

Research Involving Human Biological Materials: Ethical Issues and Policy Guidance Executive Summary

Introduction

Biomedical researchers have long studied human biological materials—such as cells collected in research projects, biopsy specimens obtained for diagnostic purposes, and organs and tissues removed during surgery—to increase knowledge about human diseases and to develop better means of preventing, diagnosing, and treating these diseases. Today, new technologies and advances in biology provide even more effective tools for using such resources to improve medicine’s diagnostic and therapeutic potential. Yet, the very power of these new technologies raises a number of important ethical issues.

Is it appropriate to use stored biological materials in ways that originally were not contemplated either by the people from whom the materials came or by those who collected the materials? Does such use harm anyone’s interest? Does it matter whether the material is identified, or identifiable, as to its source, or is linked, or linkable, to other medical or personal data regarding the source? The extent to which a research sample can be linked with the identity of its source is a significant determination in assessing the risks and potential benefits that might occur to human subjects. For this reason, the National Bioethics Advisory Commission (NBAC) has developed a schema to describe the character of the personal information associated with particular samples of human biological materials as they exist in clinical facilities or other repositories and in the hands of researchers. (See Table 1.)

Table 1: Categories of Human Biological Materials

Repository Collections

Unidentified specimens: For these specimens, identifiable personal information was not collected or, if collected, was not maintained and cannot be retrieved by the repository.

Identified specimens: These specimens are linked to personal information in such a way that the person from whom the material was obtained could be identified by name, patient number, or clear pedigree location (i.e., his or her relationship to a family member whose identity is known).

Research Samples

Unidentified samples: Sometimes termed “anonymous,” these samples are supplied by repositories to investigators from a collection of unidentified human biological specimens.

Unlinked samples: Sometimes termed “anonymized,” these samples lack identifiers or codes that can link a particular sample to an identified specimen or a particular human being.

Coded samples: Sometimes termed “linked” or “identifiable,” these samples are supplied by repositories to investigators from identified specimens with a code rather than with personally identifying information, such as a name or Social Security number.

Identified samples: These samples are supplied by repositories from identified specimens with a personal identifier (such as a name or patient number) that would allow the researcher to link the biological information derived from the research directly to the individual from whom the material was obtained.

Ethical researchers must pursue their scientific aims without compromising the rights and welfare of human subjects. However, achieving such a balance is a particular challenge in rapidly advancing fields, such as human genetics, in which the tantalizing potential for major advances can make research activities seem especially important and compelling. At the same time, the novelty of many of these fields can mean that potential harms to individuals who are the subjects of such research are poorly understood and hence can be over- or underestimated. This is particularly true of nonphysical harms, which can occur in research conducted on previously collected human biological materials when investigators do not directly interact with the persons whose tissues, cells, or DNA they are studying.

Increasing concerns about the use of genetic and other medical information have fueled the current debate about medical privacy and discrimination. Because medical research can reveal clinically relevant information about individuals, scientists must ensure that those who participate in research are adequately protected from unwarranted harms resulting from the inadvertent release of such information. Although protection of human subjects in research is of primary concern in the U.S. biomedical research system, research that uses biological materials—materials that often are distanced in time and space from the persons from whom they were obtained—raises unique challenges regarding the appropriate protection of research subjects.

Research sponsors, investigators, and Institutional Review Boards (IRBs) thus must exercise great care and sensitivity in applying professional guidelines and government regulations to protect subjects whose biological materials are used in research. **Properly interpreted and modestly modified, present federal regulations can protect subjects’ rights and interests and at the same time permit well-designed research to go forward using materials already in storage as well as those newly collected by investigators and others.** Fundamentally, the interests of subjects and those of researchers are not in conflict. Rather, appropriate protection of subjects provides the reassurance needed if individuals are to continue to make their tissue,

blood, or DNA available for research. Indeed, public confidence in the ethics and integrity of the research process translates into popular support for research in general.

