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Reinventing the Academic Medical Center

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The academic medical center (AMC)'s value derives from cooperation between distinct bodies of expertise. Yet operational and physical barriers often inhibit the AMC's ability to realize this value. Traditionally, the institution comprises three independent functions: clinical care, research, and teaching. The separation of these facilities impedes the ability to test research in the clinical environment; convey research results into the teaching environment; and access outcome-based funding.

In response, AMCs are integrating these missions within cohesive, interconnected facilities. Benefits include: improved skill development and health outcomes; enhanced reputation and ability to attract and retain students, faculty and practitioners; more effective use of resources; and opportunities to distinguish the AMC from its peers and other healthcare providers.

The article explores strategies and solutions for creating a truly integrated medical center. One option is the Institute Model, which organizes the medical center around specialties or institutes. The author describes the pacesetter implementation of this model at the University of California, San Francisco's new, integrated hospital campus at Mission Bay. Here, UCSF is creating a new paradigm for healthcare delivery, linked with the university's research hub. The new, 869,000-square-foot academic medical center will accommodate international centers of excellence for the care of women, children and cancer, for the first time fully integrated with ambulatory services, translational research and teaching.

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A Patient Room

Prototype: Bridging Design and Research

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Reinventing the Academic Medical Center

The academic medical center (AMC) is the backbone of the U.S. health system. We read daily of scientific and treatment breakthroughs. New facilities rise on local campuses. Thousands of students compete to enter medical schools. Surely the welfare of the academic medical center is no cause for concern. And yet, appearances notwithstanding, the AMC's wellbeing is more fragile than we think, and the consequences, should it fail in its mission, are enormous.

The AMC is at the core of the modern human experience. It frames the debate about the nature of life, the responsibilities of research and medicine, and the relationship of human beings to their environment. It cares for the sickest among us, while serving as the epicenter for acquiring new medical knowledge and educating the next generation of physicians and physician-researchers.

But the AMC is also at a crossroads; its very success now threatens to overwhelm it. A simple analogy will illustrate.

Imagine you are a world-famous chef. You appear in magazines, talk-shows, celebrity sightings. But there are problems. While everyone knows where your restaurant is, the front door no longer leads to the dining room, but to the original space the restaurant long ago outgrew. Dining patrons must now navigate two corridors and a stairway to get to the dining room. Your customers expect the inventiveness and perfection for which you are legend, but they are now used to the more affordable prices of the chain-restaurant in the local mall. Your chefs-in-training get in the way of the wait-staff, and never find out which foods the patrons like. Because the kitchen required a big expansion, it is no longer adjacent to the dining room but is in a basement across the street.

Sound farfetched? Welcome to the world of the academic medical center. For a world-renowned AMC such as the University of California at San Francisco (UCSF), these challenges are typical. Indeed, UCSF has passed through so many of the trials and triumphs of the AMC—and is so actively committed to its future—that we will return to UCSF at key points during the course of this paper as a case study and reality check.

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1. History

The oldest AMCs began as university hospitals. One building may have housed patient care, laboratories, some classrooms or lecture halls, as well as offices, all in location (Figure 1). Everything was next to everything else. Adjacency and accessibility enabled synergy, collaboration, and a shared mission. This is the picture of UCSF in embryo, when it was still Cowell Hospital on the UC Berkeley campus.

Over time however, demand for services increased, funding systems changed, and building codes became specialized. All three trends played their part in unbundling the university hospital into a community of distinct and increasingly disparate facilities (Figure 2). With code-implemented construction standards making hospitals more expensive to construct and operate, hospitals jettisoned all but acute care functions. Non-acute (outpatient) care was relegated to a less expensive clinic or medical office building (faculty practice plan)—sometimes nearby, sometimes across campus. In the laboratory, meanwhile, improved and more diversified technology, more standardized procedures, and increased participation by faculty and students required major expansion that could only be accommodated in new construction. The teaching function itself, poorest cousin of the bunch, was sometimes left in the hospital, but more often found itself scattered among several campus locations.

