

# Point Prevalence Surveys in Stewardship: the what, why, how and where?

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# ESAC: European Surveillance of Antimicrobial Consumption



- Launched in November 2001 (Belgian EU Presidency)
- ESAC is an international network of surveillance systems, aiming to maintain a continuous, comprehensive and comparable database on antimicrobial consumption for all Member States, candidate countries and EFTA-EEA countries
- Funding organisation: DG SANCO of EC (2001-2007) and ECDC (2007-2011)
- Transfer to ECDC (Stockholm) in July 2011
- New acronym: ESAC-Net



# Background (1)



- Sparse comparable data on antimicrobial use/prescribing in hospitals in Europe
- Lack of standardised methods for producing valid data on antimicrobial use in hospitals
- There is an increased demand to identify targets for quality improvement, measure indicators of appropriate antibiotic prescribing and assess interventions

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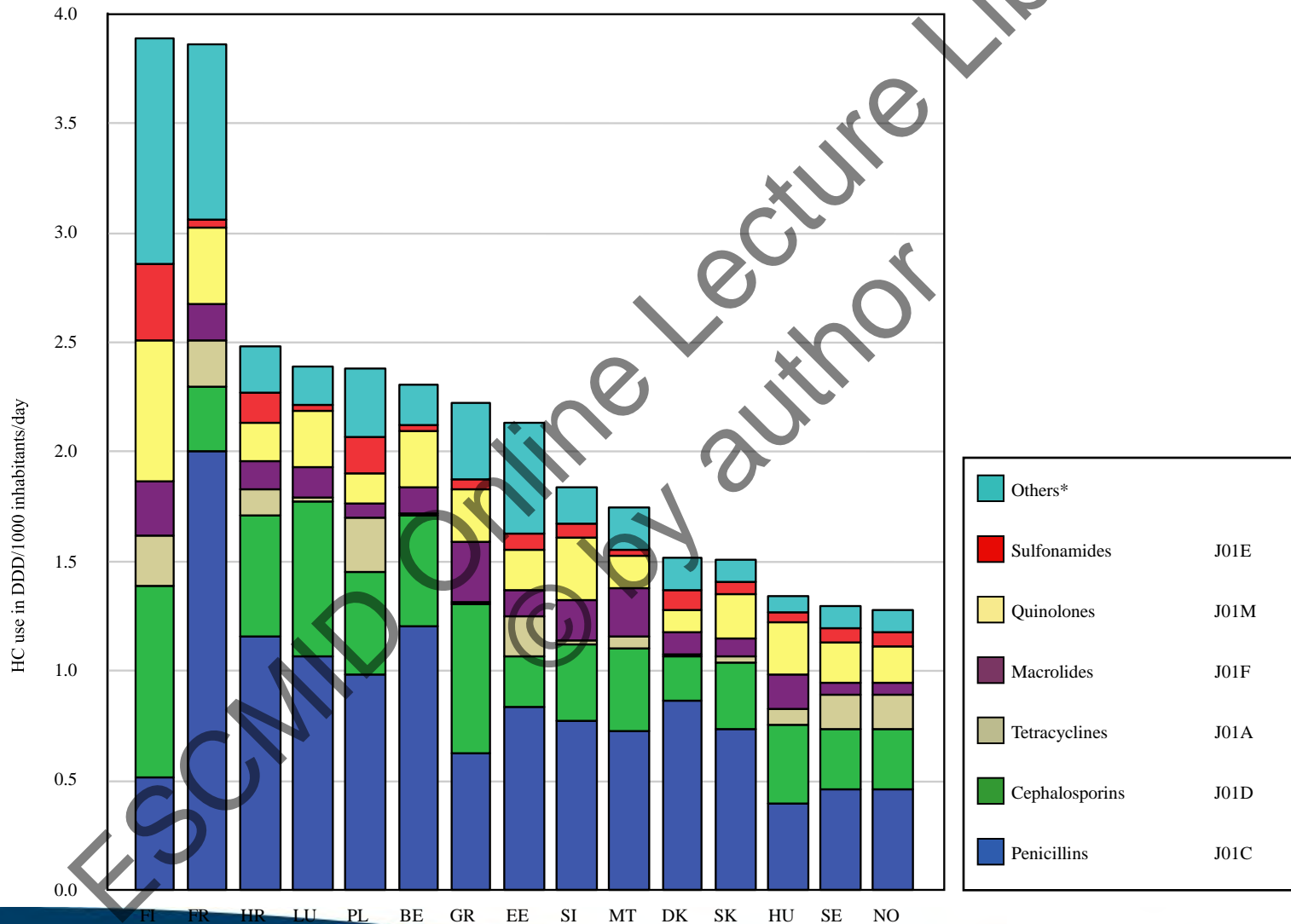
## Background (2)



- ESAC-I (2001-2004): to collect data on antimicrobial use in European hospitals at regional/national level
  - Vander Stichele et al, J Antimicrob Chemother 2006; 58: 159-67
- ESAC-II (2004-2007): to develop and pilot a methodology for PPS on antimicrobial prescribing in European hospitals (PPS 2006)
  - Ansari et al, Clin Infect Dis 2009; 49: 1496-1504
- ESAC-III-IV (2007-2011): to expand the PPS to as many hospitals as possible (PPS 2008, 50 hospitals; PPS 2009, 172 hospitals)
  - Zarb et al, J Antimicrob Chemother, 2010; Amadeo et al, J Antimicrob Chemother 2010, etc



# Total Antibiotic Use in Hospital Care in 2002





# Objectives



- To standardize and rollout a PPS method for antimicrobials use in European hospitals, from different healthcare systems.
- To collect and disseminate data about Prescribed Daily Doses (PDD) of antimicrobials in hospital practice for comparison with WHO DDDs to help interpretation of data about antibacterial use from hospital pharmacies.
- To investigate hospital characteristics that explain variation in antimicrobial use.
- To identify targets for quality improvement.
- To develop quality indicators of antimicrobial consumption in the hospital care sector
- To develop a tool for assessing interventions in hospitals



# Methods PPS 2006



- PPS in April-May 2006 in 20 European hospitals (1 hospital/country)
- Using the Swedish protocol and web-based soft-ware (Skoog, ECCMID 2004)
- Each hospital had to carry out PPS in  $\leq 2$  weeks
- Entire hospital
- In each in-patient ward:
  - Collecting the number of patients present at 8 am
  - Collecting information about the treated patients, only
- Treated patients:
  - Demographic data (age/gender)
  - Prescription (drug, dose, route of administration)
  - Indication/Diagnosis
  - Basic quality indicators (relevant culture before therapy)
- 19 pre-defined diagnosis groups by anatomical site
- Indication for therapy: community and hospital acquired infection or (medical/surgical) prophylaxis