Policies and guidelines governing human subjects research should permit investigators—under certain circumstances and with the informed, voluntary consent of sample sources—to have access to identifying information sufficient to enable them to gather necessary data regarding the subjects. Provided that adequate protections exist (which usually, but not always, include informed consent), such information gathering could include ongoing collection of medical records data and even requests for individuals to undergo tests to provide additional research information. In some cases, it even will be acceptable for investigators to convey information about research results to the persons whose samples have been studied. Where identifying information exists, however, a well-developed system of protections must be implemented to ensure that risks are minimized and that the interests of sample sources are protected.

Finally, any system of regulation is most likely to achieve its goals if it is as clear and as simple as possible. This is especially true in the research use of human biological materials, because the federal protections for research subjects require investigators to outline the involvement of human subjects in their studies and to undergo institutional review of their protocols. Thus, one reason to modify regulations is to clarify which protocols are subject to what sorts of prior review; likewise, illustrations and explanations may be useful in clarifying how the regulations apply to novel or complicated fields that use human biological materials.

How well does the existing Federal Policy for the Protection of Human Subjects (the so-called Common Rule, codified at 45 CFR Part 46) meet these objectives? Specifically, does it provide clear direction to research sponsors, investigators, IRBs, and others regarding the conduct of research using human biological materials in an ethical manner? NBAC finds that it does not adequately do so. In some cases, present regulatory language provides ambiguous guidance for research using human biological materials. For example, confusion about the intended meaning of terms such as “human subject,” “publicly available,” and “minimal risk” has stymied investigators and IRB members. Beyond these ambiguities, certain parts of current regulations are inadequate to ensure the ethical use of human biological materials in research and require some modification.

In this report, NBAC offers a series of recommendations that have been developed to address perceived difficulties in the interpretation of federal regulations and in the language of position statements of some professional organizations; ensure that research involving human biological materials will continue to benefit from appropriate oversight and IRB review, the additional burdens of which are kept to a minimum; provide investigators and IRBs with clear guidance regarding the use of human biological materials in research, particularly with regard to informed consent; provide a coherent public policy for research in this area that will endure for many years and be responsive to new developments in science; and provide the public (including potential research subjects) with increased confidence in research that makes use of human biological materials. In particular, this report provides interpretations of several important concepts and terms in the Common Rule and recommends ways both to strengthen and clarify the regulations and to make their implementation more consistent.

Recommendations

Interpretation of the Existing Federal Regulations

NBAC offers the following recommendations to improve the interpretation and implementation of the existing federal regulations as they apply to research using human biological materials.

Recommendation 1:

Federal regulations governing human subjects research (45 CFR 46) that apply to research involving human biological materials should be interpreted by the Office for Protection from Research Risks (OPRR), other federal agencies that are signatories to the Common Rule, IRBs, investigators, and others, in the following specific ways:

- a) **Research conducted with unidentified samples is not human subjects research and is not regulated by the Common Rule.**
- b) **Research conducted with unlinked samples is research on human subjects and is regulated by the Common Rule, but is eligible for exemption from IRB review pursuant to 45 CFR 46.101(b)(4).**
- c) **Research conducted with coded or identified samples is research on human subjects and regulated by the Common Rule. It is not eligible for exemption unless the specimens or the samples are publicly available as defined by 45 CFR 46.101 (b)(4). Few collections of human biological materials are publicly available, although many are available to qualified researchers at reasonable cost. Therefore, OPRR should make clear in its guidance that in most cases this exemption does not apply to research using human biological materials.**

The current federal regulations appear to make eligible for expedited review research on materials that will be collected for clinical purposes or those that will be collected in noninvasive or minimally invasive ways for research purposes. NBAC finds that there is no need to distinguish between collections originally created for clinical purposes and those created for research purposes. In both cases, research on the collected materials should be eligible for expedited review if the research presents no more than a minimal risk to the study subjects. (See the discussion of minimal risk below.)