In some cases, there wasn't room on campus for all of these pieces, and the medical center itself was cut off from the main campus. UCSF itself was born of the vision of a stand-alone medical campus with room not only for all of these disciplines, but room to grow as well. As is the case with most AMCs, UCSF eventually reached full site capacity, and had to consider its expansion options.

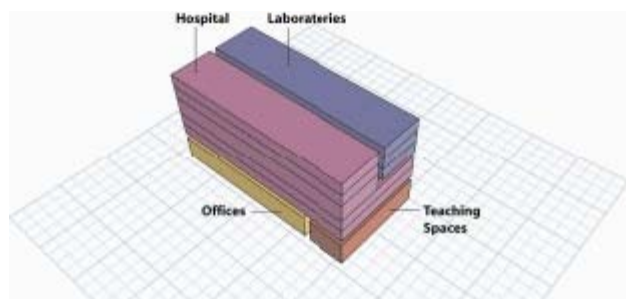


Figure 1: The Historic Model

From Table d'Hôte to à La Carte

As specific functions moved away from a single campus to separate facilities, these discrete functions became identified with the structures they inhabited:

The Hospital: a “super-sized” version of a county hospital, scaled up to accommodate students and interns.

- *The Medical Office Building (MOB): the most private-sector-oriented component of the academic medical center, with a blurred identity between the public realm and the university. Faculty physician offices sometimes came to reside within the MOB.*

- **The Research Laboratory: physically distinct from the hospital, other caregiving environments, and from the school as well, even though faculty offices came to reside within the lab environment. In UCSF's case, space on the main campus was at such a premium that a new 43-acre campus dedicated to research was established in the Mission Bay neighborhood, on the central bay shore of San Francisco.**
- **The School of Medicine: comprising a library, lecture hall, classrooms, dean's office, administration, and student support, with most hands-on teaching and learning occurring in the hospital.**
- **New Trends**
While the AMC became entrenched in the building types just mentioned, the world outside its gates evolved in sometimes contradictory directions. New trends in care delivery, for instance, flourished outside of the AMC. The private healthcare sector crafted high-visibility "centers of excellence" in cancer, women's health, cardiac care, and pediatrics, with the emphasis on nurturing, patient-focused environments. For the AMC, with its added focus on students and researchers, this model was hard to replicate. As another example, HMO reimbursement protocols, as well as an increasingly health-conscious public, pushed the concept of "wellness" to the center of healthcare discourse, threatening to displace the disease and traumatic injury foci upon which the AMC is founded.

Another trend was the growing empowerment of the communities which surround (and increasingly dominate) the AMCs. In UCSF's case, for instance, resistance from neighborhood groups in the late 1960s and 70s resulted in significant limitations to future development—the very obstacle the satellite campus was created to avoid.

By far the weightiest trend (and the focus of this article) has been the growing integration of disciplines within the AMC. Empirical evidence has credited accelerations in the pace of clinical innovation in the integration of patient-care with research; i.e., translational research. Subsequent observations have underscored the importance of educational connection to research. A new philosophy of academic medicine has emerged—a continuum of healing, discovering, and learning environments. The AMC facility nomenclature, meanwhile, has evolved to reflect these changes:

- **Trending away from the physical model of "hospital, laboratory, school"**
- **through the functional model of "inpatient/outpatient, research, education"**
- **On to the mission-based model of "healing, discovering, learning"**

