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Nationwide multicentre survey on multidrug-resistant Pseudomonas aeruginosa isolates in Belgian hospitals in 2015 and in 2016

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Background: The increasing prevalence of nosocomial infections produced by multidrug resistant (MDR) *Pseudomonas aeruginosa* (PA) severely compromises the selection of appropriate treatment and is associated with significant morbidity and mortality. The aims of this study were to determine the proportion and incidence of MDR PA isolates in Belgian hospitals in 2015 and to assess the in vitro susceptibility patterns and ß-lactam resistance mechanisms in a large collection of MDR clinical PA isolates that were isolated in 2016.

Material/methods: All hospitals laboratories participating to the Belgian national surveillance network (NSIH) were invited to collect data on the proportion and incidence (/1000 admissions) of MDR PA isolates (defined by resistance to ≥4 classes of antimicrobials among expanded-spectrum cephalosporins, broad-spectrum penicillins, carbapenems, aminoglycosides, quinolones, polymyxins) in 2015 and to collect prospectively up to 5 nonduplicate isolates over a 3 month period in 2016. MICs of 12 antipseudomonal antibiotics were determined centrally by microdilution using customized Sensititre panels (TREK Diagnostic, Thermo Fisher, UK) according to CLSI guidelines. All isolates were analyzed by multiplex PCR and sequencing with specific primers targeting most class A, B and D β-lactamase coding genes. The epidemiological relatedness of the strains was studied by PFGE and MLST.

Results: Overall, MDR were found in 103 (83%) out of 124 hospitals who reported data on incidence (mean: 0.78/1000 admissions; range; 0 to 9.71/1000); Mean proportion of MDR PA was 5.5% (Range: 0 to 31.9%) with no significant variations by region nor by size or type of hospital. Of 191 isolates received, 143 (75%) originating from 45 hospitals were confimed as MDR PA. Colistin was the only agent tested which remained consistently active (100% susceptibility). The other drugs were active against <10 to 40% of the isolates. Metallo-β-lactamases (MBLs) were detected in 50% of the MDR PA (VIM-2 [n=57], VIM-4 [n=12]). Minor ESBLs (GES-1, BEL-1, PER-1) were found in 14 isolates while penicillinases of OXA type were found in 23 strains (OXA-2 group, [n=9]; OXA-1 group, [n=8]; OXA-10 group, [n=4], OXA-9, [n=2]).The MBL VIM-producing isolates clustered in 14 different PGFE types and belonged to 9 different STs among which ST111 and ST235 clones were predominant (70% of all STs). In comparison to studies performed in 2010 and in 2013 there has been an increase in proportion, incidence and diversity among MDR PA isolates which are now encountered in all regions and almost all institution types including non-university hospitals of smaller bed size.

Conclusions: A rapid spread of several MDR PA clones predominantly involving VIM-2 and VIM-4 has occurred in Belgian hospitals over the last years. The wide diffusion of MDR PA isolates in Belgium raises concern both for patient management and infection control and underlines the need for continuous epidemiological monitoring.