Antimicrobial resistance in Vietnam

Patrick De Mol

Medical Microbiology

p.demol@ulg.ac.be

with the support of Wallonie-Bruxelles International

Antibiotic Resistance A Catastrophic Threat

Consequences of antimicrobial resistance

- **Mortality**: ↑ if resistant infections
- **Morbidity**: ↑duration of infections
  - ↑ length of suffering
  - ↑ risk of R-bacteria diffusion
- **Costs**: ↑ due to use of
  - More antibiotics,
  - Antibiotics associations
  - new expansive AB
- **Few solutions**: few new drugs

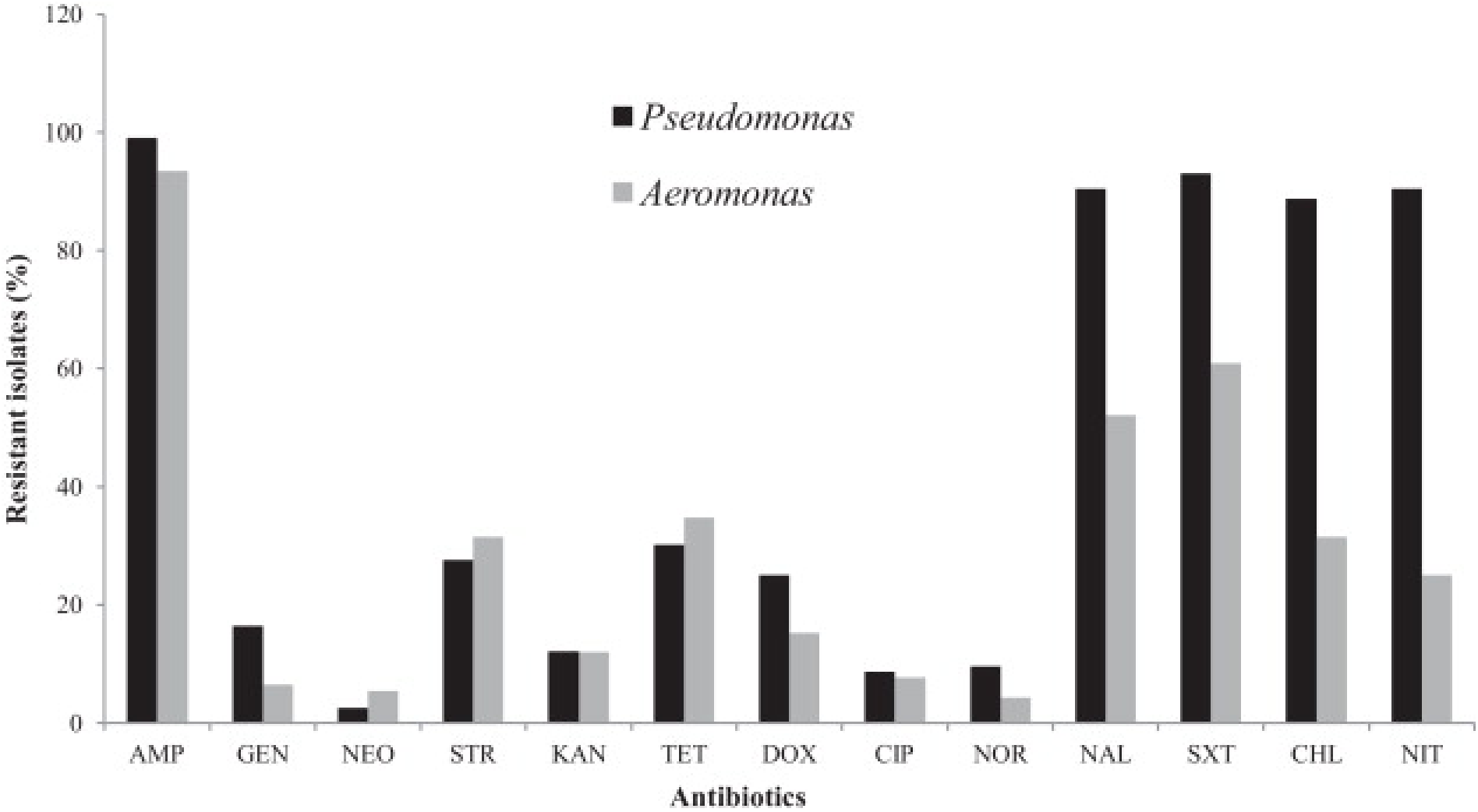
Antibiotic resistance in the environment