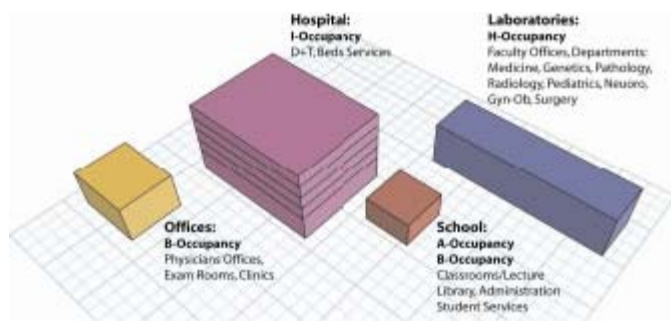


Figure 2: The Current Model

Struggling with a Larger Mission

Nomenclature alone, however, cannot reconcile the conflict between the evolving, interrelated missions of academic medical centers and the fragmented building typologies within which they are bound. The hospital suffers from too little emphasis on the quality of the patient and visitor experience. The medical office buildings are saddled with the disease focus of the university or departments while the HMO focuses on wellness; the labs suffer from their physical separation from the hospital and the school. Many schools of medicine, meanwhile, are attempting complete overhauls to keep up with ongoing revolutions in pedagogy.

These physical separations impede fulfillment of the newly expanded academic medical center mission, a mission that unites care delivery, scientific discovery, learning, and financial solvency. Patients and visitors experience mainly the negatives—the density and confusion—of the AMC healthcare environment, instead of the positive attributes of which the institution is worthy. Thus AMC hospitals run the risk of losing patient volume to other providers. Because of functional segregation, AMCs lag in their dissemination of research results to the teaching environment. They lag as well in clinical implementation of research discoveries, often missing outcome-based funding opportunities. The schools of medicine themselves suffer from a pedagogical gap between classroom-learning and hands-on experience, as well as an insufficient focus on group learning, team interaction, and bedside manner. And when schools are too isolated from their communities, they miss out on the curricular, political and financial benefits of local support.

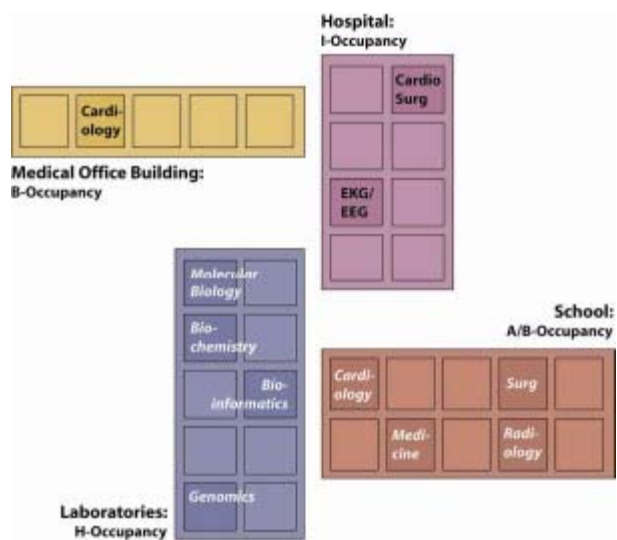


Figure 3: The Current Model of Departmental Organization

The current challenges to integration can best be seen when we track a specific service line that is split between multiple facilities (for example, one AMC's heart program (Figure 3)). Caregiving, research, and educational components spread over several facilities impede not only staff-student interaction, but also the ease and clarity of patient support. Furthermore, hospital "departments," used by patients and visitors, do not parallel laboratory and school "departments," used by students and faculty (shown in italics in Figure 3). To add to the confusion, an individual research discipline may include multiple hospital departments, and vice versa. The research discipline of cardiology, for example, includes hospital departments such as surgery and imaging, while the hospital department of imaging includes multiple research disciplines such as radiology, oncology, and other departments.

Finally, while many AMCs have followed the private sector lead in organizing themselves around service lines, this has occurred chiefly in the acute care environment (Figure 4), and in stand-alone outpatient facilities such as cancer centers. On campuses where service-specific research "institutes" have been established, these are as yet ambiguously aligned with the clinical environment. The promise of "one-stop shopping" around a specific service line is, for most AMCs, still on the horizon.

