Letter to the Editor

Governance of Science at the National Cancer Institute: Management of Resources in an Era of Scarcity

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Proper management and governance of science depend on careful disposition of resources. Between 1980 and 1982, the budget of the NCI decreased overall by 1.5%; the most abrupt change was a 4% decrease in 1982. When resources are limited, as they have been in recent years, NCI receives many suggestions about how these resources should be allocated. The newly instituted corporate management system described in a previous letter to Cancer Research (1) allowed the NCI, with the many suggestions of its advisory boards, to adjust rapidly to the budget reductions in 1982 by sharing scarce resources across program boundaries according to a hierarchy of scientific priorities. In addition to identifying areas of special scientific interest institute-wide, individual projects are scored by peer review groups according to a time-honored system. How the staff correlates priority scores and general guidelines with available dollars is often poorly appreciated. Some methods have been discussed at 2 consecutive business meetings of the American Association for Cancer Research, Inc., and are described below.

Priority Scores and Funding Decisions

The use of priority scores as a means for determining funding of individual grants and their use in planning budgets are often regarded as identical. They are not. In any given year, approximately 90% of the NCI budget is committed to obligations undertaken in previous years. While these obligations can and have been adjusted (witness the 4% reduction in noncompeting grants in 1982 and the reduction and cancellation of over $40 million worth of contracts in 1980 and 1981), the obligations are, under most circumstances, considered moral commitments. Therefore, the budget is predicated on a 90% commitment base. The uncommitted funds are allocated to the grant pool in several rounds. The number of competing renewals expected is arrived at by projecting the number of grantees with expiring grants who can be expected to reapply, based on previous experience. The total number of grants in these 2 categories is then multiplied by an estimate of the average cost of each type of grant instrument in any given year, based on standard inflation factors. Using this information, the distribution by priority scores of competing grants can be determined. In this way, we can predict the "average" priority score payline at which the uncommitted funds will run out. This gives us the average "budget" payline at the start of the fiscal year, a figure often announced at the fall meeting of the NCAB, the President's Cancer Panel, and the divisional Boards of Scientific Counselors. Obviously, this payline varies according to the accuracy of our predictions and the availability of additional funds resulting from negotiations between our business managers and supported institutions. For this reason, grantees should not attach too much importance to this "average" payline (as they often do), since the figures available early in the budget year are not definitive vis-à-vis the final funding decision affecting an individual grant.

Use of a Priority Score as a Determinant of Funding of Individual Grants

The NCI staff, with the help of its advisors, selects grants for payment up to and beyond the average budget payline according to scientific and programmatic priorities. This selection process, although it appears to deviate from the routine process of priority setting by scores, is necessary because study sections review their own area of research independent of other study sections. Scoring between study sections may also not reflect the overall priorities set by the NCI and its advisors, or the relative merit of the science in different areas. Differences between study sections are highlighted by the percentage of applications reviewed by each study section that would be funded if the priority score were the only criterion for funding decisions. This unadjusted "percentile funding" varies considerably from study section to study section. Percentage funding of approved applications after staff decisions more accurately reflects the NCI priorities in any given scientific area. This human but very necessary adjustment is the final input to development of the year-end payline for grants and results in grants being paid or not paid, within a range of 20 points, above and below the budget payline. Thus, the priority score payline, where used as a budget tool, should not be given too much weight, either by scientists awaiting word about the funding of their grants or members of study sections reviewing grants, since it undulates throughout the fiscal year.

To assure that decisions to fund exceptions above and below the payline are fair, several levels of internal review are required, culminating in a review by the NCI Executive Committee and the staff's presentation of its entire funding plan to the NCAB at the annual November program review. Also, unusual departures from the "average" payline not requested by NCAB members are, by general agreement, discussed in advance with the chairman of the NCAB. Finally, in recent years, systems to stretch grant funds have been superimposed upon and have complicated this process. The system the Executive Committee and the NCAB select for stretching dollars will also affect the final payline.

Mechanisms Used by NCI to Stretch Research Dollars

Starting in 1980, because of budgetary limitations, the NCI Executive Committee chose not to pay at levels recommended...
by study groups but, rather, to stretch resources over a greater number of grants to keep more topflight scientists working on course. These funding plans, first developed for clinical cooperative groups, were then used for center core grants and PO1 grants in 1981 and 1982 and, for the first time, for RO1 grants in 1983.

