UNIVERSITY OF BERN

**Open Science**
Research Data Management
University Library of Bern
Hochschulstrasse 6
3012 Bern, Switzerland

# Research Data Management Guideline

With this guideline on Research Data Management (RDM), the data stewards at the Open Science Team in the University Library of Bern aim to support researchers from all faculties at the University of Bern and Insel Hospital in research data management throughout the project life cycle. This includes dealing with ethical data collection, data reuse, data generation and data processing, data documentation, and preparing data and metadata, as well as code, and software for publication.

Research Data of high quality is an essential resource for science and society. Research Data Management (RDM) is a part of good scientific practice according to nationally and internationally recognized standards for scientific integrity. Good RDM enhances the robustness of research outputs, facilitates research collaborations, makes research results more reproducible, and strengthens society's trust in science.

## 1. Planning of Research Data Management

The Data Management Plan (DMP) is a document and tool (*Annex A, C, D*), and guideline for researchers themselves to facilitate the implementation of good RDM practices in their projects throughout the whole project life cycle, including the reporting, as well as for planning the storage and safeguarding of data.

The DMP stipulations issued by funding agencies must be strictly adhered to. The responsibility for this lies with the grantee(s).

## 2. Data collection and processing

Before data collection, data types should be identified. Sensitive (e.g., coded patient data or patient genomic data) and some non-sensitive data (e.g., animal data, plant tissues and / or seeds, soil etc.) all need authorized permissions, which must be obtained before data collection (*Annex A, E*).

Data volume should be roughly estimated, considering raw, re-processed and analysed data may have a different data volume, therefore, more space for data storage may be needed. This should be considered before and during data collection.

## 3. Data documentation and metadata

The structure and the processing steps of all research data must be systemically documented in a digital, logical manner in order to ensure adherence to the **FAIR** (Findable, Accessible, Interoperable and Reusable) principles[1,2].
The documentation includes general information like title of dataset; contributor information; date of data collection; geographic location of data collection; keywords describing the subject of the dataset; information about funding sources that supported the collection of the data; a codebook, lab journal and special software (*Annex B*).

## 4. Data storage, security and backup

Consult group / laboratory guidelines describing where raw, reprocessed, analysed, unpublished and published data and / or the corresponding protocols, surveys, paper data and samples are stored, as well as get in touch with the IT-Department of the University of Bern to ensure storage process and location (*Annex A4*).

## 5. Ethical, legal and security issues

Research projects conducted in Switzerland are subject to data protection law (cantonal data protection law, in some cases additionally the national data protection law) as well as special legal provisions on data protection under the Human Research Act (HRA) (*Annex A2*). The use of data in research projects within the scope of the HRA requires permission from the cantonal ethics commission Bern (CEC, Swissethics, Swissmedic) *(Annex A8)*. The HRA's scope includes all method-led research on physical and mental illnesses in humans and on the structure and function of the human body, with the aim of gaining generalizable knowledge. The HRA's scope includes all method-led research on physical and mental illnesses in humans and on the structure and function of the human body, with the aim of gaining generalizable knowledge.

Use of (coded) patient samples or data for research purposes is only permitted if written consent has been obtained (General or Informed Consent, respectively). The signed consent and a potential electronic Informed Consent (eIC) should be collected and stored separately from the coded sample/data, to avoid person identification.

Research projects that do not fall within the scope of the HRA do not need permission from the cantonal ethics committee but are required to get legal authorization before an experiment can be conducted (e.g., animal studies). Depending on the project and institution, special provisions may apply for obtaining authorizations (*Annex A8*).

According to the law (see Art. 70 Bern University Act, Annex A4; Art. 60 on the Law on Personnel (Personalgesetz; *Annex A5*), research results and outputs obtained at the University of Bern belong to the University. If data are obtained at different Universities, then joint ownership should be applied (see *Unitectra, Annex A5*). For clarification of details, please contact the legal services office at UniBE (*Annex A2*).

## 6. Publication of Research Data, Programming Code and Software

To follow the good scientific practice, research data should be published according to the principle "*as open as possible, as closed as necessary*". Research data and programming code both are relevant and requested to be shared along with the publication under a "Research Data and Code Availability Statement". They should be published and deposited in a **FAIR research data repository** along with rich metadata information (*see section 3, Annex E4*). If data cannot be openly published due to ethical or legal restrictions then a Data Transfer Agreement is recommended to upload along with the metadata and supplementary documentation material about the dataset, which will allow other researchers to understand and reuse the data (*Annex A1,2 E*).

