Understanding Utilization Measures for Evaluating Research Space: A Number Is Only A Number

Eric Boberg, PhD[a,], Scott DeBlaze[b], Denise A. Johnson[c], Sucheta Kulkarni, MUP[d], Lynn K. Meaney, MBA[e], Gregory Robinson, DMin[f], Jerome Sak[g], Niki Smith[h,] Rebecca Waltman, MBA[i], and Pam Bounelis, MS, PhD[j,*,†]*

[a] *Executive Director for Research and Research Assistant Professor, Department of Medicine, General Internal Medicine and Geriatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois.*

[b] *Director, Space Planning, Real Estate Management, and Architectural Services, The University of Chicago – Biological Sciences & Pritzker School of Medicine*

[c] *Director, Planning and Operations, Saint Louis University School of Medicine, Saint Louis, Missouri*

[d] *Geo-Spatial Information Manager, Space Information, Analysis and Planning, University of Michigan Medical School, Ann Arbor, Michigan*

[e] *Director, Decision Support and Analysis, University of Pennsylvania, Perelman School of Medicine, Philadelphia, Pennsylvania*

[f] *Associate Dean for Academic Administration and Resource Management, University of Maryland School of Medicine, Baltimore, Maryland*

[g] *Director, Institutional Analysis, University of California San Francisco, San Francisco, California*

[h] *Director, Space Management, Vanderbilt University Medical Center, Nashville, Tennessee*

[i] *Director of Facilities Planning and Management, University of Iowa, Carver College of Medicine, Iowa City, Iowa*

[j] *Associate Professor, Department of Cell, Developmental, and Integrative Biology and Assistant Dean for Biomedical Research, School of Medicine, University of Alabama at Birmingham, Birmingham, Alabama and Chair ,GIP Data and Information Management Subcommittee*

[*] *equal contribution*

[†] *to whom correspondence should be addressed*

KEYWORDS

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ABSTRACT

The Association of American Medical Colleges Group on Institutional Planning undertook a project to identify key research space and financial indicators from readily accessible institutional databases to establish comparative space utilization metrics. Three surveys were administered to gain understanding of our institutional record systems. Once common variables were identified, a hypothetical department of ten faculty was created and characterized by academic phenotype, space assignments, extramural awards and expenditures, and research personnel. Using this common dataset, participants from eight schools calculated space utilization measures (dollars per net square feet) for both individual faculty and the overall department. Calculated space utilization measurements for each hypothetical faculty member varied 1.21 to 18.33-fold (mean = 6.3 fold) across participating institutions. Total department values varied 10.5-fold. Contributing variables included the financial indicator used, federal facilities & administrative rates, inclusion or not of common lab space, office areas, and department administrative space, and inclusion or not of spaces (i.e. clinical trial or animal housing) that are sometimes recorded in other organizations. Without recognizing, understanding, and accounting for the differences in our separate organizational methodologies, inter-institutional comparisons of typical, high-level productivity metrics such as research dollars per square foot are not valuable and can be misleading. A recommendation from this project is that a variety of data types should be used in SOM-specific space allocation, reallocation, and planning decisions. Decisions should be informed by both institutionally relevant metrics and discussions of space locations, adjacencies, and quality; personnel involved; and research progress and strategy.

Introduction

A long-term interest of the Association of American Medical Colleges (AAMC) Group on Institutional Planning (GIP) is providing comparative and best-practice information to Schools of Medicine (SOM) for use in operations and planning. Such information on space management and planning was the subject of the 1991 guideline book[1] from the GIP and colleagues from the AAMC Group on Business Affairs (GBA). Recommendations and examples of space allocation standards and guidelines and space utilization measures were presented in that report. Space utilization examples that were described ranged from a headcount type of approach for space allocation, such as 1,000 net square feet (nsf) lab space per faculty, to more complex formulaic systems that took into account assigned laboratory space, support spaces, extramural support, and salary coverage. The authors recognized that space utilization was measured in a host of ways and that no national standards were readily available. More than two decades later, this

