Guidelines for Investigators in Scientific Research

INTRODUCTION

These guidelines describe practices generally accepted by members of the Faculty of Medicine and already in effect in their laboratories. The primary intent of codifying them is to bring them to the attention of those beginning their careers in scientific research. These recommendations are not intended as rules, but rather as guidelines from which each group of investigators can formulate its own set of specific procedures to ensure the quality and integrity of its research.

I. SUPERVISION OF RESEARCH TRAINEES

Careful supervision of new investigators by their preceptors is in the best interest of the institution, the preceptor, the trainee, and the scientific community. The complexity of scientific methods, the necessity for caution in interpreting possibly ambiguous data, and the need for advanced statistical analysis, all require an active role for the preceptor in the guidance of new investigators. This is particularly true in the not uncommon circumstance of a trainee who arrives in a research unit without substantial experience in laboratory science.

Recommendations

1. The responsibility for supervision of each junior investigator should be specifically assigned to some faculty member in each research unit.

2. The ratio of trainees to preceptors should be small enough that close interaction is possible for scientific interchange as well as oversight of the research at all stages.

3. The preceptor should supervise the design of experiments and the processes of acquiring, recording, examining, interpreting, and storing data. (A preceptor who limits his/her role to the editing of manuscripts does not provide adequate supervision.)

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

5. The preceptor should provide each new investigator (whether student, postdoctoral fellow, or junior faculty) with applicable governmental and institutional requirements for conduct of studies involving healthy volunteers or patients, animals, radioactive or other hazardous substances, and recombinant DNA.

II. DATA GATHERING, STORAGE, AND RETENTION

A common denominator in most cases of alleged scientific misconduct has been the absence of a complete set of verifiable data. The retention of accurately recorded and retrievable results is of 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, but not limited to, those that may arise without any implication of impropriety.

Moreover, errors may be mistaken for misconduct when the primary experimental results are unavailable. In addition, when statistical analysis is required in the interpretation of data, it should be used in the design of studies as well as in the evaluation of results.

Recommendations

1. Custody of all original primary laboratory data must be retained by the unit in which they are generated. An investigator may make copies of the primary data for his/her own use.

2. Original experimental results should be recorded, when possible, in bound books with numbered pages. An index should be maintained to facilitate access to data.

3. Machine print-outs should be affixed to or referenced from the laboratory notebooks.

4. Primary data should remain in the laboratory 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 such 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.

III. AUTHORSHIP

A gradual diffusion of responsibility for multi-authored or collaborative studies has led in recent years 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 the active participation of each co-author in verifying that part of a manuscript that falls within his/her specialty area and the designation of one author who is responsible for the validity of the entire manuscript.

Recommendations

1. Criteria for authorship of a manuscript should be determined and announced by each department or research unit. The Committee considers only reasonable criterion to be that the co-author has made a significant intellectual or practical contribution. The concept of "honorary authorship" is deplorable.

2. The first author should assure the head of each research unit or department chairperson that he/she has reviewed all the primary data on which the report is based and provide a brief description of the role of each co-author. (In multi-institutional collaborations, the senior investigator in each institution should prepare such statements.)

3. Appended to the final draft of the manuscript should be a signed statement from each co-author indicating that he/she has reviewed and approved the manuscript to the extent possible, given individual expertise.

IV. PUBLICATION PRACTICES

The Committee has observed certain practices that make it difficult for reviewer and reader to follow a complete experimental sequence: the rapid publication of data without adequate tests of reproducibility or assessment of significance, the publication of fragments of a study, and the 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, the methods were described imperfectly, the statistical analyses were flawed, or inappropriate conclusions were drawn. Investigators should review each proposed manuscript with these principles in mind.

Recommendations

1. The number of publications to be reviewed at the time of faculty appointment or promotion should be limited in order to encourage and reward bibliographies containing fewer but more substantive publications rather than those including many insubstantial or fragmented reports. (It has been suggested, for example, that no more than 5 papers be reviewed for appointment as Assistant Professor, no more than 7 for Associate Professor, and no more than 10 for Professor.)

2. Simultaneous submissions of multiple similar abstracts or manuscripts to journals is improper.

V. LABORATORY GUIDELINES

Because each research unit addresses different scientific problems with different methods, each unit should develop its own specific guidelines to identify practices that seem most likely to enhance the quality of research conducted by its members. Those guidelines should be provided to the new investigators upon starting work.

Adapted on February 16, 1988

Table of Contents