

Antimicrobial usage vs. resistance in hospital

Antibiotic resistance in hospitals

- high consumption 25-30% in vain
- 50-60% inappropriately prescribed

Antibiotic resistance in hospitals

- ACTION:

- 1) restricted usage of antimicrobials
- 2) rotation of aminoglycosides (other antimicrobials)
 - a) netilmycin for gentamycin (whole hospital)
 - b) amikacin for gentamycin (only in ICU)
- 3) limited dispensing of parenteral antibiotics from hospital pharmacy
- 4) perioperative prophylaxis according to the guidelines

Antibiotic resistance a major public health problem

- Infections caused by multi-drug resistant bacteria are associated with:
 - higher mortality
 - higher morbidity
 - longer hospital stay

Possible solutions:

- new antimicrobial drugs
- better use of currently available antibiotics
- avoiding needless use of antibiotics
- strategies to reverse the trend

Possible solutions:

- new antimicrobials :
 - scarce
 - linezolid, telithromycin
- better use of currently available agents
 - plenty of room for improvements
 - 50% of usage in hospitals inappropriate
 - prophylactic use in proven indications only

Possible solutions:

- Avoiding needless use of antimicrobials (24% of patients hospitalized in the CHC Zagreb)
 - viral infections
 - febrile episodes
 - colonization
- ultimate goal to decrease the selective pressure of antibiotic usage

The classification for interventions to change antibiotic prescribing:

- **educational** - educational meetings; reminders; voluntary order forms; patient mediated intervention
- **organizational** – multi-disciplinary antimicrobial management teams
- **structural** - introduction of new computer systems
- **restrictive** - antibiotic policy or formulary restriction; prior authorization; compulsory order forms

Antibiotic resistance- Zagreb Clinical Hospital Center (GNB- gentamycin)

YEAR	ICU	SURGERY	INTERNAL MEDICINE
1994	-	72.9%	44.7%
1995	58.8%	54%	28%
1996	66.9%	65%	24%

Antibiotic resistance- Zagreb Clinical Hospital Centre (GNB- netilmycin)

YEAR	ICU	SURGERY	INTERNAL MEDICINE
1994	—	43.6%	29%
1995	27.1%	32.8%	20.1%
1996	33.7%	37.1%	11.2%

Amikacin (A) substituted for gentamycin (G)
 % resistant GNB in ICU in CHC (2003; 2004)

PATHOGEN	2003	2004
K. pneumoniae	G 30,7 A 21,5	G 20,3 A 10,1
Acinetobacter	G 72,7 A 17,0	G 57,69 A 10,1
P. aeruginosa	G 48,3 A 36,5	G 36,56 A 18,6
E. coli	G 29,7 A 25,8	G 13,44 A 7,4
Enterobacter	G 42,4 A 19,3	G 20,7 A 13,16

Pediatric ICU- Zagreb Clinical Hospital Centre

- E. coli ESBL (1997)
- 4 children with BSI (sepsis) + 1 child from cerebrospinal fluid (meningitis)

INTERVENTION (Hospital Drug Committee):

imipenem instead of 3rd generation cephalosporins
as a first line treatment for 2 months

RESULT

No E. coli (ESBL) isolated for two years

Pediatric ICU- Zagreb Clinical Hospital Centre

- E. coli ESBL (1999)
- 2 children with BSI+ 7 with UTI+ 30 from tracheal aspirate

INTERVENTION

- the same antibiotic regimen as in previous case was instituted

RESULT

- so far No E. coli ESBL

What did we do?

Introduction of the monitoring of antimicrobial therapy:

- a) educational rounds and discussions between clinical pharmacologists and other clinicians practicing in the Zagreb Clinical Hospital Centre
- b) the concept of restricted antibiotics (forms, monitoring, procedures)
- c) concept of 48h parenteral application of antibiotics (forms, procedures, monitoring)
- d) rotation of antibiotics (at our institution rotation of aminoglycosides)

Concept of restricted antibiotics - rationale

- need for monitoring antimicrobial therapy and prevention of resistance to antibiotics
- prevention of improper use of restricted antibiotics

Concept of restricted antibiotics- operationalization

- at Zagreb Clinical Hospital Centre we have introduced special forms that have to be filled in by physicians who want to use restricted antibiotics with following data:
 - previous targeted antimicrobial therapy
 - previous empirical use of antibiotics
 - type of infection that need to be treated
 - pathogen and antibiogram

Concept of restricted antibiotics - audit

- forms have to be signed and approved either by clinical pharmacologists or by authorized physician

Dispensing parenteral antibiotics for 48 hours - rationale

- prevention of unnecessary antimicrobial therapy without definite signs of infection (leukocytosis, fever)
- promotion of the switch from parenteral to oral application of antimicrobial therapy as soon as possible
- allowing time (48h) for revision of the diagnosis of bacterial infection

Dispensing parenteral antibiotics for 48 hours - operationalization

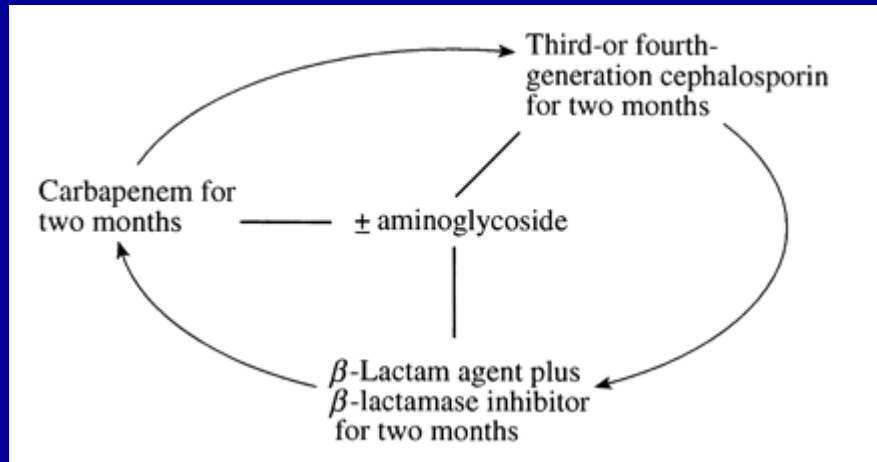
- forms for parenteral use of antibiotics asking for the following data:
 - leukocyte count and the percentage of non-segmented leukocytes in the count
 - CRP, body temperature
 - were the cultures for detections of microorganisms taken (blood, swab, urine etc.)

Rotation of antibiotics

- Rotation of antibiotics in hospitals is regarded as one of the possible ways of postponing the development of resistance of nosocomial pathogens or reversing resistance
- rotation of antibiotics could help to avoid ventilator-associated pneumonia. It could greatly improve the susceptibilities of the potentially antibiotic-resistant Gram-negative bacilli responsible for late-onset ventilator-associated pneumonia.
- in our institution we practice rotation of aminoglycosides

Antibiotic rotation

Suggested scheme for cycling of empirical treatment of serious sepsis in units where there are no major, established resistance problems that would prevent the first-line use of one of the three main categories of β -lactams. Aminoglycosides should be used in combination where there is clinical severity or a particular need to prevent emergence of resistant mutants.



(I. M. Gould A review of the role of antibiotic policies in the control of antibiotic resistance *Journal of Antimicrobial Chemotherapy* (1999) 43, 459-465)

Optimal solution

- combination of educational, organizational, structural and restrictive measures
- everybody has a role and should be aware of it
- we have lost many fights but the war is still going on