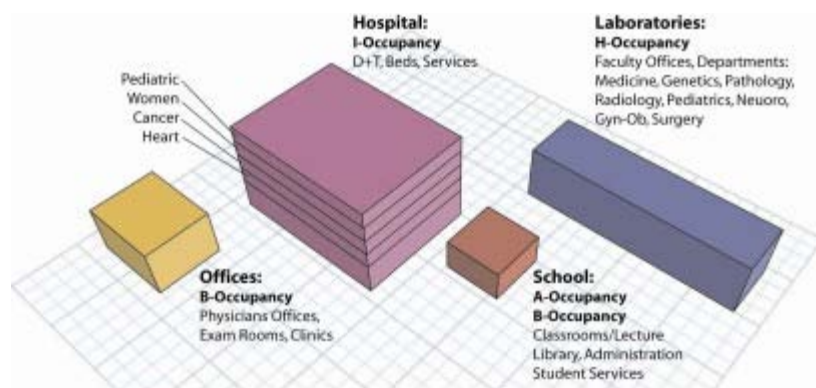


Figure 4: The Current Model of Service Lines within the Hospital

2. The Case for Integration

A Healthier Patient

Assuming integration is possible, what would it achieve, and what would it look like? Let's start with achievements.

Improved and accelerated results—especially patient outcomes—are one of the great promises of integration. The development of new clinical programs and models of care, coupled with the fostering of collaborative cross-departmental relationships and synergy, are greatly enhanced by an integrated approach. Improved productivity, efficiency, and capacity in all sectors of the AMC can be achieved through state-of-the-art integrated facilities that break down the traditional barriers.

Specific alliances bring specific rewards. When inpatient services are better linked to research, the application of research discoveries (the "bench-to-bedside" metric) accelerates, as does the feedback on efficacy ("bedside-to-bench"). Such linkages also position the AMC to develop more personalized clinical practices. When the outpatient facilities (MOB/clinic) are integrated with their corresponding acute specialties, front-door/back-door utilization of diagnostic and treatment resources maximizes physician output and return on capital investment, and provides a friendlier front door to the acute-care environment. A more patient-friendly access point to a research specialty also makes translational research accessible to outpatient clinical trials. Finally, when learning is integrated with acute care and research, physicians and staff learn better practitioner protocols, and mid-career continuing medical education is encouraged.

