

A web application for structured management and reuse of electronic case report forms in REDCap

Daniel Birthelmer, Frank Kramer, Florian Auer

Angaben zur Veröffentlichung / Publication details:

Birthelmer, Daniel, Frank Kramer, and Florian Auer. 2026. "A web application for structured management and reuse of electronic case report forms in REDCap." In *Opening the personal gate between technology and health care: proceedings of MIE 2026*, edited by Mauro Giacomini, Jaime Delgado, Theodoros N. Arvanitis, Elisavet Andrikopoulou, Arriel Benis, Gabriella Balestra, Riccardo Bellazzi, et al., 1599–1600. Amsterdam: IOS Press. <https://doi.org/10.3233/shti260490>.

A Web Application for Structured Management and Reuse of Electronic Case Report Forms in REDCap

Daniel BIRTHELMER^{a,1}, Frank KRAMER^a and Florian AUER^a

^a*IT-Infrastructure for Translational Medical Research, University of Augsburg, Germany*

ORCID ID: Daniel Birthelmer 0009-0002-4864-9995,

Frank Kramer 0000-0002-2857-7122,

Florian Auer 0000-0002-5320-8900

Abstract. Electronic Data Capture systems such as REDCap are essential tools in biomedical research but provide limited support for managing the full lifecycle of electronic questionnaires, particularly regarding version control, reuse, and collaborative development. This work introduces a lifecycle-aware, version-controlled questionnaire management platform that complements existing REDCap workflows. The web-based tool supports structured questionnaire composition, item-level versioning, and standards-compliant CSV import and export. Evaluation using real-world REDCap data dictionaries demonstrated reliable round-trip interoperability and explicit traceability of questionnaire evolution.

Keywords. Electronic Data Capture, REDCap, Questionnaire Management

1. Introduction

The increasing complexity of clinical and translational research, characterized by evolving multi-site studies, creates growing challenges for the reuse of electronic case report forms [4]. REDCap is one of the most widely adopted Electronic Data Capture platforms in academic research due to its usability, audit trails, and flexible data export capabilities [1]. However, iterative questionnaire development and structured reuse of validated questions are only partially supported and are often handled manually using spreadsheets or duplicated project files, increasing the risk of inconsistencies and loss of provenance information [2,4]. Existing solutions primarily operate at the project level and do not provide fine-grained, item-level lifecycle management across studies [1,2].

2. Methods

A standalone web application was developed as a companion tool to REDCap and adheres strictly to REDCap's CSV-based data dictionary format to ensure interoperability. During import, questionnaires are validated against REDCap field definitions and transformed into an internal Form-Section-Question schema. Each

modification automatically generates a new immutable version annotated with author, timestamp, and change type, enabling full traceability.

3. Results

Evaluation using real-world REDCap data dictionaries demonstrated reliable CSV round-trip interoperability without loss of structural or semantic information. Fine-grained item-level version control enables explicit reconstruction of questionnaire evolution and supports structured reuse across studies. The platform facilitates transparent modification of questionnaires while maintaining consistency across projects.

4. Discussion

The presented platform extends REDCap by introducing structured item-level version control, modular reuse, and provenance-aware questionnaire management while preserving compatibility with existing workflows. Compared to spreadsheet-based practices, the system improves traceability, reduces manual errors, and supports collaborative development. Prior work has emphasized the importance of provenance and controlled reuse in clinical research data management [4,5].

5. Conclusion

This work presents a web-based companion platform that addresses key limitations in collaborative questionnaire development for clinical and translational research. Structured item-level version control and modular reuse preserve compatibility with existing REDCap workflows while improving transparency and traceability. By making questionnaire evolution explicit and machine-readable, the platform contributes to FAIR principles, particularly reusability and provenance transparency.

The source code for deploying own instances is publicly available at https://github.com/frankkramer-lab/REDCap_Questionnaire_Manager.

References

- [1] Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap). *J Biomed Inform.* 2009;42(2):377–381. doi:10.1016/j.jbi.2008.08.010
- [2] Auer F, Schmid V, Kramer F. A web-based questionnaire builder to facilitate form management for REDCap. *Stud Health Technol Inform.* 2024. doi:10.3233/SHTI240388
- [3] Kush RD, Alschuler L, Ruggeri R, et al. Implementing single source: the STARBRITE proof-of-concept study. *J Am Med Inform Assoc.* 2019;26(8–9):784–795. doi:10.1093/jamia/ocz033
- [4] Ohmann C, Kuchinke W, Canham S, Lauritsen J, Salas N. Standard requirements for GCP-compliant data management in multinational clinical trials. *Trials.* 2011;12:85. doi:10.1186/1745-6215-12-85
- [5] Hartung M, Terwilliger J, Rahm E. Recent advances in data provenance in biomedical data management. *Brief Bioinform.* 2018;19(1):129–141. doi:10.1093/bib/bbw099