High Asymptomatic Carriage of Carbapenem Resistant Enterobactiaceae and Vancomycin Resistant Enterococcus by Active Screening for Intubated Patients in ICU and RCU

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Methods

Background

Multi-drug resistant organisms (MDROs) pose a threat to human health in recent years. Asymptomatic colonization of MDROs was often overlooked and played an underestimated role in nosocomial infection.

From September 2015 to December 2016, a prospective study was conducted in Changhua Christian hospital, a tertiary hospital with 1,684 inpatient beds. Rectal swabs were collected for every intubated patient admitted to our intensive care units (ICU) and respiratory care units (RCU). A selective culture medium (ChromID™ CARBA agar) was used for active screening of carbapenem resistant Escherichia coli (CREC), carbapenem resistant Klebsiella pneumoniae(CRKP) and vancomycin resistant enterococci (VRE). A multivariate logistic regression model was applied to identify independent variables associated with positive stool carriage of MDROs. CRKP was further tested for Klebsiella pneumoniae carbapenemase (KPC) and New Delhi metallo-beta-lactamase 1 (NDM-1) gene. Pulsed field gel electrophoresis was used for phylogenetic analysis.

Results

A total of 1,146 patients were screened for asymptomatic carriage of enteral MDROs. The carriage rates by rectal swab were 13.1%, 0.3% and 6.4% for VRE, CR-EC and CR-KP, respectively. The factors associated with positive stool carriage of MDROs including age (relative risk [RR], per 1-year increase, 1.01; 95% confidence interval [CI], 1.00-1.02, p=0.035), chronic respiratory failure with long-term intubation (RR 3.07; 95% CI, 1.89-5.00, p<0.001), and recent broad-spectrum antibiotics exposure (RR 2.50; 95% CI, 1.83-3.43, p<0.001). The 64.5% of CRKP from rectal swab was positive for KPC gene but none was positive for NDM-1 gene. All KPC positive isolates were belong to the same strain.

Conclusions

Multi-drug resistant organisms (MDROs) pose a threat to human health in recent years. Asymptomatic colonization of MDROs was often overlooked and played an underestimated role in nosocomial infection. A total of 1,146 patients were screened for asymptomatic carriage of enteral MDROs. The carriage rates by rectal swab were 13.1%, 0.3% and 6.4% for VRE, CR-EC and CR-KP, respectively. The factors associated with positive stool carriage of MDROs including age (relative risk [RR], per 1-year increase, 1.01; 95% confidence interval [CI], 1.00-1.02, p=0.035), chronic respiratory failure with long-term intubation (RR 3.07; 95% CI, 1.89-5.00, p<0.001), and recent broad-spectrum antibiotics exposure (RR 2.50; 95% CI, 1.83-3.43, p<0.001). The 64.5% of CRKP from rectal swab was positive for KPC gene but none was positive for NDM-1 gene. All KPC positive CRKP were belonged to same genotype by PFGE.

A high rate of asymptomatic CRE and VRE carriage was demonstrated by active screen for intubated patient admitted to ICU and RCU. The PFGE analysis of CRKP disclosed a single strain transmission in the study hospital. In addition to proactive isolation, study aiming on methods of de-colonization is warranted to prevent further intra-hospital transmission.