

THE ECOSYSTEM OF EVIDENCE

Navigating the future
of the ecosystem of evidence

Artificial intelligence and digital transformation
in research and healthcare

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Designing a Machine-Interoperable Repository for Readily Shareable Clinical Evidence

Reusable RCT evidence with expert verification

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Background and aims

Evidence synthesis struggles to keep pace with growing literature

1. **Resource intensive**
2. **Time consuming**
3. **Lacks reusability**

Current situation

The same RCT evidence is re-extracted for each use



Systematic reviews
Extract for specific reviews



Evidence synthesis
Guidelines and HTA



Clinical / policy decisions
Evidence for decisions

Read and extract again



RCT publications

Reusable evidence

Proposed approach **One evidence object, many uses**

Extract and verify once for reusable, computable evidence



RCT publication

Verified structured evidence object

- Trial characteristics
- Population
- Intervention / comparator
- Outcomes and results
- Citations
- Source provenance

Systematic reviews
Structured access

Evidence synthesis
Computable data

Analysis + decisions
Traceable reuse

Aim | Develop and evaluate FAIR-aligned, machine-interoperable, reusable RCT evidence.

Methods

A source-grounded workflow with expert evaluation

1 Source RCT publications

Full-text reports as the source of truth



RCT publication

- Trial characteristics
- Interventions
- Outcomes
- Results
- Citations

2 Grounded extraction

Source passages, examples and expert involvement

Source text

Few-shot prompts

LLM extract

Expert

Review + correction

Structured content with source links

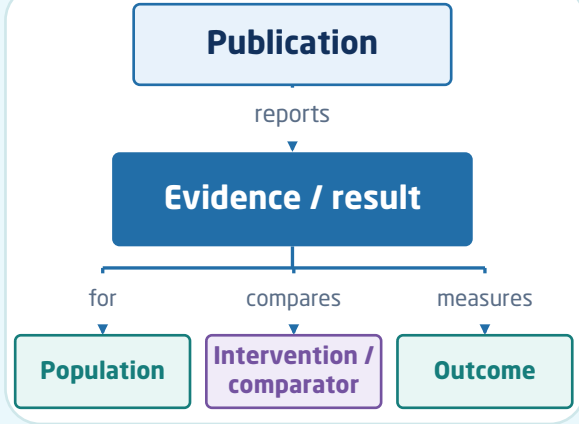
3 FHIR-inspired evidence objects

Standardised, computable evidence objects

- **Study metadata**
- **Population**
- **Intervention / comparator**
- **Outcome definition**
- **Evidence / result**
- **Citation**
- **Provenance**

4 Provenance-aware repository

Graph + semantic indexing



Vector embeddings + source traceability

Results

130 RCTs evaluated

A Extraction

Information extraction from RCTs

Correctness

96.35%

Matches source content

Completeness

94.37%

Expected content captured

Hallucinated content

1.81%

Not supported by source text

Source text + Expert annotated ground truth

B Standardization

FHIR-inspired transformation

npj Digital Medicine

Transformation accuracy

100%

Relative to source evidence

FHIR validation tool

C. Repository outcomes

A reusable knowledge graph of RCT evidence

Evidence successfully represented in a knowledge graph

Computable node	Meaningful relationships	Provenance tracked	Unique identity + versioning

Conventional + semantic queries	Global reuse across studies	Source / citation / version links	Downstream applications

A reusable, machine-interoperable representation of RCT evidence, validated with real publications.

Limits and conclusions

Feasible structured reuse, extended to governed reuse over time

Study limits

130 RCTs
Limited sample; broader validation remains necessary.

Open-access publications
Dependent on available metadata and full text.

Two-arm trials
Evaluated for two-arm parallel designs only.

Main conclusion

Feasible transformation of RCTs into FAIR-aligned, computable, reusable evidence with expert validation and source traceability.

Further extension

- Study-design-aware knowledge graph
- Published and generated systematic reviews

Provenance across the evidence lifecycle

Metadata
Source identifiers and registry records

Intra-document
Page, table or section within the source

Derivation
Links from evidence to derived outputs

Evidence lifecycle: selective updates

One publication, two evidence branches, traceable downstream use