# ESAC PPS 2006 - Demographics

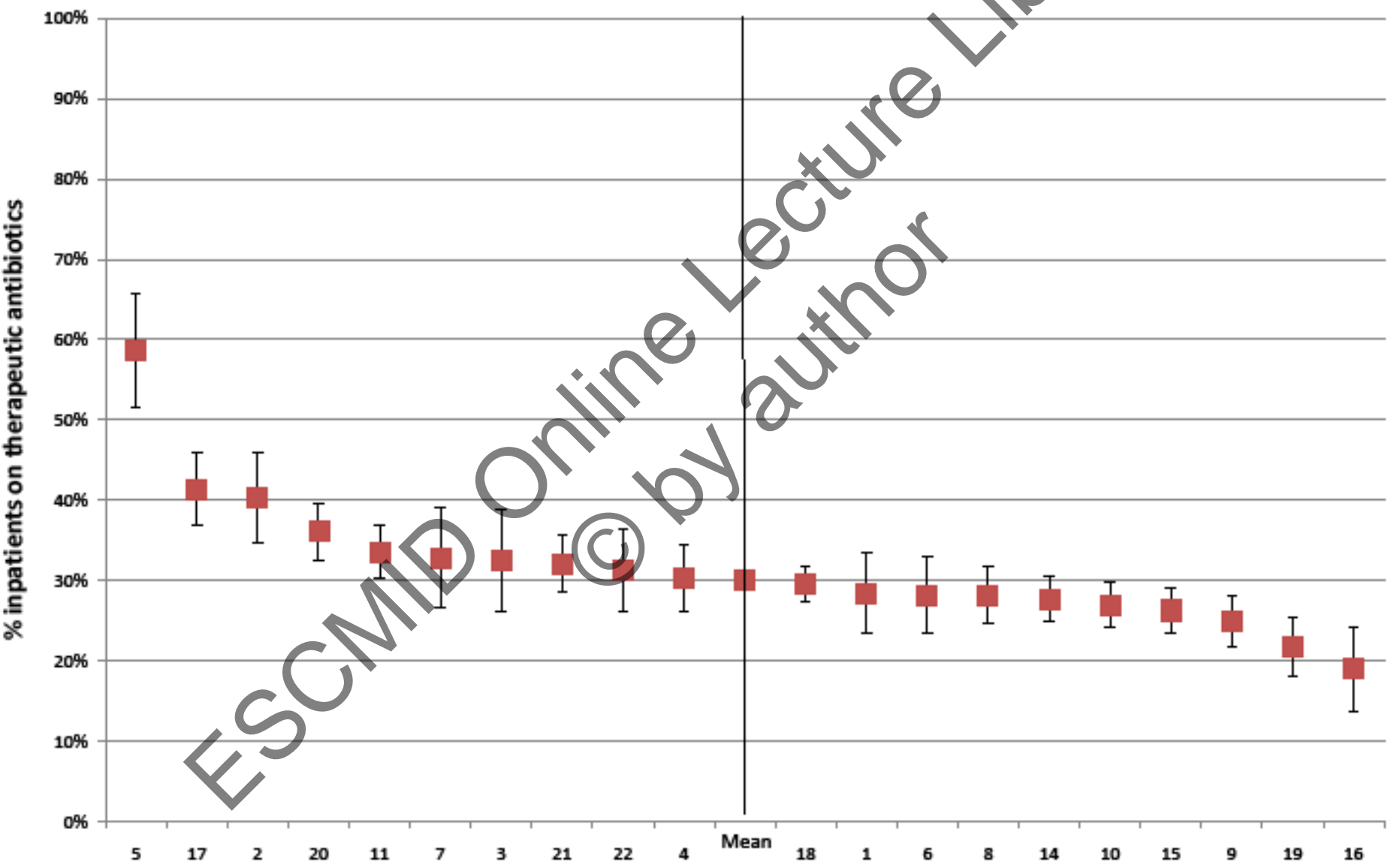


- 20 hospitals - 11,571 admitted patients
- 3,483 patients treated with antibiotics
- 30.1% (19.0 – 59.0) of all admitted
- 47.5% women
- 371 children - 10.7%



