**BACKGROUND**

Nosomial carbapenemase resistant enterobacteraceae (CRE) is an emerging threat in Canada and worldwide. CRE represents challenges for healthcare facilities in spite of the strict adherence to infection control standards and practices. Carbapenemases are hydrolyzing enzymes responsible for resistance to a broad-spectrum type of beta-lactam antibiotics. The ease of horizontal gene transfer and ability to survive in hospital environment plays an important role in nosomial outbreaks with CRE. A contaminated hospital environment could serve as a potential frequent source for the spread of resistant genes, either directly or indirectly via health care workers.

**OBJECTIVE**

To investigate the source of a prolonged but sporadic nosomial outbreak of blaGES-5 containing carbapenemase producing bacteria and the potential epidemiological link between cases identified at a tertiary care hospital.

**METHOD**

Patients were identified as being colonized or infected with a blaGES-5 containing carbapenemase producing enterobacteraceae through clinical and surveillance cultures from October 2010 through August 2015. Multiple surveillance environmental samples were collected from patients' rooms in the wards, general system (GSICU) and cardiovascular intensive care unit (CVICU) in attempt to identify a source. Molecular typing using pulse filed gel electrophoresis; multiplex PCR and DNA sequencing using 454 pyrosequencing (454-Genome Sequencer FLX; Roche Diagnostics) were conducted on all isolates for genetic fingerprinting at the National Microbiology Laboratory (NML) in Winnipeg.

**RESULTS**

Seven patients were infected or colonized with bacteria harboring the blaGES-5 gene over a 5 year period. A blaGES-5 *Escherichia coli* was isolated from 2 patients in cardiovascular intensive care (CVICU), *Serratia marcescens* was isolated from 3 patients in general systems intensive care (GSICU), and *Raoallita planticola* was isolated from 2 patients in CVICU.

All patients acquired infection or colonization > 2 weeks after hospitalization. Environmental swabs were taken from all rooms where positive patients were identified. Positive results were identified from sink drains in 2 rooms in CVICU. After increased cleaning, the sink drains from one of the CVICU rooms was persistently culture negative while the drain from the other room remained positive. The sinks were replaced and the new sinks were tested for the presence of blaGES-5 on a monthly basis and were negative for a period of 6 months but then became positive again. This coincided with a shortage of the accelerated hydrogen peroxide gel that was used on a weekly basis. When this product was reintroduced, the sink again became negative.

**CONCLUSION**

This study described an outbreak of blaGES-5 containing enterobacteraceae over a 5 year period. This outbreak was unique in the fact that cases were identified very sporadically with a minimum time between cases of 4 months. This carbapenemase producing gene is also unique in that it has not been previously described in the hospital setting. We feel the most likely source of the outbreak was a contaminated sink given the persistence of the growth despite measures being taken to eradicate the bacteria. This highlights the difficulty in eradicating biofilm in hospital water systems. In the absence of eradication, diligence with respect to hand hygiene and ongoing surveillance is of paramount importance.