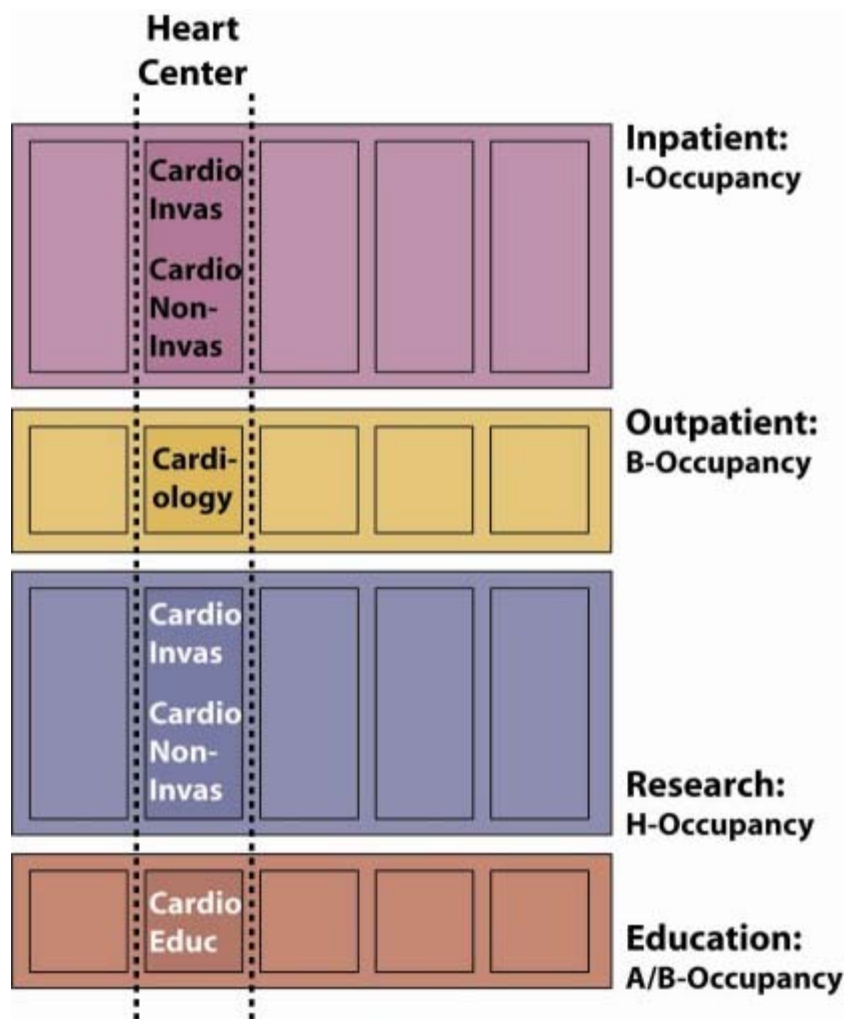


Figure 5: The Institute Model of Departmental Alignment

A Healthier Reputation

When the patients' outcomes improve, when discoveries are accelerated, when the physicians have the infrastructure to do their best work, and when students have access to the best learning environments, it seems obvious that the AMC will see its reputation enhanced, the quality of its students and faculty improve, and the national rankings of its school edge ever higher.

When patient care is integrated with research, for instance, the results-based research philosophy attracts better physicians, researchers and medical students, while a state-of-the-art care environment appropriately linked to research and education retains the best clinical staff. Students are drawn to more applicable research and learn more thoroughly via rapid results. Integrating outpatient services with specialty research can "brand" an outpatient care environment with the prestige of the medical center, and integrating outpatient services with the school provides better training for primary care physicians, thereby attracting more students. When learning is linked with acute care and research, students:

- learn how to conduct research*
- learn how to work in teams (ER and surgery simulations, etc.)*
- benefit from multiple, test-measurable steps between*

- *book and bedside*
- *achieve greater mastery through immersion techniques*

A Healthier Quarterly Report

Finally, a greater ability to recruit and retain renowned experts goes hand in hand with greater ability to compete for revenue, grants, federal funding, and philanthropic support. An improved financial position differentiates the AMC from its competitors and peers and strengthens its ability to partner with private industry in research/development and capital investment.

As was true above, each linkage contributes specific fiscal advantages. Integrating inpatient care with research can better associate patient care with fundable research institutes, thereby including some patient care within traditional funding streams. Grants, federal funding and philanthropy based on outcomes can only increase as integration accelerates the rate of discoveries and clinical innovations. Aligning research with the mission of care also reduces the "ivory tower" perception of research, making discoveries more transparent to the greater community. All of this in turn increases the community's perception of state-of-the-art and accessible treatment, rendering the AMC a good investment for corporate and individual donations. And when outpatient care (MOB/clinic) is integrated with research, an additional benefit is that the AMC operates on the wellness model of care—instead of the disease model—thereby improving its competitive position with HMOs and attracting a greater patient volume to the AMC.