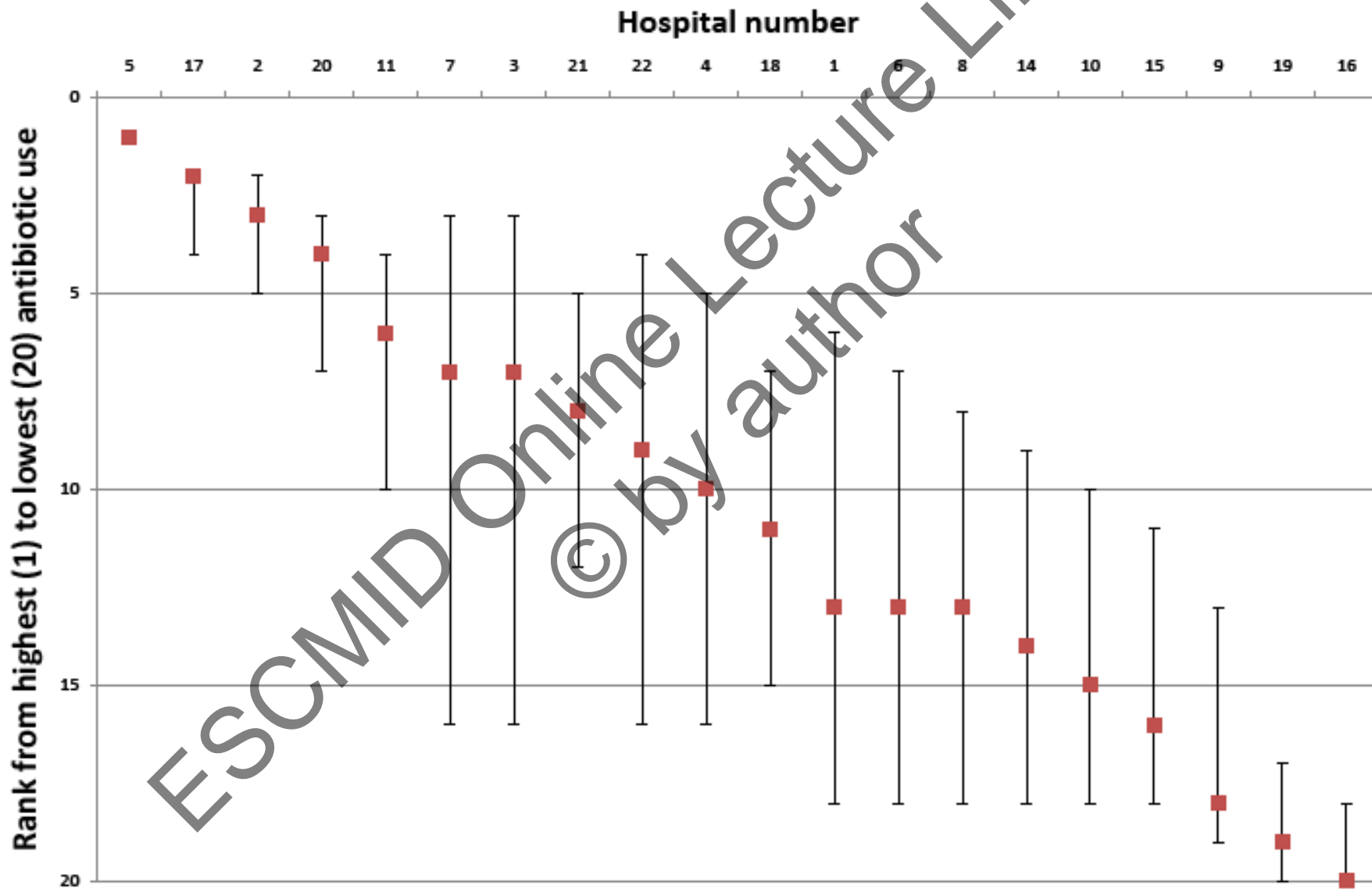


# Percentage of Patients Treated with Antibacterials (95% CI vertical bars)





# Estimated True Ranks from 1 (Highest) to 20 (Lowest) (95% CI vertical bars)



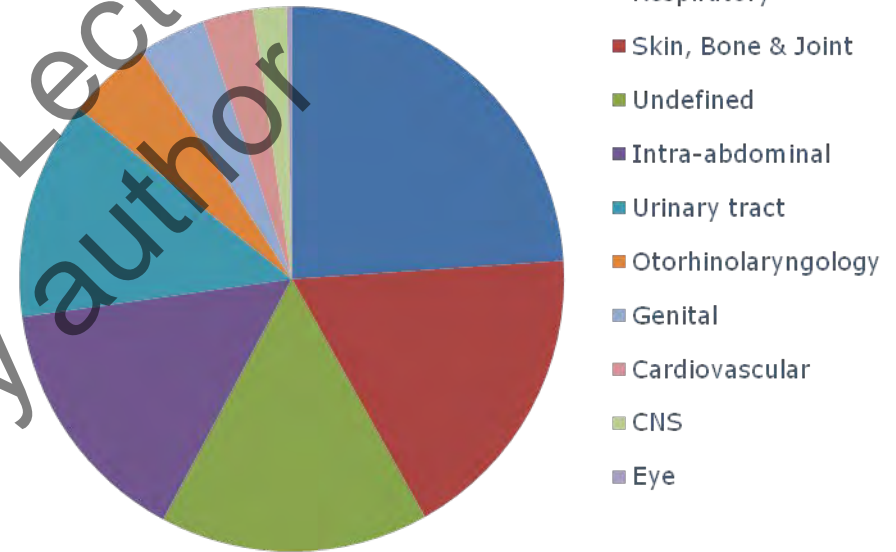


# Anatomical Sites Recorded for Antimicrobial Treatment and Prophylaxis



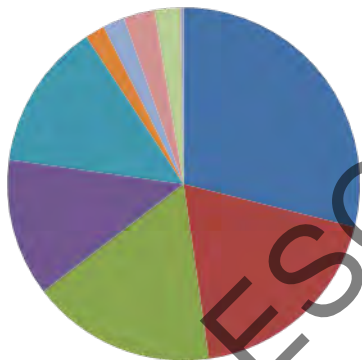
Site	All treatments	Infection	Prophylaxis
Respiratory	24%	29%	8%
Skin, Bone & Joint	18%	19%	16%
Undefined	16%	17%	12%
Intra-abdominal	15%	13%	23%
Urinary tract	13%	13%	12%
Otorhinolaryngology	5%	2%	13%
Genital	4%	2%	9%
Cardiovascular	3%	3%	3%
CNS	2%	2%	3%
Eye	0.3%	0.3%	0.5%

