

# Do Carbapenemase-producing strains make a difference in nosocomial outbreaks caused by *Klebsiella pneumoniae*? – Results of a systematic review

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## Objectives

Nosocomial outbreaks (NO) caused by carbapenemase-producing *Klebsiella pneumoniae* represent an emerging threat for health care systems worldwide.

We report here characteristics of NO caused by carbapenemase-positive *Klebsiella pneumoniae* (NO-CPK) and compare them with NO caused by carbapenemase-negative *Klebsiella pneumoniae* (NO-CNK) strains.

## Methods

NO-CPK search terms: "carbapenemase" + "klebsiella" + "nosocomial" + ("outbreak"/"epidemic") in PubMed and reference lists. NO-CNK data was retrieved directly from the Outbreak Database [1] only. Inclusion criteria were: Original reports in English, German, French or Spanish language.

## Results

A total of 47 NO-CPK and 123 NO-CNK were included. The median duration of the NO were 6.0 and 5.5 months respectively. Publications of both types of NO reports, their geographical location and the choice of infection control measures taken are shown in FIGURE 1 & 2 and TABLE 1.

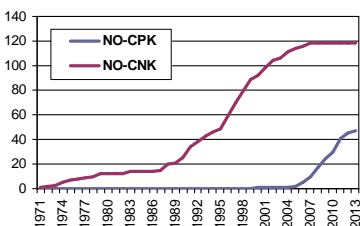


FIGURE 1: Cumulative number of reports due to NO-CPK and NO-CNK

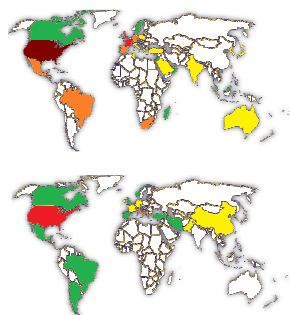


FIGURE 2: Worldwide distribution of NO-CNK (top) and NO-CPK (bottom) white:0, green:1, yellow:2-3, orange:4-7, red:8-10, dark red:>10

Infection Control Measures	NO-CPK	NO-CNK	P-value
change in antibiotic stewardship	26 (55,3%)	48 (39,0%)	0,06
screening of patients	26 (55,3%)	64 (52,0%)	0,70
screening of personnel	2 (4,3%)	30 (24,4%)	<0,01
isolation or cohorting of patients	29 (61,7%)	42 (34,1%)	<0,01
enforcing hand hygiene practice	25 (53,2%)	65 (52,8%)	0,97
disinfection and sterilization	26 (55,3%)	45 (36,6%)	0,03
use of protective clothing	22 (46,8%)	30 (24,4%)	<0,01
changes in the use of medical devices	14 (29,8%)	35 (28,5%)	0,86
education of staff	22 (46,8%)	29 (23,6%)	<0,01
total closure of the unit or ward	3 (6,4%)	10 (8,1%)	0,70
improvement of patient-to-staff-ratio	12 (25,5%)	10 (8,1%)	<0,01
environmental screening	18 (38,3%)	23 (18,7%)	<0,01

TABLE 1: Comparison of infection control measures in NO-CPK and NO-CNK

There were 966 patients affected by NO-CPK, thereof 586 patients with a nosocomial infection (46.6%). 205 patients died (35.0% mortality). The FIGURES 3 & 4 show the types of wards affected and the infections caused by NO-CPK.

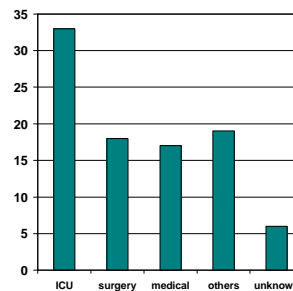


FIGURE 3: Distribution of wards

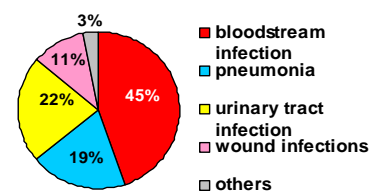


FIGURE 4: Types of infections

FIGURES 5 & 6 show the remaining susceptibilities and the distribution of the different carbapenemase enzymes of strains involved in NO-CPK.

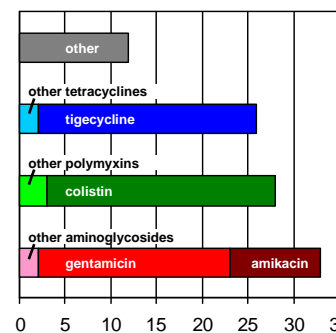


FIGURE 5: Remaining susceptibilities

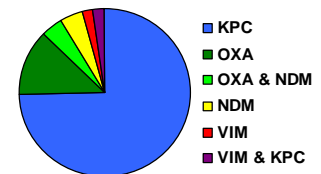


FIGURE 6: Carbapenemase enzymes

## Conclusions

The rather large proportion of infected patients (46.6%) may be a consequence of not covering CPK by the empiric antimicrobial regimen. The high mortality rate (35.0%) in NO-CPK underlines the clinical importance of this multidrug resistant pathogen.

## References

1. <http://www.outbreak-database.com>

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