

Supporting the Academic Mission in an Era of Constrained Resources: Approaches at the University of Arizona College of Medicine

Keith A. Joiner, MD, MPH, Ann Libecap, MArch, Anne E. Cress, PhD, Steve Wormsley, PhD, Patricia St. Germain, MS, Robert Berg, MD, and Philip Malan, MD, PhD

Abstract

The authors describe initiatives at the University of Arizona College of Medicine to markedly expand faculty, build research along programmatic lines, and promote a new, highly integrated medical school curriculum. Accomplishing these goals in this era of declining resources is challenging. The authors describe their approaches and outcomes to date, derived from a solid theoretical framework in the management literature, to (1) support research faculty recruitment, emphasizing return on investment, by using net present value to guide formulation of recruitment packages, (2) stimulate efficiency and growth through

incentive plans, by using utility theory to optimize incentive plan design, (3) distribute resources to support programmatic growth, by allocating research space and recruitment dollars to maximize joint hires between units with shared interests, and (4) distribute resources from central administration to encourage medical student teaching, by aligning state dollars to support a new integrated organ-system based-curriculum. Detailed measurement is followed by application of management principles, including mathematical modeling, to make projections based on the data collected. Although each of the initiatives was

developed separately, they are linked functionally and financially, and they are predicated on explicitly identifying opportunity costs for all major decisions, to achieve efficiencies while supporting growth. The overall intent is to align institutional goals in education, research, and clinical care with incentives for unit heads and individual faculty to achieve those goals, and to create a clear line of sight between expectations and rewards. Implementation is occurring in a hypothesis-driven fashion, permitting testing and refinement of the strategies.

Acad Med. 2008; 83:837–844.

"Supporting the Academic Mission in Difficult Times" was the title of a joint meeting of the Association of Academic Health Centers and the University Health Systems Consortium in October 2004. The underlying theme was the critical importance of transparency in financial and strategic planning between colleges of medicine, hospitals, practice plans, and universities. More implicit in the discussion was the recognition that the magnitude of annual investments at academic health centers (AHCs) is enormous and that managing those investments wisely is an essential tool in supporting the academic mission. These include investments in personnel (faculty, staff, administration), investments in supplies and equipment (software; hardware for clinical care, education, and research), capital expenditures, and more. Simultaneously, operating budgets are growing dramatically. Both are occurring on a

constantly changing landscape. Over the course of the last half century or more, there have been wide variations in the level of federal funding for research; changes in the margins from the clinical mission; variations in the real or perceived excess or shortage of physicians which drives salaries; fluctuations in the population of uninsured or underinsured; modifications in the level of support for the educational mission from the Centers for Medicare and Medicaid Services, state government, and other sources; and changes in the overhead expenses associated with new construction, compliance, and other matters.^{1,2} Until recently, diminutions in one area have often been isolated to that area. Currently, however, the situation is more dire, because all of these metrics are moving in the "wrong" direction simultaneously, at least when considered from the standpoint of the AHC.

There are multiple reactions, some overlapping, to the above circumstances, all of which will be framed by the history of a particular AHC. One reaction is that everything is cyclical and that one should take the long-term view that continuing to make investments is the wisest approach. Another reaction is to

substantially cut back investments, at least in selected areas. Senior leadership have a different reaction at the University of Arizona College of Medicine, as a consequence of our recent history. Whereas most AHCs have experienced steady increases in faculty size during the last two to three decades, the faculty size at the University of Arizona College of Medicine (COM) has remained nearly static during the decade of the 1990s, and into the early part of this century. With construction of new research facilities underway, a rapidly expanding population, and creation of two new sites for clinical faculty activity, in 2004 the COM set a goal to double its total number of full-time faculty, to more than 900, by 2011. Simultaneously, the COM launched a concerted effort to recruit new department heads and center directors. As part of this initiative, and since 2004, nearly 60% of the current compliment of 33 department heads and center/institute/program directors in the COM have been newly appointed, and, in each case, substantial resources were devoted to those recruitments. Simultaneously, the college has implemented a completely revised medical school curriculum and, as

Please see the end of this article for information about the authors.

Correspondence should be addressed to Dr. Joiner, University of Arizona College of Medicine, Room 2205, PO Box 245017, Tucson, AZ 85724-5017; telephone: (520) 626-0998; fax: (520) 626-6252; e-mail: (kjoiner@email.arizona.edu).

part of that process, completely reconfigured departmental support for the educational mission.

Throughout these processes, senior leadership endeavored to maximize efficiencies and to manage scarce resources wisely. This involved, at least in part, looking to other industries or to generic management tools to optimize utilization of resources. These tools have included, but are not limited to, financial and managerial accounting, finance, competitive strategy, organizational behavior, not-for-profit management, decision analysis, operations, optimization, and modeling. In this article, therefore, we present insights, approaches, and outcomes in four different areas of resource management at the University of Arizona COM: (1) support of research faculty recruitment, emphasizing return on investment, (2) stimulation of efficiency and growth through incentive plans, focusing on the importance of incentive plan structure, (3) distribution of resources to support programmatic growth, emphasizing methods to incentivize collaborative recruitment, and (4) redistribution of resources from central administration to departments to support education, focusing on the process and logic used to drive the reallocation.