All treatments



Infection

Prophylaxis

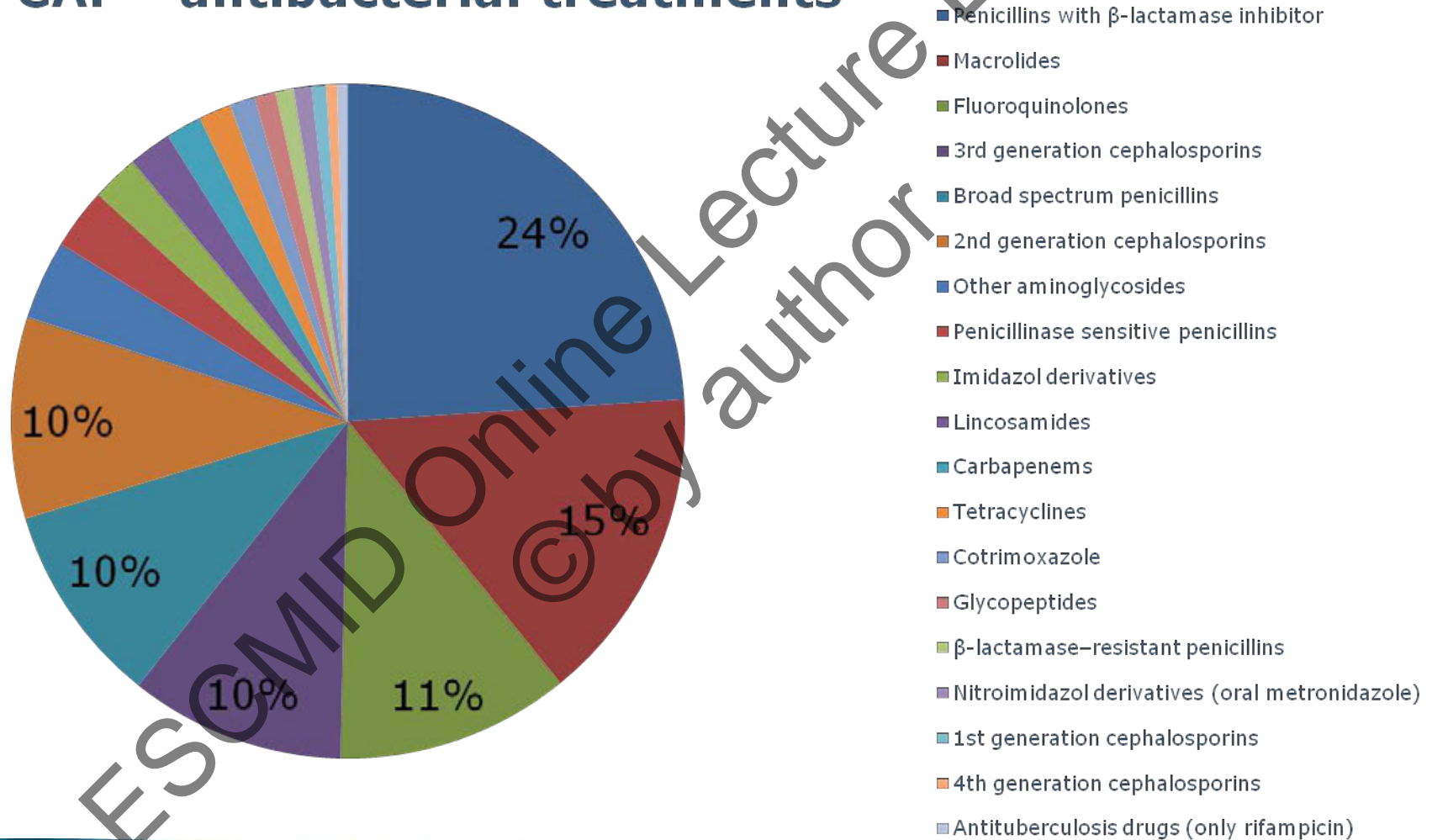




# Antibacterials Used for Treatment of Community-Acquired Pneumonia (CAP)

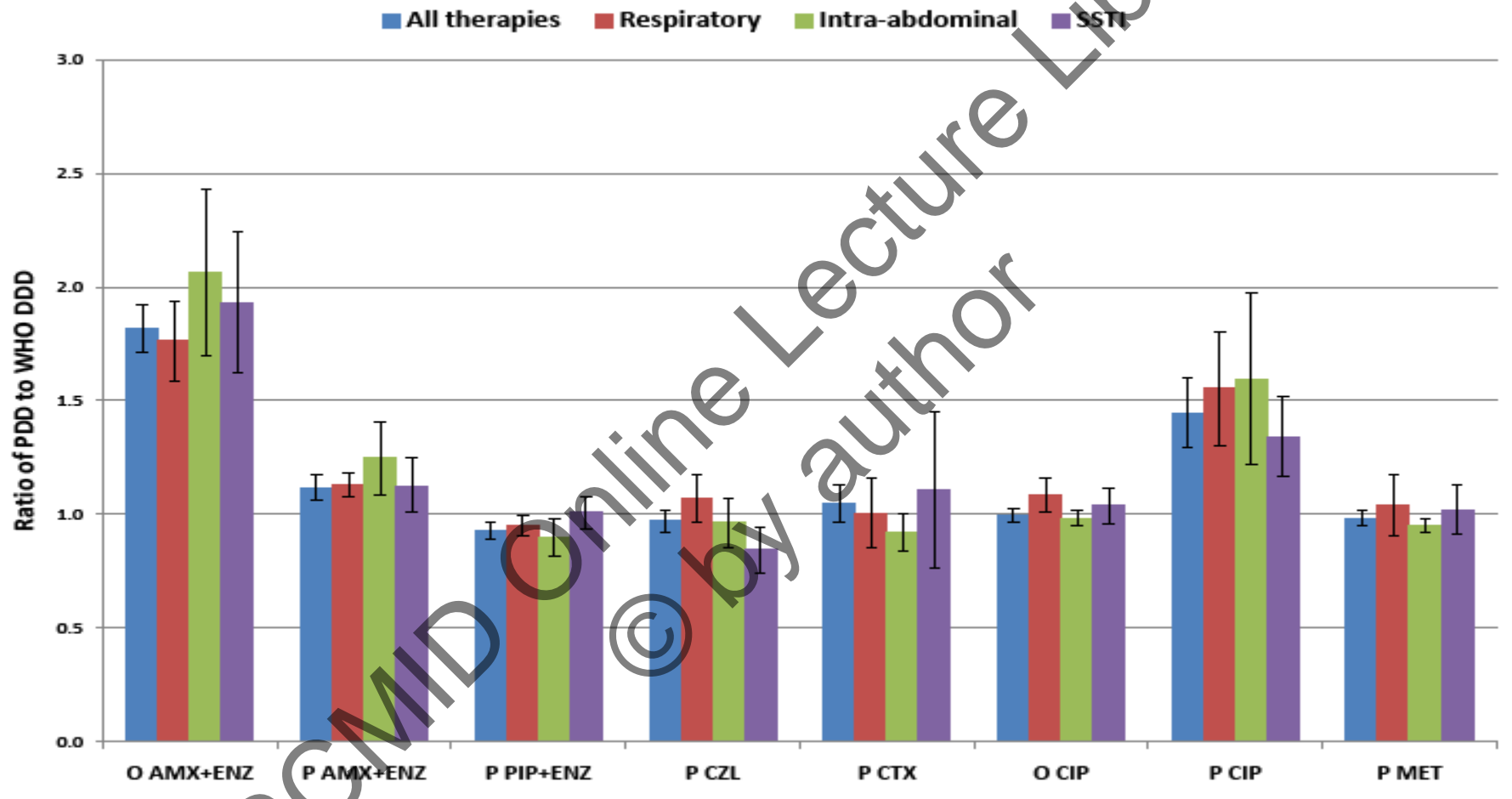


## CAP - antibacterial treatments





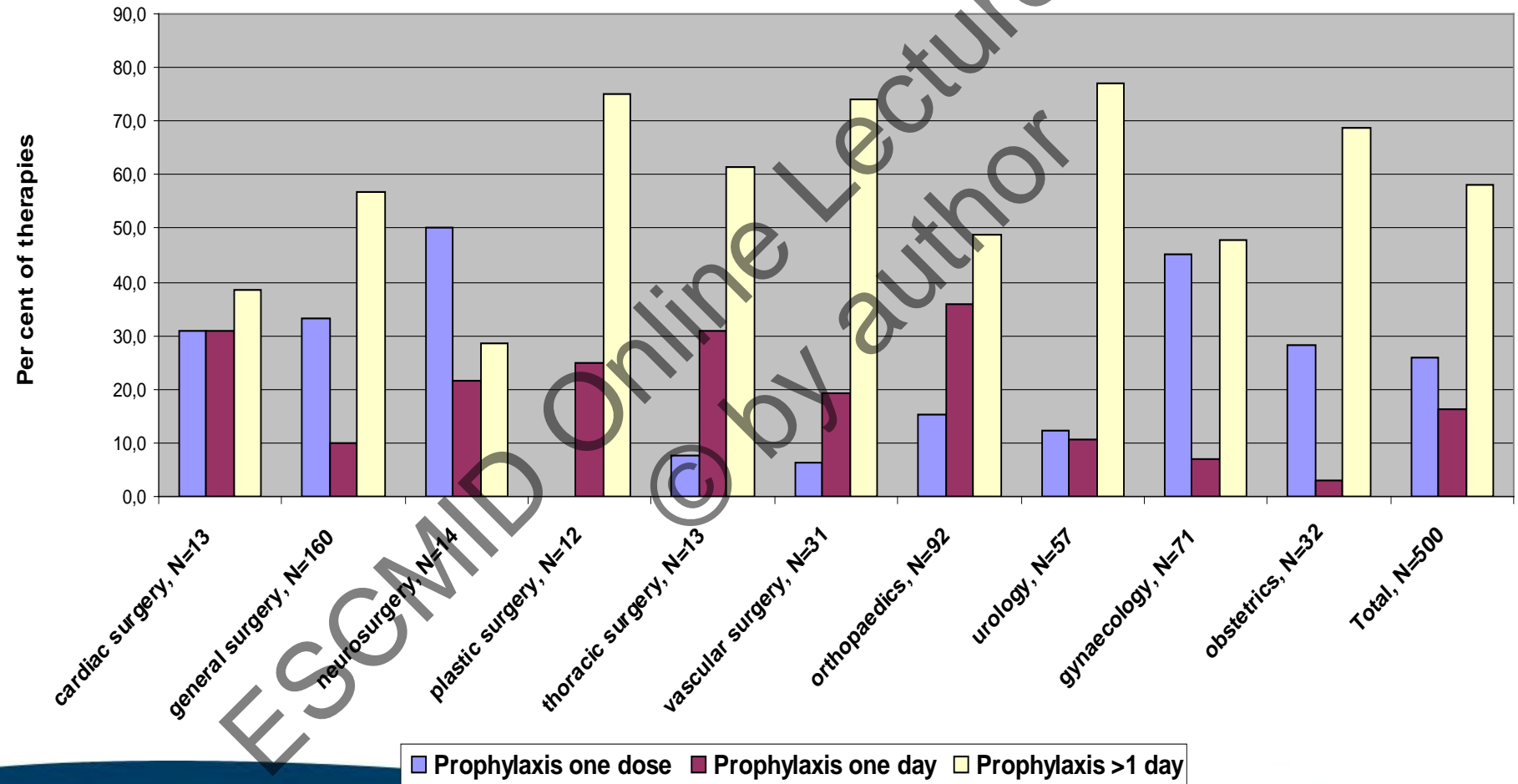
# Ratio of PDD/DDD for Eight Prescribed Formulations for Three Indications (with 95% CI)



**Key:** O=oral, P=parenteral, AMX+ENZ = amoxicillin plus enzyme inhibitor, PIP+ENZ = piperacillin plus enzyme inhibitor, CZL = cefazolin, CTX = ceftriaxone, CIP = ciprofloxacin, MET = metronidazole.



# Length of Pre-operative Prophylaxis in Surgical Specialities



***One colleague:***

“It is very interesting and helpful. I love doing the PPS even though it is a big headache!”

## *Another colleague*

“I really don't remember anymore how much time I spent or if I had any problems/issues about the data entry. It can't have been that bad, otherwise I probably would have remembered... :-)”





# Conclusions



- A web-based standardised PPS method was successfully piloted in 20 hospitals across Europe
- The PPS offers quantifiable outcome measures and can identify targets for quality improvement:
  - Duration of surgical prophylaxis
  - Proportion of oral/parenteral use
  - Therapy for certain diseases (e.g. CAP) not including certain antibiotics (e.g. third generation cephalosporins or quinolones)
  - Reason for prescription in notes
- The PPS method can be used as a tool for assessing interventions to improve antibiotic prescribing in hospitals

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# PPS 2008 and 2009



- Developed in-house custom tool (Web-PPS)
- Personal Digital Assistant (PDA): only used in PPS 2008
- Added hospital classification:
  - 3 categories for non-specialised hospitals (primary, secondary and tertiary)
  - Not based on size of the hospitals
- Deleted information:
  - Relevant culture before therapy
- Additional information:
  - Compliance with hospital guidelines
- Instant web-report per hospital after data validation

MS	PPS2006	PPS2008	PPS2009	MS	PPS2006	PPS2008	PPS2009
AT	1	2	7	SC	1	2	5
BE	1	2	19	SE	1	1	1
CZ	1	3	4	SI	1	1	5
DK	1	1	2	BG	1	1	1
EE	1	2	3	CH	1	1	1
EN	1	3	45	CY	1	2	2
FI	1	1	3	DE	1	1	2
FR	1	1	3	ES	1	1	2
GR	1	1	3	HU	1	1	1
HR	1	2	3	IE	1	2	21
LT	1	2	3	IL	1	1	1
LV	1	2	2	IT	1	3	2
MT	1	1	1	LU	1	1	1
NI	1	1	4	PT	1	2	2
NL	1	2	2	RU	1	2	3
NO	1	2	2	TR	1	1	1
PL	1	2	2	WL	1	2	5



# ESAC Point Prevalence Surveys with Web-Based Data Entry



[home](#) [my institution](#) [select institution](#) [my surveys](#) [PDA](#) [my profile](#) [FAQ](#) [News](#) [Documents](#)

Departments ▾ Patients ▾ Download survey data

department	<input type="text"/>
speciality	<input type="text"/>

survey no	<input type="text"/>
gender	<input type="radio"/> Male <input type="radio"/> Female
age	<input type="text"/> year <input type="text"/> or month

