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The nosocomial XDR score: a prediction model for nosocomial sepsis caused by extensively drug-resistant (XDR) pathogens

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Background: The incidence of nosocomial infections caused by extensively-drug resistant (XDR) pathogens is continuously rising worldwide, posing a significant burden on hospitalized patients and on public health. In endemic hospitals, the clinician has to make a fast and educated guess pertaining to the appropriate empiric management of acute nosocomial infection. In septic shock, every hour of delay in initiating appropriate antimicrobials decreases the rate of survival by 7.6%. However, initiating broad-spectrum agents to every septic patient might increase the burden of resistance. In severe nosocomial infections, empiric regimens might cover multidrug resistant (MDR) organisms (e.g., vancomycin, carbapenems), but the major challenge is selecting appropriate coverage for XDR infections (e.g., colistin, linezolid, daptomycin, and tigecycline). The study aim was to develop a score to predict whether, among patients with nosocomial sepsis, the causative organism was XDR. Such a score could decrease the frequent delay in initiating appropriate therapy, while avoiding misuse of broad-spectrum agents for infections caused by organisms that are more susceptible.

Material/methods: A retrospective case-control analysis was conducted at Assaf Harofeh Medical Center for calendar year 2014. Adults (>18 years) with nosocomial (≥3 calendar days) bloodstream

infection (BSI) were enrolled. Extensive epidemiological data was extracted from all available electronic and hard copy medical records. A prediction score was developed based on the multivariable analysis (logistic regression) of risk factors for nosocomial XDR BSI, and its performance was measured.

Results: Overall, 159 patients with nosocomial BSI were included: 25 patients with XDR (cases) and 134 with non-XDR pathogens (controls). Patients with XDR BSI were less likely to receive appropriate antibiotic therapy ($p<0.001$). The score components consisted of (1) male sex (2 points), (2) exposure to antibiotics in the preceding 3 months (1 point), (3) altered consciousness (including dementia) on admission (3 points), and (4) underlying neurological disease that served as a protective factor (-4 points). Using a cutoff value of 3 to predict nosocomial XDR sepsis, sensitivity was 76%, specificity 63%, positive predictive value 28%, negative predictive value 93%, and the area under the receiver operator characteristic curve (AUROC) was 0.694.

Conclusions: The predictive performance of this score was poor, indicating that we cannot yet provide hospitalists an effective tool to quantify the possibility for XDR infection in patients presenting with nosocomial sepsis. Larger prospective multicenter trials are needed in order to develop and validate) a score with high performance values. Future studies should use controls that better reflect the background population from which cases arose. A nosocomial XDR score could improve patient outcomes and institutional stewardship efforts.