Support of Research Faculty Recruitment and Return on Investment

Faculty recruitment to AHCs is (increasingly) challenging. Rather than dwelling on the factors which are driving that challenge, we first present the paradigm used to conceptualize the process at our institution.

Faculty recruitment viewed as an auction

Recruitment is inevitably driven by the law of supply and demand. Arguably, at least for physician scientists, demand exceeds supply. How is this manifest? One of us (K.A.J.) has suggested that it is useful to think of faculty recruitment as exhibiting characteristics of an auction.³ There are many forms for auctions. Auctions are either closed (bids are secret) or open (bids are known), ascending (highest bid wins) or descending (first to bid as price is lowered wins), first price (the cost to the winning bidder is the highest

bid) or second price (the highest bidder pays the price of the second highest bidder), and private value (worth of object is subjective, e.g., art) or common value (worth of object, at least ultimately, will be agreed to by all bidders; e.g., oil rights lease). Depending on the auction form, various anomalies result, which have been well studied and thoroughly described in the literature.⁴

The proposed paradigm is that auctions in the AHC context are most akin to open-bid, ascending, first-price, common-value auctions. The bidder/buyer is the dean or department/section head, and the seller is the candidate. The value of the bid is typically known (open bid) and is progressively increased by the buyer (ascending), with the winner being the highest bidder (first price). In general, the value of the bid will ultimately be known (common value), albeit multiple years after the auction is complete. These characteristics facilitate the “winner’s curse” (e.g., “postdecision surprise,” “buyer’s remorse”).⁵ The buyer is uncertain of the ultimate valuation, his or her bidding is influenced by others, and the “winner” ultimately recognizes that his or her bid was too high. This is exacerbated by many factors that are commonplace in AHCs. Among the more powerful factors are the following reactions: (1) a “failed” search conveys a negative reaction to the search committee, faculty, and institution, (2) a “failed” search is perceived as being attributable to insufficient resources being committed to the candidate, and (3) a “successful” search is interpreted as a testimony to the excellence of the unit, especially when other buyers are from prestigious institutions.

Determining project value

It is prudent to minimize the factors that exacerbate the winner’s curse. A key strategy for the buyer is to have a clear sense for the value of the project when entering the auction. Although this is considered impractical and even distasteful to some in the academic arena, if explicitly stated as such, in fact it is done implicitly in all faculty recruitments. The scale and scope of the recruitment package is predicated on some estimation of the value, even if not explicitly stated or recognized as such. Junior faculty do not receive the same package as senior, established faculty.

One paradigm for estimating faculty value in the not-for-profit setting is illustrated in Figure 1, modified slightly from the version published previously.⁶ This is a general paradigm for categorizing project value in not-for-profit organizations.⁷ In essence, this is a visual representation of the saying, “No margin, No mission.” The diagram illustrates explicitly that revenue-generating projects may contribute substantially (stars) or less substantially (cash cows) to the mission. The more implicit message is that cash cows and stars must cross-subsidize projects that often define the “soul” of the mission but that are poor at revenue generation. The most difficult message to embrace is that projects in the lower left corner, which in the original version⁶ of the diagram bore a moniker poorly received in the academic arena (wagging tail, bark), should be neither supported nor initiated. Our experience is that faculty must be encouraged, or even mandated, to move from the underperformers category into another quadrant, by using positive incentives rather than by applying the underperformer moniker.

To use this framework in the setting of recruitment, individual faculty are considered as investment projects. Although the term “project” has a problematic ring to it in academics, when referring to faculty, the term “investment” is well received, if broadly framed. Valuing the faculty recruit (investment project) along both axes—contribution to mission and contribution to revenue—is an explicit acknowledgment that the

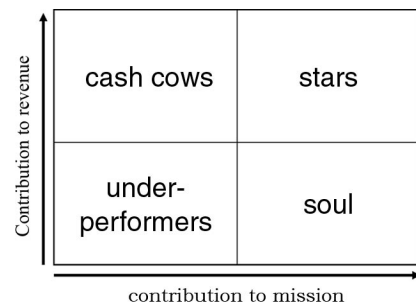


Figure 1 Categorizing project value in not-for-profit organizations. All projects in not-for-profit organizations can be categorized simultaneously for their contribution to mission and their contribution to revenue generation. The overall value of the project is determined by intersection of the contributions along both axes. The text provides descriptions of the categories in the four quadrants.

investment potential is being broadly framed.

Of importance, the two axes can be evaluated separately, using different metrics. Contribution to mission is defined in qualitative terms and is oftentimes specific to an institution and/or department, using metrics which may or may not be readily transferable. This qualitative character confounds the capacity of chairs and other leadership to measure and/or apply the parameter in explicit terms. This is even truer for faculty recruitment than for faculty retention. By contrast, contribution to revenue generation is assessed in quantitative terms, using a common metric: dollars. It is straightforward to set benchmarks for revenue generation, and it is commonplace to use these benchmarks on an annual basis when evaluating faculty performance. In our work, we have applied this strategy to recruitments by considering estimated future revenue generation in constructing recruitment packages.

