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KPC-producing Klebsiella pneumoniae outbreak associated with an environmental reservoir in an ICU

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Background:

Carbapenemase producing enterobacteriaceae (CPE) have become an important threat worldwide. Infections with such bacteria are associated with poor outcome, especially in intensive care units (ICU). We report here an outbreak of KPC producing *Klebsiella pneumoniae* (KPC Kp) in a surgical ICU with an environmental reservoir.

Material/methods:

We investigated a 15 months outbreak in a surgical ICU starting in November 2013. From January 2015 to September 2016 patients in the ICU were screened at admission, on a weekly basis and on discharge for carbapenemase carriage.

During summer 2015, after several sporadic cases of acquisition, we conducted an environmental investigation of all sinks, potential materials associated with cross-transmission and several dry surfaces in the ICU to identify an environmental reservoir.

Sinks, material and surfaces samples were taken with sterile, cotton-tipped swab.

All samplings (patients and environmental) were cultured on chromID CARBA SMART (Biomérieux – France) and carbapenemase type were confirmed by PCR.

Strains were compared by pulsed –field gel electrophoresis (PFGE) profiles.

Results:

In November 2013, a patient from Greece was admitted to the surgical ICU. Rectal sampling on admission was positive for KPC Kp. She was the only case with a history of hospitalization abroad during the outbreak. A single secondary case occurred through cross-transmission. A new case was detected in the same ICU in March 2014, 4 months after discharge of previous cases, in a different room. Two other sporadic cases in December 2014 and July 2015 resulting in cross transmissions to 3 patients. Considering these sporadic acquisition, without any link between them, we investigated a potential environmental source of transmission. KPC Kp was found in the effluent reservoir of a bedside shower device, in siphons from 4 rooms (31% of sink samples) including the carrier's room, but none on dry surfaces. An intensive cleaning program and change of all siphons in the ICU was decided and the bedside shower device was removed from ICU. Cleaning protocols for siphons and surfaces, and hand hygiene compliance were reinforced along with cohorting to control the outbreak which had spread to 12 other patients during the next 3 months (figure 1). A total of 20 patients acquired KPC Kp in the ICU over a 15 months period. Six patients developed KPC infections resulting in death in one patient.

PFGE comparison showed a similar strain in all patients.

Conclusions:

We report here the persistent transmission of a single KPC Kp clone in a surgical ICU with a role of water environment in the transmission of the bacterial strain. Control of an outbreak is challenging in ICU, and environmental investigation should be conducted promptly after several sporadic cases. Closing the ICU to thoroughly clean the environment should be considered in such situations.

Figure 1 :