

Plan for Instruction in Methods for Enhancing Reproducibility

Individuals are required to comply with the instructions for the Plan for Instruction in Methods for Enhancing Reproducibility as provided in the SF424 (R&R) Application Guide, which include a description of how the program will provide training in scientific reasoning, rigorous research design, relevant experimental methods, consideration of relevant biological variables such as sex, authentication of key biological and/or chemical resources, quantitative approaches, and data analysis and interpretation, as appropriate to the field of study and the level and prior preparation of the trainees.

Beyond the comprehensive in-person training in responsible conduct of research (RCR) provided through the Pitt Clinical and Translational Science Institute (CTSI), trainees will be required to complete in-person and/or online instruction appropriate to their research methods on ensuring the collection, management, and analysis of reliable, reproducible data.

Many CTSI RCR workshops specifically address methods for enhancing reproducibility, including a growing series focused on rigor and reproducibility:

- Using Critical Appraisal to Assess the Rigor of the Prior Research and Critical Appraisal Journal Club
- Planning Your NIH Application for the Best Review Possible (covers rigor & reproducibility criteria)
- Enhancing Reproducibility through Transparency in Reporting Experimental Details
- Best Practices for Reproducible Data
- Crafting a Data Management Plan
- Is Social Science Reproducible?
- Responsibly Reusing Data

All trainees will complete the NIH online module providing an overview of the policy to enhance reproducibility through rigor and transparency and all NIGMS online training modules to enhance data reproducibility:

- Module 1: Lack of Transparency
- Module 2: Blinding and Randomization
- Module 3: Biological and Technical Replicates
- Module 4: Sample Size, Outliers, and Exclusion Criteria

NIGMS provides a clearinghouse with links to several additional modules addressing various topics in reproducibility and transparency that will be used to create individualized training plans, depending on the trainee's research focus, such as:

- Improving Reproducibility in Research (Indiana University)
- Let's Experiment: A Guide for Scientists Working at the Bench (iBiology)
- Pragmatic and Group-Randomized Trials in Public Health and Medicine (NIH Office of Disease Prevention)
- Controls in Animal Studies for Rigor and Reproducibility (American Physiology Society)
- Statistical Topics for Reproducible Animal Research (Indiana University & University of Alabama)
- Improving Reproducibility of Computational Microbiome Analysis (University of Michigan)
- Principles, Statistical and Computational Tools for Reproducible Science (Harvard University)
- Society for Neuroscience Rigor and Reproducibility Training Webinars (Rutgers University)
- Cell Line Authentication Training (Global Biological Standards Institute)

Past NIH conferences on rigor and reproducibility will also be recommended based on relevance to trainee research plans:

- Modern Technologies in Cell Biology: Potentials and Pitfalls
- Modern Technologies in Structural Biology: Potentials and Pitfalls
- Modern Technologies in Genome Technology: Potentials and Pitfalls

- NIH Workshop on Reproducibility in Cell Culture Studies

Similarly, trainees will have the opportunity to watch and discuss as a group videos from the NIH Office of Research in Women's Health on Sex and Gender Influences in Health & Disease, including how to take sex and other biological variables into account in preclinical research:

- Importance of Sex as a Basic Biological Variable in Preclinical Research
- Challenging Assumptions About Sex in Preclinical Research
- Understanding Gender in Research
- Practical methods to integrate the biological variable sex into research projects and cultivating a culture of "Sex Matters" across multiple disciplines
- Importance of reproducibility in biomedical research, the concept of including male and female subjects in studies, and the impact of including or not including sex as a basic biological variable

All research personnel (faculty, staff, trainees) involved with NIH-funded clinical trials are required to complete Good Clinical Practice (GCP) training. GCP is an international ethical and scientific quality standard for designing, conducting, recording and reporting clinical trials. The principles of GCP help assure the safety, integrity, and quality of clinical trials. Investigators and clinical trial staff who are competent in GCP principles will be better able to assure that the rights, safety, and well-being of human subjects are protected, that clinical trials are conducted in accordance with approved plans and with rigor and integrity, and that data derived from clinical trials are reliable and reproducible.

The Collaborative Institutional Training Initiative (CITI) offers basic and refresher courses in GPC for Clinical Trials with Drugs and Medical Devices (US FDA focus) and GPC for Clinical Trials with Investigational Drugs and Biologics (International Conference on Harmonisation/ICH focus). Trainees engaged in social or behavioral research will complete the 9-module GCP eCourse developed by the NIH Office of Behavioral and Social Sciences Research and the National Center for Advancing Translational Science and hosted by the Society of Behavioral Medicine.

Trainees conducting clinical research of any kind will undergo a RISE Review (Research Investigator Start-Up Education) by the Pitt Education & Compliance Office for Human Subjects Research (ECOHSR). The goal of the RISE program is to protect human subjects, enhance the rigor of data collected, and foster compliance by providing protocol-specific regulatory guidance and study documentation tools at the time of study initiation or shortly thereafter. The RISE review includes an interview lasting approximately 45 minutes followed by a review of the regulatory records. The interview covers all elements of the conduct of the study, including the logistics of implementing individual study procedures. If subjects are enrolled at the time of the review, several of the research records are assessed for compliance with the applicable regulations and institutional policies. Record review may include evaluation of:

- Informed consent documents/narrative note of informed consent
- Eligibility documentation/screening/enrollment logs
- Protocol adherence
- Source documentation
- Drug and device accountability (if applicable)
- Regulatory file/binder
- Unanticipated problem/Adverse event reports

Trainees engaged in clinical research will also complete the 90-minute, in-person Good Research Practice program also offered by the Pitt ECOHSR. The program covers the highlights of Good Research Practice and includes a brief review of:

- Protocol Implementation from Preparation to Closure
- Protocol Adherence and Oversight
- Informed Consent
- Study Documentation

- Drug/Device Accountability
- PI Responsibilities

All topics will be discussed in lab group and in mentor-mentee meetings to reinforce their implementation in practice in the course of individual trainee projects.

Relevant resources (for PI/trainees, not for inclusion in grant application):

CTSI RCR Workshops: <https://ctsi.pitt.edu/education-training/responsible-conduct-of-research-training/>

Pitt ECOHSR (Good Research Practice, RISE Review): <http://www.ecohsr.pitt.edu/activities-services/>

CITI (GCP): <https://about.citiprogram.org/en/series/good-clinical-practice-gcp/>

NIH: <https://grants.nih.gov/policy/reproducibility/training.htm>

NIH: <https://www.nih.gov/research-training/rigor-reproducibility/training>

NIGMS: <https://www.nigms.nih.gov/training/pages/clearinghouse-for-training-modules-to-enhance-data-reproducibility.aspx>

NIMH CREST: <https://www.nimh.nih.gov/funding/clinical-research/nimh-clinical-research-education-support-and-training-crest-program.shtml>

ORWH: <https://orwh.od.nih.gov/sex-gender/methods-techniques-integrating-sex-research>

OBSSR: <https://obssr.od.nih.gov/training/online-training-resources> (workshop videos & materials for enhancing reproducibility in mixed methods and other behavioral research)

Society of Behavioral Medicine: <https://www.sbm.org/training/good-clinical-practice-for-social-and-behavioral-research-elearning-course>