Background: The University Hospital of Leipzig, Germany, a 1300 bed referral institution experienced the so far largest outbreak in Germany of a KPC2 producing Klebsiella pneumoniae strain (KPC). The index patient was transferred by air from a Greece hospital because of an ARDS necessitating extra-corporal CO2 elimination. He was admitted to the ICU and not kept in isolation for the first week. At that time, the carbapenem resistant Klebsiella pneumoniae strain was grown from a BAL specimen, the resistance mechanism confirmed by PCR, and the patient was isolated. From this situation an outbreak evolved inflicting 103 patients and lasting from July 2010 until April 2013.

Methods: The diagnostic management changed during the outbreak. All microbiological specimens were analyzed employing both conventional culture and MIC determination and also a commercially available multiplex-PCR-test. While at first only symptomatic patients and their direct contacts were tested, it seemed later necessary to screen all patients admitted to the hospital. Screening was also repeated after each week of hospitalization. Bacterial isolates were further analyzed by PFGE and rep-PCR-fingerprinting. During the outbreak it seemed necessary to improve isolation procedures and new wards were created to facilitate the cohorting isolation.

Results: All of the 103 patients had repeatedly positive PCR results for KPC, while 100 of them were also culture positive. The figure displays the timeline of patients with positive cultures. The isolates were clonal as demonstrated by PFGE and PCR-fingerprinting. Among 24 tested antimicrobials isolates demonstrated susceptibility to colistin, gentamicin and tigecycline. In some cases resistance against colistin and/or gentamicin developed under therapy. 43 patients showed signs of infections and appropriate specimens (i.e. tracheal aspirates, wound aspirates, blood cultures) were positive for KPC, while 60 patients were colonized only, as stool or rectal swabs were KPC positive. Altogether, 42 patients died, 26 from the infected group and 16 from the apparently uninfected but colonized patients. Mortality was especially striking in patients post liver transplant, 7 of 9 died. During the outbreak one additional patient was found to have a KPC infection that was unrelated to the outbreak clone.

Conclusions: The Klebsiella pneumoniae strain of the outbreak described here showed a surprising tenacity as it established itself in the hospital for over two years. As a large number of patients was involved in the outbreak, risk factors for acquiring the organism could be identified. Currently, a risk adapted screening to identify patients carrying Enterobacteriacea that are carbapenemase positive is in place. This screening has meanwhile identified several patients at risk to develop a multi-drug-resistant bacterial infection or at least to transmit such organisms to other patients.