



Between centre variation in the diagnosis and treatment of stroke associated pneumonia

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On behalf of the SSNAP Collaboration

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Background

Stroke associated pneumonia (SAP) is common, estimated to affect 5-10% of patients with acute stroke. It is a major cause of mortality and morbidity in the stroke population. There is however a lack of standardised approaches to its diagnosis and management and it is not known whether this variation in practice contributes to poorer outcomes in patients with acute stroke. We therefore aimed to use a national quality register to describe variation in the diagnosis of SAP across all hospitals in England and Wales

Methods

Data of patients admitted with acute stroke (ischaemic stroke and primary intracerebral haemorrhage) from June 2013-July 2016 were collected by clinical teams through the Sentinel Stroke National Audit Programme (SSNAP). SSNAP is the national quality register for stroke in England and Wales, with participation from all admitting hospitals and an estimated 95% case ascertainment.

SAP was defined as new antibiotic prescription for a clinical diagnosis of pneumonia in the first 7 days of admission

SAP prevalence was compared across stroke units, adjusting for age, sex, stroke type, pre stroke functioning (modified Rankin Scale), pre-stroke atrial fibrillation, and stroke severity (NIHSS or level of consciousness). Multivariable logistic regression models were fitted to estimate the predicted prevalence of SAP in all hospitals, based on SAP risk factors. Predicted and observed prevalence rates were compared.

Characteristic	n
Size of the cohort	230838
Age, years (median, IQR)	77 (67-85)
Female	114733 (50%)
Ischaemic stroke	204078 (88%)
Primary intracerebral haemorrhage	26760 (12%)
Onset in hospital	12580 (5.5%)
mRS pre-stroke:	
0	128271 (56%)
1	34741 (15%)
2	23476 (10%)
3	26412 (11%)
4	13871 (6%)
5	4067 (2%)
AF pre stroke	46823 (20%)
NIHSS on admission (median, IQR)	4 (2-10)
Stroke associated pneumonia	20149 (8.7%)

Characteristics of the cohort

Results

186 hospitals were included in the analysis, providing a cohort of 230,838 patients. The median age was 77 years (IQR 76-85) and 204,078 (88%) had ischaemic stroke. The overall prevalence of SAP was 8.7%.

