The cost-effectiveness of biologic/targeted synthetic/biosimilar disease modifying antirheumatic drugs: a systematic review

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Background

Economic evidence of biologic/targeted synthetic/biosimilar disease modifying antirheumatic drugs (b/ts/biosimilar DMARDs) in treating chronic inflammatory arthritis remain unorganized and scattered. We aim to identify the updated evidence for b/ts/biosimilar DMARDs cost-effectiveness in the management of chronic inflammatory arthritis to inform prescribing and formulary decisions.

Method

Systematic literature search was conducted on PubMed, EMBASE, International Network of Agencies for Health Technology Assessment, Web of Science, and the Cochrane Library from January 2010 to March 2021. Studies were included if they

- Targeted patients with chronic inflammatory arthritis
- Evaluated at least one type of b/ts/biosimilar DMARDs
- Modeling-based on long-term cost-effectiveness analysis

Analysis

- We standardized the reported cost and incremental cost-utility ratios (ICURs) to 2020 US dollar Purchasing power parity (PPP)
- We categorized B/ts/biosimilar DMARDs to new generation and old generation based on FDA approval year, demarcated by 2010
- We summarized the proportion of studies that found b/ts/biosimilar DMARDs are cost-effective over conventional synthetic DMARDs
- For studies focused on the comparison among different b/ts/biosimilar DMARDs, we ranked the alternatives by ascending order of the costs, recalculated the ICUR compared to the least expensive option
- For studies reporting costs for both biosimilar and bio-originators, we analyzed the percentage of medical cost reduction
- For studies conducted from both societal and payer perspectives, we calculated the magnitude of ICUR reduction by accounting for the indirect costs (i.e., non-medical costs incurred due to productivity loss)

Results

We identified 58 studies covered four type of chronic autoimmune disease: rheumatoid arthritis (RA), juvenile idiopathic arthritis (JIA), ankylosing spondylitis (AS), and psoriatic arthritis (PsA)

