

Measuring antimicrobial consumption

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*ESCMID Postgraduate
Education Course
Antimicrobial Stewardship:
a Practical and
Integrated Approach*

| **A** | **B** | **S** | antibiotic
stewardship

Antimicrobial consumption

- What to measure?
- How to measure?
- Why to measure?

Antimicrobial consumption

➤ What to measure?

- Antibacterials
- Antimycotics
- Antimycobacterials
- Antivirals

Antiinfectives

for:

- systemic use
- (local use)

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J ANTIINFECTIVES FOR SYSTEMIC USE

Antiinfectives are also classified in the following groups:

A01AB Antiinfectives and antiseptics for local/oral treatment

A02BD Combinations for eradication of Helicobacter pylori

A07A Intestinal antiinfectives

D01 Antifungals for dermatological use

D06 Antibiotics and chemotherapeutics for dermatological use

D07C Corticosteroids, combinations with antibiotics

D09AA Ointment dressings with antiinfectives

D10AF Antiinfectives for treatment of acne

G01 Gynecological antiinfectives and antiseptics

P Antiparasitic products, insecticides and repellents

R02AB Antibiotics

R05X Other cold preparations

S01/

S02/

S03 Eye and ear preparations with antiinfectives

Even systemically administered antibacterials and antimycotics may be classified in other groups if their target is exclusively local, e.g. the skin - D01 - Antifungals for dermatological use

Inhaled antiinfectives are classified in J.

J ANTIINFECTIVES FOR SYSTEMIC USE

J01 ANTIBACTERIALS FOR SYSTEMIC USE

J02 ANTIMYCOTICS FOR SYSTEMIC USE

J04 ANTIMYCOBACTERIALS

J05 ANTIVIRALS FOR SYSTEMIC USE



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J ANTIINFECTIVES FOR SYSTEMIC USE