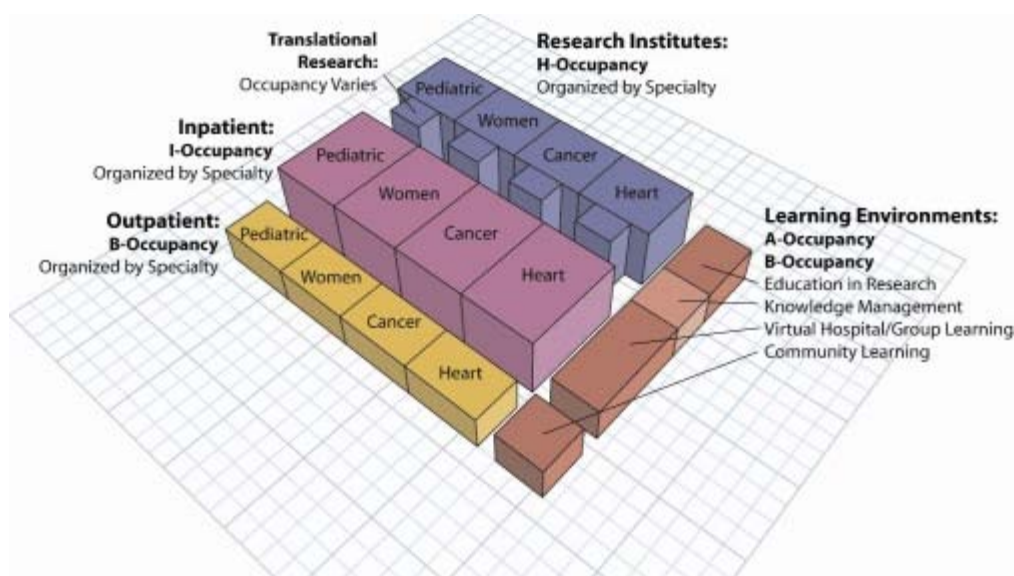


Figure 6: The Institute Model of Facility Integration

3. Impediments to Change

Blocked by the Organization

So much promise does not come without a price, both financial and organizational. The current entrenchment of many AMCs is not merely physical—organizational "silos" also impede integration and consensus. There are even constraints around just talking about integration: Who takes the lead? Is there co-leadership or a singular overarching authority? How does the AMC cope with differing priorities and protocols? How

does the AMC balance limited resources against demand and—most of all—vision?

Blocked by the Facilities

Contrasting with organizational issues are the “nuts and bolts” constraints imposed by the existing facilities. Uninspired or obsolete facilities, or both, obscure the AMC’s excellence and hinder space utilization, capacity, and efficiency. Seismic or safety issues and inefficiencies related to multi-site or constrained campus locations, or both, may also be a concern.

Some of these constraints are due to existing building codes and construction types, which tend to reinforce the segregation of functions within the AMC. The hospital (I-Occupancy) is the most expensive construction type, a fact which causes many functions to be routinely pushed into less expensive typologies. The intensity and acuity of hospital use restricts change and flexibility: one can’t just work around patients. They must be moved away or protected from disruption and construction areas. The hospital must be self-sufficient for all utilities, and must have on-site back-up to see the hospital through a temporary loss of service. This takes up site area and limits the placing of “non-compliant” structures relative to utility lines. Because egress of hospital occupants must be separate from other occupancies, and because the hospital’s boundaries require high fire ratings, the functional permeability of the hospital perimeter is usually quite restricted, impeding its integration with adjacent building types.

Meanwhile the MOB/clinic (B-Occupancy) is the least expensive construction type and has the least intensive infrastructure. Less mechanical space in the ceiling means the resulting lower floor-to-floor heights of the MOB can be a mismatch with those of the hospital, limiting connectivity. Similar restrictions impact the connectivity potential for labs (H-Occupancy) and the school (A-Occupancy/B-Occupancy).

Blocked by Traditional Funding Sources

Current functional distinctions among the components of the AMC also affect funding sources, discouraging the merging of capital campaigns. With so many challenges to academic healthcare profitability, expensive hospital construction relies increasingly less on revenue and more on university and donor support. Multiple donor opportunities are therefore a pervasive feature of contemporary hospital design. Less expensive MOB and/or clinic construction, on the other hand, tends to be supported by physicians’ leases. This is the most flexible of the building types and therefore easy to develop as a leaseback. Laboratory construction is supported by grants, donors, and increasingly corporate (pharmaceutical) investment. While there can be departmental turf battles over funding, the labs, because of the opportunities for high-visibility discoveries, often bring with them the highest donor visibility. School construction, on the other hand, while theoretically supported by tuition, the university, and donors, is the poorest member of the AMC, and has traditionally been seen as the least glamorous to donors (i.e., the least connected to a fundable “cause”). Discussions within the AMC

about “who pays for what” can therefore become fractious.

