Northwestern University

Guidelines for Investigators in Scientific Research

Introduction

These *Guidelines for Investigators in Scientific Research* were formulated by the Research Affairs Committee of the General Faculty Committee. They reflect the commitment of the faculty and administration of Northwestern University to maintain the highest level of integrity in University research and scholarly activity.

If adopted by research groups in all schools of the University, the practices described in these guidelines should assure quality and integrity in research and accuracy in the scientific reports produced at Northwestern. These recommendations are not intended as rules, but rather as guidelines from which investigators in various disciplines can formulate specific procedures to ensure the quality and integrity of their research.

Because these guidelines must be an essential part of Northwestern University's research culture, it is essential that faculty disseminate this information to associated students and staff.

Supervision of Research Trainees

Careful supervision of new investigators by their preceptors is in the best interests of the institution, preceptor, trainee, and scientific community. The complexity of scientific methods and advanced statistical analyses, as well as the necessity for caution in interpreting possibly ambiguous data, require that preceptors assume an active role in guiding new investigators, particularly trainees without substantial research experience.

Recommendations

1. Responsibility for supervising each junior investigator should be assigned to a specific faculty and/or postdoctoral preceptor in each research unit.

2. The ratio of trainees to preceptors should be small enough to permit scientific interchange, as well as oversight of the research at all stages.

3. The faculty adviser should be involved in the conduct and frequent review of research produced by his/her group. An adviser who limits his/her role to the editing of manuscripts does not provide adequate supervision.

4. Collegial discussions among preceptors and trainees should be held regularly, both to contribute to the scientific efforts of the research group and to provide informal peer review.

5. The faculty adviser should provide and discuss with each new investigator or trainee the applicable governmental and institutional guidelines and requirements for conduct of studies (e.g., involving human subjects, animals, use and disposal of radioactive or other hazardous substances, and recombinant DNA).

Data Gathering, Storage, and Retention

A common denominator in most cases of alleged scientific misconduct is the absence of a complete set of verifiable data. The retention of accurately recorded and retrievable results is of the utmost importance for the progress of scientific inquiry. A scientist must have access to his/her original results in order to respond to questions, including those that may arise without any implication of impropriety. Moreover, errors may be mistaken for misconduct when the primary experimental results are unavailable.

Recommendations

1. Custody of all original primary data must be retained by the unit in which they are generated. An investigator may make copies of the primary data for their own use.
2. Original results should be recorded systematically, using identifying dates.
3. Machine print-outs should be affixed to, or referenced from, the laboratory notebook.
4. Primary data should remain in the research center at all times and should be preserved as long as there is any reasonable need to refer to them. The chief of each research unit must decide whether to preserve primary data for a given number of years or for the life of the unit. In no instance, however, should primary data be destroyed while investigators, colleagues, or readers of published results may raise questions answerable only by reference to such data.

Authorship

In recent years, a gradual diffusion of responsibility for multi-authored or collaborative studies has led to the publication of papers for which no single author was prepared to take full responsibility. Two critical safeguards in the publication of accurate scientific reports are:

a) active participation of each co-author in verifying that portion of the manuscript which falls within his/her specialty area, and

b) designation of one author who is responsible for the validity of the entire manuscript.

Recommendations

1. Criteria for authorship should be determined by the research team before the research begins. The only reasonable criterion would seem to be that each co-author should have made a significant intellectual or practical contribution. The concept of *honorary authorship* should be avoided.
2. The first and/or primary author is assumed to have sufficient knowledge of the data to assure its accuracy and reliability.
3. Before submitting for publication the final draft of a manuscript, or of subsequent revisions, the first or primary author should obtain a signed statement from each co-author indicating that he/she has reviewed and approved the manuscript to the extent possible, given individual expertise.

Publication Practices

Certain practices make it difficult for reviewers and readers to follow a complete research sequence:

a) rapid publication of data without adequate tests of reproducibility or assessment of significance;

b) publication of fragments of a study;

c) submission of multiple similar abstracts or manuscripts differing only slightly in content.

In such circumstances, if any of the work is questioned, it is difficult to determine whether the research was done inaccurately, methods were described imperfectly, analyses were flawed, or inappropriate conclusions were drawn. Investigators should review each proposed manuscript with these potential problems in mind.

Recommendations

1. Each school or department has individual guidelines for promotion and tenure. In general, the schools at Northwestern stress quality, rather than quantity, of publications. The University does not encourage hasty or trivial publications in its promotion and tenure policies.
2. Simultaneous submission of multiple similar abstracts or manuscripts to journals is improper and should be discouraged.

Guidelines for Scientific Research

Because groups in the various schools address different scientific problems with different methods, each school or department should develop specific variations on, or additions to, these guidelines to identify practices that seem most likely to enhance the quality of research conducted by its members.

Recommendations

1. The publication containing Guidelines for Investigators in Scientific Research and Policy on Integrity in Research and Procedures for Reviewing Alleged Misconduct should be provided to each new investigator upon starting work.
2. Each new investigator should be given a copy of 0n Being a Scientist (National Academy Press, Washington, D. C., 1989).
3. The faculty adviser should insure that each new investigator or trainee has familiarized him/herself with the contents of both publications. Questions or issues pertaining to these documents should be discussed, preferably in the context of a meeting of the adviser's research group.

These guidelines are closely modeled after *Guidelines for Investigators in Scientific Research* adopted by Harvard Medical School, Spring 1988.