Drug	<input type="text"/>	Route	<input type="text"/>
Unit Dose	<input type="text"/>	Doses /day	<input type="text"/>
Diagnosis	<input type="text"/>	Indication	<input type="text"/>
Guidelines Compliance	<input type="text"/>	<input type="checkbox"/> Reason in notes	

Antibiotic	Dose	No dose/day	Daily dose	Route	Diagnosis	Indication	Compliance	Reason in notes
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## Patients Overview

### Distribution of patients

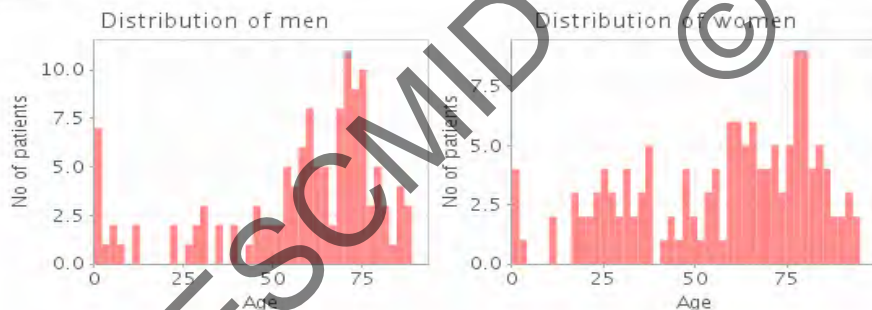
Number of patients:	744	
Number of treated patients:	270	(36 %)

### Distribution of the treated patients by specialities

	Number	Percent in speciality	Percent in institution
Medicine	99	28 %	37 %
Surgery	111	42 %	41 %
Intensive care	23	85 %	9 %
Other	37	36 %	14 %

### Distribution of the age of the treated patients

Median age:	63	[min: 0-max: 95] [IQ25%: 44-IQ75%: 75]
Median men age:	64	[min: 0-max: 89] [IQ25%: 49-IQ75%: 74]
Median women age:	63	[min: 0-max: 95] [IQ25%: 37-IQ75%: 78]
Ratio of men among treated patients:	47	



## All hospitals

### Distribution of patients

	median	distribution
Number of patients:	349	[min: 15-max: 2771] [IQ25%: 190-IQ75%: 564]
Percent of treated patients:	30	[min: 8%-max: 97%] [IQ25%: 25%-IQ75%: 34%]

### Distribution (%) of the treated patients by specialities

Speciality	Median	Distribution
Medicine	27.0	[min: 0%-max: 74%] [IQ25%: 22%-IQ75%: 32%]
Surgery	33.0	[min: 0%-max: 90%] [IQ25%: 26%-IQ75%: 41%]
Intensive care	60.0	[min: 0%-max: 100%] [IQ25%: 46%-IQ75%: 80%]
Other	9.0	[min: 0%-max: 100%] [IQ25%: 3%-IQ75%: 27%]

### Distribution of age of treated patients by gender

Gender	Median	Distribution
Male	66.0	[min: 0-max: 102] [IQ25%: 49-IQ75%: 77]
Female	69.0	[min: 0-max: 105] [IQ25%: 47-IQ75%: 81]
Total	67.0	[min: 0-max: 105] [IQ25%: 48-IQ75%: 79]

### Median ratio of men among treated patients:

	median	distribution
	51.0	[min: 0%-max: 83%] [IQ25%: 46%-IQ75%: 55%]



# PPS 2008 and 2009



- PPS 2008:
  - Hospitals included: 50 institutions from 31 countries
  - Patients included: 25,993
  - Treated patients: 31%
- PPS 2009
  - Hospitals included: 172 institutions from 26 countries
  - Patients included: 59,700
  - Treated patients: 30%

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# PPS Advantages & Disadvantages



## • Advantages

- Simple protocol
- Easy to organize & implement
- Instant web-based report upon data validation
- National/Local baseline information
- Can identify issues which can be converted into quality indicators
- Evaluation of interventions at follow-up PPS
- Fosters collaboration and stimulates local networking

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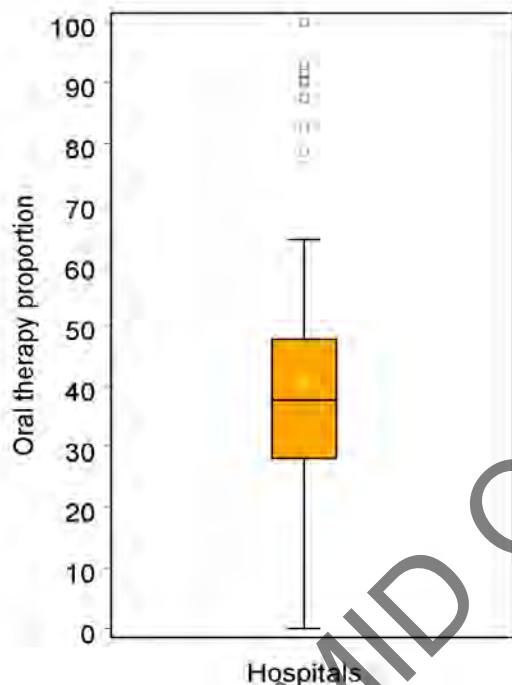