J01 ANTIBACTERIALS FOR SYSTEMIC USE

J01A TETRACYCLINES

J01B AMPHENICOLS

J01C BETA-LACTAM ANTIBACTERIALS, PENICILLINS

J01D OTHER BETA-LACTAM ANTIBACTERIALS

J01E SULFONAMIDES AND TRIMETHOPRIM

J01F MACROLIDES, LINCOSAMIDES AND STREPTOGRAMINS

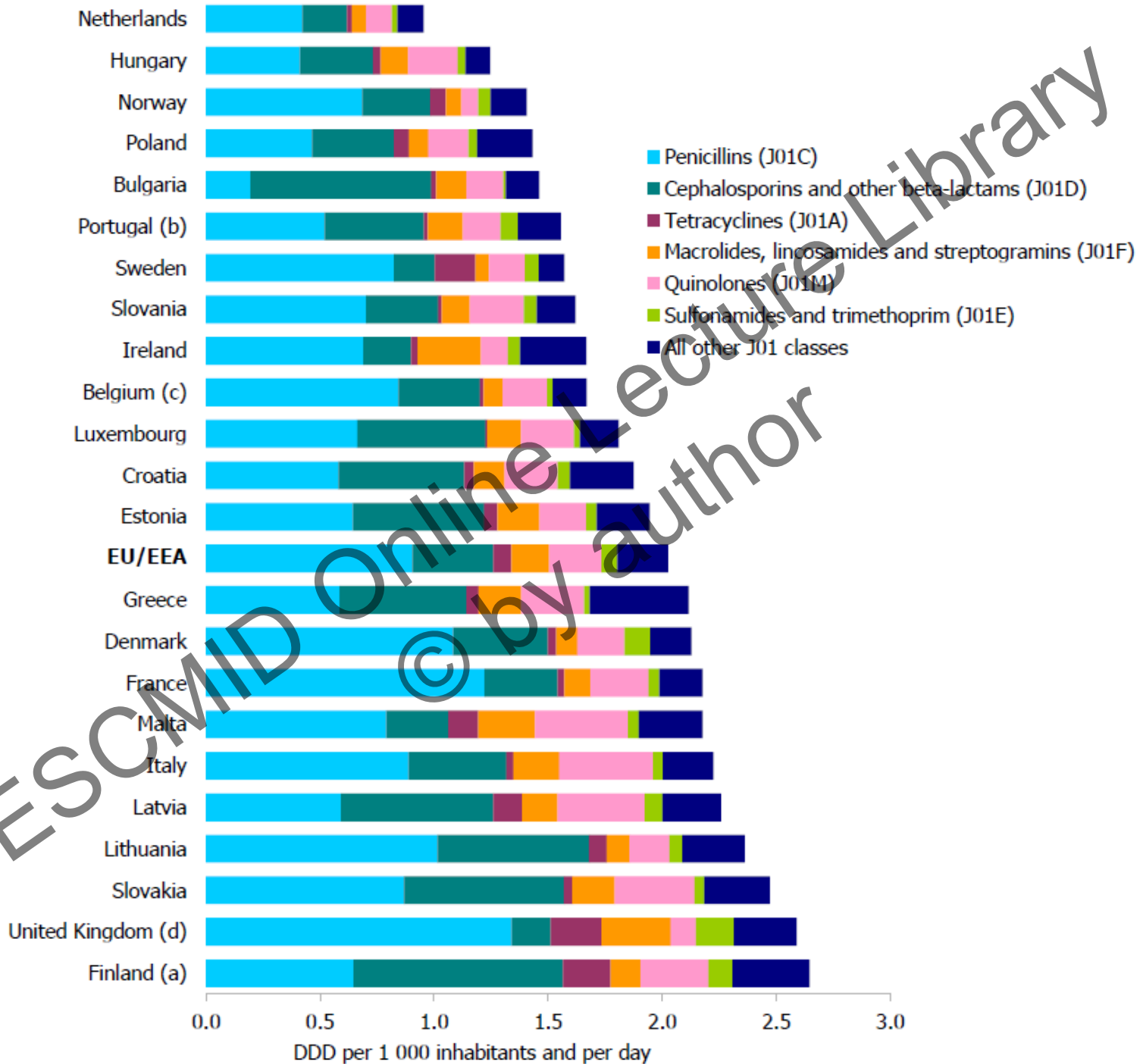
J01G AMINOGLYCOSIDE ANTIBACTERIALS

J01M QUINOLONE ANTIBACTERIALS

J01R COMBINATIONS OF ANTIBACTERIALS

J01X OTHER ANTIBACTERIALS

Last updated: 2015-12-16



ATC/DDD-Index (WHO)

J	ANTIINFEKTIVES FOR SYSTEMIC USE	1st level, anatomical main group
J01	ANTIBACTERIALS FOR SYSTEMIC USE	2nd level, therapeutic subgroup
J01C	BETA-LACTAM ANTIBACTERIALS, PENICILLINS	3rd level, pharmacological subgroup
J01CR	Combinations of penicillins, incl. beta-lactamase inhibitors	4th level, chemical subgroup
J01CR01	ampicillin and enzyme inhibitor	5th level, chemical substance
J01CR04	sultamicillin (o)	5th level, chemical substance
J01CR02	amoxicillin and enzyme inhibitor	5th level, chemical substance
J01CR02	amoxicillin and enzyme inhibitor	5th level, chemical substance
J01CR05	piperacillin and enzyme inhibitor	5th level, chemical substance

ATC/DDD-Index and pitfalls

- J01 D other beta-lactams
 - cephalosporins
 - carbapenems
- J01 C beta-lactam antibacterials, penicillins
 - aminopenicillins
 - ureidopenicillins

Antimicrobial consumption

➤ methods

- daily doses/1000 inhabitants/day (outpatient)
- packages/1000 inhabitants/day (outpatient)
- daily doses/100 hospital days (inpatient)
- daily doses/100 cases (inpatient)

definition of daily dose

- *DDD*: *defined daily dose* (www.whooc.no)
 - is the assumed average maintenance dose per day for a drug used for its main indication in adults.
- *RDD*: *recommended daily dose* (www.antiinfektiva-surveillance.de)
 - „German approach“ to account for guideline-recommended dosing („more realistic“)
- *PDD*: *prescribed daily doses*

ATC/DDD Index



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J ANTINFECTIVES FOR SYSTEMIC USE
J01 ANTIBACTERIALS FOR SYSTEMIC USE
J01D OTHER BETA-LACTAM ANTIBACTERIALS
J01DC Second-generation cephalosporins

ATC code	Name	DDD	U	Adm.R	Note
J01DC02	<u>cefuroxime</u>	0.5	g	O	
		3	g	P	

List of abbreviations

Last updated: 2013-12-19

Definition of daily doses

- DDD = *Defined Daily Dose* (ATC/DDD-Index)
- RDD = *Recommended Daily Dose*
(www.antiinfektiva-surveillance.de)

