

Annual report of antibiotic and antimycotic consumption 2019

Centre hospitalier du Valais Romand

Background

ANRESIS collects antimicrobial consumption data that can be used as a basis for stewardship and monitoring programs. The WHO lays out the roles of surveillance data on antimicrobial consumption by [1]:

- identifying and providing early warning to changes in antimicrobial use
- developing interventions to address the problems
- monitoring the outcomes of interventions
- assessing the quality of prescribing in terms of adherence to practice guidelines
- raising awareness among healthcare professionals and policy-makers about the inappropriate use of antimicrobial use

Method

In this report antimicrobial consumption corresponds to the quantity of antimicrobials dispensed from hospital pharmacies to the hospital wards.

The measurement of antibiotic and antimycotic consumption is based on the Anatomical Therapeutic Chemical (ATC)/ Defined daily dose (DDD) methodology of the WHO [2]. The following classes of antimicrobials are included in the monitoring:

ATC code	Description
J01	Antibacterials for systemic use
J04A	Drugs for treatment of tuberculosis
J02	Antimycotics for systemic use
A07AA	Intestinal antibiotics
P01AB	Nitroimidazole derivates are included in J01

The antibiotic consumption is expressed as the number of DDDs per 100 bed-days. The DDD is the international standard measurement for drug utilization studies and is the assumed average maintenance dose per day for a drug used for its main indication in adults. The DDD is a technical unit and does not necessarily correspond to the recommended or prescribed daily dose; it is inaccurate in pediatric population and patients with renal failure. Despite its limitations, the DDD enabling the assessment of trends in the consumption of antibiotics and allows to perform comparisons among hospitals or countries.

About the annual report

This report is generated automatically from ANRESIS. Even if plausibility of the results is assessed, local verification is needed. The report is divided into the following chapters:

1. Antibiotic consumption in the entire hospital group
2. Antimycotic consumption in the entire hospital group
3. Antibiotic consumption in the ICUs of the entire hospital group

Appendix

References:

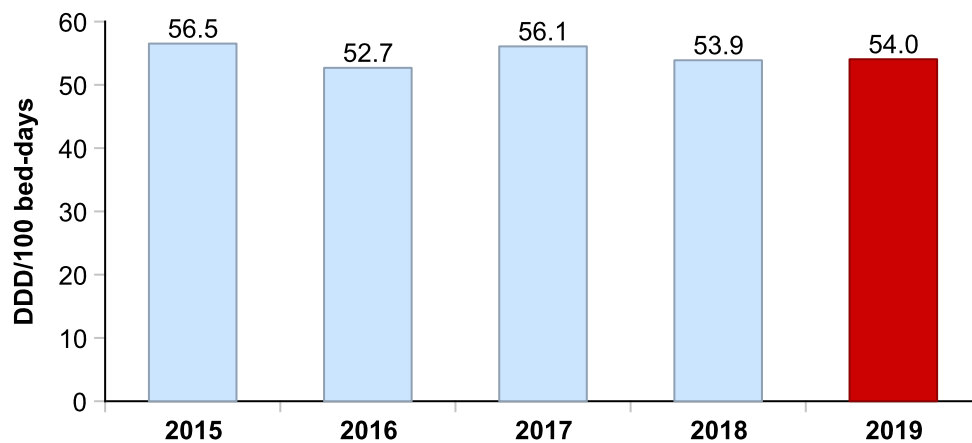
[1] WHO report on surveillance of antibiotic consumption: 2016-2018 early implementation. Geneva: World Health Organization; 2018. Licence: CC BY-NC-SA 3.0 IGO.

[2] WHO Collaborating Centre for Drug Statistics Methodology, Guidelines for ATC classification and DDD assignment 2019. Oslo, Norway, 2018. Accessed on https://www.whocc.no/filearchive/publications/2019_guidelines_web.pdf

1. Combined antibiotic consumption of all sites of the hospital group

The antibiotic consumption covers all systemic antibacterial agents for human use listed in the ATC classification system under the code J01. The only other antimicrobial agent included is metronidazole (ATC code P01AB01). Intestinal antibiotics (ATC code A07A, including f.e. fidaxomycin and vancomycin oral) and antimycobacterial agents (ATC code J04) are not included here.

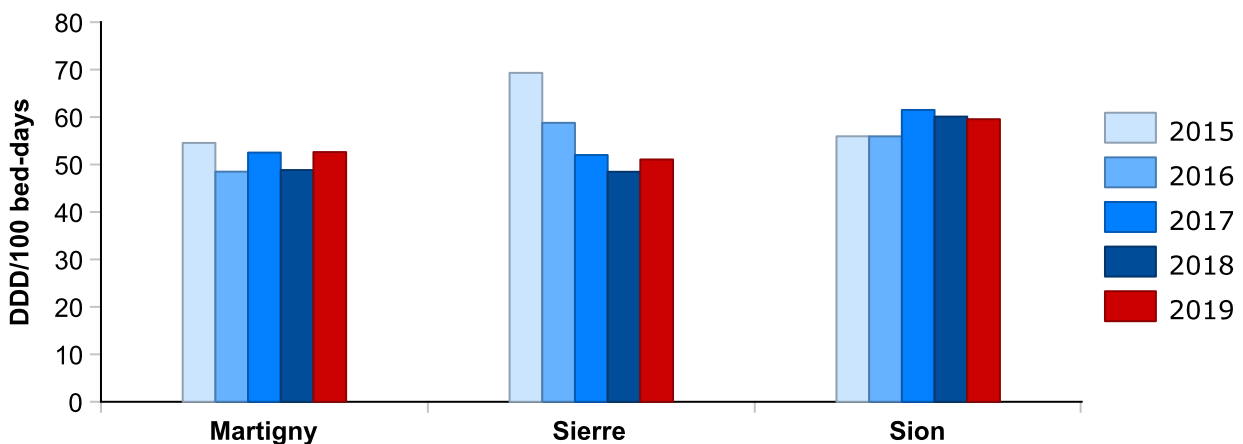
1.1 Global antibiotic consumption



The global consumption of systemic antibiotics in DDDs per 100 bed-days in the entire hospital group increased by 0.3 %, from 53.9 in 2018 to 54.0 in 2019.

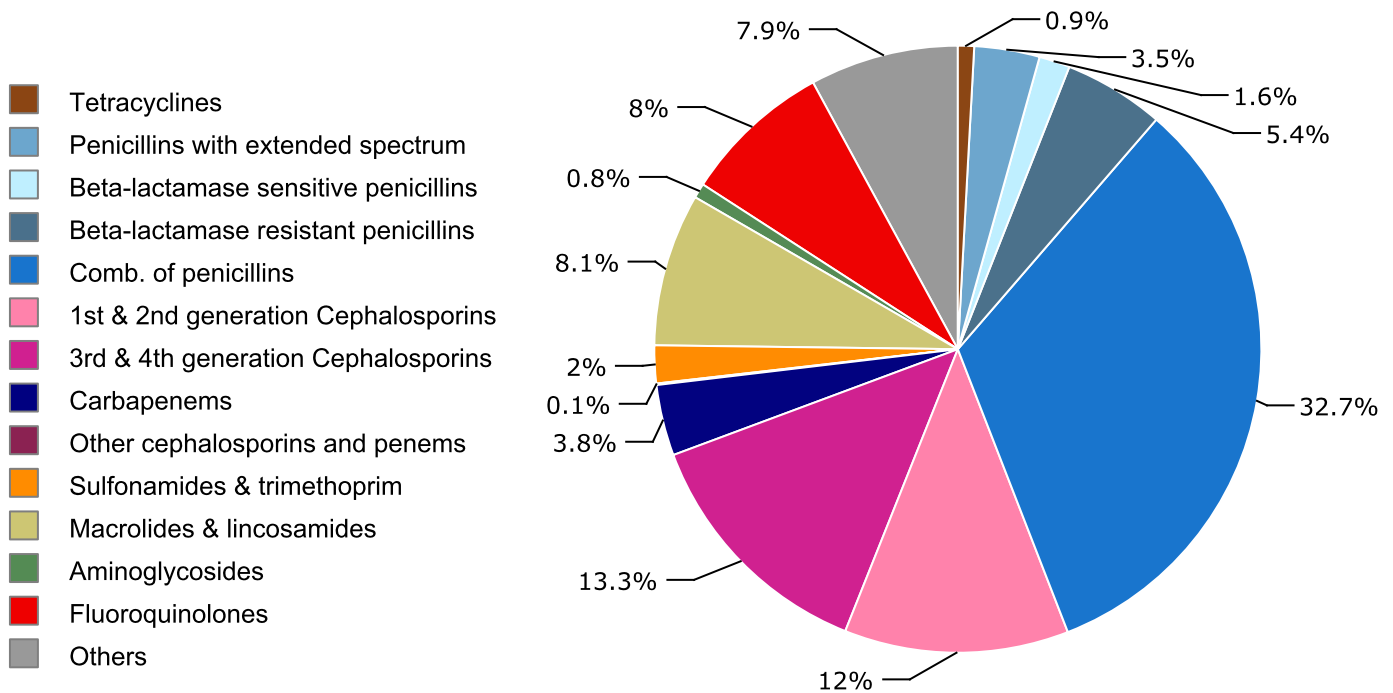
Over the past five years the global consumption of systemic antibiotics decreased by 4.4%.