One of us (K.A.J.) has proposed that a commonly used methodology termed the net present value (NPV)⁸ is preferable to other tools for assessing contribution to revenue generation in the academic setting.⁶ This methodology considers the “time value” of money and recognizes that “a dollar today is worth more than a dollar tomorrow.” There are multiple advantages to the NPV methodology. The most important is that it imposes fiscal discipline: opportunity costs are explicitly determined. Other important advantages are that projects can be added or subtracted to determine aggregate value, and that timing of cash flows is a central factor in the NPV determination. This latter factor is of substantial importance and is highly relevant to recruitment packages, where institutional resources are typically provided to the recruit in the first three to five years after the recruit’s arrival, but revenues generated by the recruit that accrue to the institution (and that, at least conceptually, are used to offset the recruitment expenses) typically accumulate later. Because of the time value of money, these latter revenues are worth less than the outlays by the institution made at the outset.

This methodology was applied to assess NPV for faculty recruited to the University of Arizona COM between

1998 and 2004.⁹ We determined the timing and magnitude of all revenue streams returned to central administration for the recruits, conceptually offsetting the expenses of central administration in supporting the recruit. The former include marginal revenue streams from the newly recruited faculty in the following categories: facilities and administrative (F&A) revenues, dean’s tax, development funds, tuition revenues, and patent and royalty fees. We determined the averages of these revenue streams by rank and faculty category, and we used them to project expectations going forward to assist in configuring recruitment packages. For F&A revenues, we used a modification of our previous modeling methodology to predict the effects of changing federal funding probabilities on newly funded grants and, hence, on F&A revenues.¹⁰

Tenure-track faculty, and, in particular, those with laboratory research programs, generated the highest positive central cash flows, calculated as NPV for positive cash flows (NPV[+]) to central administration. Nonetheless, the values for NPV[+] for assistant professors at 6 and 10 years after recruitment (\$118,600 and \$255,400, respectively) and for professors at 6 and 10 years after recruitment (\$172,600 and \$298,000, respectively) were substantially less than the estimated central costs for recruitment, expressed as NPV for negative cash flows (NPV[-]).

Hence, most newly recruited tenure-track faculty must be retained at the institution for more than 10 years to accumulate a positive NPV for central administration (the reader is referred to Joiner et al⁹ for details). The larger the magnitude of the recruitment package, the more true this observation. Conversely, the better the match between the timing of revenues provided to the recruit and the revenues generated by the recruit, and between the entity providing the recruitment resources and the ultimate flow of resources back to that entity, the less true this observation. In fact, this information has been instrumental in configuring recruitment packages in which the NPV[-] and the NPV[+] for each entity contributing to the recruitment (provost, vice president for research, dean, department, center/institute) are matched.

The University of Arizona COM applied this methodology while recruiting 11 new

department heads and eight new center/program/institute directors from 2004 until the present. All of these unit directors were given commitments of resources to recruit additional tenure-track faculty, as described further below. Project NPV was estimated for central administration from these newly recruited faculty; the projections were used to assist in configuring the recruitment package for the unit director. Although it was commonplace for the recruits to suggest that the resources provided were below those provided at top-tier institutions (e.g., “the market”), having data to support our logic was helpful in getting joint buy-in from the COM and from recruits for the strategy. The data accelerated discussion about identifying other revenue sources—in particular, from philanthropic sources. Perhaps most importantly, having a data-driven model facilitated the willingness of unit head recruits to share responsibility for identifying additional resources to support recruitment. Between July 1, 2005, and December 1, 2007, a total of 24 tenure-track professors and associate professors and 25 tenure-track assistant professors were recruited using this strategy.

Senior leadership sought to achieve broad faculty buy-in to this strategy. NPV[+] was determined for all faculty already at the University of Arizona COM during the same period, from 1998 to 2004. Faculty who had been at the institution for more than 15 years were disproportionately higher in NPV[+] than were those with shorter tenures. High-NPV[+] faculty in a myriad of categories (top 10% of total F&A or dean’s tax generation; F&A, dean’s tax, or combined revenue over specified dollar amounts) were notified with an individual letter thanking them for their efforts while emphasizing that their contributions to mission were equally important. Many faculty commented that this was the first time their contribution to revenue generation at an institutional level had been acknowledged, and some expressed surprise at the magnitude of their dollar values. Gratifyingly, few expressed the sentiment that a larger fraction of the central resources should be returned directly to them or to their units. We presume that this was at least in part because of the clear statement from central administration that the majority of the central cash flows were

being allocated back to units for new faculty recruitment.

Stimulation of Efficiency and Growth Through Incentive Plans

There is an increasing acceptance of the importance of incentive systems in managing the academic medicine enterprise. Incentives are most thoroughly implemented in clinical medicine, but they apply as well in research, education, administration, and outreach.

