# Concepts in Flexibility in Healthcare Facility Planning, Design and Construction

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This is an excellent and well thought-out document, if a bit dated, but for Western applications. It is still very relevant to us in India.

If you find it difficult to read, kindly try to read and understand only the text highlighted in blue and the comments in red. Even an architect would find the going difficult!

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(Highlights in Blue, Comments in Red)

## Introduction

More than 50 years ago, significant medical advances occurred once or twice a decade, and through the 1940s and '50s, changes to the healthcare system were based primarily on the growth of services to support a booming postwar population. The 1960s and '70s saw increasing breakthroughs in technologies in clinical fields such as transplantation, microsurgery, and synthetic antibiotics and also in the fields integral to healthcare delivery such as communication systems, automated material movement systems, and systematized infrastructure and building structures (e.g., those used at McMaster University Medical Center in Hamilton, Ontario).

By the 1980s, major clinical advances came even more rapidly, but economic recession brought the realization that "bigger, better, more" could no longer be sustained, and the Industry sought methods to deliver high-quality services more affordably. By the 1990s, further cost cuts came from reserving inpatient care for the severely ill and injured, reducing length of inpatient stay, and promoting outpatient services. Faster advances in medical technology emerged along with new methodologies and mantras such as "patient-focused care" (arguably a backlash to the perceived focus on the bottom line rather than on patient satisfaction), "multi-skilled" staff, and the "paperless medical record."

Today we have an almost incomprehensible list of trends to be addressed including:

- Continued clinical advances, many tending toward miniaturization and mobility
- Increased acuity of both inpatients and ambulatory patients seen in the hospital setting
- Decentralization of services and staff to patient care units, resulting in multidisciplinary care teams
- Advances in communication/information systems for patient profiling and charting, for communications between staff, and between diagnostic services and patient charts
- Increase In minimally invasive procedures, reducing the need for overnight admission
- Expansion of outpatient clinics and the creation of ambulatory "themes" through selective clustering
- Increased recognition of the family/caregiver's contribution to the healing process
- Gradual acceptance of the benefits of nontraditional modes of therapy such as massage therapy and acupuncture
- Increased public awareness and access to information, fueling the consumers' desire for the latest in diagnostic techniques and treatments
- Increased point-of-care diagnostic testing
- Increased clinical research integrated into patient care settings
- Increased emphasis on patient (self-) education in the hospital setting.

Based on the exponential changes in clinical services, operational trends, and new technologies, it is not surprising that many facilities, hailed as state-of-the-art 20 or even 10 years ago, are becoming functionally obsolete long before their physical life is spent. As an industry and for most of our individual careers, we have worked in environments that are the opposite of flexible. Static building solutions have compromised our abilities to respond to changes in how we work and deliver services. For instance, too many solid walls limit our ability to connect visually and acoustically with our patients and our colleagues. Floor plans are too narrow to allow for appropriate relationships. Floor-to-floor heights limit our ability to maintain current standards for building air handling and electrical systems

and to accommodate some of the new pieces of high-tech equipment. Building sites do not permit the expansion and renewal that Is essential for today's and tomorrow's healthcare system.

In our case we have both the opportunity to increase the floor height to an optimum level, one that is not restricted by an arbitrary height restriction and a large site for "expansion and renewal"

**Why Flexibility?**

The challenge to all involved in planning, construction, and management of healthcare facilities is to anticipate, to the greatest degree, where changes are most likely to happen and to consider flexibility throughout all stages of the planning, design, construction, and post-occupancy phases. Incorporating flexibility into all phases can help to achieve the ultimate goals of client satisfaction, desirable clinical outcomes, efficient work environment, and effective use of limited capital dollars.

Flexibility in thought processes? Let us abandon the cookie-cutter approach and think out-of –the-box!

*Flexibility*: The term has acquired motherhood status over the past decade. We're all familiar with Its dictionary definition: "adaptable or variable, not rigid, responsive to changing conditions." But how can you really ensure that your healthcare facilities are a sustainable resource in the face of a rapidly changing and unknown future?

That is the question this article addresses. We identify some of the critical issues involved throughout the planning and design processes, provide examples, and outline the pros and cons of specific approaches to addressing flexibility.