Antibiotic consumption at the individual sites



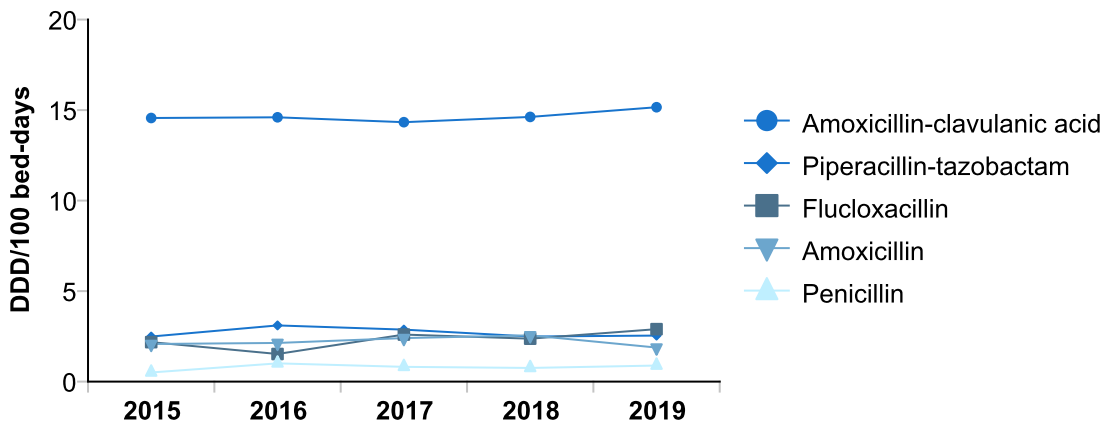
1.2 Consumption by antibiotic classes in DDD/100 bed-days over time

ATC-category	2015	2016	2017	2018	2019
Tetracyclines (J01AA)	0.3	0.3	0.3	0.3	0.5
Penicillins with extended spectrum (J01CA)	2.1	2.1	2.4	2.6	1.9
Beta-lactamase sensitive penicillins (J01CE)	0.5	1.0	0.8	0.8	0.9
Beta-lactamase resistant penicillins (J01CF)	2.2	1.5	2.6	2.4	2.9
Comb. of penicillins, incl. Beta-lactamase inhib. (J01CR)	17.1	17.7	17.2	17.1	17.7
1st & 2nd generation Cephalosporins (J01DB, DC)	6.1	5.6	5.5	6.0	6.5
3rd & 4th generation Cephalosporins (J01DD, DE)	8.9	7.4	7.9	7.6	7.2
Monobactams (J01DF)	0.0	0.1	0.0	0.0	
Carbapenems (J01DH)	3.6	2.8	2.7	1.8	2.0
Other cephalosporins and penems (J01DI)			0.0	0.1	0.0
Sulfonamides & trimethoprim (J01E)	0.9	0.8	3.1	1.3	1.1
Macrolides & lincosamides (J01F)	4.4	3.7	4.5	4.3	4.4
Aminoglycosides (J01G)	0.4	0.3	0.4	0.4	0.4
Fluoroquinolones (J01MA)	5.2	4.5	3.5	4.1	4.3
Others (J01B, J01X, P01AB01)	4.9	4.9	5.1	5.2	4.3
Total DDD/100 bed-days	56.5	52.7	56.1	53.9	54.0



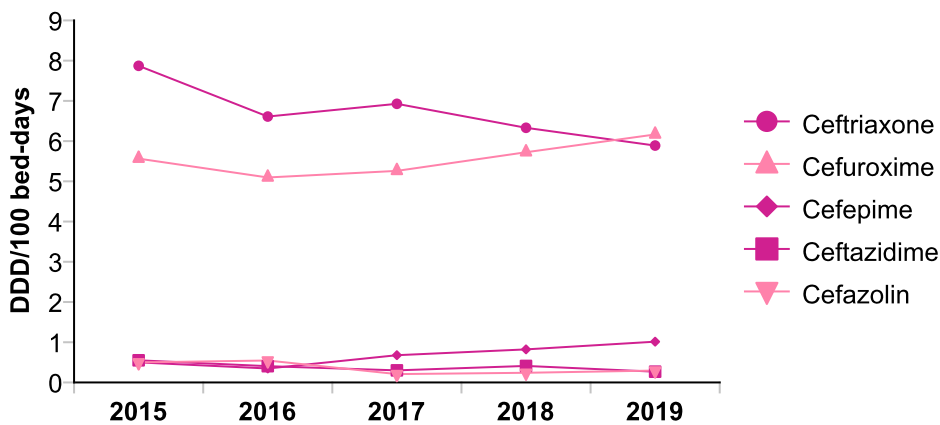
1.4 Consumption of individual antibiotics over time

Frequently* used penicillins (ATC code J01C)



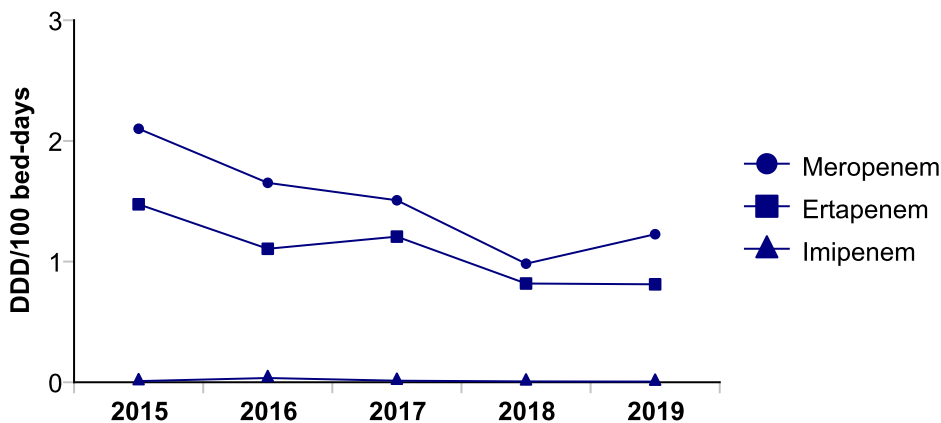
* The five most commonly used penicillins during the last five years

Frequently* used cephalosporins (ATC code J01DB-DE)

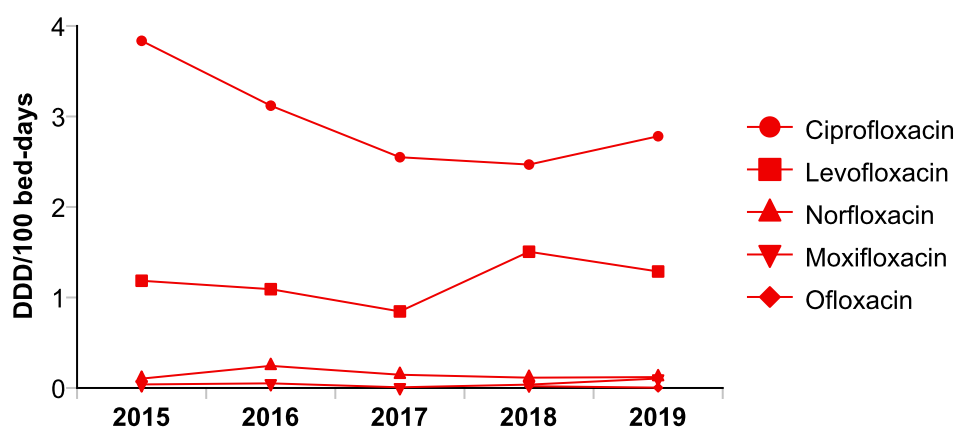


* The five most commonly used cephalosporins during the last five years

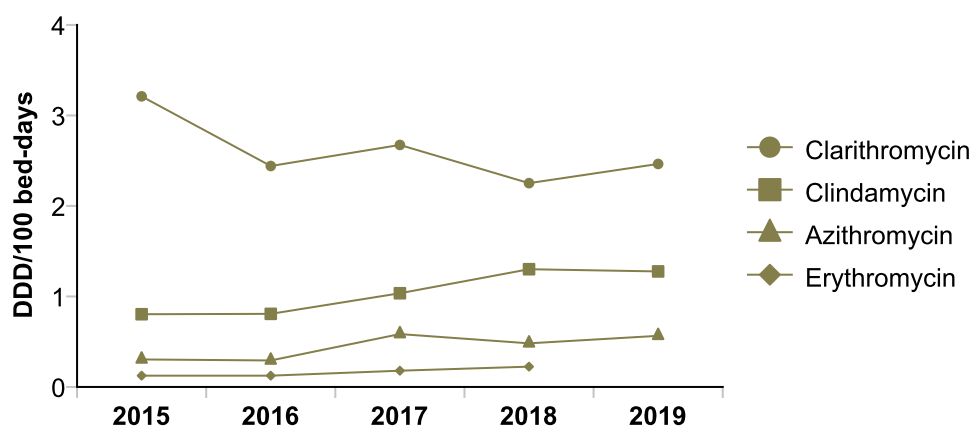
Carbapenems (ATC code J01DH)



