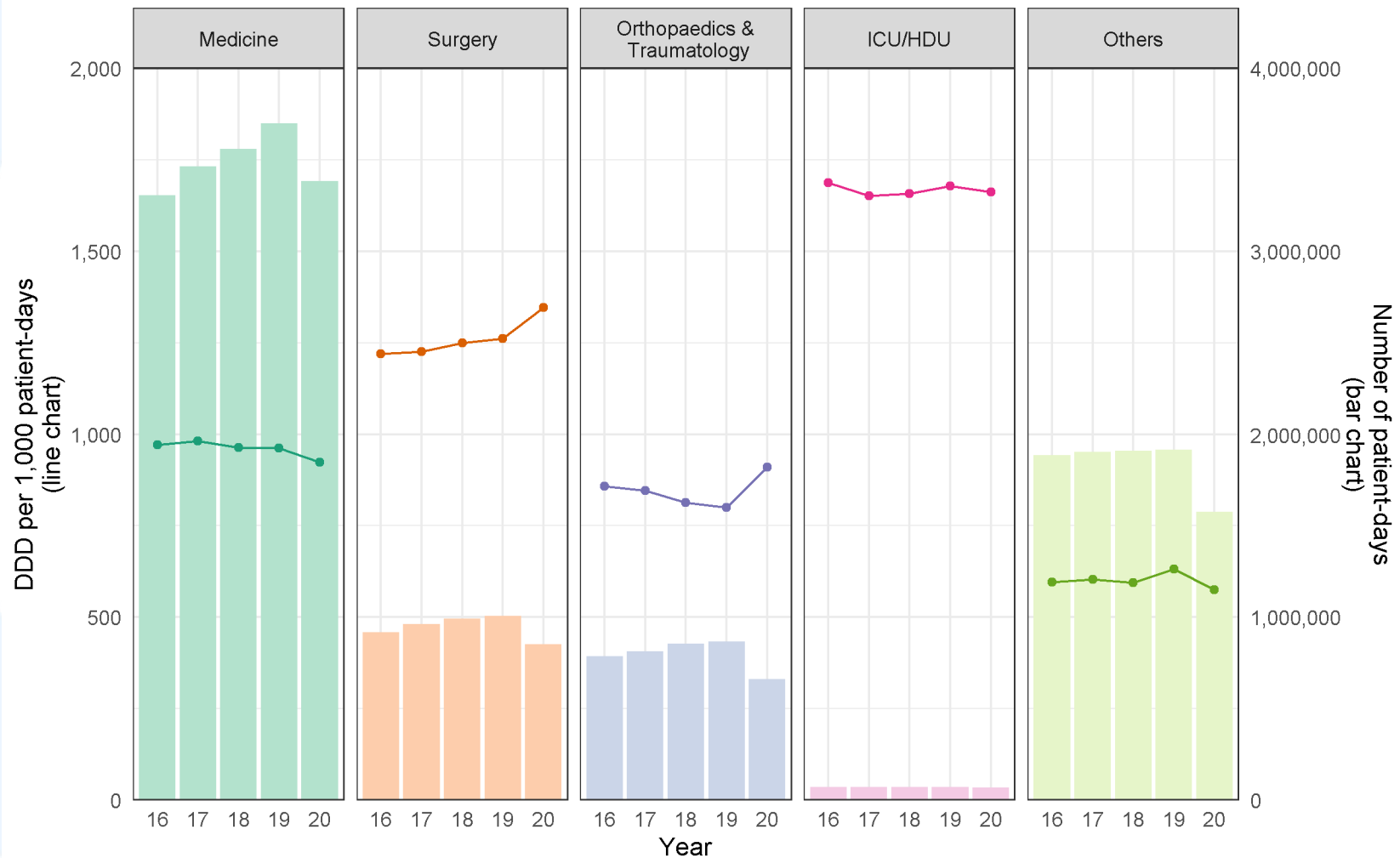


Results

3. Antimicrobials dispensed in HA inpatient service by specialty



Total Antimicrobials Dispensed in HA Inpatient Service by Specialty



Total Antimicrobials Dispensed in HA Inpatient Service by Specialty

Year		Medicine	Surgery	O&T	ICU/HDU	Others	All Inpatient Services
2016	DDD per 1,000 patient-days [‡]	970.57	1220.10	858.00	1687.98	595.59	896.40
2017	DDD per 1,000 patient-days [‡]	981.25	1225.26	845.91	1651.98	603.51	905.35
2018	DDD per 1,000 patient-days [‡]	963.87	1250.22	812.59	1658.41	593.68	895.87
2019	DDD per 1,000 patient-days [‡]	961.52	1261.29	800.37	1678.31	631.31	906.10
2020	DDD per 1,000 patient-days [‡]	923.38	1346.71	910.33	1662.92	575.03	900.83
Compound annual growth rate (16 to 20)	DDD per 1,000 patient-days ^{‡§}	-1.24%	2.50%	1.49%	-0.37%	-0.87%	0.12%

[‡]Rounded to two decimal places

[§]Due to rounding, percentages may not precisely reflect the absolute figures

- Total antimicrobials dispensed in HA inpatient service showed an increase in CAGR of 0.12% from 2016 to 2020
- By specialty, Surgery showed the largest increase in CAGR of 2.50% from 2016 to 2020, while Medicine showed the largest decrease in CAGR of -1.24%



Five Most Dispensed Antimicrobial Groups in Inpatient Service

ATC Pharmacological Subgroup		DDD per 1,000 patient-days					Compound annual growth rate (16 to 20) ^{*†}
Code	Description	Year 2016*	Year 2017*	Year 2018*	Year 2019*	Year 2020*	
J01C	Beta-lactam Antibacterials, Penicillins	529.12	537.11	522.80	522.34	498.48	-1.48%
J01D	Other Beta-lactam Antibacterials	107.60	100.02	101.50	101.70	113.11	1.26%
J01M	Quinolone Antibacterials	93.29	93.48	92.93	87.84	86.09	-1.99%
J01A	Tetracyclines	40.69	51.13	60.10	74.43	81.04	18.79%
J01X	Other Antibacterials	35.02	33.78	34.57	34.72	38.16	2.18%
	Others	90.69	89.83	83.98	85.06	83.95	-1.91%
	Total	896.40	905.35	895.87	906.10	900.83	0.12%

Note:

The five most dispensed antimicrobial groups were identified from year 2020 data

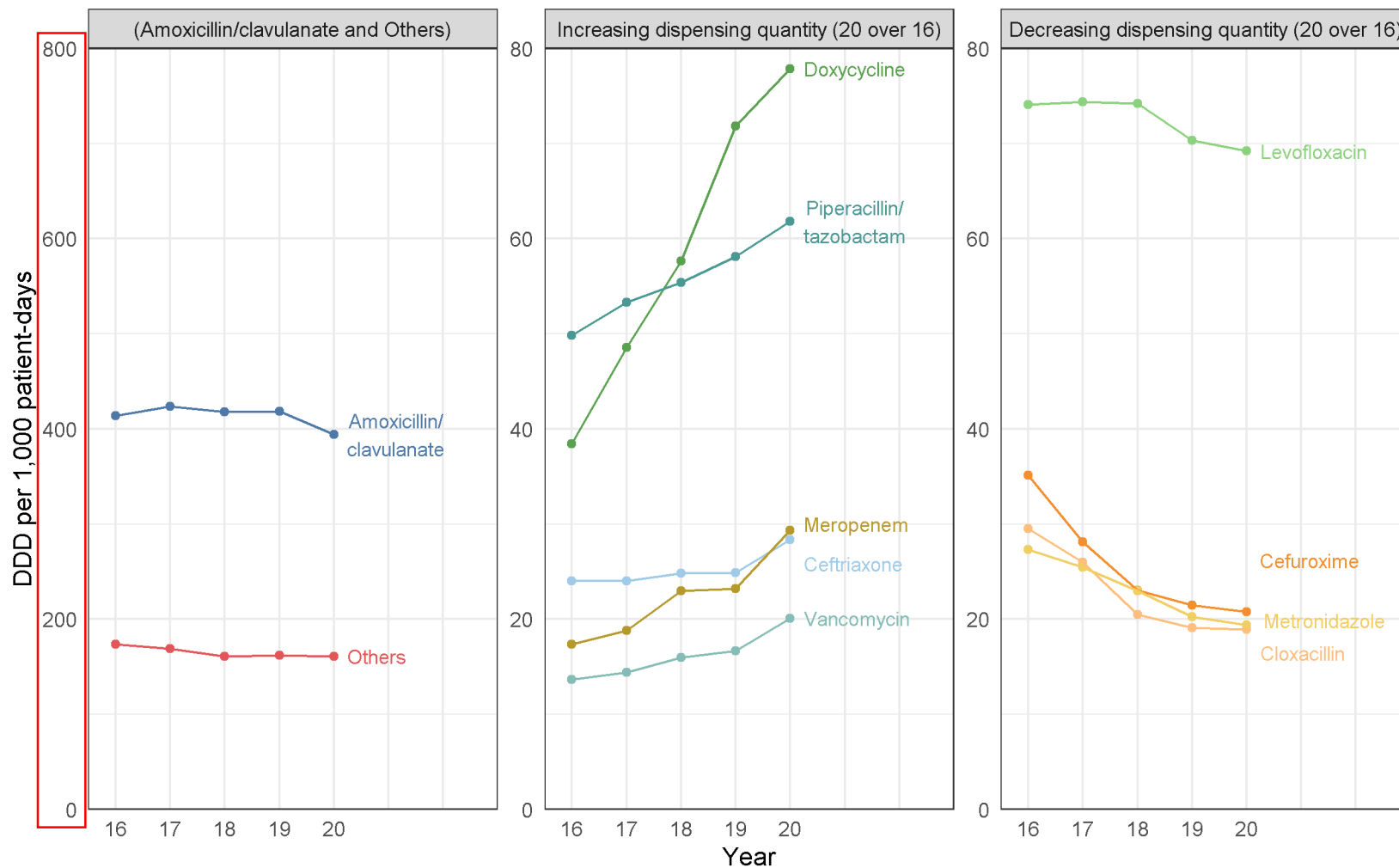
*Rounded to two decimal places

†Due to rounding, percentages may not precisely reflect the absolute figures

- Tetracyclines group (J01A) showed the largest increase in CAGR of 18.79% from 2016 to 2020
- Other antibacterials (J01X) and other beta-lactam antibacterials (J01D) showed an increase (2.18% and 1.26% in CAGR respectively), while quinolone antibacterials (J01M) and beta-lactam antibacterials, penicillins (J01C) showed a decrease (1.99% and 1.48% in CAGR respectively) from 2016 to 2020



Ten Most Dispensed Antimicrobials in Inpatient Service



Ten Most Dispensed Antimicrobials in Inpatient Service

ATC Pharmacological Subgroup		DDD per 1,000 patient-days					Compound annual growth rate (16 to 20) ^{*†}
Code	Description	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
J01CR02	Amoxicillin/clavulanate	413.56	423.55	417.86	418.20	394.06	-1.20%
J01AA02	Doxycycline	38.42	48.54	57.66	71.84	77.86	19.31%
J01MA12	Levofloxacin	74.11	74.36	74.22	70.35	69.22	-1.69%
J01CR05	Piperacillin/tazobactam	49.85	53.31	55.38	58.13	61.83	5.53%
J01DH02	Meropenem	17.36	18.77	22.99	23.21	29.36	14.04%
J01DD04	Ceftriaxone	23.98	24.01	24.84	24.86	28.34	4.26%
J01DC02	Cefuroxime	35.13	28.13	23.02	21.49	20.79	-12.29%
J01XA01/ A07AA09	Vancomycin	13.65	14.37	15.97	16.63	20.09	10.14%
P01AB01/ J01XD01	Metronidazole	27.28	25.43	22.98	20.24	19.38	-8.19%
J01CF02	Cloxacillin	29.51	25.98	20.45	19.11	18.89	-10.55%
	Others	173.55	168.90	160.49	162.05	161.00	-1.86%
	Total	896.40	905.35	895.87	906.10	900.83	0.12%

Note:

The ten most dispensed antimicrobials were identified from year 2020 data

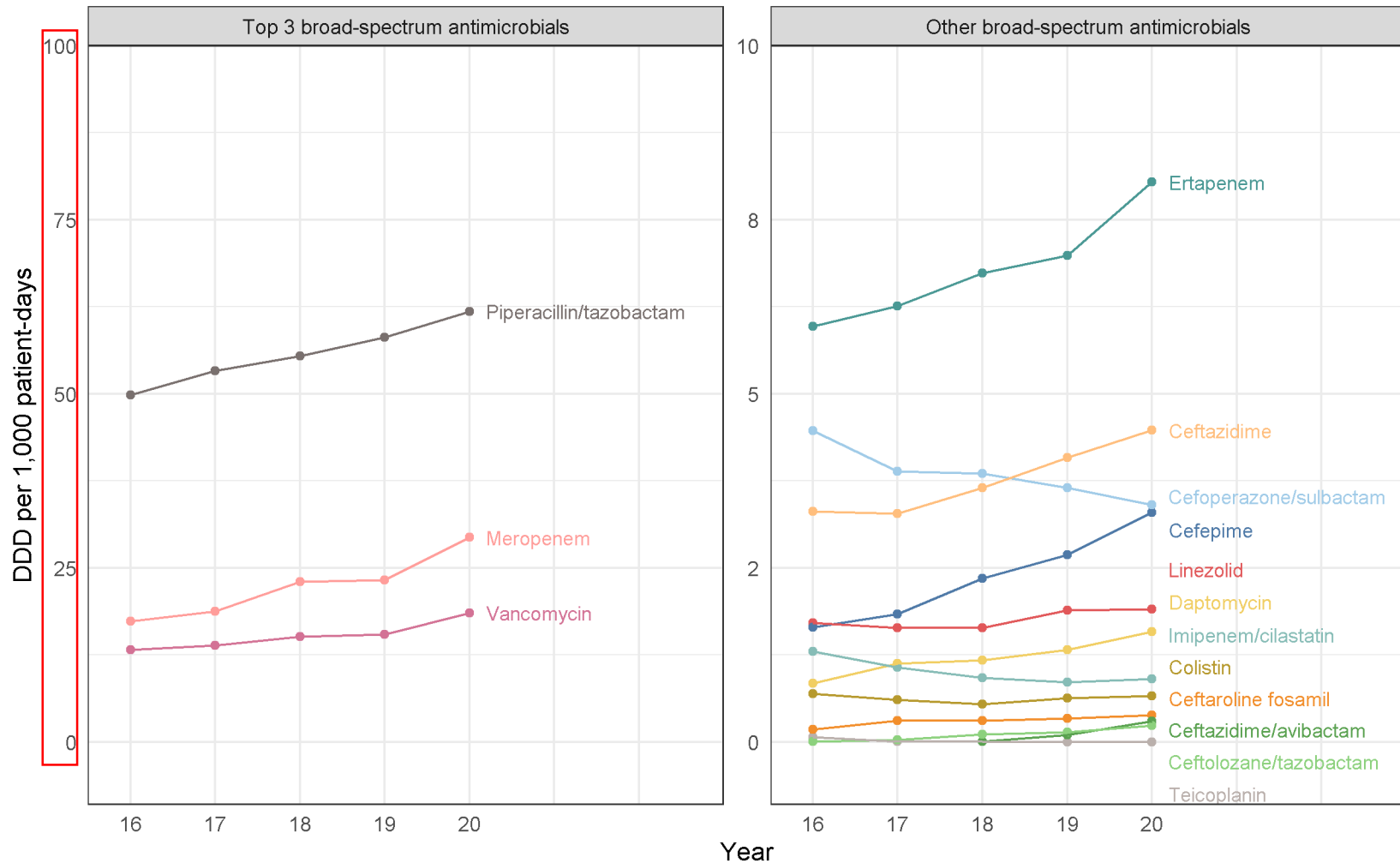
^{*}Rounded to two decimal places

[†]Due to rounding, percentages may not precisely reflect the absolute figures

- Amoxicillin/clavulanate was the most dispensed antimicrobial from 2016 to 2020
- Doxycycline showed the largest increase in CAGR of 19.31% from 2016 to 2020, followed by meropenem (CAGR: 14.04%), vancomycin (CAGR: 10.14%), piperacillin/tazobactam (CAGR: 5.53%), and then ceftriaxone (CAGR: 4.26%)
- Cefuroxime showed the largest decrease in CAGR of -12.29% from 2016 to 2020, followed by cloxacillin (CAGR: -10.55%)