If we considered the ultimate in flexibility to be "disposable" buildings and, during planning, assumed a 15-year facility life span (as we might for equipment or hardware), then we could avoid writing this article. Instead, we assume a building has a 50-year life span and take the attitude that buildings are too costly to tear down. Should the driving motivation be the cost to operate the services rather than the cost of the building? As you think about that one, we will discuss the more traditional approaches to flexibility.

**The Planning Process**

While the capital development process has many aspects, we have framed our discussion around the following broad phases of work:

1. Strategic planning
2. Master programming and master planning
3. Functional programming
4. Design development and contract documentation

During each of these phases, planners, designers, staff, and the facility's decision makers are responsible for exploring possibilities for flexibility appropriate to that phase and for clearly directing the subsequent phase. Each phase has its own set of questions and possibilities for incorporating strategies for flexibility. If these strategies are carefully considered during each step of the planning and documentation of the building, the result will be a dynamic solution that solves current demands, responds to changing needs, and welcomes the future for the next generation.

Yes…"responds to changing needs and welcomes the future for the next generation…"

Parallel to any capital planning process Is an operational planning process which, when linked to the facility planning process, will ensure that the resulting facility financially supports the organization. This operational planning will also be the vehicle to identify opportunities to efficiently deliver and expand services that will maintain the viability of the institution, consistent with its mission.

**1. Flexibility in Strategic Planning**

Hospitals will never be tomorrow exactly what we think they will be. The corporate strategic plan and mission and vision statements will define the long-term role of the organization, yet they must be fluid and changeable. They must anticipate shifts in program and service delivery. These shifts will result from new program opportunities, changing demographics, new technologies, new approaches to service delivery, and other inevitable changes. The strategic plan should be revisited every few years and adjusted as appropriate. It is a living document.

To give direction to the strategic plan we must have a vision statement for the project.

Consider the following questions during the strategic planning phase:

*Do we manage our way through changing service demands or design our way out of them?* Issues such as changing demographics can significantly affect certain care programs as well as diagnostic and therapeutic services. Historically, the primary approach to developing projections has been to straight-line the activity or need projections (they never seem to plateau!) and, therefore, to project a forever increasing need for space. New discussions focus on whether alternate service delivery approaches might allow the organization to gradually change how it manages demand, including alternate approaches to operating the program, allocating staffing, selecting the array of service providers, and determining how the facility will be used.

*Do current trends create opportunities or barriers?*

For example, consolidating a specialized service with a single provider or within a single site can create an opportunity to maintain or develop specialist expertise and attract scarce specialist resources, but ft can also create discord in a community if the quality of service is not seen as worth the greater distance to access this service.

Asked another way: *Do alternate ways of clustering services within a facility create opportunities or limitations in responding to long-range demands and pressures?* For example, will a pediatric strategic plan include pediatric rehabilitation, or will the rehabilitation strategic plan include adult and pediatric rehabilitation? Where is the pressure for flexibility likely to be greater? Is there an alternate service delivery strategy if experience indicates that the strategy chosen is not providing the desired outcome?

The range of questions regarding flexibility will tend to recur in every phase, but the way in which you achieve flexibility becomes more narrowly defined and more tangible with each subsequent planning and design phase.

**2. Flexibility in Master Programming and Master Planning**

Master programming and master planning is the first planning phase undertaken toward the realization of a physical hospital plan. The master program is developed based on the strategic plan describing programs and services at a high level and completing basic workload and staffing projections. This information is used to develop broad-brush estimates of space requirements for each block of space (i.e., programs, services, or departments) that will make up the facility. Relationships between these blocks of space are also documented.

This is where we put pen to paper. I tell my students that the first line you draw on a blank site is the most important line in the project. It will affect all other lines drawn. And if you find it does not work you must rub it out and start again without hesitation. In this age of virtual design, where speed seems to be the new mantra, this is difficult to do, but must be done, the investment in time is not be considered.

At the same time, detailed information is gathered regarding the site or possible sites (existing or new) for development of the facility. Investigations Include, among many elements, adequacy of the site to accommodate the anticipated use; location relative to the population served; proximity to major highways for emergency vehicular access; and sufficient size to ensure that the changes, growth, renewal, and reinvention of the facility are limited only by imagination, not by real estate.