The generic goals of any incentive system are to (1) increase overall productivity, defined in the broadest sense—e.g., the “pie” should get larger for everyone, (2) expand both the responsibility and the accountability of individuals, (3) stimulate innovation by creating motivation to achieve more efficiency, (4) induce diligent behavior in those individuals who are underperforming, and (5) reward diligent behavior in those individuals who are performing above expectations. Typically, a subset of these goals is considered of utmost importance, even if not explicitly stated as such.

The following principles create a “clear line of sight” for framing an incentive program and are characteristics of the most effective programs¹¹: (1) incentives are based on the individual’s performance rather than performance of a group, (2) incentives are based on clearly specified behaviors or outputs, (3) individuals will receive a reward (typically, extra compensation) if they meet the targets, and (4) incentives are paid as soon as possible after the performance.

Typically, incentive systems in academic medicine are designed by intuition, with insufficient attention to the large literature relevant to optimal design. Relevant to this article, the discipline of utility theory predicts how individuals will react to a particular incentive (and accompanying disincentive) by determining the value (utility) they place on the various choices and the trade-offs which they will make to maximize their utility. This methodology can be used to optimize the balance between the risks assumed by the employee and the employer, and the benefits to both (e.g., maximizing utility while minimizing expense). Doing so may result in a structure which is not intuitively obvious, either in terms of the way incentives are

constructed or in terms of the outcome. This approach has been used for a myriad of applications,^{9,12,13} described immediately below first for the clinical practice, and then for the research mission at the University of Arizona COM.

Stimulating efficiency and growth of the clinical practice

With the help of one author (K.A.J.), a clinical incentive plan was previously designed and implemented for an outpatient subspecialty practice—the Dana Clinic, in the Department of Internal Medicine at Yale School of Medicine.¹² Before implementing the incentive scheme, faculty received a fixed percentage of their gross collections from the clinic irrespective of their productivity or the overhead expenses associated with the clinic. This approach did not meet the criteria of an optimal incentive system.

The productivity of faculty practicing in the clinic was arrayed to determine the fraction practicing below a wRVU benchmark per clinic session. The explicit goal of the incentive system was to bring underproductive faculty up to that minimum standard, which was reasonable by available benchmarks, and which would generate reasonable revenue to offset overhead costs. Incentive pay for additional effort over and above the benchmark was a secondary, but subsidiary, goal.

Faculty were surveyed regarding their risk profile for having the costs of their ambulatory practice covered in exchange for reaching a benchmark level of productivity. An instrument called the standard gamble (or 50:50 gamble) was used to generate the risk profile (utility) curve. Optimization modeling was used to determine the structure of the system which maximized utility for the faculty while simultaneously minimizing expense to the practice.

A nonintuitive structure for the plan was suggested. If faculty reached a specified benchmark, all of the overhead associated with the ambulatory activities would be covered by the practice. If they failed to reach that benchmark, none of their overhead would be covered by the practice, although they would have access to their collections to help offset expenses. A second nonintuitive feature of the plan was that all faculty could

specify, by individual choice, the number of clinic sessions (defined by wRVUs) which they wished to hold. In other words, an individual might choose to have only one clinic every month, to ensure that he or she would reach his or her appropriate productivity standard. This was an explicit recognition that some faculty would choose to devote their time to other pursuits (research, education, inpatient activities); by allowing them the personal choice to do so, utility would be maximized because of the explicit incentives and disincentives. Gratifyingly, the incentive scheme produced the predicted result during the first year (see Wilson et al¹² for details). The major result was to markedly increase the productivity of those below the benchmark.

These same principles are currently being used to improve the incentive schemes for clinical activities at the University of Arizona COM. They are also being used to more effectively manage overall departmental clinical finances. In both situations, there is more individual choice, associated with clearly defined incentives and disincentives, with the goals being to better align pay and performance and to achieve a heightened sense of responsibility and accountability. This is necessitated by difficulties in sustaining practice plan profitability. Although faculty and department heads generally acknowledge the importance of these measures, there is substantial resistance to implementing incentive plans which have lower base salaries and/or more stark penalties for underperformance, even with a potential for higher incentives and total compensation than is currently the case.

Using incentives to stimulate efficient use of resources to support research

An incentive scheme was previously created and implemented by the authors for return of F&A revenues to departments, centers, and programs at the University of Arizona COM.¹³ This system was predicated on the following principles: (1) each unit has fixed overhead expenses for administration, irrespective of the amount of research space occupied. For each unit, a fixed percentage of the F&A revenues generated was returned to cover these fixed costs, and (2) each unit has variable F&A expenses which are directly related to the amount of research space occupied. This framework distinguishes marginal revenues

and expenses from average revenues and expenses. The explicit goal was to make units and individual faculty aware, even if implicitly, of that distinction, and to provide recognition for those units which brought in overhead revenues above those required to cover fixed expenses.

