Factors associated with transmission of carbapenemase producing Enterobacteriaceae around a known carrier

P1032

Legeay C[1], Thépot-Seegers V[2], Hilliquin D[1], Pailhoriès H[3], Zahar JR[1]

[1] Infection Control and Prevention, [2] Service d'Information Médicale, [3] Laboratoire de Bactériologie, Institut de Biologie en Santé
CHU Angers, Université d'Angers, France

26th ECCMID Amsterdam, Netherlands 9 – 12 April 2016
ESCMID

INTRODUCTION AND PURPOSE

Carbapenemase producing enterobacteriaceae (CPE) have become an important threat worldwide. However, few is known about factors limiting the occurrence of secondary cases and the most effective interventions in preventing cross transmission.
We investigated an ongoing CPE outbreak in a French teaching university hospital. Our objective was to identify factors associated with the transmission of CPE around a known carrier, in absence of cohorting. CPE carriers were isolated with contact precautions.

METHODS

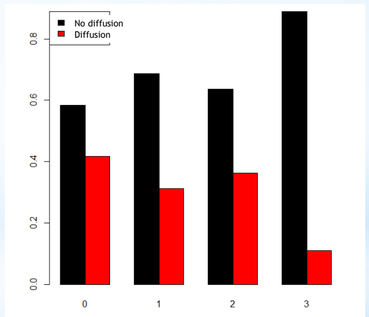
- Design : retrospective descriptive study
- Inclusion criteria : each period of 2 consecutive weeks where, 1) known CPE carriers were admitted in our hospital and 2) among which 80% of relative contacts were screened, were included.
- Data collected : unit type, colonization pressure as defined in the literature[1], patient/nurse ratio, hand hygiene compliance (HHC)*, hydro-alcoholic product (HAP) consumption**, antibiotic consumption*** and infection control team (ICT) involvement through educational sessions and audits****.
- Statistics : we compared time periods where secondary cases were acquired to periods without any new acquisition. Using a logistic regression we identified factors associated with secondary transmission. A p value < 0.05 was considered significant.
- Definitions : * compliance measured through direct observation (total HH observed / total HH expected); ** total HAP consumed / total HAP consumption expected according to ward activity ; *** antibiotic consumption based on annual data, ranking by quartile in low, medium and high consumption compared to hospital median ; **** rank according to frequency of educational sessions and/or audits : 0 = none, 1 = 1 or 2 per week ; 2 = 3 per week ; 3 = daily audit

RESULTS

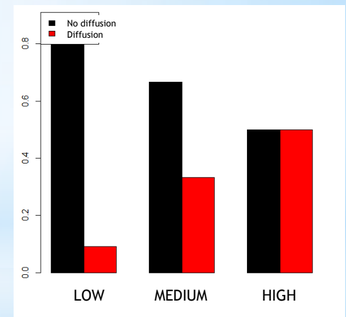
A total of 48 periods were identified. Among them 15 resulted in cross-transmission, while 33 did not. All those cross-transmission involved 1 patient, but one of those secondary case generated 4 other cases. Fourteen different wards admitted CPE carriers during the study. Median colonization pressure (carriers-day / patients-day * 100) was 4.9% (1.1 – 25.0). Results are summarized in table 1. In univariate and multivariate analysis (table 2), antibiotic consumption was the only factor significantly associated with increased cross-transmission (OR = 34,38 ; CI 95% 1,01 – 1173,03 ; p < 0,05).
Diffusion occurred more frequently when the colonization pressure was superior to the median (12.5% versus 50%) (not significant - NS). Cross transmission occurred less frequently when ICT has audited daily (score 3) comparing to time period were auditing was less frequent (NS). Whereas cross-transmissions occurred in 36% of studied periods when hand hygiene compliance was below 80%, this rate dropped to 27.2% when HHC was above 80% (NS). However, these factors remained non-significant, probably due to lack of power. No effect was observed for caregiver/patient ratio or hydro-alcoholic product consumption.

Table 1 : Results for collected data regarding CPE cross-transmission.

	Average	Median	Minimum	Maximum
Number of carriers in a single period	1.9	1.0	1.0	7.0
Patient/Nurse ratio	1.7	1.7	0.8	3.8
Colonization pressure (%)	7.7	4.9	1.1	25.0
Hand hygiene compliance (%)	64.8	72.0	39.0	100.0
HAP consumption (% of the expected volume)	126.0	130.0	56.0	390.0
ICT involvement in points	1.4	1.0	0.0	3
Antibiotic consumption in DDD / 1000 patient days	1 550,5	1 113,5	55.6	2 884.3



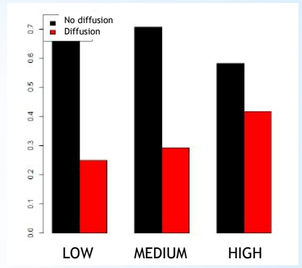
Diffusion according to audit frequency



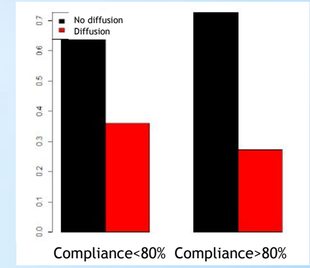
Diffusion according to antibiotic consumption[§]

Table 2 : Univariate and multivariate analysis of factors associated with CPE transmission.

		UNIVARIATE				MULTIVARIATE			
		OR	95% CI		p	OR	95% CI		p
Patient/Nurse ratio		0.90	0.22	3.58	0.88	22.55	0.22	2340.78	0.19
HAP consumption (% of the expected volume)		1.00	0.99	1.02	0.53	1.01	0.99	1.03	0.37
Colonization pressure	Medium vs low	1.24	0.26	5.97	0.79	1.59	0.24	10.59	0.63
	High vs low	2.14	0.38	12.20	0.39	2.34	0.22	24.76	0.48
Antibiotic consumption in DDD / 1000 patient days	Medium vs low	5.00	0.54	46.14	0.16	11.96	0.67	214.24	0.09
	High vs low	10.00	0.96	104.49	0.05	**34.38**	**1.01**	**1173.03**	**0.05**
ICT involvement		0.67	0.36	1.25	0.21	0.51	0.18	1.46	0.21
Hand hygiene compliance (%)		0.67	0.19	2.31	0.52	2.93	0.22	38.50	0.41



Diffusion according to colonization pressure [§]



Diffusion according to hand hygiene compliance

§ Low = first quartile ; Medium = second and third quartile ; High = fourth quartile

CONCLUSIONS

In our study, antibiotic consumption was the only factor significantly associated with CPE cross-transmission. These results are limited by lack of power, and should be validated by a larger study. In absence of cohorting, managing CPE requires the ICT involvement to support HCW and to ensure a high compliance to hand hygiene.

[1] Merrer J1, Santoli F, Appéré de Vecchi C, et al. "Colonization pressure" and risk of acquisition of methicillin-resistant Staphylococcus aureus in a medical intensive care unit. Infect Control Hosp Epidemiol. 2000 Nov;21(11):718-23.