Recommendation 2:

OPRR should revise its guidance to make clear that all minimal-risk research involving human biological materials—regardless of how they were collected—should be eligible for expedited IRB review.

Special Concerns About the Use of Unlinked Samples

Given the importance of society's interest in treating disease and developing new therapies, a policy that severely restricts research access to unidentified and unlinked samples would severely hamper research and could waste a valuable research resource. As noted in Recommendation 1, research using unlinked samples may be exempt from review. However, if coded or identified samples are rendered unlinked by the investigator, special precautions are in order.

Recommendation 3:

When an investigator proposes to create unlinked samples from coded or identified materials already under his or her control, an IRB (or other designated officials at the investigator's institution) may exempt the research from IRB review if it determines that

- a) the process used to unlink the samples will be effective, and**
- b) the unlinking of the samples will not unnecessarily reduce the value of the research.**

Requirements for Investigators Using Coded or Identified Samples

Repositories and IRBs share responsibility with investigators to ensure that research is designed and conducted in a manner that appropriately protects human subjects from unwarranted harms.

Recommendation 4:

Before releasing coded and/or identified samples from its collection, a repository should require that the investigator requesting the samples either provide documentation from the investigator's IRB that the research will be conducted in compliance with applicable federal regulations or explain in writing why the research is not subject to those regulations.

Recommendation 5:

When reviewing and approving a protocol for research on human biological materials, IRBs should require the investigator to set forth

- a) a thorough justification of the research design, including a description of procedures used to minimize risk to subjects,**
- b) a full description of the process by which samples will be obtained,**
- c) any plans to obtain access to the medical records of the subjects, and**
- d) a full description of the mechanisms that will be used to maximize the protection against inadvertent release of confidential information.**

When an investigator obtains access to a patient's medical records, either to identify sample sources or to gather additional medical information, human subjects research is being conducted. IRBs should adopt policies to govern such research, consistent with existing OPRR guidance related to medical records research.

Obtaining Informed Consent

Research using coded or identified samples requires the consent of the source, unless the criteria for a consent waiver have been satisfied. Unfortunately, the consent obtained at the time the specimen was obtained may not always be adequate to satisfy this requirement. When research is contemplated using existing samples, the expressed wishes of the individuals who provided the materials must be respected. Where informed consent documents exist, they may indicate whether individuals wanted their sample to be used in future research and in some instances may specify the type of research.

When human biological materials are collected, whether in a research or clinical setting, it is appropriate to ask subjects for their consent to future use of their samples, even in cases where such uses are at the time unknown. In this latter case, however, particular considerations are needed to determine whether to honor prospective wishes.

Whether obtaining consent to the research use of human biological materials in a research or clinical setting, and whether the consent is new or renewed, efforts should be made to be as explicit as possible about the uses to which the material might be put and whether it is possible that the research might be conducted in such a way that the individual could be identified. Obviously, different conditions will exist for different research protocols, in different settings, and among individuals. NBAC notes that the current debate about the appropriate use of millions of stored specimens endures because of the uncertain nature of past consents. Investigators and others who collected and stored human biological materials now have the opportunity to correct past inadequacies by obtaining more specific and clearly understood informed consent.

Recommendation 6:

When informed consent to the research use of human biological materials is required, it should be obtained separately from informed consent to clinical procedures.

Recommendation 7:

The person who obtains informed consent in clinical settings should make clear to potential subjects that their refusal to consent to the research use of biological materials will in no way affect the quality of their clinical care.

Recommendation 8:

When an investigator is conducting research on coded or identified samples obtained prior to the implementation of NBAC's recommendations, general releases for research given in conjunction with a clinical or surgical procedure must not be presumed to cover all types of research over an indefinite period of time. Investigators and IRBs should review existing consent documents to determine whether the subjects anticipated and agreed to participate in the type of research proposed. If the existing documents are inadequate and consent cannot be waived, the investigator must obtain informed consent from the subjects for the current research or in appropriate circumstances have the identifiers stripped so that samples are unlinked.

