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Antimicrobial Use (AMU) Surveillance in Public Hospitals and Clinics - Hospital Authority Antibiotics Dispensing Data (2014 - 2016)

October 2019

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Background

- The Hong Kong Strategy and Action Plan on Antimicrobial Resistance 2017-2022 was issued in July 2017
- Activity 3.2.1 suggests collecting antibiotic dispensing data from Hospital Authority (HA) and monitor antibiotic use in public hospitals and clinics

Data Scopes

- Collected data were grouped in accordance with services and specialties
  - Inpatient services (Medicine, Surgery, Orthopaedics and Traumatology, Intensive Care Unit/ High Dependency Unit (ICU/ HDU) and Others)
  - Non-inpatient services (Accident and Emergency (A&E), Primary Care (GOPC) and Specialist Out-patient (Clinical))

Methodology and Analysis

- Data covered section 5.1 of the British National Formulary (BNF)
- Relevant items under the following classes of the World Health Organization (WHO) Anatomical Therapeutic Chemical (ATC) classification system were included:
  - J01 (Antibacterials for Systemic Use);
  - A07AA (Antibiotics of Intestinal Antiinfectives, under Antidiarrheals, Intestinal Antiinflammatory/ Antiinfective Agents, e.g. nystatin and rifaximin); and
  - P01AB (Nitroimidazole derivatives of Agents against Amoebiasis and Other Protozoal Diseases under Antiprotozoals, e.g. metronidazole and tinidazole through oral or rectal administration)
- Selected broad spectrum antibiotics dispensed to various specialties were also examined because of their importance for treatment of resistant infections in human

Methodology and Analysis - Quantification of Antibiotic Usage

Defined Daily Dose (DDD)

- Defined as the assumed average maintenance dose per day for a drug used for its main indication in adults
- Commonly used across many overseas health authorities for comparison of drug usage

DDD per 1,000 patient-days

- A standardised unit commonly used internationally to measure antibiotic used in inpatient service

DDD per 1,000 attendances

- A standardised unit commonly used internationally to measure antibiotic used in non-inpatient service

Results (1) - Overall Dispensing

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Year	Service Type					
	Non-inpatient Service			Inpatient Service		
	Service Volume*	Antimicrobial†‡	DDD per 1,000 attendances§¶	Service Volume**	Antimicrobial†‡	DDD per 1,000 patient-days§¶
2014	15,542,052	4,716,010	303.44	6,490,394	6,752,180	1,040.33
2015	15,806,229	4,958,607	313.71	6,611,605	6,994,498	1,057.91
2016	16,095,392	5,209,270	323.65	6,966,631	7,449,988	1,069.38

* In terms of attendances

† In terms of DDD

‡ Rounded to the nearest integer

§ Rounded to two decimal places

¶ Due to rounding, figures may not precisely reflect the absolute figures

** In terms of patient-days

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Results (2) - Five Most Dispensed Groups in Public Hospitals

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ATC Pharmacological Subgroup		Antimicrobial dispensed in DDD			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)†‡
J01C	Beta-Lactam Antibacterials, Penicillins	7,222,226	7,671,541	8,168,394	13.10%
J01M	Quinolone Antibacterials	963,473	998,429	1,010,965	4.93%
J01F	Macrolides, Lincosamides and Streptogramins	933,319	883,291	954,777	2.30%
J01D	Other Beta-Lactam Antibacterials	962,700	928,124	927,997	-3.60%
J01A	Tetracyclines	446,934	535,124	643,337	43.94%

* Rounded to the nearest integer

† Rounded to two decimal places

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Results (3) - Ten Most Dispensed Items in Public Hospitals

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ATC Chemical Substance		Antimicrobial dispensed in DDD			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)†‡
J01CR02	Amoxicillin/ Clavulanate	5,100,534	5,724,085	6,338,536	24.27%
J01MA12	Levofloxacin	684,025	708,162	733,549	7.24%
J01FA09	Clarithromycin	612,409	554,371	583,222	-4.77%
J01AA02	Doxycycline	376,846	465,748	575,008	52.58%
J01CF02	Cloxacillin	686,979	607,710	515,002	-25.03%
J01CA04	Amoxicillin	493,968	449,668	449,054	-9.09%
J01CA01	Ampicillin	535,005	457,465	382,267	-28.55%
J01CR05	Piperacillin/ Tazobactam	250,038	307,238	347,394	38.94%
J01DC02	Cefuroxime	455,261	381,014	332,895	-26.88%
J01MA02	Ciprofloxacin	264,108	273,619	260,535	-1.35%