Resistance to 11 antimicrobial drugs of *bla*$_{NDM-1}$–positive *Klebsiella pneumoniae* isolates from the Kim Nguu River, Hanoi, Vietnam

Antimicrobial drug	MIC, mg/L		
	EUCAST brakpoint	Site X	Site Y
Piperacillin/tazobactam	R > 16	64–>256	64–>256
Ceftazidime	R > 4	>256	>256
Ceftriaxone	R > 2	96–>256	128–>256
Meropenem	R > 8	8–>32	12–>32
Imipenem	R > 8	6–>32	>32
Fosfomycin	R >	3–8	8
Gentamicin	R > 4	>1,024	>1,024
Tobramycin	R > 4	384–>1,024	256–384
Ciprofloxacin	R > 1	0.064–1.5	0.064
Colistin	R > 2	0.19–2	0.125–0.38
Tigecycline	R > 2	1.5–3	0.5–1.5

Emerg Infect Dis. 2012 August; 18(8): 1383–1385

Antibiotic resistance in fishculture



Percentage of catfish Pseudomonas and Aeromonas isolates resistant to antibiotics. Antibiotic susceptibility test was carried out for 116 Pseudomonas and 92 Aeromonas catfish isolates against 13 antibiotics: AMP, GEN, NEO, STR, KAN, TET, DOX...

Hoang Nam Kha Nguyen , Thi Thu Hao Van , Huu Thinh Nguyen , Peter M. Smooker , Jeff Shimeta , Peter J. Coloe

Molecular characterization of antibiotic resistance in *Pseudomonas* and *Aeromonas* isolates from catfish of the Mekong Delta, Vietnam

Veterinary Microbiology, Volume 171, Issues 3–4, 2014, 397 - 405

Antibiotic resistance in general population

Resistance prevalence to tested antibiotics among 818 fecal isolates of *E.coli* from children aged 6-60 months in FilaBavi, Vietnam (BMC Infect Dis. 2012; 12: 92).

Antibiotic(s) tested	Prevalence of resistance % (n, total n = 818)
TET	74 (609)
SXT	68 (559)
AMP	65 (533)
CHL	40 (325)
NAL	27 (220)
CIP	< 1 (2)
TET + SXT + AMP	45 (368)
TET + SXT + AMP + CHL	25 (208)
TET + SXT + AMP + CHL + NAL	8 (68)

Abbreviations used: TET = tetracycline; SXT = co-trimoxazole; AMP = ampicillin; CHL = chloramphenicol; NAL = nalidixic acid; CIP = ciprofloxacin

Antibiotic resistance in community acquired infections

Antibiotic therapy for inpatients with community-acquired pneumonia in Vietnam

Trinh et al , Pharmacoepidemiol **Drug** mar 2014

KEY POINTS

- Irrational antibiotic combinations for CAP are common.
- Hospitalization, choice of intravenous route, and use of combination antibiotic therapy occurred without correlation to CAP severity in Vietnamese hospitals.
- Antibiotic combination highly varies among hospitals.
- Further research into the factors influencing these decisions is needed