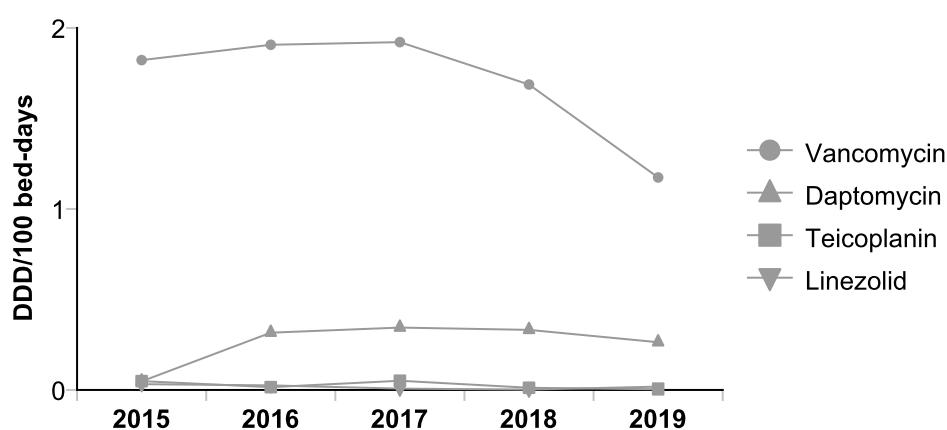
Fluoroquinolones (ATC code J01MA)



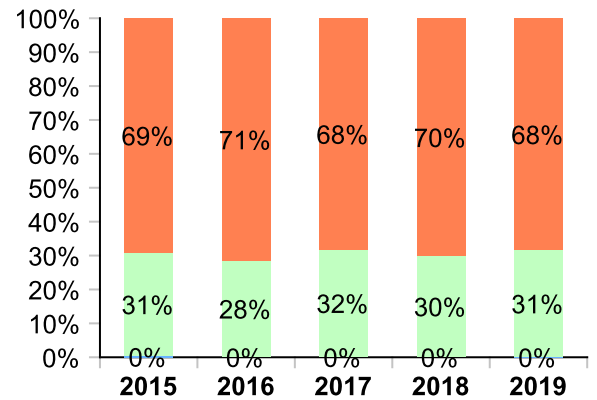
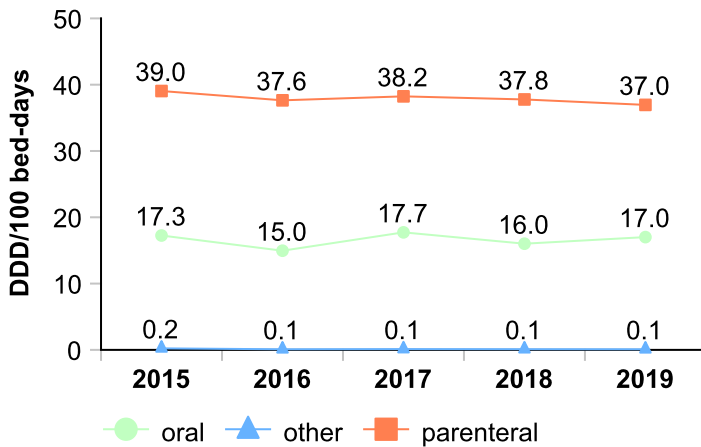
Macrolides & lincosamides (ATC code J01F)



Consumption of antibiotics active against resistant Gram-positive bacteria

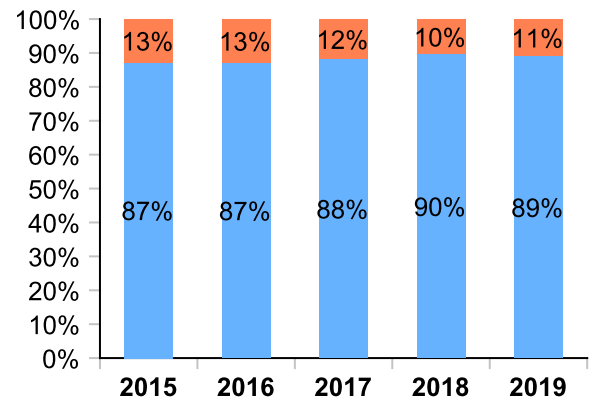
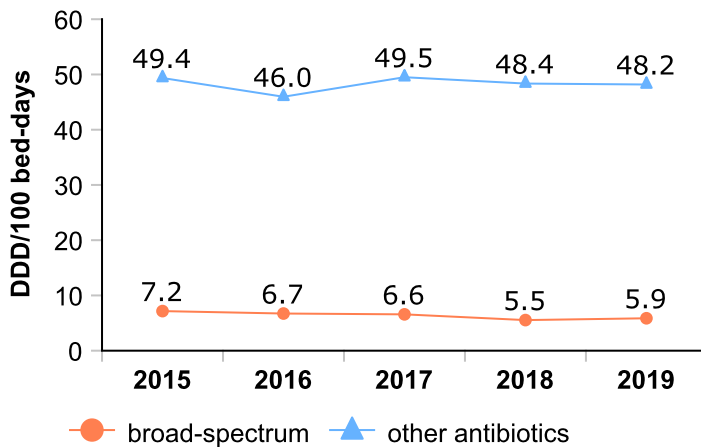


1.5 Antibiotic consumption according to the administration route

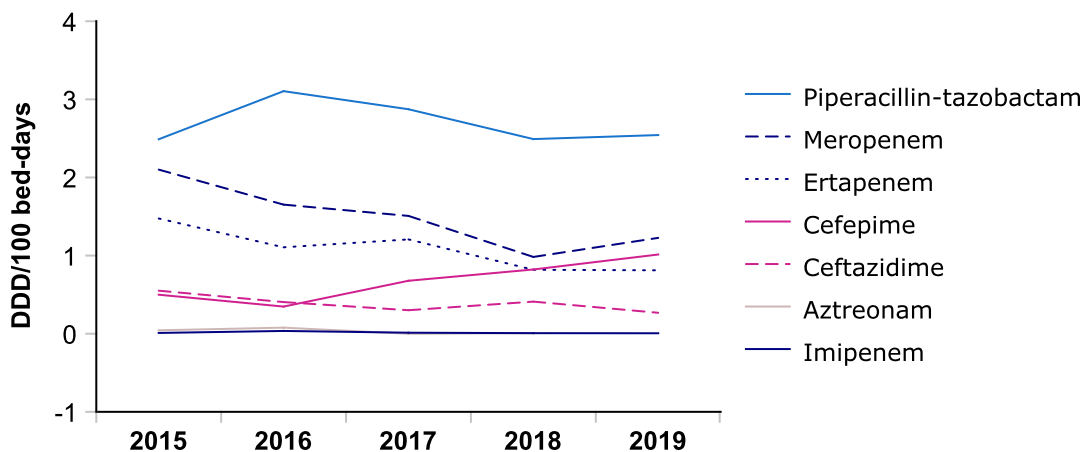


1.6 Consumption of broad-spectrum antibiotics

Broad-spectrum antibiotics include monobactams, carbapenems, the two 3rd and 4th generation cephalosporins Cefepime and Ceftazidime and the two penicillins with extended spectrums Ticarcillin and Piperacillin(-tazobactam).

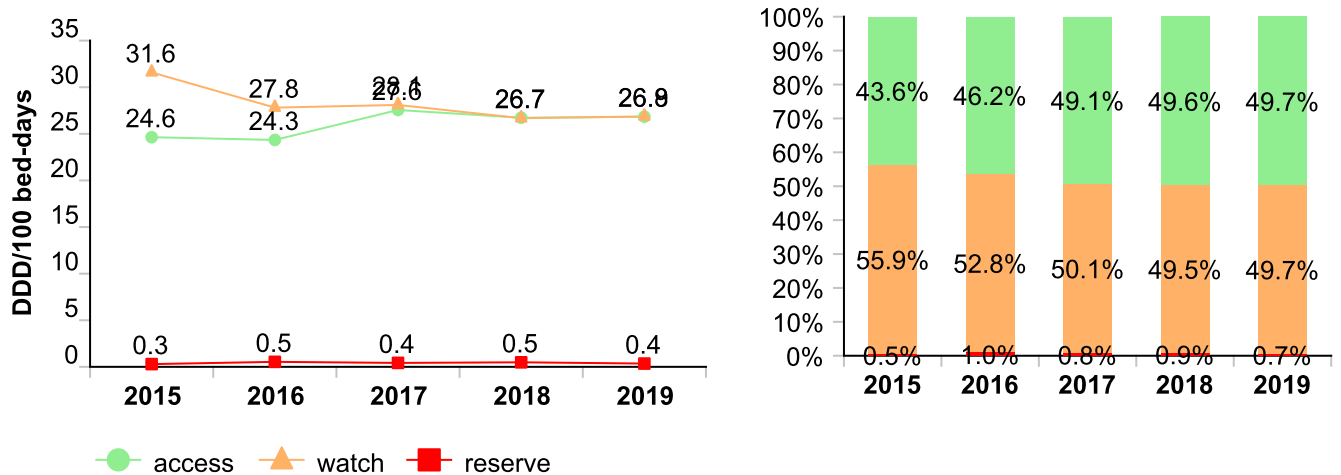


1.7 Consumption of individual broad-spectrum antibiotics



1.8 Antibiotic consumption according to the AWaRe groups

According to the WHO AWaRe Classification Database (2019). For details see Appendix.



