Clinical and economical effects of rapid antimicrobial susceptibility testing for sepsis patients in ICUs

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Background & Objective

- Severe bacterial infections require an optimization of antibiotic therapy as early as possible. The rate of incorrect initial antibiotic therapies (I-IAT) is of high relevance for the patients' outcome.
- The Accelerate PHENO ™ BC tests, on the market since 2016 in Europe, provide identification (ID) and antimicrobial susceptibility testing (AST) within approximately 7 hours from a positive blood culture [1].
- A 25% I-IAT rate resulted from a meta-analysis. In addition, there is often the opportunity for de-escalation (e.g. bacteremia with *S. aureus*) [2].
- The main objective of the PHENO Medical EcoNOmic EvaluatioN (PHENOMENON) study is to show that results for ID and AST can be obtained much faster and by that antibiotic therapy optimized. For this clinical and economical factors were evaluated.

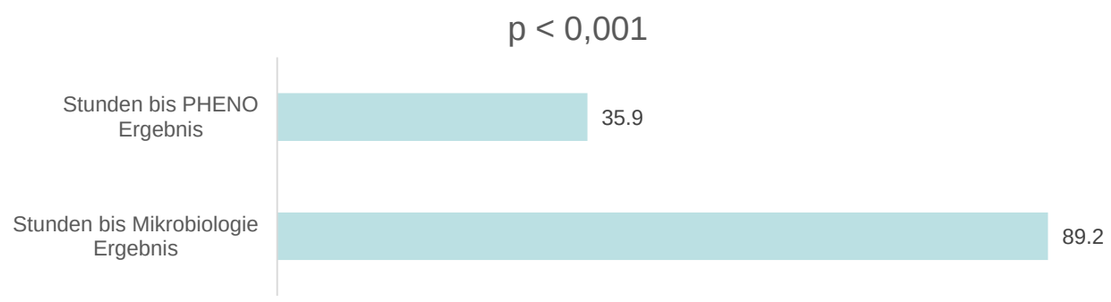
Material & Methods

- Intensive care unit (ICU) patients with sepsis and positive blood culture were selected from a historical cohort, and IAT & microbiology results were observed.
- A benefit for the patient was assumed in all cases, where the AST results lead to a change of therapy (broadening or narrowing the spectrum).
- In a prospective cohort the Accelerate PHENO ™ BC test was used for all ICU patients having a positive blood culture.
- Time to result and the frequency of recommendations to change antibiotic therapy were determined. Besides mortality, length of stay and the economic contribution margin were compared.
- All cases were reviewed a second time by an independent reviewer.

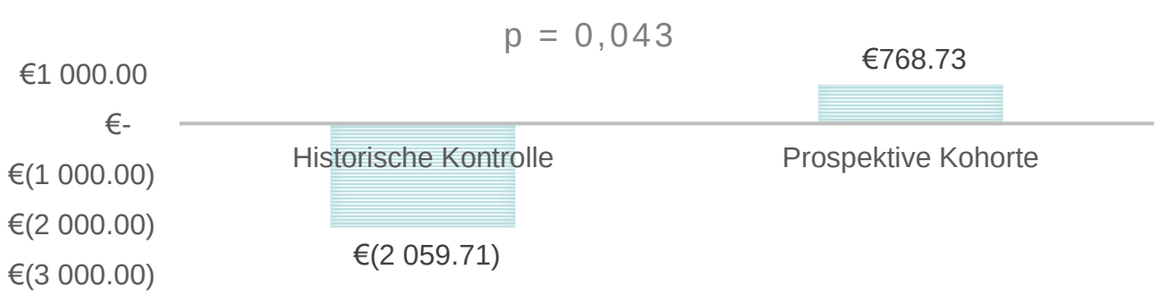
Results (historical cohort)

- In the historical case review, 60% of the cases (n = 30/50) resulted in optimization options with regards to antibiotic therapy. Approximately 35% for escalation / spectrum expansion, in 25% of the cases the narrowing (de-escalation) would have been possible.
- It was evaluated that the ICU stay can be reduced by 2 days , additionally 1 day on the normal ward and/or 2000€ per case can be saved.
- The mortality rate was 56.7%, the ICU stay days 21.1 and the contribution margin was -2.056€.

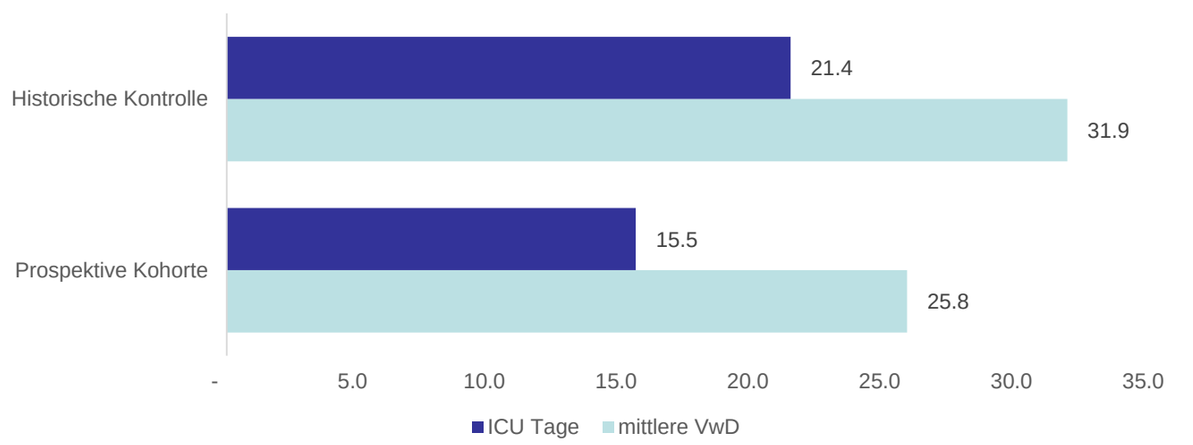
Time to result in hours (comparison of all patients)