Recommendation 9:

To facilitate collection, storage, and appropriate use of human biological materials in the future, consent forms should be developed to provide potential subjects with a sufficient number of options to help them understand clearly the nature of the decision they are about to make. Such options might include, for example:

- a) refusing use of their biological materials in research,**
- b) permitting only unidentified or unlinked use of their biological materials in research,**
- c) permitting coded or identified use of their biological materials for one particular study only, with no further contact permitted to ask for permission to do further studies,**
- d) permitting coded or identified use of their biological materials for one particular study only, with further contact permitted to ask for permission to do further studies,**

- e) **permitting coded or identified use of their biological materials for any study relating to the condition for which the sample was originally collected, with further contact allowed to seek permission for other types of studies, or**
- f) **permitting coded use of their biological materials for any kind of future study.***

Criteria for Waiver of Consent

When an investigator proposes to conduct research with coded or identified samples, it is considered research with human subjects. Ordinarily the potential research subject is asked whether he or she agrees to participate. Seeking this consent demonstrates respect for the person's right to choose whether to cooperate with the scientific enterprise, and it permits individuals to protect themselves against unwanted or risky invasions of privacy. But informed consent is merely one aspect of human subjects protection. It is an adjunct to—rather than a substitute for—IRB review to determine if the risks of a study are minimized and acceptable in relation to its benefits.

When a study is of minimal risk, informed consent is no longer needed by a subject as a form of self-protection against research harms. However, it is still appropriate to seek consent in order to show respect for the subject, unless it is impracticable to locate him or her in order to obtain it. Thus, when important research poses little or no risk to subjects whose consent would be difficult or impossible to obtain, it is appropriate to waive the consent requirement.

Recommendation 10:

IRBs should operate on the presumption that research on coded samples is of minimal risk to the human subject if

- a) **the study adequately protects the confidentiality of personally identifiable information obtained in the course of research,**
- b) **the study does not involve the inappropriate release of information to third parties, and**
- c) **the study design incorporates an appropriate plan for whether and how to reveal findings to the sources or their physicians should the findings merit such disclosure.**

Failure to obtain informed consent may adversely affect the rights and welfare of subjects in two basic ways. First, the subject may be improperly denied the opportunity to choose whether to assume the risks that the research presents, and second, the subject may be harmed or wronged as a result of his or her involvement in research to which he or she has not consented.

Further, when state or federal law, or customary practice, gives subjects a right to refuse to have their biological materials used in research, then a consent waiver would affect their rights adversely. Medical records privacy statutes currently in place or under consideration generally allow for unconsented research use and could be interpreted to suggest a similar standard for research using human biological materials. But as new statutes are enacted, it is possible that subjects will be given explicit rights to limit access to their biological materials.

* Commissioners Capron, Miike, and Shapiro wrote statements regarding their concerns about various aspects of this recommendation. (See page 65 of the full report.)

Recommendation 11:

In determining whether a waiver of consent would adversely affect subjects' rights and welfare, IRBs should be certain to consider

- a) whether the waiver would violate any state or federal statute or customary practice regarding entitlement to privacy or confidentiality,**
- b) whether the study will examine traits commonly considered to have political, cultural, or economic significance to the study subjects, and**
- c) whether the study's results might adversely affect the welfare of the subject's community.**

Even when research poses no more than minimal risk and a consent waiver would not affect the rights and welfare of subjects, respect for subjects requires that their consent be sought. However, on some occasions, demonstrating this respect through consent requirements could completely halt important research. An investigator who requests a waiver of the informed consent requirement for research use of human biological materials under the current federal regulations must provide to the IRB evidence that it is not practicable to obtain consent. Unfortunately, neither the regulations nor OPRR offers any guidance on what defines practicability.