UNIVERSITY OF BERN

**Open Science**
Research Data Management
University Library of Bern
Hochschulstrasse 6
3012 Bern, Switzerland

# Annexes

The following annexes provide additional information and available tools for research data management.

## Annex A: Support

### A1. Open Science Research Data Management

- The Data Stewards at the Open Science Team support researchers and research groups in research data management (Webpage link) like:
  - Research Data Management Plans (i) (e.g., for funding agencies SNSF, NIH, EU-Commission and research purposes).
  - Data documentation (Readme_Template_EN.txt)
  - Data and metadata publication in institutional BORIS Portal Research Data Repository (https://boris-portal.unibe.ch)
  - Data Transfer Agreement (Template)
  - Data licensing (Webpage link)
  - Instructions for the publication of software as Open Source Software for researchers of the University of Bern Open-Source-Software (PDF, 68KB)
  - Research Data Management Guidelines (Link)
  - Training Sessions and Workshops (Link)
  - Tools in Research Data Management (Link RDM)

### A2. Legal Services Office

- Legal Service Office at the University of Bern (Link)
- The Data Protection Officer (DPO) at the University of Bern is a contact point for University employees for advice on data protection issues.
- University of Bern Act (BSG 436.11 - Gesetz über die Universität - Kanton Bern - Erlass-Sammlung in German and French)
- Federal Act on Data Protection (FADP), cantonal data protection law
- Human Research Act (HRA)
- For consortia consider an Intellectual Property Rights Ownership agreement https://www.belex.sites.be.ch/app/de/texts_of_law/436.11
- Data Transfer and Use Agreement (DTUA) and Data Transfer and Processing Agreement (DTPA) of the Swiss Personalized Health Network (SPHN) (here).

### A3. IT Security

- You should check if an assessment of information security and data protection (ISDP) must be performed for studies with sensitive data (e.g., personal, genomic and health-related data) to define the information security and data protection measures at the UniBE (contact the IT Security Officer CISO at UniBE).

### A4. IT-Service at the University of Bern

- The IT-Service at the University of Bern supports researchers with internal IT infrastructure and related services https://serviceportal.unibe.ch/sp/

### A5. Unitectra

- The University Executive Board has defined guidelines with respect to the ownership, protection and exploitation of intellectual property at the University of Bern (Guideline in German only, Art. 60).
- For the commercialization of research results into new products and services (patents, licenses), for the negotiation of research agreements as well as for joint ownership agreements on creation or joint research work of a spin-off company, please contact Unitectra at the University of Bern and Insel Hospital.

### A6. Animal Welfare Office

- The Animal welfare Office ensures the quality of animal research and animal welfare

### A7. Research Management Office (RMO)

The RMO supports researchers in

- Export Control Focal Point

### A8. Research Integrity and Ethics

- Research Integrity and Ethics at the University of Bern
- Ethics Committee at the Faculty of Humanities at the University of Bern: Phil.-hist. Ethics Committee
- Ethics Committee at the Faculty of Human Sciences at the University of Bern: Phil.-hum. Ethics Committee
- Ethics Committee at the Faculty of Business, Economics and Social Sciences (WISO, Ethics Committee in German only)
- Bern Cantonal Ethics Commission Bern (CEC)
- Swiss Association of Research Ethics Committees (Swissethics)
- Swiss Agency for Therapeutic Products (Swissmedic)

### A9. Insel Hospital, Directorate for Teaching and Research

- The Directorate for Teaching and Research (DLF, in German only) at the Insel Hospital supports researchers on ethics applications, questions on patient data protection regulations and data delivery.

### A10. Clinical Trial Unit (CTU)

- Research Data Management support in clinical studies, incl. data management plans, database review and support.

## Annex B: Data documentation

- Description of obtained dataset by providing general information, sharing / access information, data and file overview, methodology and data-specific information. For more details see Readme_Template_EN.txt (3KB)
- Recommendation on research data documentation from the Open Science Team (PDF, 141KB)
- Codebook
- Electronic Laboratory Notebook (ELN)
- Laboratory Information Management System (LIMS)
- ELN vs. LIMS: How to Make a Choice?
- Research Electronic Data Capture REDCap (GCP-compliant)
- For clinical studies secuTrial (GCP-compliant)

## Annex C: Tutorials for SNSF Data Management Plans (DMPs)

The SNSF provides a template to help researchers complete their data management plan.

UNIVERSITY OF BERN

**Open Science**
Research Data Management
University Library of Bern
Hochschulstrasse 6
3012 Bern, Switzerland

DMPs shall be used to plan the life cycle of data, offering a long-term perspective by outlining how data will be 1) collected and generated; 2) processed; 3) documented; 4) shared and 5) preserved and published.

