

Methodology and Reporting of Meta-analyses in the Neurosurgical Literature

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Introduction

A 'meta-analysis' is a multi-step statistical analysis of the results from independent studies, the goal to produce a single estimate of a treatment effect. Meta-analyses are becoming increasingly popular in the neurosurgical literature. AMSTAR (1) is an 11 point scale used to assess methodologic quality. PRISMA (2) is a 27-item checklist used to ensure the transparent and complete reporting of meta-analyses.

Methods

All meta-analyses ever published in the two main neurosurgical journals were retrieved. We first determined whether the term 'meta-anlaysis' was appropriate based on our simple definition: it is a multi-step, statistical ("comparative") tool used to assess the effectiveness of an intervention or the effect of an exposure on group compared to others by combining currently available data in the literature. Thus, the outcome(s), exposure or intervention, and populations must be clearly specified and the statistics used to combine the results must be appropriate. We then applied the Assessment of Multiple Systematic Reviews (AMSTAR) and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to each metanalysis. Each metanalysis was then assigned a 'score' for each checklist, which was the number of components present within each paper for each checklist, expressed as a percentage.

Results

Sixty-three meta-analysis were reviewed, 39 from the Journal of Neurosurgery and 24 from Neurosurgery, from 1990 to 2011. Nineteen (30%) of the articles did **not** meet our definition of a meta-analysis. The average AMSTAR score was 31.2% (range, 0-82%); the average PRISMA score was 52.6% (range, 3.7-92.6%). Both the AMSTAR and PRISMA scores showed improvement with time, as defined as 5-year intervals from 1990 to 2010 and beyond (AMSTAR p=0.5, PRISMA p=0.0015), if one of the authors was a person who potentially had metaanalysis expertise (ex. biostatistician) (AMSTAR p=0.0009, PRISMA p=0.0146), and if the authors solely focused on conducting a metaanalsysis ("pure" meta-analysis) as opposed to first reviewing their own institution's data and then secondarily performing a meta-analysis ("mixed" meta-analysis) (AMSTAR p=0.0014, PRISMA p=0.0003). The most statistically significant predictor of both the AMSTAR and PRISMA scores was whether a paper met our definition of a meta-analysis (AMSTAR p=0.0000, PRISMA p=0.0000). The average AMSTAR score for papers that met our criteria for a meta-analysis was 39%, compared to 13% for those that did not. For PRISMA it was 31% and 62%, respectively.

Conclusions

The overall methodology and reporting of meta-analyses in the neurosurgical literature is poor but is improving with time. One-third of papers inappropriately use the term "metaanalysis". Academic neurosurgery needs to hold these papers to high standards, which can be done by applying these checklists.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Define a "meta-analysis" 2) Discuss, in small groups, the key methodologic and reporting components of a metaanalysis 3) Identify effective methods to improve methodology and reporting of meta-anslyses.

References

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