POLICY

Core Facilities: Maximizing the Return on Investment

Gregory K. Farber[1]* and Linda Weiss[2]

To conduct high-quality state-of-the-art research, clinical and translational scientists need access to specialized core facilities and appropriately trained staff. In this time of economic constraints and increasing research costs, organized and efficient core facilities are essential for researchers who seek to investigate complex translational research questions. Here, we describe efforts at the U.S. National Institutes of Health and academic medical centers to enhance the utility of cores.

Over the past 20 years, researchers have increasingly relied on complex instruments (*1*, *2*) that may live in the laboratory of a single researcher or in a core facility. In many areas of clinical and translational science, access to core facilities has gone from being useful to being essential in the conduct of biomedical and behavioral research. These cores must contain both sophisticated instruments critical for their function and staff with expertise in operating the instruments, interpreting the data, and providing consultation on how best to use the resources to address distinct research questions. Researchers and institutions are challenged with finding the most efficient ways to manage core facilities and common use of complex instruments in individual laboratories. Here, we outline efforts at the U.S. National Institutes of Health (NIH) and academic medical centers to strengthen core facilities by disseminating information about these resources to the research community; developing career paths and training for core directors; promoting an understanding of federal regulations; and aiding in core centralization and consolidation (Fig. 1).

Core facilities are centralized shared resources that provide access to instruments, technologies, services, and expert consultation to scientific investigators. Many cores focus on instrumentation, but informatics and biostatistics cores are key resources for translational researchers. The consultation provided by core facilities is often as important as the data because biomedical researchers not trained in a specific technique or field can find it difficult to interpret specialized data without help from core experts (*3*). Cores also foster a more collaborative research environment at a university or academic medical center, which is crucial to interdisciplinary translational science. Each year, NIH invests substantial resources in core facilities through a wide array of awards, which makes the investment difficult to precisely quantify. However, a reasonable estimate is that NIH provides ~$900 million per year to operate and use core facilities (*4*).

Academic institutions also make large monetary investments in cores, often by providing matching funds to acquire new instruments, renovate space, and partially support the salaries of core staff members. Such investment can be necessary because many cores cannot cover their actual operating costs by recharges to users of the facility.

This large investment by both the federal government and academic institutions suggests that ways to improve the efficiency of core facilities should be evaluated and implemented when appropriate. Unfortunately, core facilities often have grown with little overall planning. This is partly a result of funding announcements dedicated to the support of core infrastructure necessary for a particular project or with a particular disease focus. Such requirements, although well intentioned to ensure that resources are available for a particular project, have too often resulted in the establishment of multiple similar core facilities rather than adding instruments or staff to a centralized facility that can serve an entire institution or geographical region. To address this problem, program announcements from the National Center for Research Resources (NCRR) now routinely encourage the adding of resources to existing cores rather than establishing new ones. In other cases, institutions have allowed similar core facilities to be set up in separate departments or schools. Often, use of such facilities is restricted, either formally or informally, to members of the department that houses the core. No matter what the root cause of this duplication, in the recent tight funding climate, research institutions and funding agencies are finding it difficult to maintain multiple similar core facilities.

Both those who use and those who manage core facilities have raised a number of issues concerning how to make cores more efficient (*5*–*7*). These issues can be broken into several broad categories: (i) Information about core facilities and their resources is either not easily available or is incomplete. (ii) Core directors and staff members often lack training in the business aspects of core facilities and have uncertain career paths in the university. (iii) Institutions are uncer-

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Fig. 1. Nourishing the core. New career paths must be paved for those who manage or work in core facilities.