A modification of previously applied approaches was used to determine the relationship between the performance of the unit relative to an F&A revenue per net square feet ($\$/\text{F\&A}/\text{nsf}$) benchmark and the variable revenue distribution returned to that unit. The underlying premise, again rooted in utility theory, was that unit heads would be “risk averse” for F&A return to their units. Operationally, this means that the first dollar of F&A returned was more valuable to the unit head than the second dollar returned, which, in turn, was more valuable than the third dollar returned, and so forth.

The system was applied to 25 units (departments, centers, and programs). During implementation, a research space-management model was simultaneously applied, which recouped space from units depending on their performance relative to a benchmark for total costs (direct + F&A). During the first two years of implementation, there was a dramatic increase (60%) in the median value (from \$57.42 to \$91.86) for $\$/\text{F\&A}/\text{nsf}$ across the 24 units. This was accompanied by a smaller, but still substantial (9.4%), increase in the mean $\$/\text{F\&A}/\text{nsf}$. This reflects a combination of the following factors, occurring simultaneously: (1) underperforming units had space recouped, (2) units opted to return space to have a higher $\$/\text{F\&A}/\text{nsf}$, and (3) more attention was paid to ensuring that faculty with appropriate F&A revenue were occupants of the research space. (See Libecap et al¹³ for more details.)

What has been the faculty response? Although the full implications of the F&A incentive plan were appreciated by some unit heads and faculty, it is generally true that neither the structure of the plan nor its application as part of the initiative to build research programmatically (see below) were well understood. The general understanding was more limited to concern about the downside risk of lower F&A return. This prompted more willingness to return space to the dean’s

reserve than had been the case previously. The faculty have repeatedly indicated the usefulness of a stated and implemented management of the space relative to the F&A return. The increased transparency of the process and the results that are readily apparent in a Web-based format are also valued. The use of the total award dollars in the benchmark calculation has resulted in the increased submission of grant applications to a broader array of potential sponsors. The increased visibility of the importance of the F&A return to unit functions increases faculty involvement. Although there has been insufficient recognition of the substantial upside potential, efforts are now underway to emphasize that component of the plan, and to achieve broader faculty buy-in, by simplifying the overall description and emphasizing increased return to individual units.

Distribution of Resources to Support Programmatic Growth

There is an increasing emphasis on team-based, programmatic clinical and translational research at AHCs. As is well appreciated, this is occurring in an environment that traditionally has more readily rewarded individual accomplishments. Furthermore, investigators at AHCs may have the most natural affinity towards, and achieve more recognition from, colleagues in their discipline at other institutions, at national meetings, or through national societies, rather than from their own institution. In a very real sense, this creates a conflict of interest for the investigators and for the institution,¹⁴ akin to the folly of “rewarding A while hoping for B.”¹⁵

How can this conflict of interest be minimized? Institutional commitment to the development of programmatic research is cited and recognized as perhaps the key factor for effective implementation and buy-in to the concept.¹⁶ At the University of Arizona COM, senior leadership are demonstrating institutional commitment to the philosophy by fostering programmatic research through distribution of resources.

Recruitment packages for newly recruited department heads and center directors are constructed in half positions.¹³ These constitute half of the resources (both

space and dollars) required to recruit a full-time faculty member. In other words, a newly recruited unit head would be allocated eight half positions rather than four full positions. This strategy is explicitly designed to drive corecruiting between units by strongly encouraging units to partner with one another to construct a full recruitment package. Typically, partnering involves a department and a center (e.g., heart center and department of cell biology; cancer center and department of medicine).

Faculty who are newly recruited through this mechanism typically occupy programmatic space, which is not formally assigned to a department, center, or program. The COM has prioritized the following programmatic themes for research: biomedical imaging, cancer, cardiovascular disease, diabetes, and human neurosciences. All new research space and the majority of recouped space is assigned to one of these five categories rather than to units. The explicit intent is to place faculty conducting similar research in adjacent space without primary regard to their unit affiliation.

Each programmatic theme has an assigned leader (theme director), who works with unit heads to populate the theme. This involves selecting those faculty currently at the COM best suited to move from their current location into incremental thematic space, and evaluating the appropriateness of newly recruited faculty to be assigned space in one of the five themes. Conceptually and practically, the space allocated to each newly recruited faculty member is derived in equal amounts from the two units who are partnering to create a full recruitment package. This strategy places veto power in the hands of either of the two collaborating units, and, as such, it is one of the most important aspects of the model. To be successful, substantial compromise is required by units not previously required to do so. It places the responsibility for this compromise squarely on the shoulders of the unit heads. For example, if a department wants to recruit primarily junior faculty and a center wants to recruit primarily established investigators, pairing requires negotiation to determine how to meet the joint needs of the units. In all cases, final approval for space assignment

for investigators within the theme must be granted by a COM-wide space committee.