Corresponding Author: Tel: (205) 283-1794
email address: bounelis@uab.edu

topic is still of broad interest to the SOM planning community. A primary result from the 2011 AAMC GIP membership survey was the desire of the members to have more complete and comparative data for benchmarking their individual SOM's performance to commonly accepted standards[2]. The survey respondents identified space as a primary interest area. As additional evidence of interest in the space-related topics, more than two-thirds (67.5%) of queries posted by GIP members on its listserv during 2013 and 2014 related to space planning, space metrics, and requests for recommendations for experts in renovation or construction projects[3]. Of these space-related queries, approximately 40% were focused on space productivity or space utilization metrics. To bridge this identified informational gap, the current members of the GIP Data and Information Subcommittee have focused recent efforts on developing recommendations for standard research space utilization m. The primary goal of this project was to identify key research space and financial indicators from readily accessible databases that could be standardized for use by the AAMC membership-at-large.

Table 1 – Characteristics of Participating Schools of Medicine

School	Region	Ownership Control	Research Intesity Quartile Rank	Organizational Location of Practice Plan
Case Western Reserve University School of Medicine	Central	Private	1	Hospital Based
Columbia University College of Physicians and Surgeons	Northeast	Private	1	Medical School Based
Northwestern University The Feinberg School of Medicine	Central	Private	1	Medical School Based
Perelman School of Medicine at the University of Pennsylvania	Northeast	Private	1	Health System Based
Saint Louis University School of Medicine	Central	Private	4	Medical School Based
University of Alabama School of Medicine	Southern	Public	1	Health System Based
University of California, San Francisco, School of Medicine	Western	Public	1	Medical School Based
University of Chicago Division of the Biological Sciences The Pritzker School of Medicine	Central	Private	1	Medical School Based
University of Iowa Roy J. and Lucille A. Carver College of Medicine	Central	Public	2	Medical School Based
University of Maryland School of Medicine	Northeast	Public	1	Medical School Based
University of Michigan Medical School	Central	Public	1	Medical School Based
University of Virginia School of Medicine	Southern	Public	2	Health System Based
Vanderbilt University School of Medicine	Southern	Private	1	Medical School Based

a) Research intensity is based on 2014 federal research expenditures as reported in the AAMC Organizational Characteristics database. A value of 1 is the most research-intense quartile of ranked SOMs

During the period of this study (2012 to 2015), involved subcommittee members represented thirteen U.S. medical schools (Table 1) that varied in geographic location, included both publicly and privately owned organizations, spanned a wide-range of research intensity, and had different organizational locations of their clinical practice plan[4]. Building upon the 1991 collaborative report[1], we reviewed internal and external data, best practices, and policies related to space utilization and allocation, particularly research space. Questions that emerged during our review included: should the same space metric be used for wet laboratory-based research as for computational or "dry"research? What types of financial indicators would best represent activities of our individual schools and be most comparable to others? Do we all use the same terminology when comparing space types? Are there best practices or a common dataset available for benchmarking to others?

There are several recent reports in the literature that describe SOM-specific space management and utilization measurement practices[5-10]. Many of these practices rely, in part or in whole, on a metric that involves some form of research dollars divided by occupied or assigned space. For example, the University of Arizona has defined an incentive benchmark for space utilization that is used to return a portion of the facilities and administrative (F&A) revenue received by the institution[7]. A benchmark of $100 F&A per nsf space was established for departments, and is used as both a financial incentive and in space allocation decisions. The University of Rochester has defined four metrics of space productivity[10] that they currently use. The metrics are generated by separately dividing two financial indicators (modified total direct cost expenditures (MTDC) and indirect cost expenditures) by two space indicators (total square footage and research square footage). They are coupled with other metrics in discussions of faculty and department productivity, and serve as part of the information that is used in their space planning and allocation processes. In another report, Solomon and Tom[5]at the University of Tennessee proposed use of a formula for objectively reviewing space allocations that considered direct research dollars, manuscripts published, research personnel, and useable, assigned laboratory space. However, they recognized that the formula did not adequately define research dollars, did not incorporate use of core facility space, and did not take into account the career stage of a faculty member.

