



A Point Prevalence Survey of Antibiotic Prescriptions and Infection in Sanandaj Hospitals, Prospects for Antibiotic Stewardship

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Global Point Prevalence Survey of Antimicrobial Consumption and Resistance



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*Supporting healthcare professionals
in the fight against resistance*





Global-PPS degree of participation 2015

AIMS Global-PPS

- Expand the standardized antimicrobial web based PPS at a global scale to collect consistent, valid and comparable antimicrobial prescribing data.
- Monitor rates of antimicrobial prescribing in hospitalized adults, children and neonates.
- Determine the variation in drug, dose and indications of antimicrobial prescribing across continents.
- Identify targets to improve quality of antimicrobial prescribing.
- Help designing hospital interventions to promote prudent antimicrobial use.
- Assess effectiveness of interventions through repeated PPS.
- Increase public health capacity.

Important research questions

- What is the quantity and quality of antimicrobial prescribing?
 - Geographical distribution and ranges
 - Broad versus narrow spectrum antibiotic use
 - Adults – children - neonates
 - Dose
 -
- What are determinants of inappropriate antimicrobial prescribing ?
 - Patient related : age, diagnosis, indication
 - Institutional : hospital type, ward type, national/local policy, existing guidelines,
 - Geographical factors: region, country, cultural, availability of drugs on market, prescriber related (training), custom,



Background



Point Prevalence Surveys (PPS) provide useful data on the patterns of in-hospital antimicrobial prescribing and is crucial for changing prescribing practices for antibiotic stewardship programs.

Herein, antimicrobial prescribing patterns in various wards of 3 teaching hospitals in Sanandaj, west Iran were studied to find targets for quality improvement.



Methods



- A 1-day PPS on antimicrobial use in hospitalized patients was performed in the October and December 2015, using a previously validated and standardized method based on the “Global Point Prevalence study project” (Global PPS) designed by Antwerp University, Belgium.



Methods



- We analyzed 678 patients from 2 teaching hospitals (Besat and Tohid hospitals) and one secondary general hospital (social security hospital).



Findings



- Out of 678 total admissions in all wards of the three hospitals, 377(55.6%) patients received at least one antimicrobial, varying considerably between the hospitals and wards.
- Similar numbers for 123 admissions in pediatric and neonatal wards, were calculated as 54(73%) and 32(65%) respectively.



Findings (Besat Hospital)



Overall antimicrobial prevalence by region and type of adult ward.

	Total	AMW	HO-AMW	T-AMW	P-AMW	ASW	AICU
North America	38.6	32.4	55.4	66.7	58.8	44.2	59.4
South America	36.8	31.8	28.3	65.9	50.0	37.3	55.1
Africa	50.0	49.9	50.0	66.7	100.0	49.0	64.1
North Europe	34.4	29.8	49.6	60.8	53.5	37.7	55.9
West Europe	28.2	23.4	43.1	80.9	49.7	28.0	56.1
South Europe	39.1	32.6	33.6	76.9	60.2	40.0	64.2
East Europe	27.4	11.6	9.1	0.0	30.5	33.2	67.3
West & Central Asia	43.7	42.0	48.1	0.0	100.0	44.6	46.6
East & South Asia	38.7	34.9	54.9	86.9	46.2	35.4	65.6
Australia & New Zealand	37.0	29.8	54.3	0.0	77.8	52.5	69.7
Our hospital	63.8	69.0	0.0	0.0	0.0	58.6	100.0
IRAN, ISLAMIC REPUBLIC OF	58.7	51.6	56.6	91.4	0.0	56.1	81.6

Antimicrobial prevalence (%): $100 \times (\text{number of treated patients} / \text{number of registered patients according to UN macro-geographical subregions})$.

Total = Overall antimicrobial prevalence in adult wards; AMW = Adult Medical Ward; HO-AMW = Haematology-Oncology AMW; T-AMW = Transplant (BMT/solid) AMW; P-AMW = Pneumology AMW; ASW = Adult Surgical Ward; AICU = Adult Intensive Care Unit.