This paradigm creates a complex landscape for configuring recruitment packages for new unit directors. How much space is assigned to my unit? Where is the space? Is it contiguous? Answering these questions, typically asked by individuals considering a position as head of a department or center, required substantial insight into the logic for space allocation. It was essential to avoid any unique arrangements with individuals who might expect a different arrangement based on their past experience. This required firm resolve on the part of the dean, the associate dean for research, and the Dean's Research Council Space Committee to avoid any temptation to create exceptions for new unit heads. The basic principle was as follows: If rules were bent or broken for any given unit or unit head, there were no longer any rules. We have adhered to the model during the past four years, where 11 of the 19 department heads and 8 of 14 center, institute, and program directors are new. To guide allocation to these unit heads of the half positions (dollars and space), which are the essence of the recruitment and space-allocation strategy for facilitating programmatic research (as described above), we developed and applied an optimization model (Joiner KA, A simple approach to optimize resource allocation when expanding the faculty research base, submitted for publication). Application of this model has ensured that sufficient space will be available to accommodate the large number of projected new faculty recruitments into incremental programmatic space, under conditions where the outcome of pairing between departments and centers cannot be predicted a priori. In particular, optimization was used to allocate 129 laboratory modules in programmatically assigned space, to 44.5 projected recruits (12 professors, 14 associate professors, and 18.5 assistant professors).

Unit heads and senior administration are evolving in their understanding of how to optimally implement the above strategies. The mechanics of implementation are confusing to many unit heads. Accordingly, the dean's office has distributed representative examples of how recruitment packages can be

assembled. Many faculty and many department heads remain uncomfortable with the notion of programmatic themes as the basis on which to allocate resources. The relative responsibilities of the theme director and the unit heads are often ambiguous. The compromise so inherent in the process has worked marvelously in some circumstances and much less effectively in others. Even in the latter case, however, the partners who perceive most value in the recruitment have typically identified additional resources and have returned to the table, leading in many instances to successful recruitments. Implementation has been facilitated by engaging unit heads who have used the strategy effectively to be advocates, ambassadors, and mentors. Unequivocally, creative approaches for assembling recruitment packages are rewarded, with the ancillary benefit that there is more diversification of risk to any single entity.¹⁷

Redistribution of Resources From Central Administration to Departments to Support Education

Education is a core element of the soul of an AHC. One of the crucial roles of central administration is to ensure that sufficient support is provided to feed the soul and, specifically, to ensure high-quality medical student education. Perhaps more so than for other functions, benchmarking and mission-based budgeting have been used at other institutions as approaches to provide the necessary support.^{18–20} Here, we describe our experience with one initiative, which has consumed enormous energy and generated substantial controversy, to make several points not usually considered central to such an approach.

In 2004, the University of Arizona COM embraced the call of the Institute of Medicine and undertook an initiative to revise its medical school curriculum. The dean for academic affairs assembled six teams (Learning Methods, Integration, Inter-Professional Education, Professionalism and Humanism, Evaluation Methods, and Faculty Rewards), each with broad faculty representation, to undertake this initiative. Their efforts focused on the mandates to teach students to provide patient-centered care, work in interdisciplinary teams, employ evidence-

based practice, apply quality improvement, and use informatics. Because the 1998 reaccreditation process conducted by the Liaison Committee for Medical Education had commented on the relative lack of integration within the University of Arizona COM curriculum, we also endeavored to create a more integrated curriculum.

In 2006, the University of Arizona COM introduced an entirely new curriculum for years one and two, ArizonaMed. In comparison with the previous curriculum, which was discipline based, ArizonaMed is a block design, with modules based on organ systems and disease processes. As part of that undertaking, one of the teams assembled by the dean for academic affairs, the Faculty Rewards team, was charged with developing metrics for recognizing and rewarding teaching in the new curriculum. There were two primary considerations by the Faculty Rewards team. First, moving from a discipline-based to an organ system-based curriculum meant that departments would no longer be responsible for courses. Any historically based funding formulas, predicated on departmentally based courses, would no longer be applicable. Second, because it is more difficult to secure faculty participation in medical student teaching than for either graduate student or resident teaching, an incentive-based system was needed. Concomitant with these two considerations, the COM was undertaking a seven-year initiative to double the number of faculty members. Because state funding is not expected to change substantially during that period, particularly for basic science departments in which state funds were historically distributed by FTE, there was a need to develop a new paradigm for the distribution of funds. Before the implementation of this paradigm, allocation of state funds to departments was historically based and did not have a clear or commonly apparent rationale.

As mentioned above, redesign of the curriculum was conducted by six broad-based teams. The Faculty Rewards team (20 members) was charged with developing a set of metrics for faculty effort devoted to developing and delivering the new curriculum through interactive lectures, small-group case-based instruction, team learning, and independent study. This team scrutinized metrics and approaches from a broad

range of institutions before developing the benchmarks for the University of Arizona COM. Subsequently, a smaller committee was responsible for integrating those metrics with a parallel set of benchmarks for graduate student teaching and additional educational activities for doctoral students (both MD and PhD). Metrics were developed in blinded fashion without regard to the impact that they would have on funds allocations to departments.

To implement the redistribution, the total pool of state funds allocated to departments (\$23.5 million) was redistributed, using the following algorithm:

- the proportion of funding allocated to basic science and clinical departments was kept constant (\$6.5 million to basic science and \$17.0 million to clinical departments);
- 10% of the total pool was divided equally among the 19 clinical and basic science departments to cover fixed infrastructure costs not related to department size;
- 20% of the total pool was allocated to departments proportional to the number of full-time faculty in the department to cover variable infrastructure costs related to department size; and
- 70% of the total pool was allocated to departments on the basis of faculty effort devoted to teaching, according to the teaching metrics as developed above.

