A model to identify patients from the community with infection by pathogens not covered by the guidelines

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Background: Alterations in the delivery of healthcare led to an increase in resistant pathogens causing infections that have their onset in the community. The objective of this study was to develop a clinical model to identify patients who are admitted to hospital with infection, who are at risk for infection by pathogens resistant to the treatment recommended in community-acquired infection (CAI) guidelines.

Material/methods: International prospective, cohort, study, including all patients admitted to hospital from the community, between 1st October 2014 and 31st March 2015, that met the definition of respiratory, urinary, intraabdominal infection or bacteremia, according to definitions proposed by the Centers for Disease Control and Prevention with microbiological documentation. Logistic regression was used to associate risk factors with infection by a pathogen not covered by CAI guidelines. The final model was validated in an independent cohort.

Results: Among the 1145 patients admitted to hospital from the community with infection, 630(55%) had microbiological documentation of infection and were included in this study. In the univariate
analysis factors significantly associated with infection by a pathogen resistant to antibiotics recommended in CAI guidelines were: age>70 years (crude OR = 1.61), male sex (crude OR = 1.48), living in a nursing home and needing > 90 minutes of nursing care per day (crude OR = 2.61), cancer (crude OR = 2.45), atherosclerosis (crude OR = 1.62), Karnofsky index<70 (crude OR = 2.30), hospitalization in the last year (crude OR = 2.76), invasive procedures in the last year (crude OR = 3.11), previous colonization with a resistant pathogen (crude OR = 3.91), antibiotic therapy in the last 3 months (crude OR = 3.65), gastric acid secretion inhibitors therapy (crude OR = 1.44). In the multivariate analysis the final model retained the following factors: atherosclerosis (adjusted OR = 1.84), invasive procedures in the last year (adjusted OR = 2.08), previous colonization with a resistant pathogen (adjusted OR = 2.48) and antibiotic therapy in the last 3 months (adjusted OR = 2.24). The area under the ROC curve for the final model was 0.71. For a predicted probability ≥21% the sensitivity of the model was 79%. In the matrix of the model this corresponds to all patients having at least one risk factor (figure 1). The validation cohort was composed of 109 patients with the same inclusion criteria, in this cohort the sensitivity of the model was 91%.

**Conclusions:** For patients admitted to hospital from the community with infection and one of the following risk factors; atherosclerosis, previous invasive procedures, previous antibiotic therapy or previous colonization, CAI guidelines probably do not apply and alternative antibiotic regimens should be considered. These results also reinforce the need for collection of samples for microbiological testing and latter refinement of antibiotic therapy.

Figure 1. Percentage, predicted by the model, of pathogens not covered by CAI guidelines for each combination of risk factors, % (total number of cases).
In green: no risk factor; in red ≥ 3 risk factors.