Findings (Besat Hospital)



Overall antimicrobial prevalence by region and type of child or neonatal ward.

	Total	PMW	HO-PMW	T-PMW	PSW	PICU	NMW	NICU
North America	26.6	41.7	53.1	100.0	71.4	51.9	2.2	20.1
South America	30.8	37.3	23.4	100.0	49.2	54.4	7.8	34.2
Africa	55.4	66.8	46.2	0.0	41.3	100.0	42.1	78.2
North Europe	34.8	33.4	72.7	100.0	33.0	73.7	18.8	30.5
West Europe	22.7	26.8	59.1	100.0	31.2	47.1	4.4	21.5
South Europe	42.0	51.6	73.4	0.0	39.6	64.7	10.8	37.7
East Europe	23.2	12.3	44.1	0.0	23.9	97.9	18.9	88.2
West & Central Asia	47.8	46.0	65.2	0.0	44.7	67.8	20.7	70.7
East & South Asia	36.4	38.8	79.5	31.6	43.8	55.4	19.3	24.4
Australia & New Zealand	28.4	35.2	66.7	0.0	41.4	50.0	6.9	51.8
Our hospital	65.7	59.1	60.0	0.0	0.0	100.0	56.0	83.3
IRAN, ISLAMIC REPUBLIC OF	76.1	75.0	60.0	0.0	0.0	100.0	54.8	90.0

Antimicrobial prevalence (%): $100 \times (\text{number of treated patients} / \text{number of registered patients according to UN macro-geographical subregions})$.

Total = Overall antimicrobial prevalence in wards admitting children and neonates; PMW = Paediatric Medical Ward;
HO-PMW = Haematology-Oncology PMW; T-PMW = Transplant (BMT/solid) PMW; PSW = Paediatric Surgical Ward;
PICU = Paediatric Intensive Care Unit; NMW = Neonatal Medical Ward; NICU = Neonatal Intensive Care Unit.



Findings (Besat Hospital)



Antimicrobial prevalence (%) by activity

	Hospital	Country	Continent	Hospital type	Europe
Adults					
Medical	69.6	55.5	34.9	33.5	28.7
Surgical	57.2	55.5	41.3	42.7	33.2
ICU	100.0	81.6	68.7	74.1	59.2
Children					
Medical	59.2	74.5	42.0	56.3	36.5
Surgical	0.0	0.0	46.0	66.7	30.5
ICU	100.0	100.0	55.4	62.0	70.5
Neonates					
GNMW	56.0	54.8	19.3	21.7	10.0
NICU	83.3	90.0	24.4	31.7	31.8

Antimicrobial prevalence = $100 \times (\text{number of treated patients} / \text{number of admitted patients})$

Antimicrobial prevalence by activity for adults, children and neonates separately for the hospital, country, continent to which the hospital belongs; and the continental results for the hospital type to which the hospital belongs (possible types are primary + secondary level, tertiary level, paediatric and infectious diseases + specialized hospital).

Country: IRAN, ISLAMIC REPUBLIC OF ; Continent: East & South Asia ; Hospital type: Tertiary hospital



Findings



- The most commonly prescribed antibiotics were as follows:
 - in **adult wards** ceftriaxone (19.6%), cefazolin (17.3%) and ciprofloxacin (10.2%);
 - in **pediatric wards** ceftriaxone (33.1%), azithromycin (6.8%) and vancomycin (5.3 %) and
 - in **neonatal wards** ampicillin (17.3%) and cefotaxime (15.8%).

