

Risk factors for cross-transmission of carbapenem-resistant Enterobacteriaceae (CRE): variables related to exposed patients, CRE-carriers and wards

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INTRODUCTION

- » Carriage of CRE is rising worldwide¹
- » Treatment options for CRE infections are limited²
- » Attributable mortality of infections is high (37%-50%)³
- » CRE carriers often have poor functional status⁴
- » CRE carriers are prone to hospital readmissions⁵
- » Strict infection control measures are crucial to limit the spread of CRE^{6,7}

CRE Cross-transmission

- » **Cross-transmission:** physical movement or transfer of pathogenic bacteria from one person, object, or place to another
- » **CRE cross-transmission case:** a patient exhibiting positive rectal (or clinical) culture after a roommate's (or a patient in another room treated by the same health care worker) identification as a new CRE case

OBJECTIVES

- » The study aim was to find the risk factors for cross-transmission of CRE post exposure
- » **Dependent variable:** cross-transmission / no cross-transmission
- » **Independent variables** related to the **CRE-carriers (transmitters)**
- » **Independent variables** related to **exposed patients**
- » **Independent variables** related to the **ward of exposure**

METHODS

- » A **retrospective cohort** study conducted between **2007-2012**
- » Study **population:** patients who were **inadvertently exposed to CRE-carriers** in the same room or were treated by the same nursing personnel and were screened to determine cross-transmission
- » Data was extracted from the **electronic health records** at Kaplan Medical Center
- » Demographic variables, comorbidities, clinical status, antibiotic treatment, invasive procedures, length of exposure and specific wards were examined in an **univariate analysis**
- » A **Poisson model** examined the hazard ratio of **transmission** from the CRE-carriers
- » **Multivariable logistic model** for variables of the CRE-carriers (identified by the Poisson model), exposed patients and wards of exposure

RESULTS

- » In 1,403 hospitalizations of 1,353 patients an inadvertent exposure to a CRE-carrier occurred
- » 328 CRE-carriers exposed other patients in 414 hospitalizations
- » 38 (11.6%) CRE-carriers transmitted CRE
- » 50 (3.7%) exposed patients were infected
- » The **CRE-carrier at risk** to transmit CRE used **antibiotics** in the prior 3 months, had CRE in **clinical culture**, had **chronic lung disease** and had a **catheter on admission**
- » The **exposed patients at risk** to become infected with CRE were **ventilated** and used **antibiotics** in the prior 3 months
- » The **wards at risk** for cross transmission were **internal medicine** wards
- » Exposure time of **≥6 days** was a risk factor

