Temporal trends of Enterobacteriaceae with resistance to higher generation cephalosporines in Switzerland, 2004 to 2010

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Background

Multidrug resistant gram-negative Enterobacteriaceae, are increasing world-wide in hospital and community-settings due to rapid spread of extended spectum betalactamase (ESBL). So far ESBL-epidemiology in Switzerland has not been described systematically.

Aims

To describe temporal and regional trends of third or fourth generation cephalosporin resistance (3GR) in *Escherichia coli* and *Klebsiella pneumonie* in Switzerland.
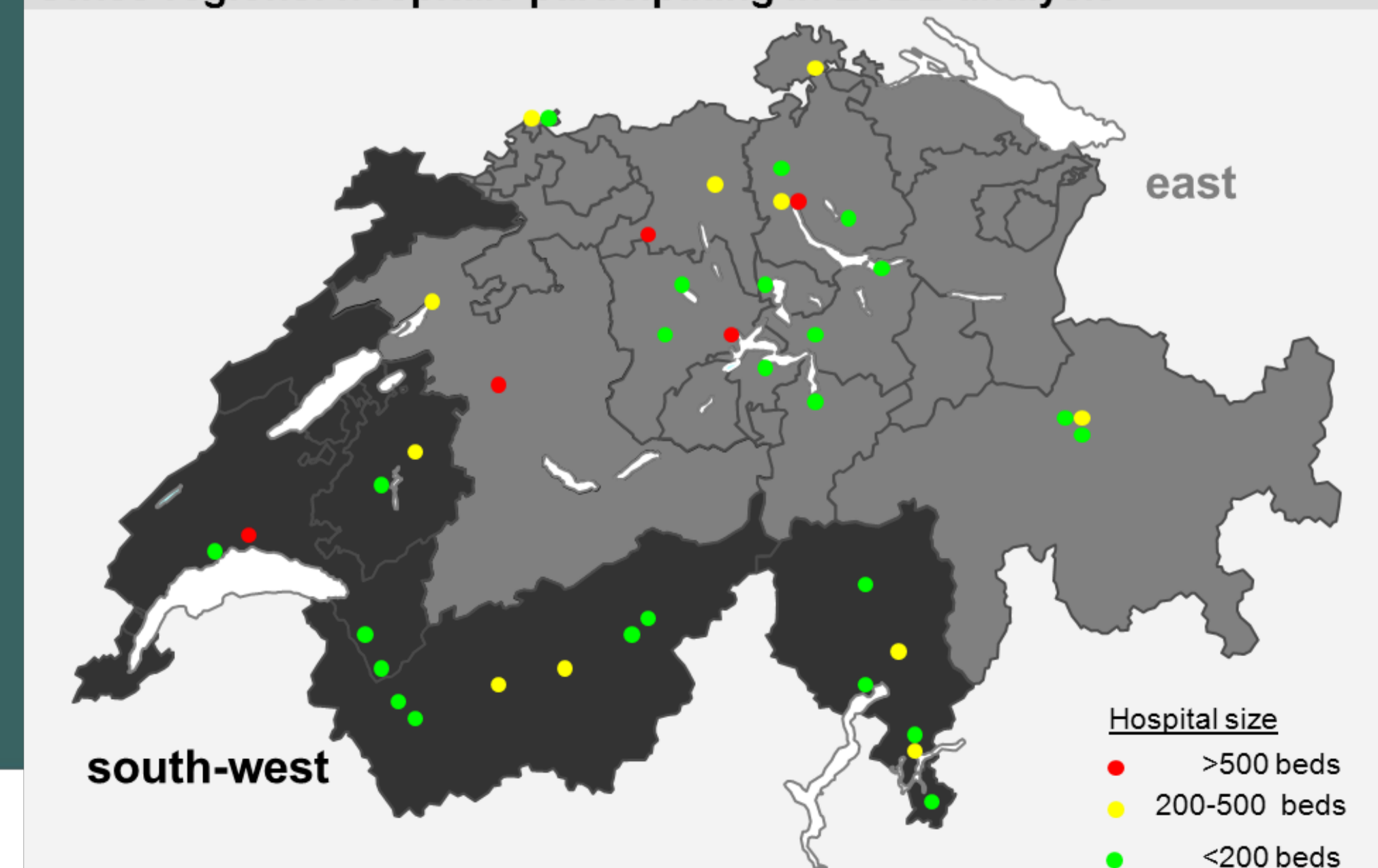
Methods