1.9 Top list (DDD/100 bed-days (% of all))

Top ten overall

Rank	Antibiotic	2018	2019	% change
1	Amoxicillin-clavulanic acid	14.6 (27.1%)	15.2 (28.1%)	3.7
2	Cefuroxime	5.7 (10.6%)	6.2 (11.5%)	7.7
3	Ceftriaxone	6.3 (11.7%)	5.9 (10.9%)	-7
4	Flucloxacillin	2.4 (4.5%)	2.9 (5.4%)	22.2
5	Ciprofloxacin	2.5 (4.6%)	2.8 (5.2%)	12.7
6	Piperacillin-tazobactam	2.5 (4.6%)	2.5 (4.6%)	2
7	Clarithromycin	2.3 (4.3%)	2.5 (4.6%)	9.4
8	Amoxicillin	2.6 (4.8%)	1.9 (3.5%)	-26.4
9	Metronidazole	1.9 (3.5%)	1.5 (2.8%)	-21.9
10	Levofloxacin	1.5 (2.8%)	1.3 (2.4%)	-14.5

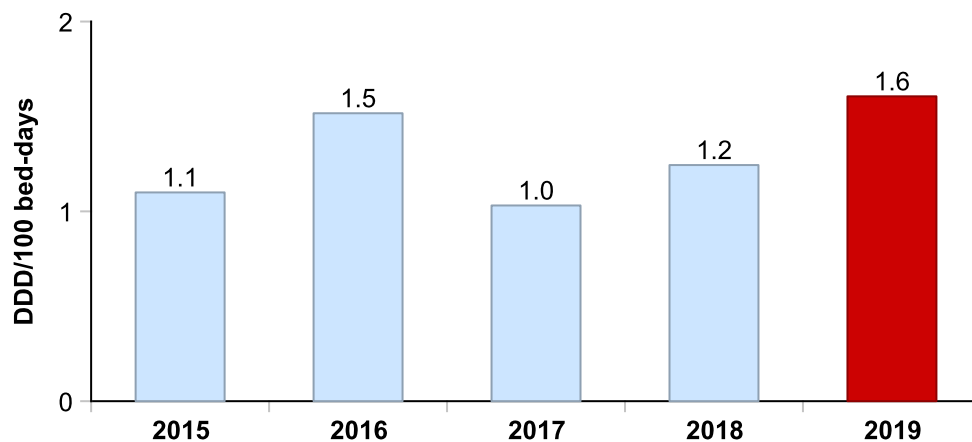
Top ten parenteral

Rank	Antibiotic	2018	2019	% change
1	Amoxicillin-clavulanic acid	11.2 (29.7%)	11.5 (31.1%)	2.4
2	Ceftriaxone	6.3 (16.7%)	5.9 (16.0%)	-7
3	Cefuroxime	4.1 (10.9%)	4.6 (12.4%)	13.1
4	Flucloxacillin	2.4 (6.4%)	2.9 (7.8%)	22.4
5	Piperacillin-tazobactam	2.5 (6.6%)	2.5 (6.8%)	2
6	Meropenem	1.0 (2.6%)	1.2 (3.2%)	24.9
7	Vancomycin	1.7 (4.5%)	1.2 (3.2%)	-30.4
8	Amoxicillin	1.8 (4.8%)	1.1 (3.0%)	-37.7
9	Cefepime	0.8 (2.1%)	1.0 (2.7%)	23.3
10	Penicillin	0.7 (1.9%)	0.9 (2.4%)	16.3

2. Combined antimycotic consumption of all sites of the hospital group

The antimycotic consumption covers all systemic antimycotic agents for human use listed in the Anatomical Therapeutic Chemical (ATC) classification under the code J02. This group does not include antimycotics specifically for dermatological use even if they are administered systemically.

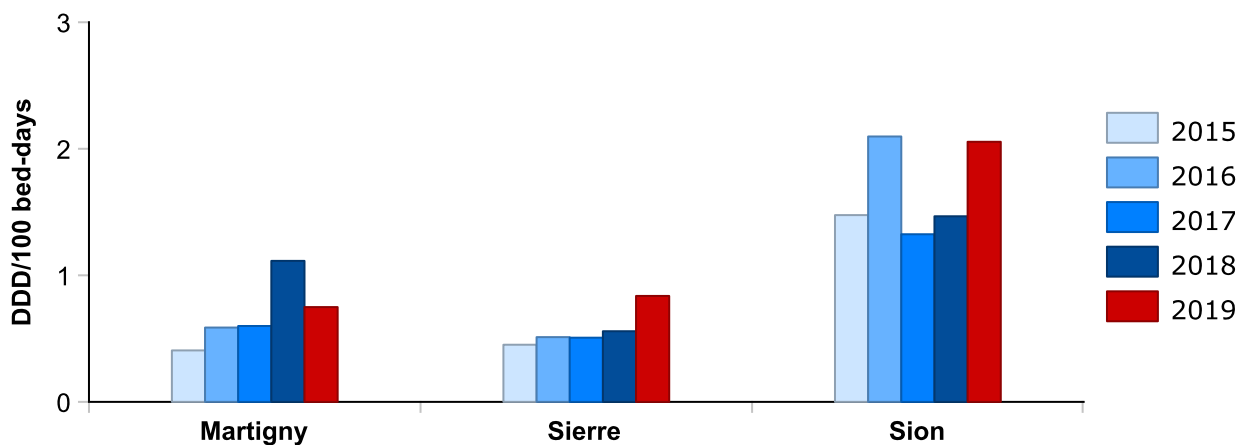
2.1 Global antimycotic consumption



The total consumption of systemic antimycotics in DDDs per 100 bed-days in the entire hospital group increased by 29.1 %, from 1.2 in 2018 to 1.6 in 2019.

Over the past five years the global consumption of systemic antimycotics increased by 46.0%.

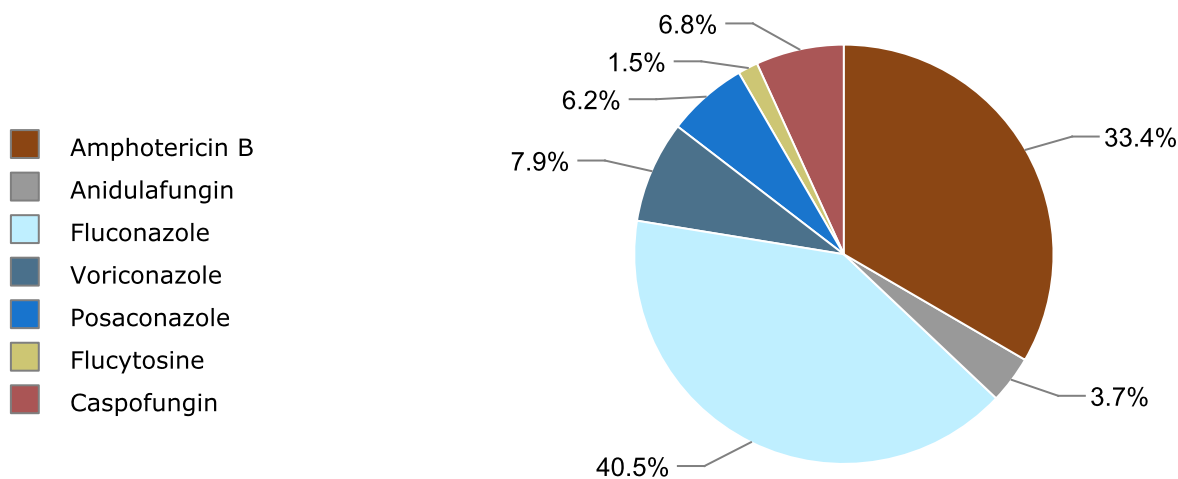
Antimycotic consumption at the individual sites



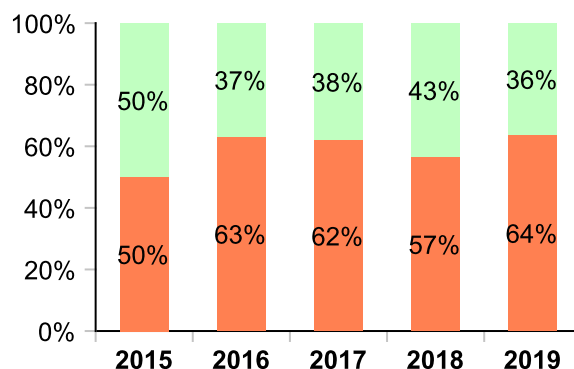
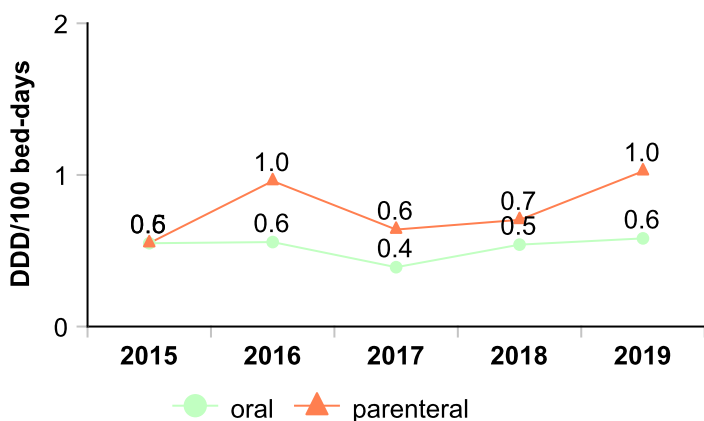
2.2 Consumption of individual antimycotics in DDD/100 bed-days over time

