Rationale

- Survey of antibiotic consumption is the first step towards optimising its use
- Benchmarking is an important initial step to identify needs of improvement

ESAC-2 Hospital Care Subproject: 2005-2007

Ansari F, Johnston A, Molana H, Davey P, Dundee, UK
Erntell M, Sweden
Neotide, Finland
Ferech M, Goossens H, Antwerp, Belgium
The ESAC II hospital care study group

ESAC-2 Hospital Care Subproject

- ***Objectives:***

1. Standardise a measure for longitudinal analysis of antibiotic use by hospitals
   - Numerator: Defined Daily Doses
   - Denominator: comparison of bed days *versus* admissions
2. Standardise a method for point prevalence survey (cross sectional analysis) of antibiotic use
3. To develop methods that can be applied in all participating countries in ESAC-3.

- ***Project components***

1. Questionnaire (hospital characteristics)
2. Longitudinal Survey (pharmacy stock data, monthly, 6 yrs, J01plus, bed days and admissions)
3. Point Prevalence Survey (STRAMA tool adopted for ESAC-2 HC)

What We Wanted to Achieve

- Standardised data from one hospital in each participating country
- A practical method that can be rolled out
  - To other hospitals in each participating country
  - To other countries in ESAC-3
- A platform for statistical analysis:
  - Trends within hospitals
  - Comparison between hospitals or countries

Composition Hospital Subproject

- **Members: 23 countries (including England, Northern Ireland, Scotland, Wales)**

  Austria (Sigrid Metz), Belgium (Hilde Jansens), Czech Republic (Jiri Vlcek) Croatia (Arjana Tambić Andrašević), Denmark (Birgit Molstad), England (Conor Jamieson), Estonia (Piret Mitt), Finland (Outi Lyytikainen), France (Isabelle Patry, Xavier Bertrand), Germany (Michaela Steib-Bauert), Greece (Anastasia Antoniadou), Latvia (Elina Pujate), Lithuania (Ilma Bertulyte), Malta (Peter Zarb), Netherlands (Margreet Filius, Claire van Nispen tot Pennerden), Northern Ireland (Sheila Maltby), Norway (Cecile Syrrist), Poland (Pawel Grzesiowski), Slovenia (Milan Cizman), Sweden (Mats Erntell), Scotland (Faranak Ansari), Turkey (Denis Gür) and Wales (Maggie Heginbotham)

ESAC-2 Longitudinal Study 2005-7

Methods

- Assignments of ATC/DDD and calculations of DBD (DDD/100 bed days) & DAD (DDD/100 Admissions) centrally in Dundee
- Estimation of discharge (DIS) and LOS (Length of stay) from Occupied Bed Days (OBD) and Admissions (AD)
- Time series analysis for DDD, DBD, DAD, LOS, DIS and effect of clinical activity variables on DDD
- Percentage of annual change for each variable.

Calculation of Clinical Activity

Bed days

- **Occupied bed days (OBD)** calculated from daily census of the number of occupied beds at a specified time (e.g. midnight).
- **Hospital care days** calculated from daily census of the number of patients that have occupied each bed in a 24 hour period (can be >1 patient per day).
- **Patient days** calculated based on length of stay, e.g. date of discharge-date of admission -1.

Admissions

- Does the number of admissions include day cases? If so can day cases be excluded? If not, does the hospital have data about % day cases by year?
- How are birth admissions included? Do they count as one admission or two? Has a consistent method been used throughout the study period?