Contribution margin (Comparison septic patients)



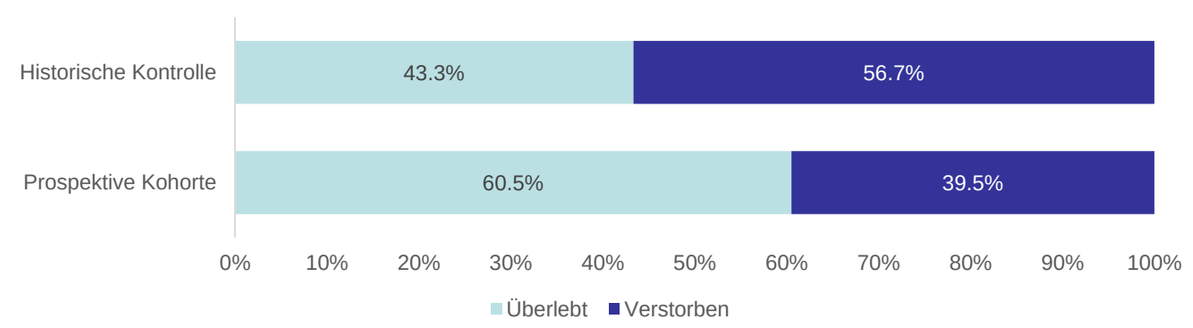
Length of stay (Comparison septic patients)



Results (prospective cohort)

- Out of 812 cases with positive BC, 228 met the inclusio criteria for the study and 184 tests were performed (81%).
- 165 tests (90%) gave an evaluable result (bacterial growth and antibiogram). 109 of these were septic patients and for 45 patients (41.2%) a change in therapy based on the AST results was recommended (ITT population). 37 (82.2%) of the changes were implemented.
- The mortality rate for these patients was 39.5%, the ICU stay days 15.5 and the contribution margin € 768.71.

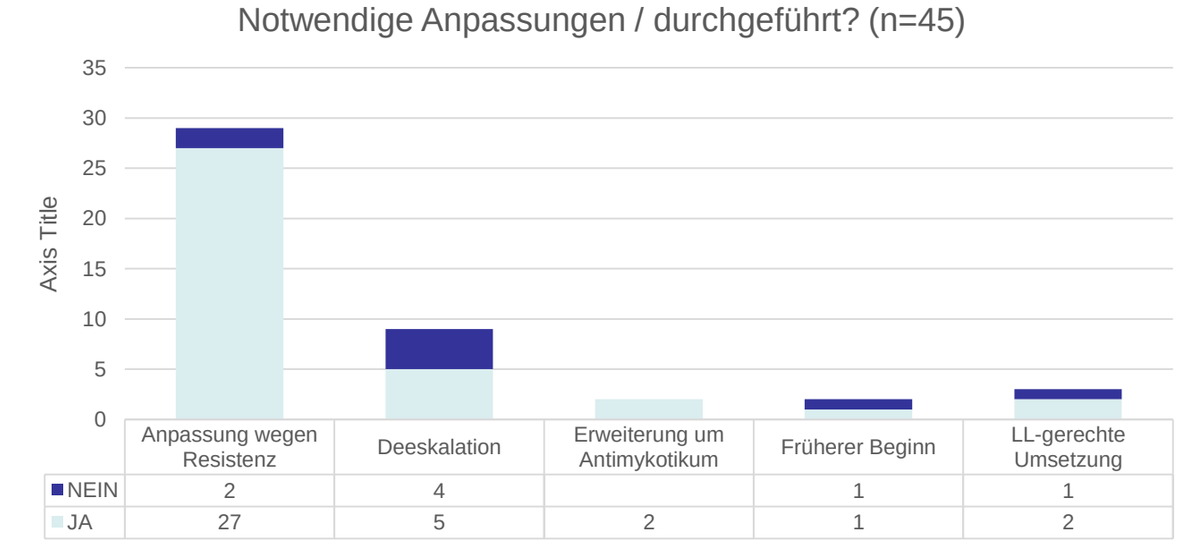
Lethality (Comparison septic patients)



Conclusions

- The use of rapid diagnostics for septic patients is beneficial.
- Results can be obtained 53.3 hours earlier (89.2 vs. 35.9; p <0.001).
- The length of stay in the hospital drops by 6.1 days, of which 5.9 are due to a reduction in the ICU days.
- The contribution margin increases by € 2,800 per case (- € 2,059.71 vs. € 768.71; p = 0.043). Mortality drops from 56.7% to 39.5%.

Recommended and performed therapy changes (Sepsis)



Literature

[1] Pancholi P et al. Multicenter Evaluation of the Accelerate PhenoTest BC Kit for Rapid Identification and Phenotypic Antimicrobial Susceptibility Testing Using Morphokinetic Cellular Analysis. Journal of clinical microbiology. 2018;56(4). DOI: 10.1128/JCM.01329-17.

[2] Worf K. Gesundheitsökonomische Aspekte einer frühzeitigen Optimierung der Antibiotikatherapie. Vortrag im Rahmen der 50. Gemeinsamen Jahrestagung der DGIIN und ÖGIAIN. Köln, 14.06.2018.

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