In addition to SOM-specific values and approaches, there are also multi-SOM comparative data and calculated values for space utilization available to members of the AAMC. In perhaps the most inclusive and comprehensive example of attempts to compare space utilization indicators for SOMs, the GBA conducts an annual voluntary benchmarking survey of its members. The survey includes a research component to compare space utilization values, and requests values for research/non-class laboratory and research/non-class laboratory service net assignable square feet (nasf), as well as annual direct and indirect expenditures values categorized by different extramural sponsor types. Values of direct expenditures per nasf or indirect expenditures per nasf are calculated and shared with representatives from responding SOMs. Each can view data for their own SOM as well as de-identified data of others. While this high-level overview is helpful, the data have inadequate detail for more granular comparisons at the individual faculty, department, or space component level. For example, in blinded datasets, it is difficult to know if space utilization is similar for SOMs that are research-intensive or in the same geographic region compared to those that are not, or if there is a difference between

values calculated for clinical or basic science departments. GIP members involved in this study also identified wide variations in their institutional reporting for what constituted "laboratory" space and what constituted extramural dollars. As a result of our review, we determined that many of the data systems in place, including those within our own institutions, have limited utility in external comparisons without greater definition of the components included. We recognized that each of us currently employed unique combinations of financial and space data in our current value systems for space utilization; thus, we sought to better understand our differences.

Here, we report findings from our analyses and discuss our collective recommendations for best practices for evaluations of space utilization by SOM academic faculty and departments.

Methods

Members of the AAMC GIP Data and Information Subcommittee reviewed and discussed space management practices at their own institutions. Three initial surveys were sent to subcommittee members, with a goal to identify areas of common ground and areas of difference in current business practices for assessing space utilization. In two cases, survey respondents were asked to complete two separately-distributed Microsoft Excel worksheets. In the third case, survey respondents completed an on-line survey using the free Survey Monkey® tool[11]. A list of variables was compiled and used to drive the creation of a fictitious department of ten faculty.

Characteristics of each fictitious faculty member were provided to the participants in a Microsoft Excel spreadsheet. Characteristics included the academic phenotype of the faculty member (e.g. laboratory-based, clinical trialist, etc.), the number and types of personnel affiliated with the faculty member, award details (sponsor, award mechanism, awarded direct dollars, awarded modified total direct cost dollars, and calculated awarded indirect dollars using each SOM's current negotiated rate), award expenditures (direct, modified total direct, and calculated indirect dollars), and space.

Table 2 – Elements Included in Space and Financial Data Systems Reported by SOM Survey Respondents

Space Type	**No Space**	**Some Spaces**	**All Spaces**
Affiliated hospitals	8	2	0
Clinical trial space	2	3	5
Research core facilities	2	8	0
Animal facilities	2	8	0
Primary computer facilities	1	4	5
Backup computer facilities	5	3	1
VA space	3	4	2
HHMI space	1	3	6
Financial Activity	**No Dollars**	**Some Dollars**	**All Dollars**
Affiliated hospitals	9	1	0
Clinical trial space	1	3	6
Research core facilities	1	3	6
Animal facilities	2	8	0
Primary computer facilities	1	4	5
Backup computer facilities	4	3	2
VA space	6	3	1
HHMI space	6	4	0

The space characteristics included nsf values for assigned laboratory space, assigned office space, assigned laboratory service space, shared laboratory areas, shared department space, and other specialty spaces. Assigned laboratory service space was defined as privately held support space outside of the main laboratory. An example of this might be a microscope room. Shared laboratory areas were defined as specialty areas that were used by more than one faculty member, such as a cold room or a centrifuge core. Participants were asked to provide their current negotiated, federal, on-campus F&A rate, and the dollar and space types used in their current business practice to calculate each faculty member's space utilization ($/nsf). Participants were asked to calculate individual faculty productivity values as well as an overall value for the department in aggregate. Productivity worksheets were collected and analyzed.

Our analysis of the data included calculating a mean value for the numerical responses, as well as a standard deviation of the sample. This was performed using the AVERAGE and STDEV.S functions in Microsoft Excel 2010.

