

# Frequency of *Klebsiella pneumoniae* carbapenemase- (KPC-) and non-KPC-producing *Klebsiella* species contamination of healthcare workers and the environment



Clare Rock MD<sup>1</sup>, Kerri A. Thom MD MS<sup>1</sup>, Max Masnick BA<sup>1</sup>, J. Kristie Johnson PhD<sup>2</sup>, Anthony D. Harris MD MPH<sup>1</sup>, Daniel J. Morgan MD MS<sup>1,3</sup>

## Background

- Contamination of healthcare worker (HCW) gowns & gloves and contamination of the near-patient environment are surrogate markers for patient-to-patient transmission.
- Frequency of HCW gown and glove contamination, and patient environmental contamination with KPC-producing *Klebsiella* is unknown.

## Objective

- To assess the frequency of HCW gown and glove contamination after caring for a patient with KPC-producing *Klebsiella* and non-KPC-producing *Klebsiella*.
- To examine patient, environmental, and HCW factors associated with higher contamination.

## Methods

- HCWs entering patient rooms with known KPC- or non-KPC-producing *Klebsiella* were asked to participate.
- The number of times that the HCW touched 1 of 9 environmental surfaces and the number of HCW-patient interactions were counted.
- Before room exit, HCW gloves and gowns were cultured in a standardized fashion by the researcher.
- Environmental sampling of the 9 surfaces was performed.
- P* values are either from a chi square or Fisher's exact test where appropriate.

## Results

- We observed 96 interactions with KPC-producing and 124 with non-KPC-producing *Klebsiella*.
- Table 1 shows the frequency with which KPC- and non-KPC-producing *Klebsiella* contaminated HCW gowns or gloves, or the near-patient environment.
- Table 2 shows specific variables associated with HCW gown or glove contamination.
- Factors associated with HCW gown or glove contamination included wound care, manipulation of catheter, and caring for a patient with ETT or tracheostomy.

Table 1. Frequency with which KPC- and non-KPC-producing *Klebsiella* contaminated HCW attire or environment.

Pathogen	Healthcare worker gown or glove contamination			Environmental contamination		
	Proportion	% (95% CI)	p	Proportion	% (95% CI)	p
KPC-producing <i>Klebsiella</i>	10/96	10.4 (5.1-18.3)	.17	2/19	10.5 (1.3-33.1)	.08
Non-KPC-producing <i>Klebsiella</i>	21/124	16.9 (10.8-24.7)		9/24	37.5 (18.8-59.4)	

**Contact information:**  
Clare Rock MD  
University of Maryland  
10 S Pine Street,  
Baltimore, MD 21201  
crock@epi.umaryland.edu

**Author affiliations:**  
1. Department of Epidemiology and Public Health, University of Maryland School of Medicine, Baltimore, Maryland  
2. Department of Pathology, University of Maryland School of Medicine, Baltimore, Maryland  
3. VA Maryland Healthcare System, Baltimore, Maryland.

**Reference:**  
ICHE. 2014 Apr;35(4):426-9. doi: 10.1086/675598

## Results, cont.

Table 2 – Association between Healthcare Worker (HCW) Activities, Patient-Specific Factors, and Type of HCW and Contamination of HCW Gowns and Gloves with *Klebsiella pneumoniae* Carbapenemase (KPC)-Producing *Klebsiella* and non-KPC-Producing *Klebsiella* Species on Room Exit

Variable	Frequency of contamination % (proportion) of opportunities	p
<b>HCW activity in room</b>		
Physical examination	13.3 (21/158)	.59
Wound care	36.4 (4/11)	.05
Manipulation of catheter	37 (10/27)	<.001
Taking vital signs	16.3 (8/49)	.61
Touching bed rail	22.8 (18/79)	.006
>5 minutes in patient room	16.8 (18/107)	.33
>2 patient contacts	25 (25/100)	<.001
>2 environmental contacts	23.7 (23/97)	<.001
<b>Patient specific factors</b>		
Presence of urinary catheter	17.2 (29/168)	.012
Presence of ET tube tracheostomy	34.9 (15/43)	<.001
<b>HCW type</b>		
Physician/nurse practitioner	3.9 (3/78)	.001
Registered nurse	16.3 (15/92)	
Other	26 (13/50)	

## Conclusions

- Frequency of HCW gown or glove contamination after caring for a patient with KPC-producing or non-KPC-producing *Klebsiella* was substantial at approximately 14%.
- Further work needs to be done to delineate the mechanisms of patient to patient transmission of KPC-producing *Klebsiella*.