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Methodological letter

Network meta-analysis: concept and value in practical application[☆]



Network metaanálisis: concepto y valor en la aplicación practica

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As new procedures, approaches and management of surgical patients develop, studies on their effectiveness are often conducted in the context of randomised clinical trials. In addition, there is a need for comparative research to assess their effectiveness when they are used for one and the same purpose. The analysis of the different studies published is undertaken by conducting a meta-analysis, which helps to synthesize the existing information with a view to drawing the most appropriate conclusions as to the impact of the different ways of managing our patients.¹ Conventional meta-analysis makes a direct pairwise comparison of the effects of the use of new treatments or approaches on a specific procedure, with data from direct comparisons often being limited.² For this reason, it is necessary to make indirect comparisons between several treatments with the same degree of efficacy as sought in clinical practice, to identify which treatment is the most appropriate one, giving rise to network meta-analyses designed for this purpose.^{3,4}

A network meta-analysis (NMA) is a statistical technique used in medical research, as well as other fields, to compare multiple treatments or interventions through the synthesis of data from multiple primary studies.⁵ Unlike a conventional meta-analysis that directly compares two treatments, NMA permits multiple treatments that may not have been directly compared in individual studies for analysis and comparison, combining the available evidence indirectly. When running an

NMA, treatments are compared using a network of evidence, where the nodes represent the treatments and the edges or connections represent the direct comparisons made in the primary studies. For example, in a network of A versus B versus C interventions, A may not have been compared to B, even though A was compared to C and B to C (Fig. 1). On such an occasion, NMA enables an indirect comparison to be made of A vs. B, where the nodes represent treatments and the edges or connections represent direct comparisons made in the primary studies. In addition, where direct evidence is available, NMA enables more precise estimates of effect to be calculated by combining direct and indirect evidence.

An NMA uses complex statistical models, based on frequency or Bayesian analyses, to combine data from multiple studies and provide estimates of the effects of different treatments, as well as to assess the uncertainty associated with those estimates. This approach can provide valuable insights into the comparative efficacy of different treatment options and help reach more accurate clinical decisions or healthcare approaches and policies in hospitals.

The European Association of Endoscopic Surgery (EAES) guidelines, recently published in *Surgical Endoscopy* on bowel preparation⁶ is a clear example of the value of NMA. This guide compares all the different ways of approaching the preparation of surgical patients who are to undergo minimally invasive colorectal surgery with anastomosis, regardless of

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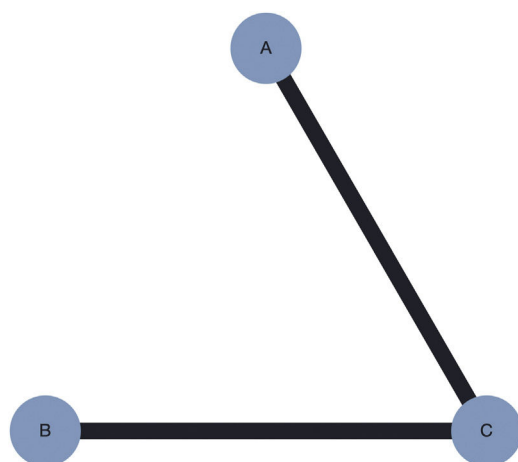


Fig. 1 – Example of an open-loop intervention network. A, B, and C represent interventions while the edges represent direct comparisons.

the indication, since patient preparation is an important part of preoperative management prior to colorectal surgery. This preparation consists of a set of measures that include the use of antegrade mechanical bowel preparation, the administration of oral antibiotics, the use of intravenous antibiotics, retrograde preparation with enemas, and even the non-preparation of patients, which can be adopted individually or in combination with a number of these, thus multiplying the management options for patients. The expected benefit of these alternatives to preparation is decisive for patients in the postoperative period, as this can have an impact on reducing the incidence of infectious complications, both superficial, at the surgical site, and deep-seated, as a consequence of anastomotic leakage. The drawbacks of these methods of preparing patients, such as mechanical bowel preparation, is that they can cause discomfort to the patient, loss of a significant amount of fluids, which can lead to dehydration and, as a consequence, implications for intra- and perioperative management. The basic problem we encounter is that existing studies are based on direct comparisons between some of these interventions or combinations of these. There are no direct comparisons between all the different options for patient preparation, which would otherwise enable comparison of multiple interventions, using advanced meta-analytic techniques, even where these interventions have not been compared directly with each other. This improves the accuracy of the calculations of their effect, potentially

resulting in greater certainty of the evidence when compared with peer-to-peer comparisons.⁷

The EAES has chosen to use an NMA in these clinical guidelines on bowel preparation for several reasons. The first is because it enables indirect comparisons between different types of bowel preparations, or combinations thereof, that have not been directly compared in individual studies using the available evidence. This statistical method makes it possible to extend the scope of comparisons beyond simple direct ones, which can provide a more complete view of the available bowel preparation options and their respective efficacies, enabling the identification of the most effective preparation in different contexts. On the other hand, this system enables the use of evidence to be optimised, even when the primary studies have not directly compared all the interventions possible. This can help minimise bias and increase the reliability of the guide's conclusions.

In summary, the use of an NMA, as in the case of these EAES clinical guidelines on bowel preparation, can provide a more complete and rigorous assessment of available treatment options, thus helping healthcare professionals to take more appropriate decisions, as is the particular case of bowel preparation in patients. prior to colorectal surgery.

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