4. A Portrait in Transition

UCSF: A Case Study

With so many obstacles to overcome, how can any AMC achieve real integration? UCSF, for one, understood that the first step towards true change is to re-imagine and redefine its vision. Once the long-term objectives have been sketched out, the steps to get there can be designed. The timing for UCSF’s visioning exercise was determined in part by a state-mandated seismic safety bill requiring UCSF to replace a large portion of patient beds. The upheaval that comes with such a major overhaul is traumatic, but it allows for a clean-slate approach to envisioning the future.

What emerged from UCSF’s envisioning process is what we will call the Institute Model (Figure 6), which organizes the medical center around specialties or institutes (Figure 5). This is an inside-out approach to integration, with each institute—children’s, women’s, cancer—encompassing affiliated research and education, and including the entire range of acuities, both inpatient and outpatient, and both medical as well as surgical clinical practice. This is accomplished by conceiving the built facilities as the warp and weft of a loom, with different building types—hospital, clinic, lab, classroom—crossing the different service lines, or institutes. This respects occupancy-based construction differences while aligning what are currently disparate functions within one center of excellence. The learning environments parallel the institute model, creating a virtual institute that uses immersive technologies and team learning to instruct students in the full range of clinical and research skills. And just as the institutes have a public-friendly front door, the school is also zoned to encourage community involvement.

How much of the spectrum is built at one time depends on adjacency to other AMC functions. In UCSF’s case, choosing a hospital replacement site in close proximity to the new Mission Bay research labs meant that the initial scope could focus on the continuum from outpatient care through translational research—in this case dedicated labs and conferencing spaces—which occupies the interactive boundary between research and care delivery.

The Institute Model is by no means the only available option for integrating the AMC. Other campuses, for instance, are envisioning what we will call a Quad Model (Figure 7), which organizes the medical center around a central campus exterior space. In contrast to the Institute Model, this represents an outside-in approach to campus planning and is somewhat at odds with the goals of the Institute Model. It does not bundle functions around individual service lines as much as it conceives of the AMC elements in general as a continuum of care, research and learning. The quad in the middle becomes the intersection of public health and academic knowledge.

Once UCSF had established a vision, its leadership used the vision to assist in overcoming many of the obstacles

mentioned above. The Institute Model helps with transition issues, for instance, by allowing one or two service lines to integrate first. This not only better distributes capital investment over time; it also allows the AMC to learn from its own process. It recognizes that not all service lines may need either the same amount of integration or need it as quickly.

This leads us to the topic of departmental turf issues, a quagmire for many AMCs. The importance of developing a vision early cannot be overemphasized. When the process of achieving consensus—a sometimes Herculean task—partners traditionally warring factions, then the vision itself becomes not only a blueprint for future “territory” but a new paradigm for cooperative interdependency. Developing the vision has a huge impact on reevaluating an AMC’s site resources. UCSF made a leap forward in choosing its research campus at Mission Bay as the location for its large patient-care initiative. Additionally, the Institute Model represented a significant change in how that campus should be zoned, where development should begin, and where growth and replacement should occur.