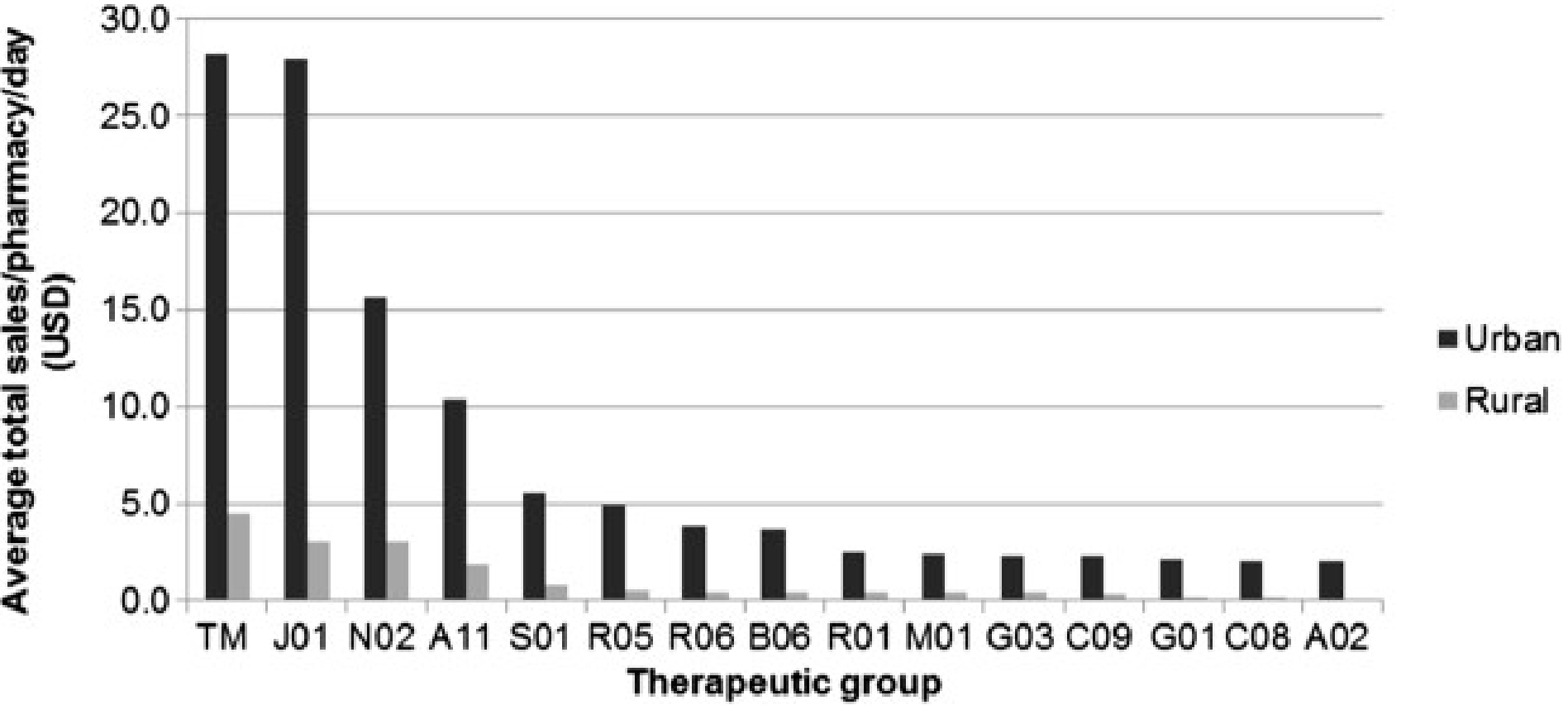
Antimicrobial susceptibility of 108 *Neisseria gonorrhoeae* isolates from Hanoi, Vietnam in 2011

Antimicrobial (Breakpoints (mg/L))	Susceptible no. (%)
Ciprofloxacin (S ≤ 0.0)	2 (2)
Tetracycline (S ≤ 0.5,)	7 (6)
Penicillin G (S ≤ 0.064)	2 (2)
Azithromycin (S ≤ 0.25)	67 (62)
Ceftriaxone (S ≤ 0.125)	103 (95)
Cefixime (S ≤ 0.125)	107 (99)
Spectinomycin (S ≤ 64)	108 (100)

BMC Pharmacol Toxicol. 2014 Feb 20;15(1):6.

Antibiotic sales in rural and urban pharmacies in northern Vietnam: an observational study.

Nga do TT[1], Chuc NT, Hoa NP, Hoa NQ, Nguyen NT, Loan HT, Toan TK, Phuc HD, Horby P, Van Yen N, Van Kinh N, Wertheim HF



Average sales in USD per pharmacy per day by therapeutic groups in urban versus rural (in USD). TM: Herbal medicines, J01: Antibiotics, N02: Analgesic, A11: Vitamins, S01: Ophthalmological, R05: Cough and cold preparation, B06: Hematological agent, R06: Antihistamine, R01: Nasal preparations, M01: Anti-inflammatory and antirheumatic products, G03: genial system, C09: rennin-angiotensin, G01: Gynecological, C08: calcium channel blocker, A02: acid related disorders.