Broad-spectrum Antimicrobials (Big Guns) Dispensed in Inpatient Service



Broad-spectrum Antimicrobials (Big Guns) Dispensed in Inpatient Service

	ATC Chemical Substance		DDD per 1,000 patient-days					Compound annual growth rate (16 to 20)*
	Code	Description	Year 2016*	Year 2017*	Year 2018*	Year 2019*	Year 2020*	
Beta-lactam Antibacterials, Penicillins	J01CR05	Piperacillin/tazobactam	49.85	53.31	55.38	58.13	61.83	5.53%
	J01DD02	Ceftazidime	3.31	3.27	3.65	4.08	4.47	7.83%
Other Beta-lactam Antibacterials (Cephalosporins)†	J01DD62	Cefoperazone/sulbactam	4.47	3.88	3.85	3.65	3.40	-6.59%
	J01DE01	Cefepime	1.65	1.84	2.35	2.69	3.29	18.95%
	J01DI02	Ceftaroline fosamil	0.18	0.31	0.30	0.34	0.39	20.79%
	J01DD52	Ceftazidime/avibactam	-	-	<0.005	0.10	0.30	-
	J01DI54	Ceftolozane/tazobactam	<0.005	0.03	0.11	0.14	0.23	Not applicable §
Other Beta-lactam Antibacterials (Carbapenems)†	J01DH02	Meropenem	17.36	18.77	22.99	23.21	29.36	14.04%
	J01DH03	Ertapenem	5.97	6.26	6.74	6.98	8.04	7.74%
	J01DH51	Imipenem/cilastatin	1.29	1.07	0.92	0.86	0.90	-8.63%
	J01XA01	Vancomycin	13.26	13.84	15.12	15.46	18.53	8.73%
	J01XX08	Linezolid	1.71	1.63	1.64	1.89	1.91	2.80%
Other Antibacterials	J01XX09	Daptomycin	0.84	1.13	1.17	1.33	1.59	17.21%
	J01XB01	Colistin	0.69	0.60	0.54	0.62	0.66	-1.30%
	J01XA02	Teicoplanin	0.07	<0.005	0.01	<0.005	<0.005	-71.16%
		Total	100.64	105.97	114.76	119.48	134.90	7.60%