Antifungal	2015	2016	2017	2018	2019
Amphotericin B	0.0	0.0	0.0		0.5
Anidulafungin				0.0	0.1
Caspofungin	0.1	0.3	0.2	0.2	0.1
Fluconazole	0.6	1.1	0.8	0.9	0.7
Flucytosine					0.0
Itraconazole				0.0	
Posaconazole	0.3	0.1	0.0	0.0	0.1
Voriconazole	0.0	0.0	0.0	0.1	0.1
Total DDD/100 bed-days	1.1	1.5	1.0	1.2	1.6

2.3 Relative contribution of individual antimycotics to global consumption in 2019



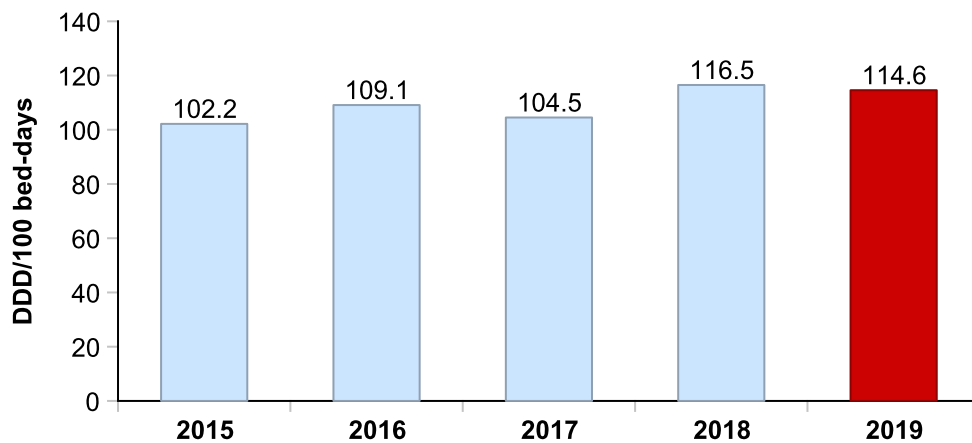
2.4 Consumption of antimycotics according to the administration route



3. Combined antibiotic consumption in the ICU of all sites of the hospital group

The antibiotic consumption covers all systemic antibacterial agents for human use listed in the ATC classification system under the code J01. The only other antimicrobial agent included is metronidazole (ATC code P01AB01). Intestinal antibiotics (ATC code A07A, including f.e. fidaxomicin and vancomycin oral) and antimycobacterial agents (ATC code J04) are not included.

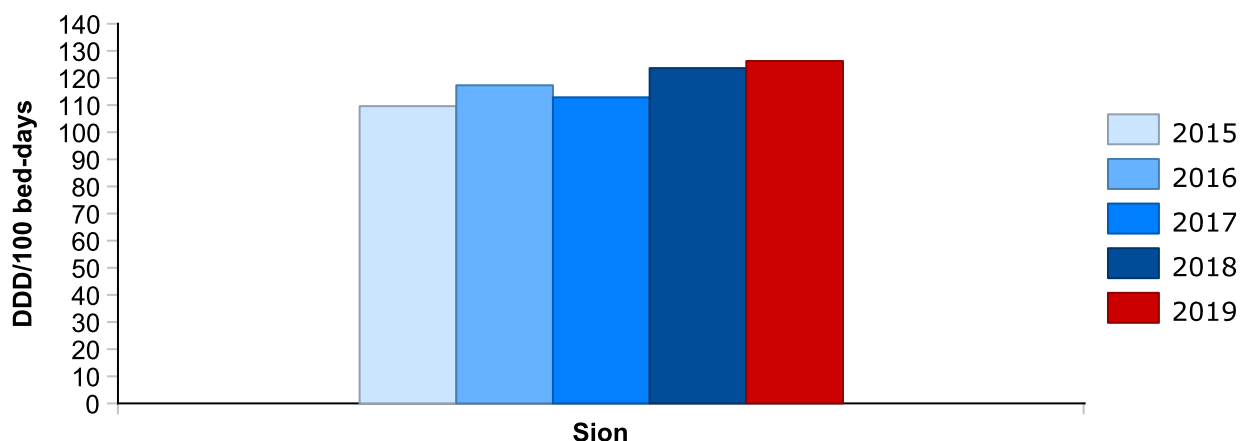
3.1 Global antibiotic consumption



The total consumption of systemic antibiotics in DDDs per 100 bed-days in the ICU's of the entire hospital group decreased by 1.7 %, from 116.5 in 2018 to 114.6 in 2019.

Over the past five years the global consumption of systemic antibiotics in the ICU increased by 12.2%.

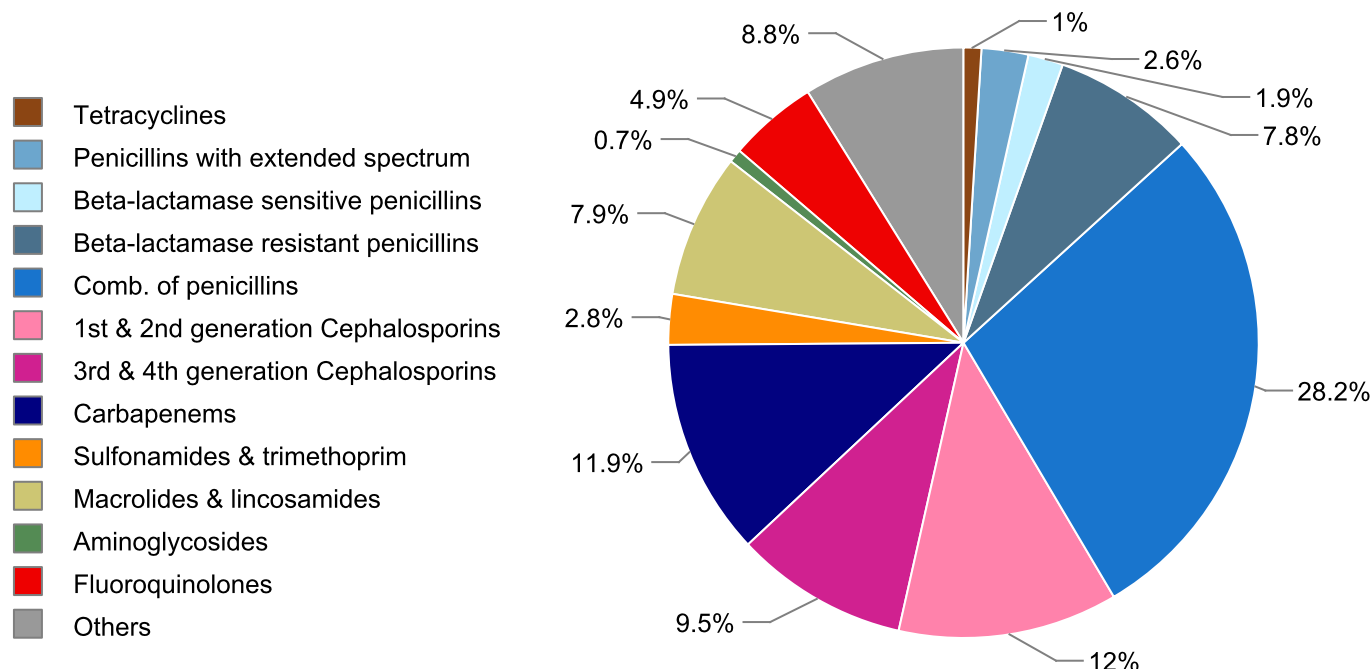
Antibiotic consumption in the ICU's at the individual sites



3.2 Consumption by antibiotic classes in DDD/100 bed-days over time

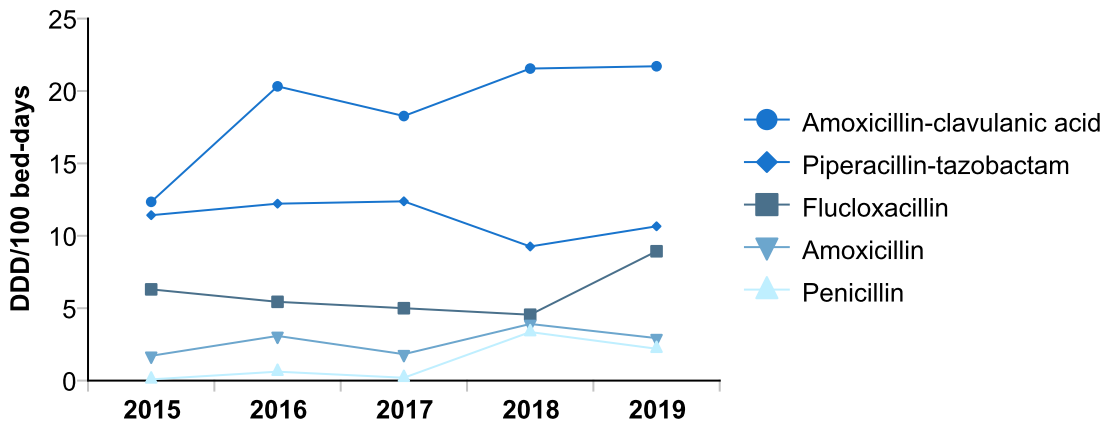
ATC-category	2015	2016	2017	2018	2019
Tetracyclines (J01AA)	0.3	1.8	0.1	1.3	1.1
Penicillins with extended spectrum (J01CA)	1.7	3.1	1.8	3.9	2.9
Beta-lactamase sensitive penicillins (J01CE)	0.1	0.6	0.2	3.4	2.2
Beta-lactamase resistant penicillins (J01CF)	6.3	5.4	5.0	4.6	8.9
Comb. of penicillins, incl. Beta-lactamase inhib. (J01CR)	23.8	32.5	30.7	30.8	32.4
1st & 2nd generation Cephalosporins (J01DB, DC)	14.5	9.9	10.5	10.2	13.8
3rd & 4th generation Cephalosporins (J01DD, DE)	13.3	12.3	10.5	12.7	10.9
Monobactams (J01DF)	0.6	0.2			
Carbapenems (J01DH)	15.0	13.5	14.7	10.7	13.6
Other cephalosporins and penems (J01DI)			0.1		
Sulfonamides & trimethoprim (J01E)	1.8	1.1	2.9	2.2	3.2
Macrolides & lincosamides (J01F)	9.7	8.6	9.2	10.6	9.0
Aminoglycosides (J01G)	0.4	1.0	2.7	1.6	0.8
Fluoroquinolones (J01MA)	4.2	5.0	2.5	10.1	5.6
Others (J01B, J01X, P01AB01)	10.6	14.1	13.5	14.4	10.1
Total	102.2	109.1	104.5	116.5	114.6