Antibiotics dispensing practices according to prescription regulation

Outcomes	Urban (n = 2083)	Rural (n = 870)
Transaction with antibiotics	499 (24%)*	257 (30%)*
With prescription	60 (12%)	23 (9%)
Comply with prescription	49 (82%)	18 (78%)
Not comply with prescription	11 (18%)	5 (22%)
Without prescription	439 (88%)	234 (91%)
Client made decision	221 (50%)*	66 (28%)*
Drug seller made decision	218 (50%)	168 (72%)

Causes for irrational antibiotics dispensing

	Percentage of respondents within area agreed with given reasons	
Reasons outcomes	**Urban (n = 26)**	**Rural (n = 17)**
Fear of losing customers	18 (69%)	17 (100%)
Pressure from patient's demand	10 (38%)*	13 (76%)*
Insufficient knowledge of dispensers	7 (27%)	4 (23%)
Inappropriate prescribing of doctors	18 (69%)*	5 (29%)*
High profitability of antibiotics	8 (31%)	6 (35%)
Other (quality of diagnosis or health services)	12 (71%)	12 (46%)

Nga *et al. BMC Pharmacology and Toxicology* 2014 **15**:6

antibiotic resistance at the hospital

Level of decreased susceptibility for the most common bacteria

Antibiotic	All ICUs S + I + R *n*	I + R *n*	%
Escherichia coli			
Amikacin	67	17	25.4
Cefotaxime	68	39	57.4
Ciprofloxacin	69	39	56.5
Gentamicin	67	40	59.7
Imipenem	61	0	0.0
Cotrimoxazole	68	56	82.4
***Klebsiella* species**			
Cefotaxime	114	72	63.2
Imipenem	103	3	2.9
Gentamicin	114	64	56.1
Ciprofloxacin	114	59	51.8

Need for improved antimicrobial and infection control stewardship in Vietnamese intensive care units