*Rounded to two decimal places

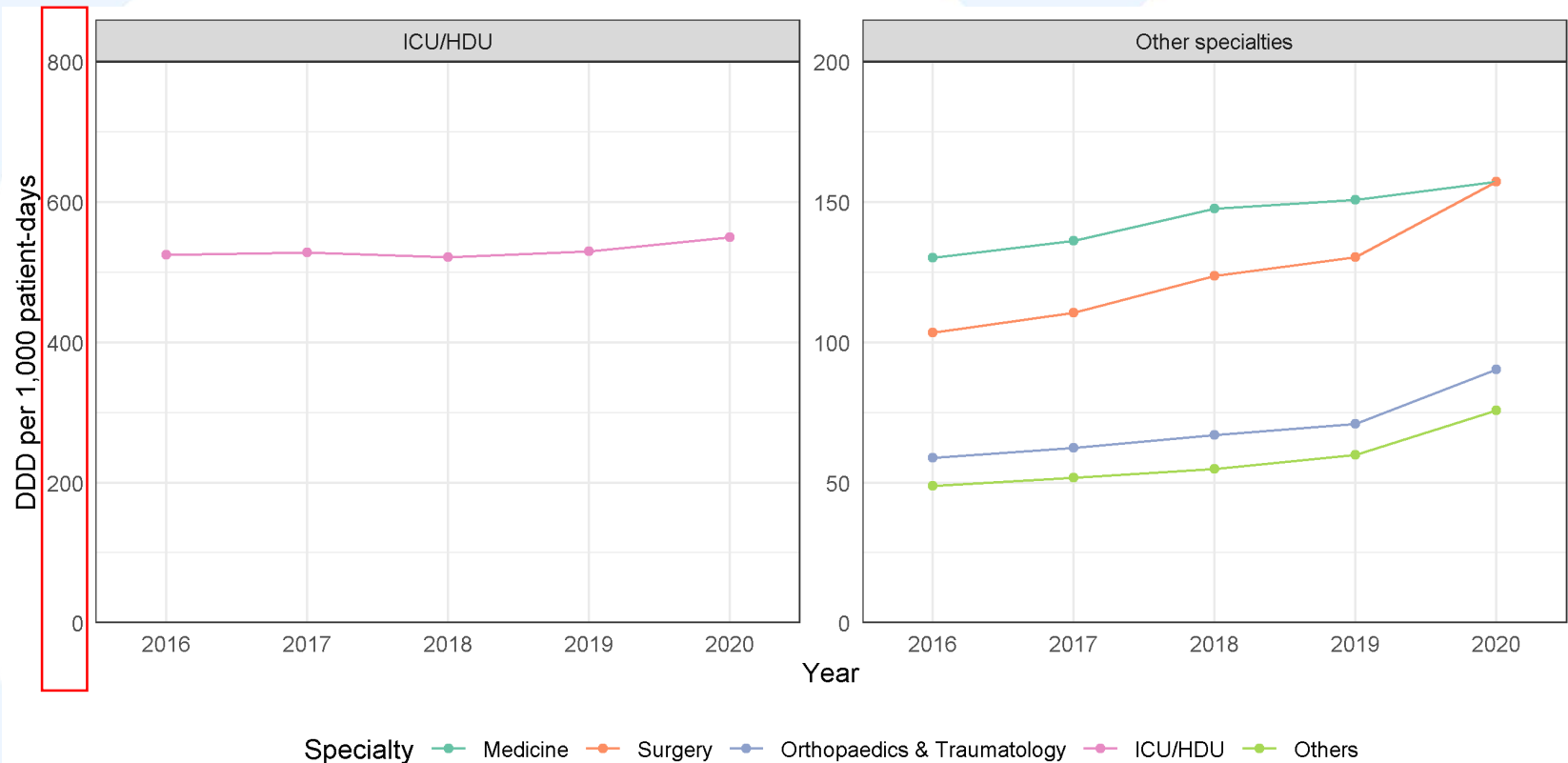
†WHO ATC Pharmacological subgroup "Other Beta-lactam Antibacterials (J01D)" is further categorized into Cephalosporins and Carbapenems groups

§ Ceftolozane/tazobactam was listed in the HA drug formulary since April 2019, it was supplied on named patient basis before enlistment

- Overall dispensed quantities of broad-spectrum antimicrobials showed a 12.90 % increase in 2020 (vs 2019), despite a slight drop in the overall dispensed quantity of antimicrobials in inpatient service
- Piperacillin/tazobactam was the most dispensed broad-spectrum antimicrobial from 2016 to 2020, followed by meropenem and then vancomycin
- Ceftaroline fosamil showed the largest increase in CAGR of 20.79% from 2016 to 2020, followed by cefepime (18.95%), daptomycin (17.21%), meropenem (14.04%) and then vancomycin (8.73%)



Broad-spectrum Antimicrobials Dispensed in Inpatient Service by Specialty



- By specialty, all specialties of inpatient service showed a steady increase of usage of the overall selected broad spectrum antimicrobials from 2016 to 2020



Broad-spectrum Antimicrobials (Big Guns) Dispensed in Inpatient Service by Specialty

Specialty	DDD per 1,000 patient-days					Compound annual growth rate (16 to 20) ^{*†}
	Year 2016 [*]	Year 2017 [*]	Year 2018 [*]	Year 2019 [*]	Year 2020 [*]	
Medicine	130.19	136.18	147.66	150.86	157.28	4.84%
Surgery	103.45	110.56	123.78	130.34	157.24	11.03%
Orthopaedics & Traumatology	58.94	62.39	67.07	70.97	90.36	11.27%
ICU/HDU	524.94	528.31	521.75	530.14	549.95	1.17%
Others	48.94	51.72	54.84	59.82	75.80	11.56%
All Inpatient Services	100.64	105.97	114.76	119.48	134.90	7.60%