3.3 Distribution of the consumption of antibiotic groups in 2019



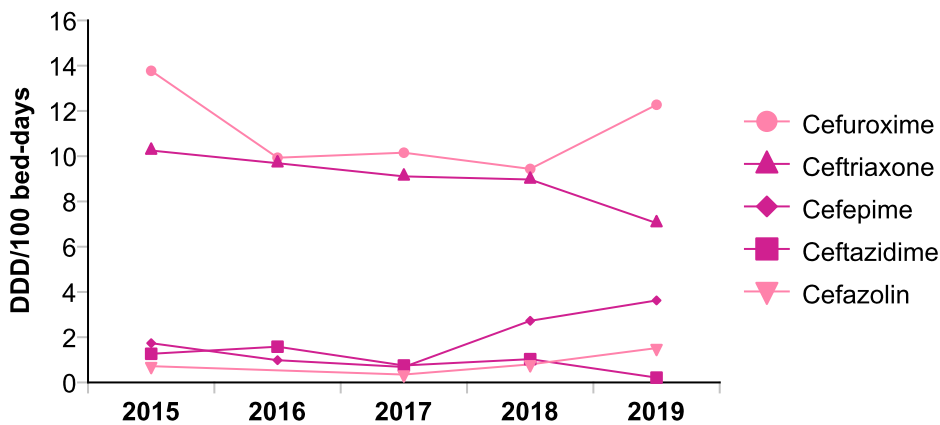
3.4 Consumption of individual antibiotics over time

Frequently* used penicillins (ATC code J01C)



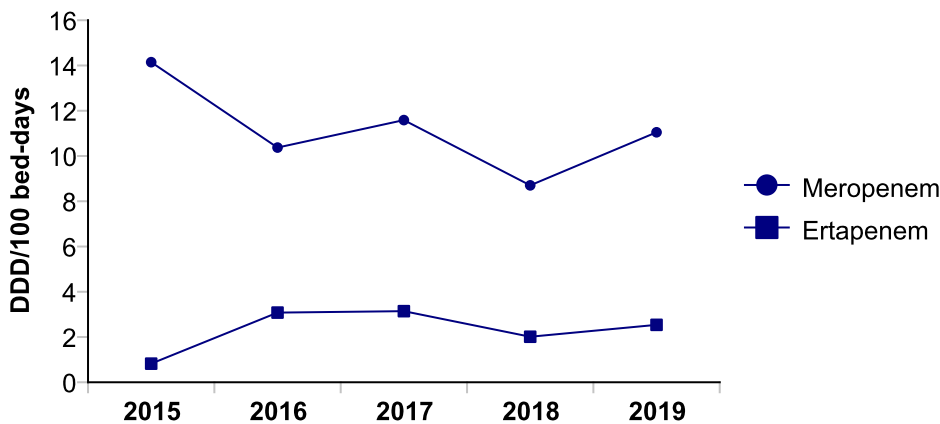
* The five most commonly used penicillins during the last five years

Frequently* used cephalosporins (ATC code J01DB-DE)

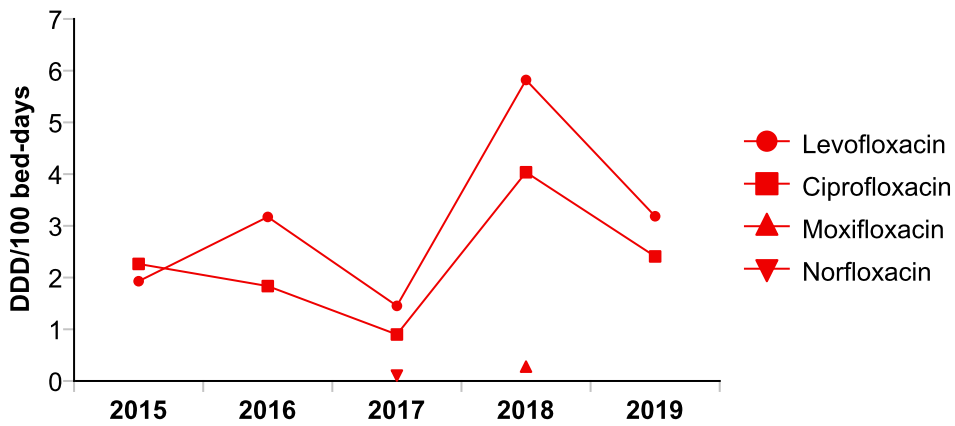


* The five most commonly used cephalosporins during the last five years

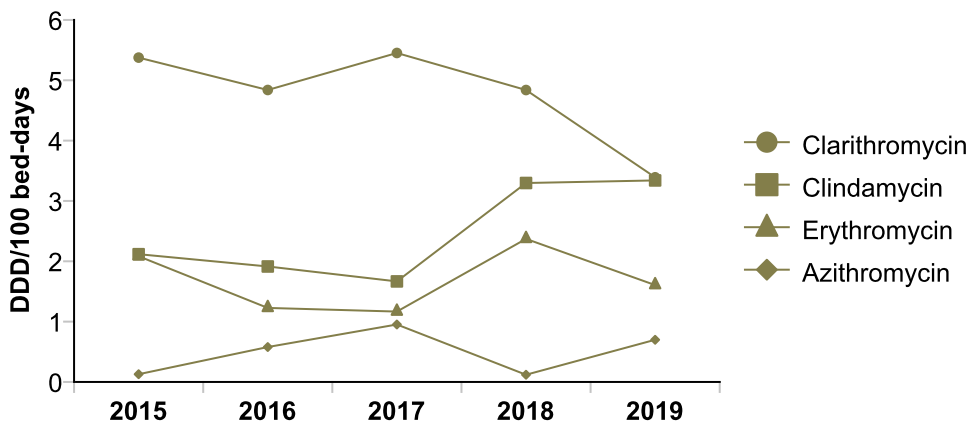
Carbapenems (ATC code J01DH)



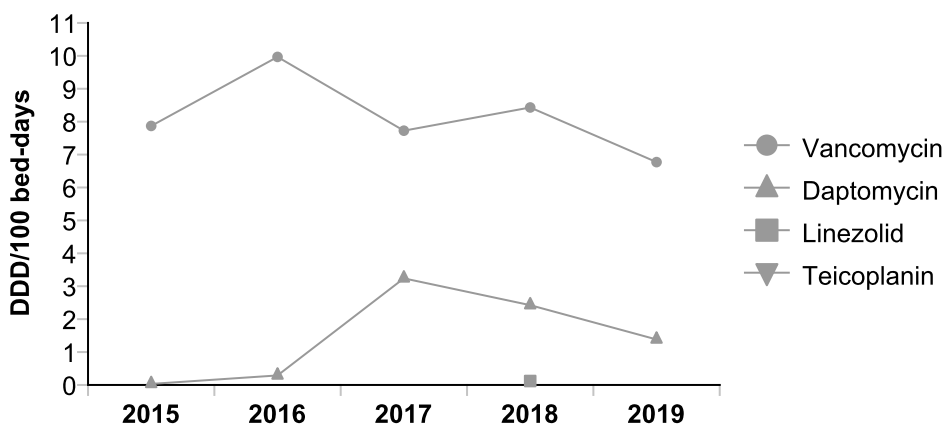
Fluoroquinolones (ATC code J01MA)