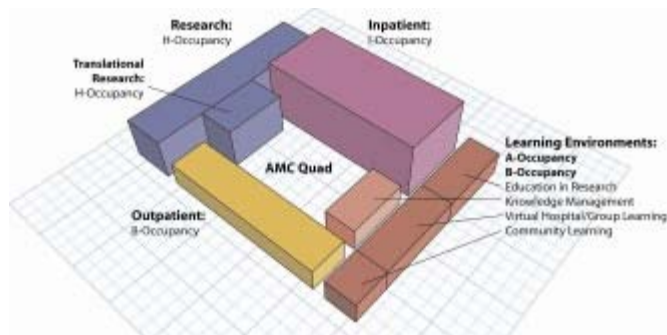


Figure 7: The Quad Model of Campus Organization

5. Application: How to Tailor Your Own Transition

Overarching Concepts

Certain preliminary steps must precede any major re-visioning of an AMC. First, strategic business, facility, and program assumptions should be aligned. Second, comprehensive assessments of benchmarks, cost models, programmatic, and project needs should be developed. Third, the AMC needs to align fiscal resources and program needs, allowing for construction cost volatility and for long-term flexibility. Fourth, it’s a good idea to tour exemplary, leading academic medical centers to see what others have done so far. Often there are success stories to be found in embryo form: system changes within existing buildings, where the physical changes have not yet caught up. Fifth (and ongoing), it is critical to achieve consensus of the medical center leadership, especially the dean, the CEO, and key departmental heads: without face-to-face dialogue, major visioning is almost impossible.

Finally, it is important to amass community, agency, and political support. UCSF learned that any kind of new construction—even replacing facilities “in kind” to achieve better public safety—can be looked at negatively by neighboring communities. UCSF created an entire community outreach organization to facilitate outreach and feedback. This proved essential in transforming potential opposition into

enthusiastic support.

Consultant Experience and Knowledge

A good consultant can make or break an AMC integration process. Consultant selection should be based on the following criteria:

- *Experience in articulating the macro-level, holistic, and birds-eye view of an AMC: the impact of site and medical planning upon patient outcomes; the complexities of funding; insurance, reimbursement, demographics; and other factors*
- *Ability to take an innovative “think tank” approach to campus and strategic planning*
- *Proven ability to stimulate institutional self-awareness and challenge conventional thinking*
- *Understanding of the value (and timing) of incorporating various experts: financing and development; benchmarking; strategic planning and visioning; planning, programming, and design*
- *Experience in the planning and design of all four pertinent environments: education, research, inpatient and outpatient care*
- *Understanding of the disparate missions within academic medical centers—the different motivators of teachers, researchers and physicians—and the need to facilitate and nurture relationships among constituents*
- *Proven nimbleness in the current environment of constant change*
- *Ability to synthesize the above to realize the vision of the next generation academic medical center*

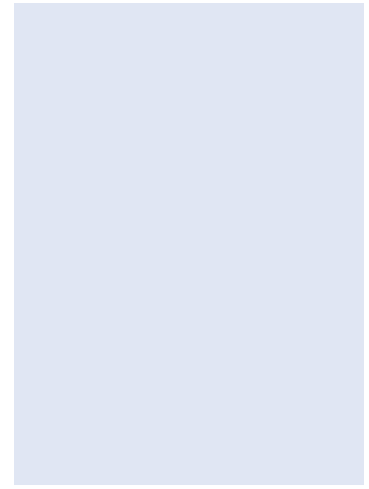
Further Evolution of the AMC

Like any institutional typology, the AMC will continue to evolve. What trends can we expect? Changing pedagogical models are at the forefront because of the pace of technological advancement: increasing immersion learning techniques, such as a “virtual hospital”; increasing technological and standardized-patient teaching methods; increasing distance connectivity via the Internet; increasing engagement of clinical staff in continuing education; and more measurable and testable steps in the learning process. We may look forward to changes in building codes and agency review processes (perhaps a future omnibus building type: the “hospitropolis”). Changes in disease and epidemiology will continue to have a profound effect on the AMC, as will new treatment approaches, such as telemedicine. Finally, we may see changes in university and hospital accreditation, as well as changes in insurance disbursements; perhaps even universal insurance coverage, which could have a significant impact on the AMC.

The wellbeing of the AMC absolutely deserves our immediate attention. The unbundling of functions within the AMC was a “hiccup”— a temporary reactive measure that wreaked serious consequences. Some segregation may happily remain, especially outside of the AMC’s centers of excellence. But for the AMC as a whole, successful integration of its core missions offers enormous opportunities—a greater ability to promote wellness in today’s population ,and the promise of hope in providing for the health and welfare of generations to come.

Although widespread organizational and physical barriers currently hinder these outcomes, aligning capital, intellectual and all other assets based on mission can help rekindle an AMC's reputation and better position it to realize its own vision as a next-generation academic medical center.

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