*Rounded to two decimal places

†Due to rounding, percentages may not precisely reflect the absolute figures

- In general, an increase in dispensed quantity of broad-spectrum antimicrobials was observed among all inpatient specialties in 2020 compared with previous years
- By specialty, ICU/ HDU was the specialty with largest quantity of broad-spectrum antimicrobials dispensed from 2016 to 2020, followed by Medicine, Surgery, O&T and Others
- Dispensing of broad-spectrum antimicrobials in “Others” specialty showed the largest increase in CAGR of 11.56% from 2016 to 2020, followed by Orthopaedics & Traumatology (CAGR: 11.27%), Surgery (CAGR: 11.03%) and then Medicine (CAGR: 4.84%). ICU/HDU only had 1.17% increase in CAGR



Remarks on interpretation of results

- Service volume for both non-inpatient and inpatient services of HA were noticeably reduced in 2020. Reader are reminded to interpret the 2020 AMU surveillance results by taking this factor into consideration
- DDD is a technical unit of use that does not necessarily reflect the recommended or average prescribed dose
- There are no separate DDDs for children which makes the DDD estimates for paediatric formulations more difficult to interpret
- The amount of antimicrobials dispensed was used as a proxy for the amount consumed
- The surveillance results cannot be used to judge the appropriateness of usage in the absence of the relevant clinical information



Marked Changes in HA service volume in Year 2020

Annual attendance count for HA non-inpatient service

	2016*	2017*	2018*	2019*	2020*	20 over 19†
Accident & Emergency	4,519,000	4,393,000	4,291,000	4,394,000	3,285,000	-25.23%
Primary Care (GOPC)	12,719,000	12,800,000	12,802,000	12,669,000	11,492,000	-9.29%
Specialist Out-patient (Clinical)	14,952,000	15,390,000	15,739,000	16,003,000	14,300,000	-10.64%
Total	32,191,000	32,584,000	32,832,000	33,067,000	29,077,000	-12.06%

*Rounded to nearest thousand

†Rounded to two decimal places

Annual patient-days for HA inpatient service

	2016*	2017*	2018*	2019*	2020*	20 over 19†
Medicine	6,617,000	6,928,000	7,121,000	7,399,000	6,771,000	-8.49%
Surgery	1,831,000	1,924,000	1,984,000	2,014,000	1,705,000	-15.34%
Orthopaedics & Traumatology	1,571,000	1,625,000	1,711,000	1,732,000	1,321,000	-23.71%
ICU/ HDU	141,000	140,000	143,000	142,000	134,000	-5.75%
Others	3,773,000	3,809,000	3,820,000	3,828,000	3,154,000	-17.61%
Total	13,933,000	14,428,000	14,779,000	15,115,000	13,084,000	-13.43%

*Rounded to nearest thousand

†Rounded to two decimal places

Summary

- Amoxicillin/clavulanate was the most commonly dispensed antimicrobials for both non-inpatient and inpatient service in HA
- Total antimicrobials dispensed showed a compound annual growth rate (CAGR) of 1.35% and 0.12% for non-inpatient and inpatient service respectively from 2016 to 2020
- Among the ten most dispensed antimicrobials
 - Doxycycline showed the largest increase in dispensing quantity from 2016 to 2020 (CAGR: 16.20%), followed by co-trimoxazole (CAGR: 11.07%).
 - Cloxacillin showed the largest decrease in dispensing quantity from 2016 to 2020 (CAGR: -14.74%), followed by clarithromycin (CAGR: -10.85%)
- Almost all broad-spectrum antimicrobials in 2020 showed increases in inpatient service (DDD/1,000 patient-days) when compared with that of 2019, except cefoperazone/sulbactam and teicoplanin
- Piperacillin/tazobactam was the most commonly dispensed broad-spectrum antimicrobial for inpatients service from 2016 to 2020



Recommendations

- Reader are reminded to interpret the 2020 AMU surveillance results with caution, due to the adjustment of non-emergency and non-essential services at public hospitals in 2020 with Covid-19 Pandemic
- Nevertheless, the steady increase in total broad-spectrum antimicrobials dispensed necessitates enhancing Antibiotics Stewardship Programmes (ASP) by monitoring and optimizing their use at various levels
- The continuous and steady rising trends of doxycycline and co-trimoxazole (16.20% and 11.07% in CAGR respectively from 2016 to 2020) among the top 10 most dispensed antimicrobials would warrant further exploration





THE END

Thank you