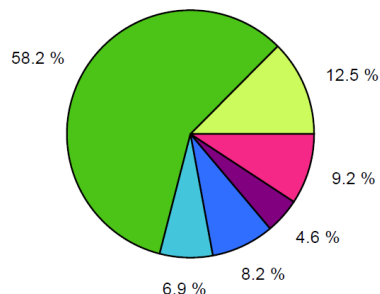


Findings (Besat Hospital)

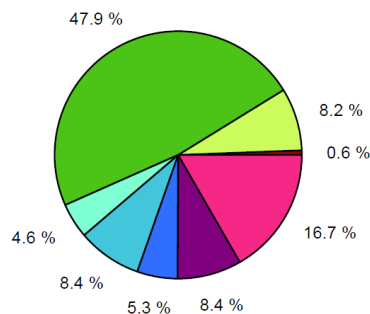


Overall proportional antimicrobial use.

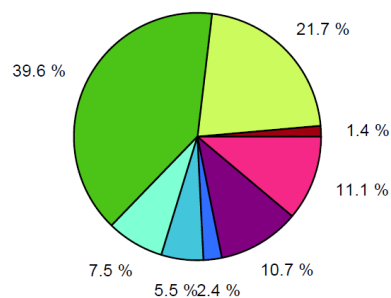
Our hospital (N= 198 treated patients)



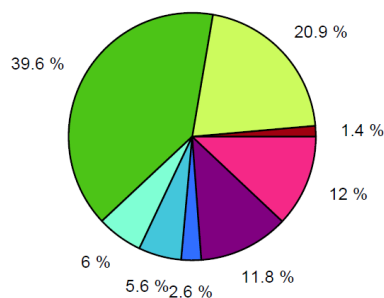
Country (n= 4 hospitals)



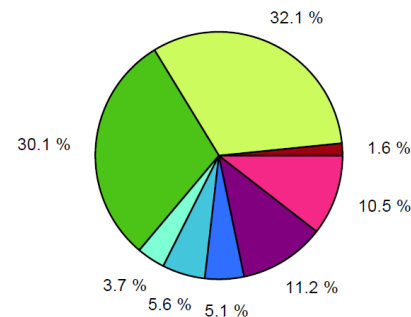
Continent (n= 29 hospitals)



Hospital type (n= 16 hospitals)



Europe (N= 213 hospitals)



■ Tetracyclines
■ Penicillins
■ Other beta-lactams
■ Sulfonamides and Trimethoprim

■ Macrolides, Lincosamides and Streptogramins
■ Aminoglycosides
■ Quinolones
■ Other antibacterials

Percentage of antibacterials for systemic use (ATC J01) at ATC3 level (pharmacological subgroup).
Proportional antibiotic use below 0.5% is not reported.

Country: IRAN, ISLAMIC REPUBLIC OF ; Continent: East & South Asia ; Hospital type: Tertiary hospital

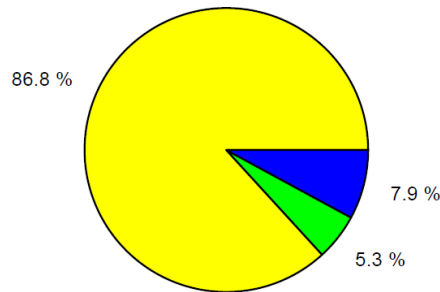


Findings (Besat Hospital)

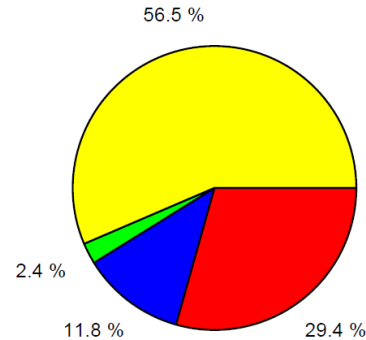


Proportional use of beta-lactam antibacterials.