Other analyses such as soil testing; topographical analysis; traffic flow patterns; and the capacity of, and access to, municipal services (i.e., water, power, and sanitation) must be ascertained and considered adequate for the present as well as the future. This information, along with the master program information, helps the architects and planners to identify the limits and opportunities offered by a site, to develop master planning massing and construction phasing options, and to develop preliminary capital cost estimates.

Master planning provides essential information regarding the current and future expandability and flexibility requirements of the facility. It is, however, a living document and will require continual review and updating to make it useful as a planning guideline.

The master plan itself is flexible.

Consider the following issues in this phase:

*The planning horizon:*

If we had a crystal ball to see 5, 10, 20 years, and beyond into the future and to accurately predict medical advances, changing technologies, and changing practices, we could more easily project what building changes would be required and incorporate this knowledge into the master plan. However, most people have difficulty in thinking much beyond the three- to five-year horizon and would likely not trust a vision that differs significantly from the status quo. Therefore, since we are planning for the buildings to last beyond 30 years, flexibility must be built in to provide for the growth and expansion of the facility and for changes in practice.

*Single building vs. healthcare campus*

A trend in hospital planning and design has been to view the concept of hospital as a single-building entity. Facilities of 1.5 million to 2 million square feet are not uncommon. As a result, floor plates with very large areas have provided significant opportunities to expand individual departments in response to changing demands. Conversely, departments located deep within the floor plates and not adjacent to exterior walls required the relocation of other departments to accommodate any expansion. This domino effect Increased cost to individual projects and, in some cases, resulted in cancellation. Alternatively, compromise solutions physically split the department, resulting in dysfunctional arrangements and increased operating costs.

The healthcare campus, not unlike a university campus, allows for progressive development toward an ultimate solution. Issues of expansion, adjacency, and sustainability of the hospital as a whole, as well as the individual departments, might best be served by a campus approach. While we assume that our hospital buildings will serve our needs for 30 years or more, the campus concept allows for continual, unlimited renewal through the strategic removal of individual buildings that have outlived their useful life spans. This ability to selectively renew, replace and expand individual elements without compromising the ongoing operation of the entire organization should be carefully considered. Additional benefits to the patients and staff concerning accessibility, way finding, and access to daylight, while not specifically flexibility issues, are opportunities for environments that are scaled to the comfort of the individual and organized as links to the future.

*Provision of support services*

Support services such as laundry, food services, and material management can be carried out on-site to meet in house needs, or they can be supplied by an off-site commercial enterprise. They could also be regionalized (i.e., one facility supports all food production services for hospitals in the area and transports the finished product). Ideally, regional planning should be completed before an individual facility develops its master plan, but if answers are not readily available, planning for in-house requirements is recommended. While developing the facility's master plan, the services in question should attempt to locate components on an outside wall or adjacent to soft space if there is a potential

need for expansion, or they should allow other services to easily occupy that space if there is a strategy to reduce on-site support services.

*Service growth and change*

Central diagnostic services and outpatient services, for example, are currently high-growth areas, and this trend expected to continue. Consider placing these services on an outside wall or adjacent to soft space such as offices and conference rooms while specifying that the appropriate building services be provided in these soft spaces to accommodate future expansion.

Beware of shelled space as a solution. The decision to shell space in anticipation of future growth may be a cost-effective solution, but be aware that It could also cause additional expense to a construction project. Vancouver General Hospital shelled its inpatient tower based on a 10-year occupancy plan. Battling major public misunderstanding about why the tower was empty-and two provincial government elections and funding cuts later-occupancy of the tower is now five years behind schedule, and finishing the shelled area now resembles a major renovation project rather than a simpler interiors finishing project.

As the electronic patient record replaces the paper record and imaging records are digitized, on-site storage for paper and films will gradually be replaced by back-up servers. Consider placing the paper record storage areas adjacent to another functional area slated for growth.

*Building type*

Locating space in specific building types, which may attract different design standards and different unit costs to construct, is worthy of consideration at the master planning stage.

Major tertiary or quaternary teaching hospitals are like small cities In that they support large numbers of people a wide variety of work environments. They also accommodate a broad range of space types, as does a city or town, including commercial space (e.g., offices or medical offices/practices), Industrial space (e.g., materiel management, engineering and maintenance shops, food production), residential space (patient and resident bedrooms, bathrooms, living space), and high-tech space (e.g., diagnostic Imaging, clinical and research laboratories, surgical suite).