Results

Common indicators: As a first step in understanding the variables in space value systems, individuals representing thirteen separate SOMs completed three surveys, although not all individuals who participated completed each of them. The surveys were designed to reveal the types of financial and space information that was available within institutional databases and to highlight areas of commonality between our schools as well as internal alignment or mismatch within each school's data systems. All participants had access to space and financial reports of their institution. Results from these surveys and follow-up discussion revealed that all respondents (n=11) could report research activities using the financial indicators of total awarded dollars, direct awarded dollars, indirect cost awarded dollars, total expenditures, direct expenditures, and MTDC expenditures. There was consensus that of the indicators in current practice, expenditures were preferred over award data as it more accurately reflected research activities on campus. Of the expenditure types, MTDC expenditures was viewed by the participants as the most comparable financial indicator of research activity because it 1) eliminated the variability in facilities and administrative cost (F&A) rates, often called indirect cost rates, between schools and extramural sponsors for research awards; and 2) excluded expenditure types that are indirectly related to research and could cause large fluctuations in values during any reporting period. Costs excluded from MTDC expenditures are those for infrastructure (equipment, alterations and renovations, off-campus rent), patient care, training (tuition remission, scholarships and fellowships), and activities occurring elsewhere (sub-awards in excess of $25,000 and subcontracts to another affiliated campus). Other findings from our surveys were that every respondent could report space areas by type using standard classifications and definitions (i.e. Higher Education General Information Survey or HEGIS codes)[12] and function using adopted codes established by OMB Circular A-21 and the National Association of College and University Business Officers[13,14]. All reported that they updated their space databases at least annually.

Misalignments of financial and space data: As we examined the space and financial data in finer detail, substantial differences between SOMs became apparent. Internal misalignment of space and financial data were reported for activities involving multiple investigators (50%, n=10), clinical research activities (40%, n=10), and research centers or institutes (67%, n=9). 50% of survey participants tracked "dry research space" in their space inventory, but the definition of this space type was inconsistent between schools, and was not defined specifically enough in the HEGIS codes for all SOMs to interpret the definition the same way. Do cubicle areas or shared landing spaces count in the office category? What about desk areas within typical wet bench laboratories? Five of ten schools (50%) reported that either all spaces used by their researchers who performed work for the Department of Veterans Affairs (VA) were included in their space inventory while none of the VA extramural research dollars were included in their expenditure data, or the converse. Similar misalignments for activities that involved affiliated hospitals, animal facilities, research cores, either the main or backup computer facilities, the Howard Hughes Medical Institute, and clinical trials (Table 2) were also found.

Defining differences using a hypothetical department and a common dataset: To investigate the impact of these differences on space utilization measures, we next created a hypothetical department of ten fictitious faculty. Each faculty member was described in a Microsoft Excel worksheet in terms of an academic phenotype, personnel, funding and expenditures, space assignments, and other characteristics (Table 3). To minimize the effect of some forms of unintentional bias, the faculty description did not include tenure status, length of time at the institution, honors or titles that the individual might hold (e.g. Institute of Medicine member), race, age, ethnicity, physical ability, gender identity, sex, degree, or national citizenship. Subcommittee members representing eight schools used this common dataset to generate a space utilization measure for each hypothetical faculty member based on their current business practices. The range of space utilization measurements calculated by each participant using this common dataset was large (mean = 6.3-fold) and varied for each hypothetical faculty member (see Table 4). For example, space utilization measures for Faculty 1, a laboratory-based investigator, ranged more than three-fold between the eight SOMs participating in this experiment.

The largest variation in measurement was observed for Faculty 6, a Center Director. In this example, there was an 18-fold range in dollars per nsf values calculated by the participants. Surprisingly, there was no consistent pattern in measurements that we could discern that would identify a particular SOM (Figure 1A) from their calculations. As an example, SOM 6 calculated the highest and SOM 8 calculated the lowest space utilization values for Faculty 4,