The philosophy is that departments receive an allocation to carry out their commitments and that it is the responsibility of the department head and departmental finance committee to distribute the funds to the faculty in a way that advances the department's mission, provided that the department's responsibilities are met.

Because this was effectively a zero-sum game, it was expected that some departments would accrue additional funds and that others would experience decreases in funds. In fact, when the calculations were done (there was a strict rule that the dollar consequences would not be determined until the principles were set), enormous and intrinsically destabilizing shifts were apparent. Five departments sustained cuts of 17%, 18%, 24%, 35%, and 51%, respectively, and

five departments received increases of 26%, 30%, 36%, 53%, and 212%, respectively. Accordingly, the process is being phased in over a longer period of time (four years) than originally anticipated, and additional steps were taken to minimize destabilization of departments (described further below).

The rationale and philosophy behind the process was generally accepted from the outset. Nonetheless, this has been a controversial, drawn-out, complicated, and frequently contentious undertaking, with the difficulties deriving primarily from the implementation process. Several overarching observations have ensued.

First, the rationale and justification for implementing the complete revision of the curriculum, which preceded any redistribution of dollars to support that curriculum, had to be emphasized repeatedly to avoid overly conflating the two issues (e.g., curriculum revision and redistribution of funds). This was important to address the retort from some faculty that the complexity in redistributing resources meant that the college should return to the original curriculum.

Second, the intent was to use precise metrics for determining distribution of a "lump sum" to departments for their integrated teaching efforts but to then empower the department heads to allocate funds to individual faculty using whatever strategy and philosophy was most appropriate to cover the overall teaching requirements of their individual unit. In retrospect, it was nearly a given that many if not most faculty would carefully scrutinize the metrics and would appropriately request explicit financial credit from their department head for each individual teaching activity. This entirely understandable dynamic has butted up squarely against the broad organizational perspective that teaching is an obligation and is also accompanied by some intrinsic rewards, such that there need not be a perfect one-to-one correspondence between dollars and effort. There will be ongoing efforts, on the part of central administration and in conjunction with department heads, to reach a better equilibrium on this point.

Finally, we have gratifyingly noted that the interest in teaching medical students and the ability to appropriately deliver the medical student curriculum has been

substantially improved, as have student and faculty perceptions and evaluation of the curriculum. This is particularly true for clinical faculty, who have demonstrated more willingness to participate in small-group and team teaching activities in which clinical knowledge and reasoning are interposed with basic science principles.

A balance sheet for other features is provided below:

- A program which is very explicit in terms of metrics has both benefits and downsides:
 - + The expectations are transparent and are the same for everyone (level playing field).
 - + The opportunity to access teaching funds is very clear, thereby creating a positive incentive.
 - +/- It puts a premium on accuracy of the data in the absence of optimal information management systems. When information needs to be corrected, there is a mixed response. Some see corrections as evidence of responsible information management; for others, corrections lead to distrust.
 - It is very complex, leading department heads and faculty members either to focus on the minor details or to tune out altogether.
 - The complexity means that an enormous amount of time was spent working with department heads and faculty members to ensure understanding of the specifics, therefore creating a sense that the implementation was rushed.
- A program that is, overall, a zero-sum game—with "winners" and "losers"—tends to pit entities against one another:
 - Department versus department
 - Clinical versus basic science
 - Medical student versus graduate student versus resident teaching, etc.
 - Units losing funds versus central administration

The dean's office recognized the stresses that this reallocation process put on departments. Three specific steps were taken to deal with those stresses: (1) a university-wide cut of 3% in the FY07 state budget was absorbed by COM central

administration and was not passed on to departments, (2) incremental funds from nonstate sources were provided by the central administration to departments for program growth, and (3) a portion of state funds for teaching were set aside to be accessed by departments wishing to increase their teaching commitments. With all of these adjustments, departments had the opportunity to be budget neutral *at worst* in comparison with their FY06 budgets. Most COM departments will have additional funds, in a circumstance where most departments university-wide are sustaining cuts.

Conclusions

We have summarized a variety of our approaches for supporting the academic mission in an era of constrained resources. In addition to published manuscripts,^{3,6,9,12,13} Web links are provided in the published manuscripts which describe these approaches and which contain much, if not most, of the primary data. Although each of the initiatives described was developed separately, they are integrally and intentionally linked to permit explicit prioritization of resource use. For example, formulation of recruitment packages for unit heads is driven by the intersection between projections for return on investment, space utilization, including pairings with other units to achieve programmatic objectives, and central dollar allocations for teaching and infrastructure that are from a “pot” of relatively fixed size. Transparency has been an underlying philosophy accompanying the implementation of these initiatives: information not previously made available (state support, F&A return, space allocations, faculty positions, dollar commitments) is now publicly accessible. Such transparency places a premium on obtaining and presenting accurate, real-time data, which has been a highly time-consuming and occasionally frustrating process in the absence of information systems designed to support the approach. Nonetheless, this openness has largely

eliminated suspicion that “special deals” have been cut, even under circumstances where debate continues about the philosophy or strategy. We are now implementing new information systems, with a focus on providing unit heads, administrators, and individual faculty with the tools to assess individual performance, yet that can be efficiently and accurately rolled up into college-wide metrics.