Tropical Medicine & International Health 16, 6, p 737–43, 2011

Isolates from sputum and endotracheal fluid

unpublished data from Bach Mai hospital, 2014

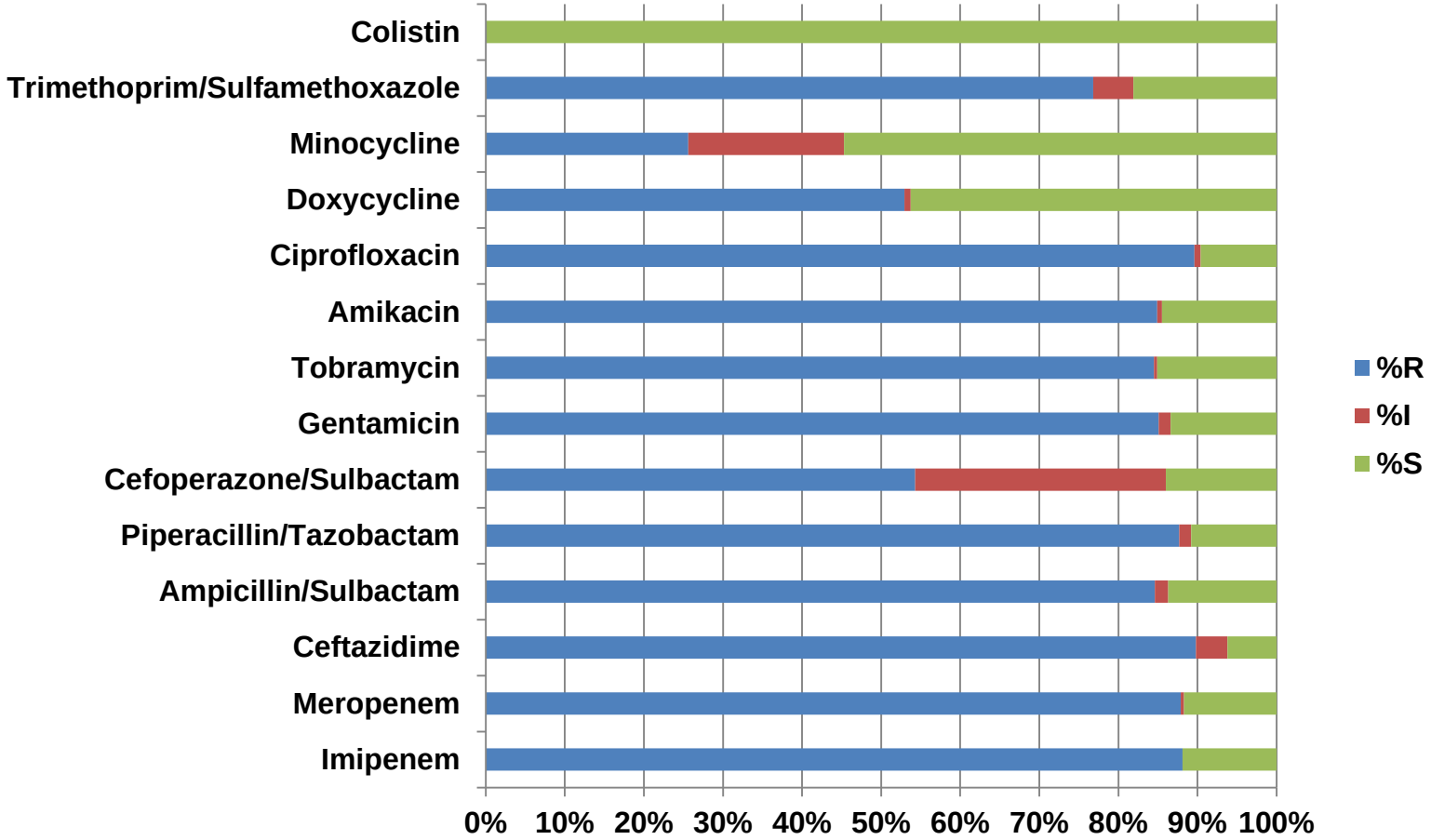
TT	Vi khuẩn	n	%
1	*Acinetobacter baumannii*	333	33.1
2	*Pseudomonas aeruginosa*	240	23.8
3	*Klebsiella pneumoniae*	130	12.9
4	*Stenotrophomonas maltophilia*	62	6.2
5	*Haemophilus influenzae*	33	3.3
6	*Staphylococcus aureus*	37	3.7
7	*Escherichia coli*	29	2.9
8	*Enterobacter cloacae*	23	2.3
9	*Burkholderia cepacia*	12	1.2
10	*Streptococcus pneumoniae*	11	1.1
11	Khác	97	9.6
12	Tổng	1007	100.0

Pham Hong Nhung, MD, PhD Dept. Microbiology, Hanoi Medical University and Bach Mai hospital

Antibiogram of *A. baumannii* (n = 481)

unpublished data from Bach Mai hospital, 2014

Pham Hong Nhung, MD, PhD Dept. Microbiology, Hanoi Medical University and Bach Mai hospital



Colistin MIC_{50} = 0.5 µg/mL; MIC_{90} = 0.75 µg/mL (n = 41)

70% chủng từ bệnh phẩm hô hấp
28.9 % chủng phân lập ở HSTC

American Journal of Infection Control Volume 40, Issue 9, November 2012, Pages 840–844

ANTIBIOTIC USE IN VIETNAMESE HOSPITALS: A MULTICENTER POINT-PREVALENCE STUDY (TRUONG ANH THU ET AL)

Prevalence and correlates of antibiotic use in Vietnamese hospitals

Characteristics	Sample (n = 7,571)	Patients with antibiotics, n (%) (n = 5,104)	Adjusted OR (95% CI)
Age group, years			
<30	2,480	2,014 (**81.2**)	Ref
30-59	2,999	1,874 (62.5)	0.8 (0.7-1.0)
≥60	2,092	1,216 (58.1)	0.7 (0.6-1.0)
Hospital type			
National	1,778	905 (50.9)	Ref
Provincial	4,676	3,341 (**71.4**)	1.4 (1.2-1.6)
District	1,117	858 (**76.8**)	2.2 (1.8-2.6)

