Antimicrobial resistance in *Klebsiella pneumoniae* as an independent risk factor for bacteraemia-related mortality

To the Editor—Although many research endeavours focus on the microbiology, epidemiology, and molecular characterisation of extended-spectrum beta-lactamase-producing and carbapenem-resistant Gram-negative bacteria, few studies aim to assess the impact of these resistance traits on patient outcomes. Therefore, Man et al[1] should be applauded for linking antimicrobial resistance in *Klebsiella pneumoniae* strains with the risk of inappropriate empirical treatment and infection-related mortality.[1] The role of empirical antibiotics in septic patients was also highlighted as a key consideration. However, although extended-spectrum beta-lactamase-producing or carbapenem-resistant *K pneumoniae* isolates were associated with a greater risk of inappropriate empirical treatment, and subsequently with significantly higher 90-day and hospital mortalities, the manuscript would benefit from delineating these two groups of resistant bacteria, as well as from including Pitt bacteraemia scores. Moreover, a paramount study by Patel et al[2] showed that even appropriate empirical treatment is often not associated with improved survival among patients with carbapenem-resistant *K pneumoniae* infections. Also, heteroresistance is an under-recognised phenomenon that may render *K pneumoniae* strains resistant to antibiotics (despite in vitro susceptibility) and, in turn, confound any steadfast conclusions.[3] This is why linking patient-level microbiology data with clinical records and patient outcomes in different settings will be a priority in years to come, as evidenced by trailblazing Global Research on AntiMicrobial resistance (GRAM) Project led by the Institute for Health Metrics and Evaluation (University of Washington) and the Big Data Institute (University of Oxford).[4] The highest burden of sepsis-related deaths was already demonstrated in locations least equipped to identify or treat sepsis[5]; thus, going forward, studies akin to Man et al[1] analysing individual-level data will be indispensable.

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