Time Series Analysis

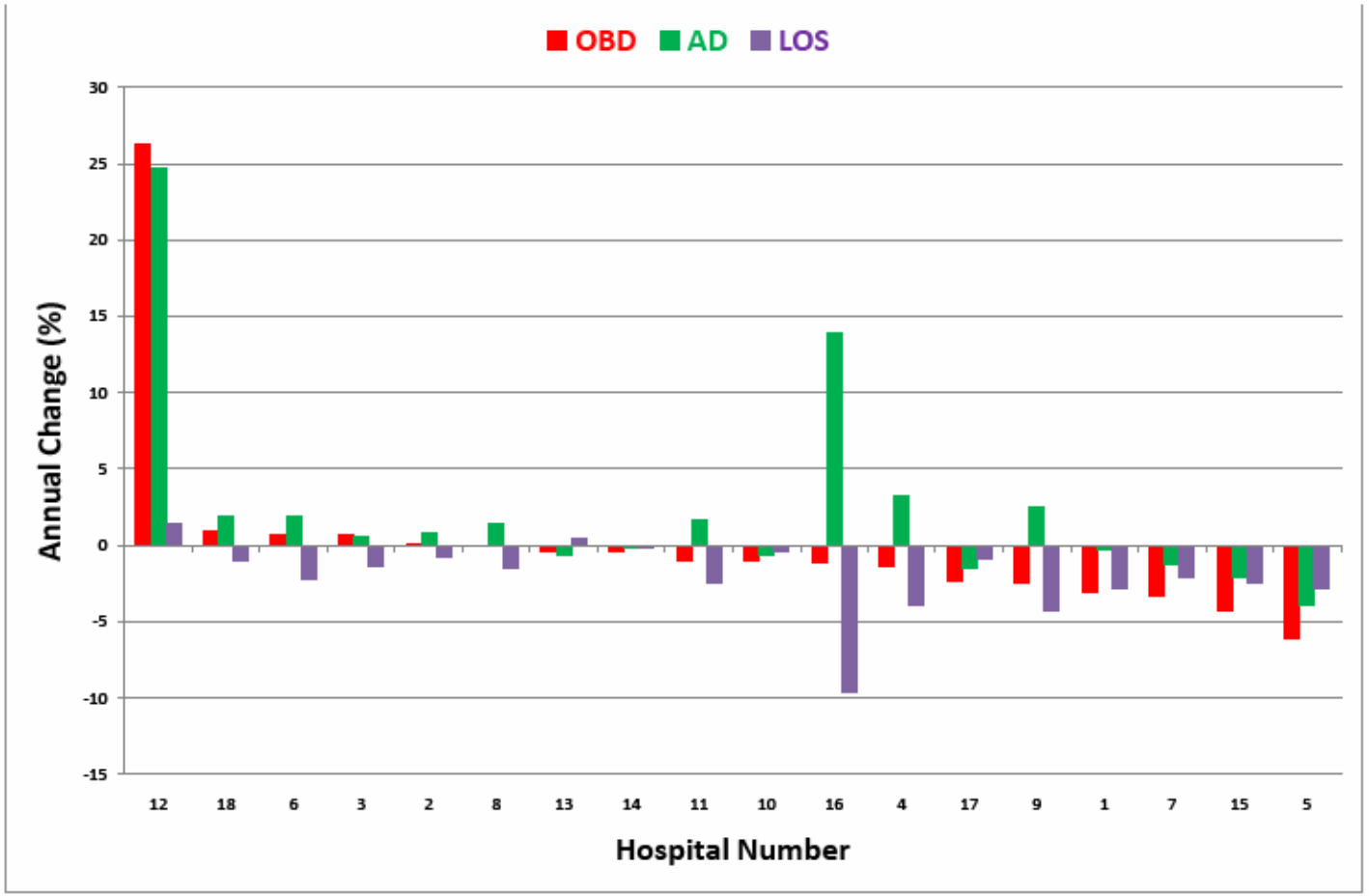
- For time series analysis we built the following dynamic regression model:

$$Y_t = \sum_{s=0}^{S}\left(a_s Y_{t-1-s} + \beta_s A_{t-s} + \gamma_s B_{t-s} + \delta_s R_{t-s} + \phi_s L_{t-s}\right) + \sum_{j=0}^{J}\mu_j t^j + \sum_{i=2}^{12}\theta_i DM_{i,t} + \sum_{k=1}^{K}\lambda_k DI_{k,t} + \varepsilon_t$$

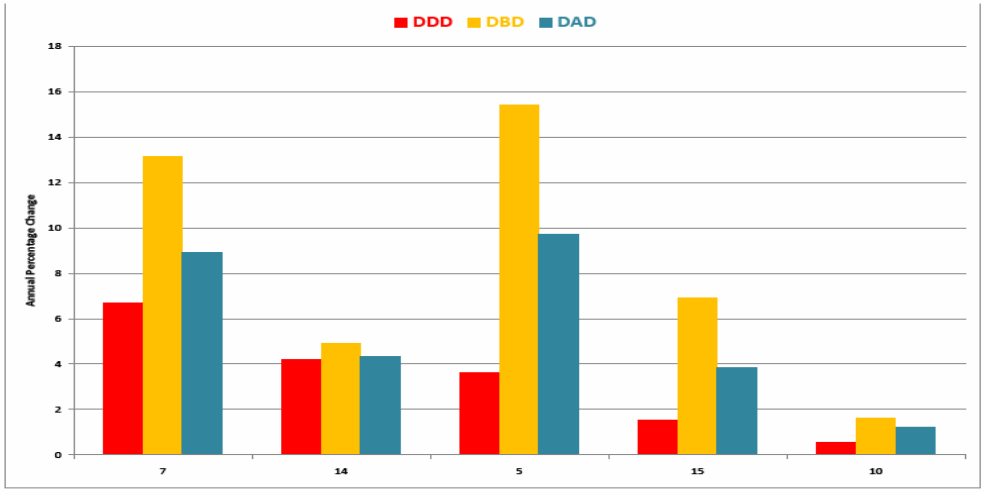
- In order to scale the changes and find a way to compare the trends between hospitals we calculated the percentage of change/ year according the following formula:

% Δ Variable = [(Slope * 12)/ Intercept] * 100

Annual Changes (%) in OBD, AD and LOS; ranked by change in AD



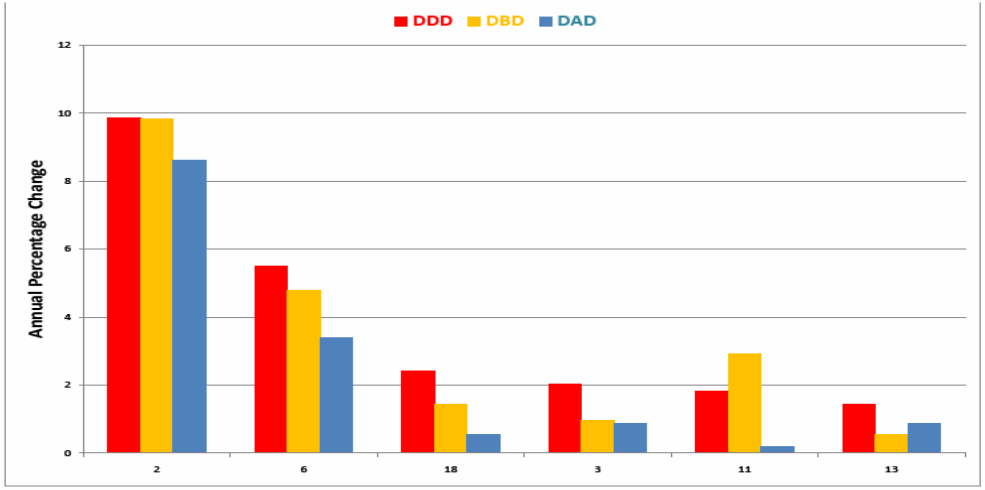
Annual Changes (%) in Antibiotic Use Measured as DDD, DBD, DAD; ranked by change in DDD