Recommendation 12:

If research using existing coded or identified human biological materials is determined to present minimal risk, IRBs may presume that it would be impracticable to meet the consent requirement (45 CFR 46.116(d)(3)). This interpretation of the regulations applies only to the use of human biological materials collected before the adoption of the recommendations contained in this report (specifically Recommendations 6 through 9 regarding informed consent). Materials collected after that point must be obtained according to the recommended informed consent process and, therefore, IRBs should apply their usual standards for the practicability requirement.

NBAC recognizes that if its recommendation that coded samples be treated as though they are identifiable is adopted, there may be an increase in the number of research protocols that will require IRB review. If, however, such protocols are then determined by an IRB to present minimal risk to a subject's rights and welfare, the requirement for consent may be waived if the practicability requirement is revised for this category of research. However, it must be noted that by dropping the requirement that consent must be obtained if practicable, NBAC does so with the expectation that the process and content of informed consent for the collection of new specimens will be explicit regarding the intentions of the subjects and the research use of their materials. (See Recommendations 6 through 9 concerning informed consent.)

According to current regulations, the fourth condition for the waiver of consent stipulates that "whenever appropriate, the subjects will be provided with additional pertinent information after participation" (45CFR 46.116(d)(4)). Thus, according to the regulations, an IRB, while waiving consent (by finding and documenting the first three required conditions), could require that subjects be informed that they were subjects of research and that they be provided details of the study—a so-called debriefing requirement. In general, NBAC concludes that this fourth criterion for waiver of consent is not relevant to research using human biological materials and, in fact, might be harmful if it forced investigators to recontact individuals who might not have been aware that their materials were being used in research.

Recommendation 13:

OPRR should make clear to investigators and IRBs that the fourth criterion for waiver, that “whenever appropriate, the subjects will be provided with additional pertinent information after participation” (45CFR 46.116(d)(4)), usually does not apply to research using human biological materials.

Reporting Research Results to Subjects

Experts disagree about whether findings from research should be communicated to subjects. However, most do believe that such findings should not be conveyed to subjects unless they are confirmed and reliable and constitute clinically significant or scientifically relevant information.

Recommendation 14:

IRBs should develop general guidelines for the disclosure of the results of research to subjects and require investigators to address these issues explicitly in their research plans. In general, these guidelines should reflect the presumption that the disclosure of research results to subjects represents an exceptional circumstance. Such disclosure should occur only when all of the following apply:

- a) the findings are scientifically valid and confirmed,**
- b) the findings have significant implications for the subject’s health concerns, and**
- c) a course of action to ameliorate or treat these concerns is readily available.**

Recommendation 15:

The investigator in his or her research protocol should describe anticipated research findings and circumstances that might lead to a decision to disclose the findings to a subject, as well as a plan for how to manage such a disclosure.

Recommendation 16:

When research results are disclosed to a subject, appropriate medical advice or referral should be provided.

Considerations of Potential Harms to Others

The federal regulations governing the protection of research subjects extend only to individuals who can be identified as the sources of the biological samples. The exclusive focus of the regulations on the individual research subject is arbitrary from an ethical standpoint, because persons other than the subject can benefit or be harmed as a consequence of the research.

Recommendation 17:

Research using stored human biological materials, even when not potentially harmful to individuals from whom the samples are taken, may be potentially harmful to groups associated with the individual. To the extent such potential harms can be anticipated, investigators should to the extent possible plan their research so as to minimize such harm and should consult, when appropriate, representatives of the relevant groups regarding study design. In addition, when research on unlinked samples that poses a significant risk of group harms is otherwise eligible for exemption from IRB review, the exemption should

not be granted if IRB review might help the investigator to design the study in such a way as to avoid those harms.

Recommendation 18:

If it is anticipated that a specific research protocol poses a risk to a specific group, this risk should be disclosed during any required informed consent process.