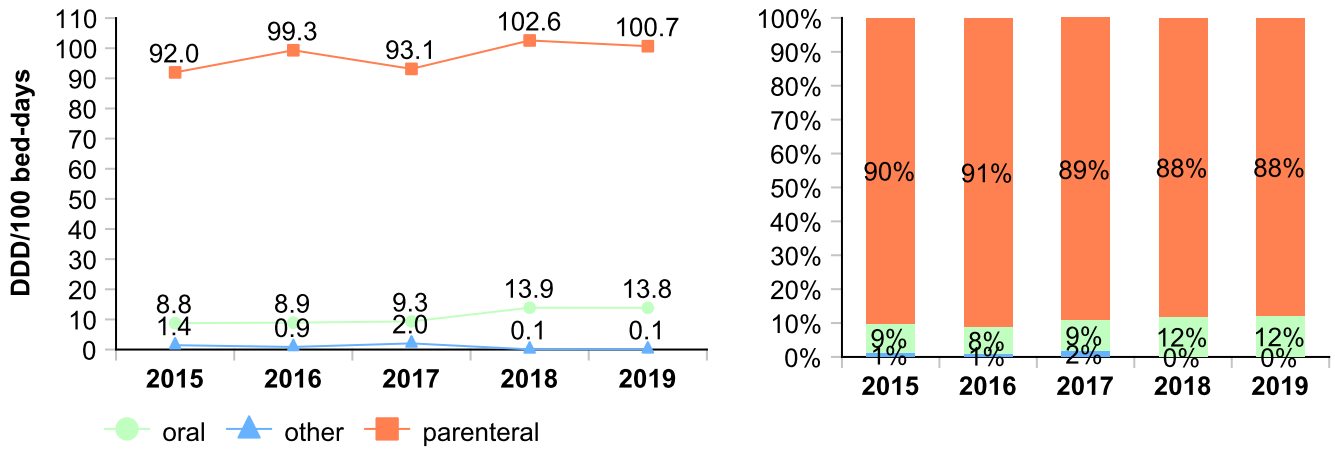
Macrolides & lincosamides (ATC code J01F)



Consumption of antibiotics active against resistant Gram-positive bacteria

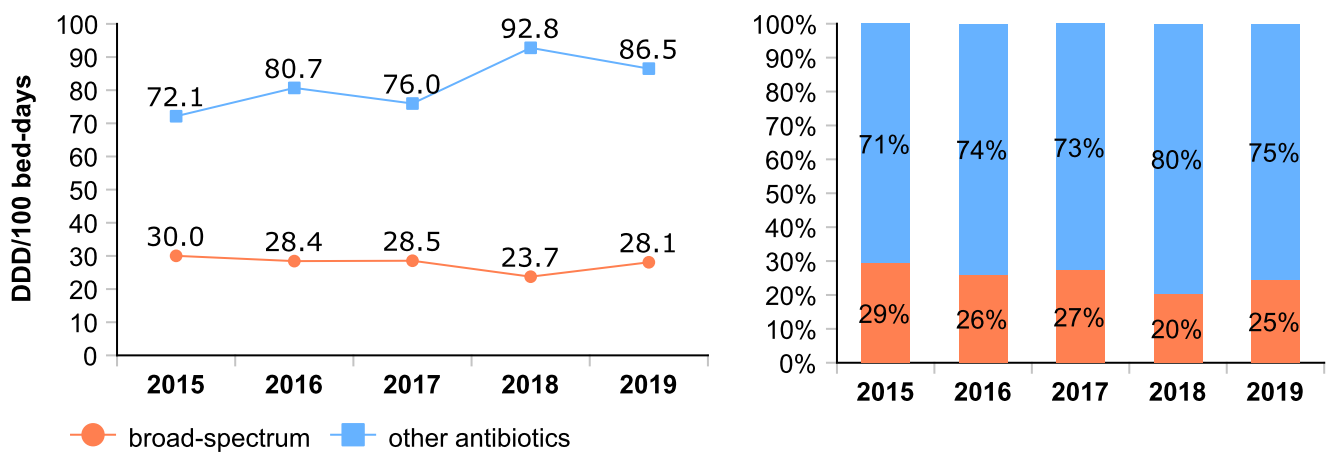


3.5 Antibiotic consumption according to the administration route

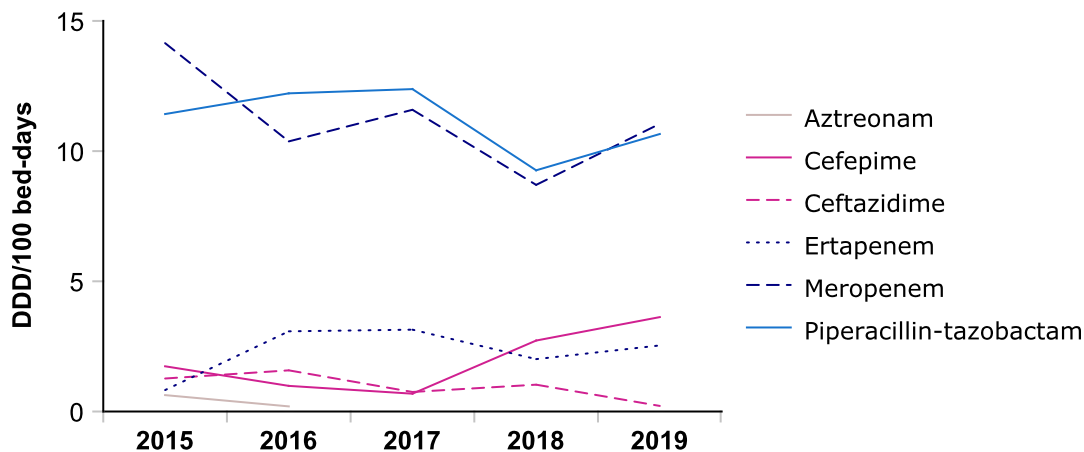


3.6 Consumption of broad-spectrum antibiotics over time

Broad-spectrum antibiotics include monobactams, carbapenems, the two 3rd and 4th generation cephalosporins Cefepime and Ceftazidime and the two penicillins with extended spectrums Ticarcillin and Piperacillin(-tazobactam).

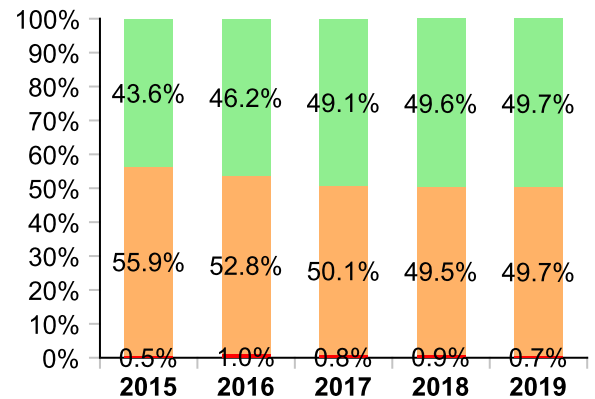
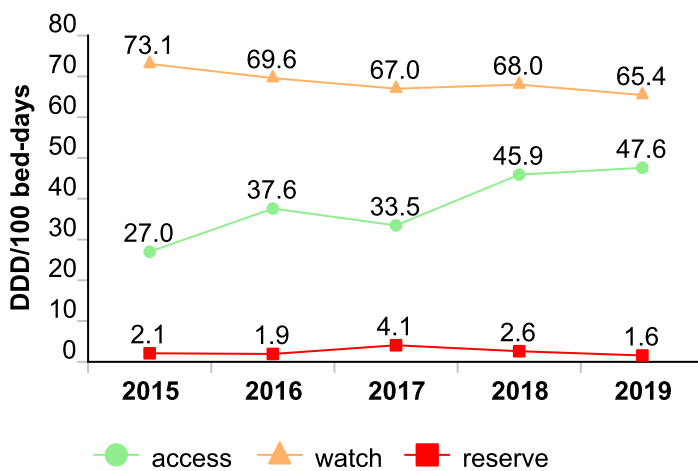


3.7 Consumption of individual broad-spectrum antibiotics



3.8 Antibiotic consumption according to the AWaRe groups

According to the WHO AWaRe Classification Database (2019). For details see Appendix.



3.9 Top list (DDD/100 bed-days (% of all))

Top ten overall

Rank	Antibiotic	2018	2019	% change
1	Amoxicillin-clavulanic acid	21.5 (18.5%)	21.7 (18.9%)	0.7
2	Cefuroxime	9.4 (8.1%)	12.3 (10.7%)	30.1
3	Meropenem	8.7 (7.5%)	11.0 (9.6%)	26.9
4	Piperacillin-tazobactam	9.3 (8.0%)	10.7 (9.3%)	15.1
5	Flucloxacillin	4.6 (3.9%)	8.9 (7.8%)	96.3
6	Ceftriaxone	9.0 (7.7%)	7.0 (6.1%)	-21.5
7	Vancomycin	8.4 (7.2%)	6.8 (5.9%)	-19.7
8	Cefepime	2.7 (2.3%)	3.6 (3.1%)	33.1
9	Clarithromycin	4.8 (4.1%)	3.4 (3.0%)	-29.9
10	Clindamycin	3.3 (2.8%)	3.3 (2.9%)	1.3

Top ten parenteral

Rank	Antibiotic	2018	2019	% change
1	Amoxicillin-clavulanic acid	19.7 (19.2%)	19.7 (19.6%)	-0.2
2	Cefuroxime	9.1 (8.9%)	11.9 (11.8%)	30.9
3	Meropenem	8.7 (8.5%)	11.0 (10.9%)	26.9
4	Piperacillin-tazobactam	9.3 (9.1%)	10.7 (10.6%)	15.1
5	Flucloxacillin	4.6 (4.5%)	8.9 (8.8%)	96.3
6	Ceftriaxone	9.0 (8.8%)	7.0 (7.0%)	-21.5
7	Vancomycin	8.4 (8.2%)	6.8 (6.8%)	-19.7
8	Cefepime	2.7 (2.6%)	3.6 (3.6%)	33.1
9	Amoxicillin	3.6 (3.5%)	2.6 (2.6%)	-27.9
10	Ertapenem	2.0 (1.9%)	2.5 (2.5%)	26.1

Appendix A

Consumption of individual antibiotics and antimycotics in the entire hospital expressed in DDD per 100 bed-days (ATC code A07AA, J01, J02, J04, P01AB).