* Rounded to the nearest integer

† Rounded to two decimal places

‡ Due to rounding, figures may not precisely reflect the absolute figures

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Results (4) - Non-inpatient Service by Speciality

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Year		Primary Care (GOPC)	Specialist Out-patient (Clinical)	Accident & Emergency	All Non-inpatient Services
2014	Total DDD of antimicrobials dispensed*	1,433,419	1,708,461	1,574,130	4,716,010
	Total number of attendance	6,173,988	7,141,161	2,226,903	15,542,052
	No. of attendance with antimicrobials dispensed†	194,855	110,599	210,593	516,047
	Percentage of attendance with antimicrobials dispensed‡	3.16%	1.55%	9.46%	3.32%
	DDD per 1,000 attendances‡§¶	232.17	239.24	706.87	303.44
2015	Total DDD of antimicrobials dispensed*	1,547,034	1,775,411	1,636,163	4,958,607
	Total number of attendance	6,275,792	7,304,951	2,225,486	15,806,229
	No. of attendance with antimicrobials dispensed†	207,148	111,897	211,372	530,417
	Percentage of attendance with antimicrobials dispensed‡	3.30%	1.53%	9.50%	3.36%
	DDD per 1,000 attendances‡§¶	246.51	243.04	735.19	313.71
2016	Total DDD of antimicrobials dispensed*	1,657,792	1,883,535	1,667,942	5,209,270
	Total number of attendance	6,359,607	7,476,202	2,259,583	16,095,392
	No. of attendance with antimicrobials dispensed†	221,499	117,351	211,276	550,126
	Percentage of attendance with antimicrobials dispensed‡	3.48%	1.57%	9.35%	3.42%
	DDD per 1,000 attendances‡§¶	260.68	251.94	738.16	323.65

* Rounded to the nearest integer

† Number of attendance with antimicrobials dispensed is defined as the annual sum of daily number of patient with antimicrobial dispensed in each cluster and each specialty

‡ Rounded to two decimal places

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

¶ Attendance refers to total attendance

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Results (5) - Five Most Dispensed Groups in Non-inpatient Service

ATC Pharmacological Subgroup		DDD per 1,000 attendances			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
J01C	Beta-Lactam Antibacterials, Penicillins	194.18	202.81	209.08	7.67%
J01F	Macrolides, Lincosamides and Streptogramins	35.58	34.16	36.63	2.94%
J01A	Tetracyclines	17.70	21.11	22.36	26.32%
J01M	Quinolone Antibacterials	21.88	22.46	22.14	1.20%
J01X	Other Antibacterials	13.00	12.25	12.56	-3.43%

* Rounded to two decimal places

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

Note:

The five most dispensed antimicrobial groups were identified from year 2016 data

Results (6) - Ten Most Dispensed Items in Non-Inpatient Service

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ATC Chemical Substance		DDD per 1,000 attendances			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
J01CR02	Amoxicillin/ Clavulanate	121.68	138.45	150.11	23.37%
J01FA09	Clarithromycin	24.29	22.71	24.48	0.78%
J01CA04	Amoxicillin	25.47	22.86	22.11	-13.18%
J01CF02	Cloxacillin	24.93	22.10	19.22	-22.88%
J01AA02	Doxycycline	13.94	17.55	19.10	36.99%
J01CA01	Ampicillin	18.28	15.81	13.89	-24.03%
J01MA12	Levofloxacin	12.66	13.15	13.50	6.63%
J01XE01	Nitrofurantoin	12.51	11.82	12.05	-3.73%
J01MA02	Ciprofloxacin	8.76	8.94	8.27	-5.51%
J01EE01	Sulfamethoxazole/ Trimethoprim	8.21	7.84	8.04	-2.10%

* Rounded to two decimal places

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

Note:

The ten most dispensed antimicrobials were identified from year 2016 data

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Results (7) - Overall Dispensing in Inpatient Service