We will be designing a small hi-tech city. Let us make sure it is also hi-touch and green, using sustainable technologies!

Some spaces in a hospital are recognized as part of a critical cluster that should be disaster-capable, while most other spaces do not need to be designed to this capacity.

***Vertical vs. horizontal expansion***

The long-term development of the site should be envisioned during master planning so that options for on-site vertical and horizontal expansion are identified at the outset. Based on zoning bylaws that articulate the allowable build-out on the property, defining the building end point allows the architects and engineers to appropriately map out parameters that will facilitate future expansion and flexibility of building use. Establishing future expansion potentials and initiating the appropriate zoning changes to accommodate them at the outset ensures that the facility can achieve its vision within its own control.

The size of the site will, over the long term, determine the direction for this decision-which; in turn, will either compromise or be influenced by physical adjacencies, travel distances, the need to create private vs. public and semipublic environments, and the need to grow.

Well said.

Ultimately, a solution that allows for both vertical and horizontal expansion is desirable, and both provide opportunities relative to future flexibility. A vertical solution, as a first phase of development, will preserve the greatest amount of site area for future needs. Depending on the final solution, some challenges to the vertical scheme exist: How large are the resulting floor plates? Can the floors support expansion of large programs, or do departments expand onto multiple floors? Can a critical mass of bed numbers and nursing units be achieved, on single floor, to allow for "swing" opportunities and changes to use? How will multiple floor levels link into future horizontal expansion?

If vertical expansion is envisioned at the outset of the project, the buildings systems can be scoped to accommodate additional floors at a later date as funding is available or as workload justifies the expansion. However, strategies must be established to allow such expansion above occupied space. Construction disruption, as well as safety to the occupants and ongoing operations, demands an understanding of how such vertical expansion can occur.

There is a well-recognized link between construction work near or in an operation hospital and the increase in HAI's (Hospital Acquired Infections). This may impact mortality rates, so you can see what a big decision this is.

A horizontal solution, on the other hand, provides the greatest opportunity to create the departmental adjacencies that we all desire. Yet this, too, presents challenges and questions that must be evaluated: Are the floor plates too large, limiting access to daylight? Are highly technical departments surrounded by similar departments, thereby limiting their ability to expand easily or economically? Will future expansion be a continuation of horizontal elements, creating even larger floor plates, or will vertical expansion be planned? If vertical, what provisions have been invested into the original scheme to ensure the economical achievement of the expansion? What investments will be lost should the future vertical expansion not take place?

Horizontal v/s vertical expansion is a question that plagues healthcare architects. It's pros and cons should be rightly discussed at the planning stage.

Understanding the envisioned facility as a dynamic system and not simply bricks and mortar and understanding the potential need for expansion beyond the timeline of the current project will demand a vision that anticipates the design of the major horizontal and vertical circulation systems (corridors and core space). Clear, easily extendable circulation routes ensure the efficient movement of patients, staff, and materials in the short and Iong term.

Corridors need to be laid out early in the design process…they need to be thought about and designed, not merely put in to connect spaces as an afterthought.

*Project phasing*

Municipal site services (water, gas, sanitary, and storm sewer lines) each have origin points on the site. The location of these entry points may affect the phasing of the construction project and should be considered in expansion plans. Facility expansion projects that do not require the re-invention of the Infrastructure are always achieved more easily, at lower cost, and therefore sooner.

Determining the phasing of the construction project will allow the appropriate placement of major building system components such as emergency generators and chillers in areas that will not require later relocation of this equipment. The location of air handling systems should also be determined with expansion in mind because they must remain operational during any future major renovation or facility expansions. The phasing plan will also inform decisions regarding the potential capacity of major mechanical systems so that informed decisions can be made to create capacity now or to create space for future expansion of these mechanical systems.

## 3. Flexibility in Functional Programming

A functional program Is a detailed document that describes the future functions and operations of a functional facility are (i.e., programs, services, and departments); describes current and projected workload; identifies the staff complement that supports the projected workload; and outlines detailed design considerations, including special design concepts to be incorporated by the architect, internal and external adjacency requirements, and a room-by-room space list.

