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Title: Healthcare associated pneumonia does not accurately identify potentially resistant pathogens: A systematic evaluation

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Body: Introduction Healthcare Associated Pneumonia (HCAP) has been suggested as a new category of pneumonia separate from hospital and community-acquired pneumonia (CAP). This concept is controversial. We systematically evaluated the ability of the HCAP concept to predict resistant pathogens in patients with pneumonia. Methods Systematic review and meta-analysis of studies comparing microbiology and outcomes in patients with HCAP and CAP. Studies were pooled using a random effects model. The accuracy of HCAP for identifying MRSA, Pseudomonas aeruginosa and enterobacteriaceae were estimated using the area under the receiver operator characteristic curve (AUC). Results 20 studies were included with a total of 20,181 patients. Only 7 studies were prospective and 6 were rated as high quality. All studies reported increased mortality in HCAP odds ratio 2.4 (95%CI 2.2-2.7, p<0.0001). The pooled analysis found an increased frequency of MRSA (OR 4.5 95%CI 3.4-5.8 p<0.001), P.aeruginosa (OR 3.0 95%CI 2.2-4.2 p<0.001) and enterobacteriaceae (OR 2.5 95%CI 1.7-3.8 p<0.001) in HCAP. HCAP had modest predictive value for resistant pathogens (AUC 0.71 95%CI 0.69-0.73) overall and poor predictive value in prospective studies (AUC 0.64 95%CI 0.62-0.67). The predictive value was not significantly better in North America (p=0.1) or Asia (p=0.09) compared to Europe. There was evidence of publication bias in the analysis of MRSA (p=0.004) and P.aeruginosa (p=0.01) using Eggers test. Conclusion HCAP is poorly predictive of resistant pathogens. Research into HCAP is affected by low study and publication bias. Our results do not support a change in management practices based on the HCAP concept.