Temporal trends and resistance patterns in nosocomial lower respiratory tract pathogens: an analysis of a nationwide surveillance, Switzerland, 2008-2018

#2604

Birrer Michèle MD[1], Marschall Jonas MD[1], MSc[1], Atkinson Andrew PhD[1], Kronenberg Andreas MD[1,2], Sommerstein Rami MD[1] and the Swiss Centre for Antibiotic Resistance (ANRESIS)
[1] Department of Infectious Diseases, Bern University Hospital, Switzerland; [2] Institute for Infectious Diseases, University of Bern, Switzerland

Hospital-acquired pneumonia is an important cause of morbidity and mortality worldwide. Surveillance studies reporting trends in pathogen distribution and resistance patterns in hospital-acquired pneumonia are scarce. Our aim was to investigate temporal trends of pathogen distribution and resistance patterns in nosocomial lower respiratory tract specimens.

This surveillance study is based on nationwide data from Anresis.ch, the Swiss Centre for Antibiotic Resistance, from 01/2008 - 08/2018. We included nosocomial respiratory samples (days 2-30 of hospitalization). Follow-up duplicate isolates on a species level from an individual patient were excluded. Co-variables included age group, gender, healthcare institution, department of sample acquisition and specimen recovery method. We used Poisson regression models to test for trends in pathogen distribution and cumulative antimicrobial resistance. Generalized additive models were used to examine antimicrobial resistance for individual pathogens.

Result of ANRESIS Query
Inpatient samples only
Study period: 01/2008 – 08/2018
1'048'576 resistance tests
165'073 isolates (=100%)
73'637 patients

→ **48'629 (29%) duplicate (follow-up) isolates excluded**

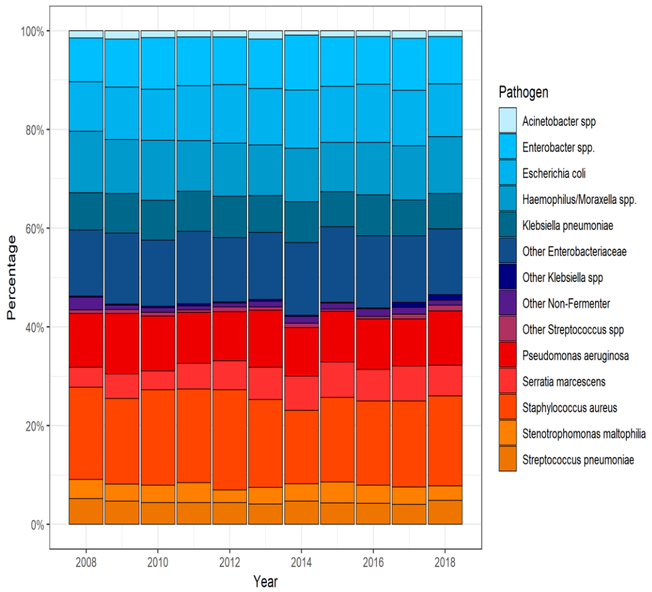
116'444 (71%) first isolates

→ **82662 (50%) isolates excluded**
56'620 (34%) day of hospitalization not available
26'042 (16%) day hospitalization ≠ day 0, 1, or >30

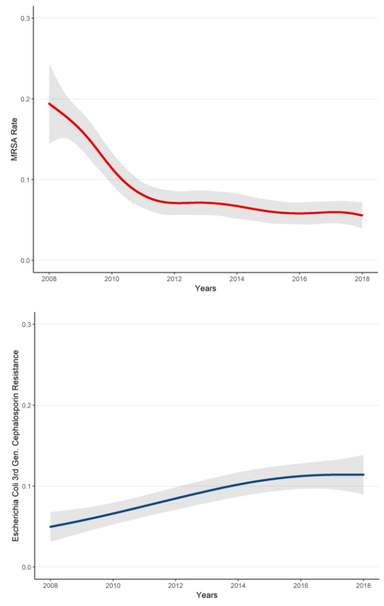
33'782 (20%) isolates recovered between day 2-30 of hospitalization

→ **2'553 (2%) isolates excluded**
1268 (50%) Isolates from «colonizers», *Aspergillus spp* and *Mycobacterium tuberculosis complex*
808 (32%) Isolates not belonging to predominant species i.e. n <30)
477 (19%) Isolates from foreign countries

31'229 (19%) isolates included (=100%)
5'584 (18%) *Staphylococcus aureus*
4'375 (14%) *Other Enterobacteriaceae*
3'471 (11%) *Escherichia coli*
3'427 (11%) *Haemophilus/Moraxella spp*
3'317 (11%) *Pseudomonas aeruginosa*
3'110 (10%) *Enterobacter* spp.
2'435 (8%) *Klebsiella pneumoniae*
1'816 (6%) *Serratia marcescens*
1'407 (5%) *Streptococcus pneumoniae*
1'106 (4%) *Stenotrophomonas maltophilia*
429 (1%) *Acinetobacter spp*
408 (1%) *Other Non-Fermenter*
229 (1%) *Other Streptococcus spp*
115 (0%) *Other Klebsiella spp*



Proportion of Groups of respiratory pathogens over the years
Bacterial groups are plotted according to their proportion of recovery per year. *Serratia marcescens* was an emerging pathogen (relative annual increase of 5.6%; 95% CI [4.1%, 7.2%], p<0.001).



Resistance rate for selected species in respiratory samples
Generalized additive model. Trend of Resistance rate of important antibiotics for two relevant bacterial pathogens are shown over the years. Top to bottom: Methicillin-resistant *Staphylococcus aureus (MRSA)*, 3rd Generation Cephalosporin resistant *Escherichia coli (3GCR E.coli).* The corresponding 95% confidence intervals are grey-shaded.
Among the 5'584 (18%) Staphylococcus aureus, *MRSA* rate decreased significantly from 18% (95% CI [15%, 21%]) in 2008 to a rate of 6.3% (95% CI [5.5%-7.2%]) between 2012 to 2018 (p<0.001). Among the 3'471 (11%) *E. coli*, 3GCR rate increased linearly and significantly from 5.0% (95% CI [3.2%-8.3%]) in 2008 to 9.1% (95% CI [5.3%-14.8%]) in 2018 (p<0.001).

Overall proportion of Resistant bacterial pathogens in respiratory samples
The overall proportion of first and second-line antimicrobial resistant pathogens was stable from 2008-2018 (annual increase of 0.3%; 95% CI [-0.5%, 1.0%], p=0.53). In comparison to days 2-4, a sample taken between days 5-10 was associated with a 40% (95% CI [32%, 49%], p<0.001) increase in resistance, and between days 11-30 with a 73% (95% CI [63%, 84%], p <0.001) increase in resistance.

Cumulative antimicrobial resistance in hospital-acquired pneumonia pathogens did not change over the last years, arguing against broadening empirical therapy on a routine basis. Nevertheless, there were pathogen specific changes, with a decrease in *MRSA* and an increase in *3GCR E. coli*. Emergence of *Serratia marcescens* as a lower respiratory tract pathogen requires further evaluation.

Disclosures: none