At this stage of planning, the greatest flexibility needs to reside in the mindset of the project participants to ensure that the impact of technologies, changes in practice and other factors are considered at this point. Ideally any operational re-engineering or redesign planning has already been completed and this information is available to feed into the functional programming process. If this work has not been done or is in progress, the planning team should be challenged to explore new ways of doing things. This is the opportunity to keep processes that work or to seek better ones, if necessary.

Flexibility-related Issues in this phase include the following:

*Operational trends*

Consultants can provide benchmarking, but staff should also be up-to-date on the latest operational trends in the area of expertise, whether it is admission procedures, delivery of nursing care, clinical management, materiel distribution, communication systems, patient records management, or food services. New ways of doing things often can achieve operational efficiencies or promote client- and family-centered care. Managers and staff should have informed opinions about the pros and cons of the implementation of these new processes.

One trend worth consideration is the use of multi-skilled staff, and there are different approaches to achieving this for different types of staff and in different areas of the hospital. Multi-skilling is generally undertaken to provide operational flexibility and to create staffing efficiencies. How do we encourage different ways of working without completely reinventing the space in which the work is done? Can a flexible environment incorporate changes in technologies, work arrangements, and/or numbers of staff without a major reconstruction project?

Another operational trend is the promotion of final food preparation close to the inpatient unit. Food is heated closer to the final destination, and salads and cold plates remain separate until the moment before serving. This a client-centered approach to care; the temperature of the food is better, patients may have more control over when they eat, and If this also done as part of a bulk services system, patients can make their main course choices at the time of meal service. This more decentralized approach implies that some food service staff functions will move out of the kitchen and onto the unit, and spaces must be planned on the units to support these functions (i.e., a serving area and possibly a patient dining room). If such approaches are considered to be a potential for the future but not part of the functional program, spaces that may be converted to these new functions should be considered and included to ensure the required flexibility.

A final example relates to the continuum of care versus clustering of like services: Is all space planned contiguously for a specific program, or will the outpatient areas be located with other outpatient services? Continuity of patient care would be the main advantage to locating a program contiguously. However, if that program is located on the 11th floor, would you want to bring outpatients to that area when they could be better served in a main-floor clinic area? In addition, it becomes less flexible in terms of the use of space (i.e., clinics can share spaces) and more expensive operationally because scattered clinics duplicate services (e.g., waiting, clerical support, and equipment).

Operational trends must be analyzed carefully to consider fully the impacts and implications for future flexibility.

*Equipment choices*

The location and selection of equipment must be considered. For example, is the volume of activity in a particular area sufficient to warrant an ultrasound room there? Alternatively, portable units may be used and moved to both locations instead of having all patients go to where the equipment is located; installation and dismantling costs are also avoided. Considering this kind of operational flexibility for diagnostic imaging services will take the pressure off the centralized space as volume and activity increase in that area.

*Service consolidation*

Where both adult and pediatric services are being planned, for example, planning will need to investigate if and what aspects of these services can be shared In such areas as the ORs, diagnostic services, and emergency services. Operational efficiencies can be achieved by sharing some supports. In addition, there is added flexibility because primary activity may spill over into the adjacent area If required. For example, if a pediatric operating room is available, an adult case may be handled in that room.

*Utilization patterns*

Some spaces such as clinic space may be shared by accommodating different clinics on different days. Generic clinic space is best suited to sharing, but additional storage may be required if supplies vary widely between clinics or supplementary rooms are added to house equipment that Is specific to one clinic.

*Changes in hours of operation*

Changes in operating hours are an option to accommodating additional workload, but the operating cost implications must be weighed against the capital cost of more space.

Modularizing or systematizing spaces and furnishings (establishing a workplace strategy) Where a variety of programs require like groupings of space, and if the scale of some programs might change, consider a generic approach to the spaces, their sizes, and clustering. This allows the space to work for all such groups and allows the reallocation of programs within the space over time. Potential applications of this principle include the following:

• Current experience indicates that inpatient rehabilitation programs have the same types of space needs a program for the multiproblem, medically complex elderly population (some provinces refer to these patients as "complex continuing care" or "extended care").