Figure 1: PRISMA flow chart of article selection process

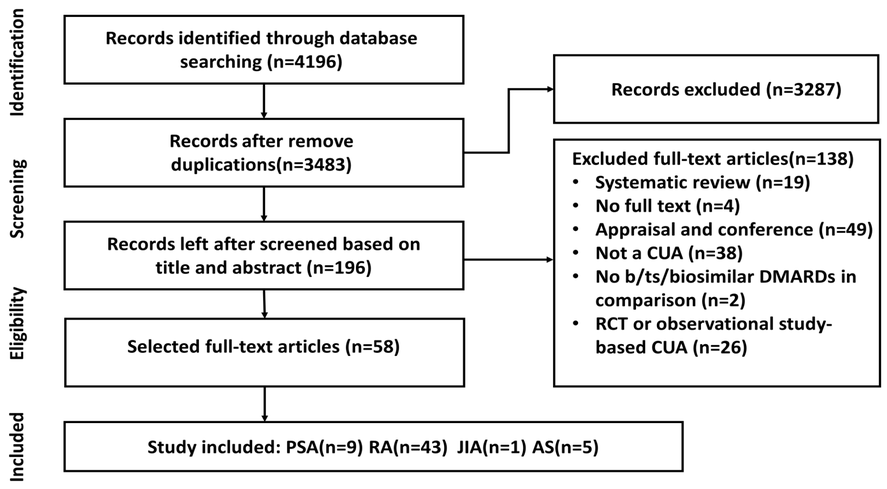


Figure 2: Characteristics of studies included

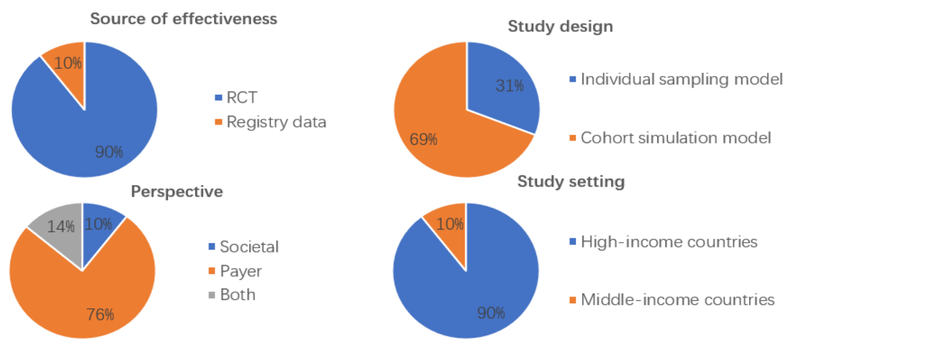
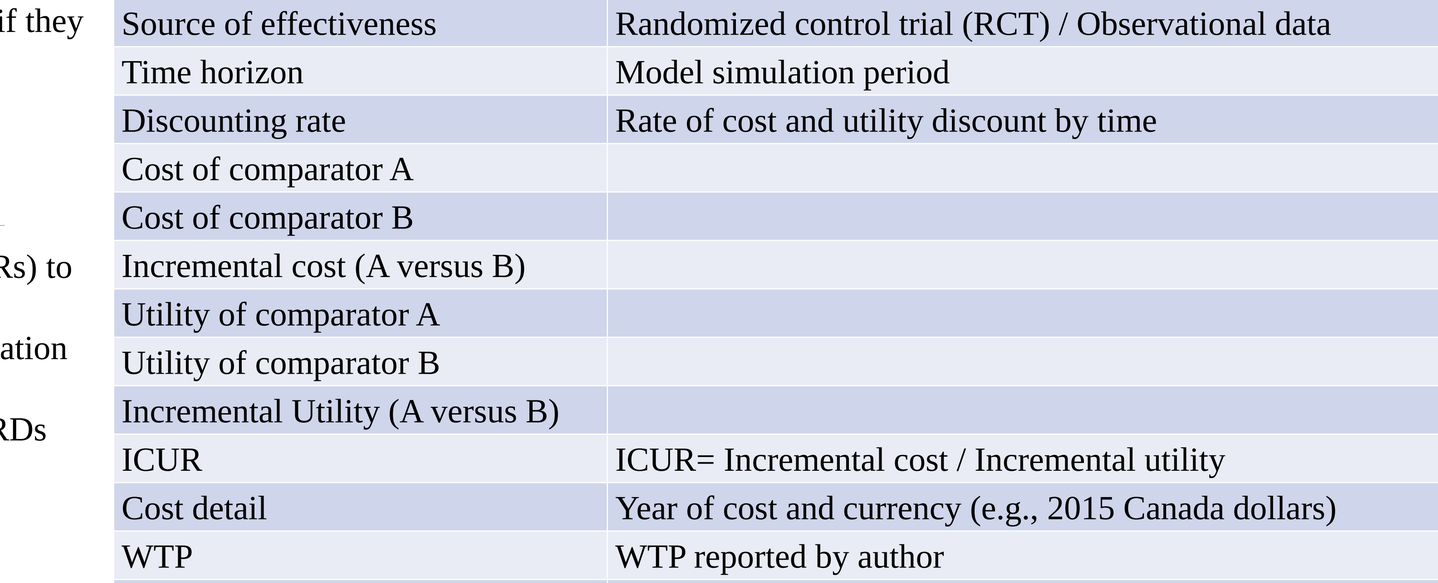


Table 1: Variables extracted out from studies

Variables	Denotes
Author and publish year	
Comparator A	B/ts/biosimilar DMARDs or csDMARDs
Comparator B	B/ts/biosimilar DMARDs or csDMARDs
Population	Simulated population, could be grouped by disease type and DMARDs prescription history
Perspective	Societal/Payer
Study design	Individual sampling model / Markov cohort model
Source of effectiveness	Randomized control trial (RCT) / Observational data
Time horizon	Model simulation period
Discounting rate	Rate of cost and utility discount by time
Cost of comparator A	
Cost of comparator B	
Incremental cost (A versus B)	
Utility of comparator A	
Utility of comparator B	
Incremental Utility (A versus B)	
ICUR	ICUR= Incremental cost / Incremental utility
Cost detail	Year of cost and currency (e.g., 2015 Canada dollars)
WTP	WTP reported by author
Cost-effective conclusion	Whether comparator A is cost-effective than comparator B

