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Large nosocomial outbreak of extended-spectrum beta-lactamase-producing Enterobacter cloacae at one Belgian university hospital

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Background: To describe an outbreak of extended-spectrum beta-lactamase-producing *Enterobacter cloacae* (ESBL-Entclo), which occurred in the ICU and cardiothoracic surgery wards of a Belgian university hospital.

Material/methods: A first case of ESBL-Entclo was detected in 11/2015 in a patient referred from another hospital and who developed sepsis after a cardiac surgery (CS). Thereafter, several other cases were detected only in CS patients hospitalized in different wards. Since 01/2016, active culture surveillance for asymptomatic carriage was implemented prospectively upon admission and on weekly basis from patients in the affected units. Risk factors were assessed by a case-control study (control

group being defined as patients present in the same units over the same period but not colonized/infected by ESBL-Entclo). Available isolates were characterized by multiplex PCR for beta-lactamases and typed by Rep-PCR and MLST.

Results: Over a 3-month period, 42 cases (33 colonizations, 9 infections [7 pneumonia, 2 mediastinitis]) were identified with an attack rate of 52% of patients who underwent a CS procedure. The majority of case acquisitions occurred in ICU (n=25) or in CS wards (n=14). Median time between surgery and colonization was 6 days in patients with positive rectal swabs (3 to 64 days) and 1.4 days (0 to 3 days) in patients with positive throat swabs. In comparison to controls, the duration of hospital stay of affected patients increased by 17 days. The 30-day overall mortality rate was 9.5%. All outbreak-related Entclo isolates produced a CTX-M-15 ESBL and were resistant to gentamicin but susceptible to carbapenems. Eighty-five percent of the ESBL-Entclo belonged to one Rep-PCR type and to MLST type ST190. The following risk factors were identified in the univariate analysis: hospitalization in ICU, previous CS, temperature monitoring by esophageal or by rectal probes during surgery and previous exposure to a transesophageal echocardiography device (TEE). In multivariate analysis only exposure to TEE remained significantly associated with colonization/infection (p=0.01). Several infection control deficiencies were observed in the operating room or during the post-operative care, most notably a lack of standardization of the cleaning/disinfection processes of the TEE probes dedicated for the CS. Despite multiple negative cultures and lack of physical defects, removal of the suspected contaminated TEE probe resulted in the rapid termination of the outbreak.

Conclusions: We report a large nosocomial outbreak caused by ESBL-Entclo in cardiac surgery patients that was indirectly shown to be associated with contamination of a TEE probe used during intervention. This outbreak caused major clinical and economic impairments at institutional level. The instrumental role of the infection control team was obvious both for early continuous monitoring as well as for implementation of appropriate measures to achieve the eradication of the outbreak.