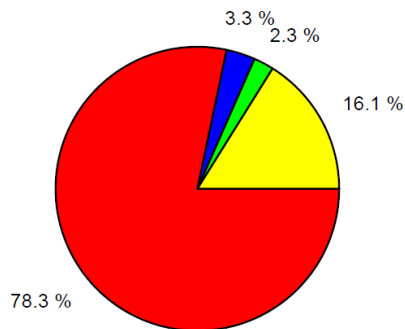
Our hospital (N= 38 treated patients)



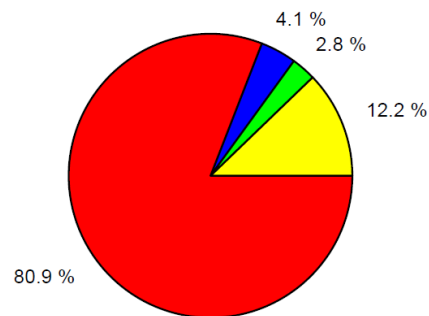
Country (n= 4 hospitals)



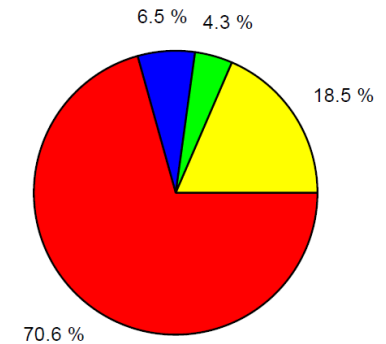
Continent (n= 29 hospitals)



Hospital type (n= 16 hospitals)



Europe (N= 200 hospitals)



■ Penicillins with extended spectrum
■ Beta-lactamase sensitive penicillins

■ Beta-lactamase resistant penicillins
■ Combinations of penicillins, incl. beta-lactamase inhibitors



Findings



- Antimicrobial combination therapies frequencies in adult, pediatric and neonatal wards in the 3 hospitals were 50%, 29%, and 90%, respectively.
- Empirical antibiotic therapies in adult, pediatric and neonatal wards were 98.4%, 91%, and 94.5%, respectively.

Therapeutic antimicrobial use for community acquired and healthcare associated infections by type of treatment.

	CAI Empiric		CAI Targeted		CAI Total	
	N	%	N	%	N	%
Our hospital	76	91.6	7	8.4	83	89.2
Country	350	87.9	48	12.1	398	63.6
Continent	2280	76.3	710	23.7	2990	57.1
Hospital type	1919	76.2	601	23.8	2520	59.1

	HAI Empiric		HAI Targeted		HAI Total	
	N	%	N	%	N	%
Our hospital	10	100.0	0	0.0	10	10.8
Country	119	52.2	109	47.8	228	36.4
Continent	1474	65.6	772	34.4	2246	42.9
Hospital type	1139	65.2	607	34.8	1746	40.9

CAI= Community Acquired Infections; HAI=Healthcare Associated Infections

Type of treatment= empiric versus targeted treatment.

For each subgroup of therapeutic use (CAI or HAI) the number of antimicrobials and proportion (%) for empiric versus targeted prescribing is reported.

Country: IRAN, ISLAMIC REPUBLIC OF ; Continent: East & South Asia ; Hospital type: Tertiary hospital



Findings



Ten most common diagnoses to be treated with therapeutic antimicrobials.

Diagnosis	Our hospital		Country		Continent		Hospital type		Europe	
	N	%	N	%	N	%	N	%	N	%
Pneu	26	49.1	88	24.7	950	24.7	756	24.9	756	24.9
SST	5	9.4	24	6.7	427	11.1	372	12.3	372	12.3
OBGY	4	7.5	4	1.1	50	1.3	37	1.2	37	1.2
GI	3	5.7	24	6.7	192	5.0	148	4.9	148	4.9
Pye	3	5.7	28	7.9	256	6.7	165	5.4	165	5.4
SEPSIS	3	5.7	43	12.1	172	4.5	149	4.9	149	4.9
BJ	2	3.8	16	4.5	139	3.6	116	3.8	116	3.8
CNS	2	3.8	15	4.2	83	2.2	71	2.3	71	2.3
URTI	2	3.8	4	1.1	63	1.6	61	2.0	61	2.0
ENT	1	1.9	7	2.0	129	3.4	97	3.2	97	3.2

Top ten diagnoses in our hospital. Count on the number of diagnoses treated with at least one antimicrobial. This implies that a patient with multiple diagnoses can be counted several times. Prophylactic prescribing and patients admitted on NICU or NMW are excluded from this analysis.