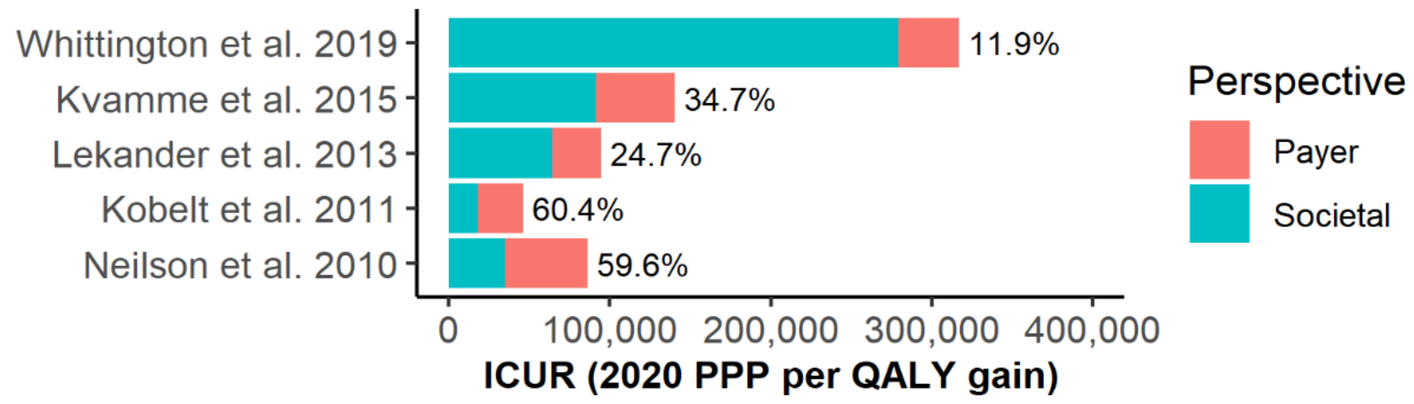
- Among biologic naïve patients, 38 out of 70 (54%) comparisons concluded that b/ts/biosimilar DMARDs are cost-effective compared with csDMARDs. For biologic experienced patients, only 10 out of 28 (36%) studies supported the cost-effectiveness of b/ts/biosimilar DMARDs.
- 14 out of 16 studies reported new generation B/ts/biosimilar DMARDs have less expensive price with non-inferior efficacy compared with old generation B/ts/biosimilar DMARDs

Figure 3: Medical cost reduction when adopting originator



- Seven studies reported the medical cost for using biosimilar or bio-originator. Overall, adopting biosimilars is associated with 1.7% to 16.7% medical cost saving.

Figure 4: ICUR reduction when using societal perspective versus payer perspective



- Five studies reported the ICUR from both payer and societal perspective (Societal perspective includes indirect costs such as productivity loss and caregiver expenditure). Overall, ICUR was reduced by 11.9-60.4% after accounting for indirect costs that could potentially alter the cost-effectiveness conclusion.

Discussion

Strength

- we updated the literature search to 2021 and included the most recent approved cutting-edge therapies
- we assessed the impact of indirect-costs and biosimilars on the cost-effectiveness evaluation of b/ts/biosimilar DMARDs
- we extracted and standardized the costs and ICUR into the same currency year to enable secondary analysis and between-study comparison

Weakness

- When interpreting cost-effectiveness results, we should be mindful that heterogeneities (e.g., Countries' economic level, time-horizon, perspective used) within studies will inevitably induce variability
- The majority of studies derived model input parameters from RCTs, which usually overestimate the effectiveness of therapy in real-world practice
- Many studies simulated lifetime results in the absence of mature long-term evidence, especially for newly-developed agents, the robustness of long-term input parameters such as transition probability, discontinuation rate are highly dependable on model assumption

Conclusion

Current economic evidence does not fully support the cost-effectiveness of b/ts/biosimilar DMARDs, despite consistent reports of improved quality of life and remission. The new generation b/ts/biosimilar DMARDs yielded comparable efficacy with lower medication costs over older generation products. Less expensive biosimilar DMARDs will encourage market competition and improve accessibility and affordability, which could become more promising in future markets.

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