[1]Office of Extramural Activities, National Center for Research Resources (NCRR), National Institutes of Health, 6701 Democracy Boulevard, Room 1001, Bethesda, MD 20892, USA. [2]Office of Cancer Centers, National Cancer Institute, National Institutes of Health, 6116 Executive Boulevard, Room 7001, Bethesda, MD 20892, USA.
*Corresponding author. E-mail: farberg@mail.nih.gov

tain whether or when large consolidated cores offer better service than small cores. If institutional officials decide to centralize existing cores, they face great difficulty in completing the process. (iv) Government policies and rules for managing and reporting on cores can be unclear and vary substantially depending on the exact terms and conditions of each award. Such variations increase the expense in administering core facilities while adding little benefit to the government.

These concerns have resulted in the activities discussed below. The goal of all of these initiatives is to try to make cores more efficient at serving the basic and translational research community.

INFORMATION UNDERLOAD

Finding information about core facilities can be unexpectedly difficult. In the meetings that we have hosted (*6*), more than one institutional representative stated that it took months or longer to devise a complete list of cores inside one institution. Nationwide databases for core facilities are maintained by both the Association of Biomolecular Resource Facilities (*8*) and the Vermont Genetics Network (*9*). These directories provide basic searching capabilities and cover a variety of different types of cores and institutions. Both require data input from the core facility, so keeping the information up to date can be a burden. Thus, neither database contains comprehensive information.

Some institutions, often supported by funds from NIH's Clinical Translational Science Award (CTSA) program, have created directories of cores that are of special interest to translational researchers. The site operated by the Harvard Catalyst provides a stellar example (*10*). In these cases, the data are generally kept up to date manually, but the infrastructure provided under the CTSA program provides the funding for this effort.

Using funds from the American Recovery and Reinvestment Act of 2009, NCRR has explored new ways of making information about people and core resources related to translational research available to the public. Two projects, VIVO (*11*) and eagle-i (*12*), focus on cataloging information about people and resources, respectively. Scientists associated with both projects are seeking ways to keep the data in the network fresh without requiring human intervention. This is a difficult computational problem, but early results from these awardees are encouraging. The strong interest in both projects from institutions that are not funded by the initial award suggests that these resources will fill an important niche. If these projects fulfill their promise, they will provide the research community with invaluable new ways to access information that is as accurate as the existing Web sites or campus phone books that supply the information. However, many researchers rely on word-of-mouth referrals from existing users before they will try a core facility themselves. Tools from social networks might provide a way for users to express opinions about the strengths and weaknesses of core facilities, but this approach has not yet been implemented (*13*).

PAVING THE CORE CAREER PATH

Discussions with the core research community revealed two different issues concerning career paths for those who manage or work in core facilities. The first involves the lack of a stable career path at many institutions. With growth in NIH funding stalled and substantial cuts in institutional budgets, those who are supported by so-called soft money in core facilities face uncertain job stability. A few institutions such as Vanderbilt and New York University have begun to establish job descriptions and promotion and tenure policies relevant to the issue of career tracks for core directors and personnel (*14*). These programs might serve as models for other institutions.

NIH does not currently have a separate award program designed to support personnel in general core facilities, although usage fees and support for personnel in core facilities are made available in a number of project-specific NIH awards. Although desirable, it is unlikely that NIH will have the funds available to launch a core award program in the near future. Core directors have also requested a program to provide training on the business aspects of running a core facility. Most core directors have a background in translational or basic science, but few have any formal training in the best way to manage inventory, how to bill for services, or other issues related to the business aspects of administering what can be a very large budget.

GOVERNMENT REGULATION

The government policy that affects the operation of a core facility the most is that which establishes rules surrounding the rates that can be charged to use the facilities. NIH has published a draft set of frequently asked questions (FAQs) that explain these issues (*15*). Input solicited from the user community is now being incorporated into a final version of the FAQs, which will be published in the NIH Guide.

A second issue that demands a great deal of time on the part of core facility directors is completing the reporting requirements for renewal applications and annual progress reports. A new annual Research Performance Progress Report is being implemented across the federal government (*16*). This process offers federal agencies the opportunity to take a fresh look at when information is collected (every year or just at the competitive renewal stage) and what sort of information is requested. Implementation of this new form also should spur a discussion of whether standardized reporting on core facilities is possible among the various Institutes and Centers (ICs) at NIH.