	DDD	RDD
cefuroxime	3 g iv	4,5 g iv
cefuroxime	0,5 g po	1 g po
ceftazidime	4 g iv	6 g iv
ampicillin/sulbactam	2 g iv	6 g iv
flucloxacillin	2 g iv	8 g iv

DDD vs RDD vs PDD

- preferable PDD
- Germany: preferable RDD because...
- DDD overestimate hospital antibiotic consumption especially of beta-lactames
- DDD for international comparisons

Calculation of antimicrobial consumption

$$\text{Drug usage in DDD} = \frac{\text{Number of units} \times \text{Amount of drug per unit}}{\text{DDD}_{\text{drug}}}$$

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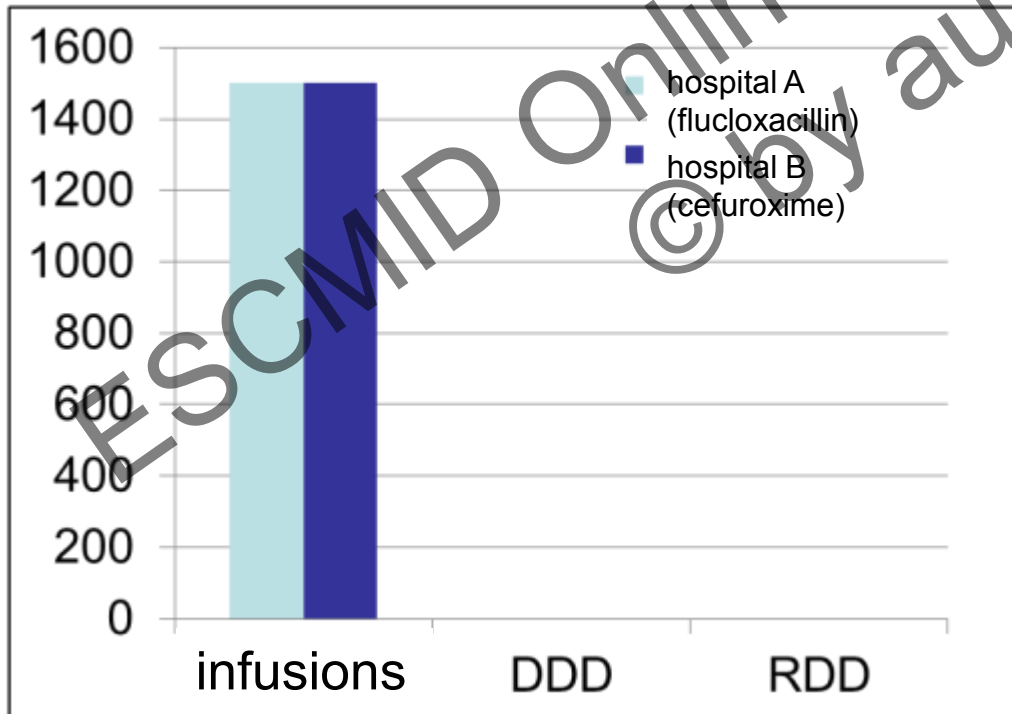
Calculation of antimicrobial consumption

$$\text{Drug usage in DDD} = \frac{\text{Number of units} \times \text{Amount of drug per unit}}{\text{DDD}_{\text{drug}}}$$

$$\text{DDD (drug usage Cefuroxime)} = \frac{200 \text{ (infusions)} \times 1,5 \text{ g}}{3 \text{ g (DDD for Cefuroxime)}}$$

Exercise

- hospital A: 1500 infusions flucloxacillin (2g)
- hospital B: 1500 infusions cefuroxime (1,5g)



	flucloxacillin IV	cefuroxime IV
DDD	2 g	3 g
RDD	8 g	4,5 g
number DDD		
number RDD		