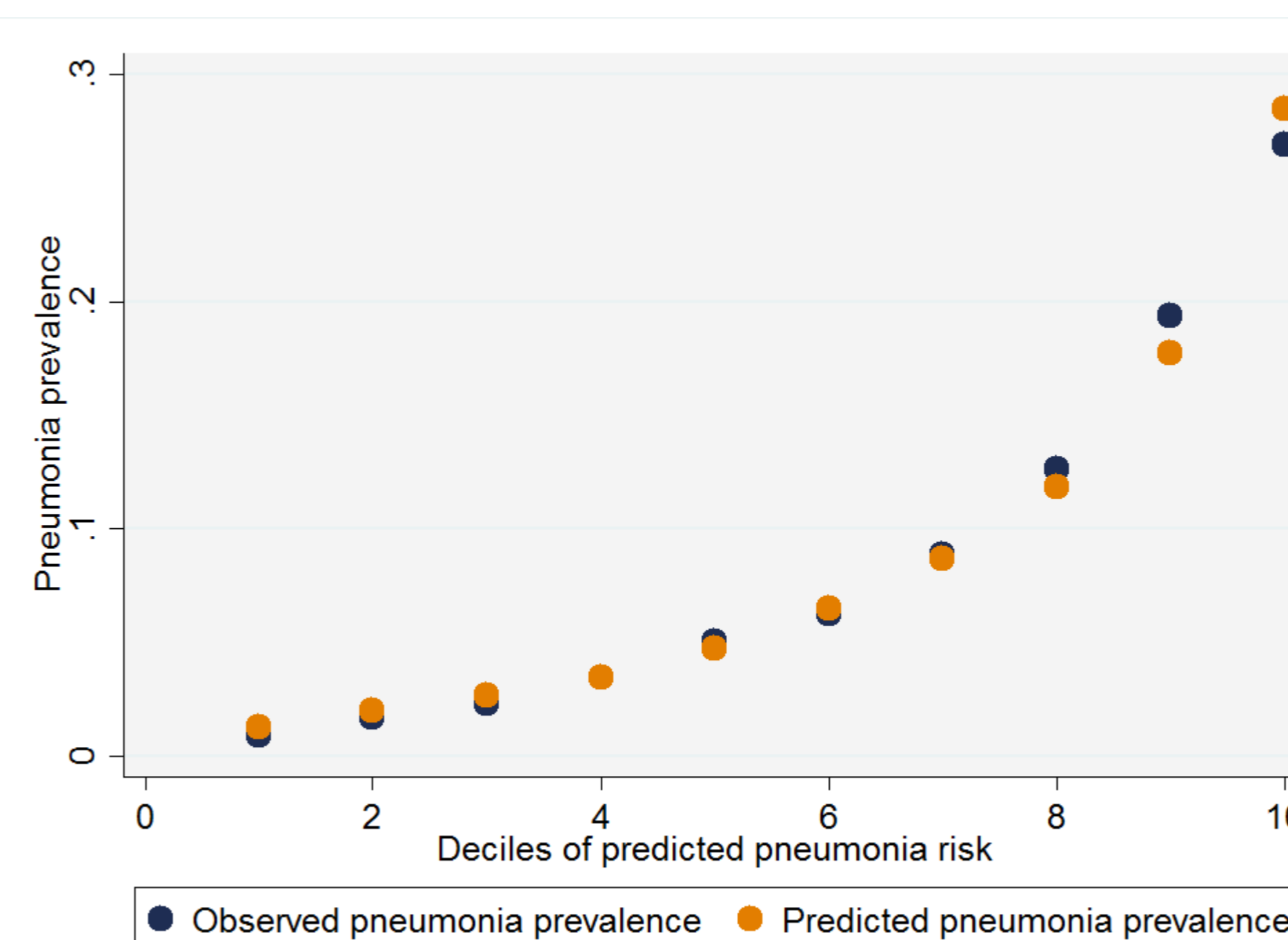
Crude rates of SAP varied between hospitals from <1% to 24%. The prevalence of SAP in the 20 units with the lowest prevalence was 2.3% (95% CI 1.7-2.9), and was 18.8% (95% CI 17.2-20.4%) in the 20 units with the highest incidence.

By contrast, variation in predicted prevalence of SAP based on SAP risk factors was much smaller than the observed variation, varying from 7 to 13%. There was a weak positive correlation ($r = 0.30$) between the predicted and observed rates of SAP.