Exactly how research dollars are to be stretched has been controversial. One has to first find sufficient funds to stretch. Early in 1982, the NCI Executive Committee made several basic decisions to reallocate funds and maintain its priority for support of investigator-initiated research in the RO1/PO1 grant programs while accommodating the 4% decrease in the President's budget: (a) the NCI intramural program would be reduced by 6.1% (reductions would, however, vary from division to division); (b) the contract program would be reduced an additional 10.6% by selectively decreasing contracts of lower priority while allowing important contract-supported programs (such as those supporting epidemiology studies and those providing valuable research resources) to grow; (c) as a member of the NIH community, NCI concurred with the NIH decision to reduce noncompeting grant applications by 4%. After these dollars were reallocated to the research project pool, we chose, instead of funding at recommended levels, to give competing applications an 8% increase over the level of the previous year. This 8% increase, coupled with a 4% decrease in the NCI budget, resulted in a 12% differential between the funding of competing RO1 renewal grants and the NCI general budget allocation. Because NCI funds a higher percentage of competing renewal grants than new applications, smaller reductions from recommended levels were made for new grants in 1982. New grant applications absorbed the 4% budget cut from the higher recommended level. Other grant programs were reduced somewhat more than the RO1/PO1 pool, which received highest priority at NCI. The overall result of this action in 1982, however, was the funding of 100 additional grants that otherwise would not have been supported. By these measures, the NCI was able to pay about 30% of its approved grant applications to a final priority score of 185,3 in spite of the abrupt reduction of resources.

Although the system NCI used did not usually match the individual recommendations of the study sections, the selective reduction was consonant with the views of the Boards of Scientific Counselors, the NCAB, and the Executive Committee. It was preferred by most grantees as well, and enabled NCI to fund more excellent grants. Also, recommended increases by study sections usually exceed the NCI budget increases by a considerable amount. For example, the average increase recommended by review groups for competing RO1 and PO1 grants in fiscal 1982 was 36%, in a year when the NCI budget was decreased by 4%! The impact of these recommendations is great, since over 50% of the NCI budget is devoted to grants.

However, no system for reducing resources is without its problems. The system, introduced rapidly in 1982, had a major flaw: some grantees were caught in a period when their projects needed to grow rapidly, and a fixed increase over the level of the previous year did not allow for this necessity. Although exceptions to the funding plan guidelines were made as often as funds allowed, the limited funds available did not always allow us to relieve all the strain inflicted by the fixed increases for competing renewals in our funding plan.

As we approached fiscal 1983, the original funding plan for that year was based on the assumption that NCI would be given a budget of $955 million (a 1.3% increase over 1982). Congressional action in December, signed by the President, actually gave NCI $983.5 million (a 4% increase over 1982), although with considerable earmarking of the increased funds.

The Executive Committee perceived the continuing preference on the part of the scientific community for the process of stretching grant dollars over a reasonable range of priority scores, rather than paying all grants at levels recommended by the study sections. Two options were considered to achieve this in 1983.

1. One option was to use a sliding scale as proposed by Vesell and Mandel (2). The NCI has, in the past, used a sliding scale to fund cancer center core grants. We abandoned this process when it did not provide a greater degree of flexibility than did increased funding over the level of the previous year for competing applications within an acceptable range of priority scores. We did reconsider it for all grants for 1983. As we worked out the implementation of the hypothetical sliding scale, it became apparent that, over the range of priority scores we were able to fund, the sliding scale provided no advantage over other systems, especially if, as suggested, the range of priority scores itself was stretched to reach 250. Stretching over a broad range of scores would result in reduced funding for grant applications with the highest priority scores while also curtailing grant applications with the lower priorities to such an extent that many projects could not realistically be accomplished. Also, a "natural" sliding scale is already imposed by the study sections themselves in that they recommend the award of a greater percentage of requested funds to grants given the best scores.

2. Another option considered was to reduce funding equally for new and competing applications by a fixed percentage from levels recommended by the study sections. In 1982, the reduction needed to equalize the allocation of funding between new and competing renewal grants would have meant a 16% reduction from recommended levels. Reductions from recommended levels tend to allow grantees with large recommended increases (due to the exciting nature of their research) to profit more from the recommendation of the study sections than is allowed by fixed increments over previous years' funding levels. This was the more appealing option.

At the October NCAB meeting, NCI proposed and the NCAB accepted the exercise of Option 2. Thus, the 1983 funding plan applies a common formula to all grants, reducing them by about 15% from their recommended levels. Uncommitted funds were allocated by the Executive Committee to each program area, according to the number of grants expected in each program assuming the reduced level. The program staff has the discretion of applying the reduction for each grant according to the merits of individual research proposals. It is important to note that these reductions from recommended levels still give the competing renewal applicants, on the average, increases over last year's level of funding. On the average, an RO1 grant reduced 15% from its recommended level will still receive a 16.5% increase over last year's level, or about 44.5% of the recommended increase. This is being accomplished even though the overall NCI budget increase is only 4%.

