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EE711

The Impact of Adherence on the Value Assessment of Cardiovascular Interventions: A Systematic Literature Review of Economic Evaluations

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INTRODUCTION

- Cardiovascular diseases (CVDs) including coronary heart disease, stroke, peripheral arterial disease, and aortic disease, are the leading causes of morbidity and mortality worldwide.[1]
- Economic evaluations play a vital role in assessing how the global burden of CVD should be managed, with a majority using decision-analytic models to guide healthcare resource allocation.[2]
- However, a common methodological approach - the omission of patient adherence – may bias economic evaluations[3, 4,5].

OBJECTIVE

To systematically assess how often patient adherence is incorporated into cardiovascular economic evaluations, how it is modelled, and the impact of adherence modelling on clinical and economic outcomes.

METHODS

- A systematic review was conducted in accordance with the PRISMA checklist to identify studies meeting the predefined PICOS framework (Table 1). For this review, lower adherence is defined as a Medication Possession Ratio (MPR) or Proportion of Days Covered (PDC) of less than 80%, consistent with thresholds commonly used in cardiovascular economic evaluations.
- A search was conducted in Embase and the Tufts Cost-Effectiveness Analysis (CEA) Registry to identify relevant economic evaluations, including terms for major cardiovascular diseases, economic evaluations and patient adherence.

Table 1. PICOS Inclusion Criteria

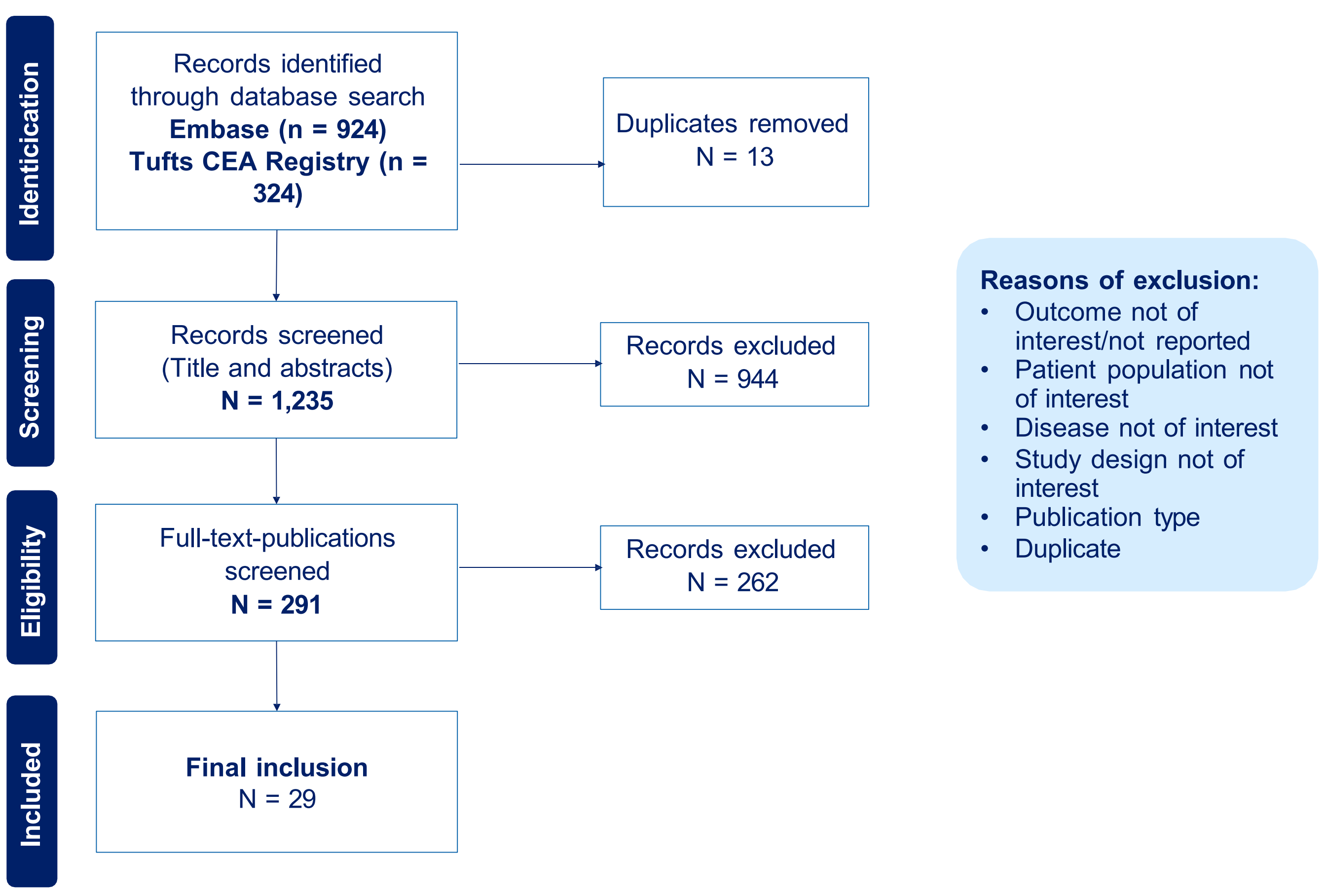
Category	Inclusion Criteria
Population	• Adults with any cardiovascular disease
Intervention/ Comparators	• Any drug therapy
Outcomes	• Economic and/or clinical outcomes (e.g. QALYs, ICER, adverse events) • Impact of economic and clinical outcomes based on how adherence was or was not incorporated.
Study type	• Full text economic evaluation
Location	• Global
Language	• English
Timeframe	• 2015-2025