Country: IRAN, ISLAMIC REPUBLIC OF Continent: East & South Asia Hospital type: Tertiary hospital

CNS=infection of central nervous system; Eye=eye infections; ENT=ear, nose and throat infections; URTI=upper respiratory tract infection; Bron=bronchitis; Pneu=Pneumonia or lower respiratory tract infection; TB=tuberculosis; CVS=cardiovascular system infections; GI=gastro-intestinal infections; IA=intra-abdominal sepsis; SST=skin and soft tissue; BJ=bone/joint infections; Cys=lower urinary tract infection; Pye=Upper urinary tract infection; OBGY=obstetric/gynaecological infections; GUM=genito-urinary males; BAC=bacteraemia; PUO=pyrexia of unknown origin; PUO-HO=fever syndrome in non-neutropaenic haematology-oncology patient; FN=fever neutropaenic patient; LYMPH=infection lymphatics



Findings



Summary of quality indicators for antibiotic use.

	Hospital		Country		Continent		Hospital type		Europe	
	N	%	N	%	N	%	N	%	N	%
Medical										
Reason in notes	76	65.0	430	70.6	3285	79.1	2600	80.6	10572	81.0
Guidelines missing	86	73.5	231	37.9	884	21.3	752	23.3	1964	15.1
Guideline compliant	0	0.0	206	78.6	2128	83.1	1530	83.0	6791	80.5
Stop/review date documented	1	0.9	280	46.0	1884	45.4	1575	48.8	4771	36.6
Surgical										
Reason in notes	56	50.9	77	45.0	1700	68.8	1462	69.9	5470	69.8
Guidelines missing	69	62.7	108	63.2	551	22.3	498	23.8	1526	19.5
Guideline compliant	0	0.0	15	37.5	1110	74.6	875	72.6	3473	71.7
Stop/review date documented	8	7.3	29	17.0	1016	41.1	870	41.6	3386	43.3
ICU										
Reason in notes	55	71.4	213	82.6	666	75.9	599	74.8	2506	78.8
Guidelines missing	72	93.5	100	38.8	202	23.0	196	24.5	618	19.4
Guideline compliant	0	0.0	82	92.1	366	77.7	322	76.5	1481	84.6
Stop/review date	1	1.3	148	57.4	493	56.2	460	57.4	1245	39.2

Antibiotic quality indicators by activity (medical, surgery, ICU) for all patients receiving antibacterials for systemic use (ATC J01).

– For reason in notes and stop/review date documented: Count at antibacterial level.

– For guidelines missing: Count on NA (= no local guidelines for the specific indication) at patient level and diagnosis over total scores for this indicator.

– For guideline compliance: Count at patient level and diagnosis for compliance= yes or no only. For combination therapy with >1 antibiotic:



Findings (Besat Hospital-ARPEC data 2011-2012)



Table 2: Reason for Antibiotic Treatment (Diagnosis) of Studied Children and Neonates