• Can a consistent approach be taken to developing clusters of ambulatory care facilities so that, while individual spaces can be furnished or equipped to meet the needs of a particular specialty group, they also can be modified for reassignment to other specialty groups at other times?
• Can certain functions be planned in large, open spaces where modular or system furnishings will allow the space to be reconfigured in a number of ways? This promotes the reuse of materials and decreases renovation cost because walls remain intact.

**Data/communication capabilities**

It should be assumed that extensive data/communication capabilities are required throughout the facility-in all offices, at all patient bedsides, in all conference rooms, in all exam and procedure rooms, and so forth. This maximizes flexibility in the use of these spaces. In addition, the type of data input device, how it is used, and its location must be considered in the functional programming discussions.

Because some areas may have special requirements, these also should be highlighted for the architect.

**Internal and external adjacency requirements**

Generally, adjacency requirements will have been determined during the master programming or master planning phase but should be confirmed during functional programming because there will still be opportunities to move things around. If new information or ways of thinking highlight the need (i.e., the master plan must be flexible to consider some immediate changes). While location and adjacencies must first serve the function of the components (i.e., program, service, or department), documentation could also reiterate the need for future expansion and adjacent "soft space" if required and could also indicate those rooms within the component that are most likely to require expansion.

**Open concept planning**

Wherever applicable, open concept planning should be highlighted in the preparation of design concepts, for the architect's consideration during the design phases. The use of open space that may be configured in many ways can be promoted in areas such as labs, offices, and the pharmacy. Modular furniture can be used to define workspaces, and if walls are necessary, demountable structures may be used if cost-effective. Standardized service grids including power and communications, supporting a variety of configurations, should be considered. This is discussed further in the section on design below, in the context of building materials and systems.

**Standardization of room sizes**

Plans typically recommend that room sizes be standardized as much as possible. The more that room sizes are tailored to certain functions, the less flexibility exists. If, for example, all exam rooms are planned at a standard size (e.g., 120 square feet), then the rooms can be used by any clinical service for this function. In addition, if all offices are planned to be 120 square feet, then clinic office space could be converted to exam space in the future.

Standardization of spaces makes the interior layout flexible.

**Flexibility at the patient bedside**

Inclusion of space for flexible bedside use has become imperative due to the following trends, among others: family members as caregivers, increased acuity, increased need for isolation, access to electronic charts at the patient bedside, and an increase in the number and complexity of mobile equipment for bedside use.

The universal room concept represents one means of achieving this flexibility. The universal room has recently been promoted to increase flexibility in the handling of patients with the full spectrum of acuity, including telemetry (Spear 1997). This generic room offers a high degree of adaptability to changes in demand and use patterns without the need for remodeling. Each universal room is a private room, and providing only private rooms promotes patient privacy, maximizes overall occupancy, and minimizes patient transfers and associated costs such as tracking records and billing. On the other hand, an Inpatient unit with all-private room's increases unit size and staffing costs, and the accommodation of all patient acuities requires constant staff reassignment. There is also an increased cost to distribution systems, housekeeping, and other support services.

The universal room concept may increase flexibility in an intensive care or step-down environment, but the benefits versus the cost to provide such a high degree of flexibility for general acute care may make this choice prohibitive. Patient care units of this nature will increase construction, equipment, and operating costs.

**Modular Space Planning**

Considering how different services expand, space allocations may be based on modules or uniform blocks of spaces that may be repeated within a component or constitute a planning unit that can easily be added later. Labs work well in the module format, as do general medical and surgical units of uniform numbers of beds.

For an Indian teaching hospital designed as per MCI rules this becomes easy to do as it is governed by a statutory need.

**4. Flexibility in Design and Construction Documentation**

During schematic design, the client begins to see the facility take shape. While the space requirements have been laid down in the functional program, there is still ample opportunity to allow flexibility in the design itself. The architect, using the functional program as a guide, creates alternative solutions (showing the proposed location of each room specified) and works closely with the users to develop a layout that is both functional in the present and flexible for future uses.

Flexibility-related issues to consider during the design and construction documentation phases include the following:

*Departmental/room adjacencies*

As identified in previous phases, the concept of locating individual departments adjacent to "soft" spaces that can absorb the expansion of "hard" spaces is essential to accommodating the ongoing needs of the department. Planning for small and continuous change is as important as the major building expansion project. For example, the need to increase a diagnostic department by a single ultrasound machine is a greater and more frequent pressure than the need to add a new MRI. How can these small but important needs be met without disrupting the entire program or locating the new technology remote from the department?

