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MetaFlow: A High-Performance Browser-Based Engine for Living Evidence Synthesis: Editorial

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Abstract

Traditional systematic reviews are slow and static, not keeping up with the rapid pace of clinical trial reporting. While statistical packages like R and Stata and Revman are methodologically strong, they lack connectivity. We have developed MetaFlow, a client-side application that automates the retrieval of data from the ClinicalTrials.gov v2 API.

Distinct from usual visualization dashboards, MetaFlow does advanced statistical computations entirely within the browser using multi-threaded Web Workers. The program uses the robust Improved Paule-Mandel (iPM-R) estimator for heterogeneity, Trial Sequential Analysis (TSA) with O'Brien-Fleming boundaries which is used to monitor cumulative evidence, and GOSH plots for combinatorial outlier detection. In our run on 10/12/2025 of lipid-lowering therapies, the system successfully synthesized data from nearly 200,000 participants, replicating known meta-regression coefficients with high precision.

We have used automated data mining with high level diagnostics (including contour-enhanced funnel plots and leave-one-out sensitivity analyses). MetaFlow takes away barriers to high-volume meta-analysis. This tool represents a shift toward continuously updated evidence synthesis which allows researchers to visualize the evidence in real-time.

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