DDD increasing

DESPITE

Clinical activity decreasing

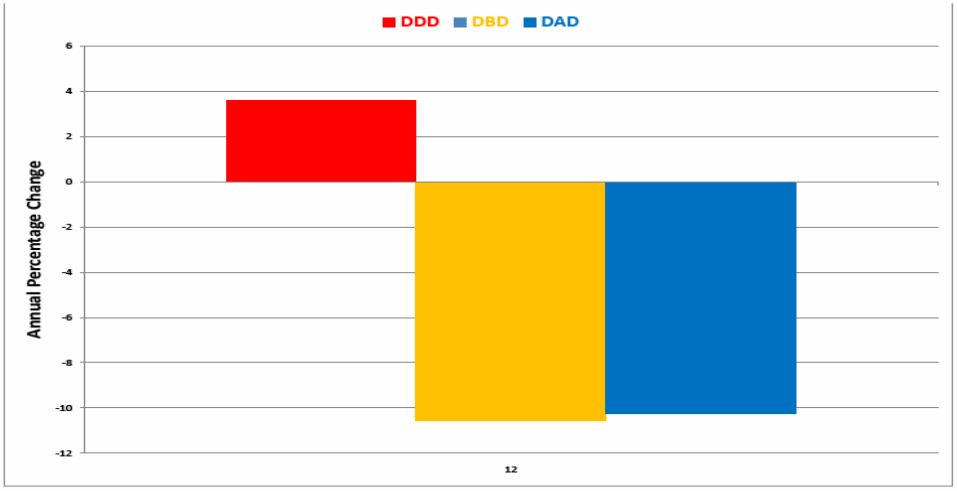


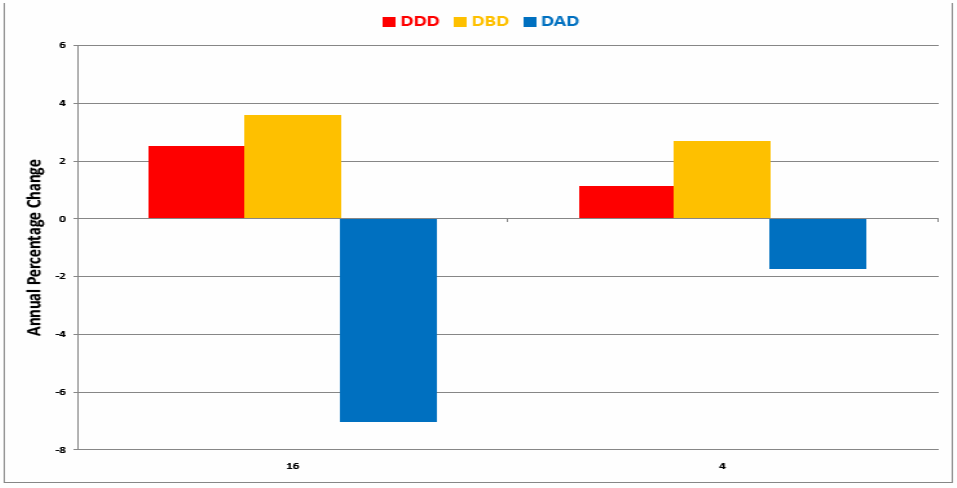
DDD increasing

PARTIALLY EXPLAINED BY

Clinical activity increasing

Annual Changes (%) in Antibiotic Use Measured as DDD, DBD, DAD; ranked by change in DDD





DDD increasing

ENTIRELY EXPLAINED BY

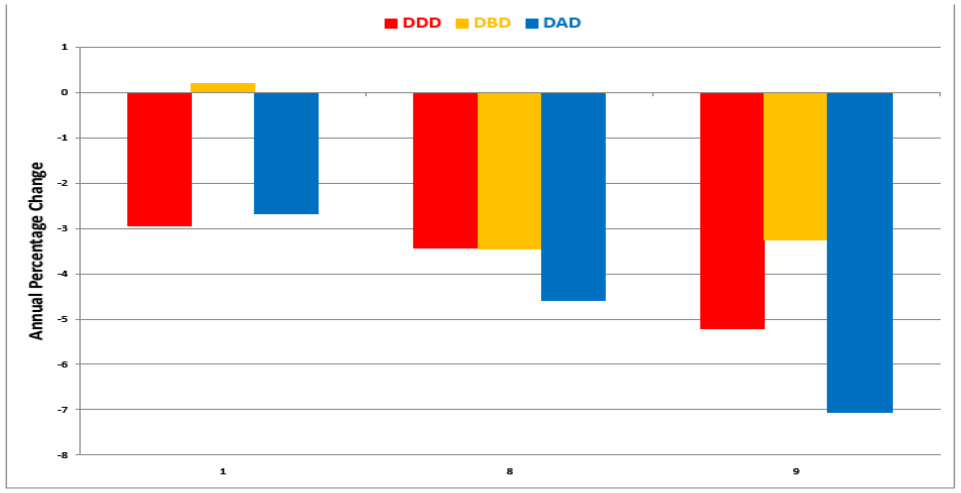
Clinical activity increasing

DDD (& DBD) increasing

ENTIRELY EXPLAINED BY

Admissions increasing & LOS decreasing

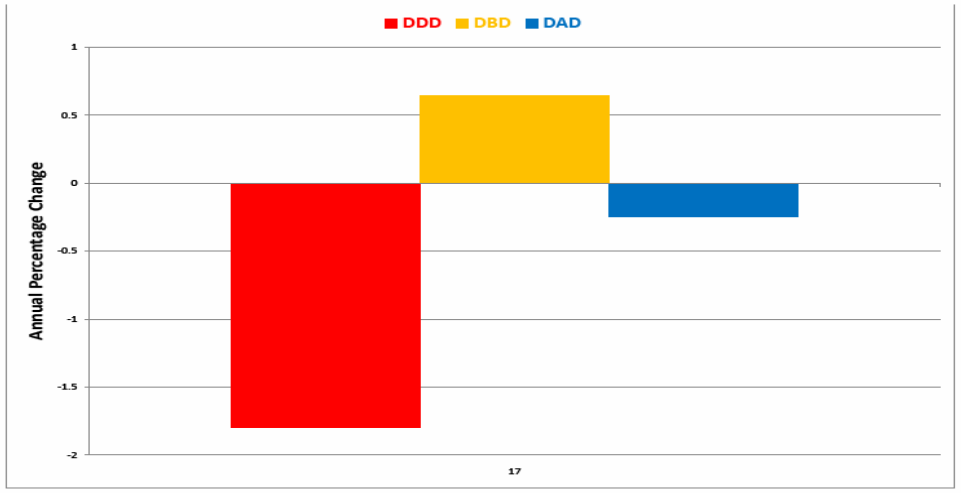
Annual Changes (%) in Antibiotic Use Measured as DDD, DBD, DAD; ranked by change in DDD