Abbreviations: QALY = quality adjusted life year, ICER = incremental cost-effectiveness ratio, CEA = cost-effectiveness analysis, CUA = cost-utility analysis, CBA = cost-benefit analysis, BIA = budget impact analysis

RESULTS

- A systematic literature search was conducted using the Embase database and the Tufts CEA Registry, which initially identified 1,248 records. After removing 13 duplicates, a total of 1,235 unique records underwent a title and abstract screening.
- During this first-pass review, 944 records were excluded because they did not meet the eligibility criteria, such as having an irrelevant outcome, patient population, disease, study design, or publication type. The remaining 291 publications were then subjected to a full-text eligibility assessment.
- Following this detailed review, an additional 262 publications were excluded for the same reasons. This multi-stage screening process resulted in a final inclusion of 29 studies for the review.

Figure 1. PRISMA[6]: Records Identified via Tufts CEA Registry and Embase Search

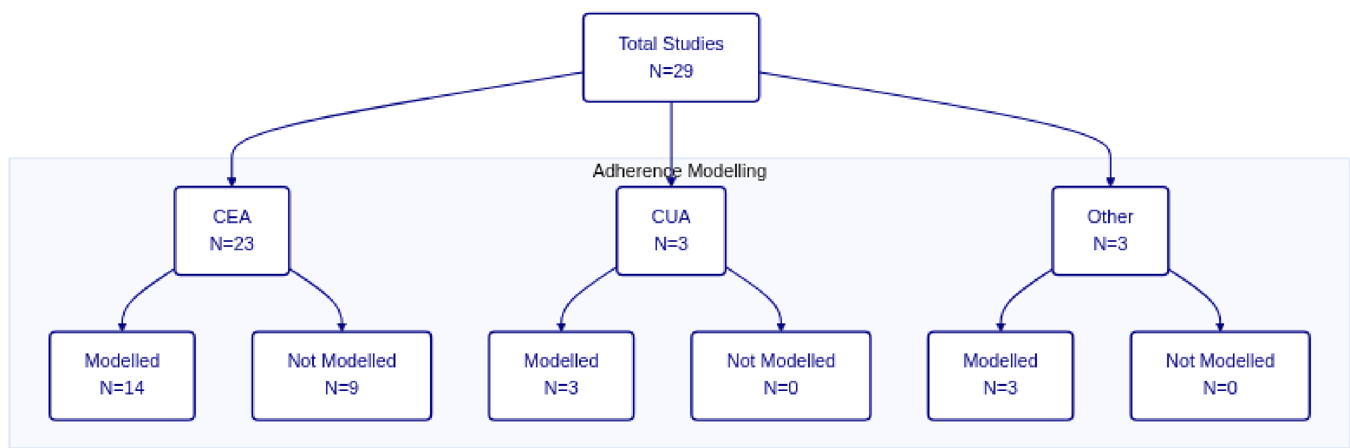


The diagram illustrates the number of records identified from the Embase and Tufts CEA Registry databases, the number of records screened after duplicate removal, the number of full-text articles assessed for eligibility, and the final number of studies included in the review. Reasons for exclusion at various stages are also listed.

Study Characteristics

- A total of 29 economic evaluations met the inclusion criteria. The included studies primarily utilized state-transition models (52%), with Markov models being the most common, to project long-term costs and outcomes. The analyses covered a range of cardiovascular conditions, most commonly atherosclerotic cardiovascular disease (ASCVD) and dyslipidaemia (34%), followed by hypertension (31%).
- As shown in Figure 2, the studies were categorized by analysis type, with the majority being cost-effectiveness analyses (CEA, n = 23, 79%). The remaining studies consisted of cost-utility analyses (CUA, n = 3, 10%) and three studies of other analysis types (n = 3, 10%). These other studies included a real-world study, an economic burden study, and a cross-sectional analysis. The decision was made to include these studies as they contained valuable information on the impact of adherence upon economic evaluations, despite two not being formal economic evaluations.
- Overall, 20 of the 29 (69%) studies modelled medication adherence. Within the CEA group, 14 studies (48%) modelled adherence while 9 studies (31%) did not. All studies in the CUA (n = 3) and Other (n = 3) categories modelled adherence.
- Of the 20 studies that modelled adherence, 7 (35%) identified adherence as a strong driver, defined as being among the top three most influential parameters in a sensitivity analysis. In contrast, five studies (25%) found adherence was not a strong driver, and eight studies (40%) did not include adherence in their analysis.