	Year 2014	Year 2015	Year 2016	Percentage change (2014 vs 2016)†‡
Total DDD of antimicrobials dispensed*	6,752,180	6,994,498	7,449,988	10.33%
Total number of patient-days	6,490,394	6,611,605	6,966,631	7.34%
DDD per 1,000 patient-days†	1,040.33	1,057.91	1,069.38	2.79%

* Rounded to the nearest integer

† Rounded to two decimal places

‡ Due to rounding, figures may not precisely reflect the absolute figures

Results (8) - Five most Dispensed Groups in Inpatient Service

ATC Pharmacological Subgroup		DDD per 1,000 patient-days			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
J01C	Beta-Lactam Antibacterials, Penicillins	647.76	675.46	689.45	6.44%
J01D	Other Beta-Lactam Antibacterials	129.84	123.13	117.92	-9.18%
J01M	Quinolone Antibacterials	96.05	97.32	93.96	-2.18%
J01F	Macrolides, Lincosamides and Streptogramins	58.59	51.94	52.43	-10.52%
J01A	Tetracyclines	26.48	30.47	40.69	53.67%

* Rounded to two decimal places

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

Note:

The five most dispensed antimicrobial groups were identified from year 2016 data

Results (9) - Top Ten Most dispensed in Inpatient Service

ATC Chemical Substance		DDD per 1,000 patient-days			
Code	Description	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
J01CR02	Amoxicillin/ Clavulanate	494.48	534.78	563.03	13.86%
J01MA12	Levofloxacin	75.07	75.68	74.11	-1.29%
J01CR05	Piperacillin/ Tazobactam	38.47	46.45	49.85	29.60%
J01AA02	Doxycycline	24.68	28.48	38.42	55.66%
J01DC02	Cefuroxime	54.47	43.03	35.13	-35.51%
J01CF02	Cloxacillin	46.15	39.09	29.51	-36.06%
J01FA09	Clarithromycin	36.20	29.54	27.17	-24.95%
J01DH02	Meropenem	19.94	24.00	26.04	30.60%
J01DD04	Ceftriaxone	23.83	22.80	23.98	0.61%
J01CA01	Ampicillin	38.65	31.40	22.78	-41.06%

* Rounded to two decimal places

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

Note:

The ten most dispensed antimicrobials were identified from year 2016 data

Results (10) - Overall Dispensing in Inpatient Service by Specialty

Specialty	DDD per 1,000 patient-days			
	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
Medicine	1,126.68	1,151.24	1,155.56	2.56%
Surgery	1,436.27	1,482.05	1,469.44	2.31%
Orthopaedics and Traumatology	1,044.93	1,043.27	1,019.94	-2.39%
ICU/ HDU	1,835.37	1,732.47	1,841.38	0.33%
Others	668.72	668.73	715.78	7.04%
All inpatient services	1,040.33	1,057.91	1,069.38	2.79%

* Rounded to two decimal places

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

Results (11) - Broad Spectrum Antimicrobials Dispensed in Inpatient Service

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WHO ATC		DDD per 1,000 patient-days			
Pharmacological Subgroup	Chemical Substance	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
Beta-Lactam Antibacterials, Penicillins	Piperacillin/ Tazobactam	38.47	46.45	49.85	29.60%
Other Beta-Lactam Antibacterials	Meropenem	19.94	24.00	26.04	30.60%
Other Antibacterials	Vancomycin‡	11.40	12.59	13.26	16.30%
Other Beta-Lactam Antibacterials	Cefoperazone/ Sulbactam	4.69	4.63	4.47	-4.71%
Other Beta-Lactam Antibacterials	Ceftazidime	2.72	3.35	3.31	21.82%
Other Beta-Lactam Antibacterials	Cefepime	2.28	3.20	3.29	44.61%
Other Antibacterials	Colistin	2.47	2.47	2.01	-18.76%
Other Antibacterials	Linezolid	1.68	1.57	1.71	1.70%
Other Beta-Lactam Antibacterials	Imipenem and Cilastatin	1.78	1.68	1.29	-27.22%
Other Antibacterials	Daptomycin	0.53	0.75	0.84	58.84%
Other Antibacterials	Teicoplanin	0.09	0.09	0.07	-28.74%
	Total	86.03	100.76	106.13	23.36%