Table 3 – Characteristics of a Hypothetical Department

Faculty Number and Phenotype	Award Types	Awarded Dollars	Expended Dollars	Personnel[a]	Assigned Spaces	Other Areas[b]
1 - Laboratory-Based	2 NIH R01s, 1 American Heart Association	$500,000 direct $450,000 MTDC	$450,000 direct $400,000 MTDC	3 students, 1 postdoc 1 lab technician	2,000 lab 300 lab service 280 office 100 animal housing[c]	50 common lab
2 - Epidemiologist	1 NIH R01, 10% salary coverage on a colleague's award	$250,000 direct $200,000 MTDC $35,000 direct salary coverage	$225,000 direct $225,000 MTDC $35,000 MTDC	4 data analysts 1 data coordinator 1 processing tech	400 lab 140 office 120 support office 300 cubicles	
3 - Clinical Trialist	Industry sponsored clinical trial	$75,000 direct $75,000 MTDC $7,500 F&A	$70,000 direct $70,000 MTDC $7,000 F&A	1 clinical coordinator, 1 research nurse	140 office 120 support office 125 record storage	100 clinical
4 - Animal Behaviorist	1 NIH R21, Core facility of NIH P01	$300,000 direct $300,000 MTDC	$265,000 direct $265,000 MTDC	1 graduate student, 1 animal caretaker	500 lab 140 office 750 animal housing[c]	
5 - Research Educator	NIH T32	$100,000 direct $100,000 MTDC $8,000 F&A	$100,000 direct $100,000 MTDC $8,000 F&A	1 administrator	500 lab space 140 office 100 support office	
6 - Center Director	NIH P30 Director has responsibility for Pilot Program (in P30)	$6,000,000 direct (P30) $5,500,000 MTDC (P30) $300,000 direct (Pilot) $300,000 MTDC (Pilot)	$5,900,000 direct (P30) $5,400,000 MTDC (P30) $300,000 direct (Pilot) $300,000 MTDC (Pilot)	1 administrator	200 director's office 120 admin office 500 conference	
7 - VA Investigator	VA Merit Award, American Diabetes Association grant (10% F&A)	$350,000 direct (includes $250,000 VA) $350,000 MTDC (includes $250,000 VA)	$325,000 direct (includes $225,000 VA) $325,000 MTDC (includes $225,000 VA)	3 research assistants	750 lab 500 lab in VA 100 lab service 140 office	100 common lab
8 - Clinical/ Research Educator	American Health Assistance Foundation, Professional Society award	$65,000 direct $65,000 MTDC $0 F&A	$47,500 direct $47,500 MTDC $0 F&A	0.5 research assistant, 1 research nurse	500 lab space 140 office 120 supply/storage	
9 - Established Investigator	No active funding. An NIH R01 is in no-cost extension.	$0	$15,000 direct $15,000 MTDC	3 graduate students	600 lab space 100 lab service space 140 office	100 common lab
10 - Beginning Investigator	Startup funds separately budgeted.	$200,000 direct $150,000 MTDC $0 F&A	$190,000 direct $140,000 MTDC	1 technician 1 graduate student	300 lab space 100 lab service 140 office space	100 common lab

a) All personnel are full-time unless specified.
b) Each faculty member had a share of 140 departmental administrative space (copy room, support offices, conference room, etc.
c) Animal housing is in the animal facility, not in the individual faculty's laboratory.
Note: all space values are in nsf

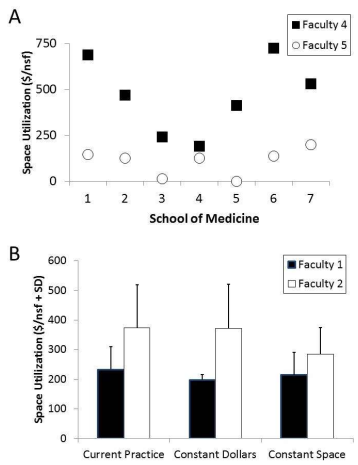

Figure 1. Variations in calculated space utilization measurements. A) Space utilization values for Faculty 4 (animal behaviorist) and Faculty 5 (research educator) that were independently calculated by seven SOMs (1-7) using identical information and their separate, current business practice. Black squares and white circles are dollars per nsf for Faculty 4 and Faculty 5, respectively. B) Mean space utilization values and standard deviations were calculated for Faculty 1 (laboratory-based) and Faculty 2 (epidemiologist) using current business practice (Current Practice), a constant value for the financial numerator (Constant Dollars), or a constant value for the space denominator (Constant Space) in the dollars per nsf equation. Mean values and standard deviations are shown for Faculty 1 (black bars) and Faculty 2 (white bars).

the animal behaviorist. Yet, two other SOMs, 7 and 5, calculated the highest and lowest values, respectively, for Faculty 5, a laboratory-based faculty who currently leads only a research training award. There was also an astonishingly high variation in the reported value for total department space utilization (mean range = 10.5-fold). These dissimilarities reflect the different value systems that are in place at each of our individual SOMs.