Locating departments that are expected to experience growth adjacent to exterior walls, along with due consideration to shafts and mechanical rooms, allows for major changes in technology and support space. However, for the more frequent minor changes, other strategies can be used. For example, a generically sized room will allow a change In functions with minor alterations. A 120-square-foot office can easily become an appropriate exam room. Also, a 240-square-foot meeting room, with minor alterations, becomes two offices or exam rooms.

*Building materials and systems*

The selection of building materials can profoundly affect patients' well-being but can also severely limit the facility's ability to effect change quickly and economically. Detailed analysis is required to ensure that materials selected for one use are not too restrictive should the use of the space change. For example, vinyl and linoleum flooring can serve multiple uses, from exam rooms to offices to meeting rooms; terrazzo also can serve many uses provided that coved terrazzo bases are restricted to very specific areas (the relocation of doors along corridors with coved terrazzo bases Is disruptive, noisy, dusty, and costly).

Simple materials, used well, will serve the facility by providing consistent surfaces for maintenance, repair and change. Wall systems, using standard construction materials and designed and engineered to provide appropriate acoustical and visual separation, will dismantle and reconfigure easily when change is required.

In all hospitals, ceiling space forms the primary conduit for the distribution of building services. Mechanical, electrical, and communication systems are most often delivered to the spaces below through the ceiling space. Ceiling systems that allow extensive access for both maintenance and change are essential.

In functional programming, we explore the use of open spaces and modular furniture, but this can be further developed during design. For example, furniture systems can enable rapid reconfiguration of a nursing station and with in-house maintenance staff meaning more effective use of the space and the staff. The addition of new equipment to a space can be addressed. New ways of working also can be implemented quickly and economically with little disruption. Such systems have given hospitals the opportunity to experiment with various spatial arrangements. Should the experiment not deliver the needed results, little time and money has been lost.

### *Structural systems*

The establishment of this basic building block must be considered very carefully. Most obviously, the establishment of the structural grid or column layout is important to the planning of the spaces. A grid too small will limit the ability to accommodate large rooms. A grid too large will tax the building's capital budget. Examples exist of hospitals that have used the concept of interstitial space to accommodate a supergrid or large, column-free space with limited structural limitations on the planning and changes to the floor plates. The increased capital cost associated with interstitial space must seem justified to provide an organization with this type of flexibility.

Space for access and expandability of building systems is particularly useful above highly technical and heavily serviced areas such as operating rooms and diagnostic imaging. In such cases, full-height interstitial spaces may be considered.

Planning for vertical expansion must be considered early to ensure that future needs can be accommodated. Vertical expansion, as mentioned previously, requires specific plans for its accomplishment and is not limited to simply ensuring that the foundations and columns can support the loads. A system is required that plans for the ongoing operation of the occupied floors below the expansion to protect the occupants during construction. Once again, the concept of interstitial space can assist in this regard by separating the construction activity from the occupied space.

Structural systems need to be compared based on a number of technical factors that affect the design and construction of building services, inhibiting flexibility to the minimum extent, and the cost.

*Mechanical, electrical, and communication systems*

These engineering elements constitute the circulatory system of a building. They are responsible for the maintenance of a comfortable environment that serves the individual needs of the patients and staff. These needs will vary dramatically from one area to another. Issues of air changes for temperature control, infection control, energy efficiency, safety, and smoke control are some of the key elements of the mechanical system. Will a system designed to provide 100 percent outside air provide the facility with the flexibility to manage its infection control concerns? Will heat recovery make such a system affordable? Can change be accommodated on an incremental basis? How much additional capacity should be built into the system in anticipation of future needs? How might future needs be met?

Similar questions must be asked and answered for the electrical and communication systems: How much capacity is required? How much redundancy should be planned for? How can incremental increases be accommodated? How will additional cabling be accommodated? Will "state of the art" today be enough in 15 years? What can we put in place now to accept changes in technology?

Many more examples of flexibility can be cited, and this list is limited only by the collective Imagination of the organization and its planning team.