CORE FACILITY FUSION

There is no single way to manage core facilities that is clearly advantageous for all interested parties (researchers, core directors, and research institutions) (*17*). A decentralized management structure can work very well. However, a number of institutions are moving to a model in which billing, scheduling, and other business activities are managed centrally (*17*). This move to centralize some aspects of core management has also resulted in a desire at some institutions to consolidate similar cores in different administrative units into a single core facility that serves the entire institution.

Centralization of core activities and core consolidation are two different activities that serve different purposes. Centralization activities can relieve or lessen the amount of time that core directors spend on the business aspects of running the facility. There are obvious advantages for everyone in centralized billing, inventory, and scheduling systems, as long as the infrastructure that is created to provide these services is robust and easy to use. NIH does not currently have programs aimed at providing the infrastructure to centralize core administration.

The aim of a core consolidation activity is to reduce the number of similar core facilities at an institution. The motivation behind such a move is that through pooling of resources, a single core facility could offer a wider array of services to the whole university community and might be able to offer higher-quality services to users. Consolidated cores may also be able to be more

responsive to changes in technology than a core housed in a department or laboratory because the core has multiple sources of support and has input from multiple researchers. However, many small cores know exactly what their local communities of users need and want. That personalized knowledge can be lost in a centralized facility. Different sorts of instruments may be more or less suited to centralization.

In an effort to understand the advantages and disadvantages of core consolidation, NCRR created a one-time program to fund core consolidation activities (*18*). Twenty-six supplements ranging from $300,000 to $1,300,000 were made to support consolidation activities. Twelve different ICs at NIH participated in this program. Both the number of applications received and the number of ICs that participated attest to the interest in core consolidation. Awardees have agreed to share best practices for core consolidation with the research community after these projects are complete. Most of the awards are being used to consolidate cores established by the institution with others established by NIH.

Both core centralization and core consolidation activities require funds up front, but the efficiencies that can result are likely to pay for those costs reasonably quickly. As NIH evaluates the success of this program, one of the key outcomes that we will be interested in is whether users of consolidated cores continue to have timely and appropriate access to high-quality service from the core.

UNITING NEIGHBORS

Also being explored are core facility centralization and sharing activities that reach beyond a single institution. For example, the Chicago Biomedical Consortium, supported by the Searle Foundation, provides core facilities to researchers at three Chicago-based universities (*19*, *20*). This idea could certainly be expanded to other metropolitan areas that have multiple research-intensive institutions.

Coordination is also being explored among core facilities in states that have relatively low populations, correspondingly fewer numbers of researchers, and often, large distances between research institutions. These states are eligible for the Institutional Development Awards (IDeA) from NCRR. The Network of IDeA Funded Core Laboratories is a developing network of core facilities from IDeA states (*21*). Core consolidation is not a major issue in IDeA states. The bigger issue—and one that is shared by many researchers across the United States—is access to appropriate core facilities by widely scattered investigators who want to use them for their research.

On an even larger scale, NIH has made certain facilities available to researchers across the country. The Molecular Libraries Program (*22*) offers biomedical researchers access to the large-scale screening, medicinal chemistry, and informatics capabilities needed to identify chemical probes for functional studies of genes, cells, and biochemical pathways. The Rapid Access to Interventional Development program also makes available to biomedical researchers resources critical for the development of new therapeutic agents such as organic synthesis, scale-up production, toxicology studies, and advice in preparing Investigational New Drug applications (*23*). NIH is now developing plans to make resources at the NIH Clinical Center more widely available to extramural researchers.

On the basis of needs expressed by basic and translational researchers, NIH has taken a number of actions to improve the efficiency of core facilities. Some of these programs are experimental, and the results from the first set of awards will influence how the community proceeds in the future. The goal is to continue to work with the community of investigators to maximize the value and accessibility of core facilities.

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