Use density

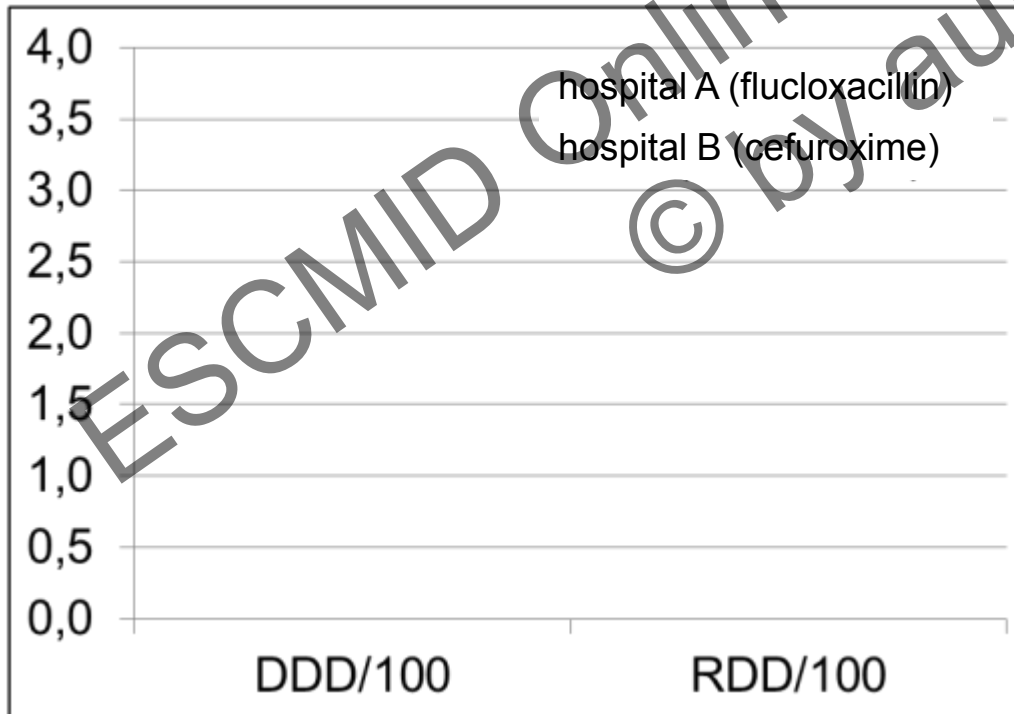
- use density DDD/100 hospital days

$$= \frac{\text{number of daily dose of substance} * 100}{\text{number of care days (cases)}}$$

- only use density is eligible for comparisons

Exercise

- hospital A: 1500 infusions Flucloxacillin (2g), 58000 care days
- hospital B: 1500 infusions Cefuroxime (1,5g), 22000 care days



	flucloxacillin IV (hospital A)	cefuroxime IV (hospital B)
DDD	2 g	3 g
RDD	8 g	4,5 g
number DDD	1500	750
number RDD	375	500
DDD/100		
RDD/100		

DDD vs „RDD“

JAC

DDD adjustments for surveillance of hospital antibiotic use

Table 3. Ranking^a of the utilization of 24 antibiotics^b in 22 Norwegian HEs; rankings based on both WHO DDDs and haDDD

Antibiotics		Ranking order																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Benzylpenicillin/phenoxymethylpenicillin	WHO DDDs	22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	haDDD	8	5	3	5	1	—	—	—	—	—	—	—	—	—	—	—	—
Metronidazole	WHO DDDs	—	—	1	3	7	4	5	1	—	—	1	—	—	—	—	—	—
	haDDD	8	9	2	1	1	—	—	—	1	—	—	—	—	—	—	—	—
Cefuroxime	WHO DDDs	—	4	2	3	2	2	2	3	—	1	—	2	—	—	—	—	—
	haDDD	4	3	4	3	2	2	1	1	—	1	—	—	—	1	—	—	—
Cefotaxime	WHO DDDs	—	4	4	2	—	1	—	5	1	2	—	1	—	1	—	—	—
	haDDD	1	1	6	2	2	3	1	1	1	—	1	1	1	—	—	—	—
Cefalotin/cefalexin	WHO DDDs	—	—	1	1	3	—	1	2	1	8	4	—	—	—	—	—	—
	haDDD	1	2	1	1	3	5	2	5	1	—	—	—	—	1	—	—	—
Dicloxacillin/cloxacillin	WHO DDDs	—	10	7	1	1	1	1	1	—	—	—	—	—	—	—	—	—
	haDDD	—	—	—	—	—	1	1	—	—	2	4	4	6	1	1	—	—

Where to evaluate antimicrobial consumption at hospital?