***Cost Considerations***

Of course, the $64,000 (or $64 million!) question is this: How much will incorporating all this flexibility cost? Throughout the process, quantity surveyors or cost consultants must work hand in hand with the planners and architects to keep the client informed of the results of their choices. While choosing flexibility over customization may decrease costs in the long term by facilitating conversion or expansion of space, overbuilding may be a danger. Strategies to increase flexibility should be tempered with the following cost considerations:

• A project phased in over the long term can be more expensive, as costs increase with each additional construction phase. Not only is there the cost of planning and designing for each construction permit, there are also the contractor's mobilization costs (e.g., crew assembly, insurance, hoarding, and site servicing) as well as demolition and make-good costs-over and above the cost of construction itself.

• The indiscriminate use of generically sized rooms could lead to increased programmed space and increase construction cost.

• In the long run, operating costs quickly will far exceed capital costs.

Check out the last bulleted point. While designing care should be taken to achieve the appropriate balance between initial costs and operational savings.

**Conclusion**

In short, the objective of the planning and design process is to support the efficient and effective use of space. Incorporating flexibility into the planning of physical space of the hospital allows for the following:

• Changes in programs provided by the organization changes in how service is delivered

• Operational changes such as new workflow methods and the reorganization of services as well as staff roles and responsibilities

• Changes in future workload (increased or decreased) Optimum utilization of current or available space

• Sustainable use of an expensive resource-the hospital facility.

In the ideal world, the perfect balance is found between functionality of the space and the generic parameters that afford its flexibility. Staff and patients will enjoy a pleasant and effective work/care environment. Construction dollars can be optimized. In the real world, this point of balance may seem elusive, but teamwork, attention to detail, and open communications throughout the planning and design process help us close in on our target. **Planning a new healthcare facility affords an opportunity to create a dynamic and long-term solution in a manner that will allow the hospital to explore innovative and exciting ways to deliver healthcare in its community. An opportunity is provided to create a facility that delivers an inventive and flexible environment that will accommodate both the predictable and the unknown changes in a sustainable manner-serving the organization, its patients and staff, their families, and the community well into the future.**

**Amen.**

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Publisher: Facility Guidelines Institute (FGI). Website: www.fgiguidelines.org. Download Also: Medical Gas Course - PDF Files. FGI Guidelines for Design and Construction of Health Care Facilities. Download Guidelines for Design and Construction of Health Care Facilities. Tags: Books HVAC Medical Gas PDF Piping Plumbing.Â  Cost Estimation in Construction Projects (PDF) Book. April 08, 2021. Flexibility in healthcare design. Published On - November 15, 2018. Hospaccx hospaccx. INTRODUCTION.Â  Healthcare designers and planners are uniquely positioned to implement flexibility strategies; this can extend the life cycle of a structure, reduce future renovation cost, and reduce the impact of construction projects on the organizationâ€™s processes and culture. Considering the above facts, Hospaccx team contributes on the market trends and dynamic of flexibility in healthcare design. This is macroficial study of Flexibility in Healthcare Design if you want to get into more detail you can contact info@hhbc.in. WHY FLEXIBILITY?Â  A facility that provides care efficiently and effectively reduces the overall cost burden of the system. Health sector buildings cater for a range of functions, that often change over time, and therefore flexibility and adaptability are essential characteristics to facilitate future re-configuring. On existing hospital sites, fast construction, generally taking advantage of off-site manufacturing is preferred, to minimise disruption to the hospital. Other important design requirements for many health buildings include noise and vibration control in sensitive areas such as hospital theatres. Many health... and construction of healthcare. facilities. 2. Identify current Military Health System. (MHS) approaches to flexible design. 3. Identify industry best practices to. flexibility in healthcare design. 4. Identify any associated cost premiums. in initial capital costs and lifecycle. return on investment (ROI). implications. 5. Assist the MHS in defining a policy for. flexible design standards relating to. iv Planning, Design, and Construction of Health Care Facilities, Second Edition. Designing for Emergency Management. . . 68 Designing for Patient Flow . . .Â  It has now become imperative to rethink facility design as a critical element in bringing about change in the way health care is provided and experienced in health care settings. This approach reflects a significant change in the way design practitioners, health care planners, and health care administrators undertake health care facility design.