

Multilevel models for network meta-analysis

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Abstract

Background: Network meta-analysis of clinical trials includes direct and indirect comparisons of multiple treatments. This study aims to explore whether and how the multilevel models can be applied to network meta-analysis, particularly in ranking multiple treatments and explaining the heterogeneity.

Methods: A three-level model with design-level (level-3), study-level (level-2) and individual-level (level-1) was formulated for network meta-analysis. A network meta-analysis of multiple monotherapy trials on type 2 diabetes mellitus was conducted with the three-level model, in which the effect sizes of multiple anti-diabetic drugs were compared according to an arm-based approach.

Results: An application example for network meta-analysis correctly ranked the anti-diabetic drugs in controlling HbA1c. It also demonstrated that a level-2 variable (i.e. follow-up) in the multilevel model could explain the between-design heterogeneity.

Conclusion: Multilevel models are applicable to network meta-analysis in not only ranking the effect sizes through direct and indirect multiple treatment comparisons but also explaining the between-design heterogeneity.

Keywords: Multiple treatment comparison; Network meta-analysis; Multilevel models