DDD decreasing

ONLY PARTIALLY EXPLAINED BY

Clinical activity decreasing



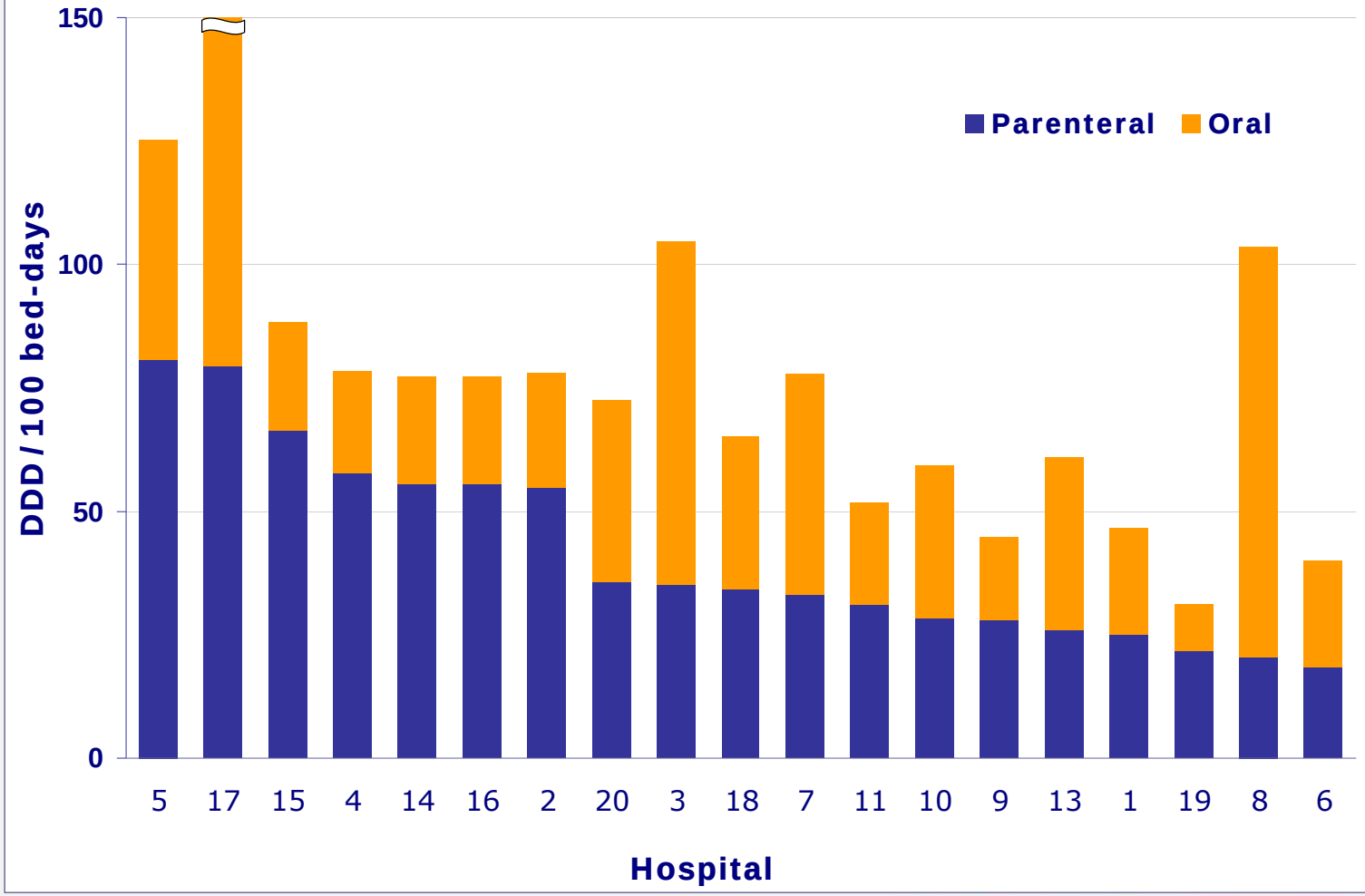
DDD decreasing

ENTIRELY EXPLAINED BY

Clinical activity decreasing

ESAC-2, HC LS-Results

Total Use of Antibacterials, 2005



Conclusions, Longitudinal Survey

- While patient specific data are not available at international level, DDD, despite limitations, is still the cornerstone in DUR studies.
- Present DDD with adjustment for clinical activity:
  - LOS decreased over time in 16 of 18 hospitals
  - Antibiotic use can be influenced by the number of admissions and by the patients' length of stay
  - Adjustment for clinical activity should be done with both admissions and occupied bed days