To describe the temporal trends of 3GR *E. coli* and *K. pneumoniae* we used data from the laboratory-based nation-wide surveillance system ANRESIS (www.anresis.ch).
- ANRESIS collects routine resistance data of actually 23 Swiss laboratories.
- ANRESIS includes in- and outpatient resistance data of all Swiss regions. Outpatient data includes data from private physicians as well as data from outpatient clinics.
- For temporal trends 2006-2010 we included data from 16 laboratories / 40 hospitals sending data continuously since 2006.
- For temporal trends 2004 – 2010 we included data from 11 laboratories / 34 hospitals sending data continuously since 2004.
- Only one isolate per patient and year was included in the analysis.

Conclusion

In Switzerland, resistance to 3rd generation cephalosporines among *E. coli* and *K. pneumoniae* is increasing at low but constant rates since 2004. Increase is comparable in the hospital and outpatient setting, but is higher in hospitals with >500beds than in smaller hospitals. While in *E. coli* 3GR is significantly higher in east- than in south-west Switzerland in 2010 there was a trend for higher 3GR in *K. pneumoniae* in south-west Switzerland in 2010.

Swiss regions: hospitals participating in ESBL-analysis

east

south-west

Hospital size
- >500 beds
- 200-500 beds
- <200 beds

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Results

Data representativeness

Inpatient data
- According to the Swiss hospital statistics 2007 (www.bag.admin.ch) the 40 hospitals included in our study covered 43.3% of acute care hospital beds in south-west and 33.6% in east-Switzerland
- In 2007 samples analyzed for this study covered 3 Mio beddays

Outpatient data
- 50.2 % of outpatient data were from medical practitioners, 49.2% from outpatient clinics. Resistance rates were comparable in both subgroups (data not shown).
- In total data from 2214 medical practitioners were included in this analysis.
- According to the statistics of Swiss physicians 2009 (www.fmh.ch) this survey covered 9.3% of medical practitioners of south-west and 17.9% of east Switzerland.

3GR in Switzerland 2010

E. coli	south-west		east		
	%	n	%	n	p
total	3.9%	12630	5.1%	17002	<0.05
inpatient	4.1%	4698	5.4%	6636	<0.05
outpatient	3.8%	7932	4.9%	10366	<0.05
age <15	3.7%	784	4.1%	1863	0.7
age 15-45	2.4%	3476	4.9%	3803	<0.05
age 45-65	4.0%	2434	5.1%	3621	0.06
age > 65	4.8%	5936	5.4%	7715	0.08
blood	3.4%	640	4.3%	839	0.5
urine	3.7%	10630	4.5%	13660	<0.05