DECEMBER 1983

6107

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3 The switch by NIH in 1981 from normalized to raw priority scores distorts the interpretation of the cutoff point in priority scores; the addition of approximately 30 points to the raw priority score yields the equivalent of the previous normalized score. Thus, paying 30% of our grant applications down to a 185 raw priority score represents a payline roughly equivalent to a normalized score of 215.
In the traditional RO1 pool, the 1983 funding plan will allow us to pay through a priority score of about 175. The reason we cannot go lower is that limited funds tend to create some score compression during review. Many grant applications are bunched at each point in the high-priority score range. For example, in 1983, there already are 38 RO1 applications with a priority score of either 171 or 172. Nonetheless, in 1983, the percentage of approved applications funded will be the same or higher than that in 1982.

We have also been asked to consider limiting the size and number of grant applications to any individual investigation, or limiting the total amount of money to a single grantee. We failed to find a logical way of setting these limits and, since the majority of grantees hold only one grant, we have not proposed the exercise of this option in any of the funding plans.

Because the issues of grant size and relative merits of RO1 versus PO1 grants (the latter are substantially larger) have been raised repeatedly, NCI proposed to the NCAB and received approval to examine the review of PO1 grants to assess the scoring of each project in these large grant applications. A committee chaired by NCAB member Dr. Maureen Henderson has considered a weighted scoring system to be used for PO1 grants and suggested a trial of such a system. In the meantime, new guidelines for the preparation and review of these grant applications have been issued. In addition, we are asking investigators to write a letter of intent before submitting new PO1 applications. This latter feature will give the NCI staff the opportunity to communicate with applicants to ascertain that projects within a PO1 grant are properly related and that sufficient funds are available in any given year to make preparation of a large grant application worthwhile.

A New Proposal: The Outstanding Investigator Grant

To add some measure of stability to grant support, we are considering a new grant instrument, referred to as the “Outstanding Investigator Grant.” It is intended to support investigators on their track records rather than individual projects and to provide stable support to productive investigators of the highest caliber. An important feature of these grants is their review and renewal at intervals longer than the standard 3-year period. It would be available to individuals of any age who have excellent records of accomplishment in cancer research and the likelihood of continued productivity. We have also suggested additional features such as allowing the carry-over of funds from year to year to afford greater flexibility to grantees supported by this funding instrument.

The idea of this award emerged because, at NCI, we are very much concerned about discovering how paradigmatic changes have come about in science. The assumption that a project-by-project review in the current peer review system is the only way to discover how best to foster these changes is not necessarily widely shared. We have, however, been unable to devise a superior system. This subject was discussed at a series of “town meetings” held by the President’s Cancer Panel at Harvard, University of California at Los Angeles, the International Cancer Congress in Seattle, the University of Texas System Cancer Center, and the University of Chicago, and the Memorial Sloan-Kettering Institute in New York. The major questions that need to be addressed in the development of the Outstanding Investigator Grant are: (a) How should we review “track records” of individual investigators? (The standard peer-review system may not be appropriate for the review of an individual investigator’s entire career.) (b) What amount of support should be provided? (c) For what length of time? (d) What should be the nature and use of the support? (e) What should be the size of the funding pool devoted to these awards? (f) What restrictions, if any, should be placed on recipients of the award?

An ad hoc committee, appointed by Dr. Armand Hammer, chairman of the President’s Cancer Panel, and chaired by Dr. Harold Amos, a past member of the Cancer Panel, has considered the structure of this instrument, the details of which have been sent for comment to all NCI investigators in a special communication.

Emerging Issues. It is common to hear complaints from investigators that not enough monies are allocated to the funding instruments through which their research is supported (RO1, PO1, or contract, etc.), while too much is allocated to the other funding mechanisms. We are concerned about reducing funds supporting a funding instrument in isolation from the science supported. To gain more data, NCI received approval for a study using the most-cited advances in cancer research to track the major advances back to the original sources, to the instrument, and to the institutional “home” supporting the research which gave rise to the published work. We hope this will enable us to compare the relative merits of various instruments such as PO1 and RO1 grants, cancer center core grants, contracts, the NCI intramural program, etc. Then NCI will be able to do more than simply argue and compare the cost of each of these instruments when its staff must make difficult but necessary budget decisions. These are the issues which will be at the center of discussion in the coming year.

The essential element in all these program changes, outlined in the previous article (1) and in this essay, is the continuing open discussion, with public participation, of NCI business at its various board and council meetings. We hope all investigators and potential grantees will ponder these issues in depth and comment to Council members directly as well as to the NCI staff as we approach decisions for funding research in 1984 and 1985.

REFERENCES
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