  - These results have relevance to microbiological surveillance as well as to prescribing surveillance
- Big variation in IV antibiotic use

ESAC-2, Point Prevalence Study

Pattern of antibacterial use in relation to diagnosis in 20 European hospitals in 2006

- Swedish STRAMA protocol and web-based soft-ware (Skoog, ECCMID 2004)
- Demographic data, dosing and indications
- 19 pre-defined diagnosis groups
- Therapy reasons: community or hospital acquired infection or prophylaxis

ESAC-2, HC PPS- Methods

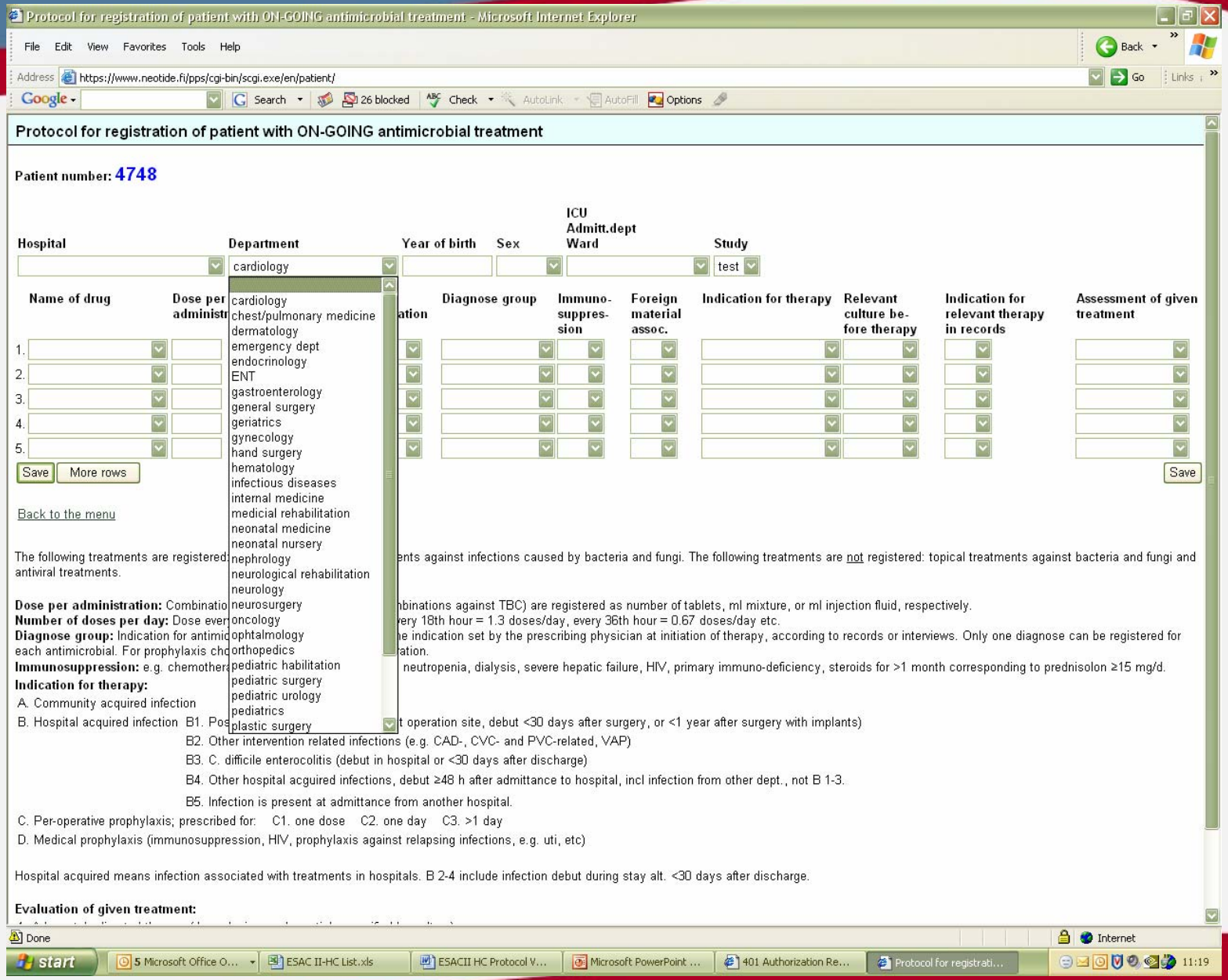
Hospital	Department	Patient (10 fig no)	Sex	ICU Admitt.dept Ward
			F / M	□ □ □