Antibiotic use in Vietnamese hospitals: A multicenter point-prevalence study

Prevalence and correlates of antibiotic use in Vietnamese hospitals			
Ward			
Medical	4,105	1,979 (48.2)	Ref
Obstetrics and gynecology	508	428 (84.3)	5.0 (3.9-6.5)
Surgical	1,910	1,780 (93.2)	13.2 (10.9-16.1)
Intensive care unit	354	292 (82.5)	4.3 (3.3-5.7)
Pediatric	694	625 (90.1)	6.8 (5.1-9.0)

Characteristics of antibiotic prescription in participating hospitals

Variable	Patients on antibiotics, n (%) (n = 5,104)
Number of antibiotics	
1	3,237 (63.4)
2	1,547 (30.3)
≥3	320 (6.3)
Antibiotic class and/or agent	
Cephalosporins	3,585 (70.2)
Penicillins	1,105 (21.6)
Aminoglycosides	963 (18.9)
Imidazole	555 (10.9)
Quinolon	246 (4.8)
Macrolide	128 (2.5)
Sulphonamide	36 (0.7)

Inappropriate indications for antibiotics and their correlates

Variables	Patients with inappropriate antibiotic treatment, n (%) (n = 1,573)	Patients with appropriate antibiotic treatment, n (%) (n = 3,531)	Adjusted OR (95% CI)
Hospital type			
National	216 (13.7)	642 (18.2)	Ref
Provincial	**1,022 (65.0)**	2,319 (65.7)	0.8 (0.5-0.9)
District	335 (21.3)	570 (16.1)	0.5 (0.3-0.7)
Ward			
Medical	368 (23.4)	1,611 (45.6)	Ref
Obstetrics and gynecology	**369 (23.5)**	59 (1.7)	33.0 (23.1-45.6)
Surgical	**766 (48.7)**	1,014 (28.7)	3.7 (3.2-4.3)
Intensive care unit	49 (3.1)	243 (6.9)	1.0 (0.7-1.4)
Pediatric	21 (1.3)	604 (17.1)	0.2 (0.1-0.3)

Incentives for antibiotic pressure in Vietnam (GARP Vietnam)

- Access to antibiotic
  - Free access !? In contradiction with the official regulations
  - 39.000 drug stores managed frequently by not qualified people
  - Drug price in public sector public (hospitals) >> private practice
  - Drugs imitations ↘
- misuse of antibiotics
  - guidelines, not always appropriate and frequently not observed

    Ex: upperRT Iinfections treated with AB
  - selfmedication
  - Oral cephalosporines +++

Incentives for antibiotic pressure in Vietnam (GARP Vietnam))

- Aproximate estimation of the resistance problems
  - Limited surveillance and studies
  - Lack of bacterial laboratory facilities
- Farm use of antibiotics
  - large use of antibiotics produced or packaged in Vietnam
    - Aquaculture
    - Breeding
    - Impact on exportations and on public health
- Bacterial food contamination
  - multiresistant bacteria in raw meat and seafood

What to do?

Multitarget actions in

- General population
- Farmers
- Pharmacists and drugstore keepers
- General practitioners
- Hospital physicians
- Bacteriological laboratories
- Pharmaceutical companies
- Politic deciders

What to do? (2)

- Reduce antibiotic consumption
  - General population education
  - Education for « medical pactitioners » and « pharmacists »
  - Rationalization of use
  - Restriction and improvement of delivery
- Improve infection control and hygiene
- Improve antibiotics quality
- Develop surveillance facilities and improve and standardize bacteriology techniques

- *Try to forbid pharmaceutical companies to tip hospitals, pharmacists, practionners…*

- *Don't wait too much from scientific innovations: bacteriophages, vaccines,…*


COMBAT
DRUG RESISTANCE
WS COMMITMENT
WEAK SURVEILLANCE
POOR DRUG QUALITY
IRRATIONAL DRUG USE
INFECTION CONTROL
LACK OF RESEARCH
DRUG RESISTANCE
No action today, no cure tomorrow
7 APRIL 2011 WORLD HEALTH DAY
World Health Organization