Pediatric Wards		Neonatal Wards	
Reason for Treatment	Frequency (%)	Reason for Treatment	Frequency (%)
Bacterial LRTI	52(19.1)	Sepsis	50(33.3)
Sepsis	43(16.1)	LRTI	46(30.7)
Treatment for surgical disease	43(16.1)	Prophylaxis for newborn risk factors	20(13.3)
CNS infections	25(9.4)	Treatment for surgical disease	12(8.0)
UTI (Upper and Lower)	18(6.7)	Prophylaxis for surgical disease	10(6.7)
Febrile neutropenia/Fever in oncologic patients	14(5.2)	Cardiac infections	2(1.3)
Prophylaxis for surgical disease	13(4.9)	CNS infections	2(1.3)
GI Tract Infections	12(4.5)	GI Tract Infections	2(1.3)
Skin/Soft Tissue Infections	10(3.7)	Joint/Bone Infections	2(1.3)
Prophylaxis for medical problems	7(2.6)	Prophylaxis for medical problems	2(1.3)
Joint/Bone Infections	5(1.9)	Other/Unknown	2(1.3)
Cardiac infections	4(1.5)		
URTI	3(1.1)		
Pyrexia of Unknown Origin	2(0.7)		
Other/Unknown	12(4.5)		
Total	267(100)	Total	150(100)



Discussion



Summary of quality indicators for antibiotic use.

	Hospital		Country		Continent		Hospital type		Europe	
	N	%	N	%	N	%	N	%	N	%
Medical										
Reason in notes	76	65.0	430	70.6	3285	79.1	2600	80.6	10572	81.0
Guidelines missing	86	73.5	231	37.9	884	21.3	752	23.3	1964	15.1
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Stop/review date documented	1	0.9	280	46.0	1884	45.4	1575	48.8	4771	36.6
Surgical										
Reason in notes	56	50.9	77	45.0	1700	68.8	1462	69.9	5470	69.8
Guidelines missing	69	62.7	108	63.2	551	22.3	498	23.8	1526	19.5
Guideline compliant	0	0.0	15	37.5	1110	74.6	875	72.6	3473	71.7
Stop/review date documented	8	7.3	29	17.0	1016	41.1	870	41.6	3386	43.3
ICU										
Reason in notes	55	71.4	213	82.6	666	75.9	599	74.8	2506	78.8
Guidelines missing	72	93.5	100	38.8	202	23.0	196	24.5	618	19.4
Guideline compliant	0	0.0	82	92.1	366	77.7	322	76.5	1481	84.6
Stop/review date	1	1.3	148	57.4	493	56.2	460	57.4	1245	39.2

Antibiotic quality indicators by activity (medical, surgery, ICU) for all patients receiving antibacterials for systemic use (ATC J01).

- For reason in notes and stop/review date documented: Count at antibacterial level.
- For guidelines missing: Count on NA (= no local guidelines for the specific indication) at patient level and diagnosis over total scores for this indicator.
- For guideline compliance: Count at patient level and diagnosis for compliance= yes or no only. For combination therapy with >1 antibiotic: if 1 antibiotic by diagnosis is not compliant, this combination therapy as a whole for this diagnosis will be counted as non-compliant.

Antibiotic quality indicators – adult wards.

	Hospital		Country		Continent		Hospital type		Europe	
	N	%	N	%	N	%	N	%	N	%
Medical										
Reason in notes	25	47.2	283	67.1	2920	80.0	2340	80.7	8805	81.3
Guidelines missing	35	66.0	154	36.5	761	20.9	658	22.7	1499	13.8
Guideline compliant	0	0.0	146	78.9	1883	83.4	1387	83.2	5810	79.7
Stop/review date documented	0	0.0	183	43.4	1643	45.0	1403	48.4	3992	36.9
Surgical										
Reason in notes	56	50.9	77	45.0	1663	68.8	1445	69.9	5053	69.1
Guidelines missing	69	62.7	108	63.2	543	22.5	491	23.7	1400	19.2
Guideline compliant	0	0.0	15	37.5	1079	74.4	864	72.4	3209	71.0
Stop/review date documented	8	7.3	29	17.0	988	40.9	860	41.6	3176	43.5
ICU										
Reason in notes	14	45.2	121	75.2	514	72.0	476	71.3	1879	76.2
Guidelines missing	26	83.9	54	33.5	145	20.3	139	20.8	451	18.3
Guideline compliant	0	0.0	56	88.9	305	75.9	284	75.5	1173	83.3
Stop/review date documented	1	3.2	97	60.2	399	55.9	390	58.4	912	37.0

Antibiotic quality indicators by activity (medical, surgical, ICU) for patients admitted on adult wards receiving antibacterials for systemic use (ATC J01).