To test this idea, we recalculated the space utilization values for both Faculty 1 and 2 using a constant space value, which included only assigned spaces, in the denominator. In comparing values generated using current business practices or those with constant space values, there was a small decrease in the mean value for Faculty 1 ($226.82 vs. $210.37 per nsf, respectively) but the standard deviation was nominally unchanged ($73.01 vs $71.98 per nsf). In contrast, for Faculty 2, both mean values and standard deviations were substantially reduced when comparing space utilization measures calculated by current business practices, $361.01 (SD=$139.30) per nsf, to those with a constant space value, $283.11 (SD=$83.53) per nsf. Taken together, these analyses demonstrate clearly that differences in components of both the numerator (dollars) and the denominator (space) of current business practices for measuring space utilization contribute to the variability.

We anticipated that the variables that contributed to differences in our measurements would include our different F&A rates as well as the different types of financial expenditures and space types that we use in our current practices. As expected, the current federal F&A rate was unique to each of the eight participating schools. Values ranged from 47% to 60% (mean=54.8%). Of the eight schools, two used total awarded dollars as their primary financial indicator, two used direct expenditures, three used MTDC expenditures, and one used MTDC expenditures plus F&A expenditures in their current space utilization measurements. Thus, we hypothesized that if a constant dollar value that excluded differences in our F&A rates was used by all SOMs, the variability in space utilization measures would be reduced and perhaps, might even be comparable.

To test this hypothesis, space utilization measures for Faculty 1 were recalculated using a constant MTDC expenditure value, but using the space value reported by each participant in the original measurement. As shown in Figure 1B, using constant financial value in the space utilization measure decreased the mean value by 13.6% from $226.82 to $195.96 per nsf. Consistent with our hypothesis, the standard deviation substantially decreased from $73.01 to $17.20 per nsf. We then tested whether MTDC expenditures would be a useful replacement in space utilization measures for other faculty phenotypes. When we applied this recalculation approach to Faculty 2, we were surprised that neither the mean space utilization value nor standard deviation was different between values calculated with current business practices, $361.01, (SD=$139.30) per nsf, and values calculated with a constant financial indicator, $359.95 (SD=141.30) per nsf. This result indicates that differences in components included in the denominator (i.e. space) were driving the variability in calculated values for hypothetical Faculty 2.

Table 4 – Space Utilization Values for A Hypothetical Department Using Current SOM-Specific Business Practices

Faculty Number and Description	Responding SOMs (n)	Range of Space Metrics ($/nsf)	Fold Variation (High Value/Low Value)[a]	Mean $/nsf (SD)
1 - Laboratory-Based	8	98.77 to 325.19	3.29	226.82 (73.01))
2 - Epidemiologist	8	197.73 to 650.00	3.29	361.01 (139.30)
3 - Clinical Trialist	6	50 to 500	10.00	223.48 (148.16)
4 - Animal Behaviorist	8	190.65 to 724.22	3.80	430.94 (212.48)
5 - Research Educator	8	0 to 200[b]	16.00	110.43 (68.55)
6 - Center Director	6	937.50 to 17,187.50	18.33	7,941.70 (5,685.25)
7 - VA Investigator	8	84.27 to 364.58	4.33	154.12 (95.17)
8 – Clinical/ Research Educator	8	74.22 to 101.56	1.37	83.06 (10.76)
9 - Established Investigator	8	0 to 21.43[c]	1.34	9.44 (10.22)
10 – Beginning Investigator	8	0 to 312[d]	1.21	259.26 (71.46)
Mean of Faculty Variation			**6.30**	
OVERALL Department Value	**6**	**112.77 to 1,189.36**	**10.54**	**568.29 (429.62)**

a) Values of zero were excluded from this calculation.
b) One of eight SOMs reported zero.
c) Four of eight SOMs reported zero.
d) Six of eight SOMs reported zero.