# Oral Therapy Proportion

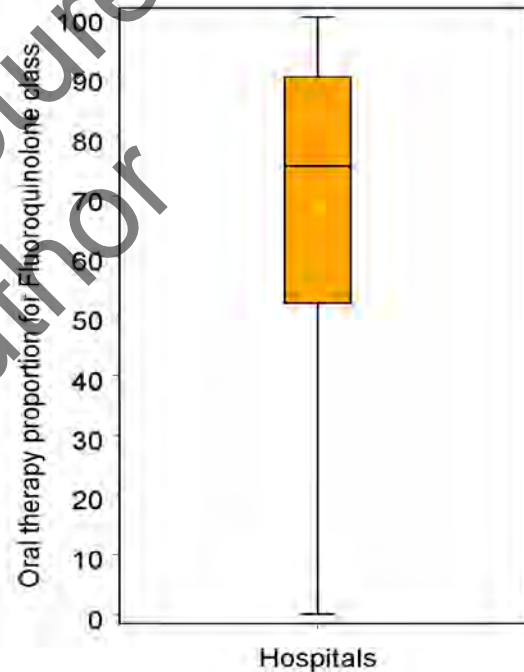


For all systemic antimicrobial use

For fluoroquinolones



Mean	40
Min	0
P25	28
Median	37
P75	47
Max	100



Mean	68
Min	0
P25	52
Median	75
P75	90
Max	100

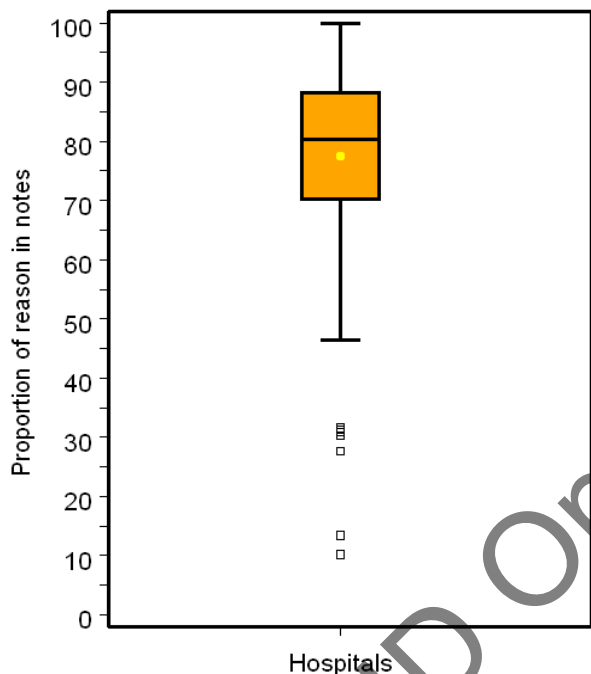




# Indication Documented and Compliance with Guidelines

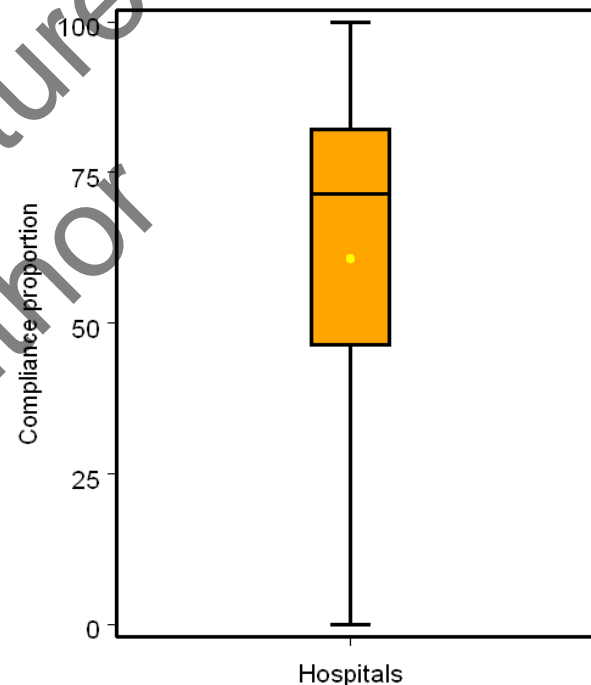


## Indication documented



Mean	78
Min	10
P25	70
Median	80
P75	88
Max	100

## Compliance with guidelines



Mean	61
Min	0
P25	46
Median	71
P75	82
Max	100

# VD Scottish ESAC 2009 PPS

- Hospitals included: 31
- Patients included: 8,732
- Treated patients: 28%
- Areas of good practice:
  - Greater use of narrow spectrum antimicrobials compared to the rest of Europe
- Areas where improvement is required:
  - Indication documented: 76% (target: 95%)
  - Compliance with NHS Board guidelines: 58% (target: 95%)
  - Surgical prophylaxis greater than one day: 30%
  - Treated patients: 28%

Conclusion: better than European data but room for improvement

William Malcolm, Health Protection Scotland, Report March 2010



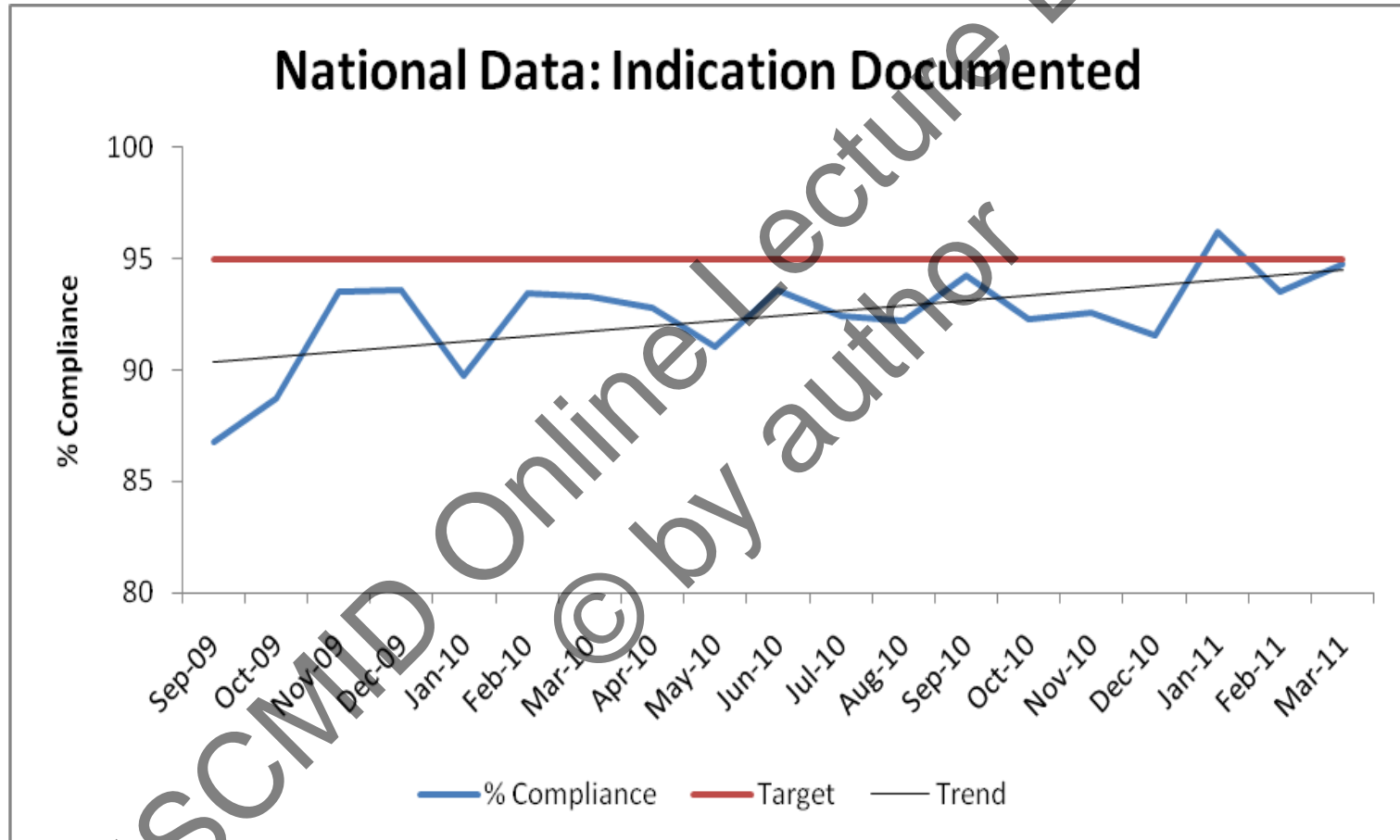
# Implementation of Indicators



- Promotion of local policies through clinical engagement and staff education
- Data collection by Antimicrobial Management Team and/or clinical team – sample 20 patients per month
- Data recording, analysis and reporting using Institute for Healthcare Improvement Extranet
- Local feedback of results monthly and national reporting every 3 months