Publication and Dissemination of Research Results

Publishing research results with identifiable information in scientific or medical journals and elsewhere may pose a risk to the privacy and confidentiality of research subjects. Public disclosure of such information through written descriptions or pedigrees may cause subjects to experience adverse psychosocial effects. In addition, without the informed consent of the individual, such disclosure infringes on the rights of the subject or patient. Because of the familial nature of information in pedigrees, their publication poses particularly difficult questions regarding consent. Investigators and journal editors should be aware that the ways in which research results are publicized or disseminated could affect the privacy of human subjects. NBAC believes that the source of funding, i.e., public or private, should not be an important consideration in determining the ethical acceptability of the research.

Recommendation 19:

Investigators' plans for disseminating results of research on human biological materials should include, when appropriate, provisions to minimize the potential harms to individuals or associated groups.

Recommendation 20:

Journals should adopt the policy that the published results of research studies involving human subjects must specify whether the research was conducted in compliance with the requirements of the Common Rule. This policy should extend to all human subjects research, including studies that are privately funded or are otherwise exempt from these requirements.

Professional Education and Responsibilities

Public and professional education plays an essential role in developing and implementing effective public policy regarding use of human biological materials for research. By education, NBAC is referring not simply to the provision of information with the aim of adding to the net store of knowledge by any one person or group; rather, education refers to the ongoing effort to inform, challenge, and engage. Widespread and continuing deliberation on the subject of this report must occur to inform and educate the public about developments in the field of genetics and other areas in the biomedical sciences, especially when they affect important cultural practices, values, and beliefs.

Recommendation 21:

The National Institutes of Health, professional societies, and health care organizations should continue and expand their efforts to train investigators about the ethical issues and regulations regarding research on human biological materials and to develop exemplary practices for resolving such issues.

Recommendation 22:

Compliance with the recommendations set forth in this report will require additional resources. All research sponsors (government, private sector enterprises, and academic institutions) should work together to make these resources available.

Use of Medical Records in Research on Human Biological Materials

In recent years, attention increasingly has been paid by policymakers to the need to protect the health information of the individual. Extensive efforts at the state and federal levels to enact such protections have resulted in the setting of a variety of limitations on access to patient medical records. NBAC notes that debates about medical privacy are relevant to researchers using human biological materials in two ways. First, these researchers often need access to patient medical records, either to identify research sample sources or to gather accompanying clinical information. Such activities constitute human subjects research and should be treated accordingly. Second, the development of statutes and regulations to protect patient medical records could have the unintended consequence of creating a dual system of protections, one for the medical record and one for human biological materials. Moreover, restrictions on access to the medical record could impede legitimate and appropriate access on the part of investigators whose protocols have undergone proper review.

Recommendation 23:

Because many of the same issues arise in the context of research on both medical records and human biological materials, when drafting medical records privacy laws, state and federal legislators should seek to harmonize rules governing both types of research. Such legislation, while seeking to protect patient confidentiality and autonomy, should also ensure that appropriate access for legitimate research purposes is maintained.

Summary

To advance human health, it is critical that human biological materials continue to be available to the biomedical research community. Increasingly, it will be essential for investigators to collect human biological materials from individuals who are willing to share important clinical information about themselves. In addition, it is crucial that the more than 282 million specimens already in storage remain accessible under appropriate conditions and with appropriate protections for the individuals who supplied this material.

The growing availability to third parties of genetic and other medical information about individuals has fueled the current debate about medical privacy and discrimination, and NBAC is sensitive to the possibility that the use of information obtained from human biological samples can lead to harms as well as benefits. These concerns require that those who agree to provide their DNA, cells, tissues, or organs for research purposes not be placed at risk. Measures to provide appropriate protections for individual privacy and for the confidentiality of clinical and research data are important if significant research is to continue. The recommendations provided in this report are intended to promote the goals of improving health through biomedical research while protecting the rights and welfare of those individuals who contribute to human knowledge through the gift of their biological materials.