Figure 2. Distribution of Studies by Analysis Type and Adherence Modelling



This flowchart illustrates how the 29 studies were categorized. They are first grouped by analysis type (CEA, CUA, or Other) and further subdivided based on whether medication adherence was included in the model. Abbreviations: CEA: cost-effectiveness analysis; CUA: cost-utility analysis.

Economic and Clinical Outcomes

- The characteristics of the 20 studies that modelled adherence are summarized in Table 2.
- A variety of methods were used to define adherence. The most frequently used method was the proportion of days covered (PDC), which was used in 9 of the 20 studies (45%). In these studies, adherence was classified as having medication available for over 80% of the time. The adherence definition was inconclusive in 8 studies (40%) and the medication possession ratio (MPR), which also uses a threshold of over 80% to define adherence, was used in 3 studies (15%).
- For modelling adherence, Scenario modelling, which incorporates more than two adherence scenarios, was the most common method, utilized in 13 of the 20 studies (65%). A dichotomous approach (classifying subjects as either adherent or non-adherent) was used in 6 studies (30%) and one study (5%) modelled adherence as a decline over time.
- The inclusion of adherence caused a change in the incremental cost-effectiveness ratio (ICER) in 16 (80%) of the 20 papers. Only 4 studies (20%) found no change in the ICER after accounting for adherence.

Table 2. Characteristics of Studies that Modelled Adherence

Metric	Category	No. of Studies
Definition of Adherence	MPR	n = 3 (15%)
	PDC	n = 9 (45%)
	Inconclusive	n = 8 (40%)
Modelling of Adherence	Decline in adherence over time	n = 1 (5%)
	Dichotomous	n = 6 (30%)
	Scenario Modelling (more than 2 adherence scenarios)	n = 13 (65%)
Impact of Including Adherence	No change in ICER due to the inclusion of adherence	n = 4 (20%)
	Change in ICER due to the inclusion of adherence	n = 16 (80%)

The table summarizes the methods used to model adherence and the impact of its inclusion on study results across 20 studies. For studies where the definition of adherence was inconclusive, it was unclear whether adherence was defined using the proportion of days covered (PDC) or the medication possession ratio (MPR). Abbreviations: MPR: Medication Possession Ratio; PDC: Proportion of Days Covered.

DISCUSSION

- This systematic review found that while most recent cardiovascular economic evaluations (69%, 20/29) incorporated medication adherence, nearly a third (31%, 9/29) did not. Among studies that modelled adherence (80%, 16/20), the conclusion was cost-effective, often lowering the ICER. This suggests that omitting adherence or assuming 100% adherence may lead to biased conclusions about the value of an intervention.
- This was further reinforced by the finding that in 7/20 (35%) studies, adherence was a strong driver in sensitivity analyses, meaning it was one of the top three most influential parameters affecting the model's conclusions.
- This review also revealed a lack of consensus on how to define and model adherence. PDC was the most common definition of adherence (9/20, 45%), while scenario modelling was the most common modelling method (13/20, 65%). Despite its demonstrated importance, nearly a third of the reviewed studies (9 of 29, 31%) did not model adherence at all or assumed 100% adherence. The reasons for this omission may include the inherent complexity of modelling adherence or a lack of real-world data to inform model parameters. However, this simplification may come at the cost of real-world applicability.
- In conclusion, this review demonstrates that incorporating adherence into cardiovascular economic models can have a large impact on cost-effectiveness results and provide a more accurate assessment of intervention value. Evidence-based adherence modelling should be prioritized in future CVD economic evaluations to ensure findings are clinically relevant and to further help inform healthcare decisions.

References

1. Lindstrom M, et al. Global Burden of Cardiovascular Diseases and Risks Collaboration, 1990-2021. J Am Coll Cardiol. 2022;80(25):2372-2425.
2. Maniadakis N, et al. Economic evaluation in cardiology. Europace. 2011;13 Suppl 2:ii3-8.
3. Jones LK, et al. Adherence to lipid-lowering therapies and cardiovascular outcomes in patients with atherosclerotic cardiovascular disease: a systematic review and meta-analysis. J Am Heart Assoc. 2025;14(17):e037530.
4. Religioni U, Barrios-Rodríguez R, Requena P, Borowska M, Ostrowski J. Enhancing therapy adherence: impact on clinical outcomes, healthcare costs, and patient quality of life. Medicina. 2025;61(1):153.
5. Cho JY, Wilson FA, Chaikledkaew U, et al. Projected cost savings with optimal medication adherence in patients with cardiovascular disease requiring lipid-lowering therapy: a multinational economic evaluation study. J Am Heart Assoc. 2024;13:e037792.
6. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71

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