Name of the drug	Dose per administration* gram	No of doses per day**	Route of administration Oral/ Parent /Rectal	Diagnose-group Code	Immuno-suppression *** Yes / No	Foreign material-assoc Yes / No	Indication for therapy**** A B 1 – 5 C 1 – 3 D	Relevant culture before therapy Yes / No / Unknown	Indication for given therapy in records Yes / No	Assessment of given treatment 1-5*****
1										
2										
3										
4										
5										

* Combinations (Bactrim, Eusaprim and combinations against TBC) are registrated in numbers of tablets or ml mixture, or ml injection fluid, respectively.
** Dose every 16th h = 1,5 dose/day, every 18th h = 1,3 dose/day, each 36th h = 0,67 dose/day, each 48th h = 0,5 dose/day etc
***Immunsuppression, e.i. chemotherapy, hematological malignancy, neutropenia, dialysis, severe hepatic failure, HIV, primary immuno-deficiency, steroids for >1 month corresponding to prednisolon ≥15 mg/d.
**** **Indication for therapy:**
A. Community acquired infection
B. Hospital acquired infection: B1. Post-operative infection (infection at operation site, debut <30 days after surgery, or <1 year after surgery with implants)
B2. Other intervention related infections (e.i. CAD-, CVC- and PVC-related, VAP)
B3. C. difficile enterocolitis (debut in hospital or <30 days after discharge)
B4. Other hospital acquired infections, debut ≥48 h after admittance to hospital, ind infection from other dept., not B 1-3.
B5. Infection is present at admittance from another hospital
C. Per-operative prophylaxis, prescribed for: C1. one dose C2. one day C3. >1 day
D. Medical prophylaxis (immunosuppression, HIV, prophylaxis against relapsing infections, e.i. uti, etc)
Hospital acquired means infection associated with treatments in hospitals. B 2-4 includes infection debut during stay alt. <30 days after discharge.
***** **Evaluation of given treatment:**
1. Adequately directed therapy (drug, dosing, and an etiology verified by culture)
2. Adequate empirical therapy / prophylaxis (drug and dosing)
3. Obviously incorrect dosing, e.i. un-reduced dose in relation to age and renal function (creatinin clearance <50 ml/min and given full dose of drug)
4. Obviously incorrect choice of drug = ineffective therapy / prophylaxis
5. Other faults

Protocol signed by:		Registrated date/sign		Patient nr:	