ATC-category	Antibiotic Name	BS*	AWaRe+	2015	2016	2017	2018	2019
Tetracyclines (J01AA)	Doxycycline	no	access	0.23	0.24	0.28	0.34	0.45
	Minocycline	no	watch	0.01				
	Tigecyclin	no	reserve	0.02	0.04	0.01		0
Penicillins with extended spectrum (J01CA)	Amoxicillin	no	access	2.04	2.13	2.4	2.57	1.88
Beta-lactamase sensitive penicillins (J01CE)	Penicillin	no	access	0.5	1	0.82	0.76	0.88
Beta-lactamase resistant penicillins (J01CF)	Flucloxacillin	no	access	2.19	1.53	2.6	2.37	2.9
Comb. of penicillins, incl. Beta-lactamase inhib. (J01CR)	Amoxicillin-clavulanic acid	no	access	14.56	14.58	14.34	14.63	15.15
	Piperacillin-tazobactam	yes	watch	2.49	3.11	2.88	2.48	2.54
1st & 2nd generation Cephalosporins (J01DB, DC)	Cefazolin	no	access	0.49	0.54	0.19	0.23	0.29
	Cefuroxime	no	watch	5.56	5.08	5.25	5.72	6.17
3rd & 4th generation Cephalosporins (J01DD, DE)	Cefepime	yes	watch	0.5	0.34	0.65	0.82	1.01
	Cefixime	no	watch	0.02				
	Cefpodoxime	no	watch	0		0	0	0.01
	Ceftazidime	yes	watch	0.55	0.41	0.29	0.41	0.26
	Ceftazidime-avibactam	no	reserve					0
	Ceftriaxone	no	watch	7.86	6.6	6.92	6.33	5.88
Monobactams (J01DF)	Aztreonam	yes	reserve	0.04	0.08	0	0.01	
Carbapenems (J01DH)	Ertapenem	yes	watch	1.47	1.1	1.21	0.81	0.81
	Imipenem	yes	watch	0.01	0.04	0.01	0.01	0.01
	Meropenem	yes	watch	2.12	1.67	1.49	0.99	1.23
Other cephalosporins and penems (J01DI)	Ceftolozane-tazobactam	no	reserve			0	0.05	0.04
Sulfonamides & trimethoprim (J01E)	Trimethoprim-sulfamethoxazole	no	access	0.9	0.82	3.09	1.31	1.09
Macrolides & lincosamides (J01F)	Azithromycin	no	watch	0.31	0.3	0.56	0.48	0.57
	Clarithromycin	no	watch	3.18	2.44	2.67	2.24	2.46
	Clindamycin	no	access	0.81	0.8	1.02	1.28	1.28
	Erythromycin	no	watch	0.11	0.12	0.19	0.22	0.1
Aminoglycosides (J01G)	Amikacin	no	access	0.03	0.04	0.02	0.05	0.11
	Gentamicin	no	access	0.24	0.22	0.25	0.34	0.2
	Tobramycin	no	watch	0.16	0.05	0.12	0.06	0.1
Fluoroquinolones (J01MA)	Ciprofloxacin	no	watch	3.83	3.14	2.56	2.45	2.78
	Levofloxacin	no	watch	1.18	1.09	0.84	1.5	1.29
	Moxifloxacin	no	watch	0.04	0.05	0.01	0.04	0.1
	Norfloxacin	no	watch	0.1	0.25	0.15	0.12	0.13
	Ofloxacin	no	watch				0.02	0
Others (J01B, J01X, P01AB01)	Colistin	no	reserve	0.15	0.07	0.06	0.09	0.02
	Daptomycin	no	reserve	0.05	0.32	0.34	0.33	0.26
	Fosfomycin_oral	no	watch	0.15	0.12	0.25	0.21	0.21
	Fusidic acid	no	watch			0.01	0.01	0.01
	Linezolid	no	reserve	0.03	0.02	0.01	0	0.02
	Metronidazole	no	access	1.52	1.64	1.77	1.94	1.52
	Nitrofurantoin	no	access	1.07	0.77	0.73	0.91	1.04
	Ornidazole	no	other					0

ATC-category	Antibiotic Name	BS*	AWaRe+	2015	2016	2017	2018	2019
	Teicoplanin	no	watch	0.05	0.01	0.05	0.02	0
	Vancomycin	no	watch	1.82	1.91	1.94	1.68	1.17

Consumption of individual antibiotics and antimycotics in the ICU expressed in DDD per 100 bed-days (ATC code A07AA, J01, J02, J04, P01AB).

ATC-category	Antibiotic Name	BS*	AWaRe ⁺	2015	2016	2017	2018	2019
Tetracyclines (J01AA)	Doxycycline	no	access	0.34	1.24	0.12	1.32	1.01
	Tigecyclin	no	reserve		0.59			0.10
Penicillins with extended spectrum (J01CA)	Amoxicillin	no	access	1.71	3.01	1.83	3.91	2.59
Beta-lactamase sensitive penicillins (J01CE)	Penicillin	no	access	0.09	0.62	0.20	3.35	2.20
Beta-lactamase resistant penicillins (J01CF)	Flucloxacillin	no	access	6.30	5.44	5.00	4.55	8.93
Comb. of penicillins, incl. Beta-lactamase inhib. (J01CR)	Amoxicillin-clavulanic acid	no	access	12.34	20.17	18.28	21.55	21.70
	Piperacillin-tazobactam	yes	watch	11.42	12.22	12.37	9.27	10.66
1st & 2nd generation Cephalosporins (J01DB, DC)	Cefazolin	no	access	0.72		0.35	0.80	1.52
	Cefuroxime	no	watch	13.77	9.94	10.16	9.44	12.27
3rd & 4th generation Cephalosporins (J01DD, DE)	Cefepime	yes	watch	1.74	0.80	0.69	2.73	3.62
	Ceftazidime	yes	watch	1.26	1.58	0.75	1.03	0.21
	Ceftriaxone	no	watch	10.25	9.69	9.10	8.97	7.04
Monobactams (J01DF)	Aztreonam	yes	reserve	0.63	0.20			
Carbapenems (J01DH)	Ertapenem	yes	watch	0.82	3.08	3.15	2.01	2.54
	Meropenem	yes	watch	14.15	10.37	11.59	8.70	11.05
Other cephalosporins and penems (J01DI)	Ceftolozane-tazobactam	no	reserve			0.12		
Sulfonamides & trimethoprim (J01E)	Trimethoprim-sulfamethoxazole	no	access	1.80	1.10	2.86	2.16	3.17
Macrolides & lincosamides (J01F)	Azithromycin	no	watch	0.13	0.58	0.48	0.12	0.70
	Clarithromycin	no	watch	5.37	4.84	5.46	4.84	3.39
	Clindamycin	no	access	2.12	1.91	1.67	3.29	3.34
	Erythromycin	no	watch	2.08	1.23	1.17	2.37	1.61
Aminoglycosides (J01G)	Amikacin	no	access	0.06	0.29	0.36	0.66	0.19
	Gentamicin	no	access	0.30	0.62	1.03	0.92	0.65
	Tobramycin	no	watch		0.09	1.34		
Fluoroquinolones (J01MA)	Ciprofloxacin	no	watch	2.26	1.83	0.90	4.04	2.40
	Levofloxacin	no	watch	1.94	3.18	1.45	5.82	3.19
	Moxifloxacin	no	watch				0.24	
	Norfloxacin	no	watch			0.14		
Others (J01B, J01X, P01AB01)	Colistin	no	reserve	1.44	0.86	0.71	0.06	0.08
	Daptomycin	no	reserve	0.03	0.29	3.24	2.43	1.38
	Fosfomycin_oral	no	watch		0.02	0.07		-0.03
	Linezolid	no	reserve				0.12	
	Metronidazole	no	access	1.22	2.74	1.78	3.17	1.55
	Nitrofurantoin	no	access		0.23		0.24	0.39
	Teicoplanin	no	watch			-0.02		
Vancomycin	no	watch	7.87	9.97	7.72	8.43	6.77	

* Broad-spectrum antibiotics (BS).

+ The WHO's essential medicines list divides antibiotics into three categories: "Access," "Watch," and "Reserve". Access antibiotics are first- and second-choice options for common infections with the lowest risk for antibiotic resistance. Antibiotics of the "Watch" category are the first- or second choice for specific indications and are considered to have higher toxicity and/or resistance potential. Antibiotics of the "Reserve" category are considered to be antibiotics of last resort. There are several antibiotics that are not included in the existing three categories. These are classified as "other". https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/

Appendix B

Occupancy data entire hospital

Hospital group	Year	Bed-days	Admissions
	2015	124961	19348
	2016	134621	20713
	2017	135382	20849
	2018	139427	21049
	2019	136121	21326

Occupancy data ICU

Hospital group	Year	Bed-days	Admissions
	2015	3888	1119
	2016	4319	1194
	2017	4200	1165
	2018	4175	1130
	2019	3862	1068