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

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INTRODUCTION AND PURPOSE

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.

METHODS

➢ Setting:
Surgical ICU (12 beds) at a French University Hospital

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

➢ Environmental sampling :
Sinks, material and surfaces samples were collected with sterile, cotton-tipped swab.

➢ Microbiological methods :
All samples (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. Outbreak is resumed on synoptic table (figure 1)

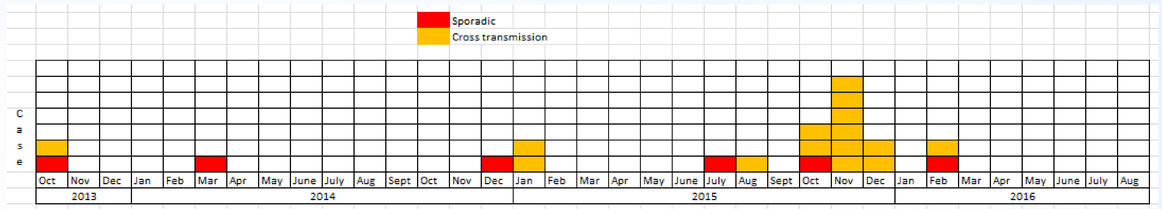

Figure 1 : Synoptic table

Considering these sporadic acquisition, with no link between them except ICU ward, we investigated a potential environmental source of transmission in July 2015. A bedside shower device (figure 2) was sampled and found positive for KPC. It was removed from ICU at this point.

Figure 2 : bedside shower device

In October 2015, another sporadic case occurred. Further investigation was conducted. Thirty-one samples were taken (eSwabs) on dry surfaces and from all sinks in the unit (1 sink per room + 5 other sinks spread in the unit). Five of them (16%) came back positive, all from different patient's room sink. All other samples were negative, including unit's sinks.

An intensive cleaning program and change of all sinks in the ICU was decided. Cleaning protocols for sinks and surfaces, along with hand hygiene compliance were reinforced. A cohorting of all cases with dedicated personnel was necessary to control the outbreak. Early termination of cohorting with a carrier still present resulted in further transmission in the ICU. It took 5 months to fully control the outbreak even after removing the environmental reservoir

Adapted from van der Mee-Marquet 2017

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 and environmental samplings.

CONCLUSIONS

Facing a sporadic acquisition of the same microorganism in a same ward, environmental investigations should be conducted. Carbapenemase producing enterobacteriaceae in contaminated sinks have been reported as outbreak source before[1,2]. To control such outbreak in ICU, cohorting cases and contacts is mandatory, along with reinforcements of hand hygiene, cleaning, and management of waste.

[1]De Geyter et al. The sink as a potential source of transmission of carbapenemase-producing Enterobacteriaceae in the intensive care unit. Antimicrob Resist Infect Control. 2017 Feb 16;6:24
[2]Clarivet B et al. Persisting transmission of carbapenemase-producing Klebsiella pneumoniae due to an environmental reservoir in a university hospital, France, 2012 to 2014. Euro Surveill. 2016 Apr 28;21(17).