Flowchart of the Study Population

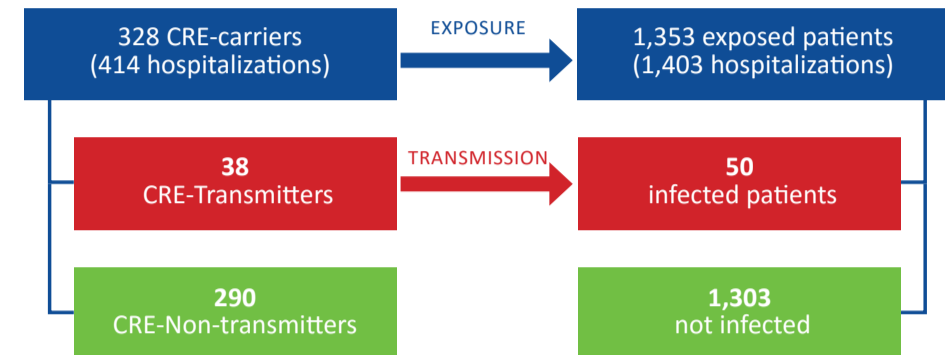
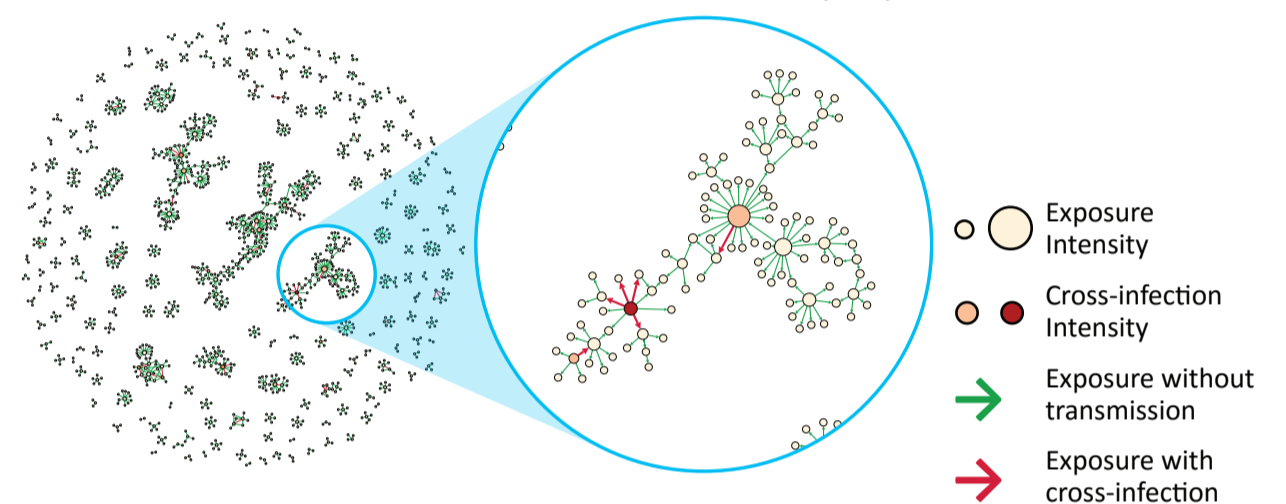
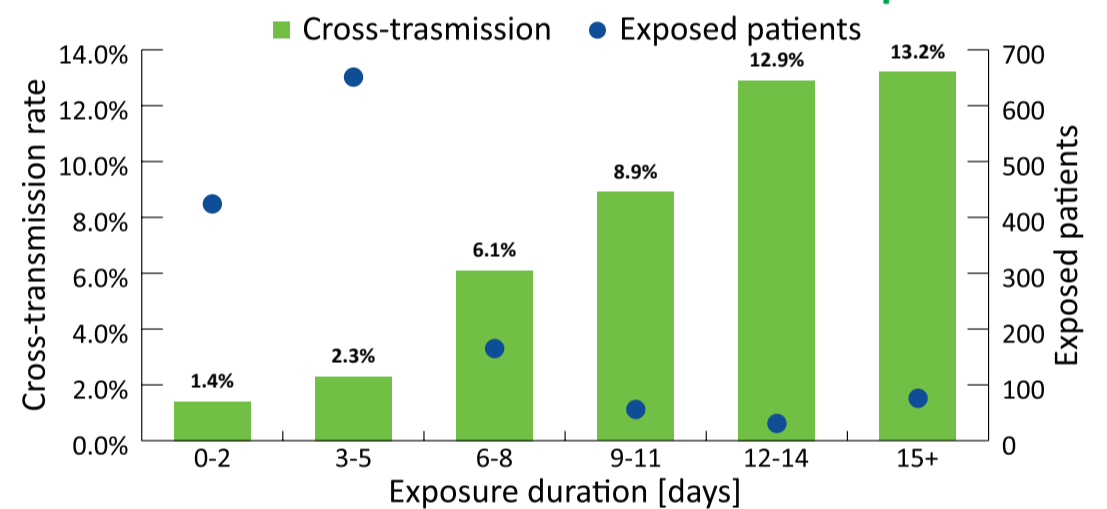


Figure 1: Exposure network

Network visualization of 1404 study exposures



Cross-transmission rates versus time of exposure



Multivariable logistic regression

	Variable	OR	P value
CRE-transmitters	CRE clinical culture (opposed to rectal culture)	2.34	0.008
	Catheter on admission	2.61	0.049
	Chronic lung disease	3.02	0.004
	Antibiotics during prior 3 months	2.83	0.003
Exposed patients	Ventilation	4.97	<0.001
	Antibiotics during prior 3 months	2.33	0.008
External parameters	≥6 days of exposure	3.88	<0.001
	Internal medicine ward	6.16	<0.001

CONCLUSIONS

- » The risk to be cross-infected with CRE is an integration of risk factors of the CRE-transmitter, the exposed patient, the ward of exposure and time of exposure
- » Risk factors for CRE transmission can be defined and could be implemented for infection control policy

References

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