ESAC-2, HC PPS- Methods

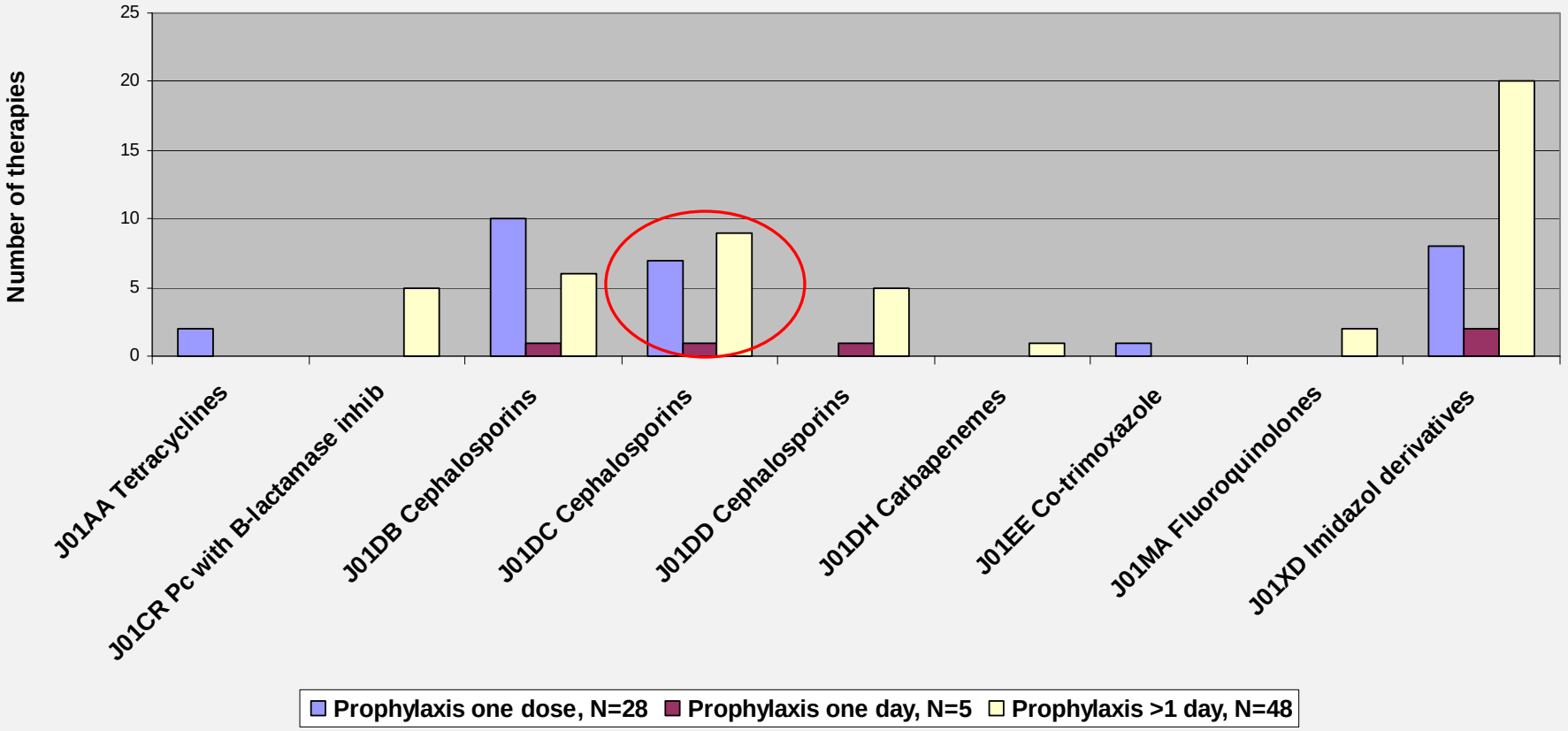


ESAC-2, HC PPS-Results

- 20 hospitals –
- 11,571 patients
- 3,496 patients treated with antibiotics
  - 30.2% (19.0 – 41.4) of all admitted
  - 47.5% women
  - 371 children - 10.6%

ESAC-2, HC PPS-Results

Drugs used in peri-operative prophylaxis therapies for the lower GI-tract



Conclusions, Point Prevalence Survey

- Three fold differences in antibiotic use
- Pneumonia is the commonest indication for treatment
- Peri-operative prophylaxis is too long
- The web-based PPS provides a tool for comparison of antibiotic prescribing in European hospitals

Key findings

A set of unique measures

- Reveal the differences between hospitals and countries and time trends
- Provide a basement for quality indicators

Different denominators of clinical activity

- Provide meaningful time trends
- Avoid comparing hospitals with differences!

LS plus PPS

- More precise view

>>>Still to go for quality indicators....

ESAC-3 Hospital Care Subproject: 2007-2010

Ansari F, Davey P, Dundee, UK
Tom Bajek, Ljubliana, Slovenia
Drapier N, Muller A, Goossens H, Antwerp, Belgium
The ESAC III hospital care study group

ESAC-3 Hospital Care Subproject 2007-2010

- To establish a European network for surveillance of antibiotic use.
- To organise a European wide longitudinal (together with EARSS) and point prevalence survey.
- To develop quality indicators of antimicrobial consumption in the hospital care sector (together with ABS).
- To improve antibiotic prescribing in Europe in specific patient groups (e.g. surgical prophylaxis, together with ESGAP)
- To use a set of clinical activity denominators for longitudinal studies to validate time trends in hospital antibiotic use.

ESAC-3 Hospital Care Subproject 2007-2010

Components PPS

- Develop webPPS Q1-2008, University of Antwerp
- PPS-1 (at least 2 hospitals/country) Q2-2008
- Roll out PPS methodology Q4-2008
- European wide PPS Q2-2009
- Release of PPS-2 results released at Annual AMR Day (November 18, 2009)

Invitation to AS MANY Belgian hospitals as possible to participate in PPS Q2-2009

Target date: November 18, 2009 (Annual European AMR Day)