Trends in MRSA 2008 – 2011:
A longitudinal analysis of data from the German Antimicrobial Resistance Surveillance (ARS)

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Background

ARS is a voluntary laboratory-based surveillance system collecting resistance data of all clinical pathogens and sample types from hospital and ambulatory care. Cross-sectional analysis based on all data available in each year for the time period 2008 to 2011 shows a decrease of the proportions of Meticillin-resistant *Staphylococcus aureus* (MRSA) in hospital care from 2010 to 2011. Due to new entries of laboratories and fluctuation in hospital-laboratory-relationships the sample of participating hospitals changes over time. Therefore, trends in MRSA in hospital care, in intensive care units (ICU) and in isolates from blood cultures are analyzed longitudinally based on data from hospitals with continuous participation over three and four years respectively.

Materials & Methods

Proportions of MRSA are computed on a yearly base for the years 2008 to 2011 based on interpretations of susceptibility to oxacillin as resistant or susceptible of non-duplicate isolates of *S. aureus* excluding screenings. Three samples of hospitals are compared: (a) all hospitals contributing data in each year, (b) hospitals with continuous participation 2008-2011 and (c) hospitals with continuous participation 2009-2011; analysis is done for isolates from hospital care, from intensive care units and isolates from blood cultures. Differences of proportions are evaluated as significant if 95-percent confidence intervals do not overlap.

Results

The sample for cross-sectional data is composed of 145 hospitals in 2008, 228 in 2009, 226 in 2010 and 214 in 2011; for longitudinal analysis 124 hospitals contributed data continuously from 2008 to 2011 and 193 hospitals for the three-year period 2009 to 2011. Results are given in table 1.

The decrease in MRSA proportions from 2010 to 2011 in overall hospital care and in blood cultures seen in cross-sectional data is confirmed by longitudinal analysis based on *S. aureus* isolates from hospitals with four-year continuous participation as well as those with three-year continuous participation; in both cases differences are significant, whereas the reduction of MRSA proportions in ICUs is not. With regard to numbers of *S. aureus* isolates in the two longitudinal samples a constant rise over time can be observed which is steeper in ICUs and blood cultures than in overall hospital care.

category		*cross-sectional*			*longitudinal*			*longitudinal*		
		all hospitals per year			*hospitals with continuous participation 2008 - 2011*			*hospitals with continuous participation 2009 - 2011*		
	year	R %	CI 95%	n	R %	CI 95%	n	R %	CI 95%	n
hospital care - overall	2008	20.3	19.6 - 20.9	14,187	19.6	18.9 - 20.3	12,909			
	2009	23.3	22.7 - 23.9	20,686	21.7	21.0 - 22.3	14,287	23.3	22.7 - 23.9	19,509
	2010	23.2	22.6 - 23.7	22,954	22.0	21.3 - 22.7	14,691	23.5	22.9 - 24.1	21,468
	2011	21.0	20.5 - 21.5	23,531	20.1	19.4 - 20.7	14,098	21.7	21.2 - 22.3	21,177
hospital care - ICU	2008	23.6	21.6 - 25.7	1,650	22.8	20.7 - 24.9	1,544			
	2009	25.8	23.9 - 27.6	2,146	25.0	22.9 - 27.1	1,649	25.4	23.5 - 27.3	2,028
	2010	25.4	23.7 - 27.1	2,460	25.2	23.2 - 27.3	1,806	25.6	23.8 - 27.4	2,314
	2011	22.6	21.0 - 24.1	2,781	22.7	20.9 - 24.6	1,904	23.9	22.2 - 25.5	2,485
hospital care - blood cultures	2008	22.4	19.5 - 25.4	780	22.4	19.2 - 25.5	671			
	2009	21.0	18.7 - 23.2	1,221	20.6	17.8 - 23.4	802	20.7	18.4 - 23.0	1,145
	2010	24.6	22.3 - 26.8	1,416	25.9	23.0 - 28.7	932	24.4	22.1 - 26.7	1,340
	2011	18.0	16.1 - 19.9	1,549	17.8	15.4 - 20.1	1,029	18.1	16.1 - 20.1	1,446

Table 1: MRSA in hospital care in Germany 2008 - 2011 - cross-sectional and longitudinal analysis for three categories: overall, intensive care units (ICU), blood cultures. Proportions of MRSA (R%), 95-percent confidence intervals (CI 95%) and number of S. aureus isolates tested (n).

Conclusion

The decrease in MRSA proportions in hospital care from 2010 to 2011 was confirmed by longitudinal analysis excluding sample effects as explanation for the cross-sectional findings. The rising numbers of *S. aureus* isolates over time in the longitudinal analysis may point to potential confounding factors such as patient mix or frequency of sample taking. For clarification further information such as number of patient days and frequency of blood cultures taken is needed.

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