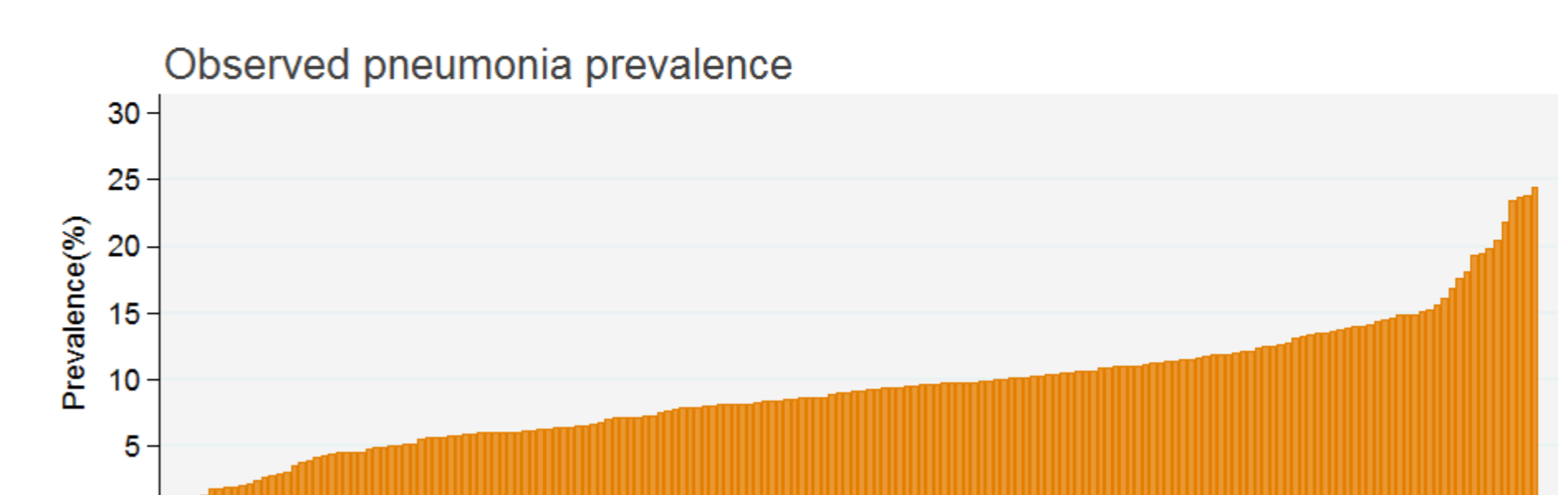
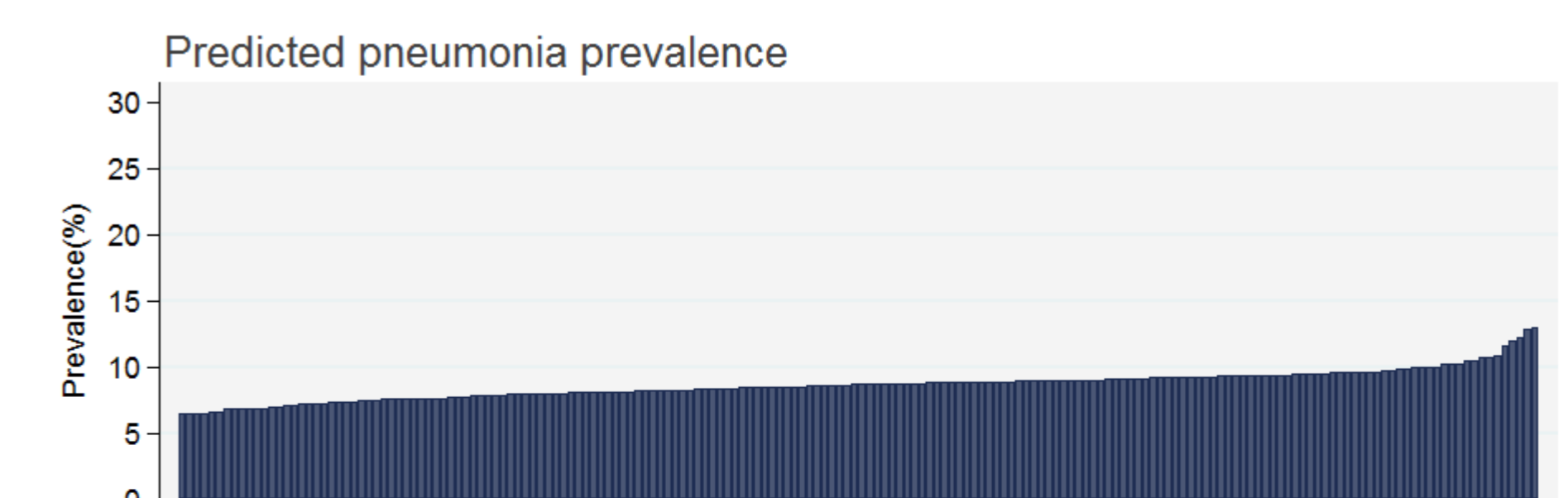
Conclusions

Observed rates of SAP vary much more widely between hospitals than would be expected based on patients' risk factors for SAP. This has several implications:

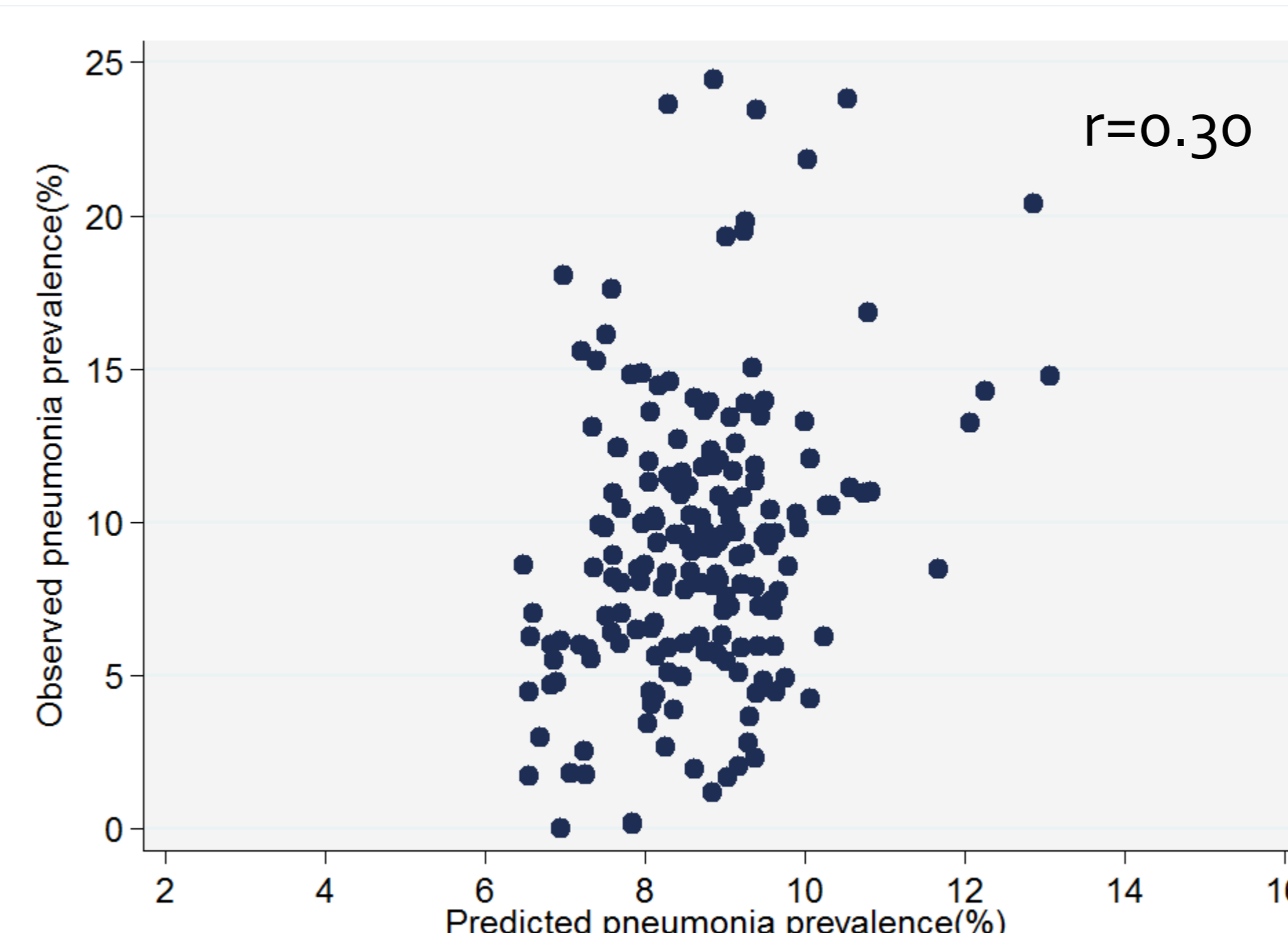
- 1) We do not know if these differences in observed SAP prevalence reflect differences in care quality or differences in SAP recognition and diagnosis
- 2) If these differences in antibiotic prescription are accurate, then there may be major under- and over- use of antibiotics, which may affect patient outcomes and the development of antimicrobial resistance
- 3) Standardised diagnostic criteria would improve the accuracy of surveillance of SAP and should help to guide more appropriate use of antibiotics in patients with stroke



The model used to predict SAP prevalence was well calibrated across the whole range of risk (c statistic 0.78)



Each bar is one of the 186 hospitals included in the study. Observed SAP prevalence varied much more widely than what would be expected based on differences in patients risk factors for SAP



Each dot is one of the 186 hospitals included in the study. There was a weak positive correlation between predicted and observed rates of SAP

Acknowledgments

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