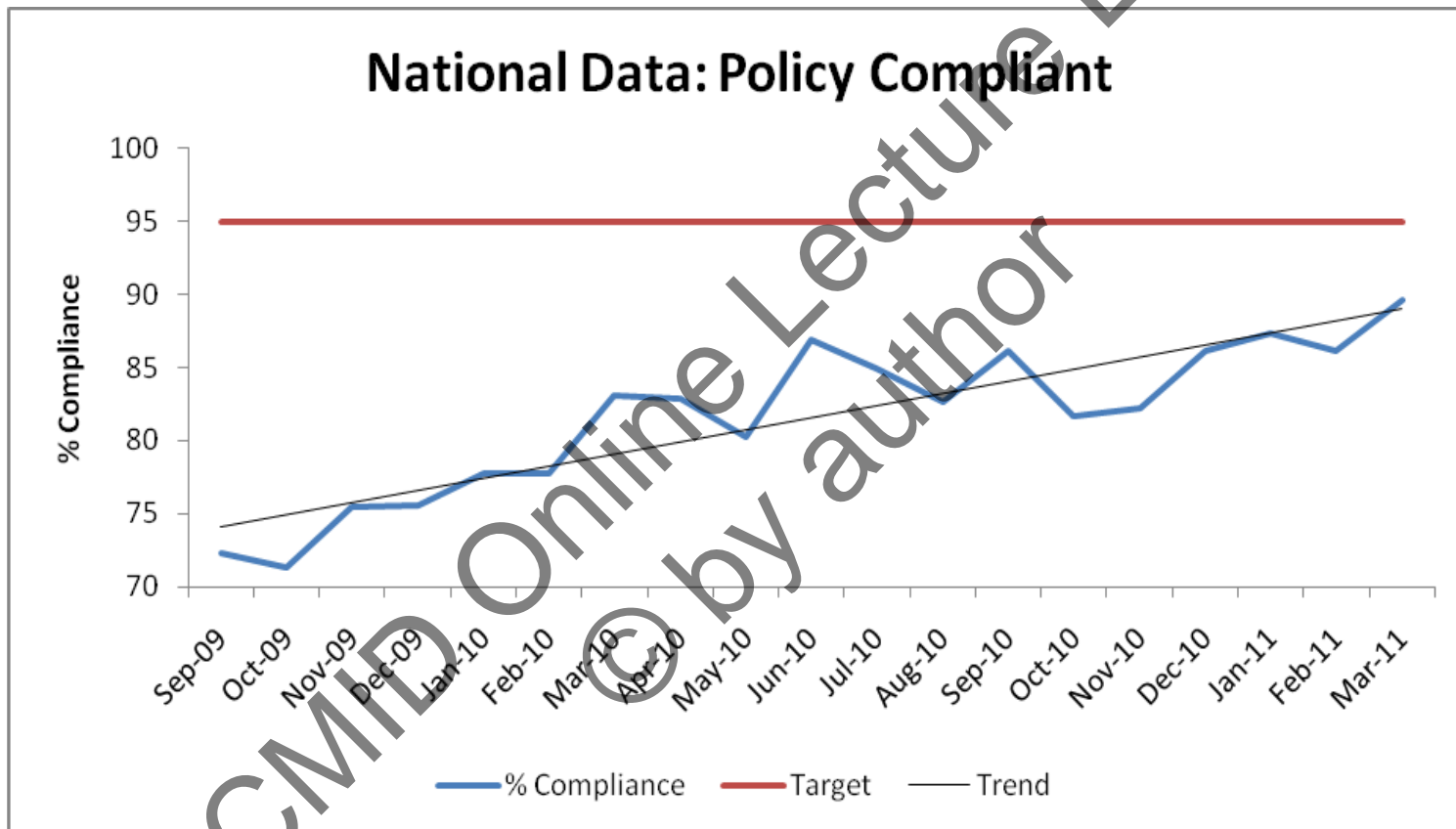
# Results Scotland – Indication Documented



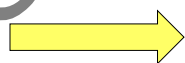
National compliance 93% and 7/14 NHS boards achieved target



# Results Scotland – Policy Compliant



National compliance 83% and 4/14 NHS boards achieved target



2011 - need to focus on improvement



# PPS Advantages & Disadvantages



## • Disadvantages

- Snap shop
- Low numbers
- No risk factors (except age) in denominator data
- Not applicable to paediatric population
- Lack of standardized clinical information
- Interviewer subjectivity
- Cannot assess therapeutic course duration
- Different formularies/dosages

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# Background



- **June 2010 - pilot PPS protocol finalized and launched**
  - Available: <https://extranet.ecdc.europa.eu/hainet>
- **June 2010 until October 2010: pilot PPS**
  - Subcontracted to University of Antwerp, in collaboration with the Institut de Veille Sanitaire, France, and the Scientific Institute of Public Health, Brussels
  - Objectives of the ECDC-pilot-PPS:
    - to test and finalize a protocol to describe and estimate the prevalence of HAI and AU in participating hospitals stratified by patients' characteristics or invasive procedures
    - to provide a standardized tool for hospitals to identify targets for quality improvement
- **November 2011 - Preliminary results presented in Workshop 3 of the Belgian EU presidency. Agreed that all Member States\*:**
  - Perform a first national PPS (3 possible periods): May-June 2011, September-October 2011 and May-June 2012, and
  - Organize at least one repeated national PPS every 5 years after that.



\*Goossens, Lancet Infect Dis 2011, April 7th



# Aims of the ECDC PPS on HAI and ABU



1. To **estimate** the total **burden** (prevalence) of HAI and **antimicrobial use** in acute care hospitals in the EU
2. To describe patients, invasive procedures, infections (sites, micro-organisms incl limited AMR markers) and **antimicrobials** prescribed (compounds, indications)
3. To **disseminate results** to those who need to know at local, regional, national and EU level
4. To provide a standardised tool for hospitals to **identify targets for quality improvement**





# Conclusions



- The **new ECDC protocol** will provide reliable, standardised European, national and local data on HAI and AB use
- First PPS should be **completed by EAAD 2012** in all MS.
- Periodicity to estimate burden at European level **at least** once every 5 years.
- ECDC protocol will **not provide a tool** for antibiotic stewardship



# ARPEC: Antibiotic Resistance and Prescribing in European Children



- Funded by the European Commission (DG SANCO)
- Coordinator: Mike Sharland, St George's University of London, UK
- Was launched in September 2010
- Includes ESAC web-based PPS for children and neonates:
  - Collect name and dose of the drug, clinical indication, weight of the child, and route of administration;
  - Neonatal form will also include gestational age, birth weight and post-natal age;
  - A standardised methodology for measuring pediatric and neonatal bed utilisation will be developed.
- Two pilot PPS conducted in 57 hospitals in 2011
- Global PPS planned for 2012