Further information on SNSF Data Management Plans can be found on the SNSF homepage https://www.snf.ch/en/dMILj9t4LNk8NwyR/topic/open-research-data and on the Universitätsbibliothek Bern YouTube Channel:

- SNSF Data Management Plan - Introduction: Open Research Data Policy
- SNSF Data Management Plan - Data collection and documentation
- SNSF Data Management Plan - Ethics, legal and security issues
- SNSF Data Management Plan - Data storage and preservation
- SNSF Data Management Plan - Data sharing and reuse

## Annex D: Data Management Plan (DMP) tools

DMPs can be written offline by using the downloaded template in a text document format. However, a number of web based DMP tools are currently available, containing DMP templates and providing guidance in interpreting and answering the questions.

Some of the tools allow collaboration on a DMP, while tracking progress.

To consider:

- Check what DMP tool is recommended or provided by your funding agency.
- Check what DMP tool is recommended or provided by your institute.
- Make sure that the tool you choose includes the DMP template that you need.
- If you want to produce a machine-actionable DMP, you need to make sure the tool you choose allows exporting the DMP in a machine-actionable format (e.g., JSON) rather than only as a PDF document.

## D1. List of the online DMP tools:

- The Research Data Management toolkit for Life Sciences RDMkit
- Useful links to some tools and resources
- The Open Science Data Stewards Team recommendation for the tools in Research Data Management (Link RDM)
- Specific tools are listed below:

*Tool 1: DMP Canvas Generator: DMP Generator (vital-it.ch)*

Description: Questionnaire that generates a pre-filled DMP.

Details:

- Questionnaire following the structure of the SNSF (Swiss National Science Foundation) with instructions for DMP submission.
- Each Swiss organization can develop their own specific template/canvas.

*Tool 2: DMP online: DMPonline (dcc.ac.uk)*

Training: Search results - TeSS (Training eSupport System) (elixir-europe.org)

Description: Data management plans that meet funder requirements by DCC.

Details:

- Tool widely used in European Research and many Universities or research Institutes.
- It provides a DMP online instance to researchers.
- It offers specific templates for specific funders.

*Tool 3: Argos: Argos (openaire.eu)*

Training: Argos - User Guide (openaire.eu)

Description: Tool that allows you to create and follow your data management plans, creating machine actionable DMPs. Configure to bestfit your specific discipline.

Details:

- Allows linking DMPs directly to underlying OpenAIRE and EOSC services.
- Offers means to source, describe (semantics) and trace the quality of your research.
- Argos templates incorporates the fullest collections of repositories, datasets, metadata standards and other additional resources to choose from.

## Annex E: Other RDM online sources

### E1. Encryption, anonymisation and pseudonymisation tools

- Recommendation on data encryption: Personal data should be kept encrypted by using e.g., Cryptomator or VeraCrypt.
- Data anonymisation tools: Amnesia https://amnesia.openaire.eu/ and Arx Arx.deidentifier
- Pseudonymisation tools: SPIDER https://eu-rd-platform.jrc.ec.europa.eu/spider/
- An efficient data masking for securing medical data using DNA encoding and chaotic system can be used http://doi.org/10.11591/ijece.v10i6.pp6008-6018
- At the ITMP, the Tissue Bank Bern (TBB) supports patient data collection and coding of data (pseudonymization) https://www.igmp.unibe.ch/research/core_facilities/tissue_bank_bern_tbb/index_eng.html

### E2. Data Management Law Tool

DMLawTool : a tool of the CCdigitallaw which aims to guide Swiss researchers through the most relevant legal issues in research data management (https://dmlawtool.ccdigitallaw.ch/).

### E3. Archiving

- Overview over most suitable file formats for long-term archiving: https://unlimited.ethz.ch/display/RC/File+formats+for+archiving+research+data
- For further general training on research data management: Best practices in research data management and stewardship | ELIXIR-DMP-DS-training (ifb-elixirfr.github.io) https://github.com/IFB-ElixirFr/ELIXIR-DMP-DS-training

### E4. Recommendations on data and / or metadata publication in research data repositories

- Swiss National Science Foundation SNSF
- National Institutes of Health: Repositories for Sharing Scientific Data - NIH data sharing
- Open Research Europe-approved repositories https://open-research-europe.ec.europa.eu/for-authors/data-guidelines#approvedrepositories
- A platform for searching a research data repository https://www.re3data.org/

## References

[1] *Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data **3**, 160018 (2016). https://doi.org/10.1038/sdata.2016.18*

[2]*FAIR Principles FAIR Principles - GO FAIR (go-fair.org)*