May 28, 2025

Comparative Efficacy of Synthetic Biology-Engineered Therapies Versus Conventional Treatments in Adult Cancer Prognosis: A Systematic Review and Meta-Analysis

DOI
https://dx.doi.org/10.17504/protocols.io.e6nvwqrd2vmk/v1

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Protocol Citation: Dr. Frank Urena 2025. Comparative Efficacy of Synthetic Biology-Engineered Therapies Versus Conventional Treatments in Adult Cancer Prognosis: A Systematic Review and Meta-Analysis. **protocols.io** https://dx.doi.org/10.17504/protocols.io.e6nvwqrd2vmk/v1

Protocol status: Working
We use this protocol and it's working

Created: May 27, 2025

Last Modified: May 28, 2025

Protocol Integer ID: 219038

Keywords: therapies versus conventional treatments in adult cancer prognosis, engineered therapies versus conventional treatment, comparative efficacy of synthetic biology, engineered therapy, conventional cancer treatments in adult patient, conventional cancer treatment, adult cancer prognosis, cell therapy, oncolytic virus, synthetic biology, systematic review

Abstract

This systematic review and meta-analysis aims to evaluate whether synthetic biology-engineered therapies, including CAR T-cell therapy, oncolytic viruses, and gene circuits, improve prognosis (overall survival and progression-free survival) compared to conventional cancer treatments in adult patients.

Guidelines

We will conduct comprehensive searches of PubMed, MEDLINE, Web of Science, and Scopus from January 2020 to February 2025. The search will use combinations of keywords and MeSH terms related to synthetic biology and cancer, such as “CAR T”, “chimeric antigen receptor”, “oncolytic virus”, “engineered bacteria”, “synthetic gene circuit”, “cancer therapy”, “survival”, and “clinical trial”. Filters will be applied to include only human studies involving adults. We will screen reference lists of included studies and relevant reviews. No language or geographical restrictions will be applied.

Materials

Synthetic biology therapies such as: Chimeric Antigen Receptor T-cell (CAR T-cell) therapies, TCR-engineered lymphocytes, Oncolytic viruses and engineered bacteria, Synthetic gene circuits or gene therapy platforms.

Types of study to be included

1 We will include randomized controlled trials (RCTs) and observational cohort studies that compare synthetic biology therapies to conventional cancer treatments in adult patients. We will exclude case reports, reviews, preclinical studies, and studies focused exclusively on pediatric populations.

Condition or domain being studied

2 The review focuses on adult cancer prognosis (including both hematologic and solid malignancies) and the effectiveness of synthetic biology-engineered therapies.

Participants/population

3 Adults (≥18 years) diagnosed with any cancer, including hematologic malignancies (e.g., lymphomas, leukemias) and solid tumors (e.g., pancreatic cancer, mesothelioma).

Comparator(s)/control

4 Conventional cancer treatments, including chemotherapy, radiotherapy, standard immunotherapies, targeted therapy, or surgery.

Main outcome(s)

5 Overall survival (OS)

6 Progression-free survival (PFS) / Event-free survival (EFS)

Measures of effect

7 Hazard ratios (HR) with 95% confidence intervals for survival outcomes. Secondary measures include response rates and quality of life indicators.

Additional outcome(s)

8 Objective response rates

9 Incidence of adverse events

10 Patient-reported outcomes, including quality of life

Risk of bias (quality) assessment

11 Risk of bias in RCTs will be assessed using the Cochrane Risk of Bias 2 tool. Cohort studies will be assessed using the Newcastle-Ottawa Scale. Overall quality and strength of evidence will be judged using GRADE criteria.

Strategy for data synthesis

12 A narrative synthesis will summarize all eligible studies. Where applicable, meta-analysis will be conducted using random-effects models (DerSimonian-Laird method). Meta-analyses will be performed for homogeneous subsets of data (e.g., CAR T-cell therapy in lymphoma). The I^2 statistic will assess heterogeneity. Results will be graphically presented using forest plots. Analysis software will include RevMan and R.

Analysis of subgroups or subsets

13 Subgroup analyses will include: Cancer type (hematologic vs. solid), Type of synthetic therapy (CAR T-cell vs. viral vs. bacterial), Study design (RCT vs. cohort), Risk of bias (low vs. high).

Funding sources/sponsors

14 None declared

Conflicts of interest

15 None declared

Review team members and organizational affiliations

16 Dr. Frank Urena, Medical Student, St. George's University

Organizational affiliation of the review

17 St. George's University, School of Medicine

Type and method of review

18 Systematic review and meta-analysis of interventional studies

Anticipated or actual start date

19 March 1, 2025

Anticipated completion date

20 December 15, 2025

Language

21 English

Country

22 Grenada, United States