Discussion and Conclusions

Using created data for a hypothetical department, we were unable to calculate the same space utilization value using our individual current business practices, or by recalculating these values using either defined constant dollar values or defined constant space values. From this experiment, we conclude that for any space utilization measure to be useful in external comparisons to other SOMs, all comparators would need to have more highly defined and identical value systems for both financial indicators and space indicators. In order to overcome the limitations of our current data systems, we recommend that research space types (e.g. dry research) and research expenditure types (e.g. clinical trials) be consistently and more finely categorized and that additional descriptive features of space and expenditures be included in most, if not all, of our current systems. These recommendations, if implemented, would allow the development of a robust comparative dataset that we feel would be highly valuable to the GIP membership and other leaders for use in setting institutional priorities, benchmarking to others, and informed and improved decision-making. Data might include institutionally relevant space utilization metrics, such as MTDC expenditures per nsf, or extramurally-supported research personnel per nsf.

We recommend that multiple metrics be used in any internal space allocation or reallocation process, and in fact, three of the eight SOMs who evaluated the hypothetical department had primary and secondary metrics that they currently employ. We recognize that numerical metrics are limited in that they do not address the career trajectory of an individual, impact of the research conducted, quality of space, or collegiality or institutional importance of the individual. Therefore, numerical measures produced by our business systems must be coupled with other types of information. Our evaluation of space utilization by Faculty 6 (Center Director) highlights the complexity of calculating a space utilization value for someone who leads a large, extramurally funded, research program, but who may be only directly involved in a smaller subset of activities. Our numerical systems do not adequately address the institutional worth of such a program or faculty member, and the range of values reported by the participating SOMs reflects our differences.

We echo the recommendations of the prior report of the AAMC GIP and GBA[1]: pace measurement systems should be acceptable within the institutional framework, be flexible, be perceived as fair, reflect current SOM goals, and correspond with current nfrastructure and technology needs of individual SOMs. We extend these recommendations and add a recommendation to exercise caution when comparing numerical space utilization measures provided by different schools. Without recognizing, understanding, and accounting for the differences in our individual databases, inter-institutional comparisons of typical, high-level productivity metrics such as research dollars per square foot are not valuable and can be misleading. Furthermore, because of the variety of internal data misalignments that we observed, comparisons of research units (e.g. department, center, or institute) or faculty within a single school may also be of limited value. Those faculty who have laboratory space on the SOM books may have a lower space utilization value than those who have laboratory space in the school but who have additional research space (e.g. animal housing or clinical trial space) that is reported on the books of another organizational entity. Thus, we recommend that any financial and space indicators used in institutional space utilization measures be absolutely aligned. If research dollars are counted in the numerator of a dollars per net square feet formula, the space where that work takes place, whether held by the SOM or elsewhere, should be included in the denominator. If a financial indicator is used in such measurements, we recommend MTDC expenditures as the preferred indicator since it excludes one-time infrastructure costs and expenditures that support some activities that take place elsewhere (e.g. sub awards to external entities).

Even if highly defined and comparable data systems were in place and used by all SOMs, we urge that numerical data are not used in isolation of other, more qualitative, information, particularly for allocating or reallocating spaces for individual faculty or departments. From our collective perspective, institutional leaders and decision makers should use information from a variety of sources in order to gain a comprehensive understanding of what is required for success. Such informational items might include floor plans that highlight adjacencies to other faculty, equipment, or facilities; extramural proposals or progress reports that describe current research projects; publications or other scholarly works; and descriptions of future activities that are planned. Similarly, space quality, specialized requirements (i.e. lighting, biosafety level, temperatures etc.), and needs for support spaces used by research personnel should be incorporated into the decision-making process. This is particularly important in the faculty recruitment process and for research strategic planning. We strongly recommend that the decision-making process for space allocation, re-allocation, and planning be grounded in institutional data but informed by discussion. Our collective opinion is that by keeping the numbers in mind, but also by spending the effort to learn as much as one can about the research program and critical factors for success of the faculty, one of our most precious academic resources, space, will be used to best institutional advantage.

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