Abstract: P1644

Personalized screening intervals for measurement of n-terminal pro-b-type natriuretic peptide improve efficiency of prognostication in patients with chronic heart failure

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Topic(s):
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Background: Predefined screening intervals and target levels do not account for variations in temporal patterns of biomarkers between individuals, which may hamper their potential use for therapy guidance. Conversely, a personalized screening approach with screening intervals and target levels based on the evolution of biomarkers in individual patients may further improve risk assessment and therapy guidance.

Purpose: We hypothesize that personalized screening intervals for N-terminal pro-B-type natriuretic peptide (NT-proBNP) measurements in patients with chronic heart failure (CHF) maximize information gain on the individual patient's disease progression, while minimizing the number of necessary measurements. We aim to compare such personalized scheduling of NT-proBNP measurements to a predefined fixed scheduling approach.

Methods: In 263 CHF patients from the Bio-SHiFT study, NT-proBNP was measured trimonthly according to a prespecified, fixed schedule [median: 9 (IQR: 5–10) measurements per patient]. The primary composite endpoint (PE) comprised cardiac death, cardiac transplantation, left ventricular assist device implantation or heart failure hospitalization, and occurred in 70 patients (26.6%). Using joint models for time-to-event and longitudinal data, we modelled the association between repeated NT-proBNP measurements and the PE. Using the fitted joint model, for each patient at each follow-up visit, we determined the optimal time point of the next NT-proBNP measurement based on the patient's individual risk profile and the maximum information gain on the patient's prognosis as assessed by the Kullback-Leibler divergence. Personalized scheduling was compared to fixed (trimonthly) scheduling by means of a realistic simulation study, based on a replica of the study population included in the Bio-SHiFT study. In this simulation study, we stopped monitoring NT-proBNP to potentially enable appropriate timely intervention if the cumulative risk of PE exceeded an arbitrary risk threshold of 7.5% within 3-months. We compared personalized scheduling with fixed scheduling in terms of capability of identification of high-risk intervals (whether timely intervention was enabled before occurrence of PE), number of measurements needed, and costs.

Results: Compared to fixed scheduling, personalized scheduling saved on average 2 measurements [personalized; median: 7 (IQR: 7–8) vs. fixed; 9 (IQR: 8–10) measurements], while the start of the time-window identified for therapeutic intervention to avoid the occurrence of PE was similar in both approaches [personalized; median: 6.6 (IQR: 4.5–11.3) vs. fixed; 6.3 (IQR: 4.2–10.3) months before occurrence of PE]. Costs saved were €165 per patient per year.

Conclusion: Personalized scheduling of NT-proBNP measurements in CHF patients shows similar prognostic performance as fixed scheduling, but requires fewer NT-proBNP measurements. This may improve efficiency of natriuretic guided therapy, if the latter were to be installed.
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Figure 1