It is not our expectation that these approaches could or would be applied verbatim at other COMs. It is our hope that the theoretical frameworks provided, and examples of their application and implementation at the University of Arizona COM, will assist others in this era of constrained resources.

Acknowledgments

The authors thank David Coleman, MD (Boston, Massachusetts) for insightful comments on the organization and content of the manuscript.

Dr. Joiner is vice provost for medical affairs and dean, and professor of medicine and cell biology and anatomy, University of Arizona College of Medicine, Tucson, Arizona.

Ms. Libcap is associate dean for planning and facilities, University of Arizona College of Medicine, Tucson, Arizona.

Dr. Cress is associate dean for research and professor of cell biology and anatomy, University of Arizona College of Medicine, Tucson, Arizona.

Dr. Wormsley is chief information officer, University of Arizona College of Medicine, Tucson, Arizona.

Ms. St. Germain is associate dean, Administration and Finance, University of Arizona College of Medicine, Tucson, Arizona.

Dr. Berg is associate dean for clinical affairs and professor of pediatrics, University of Arizona College of Medicine, Tucson, Arizona.

Dr. Malan is vice dean for academic affairs and professor of anesthesiology and pharmacology, University of Arizona College of Medicine, Tucson, Arizona.

References

- 1 Heinig SJ, Krakower JY, Dickler HB, Korn D. Sustaining the engine of U.S. biomedical discovery. *N Engl J Med*. 2007;357:1042–1047.
- 2 Dickler HB, Fang D, Heinig SJ, Johnson E, Korn D. New physician–investigators

receiving National Institutes of Health research project grants: A historical perspective on the “endangered species.” *JAMA*. 2007;297:2496–2501.

- 3 Joiner KA. Avoiding the winner’s curse in faculty recruitment. *Am J Med*. 2005;118:1290–1294.
- 4 Engelbercht-Wiggans R, Wiggans RE, Shubik M. Auctions, Bidding and Contracting: Uses and Theory (Studies in Game Theory and Mathematical Economics). New York, NY: New York University Press; 1983.
- 5 Thaler RH. The Winner’s Curse: Paradoxes and Anomalies of Economic Life. Princeton, NJ: Princeton University Press; 1999.
- 6 Joiner KA. A strategy for allocating central funds to support new faculty recruitment. *Acad Med*. 2005;80:218–224.
- 7 Oster SM. Strategic Management for Nonprofit Organizations: Theory and Cases. Oxford, UK: Oxford University Press; 1995.
- 8 Brealey RA, Myers SC. Principles of Corporate Finance. 7th ed. New York, NY: McGraw-Hill Irwin; 2001.
- 9 Joiner K, Hiteman S, Wormsley S, St. Germain P. Timing of revenue streams from newly recruited faculty: Implications for faculty retention. *Acad Med*. 2007;82:1228–1238.
- 10 Joiner KA. Sponsored research funding by newly recruited assistant professors: Can it be modeled as a sequential series of uncertain events? *Acad Med*. 2004;79:633–643.
- 11 Bucklin BR, Dickinson AM. Individual monetary incentives: A review of different types of arrangements between performance and pay. *J Organ Behav Manage*. 2001;21:45–137.
- 12 Wilson MS, Joiner KA, Inzucchi SE, et al. Improving clinical productivity in the academic setting: a novel incentive plan based on utility theory. *Acad Med*. 2006;81:306–313.
- 13 Libcap A, Wormsley S, Cress A, Matthews M, Souza A, Joiner KA. A comprehensive space management model for facilitating programmatic research. *Acad Med*. 2008;83:207–216.
- 14 Joiner KA. The not-for-profit form and translational research: Kerr revisited? *J Transl Med*. [serial online]. April 29, 2005;3:19.
- 15 Kerr S. On the folly of rewarding A, while hoping for B. *Acad Manage J*. 1975;18:769–783.
- 16 Facilitating Interdisciplinary Research. Washington, DC: National Academies Press; 2005:61–83.
- 17 Kaiser J. Med schools add labs despite budget crunch. *Science*. 2007;317:1309–1310.
- 18 D’Alessandri RM, Albertsen P, Atkinson BF, et al. Measuring contributions to the clinical mission of medical schools and teaching hospitals. *Acad Med*. 2000;75:1231–1237.
- 19 Mallon WT, Jones RF. How do medical schools use measurement systems to track faculty activity and productivity in teaching? *Acad Med*. 2002;77:115–123.
- 20 Holmes EW, Burks TF, Dzau V, et al. Measuring contributions to the research mission of medical schools. *Acad Med*. 2000;75:303–313.