ABSTRACT: Task-Based versus Case-Based Analysis of Time Outcomes in Multi-Country Time and Motion (T&M) Studies: Methodological Considerations and Application

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Objectives

A challenge in multi-centre Time and Motion (T&M) studies is performing inferential statistics, in light of hierarchical data. Our objective was to investigate two approaches to analyze the data.

Methods

Task-based approach analysed tasks independently, mean times were summed, and 95% confidence intervals (CIs) were computed based on Variance Sum Law I (assuming time is independent among all tasks). Case-based approach involved imputation for missing time; all tasks per observation were summed, and a single time variable was analysed. Both approaches were applied to three countries participating in a multi-country T&M study comparing
intravenous [IV] and subcutaneous [SC] administration processes. Absolute and relative differences in country means (case-based minus task-based) and the difference in CI range were computed using a random intercept model, to account for centre clustering.

**Results**

Mean times were similar for both approaches. For IV process, absolute (relative) differences in time were −0.03min (−0.1%) in France, −0.77min (−2.3%) in Italy, and −0.07min (−0.3%) in Russia. For SC process, results were 0.30min (2.1%) in France, 0.90min (4.5%) in Italy, and 0.01min (0.1%) in Russia. The differences in CI range between both approaches were noticeable: 0.51min (5%) in France, 25.04min (57%) in Italy, and 10.06min (46%) in Russia for IV and 4.38min (40%) in France, 0.88min (5%) in Italy, and 8.19min (56%) in Russia for SC.

**Conclusions**

The choice of task-based or case-based approach did not impact mean process time; however, since task-based approach assumed independence of task times, it resulted in much narrower CI range. On the other hand, case-based approach eliminates the underestimation of variations, thus may therefore be a more optimal choice to analyse time outcomes for complex processes. With only a single time variable being analysed, it also allows pooling of data across countries, therefore providing more power to generate reliable CIs.