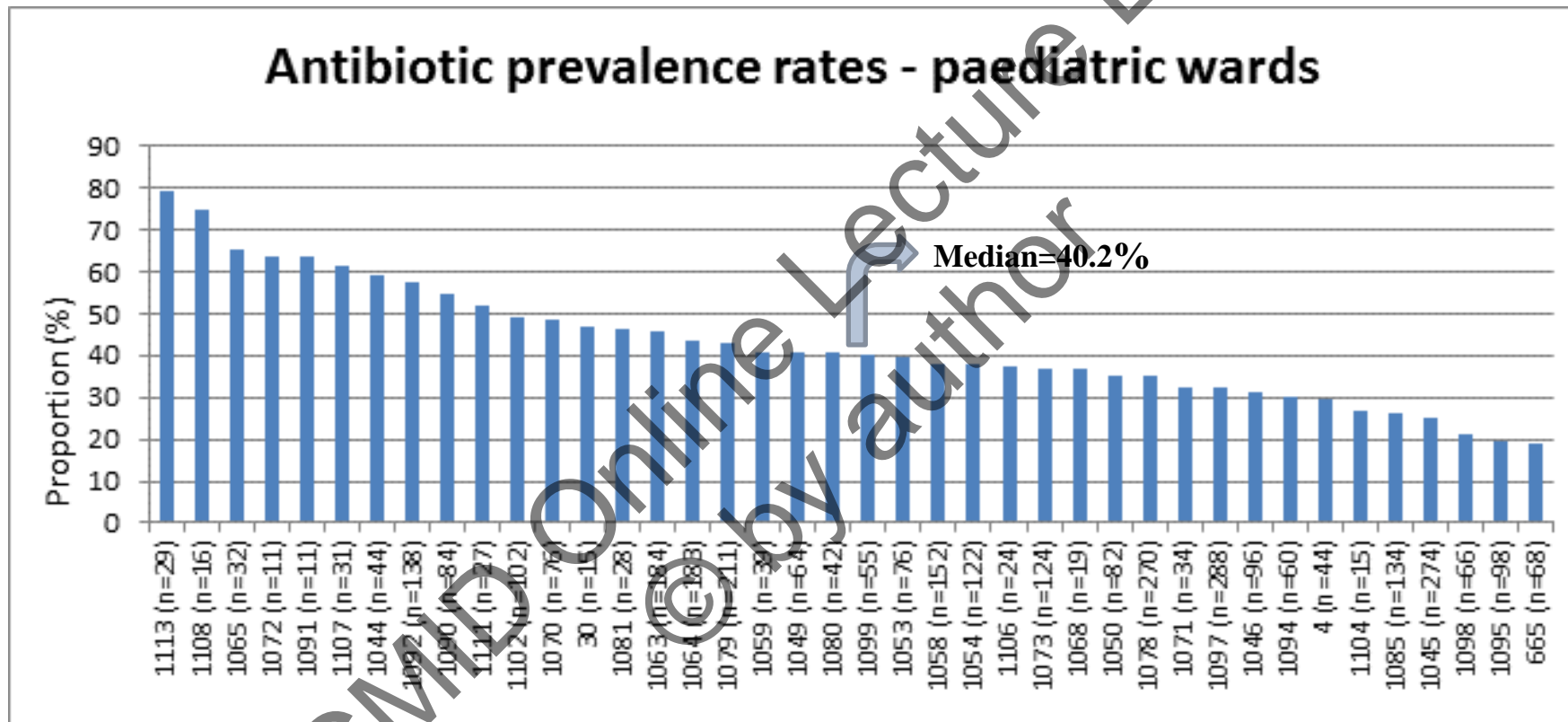


N countries	N HOSPITALS			
	Teaching	Non teaching	Total	
<b>Europe</b>				
BELGIUM	2	2	4	
ESTONIA	1		1	
FRANCE	1	3	4	
GERMANY	1		1	
GREECE		2	2	
ITALY	1	3	4	
LATVIA		2	2	
LITHUANIA		1	1	
LUXEMBOURG	1		1	
PORTUGAL		2	2	
ROMANIA		2	2	
SPAIN	1	4	5	
SWITZERLAND		2	2	
UNITED KINGDOM	2	3	5	
<b>14</b>	<b>Subtotal</b>	<b>10</b>	<b>26</b>	<b>36</b>
<b>Non Europe</b>				
AUSTRALIA		2	2	
GAMBIA		2	2	
GEORGIA		11	11	
GHANA		1	1	
ISLAMIC REPUBLIC OF IRAN	2		2	
KINGDOM OF SAUDI ARABIA		1	1	
MALAWI		1	1	
UNITED STATES		1	1	
<b>8</b>	<b>Subtotal</b>	<b>2</b>	<b>19</b>	<b>21</b>
<b>22</b>	<b>Grand Total</b>	<b>12</b>	<b>45</b>	<b>57</b>





# Proportion of Children on Antibiotics Admitted on Paediatric Wards



Omitted are hospitals  $\leq 10$  patients admitted, and 2 hospitals with prevalence of 100%

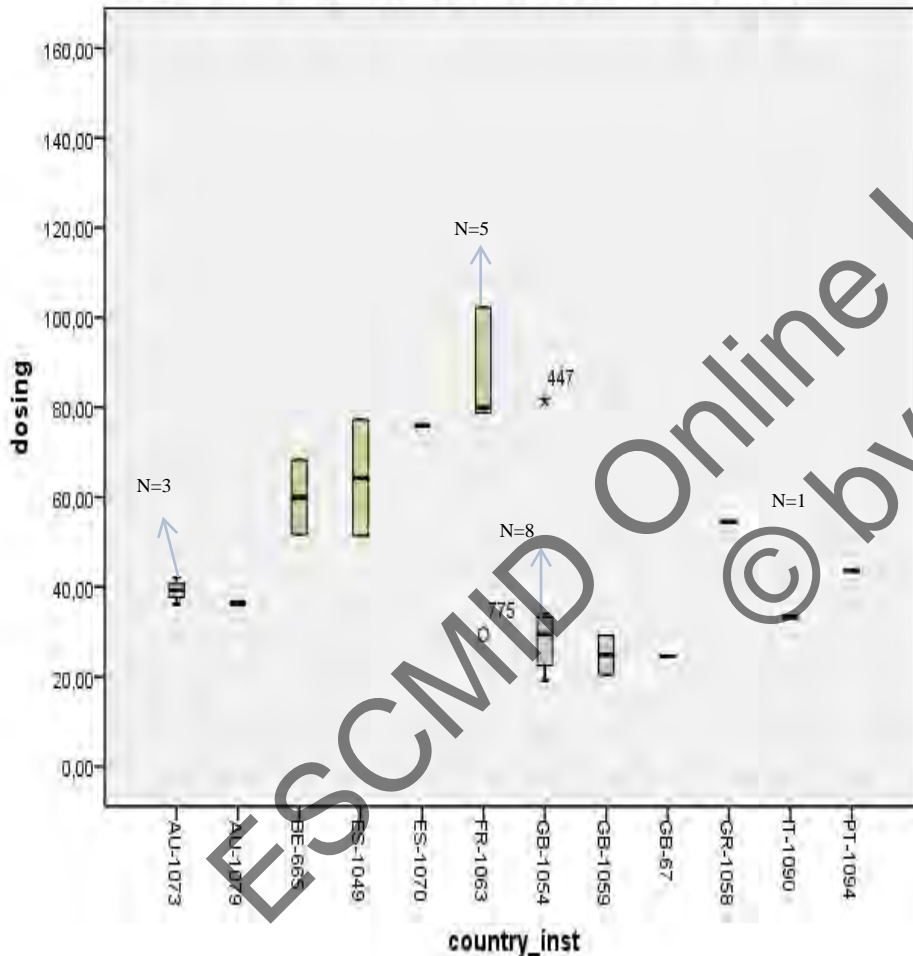




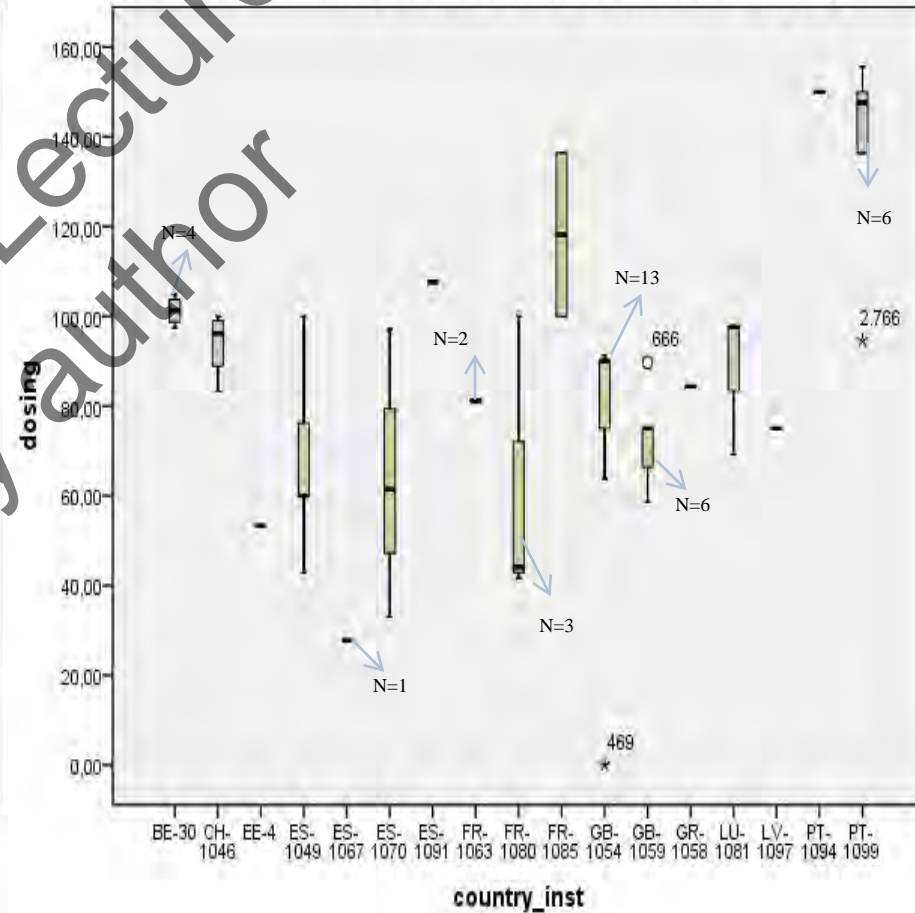
# Differences Observed in Prescribed Doses of Co-amoxiclav (J01CR02) in mg/kg/day, Paediatric Wards.



Oral co-amoxiclav (J01CR02) prescribed doses in mg/kg/day



Parenteral co-amoxiclav (J01CR02) prescribed doses in mg/kg/day





# Conclusion



- A web-based standardised PPS method was successfully developed
- Tested in several hundreds of hospitals and results published in many peer-reviewed journals
- Instant web-report per hospital
- Quantifiable outcome measures and targets for quality improvement
- Tool for assessing interventions to improve antibiotic prescribing in hospitals
- Could/Should be globally expanded

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