A new paradigm – bench to bedside and back

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Translational medicine — the transfer of clinical research knowledge to patient care — has become increasingly important to academic, research and healthcare institutions. This paradigm must create new modes of communication, operations and management, and scientific and clinical practices that have not experienced before. It has significant implications for an institution’s physical space which must facilitate interdisciplinary communication, not only between researchers and clinicians within the institution, but also among colleagues at institutions around the world. From an operational and management standpoint, physical space must be viewed not only as a capital asset, but as a means to integrate the processes of scientific discovery and clinical treatment. From the standpoint of scientific and clinical practices, physical space must be designed not only for today’s practices, but also with the flexibility to adapt to those yet to be imagined. Moreover, translational medicine has found support from key research and funding institutions such as the National Institutes of Health (NIH). As articulated in the “NIH Roadmap”, NIH director, Dr. Elias A. Zerhouni, has cited the advancement of translational medicine as one of his primary goals.

Uniting Clinical and Research Components

There are opportunities to achieve major advances on both the research and treatment sides of the equation, yet the challenge of translating basic research results into new diagnostic and treatment modalities requires interdisciplinary collaboration among clinicians and scientists -- laboratory, office and clinical spaces in proximity to one another and the complex infrastructure required to support these interdisciplinary activities – is critical.
An effective translational medicine program can help institutions compete for top clinical and research staff, funding, and patients. For institutions with well-established clinical programs, emerging interest in translational medicine may have led in the past to an ad hoc approach to implementing the research component. However, as translational medicine has grown in strategic importance, these institutions are undertaking master-planning efforts to unite the clinical and research components into an environment that truly supports an effective program.

Typically, translational medicine is comprised of three major components: “wet” or bench research; “dry” or computational research (i.e., informatics); and clinical/patient-care. A master plan for translational medicine on a medical center campus might align wet cardiovascular research spaces, dry research spaces and patient-care spaces adjacent to one another, and next to that might be similar groupings for cancer or diagnostic imaging. This approach to space planning creates adjacencies that facilitate research and patient care within each specialty, while also promoting lateral adjacencies that facilitate interdisciplinary interaction among specialties, as well as efficiencies from an infrastructure standpoint. Similar adjacencies can be created among separate buildings, as well. On academic medical center campuses, transitional zones may be used to create linkages between patient care and educational components.

For example, the Ohio State University Medical Center, Columbus is one of a handful of academic medical centers in the country that is co-located with the College of Medicine, the majority of Health Sciences colleges as well as the larger University. The master plan currently under development by Tsoi/Kobus & Associates (TK&A) envisions growth from 6 million square feet to 11 million square feet over the next 20 years. OSU has invested considerable resources in the construction of wet research labs at the Medical Center, including a 400,000-square-foot research tower presently under construction. The master plan unifies OSU’s investment in wet research facilities with current and future investments in clinical facilities, creating the necessary environment for translational medicine. The plan recommends a 700,000-square-foot transitional zone of faculty offices and dry research functions between research and clinical spaces.

Similarly, the master plan for The Children’s Hospital of Philadelphia (CHOP), which recently has been ranked as the No. 1 children’s hospital in the United States by U.S. News and World Report and Child Magazine involves the potential development of three million square feet on a 7.88-acre parcel adjacent to CHOP and the University of Pennsylvania. Currently, the facilities are more traditionally distributed in distinct clinical and research components. In fact, much of the research space is located in rental space four blocks away from the main clinical space. To meet CHOP’s goal of allowing every patient the potential to be involved in research, the master plan developed by TK&A and Ballinger creates a U-shaped complex with ambulatory space and a research tower on either side connected by clinical spaces. The towers will be identical widths to enable patient and research space to be integrated within a single building if CHOP wishes to do so in the future.

The planning process must not only address the important adjacencies among all of the components of the translational medicine program, but also address the institution’s real estate and financial resources. Many institutions face significant budgetary constraints because of the boom of new construction over the last three decades. Because much of this construction used campus real estate inefficiently, land constraints present additional problems. Moreover, the inherent inflexibility of many older buildings poses challenges to adjacency and infrastructure requirements of translational medicine. For example, attempting to shoehorn advanced acute care or wet clinical research programs into older buildings with limited floor-to-floor heights, restricted bay spacing, and outdated mechanical, electrical and plumbing infrastructure does not fulfill the institution’s program goals or reduce construction costs.

The goal of the planning process is to identify the optimal solution through careful consideration of a host of issues including program needs, dynamics among programs, budget, real estate, and building characteristics. The most practical solution may combine replacement, additional new construction and/or renovations.

For example, TK&A’s master plan for Washington University in St. Louis School of Medicine, which ranks No. 2 in NIH awards to medical schools, will identify the highest and best use of 4.5 million square feet of space on 68 acres of land. The School of Medicine has a well-established and highly functioning culture of collaboration between clinical and research. Existing facilities are
proximate, with clinical spaces actually wrapping around research in some places, but both clinical and research have outgrown their spaces. The master plan evaluates a number of options to facilitate continued growth, including tearing down and replacing older buildings directly adjacent to the current clinical/research space and construction of new space on available land within a 10-minute walk.

**Designing the Connection**

Building research facilities for translational medicine represents a significant capital investment, sometimes more per square foot than clinical space, but this investment can meet the institution’s strategic goals effectively for regional or national prominence in highly competitive markets. Thus, through the language of architecture, designers should seek to express the forward-looking and technological aspects of the research environment to inspire confidence that the patient will be exposed to the latest advances in medicine, while providing visible links between the research environment and clinical care environment.

At Children’s Hospital Boston, TK&A’s sleek, modern design for a new 296,000-square-foot research building communicates the advanced research mission to researchers, staff, patients’ families and the general public. A series of three-story atriums sheathed in glass provide “windows” into the research mission and at the same time, orient back to the hospital’s main entrance forging a strong connection with the clinical component.

Translational medicine is emerging as the new paradigm for medical research and patient care, certainly among institutions whose strategic mission is to establish or maintain national prominence. Effectively forging the connections between the bench and the bedside requires a knowledgeable, methodical, multidisciplinary approach to planning and design. The challenges are formidable. Yet the future of medicine depends on meeting these challenges with optimal solutions.

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