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872. PROPHETIC: Predicting Pneumonia in Hospitalized Patients in the ICU—A Model and Scoring System

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Background. Prospectively identifying patients at highest risk for hospital-acquired and ventilator-associated bacterial pneumonia (HABP/VABP) by implementing a risk assessment scoring tool may help focus prevention efforts, optimize the screening process to improve clinical trial feasibility, and enhance development of new antibacterial agents.

Methods. Within the intensive care units (ICU) of 28 US hospitals, between February 6, 2016 and October 7, 2016, patients hospitalized >48 hours and receiving high levels of respiratory support were prospectively followed for meeting the definition of HABP/VABP recommended in US FDA draft guidance. Patient demographics, medical comorbidities, and treatment exposures were recorded. The association between candidate risk factors and odds of developing HABP/VABP was evaluated with a multivariable logistic regression model. Risk factors were selected using backward selection with $\alpha = 0.1$ for model inclusion. A web-based scoring system was developed to estimate the risk of HABP/VABP from the risk factors identified.

Results. A total of 5,101 patients were enrolled, of whom 1,005 (20%) developed HABP/VABp. 4,613 patients were included in the model, excluding 488 (10%) with HABP/VABP at or before enrollment. There are 15 variables included in the model. APACHE II admission score >20 ($P < 0.001$, OR 2.14, 95% CI 2.00–2.29), admission diagnosis of trauma ($P < 0.001$, OR 3.31, 95% CI 1.90–5.74), frequent oral or lower respiratory tract suctioning ($P < 0.001$, OR 2.33, 95% CI 1.81–2.99), and receipt of enteral nutrition ($P < 0.001$, OR 2.31, 95% CI 1.69–3.16) were the key drivers of increased pneumonia risk. The model demonstrated excellent discrimination (bias-corrected C-statistic 0.861, 95% CI 0.843–0.880). The web-based scoring system can be accessed via this link: https://ctti-habpvabp.shinyapps.io/web_based_tool/.

Conclusion. Using a web-based scoring system, ICU patients at highest risk for developing HABP/VABP can be accurately identified. Prospective implementation of this tool may assist in focusing additional prevention efforts on the highest risk patients and enhance new drug development for HABP/VABP.

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873. Using the Host Immune Response to Identify Viral-Bacterial Coinfection in Children With Respiratory Syncytial Virus Infection

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Background. A major challenge in the effective management of children with RSV infection is the clinical difficulty of distinguishing a simple viral from viral–bacterial coinfections. As a result, despite the low rates of viral–bacterial coinfection, RSV patients are often prescribed antibiotics with recent reports demonstrating more than 60% antibiotic overuse rates (Van Houten et al. 2018). Here, we examined whether a host-immune signature combining the viral-induced proteins TRAIL and IP-10 with the bacterial-induced protein CRP (ImmunoXpert; Oved et al. 2015) can distinguish simple viral from viral–bacterial coinfection in RSV patients.

Methods. We studied 402 febrile children enrolled as part of "Curiosity," a prospective study designed to develop and validate the host-immune signature. Infection etiology—viral or viral-bacterial coinfection—was determined by a panel of experts following a review of patients' clinical, laboratory, radiological, microbiological, and follow-up data. RSV strains were detected using a respiratory multiplex PCR applied to nasal swabs (Seeplex-RV15).

Results. Out of the 402 children with suspected acute infection 29 had a positive RSV detection (Figure 1); of them, 27 had a unanimous expert panel etiology determination: 24 viral and 3 viral–bacterial coinfections. Out of the 24 patients unanimously assigned viral by the expert panel, 13 were given antibiotics, indicating a 54% antibiotic overuse rate. The host-immune signature correctly identified all 3 viral-bacterial coinfection cases, as well as 22 out of the 24 (92%) simple viral patients. This finding supports that the signature has the potential to reduce antibiotic overuse by 6.5-fold (from an overuse of 13/24 = 54% to 2/24 = 8%, $P < 0.001$).

Conclusion. Our results demonstrate high antibiotic overuse rates for RSV patients, consistent with previous reports. The host-immune signature correctly distinguished simple viral from viral–bacterial coinfection and therefore may have the potential to aid physicians in the correct management of children with RSV infection. Implementation studies are required to evaluate its utility in safely decreasing unnecessary antibiotic use for RSV patients.

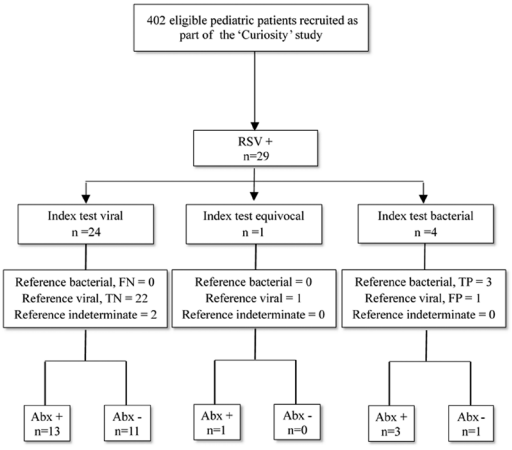

Figure 1. Recruitment and flow of pediatric patients with positive RSV detection

Flow diagram is in line with the Standards for Reporting Diagnostic Accuracy (STARD); RSV – respiratory syncytial virus, Abx – antibiotic treatment, TP – true positive, FP – false positive, TN – true negative, FN – false negative. The index test is available in Europe as ImmunoXpert (CE-IVD), not yet cleared by the FDA.