- For reason in notes and stop/review date documented: Count at antibacterial level.
- For guidelines missing: Count on NA (= no local guidelines for the specific indication) at patient level and diagnosis over total scores for this indicator.
- For guideline compliance: Count at patient level and diagnosis for compliance = yes or no only. For combination therapy with >1 antibiotic: if 1 antibiotic by diagnosis is not compliant, this combination therapy as a whole for this diagnosis will be counted as non-compliant.

Discussion

- In the present study, ceftriaxone and vancomycin were found to be the most frequently prescribed antibiotics in pediatrics. This is in parallel to the studies from European countries for ceftriaxone but in a much higher rate (29.2%vs. 8.5%).

Discussion

- The overuse of ceftriaxone and other third generations of cephalosporins might be the important cause of a high resistance rate (54%) observed
- for ceftriaxone in our hospitals[[16](#)] and high rate of ESBL producing *enterobacteriace* (61% of *klebsiella pneumonia* and 35% of *E.coli* isolates)in Iran which
- is comparable to resistance rates in resource-limited countries with overuse of ceftriaxone.[[10](#), [21](#)]
- Our prescription rate is also higher for vancomycin in comparison to European countries (15% vs. 8%)

Discussion

- LRTI was the most prevalent cause of hospitalization and antibiotic treatment in pediatric group.
- They were treated mostly with ceftriaxone (35.3%), clindamycin (15.7%), vancomycin (11.8%), meropenem (9.8%) and azithromycin(7.8%).
- This finding is consistent with that found in European countries which reported LRTI as a common cause of inappropriate antibiotic prescription.[32]

Discussion

- In comparison, the prescription rates were significantly higher for vancomycin and clindamycin and significantly lower for macrolids in our hospitals.[33]
- This might increase the cost and clinical failure.
- A study from Italy documented a significant role for *Mycoplasma pneumonia* (35%), as the etiology of LRTI in 613 children aged between 2-14 years necessitating the use of macrolids.[34]

Discussion

- A large recent series of study from USA found staphylococcus infection in only 22/2533 of LRTI cases.[[36](#)]
- Vancomycin is indicated for *S. aureus* and rarely for highly resistant pneumococcal infection.[[37](#)]
- *Streptococcus Pneumonia* (*S. Pneumonia*) is the most common cause of bacterial pneumonia in all ages.[[38](#), [39](#)]

Discussion

- However, the antibiotic choices are not different between sensitive and resistant cases of *S. Pneumonia* in the management of LRTI.
- The lung has a very rich blood supply that delivers antibiotics in high concentration to the site of infection and thereby overcome the concentration dependent resistance of *S. Pneumonia*. “
- To date, no association with resistance and treatment failure has been demonstrated in children”.[\[39\]](#)

Discussions

- Identified targets for quality improvement in antimicrobial prescribing include
 - excessive use of (3th generation) cephalosporins in pediatric and neonatal wards,
 - Prolonged duration of surgical prophylactic use > 1day (for pediatric and neonatal patients),

Discussions

- excessive use of antimicrobial combinations, high proportion of parenteral antimicrobial use and
- inappropriate use of narrow versus broad spectrum antibiotics.

Discussion



- Conclusions:
- Quality improvement in hospital antibiotic prescriptions is strongly needed. The high percentage of antimicrobials use, combination and empirical therapies could be targeted for quality improvement in our health centers.

**Any hospital can participate
Ready to join us ?**

Contact

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URL

http://app.globalpps.uantwerpen.be/globalpps_webpps/



Special Thanks to:

- Ann Versporten
- Herman Goossen



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