

A Markov Chain approach for ranking treatments in network meta-analysis

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Network meta-analysis (NMA) under certain conditions provides the highest possible level of evidence for the development of clinical guidelines. A key feature of NMA is that it can rank for a specific outcome all alternative treatments of a comparative effectiveness review as long as they form a connected network.

All ranking approaches to date are based solely on the NMA relative effects. However, a range of characteristics may influence the choice of the most appropriate interventions in practice. For example, the credibility of the evidence is often limited for some comparisons or important prior knowledge about treatment performance is available from clinical experience. Sometimes treatments poorly connected to the network tend to appear at the top ranks although it is known that such treatments should not be recommended. Safety is also a crucial aspect of treatment performance, though very often disregarded in the evidence synthesis setting due to absence of appropriate and adequate data.

We developed a new approach for treatment ranking that combines the NMA relative effects and other characteristics affecting the treatment choice in clinical practice. We suggest the *Probability Of Selecting a Treatment to Recommend* (POST-R) as a new measure to rank treatments after obtaining the NMA results. We use a Markov Chain approach in which the probability of treatment selection at a certain step depends on the treatment selected at the previous step and the stationary distribution of the probability vector is regarded as the probabilities of treatment recommendation. The suggested algorithm allows incorporating information other than that of the relative effects through informative prior probabilities assigned to each treatment.

We illustrate our method using a NMA comparing the effectiveness of 19 drugs and placebo for chronic plaque psoriasis. We define transition probabilities based on the relative effects for efficacy and the prior probabilities informed by credibility of evidence, clinical experience, safety of treatments and cost. According to conventional ranking measures, a treatment connected weakly to the rest of the network had the better compromise between safety and efficacy. Our approach provided clinically more meaningful results by revealing a group of treatments with good performance on all the aforementioned aspects.

Our method offers a more intuitive way of thinking treatment ranking as it accommodates the different considerations being made before selecting a treatment in practice. In addition, the POST-R approach naturally captures the uncertainty in treatment selection by allowing the NMA end-user to 'move' between different treatment options with estimated probabilities.