- hospital overall
- separate high-consumer-areas
 - Urology
 - ENT
 - Intensive care units
 - hematology/onkology

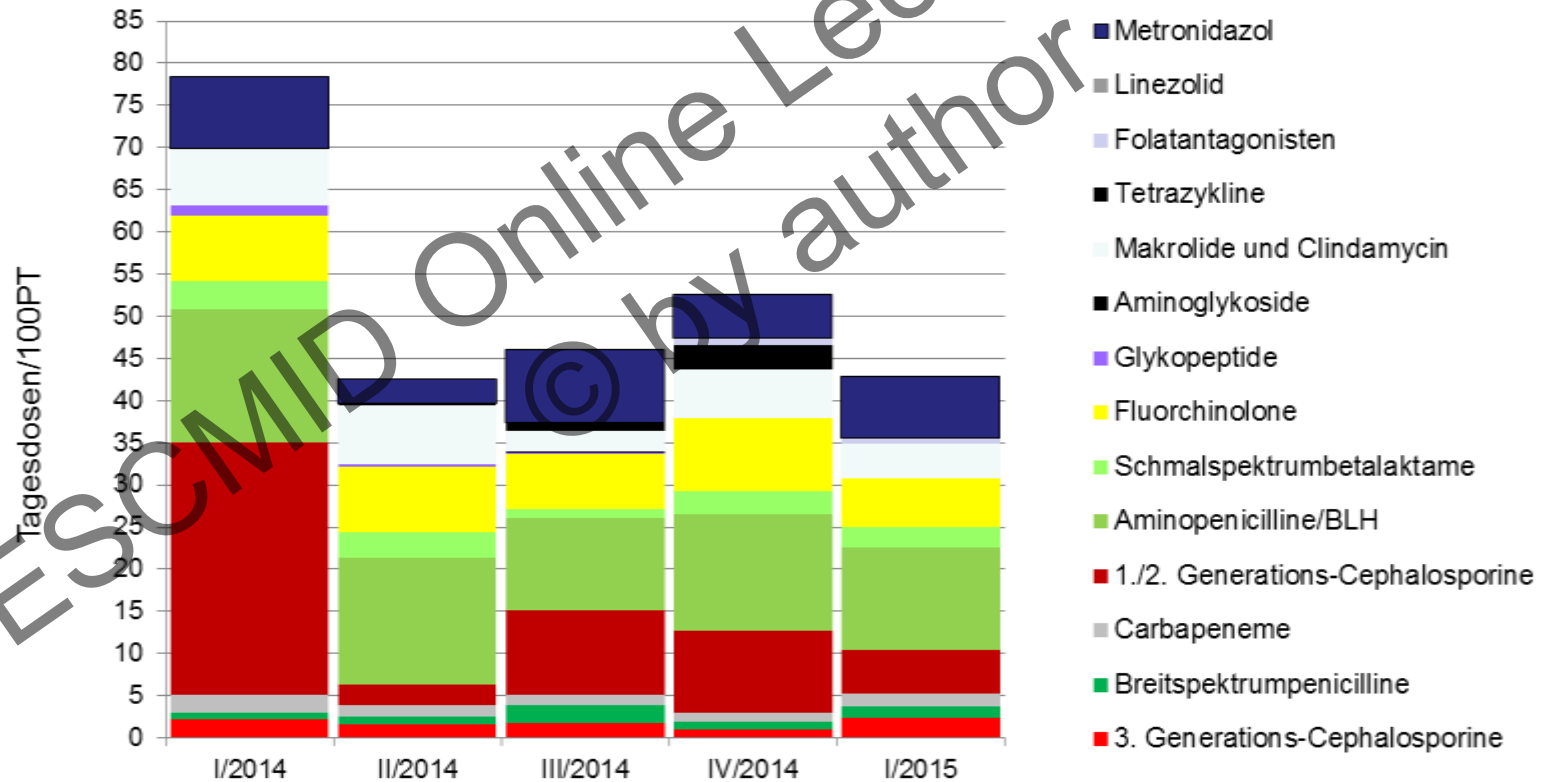
...how often evaluate antimicrobial consumption???

➤ yearly

➤ quarterly

➤ monthly

Antibiotic Stewardship at the ICU



Summary

- Daily doses per 100 hospital days
- Hospital-wide, for individual departments and at ward level
- specific antibiotic classes
- Top 15 antibiotics
- parenteral vs. oral