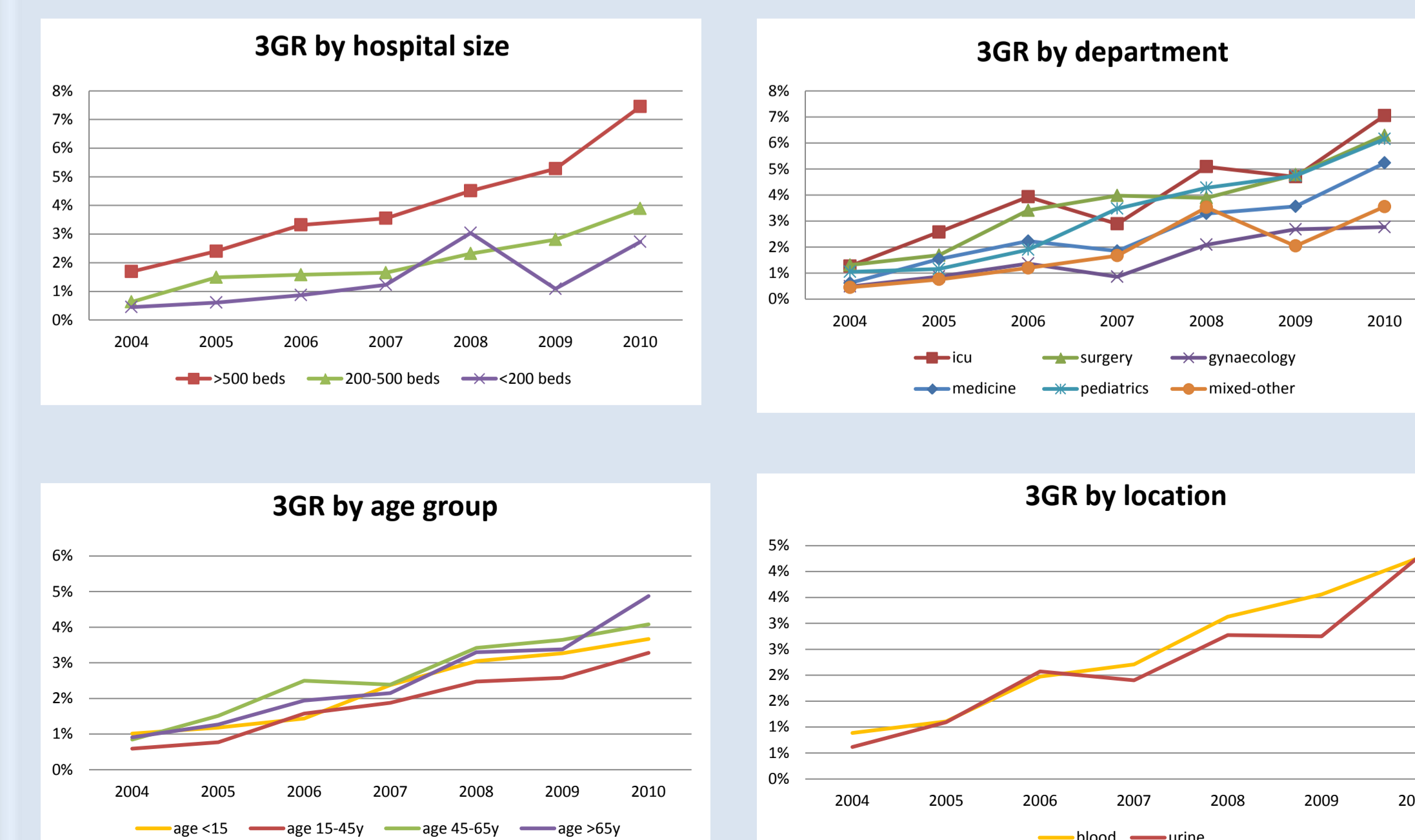| K. pneumoniae	south-west		east		
	%	n	%	n	p
total	5.9%	1601	4.6%	2815	0.08
inpatient	6.4%	845	5.5%	1391	0.5
outpatient	5.3%	756	3.7%	1424	0.1
age <15	16.2%	68	4.7%	191	<0.05
age 15-45	5.9%	273	5.4%	391	0.9
age 45-65	7.7%	323	4.9%	611	0.1
age > 65	5.9%	1601	4.3%	1622	0.05
blood	7.8%	128	3.6%	167	0.2
urine	4.5%	1103	3.3%	1868	0.1

Temporal trends for E. coli

- From 2004 – 2010 3GR increased from about 1 to 4% in south-west and from 1 to 5% in east-Switzerland.
- Increase was comparable in in- and outpatients.
- In outpatients data were congruent for analysis from 2004 onwards and 2006 onwards.
- In inpatients inclusion of one >500bed hospital in south-west Switzerland in 2006 led to higher 3GR rates. However the increase rate was comparable.

South-west

East

Outpatient

Inpatient

Subgroup analysis (data 2004-2010 pooled)

- 3GR increase was observed in all age groups an in urinary samples as well as in blood cultures.
- 3GR increase was more pronounced in bigger hospitals and occurred in all hospital departments.

Temporal trends for K. pneumoniae

- From 2004 – 2010 3GR increased in east and south-west-Switzerland.
- Increase was comparable in in- and outpatients.
- In 2010 3GR tended to be higher in south-west Switzerland (p=0.08). This trend could be observed in in- and outpatients.
- Due to small numbers overlap of data from 2004 onwards versus data from 2006 onwards was less complete as for *E. coli*, although trends were comparable.

South-west

East

Outpatient

Inpatient

Subgroup analysis (data 2004-2010 pooled)

- As in *E. coli* 3GR increase was observed in all subgroups and was more pronounced in bigger hospitals.
- The peak in patients <2years in 2006 was caused by an outbreak in a single hospital.