Trends of ventilator-associated pneumonia incidence in the elderly patients admitted in French intensive care units between 2007 and 2014

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Background: During the last decade, the number of elderly patients admitted to intensive care unit (ICU) has increased due to secular trends and improvement of ICU outcomes. Elderly are particularly exposed to healthcare-associated infections (HAI) due to age-associated physiological and anatomical conditions. In ICU, ventilator-associated pneumonia (VAP) remains the major cause of HAI, but epidemiologic data on VAPs in the elderly are limited. The objective was to assess the trends of VAP incidence according to age, with particular focus on elderly patients admitted in ICUs in France between 2007 and 2014.

Material/methods: Data of the multicenter prospective French National HAI surveillance Network in ICU (REA-RAISIN) were analyzed. All adult patients hospitalized ≥48h between 01/01/2007-31/12/2014 in an ICU participating in the network were included; ICU participating ≥2 complete years during the period were selectively included. VAP was defined according to standardized criteria in accordance with ECDC definition. Four time periods were defined: 2007-2008, 2009-2010, 2011-2012, 2013-2014. Age was categorized in 3 groups: adult (18-65y), old (65-75y) and very old (75+y). VAP incidence rates were expressed for 1000 intubation-days. Overall and age-stratified multivariate mixed-effects Poisson regressions were performed to examine the effect of age and time period on the VAP incidence rates, center was the random effect.

Results: 129,220 patients, accounting for 986,602 intubation-days, were included in the study; 47.8% were adults, 22.4%, and 29.8% very old. 12.4% developed VAP. Mean age ± standard deviation was 63.4±16.4 years, sexe ratio M/F was 1.73. 25.1% of patients died during the hospitalization. Overall VAP incidence rates were 17.4 (N=7965, 95% CI: 17.0-17.8), 16.2 (N=3830, 95% CI: 15.7-16.7), 14.7 (N=4284, 95% CI: 14.3-15.1) for each group, respectively. Third-generation cephalosporin-resistant Enterobacteriaceae were identified in 21.2% of VAPs in adults group, 23.0% in olds group and 23.8%

in very olds group (*P*=0.006), meticillin-resistant *Staphylococcus aureus* was identified in 4.8% of VAPs in adults group, 5.7% in olds group and 8.0% in very olds group (*P*<0.001). Overall adjusted incidence decreased by 6.8% (95% CI: 2.3-11.1%, P=0.004) from 2007-2008 to 2013-2014. Age was independent risk factor for VAP (adjusted incidence rate ratio [aIRR]=0.924, 95% CI: 0.889-0.962, P<0.001) in adult compared with very old patients. The stratified models disclosed that adjusted VAP incidence decrease selectively in the adults group in 2013-2014 compared with 2008-2009 (aIRR=0,907, 95% CI: 0.848-0.969, P=0.004).

Conclusions: Very old age was associated with a lower VAP incidence rate, but a higher proportion of multi-resistant bacteria in ICU patients from France. Decreased VAP incidence rate was observed only for the adult age. Infection control measures targeted to the elderly patients with focus on multi-resistant bacteria and geriatric evaluation might help prevent VAP in this increased population.