Meta-analysis Appraisal for Internists

Wipat Phanthawimol

Division of Cardiology, Cardiac Center, Department of Medicine, Police General Hospital, Bangkok 10330, Thailand

Practical steps in meta-analysis appraisal for internists

1. Quality Assessment of Each Study
Internal and external validity of each study in the meta-analysis is critically important. The initial step is to comprehend, analyze study details, and appraise its validity including potential bias (allocation, ascertainment bias in the randomized controlled trial), the way it was analyzed (intention-to-treat or per-protocol analysis), drop out, cross-over, outcome, and median follow-up time. A few proposed scoring systems are also used for quality assessment, such as Jadad scale and Cochrane Risk of Bias tool.

2. Acknowledge Heterogeneity
Determining heterogeneity and appropriately choosing suitable model for pooled treatment effect estimate are the next key steps in meta-analysis appraisal. Two methods commonly used for heterogeneity assessment are as follows.

Qualitative method
Comparing demographic and clinical characteristic of the enrolled population, given treatment, follow-up protocol among all studies (Clinical Difference). Analogizing study method and their statistical analysis (Methodological Difference).

Quantitative method
Three statistical parameters are Cochran’s Q distributed as chi-square statistic ($p < 0.10$), $I^2$ index referred to the percentage of variability (> 50% suggestive of medium to high heterogeneity) and $\tau^2$ representing absolute value of the true variance (> 0.1).

Fixed-effect model assuming identical true effect size among all studies is suitable for calculating the pooled effect estimate if there is no or low heterogeneity. By contrast, random-effects are preferable in case of high heterogeneity.

3. Untangle Funnel Plot
Visual inspection, statistical analysis, and manipulation of the funnel plot are the final step of the meta-analysis appraisal. Possible etiologies of asymmetry funnel plot are true heterogeneity, reporting bias and small study effect.

References

Keywords: Meta-analysis, Appraisal, Heterogeneity, Funnel plot, Fixed-effect model, Random-effects model