* Rounded to two decimal places

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

‡ Only parenteral vancomycin (WHO ATC Chemical Substance Code J01XA01) was included for analysis

Note:

Antimicrobials are ordered by descending order of dispensed quantity in year 2016

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Results (12) - Broad Spectrum Antimicrobials Dispensed in Inpatient Service by Specialty

Specialty	DDD per 1,000 patient-days			
	Year 2014*	Year 2015*	Year 2016*	Percentage change (2014 vs 2016)*†
Medicine	110.08	131.62	137.22	24.66%
Surgery	77.62	92.78	101.90	31.27%
Orthopaedics and Traumatology	42.19	49.93	59.81	41.75%
ICU/ HDU	643.94	597.66	635.69	-1.28%
Others	46.13	52.64	53.11	15.12%
All inpatient services	86.03	100.76	106.13	23.36%

* Rounded to two decimal places

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

Discussions (1) - Overall

- Overall increased dispensing quantity (in DDD/1,000 attendances or patient-days) from 2014-2016
- Percentage increase in non-inpatient (in DDD/1,000 attendances) was greater than that of inpatient (in DDD/1,000 patient-days)
- The five most dispensed antibiotic groups in both hospitals and clinics were antibiotics commonly used to treat common bacterial infections in both hospitals and clinics. They are usually prescribed as first-line treatment for suspected bacterial infections.

Discussions (2) - Broad Spectrum Antimicrobials

- The 11 locally-important broad spectrum antimicrobials accounted for about 9.92% of the overall dispensing quantity in inpatient service in 2016
- ICU/HDU has the highest rate of dispense of these broad spectrum antibiotics
- It is not an unexpected observation as ICU/ HDU is the specialty in which more vulnerable patients and more patients with resistant infections are being treated

Discussions (3) - Broad Spectrum Antimicrobials

- In 2016 piperacillin/ tazobactam and meropenem were among the 10 most commonly dispensed antibiotics in inpatient service
- The two broad spectrum antimicrobials were found to have dispensed around 30% more in 2016 when compared with that of 2014
- Being recognised as last resort antimicrobials for treating resistant bacterial infections, colistin was found to have percentage decrease of 18.76% when compared with 2014

Limitations

- Clinical data needed to be converted before analysis and surveillance
- Information on indications is not available in dispensing data
- Analysis is based on dosage form[1] and route of administration[2]
- The analysis assumes that amount of antibiotics dispensed equals to amount of antibiotics consumed
- Results cannot be used to just the appropriateness of use

[1]Common dosage forms include: tablet, solid for oral suspension, injectable, etc

[2]Common routes of administration include: oral, injection, etc

Way Forward

- Antibiotic Stewardship Programme should be enhanced to expand its present coverage to advocate further on appropriate use of antibiotics in HA
- Antibiotics are precious resources for human health and modern medicines and every member of the society should make efforts to preserve it effectiveness against bacterial infection

What can I do to combat AMR?

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For General Public

- Proper use of antibiotics
  - Do not demand antibiotics from your doctor
  - Follow your doctor's advice when taking antibiotics
  - Do not stop taking antibiotics by yourselves even if you are feeling better
  - Do not take leftover antibiotics
  - Do not share your antibiotics with others
  - Do not self-purchase antibiotics without a prescription
- Practise frequent hand hygiene, especially before eating and taking medicine, and after going to the toilet
- Ensure your vaccination is up-to-date
- Maintain cough etiquette, wear a mask if you have respiratory symptoms

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What can I do to combat AMR?

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For Healthcare Workers

- Antibiotics are precious resources against infections. Healthcare workers play an essential role in preserving them:
  - Prescribe antibiotics in accordance with therapeutic guidelines in consideration of clinical situations
  - Educate your patients
    - To take antibiotics as prescribed and always complete the full course of medication
    - Discuss about the importance of appropriate antibiotic use and the dangers of AMR where appropriate
    - Talk about how to prevent infections and their spread. For example, vaccination, maintain good personal hygiene and hand hygiene
  - Apply best practice of infection prevention and control, and to practise frequent hand hygiene
  - Receive seasonal influenza vaccine

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