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Cancer Centers:
A Look at Environmental Issues and Patient Needs

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This study reviews the current trends to "humanize" the cancer center, and it also explores the physical design and maintenance issues. The healthcare environment affects how the patient reacts to treatment. Sufficient evidence indicates that stress inhibits the patient's capacity to be cured, while positive visualization enhances treatment.

Stress may be subliminal to the patient, a product of unspoken cues that create anxiety.

The staff may be conditioned to create stress for the patient by mirroring these environmental cues.

The design of the patient-friendly cancer center goes deeper than the mere "fish tank in the soft-textured waiting room." The comprehensive cancer center is unique because of "the diverse nature of programmatic areas integrated into one facility."

Different programs should not be required to compete for the same space. This issue relates to competition between patient needs and the layout and proximities of programs and their respective departments. The large facility should be patient oriented but, unfortunately, physical contingencies can interfere with the comfort and the dignity of the patient. Major problems include the comingling of old and new buildings' utilities and air space. Patient operations can interfere with patient comfort when multidisciplinary treatments are involved. "One-stop shopping" for the patient is encouraged, but achievement of this objective requires workflow changes and departmental relocations.

The article offers solutions to these and several other issues.

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The cancer center varies in its scope, from a specialty center for specific treatment or diagnosis to the "comprehensive cancer center" designated by the National Cancer Institute. In most cancer facilities, regardless of scope, the physical environment is very much governed by high-technology equipment. Often the equipment costs more than the architecture, and the facility serves as a "box" to hold the "guts" that are most important to patient care.

The cost-control factor combined with traditional modes of thinking about the clinical environment have resulted in a nightmare for patient comfort and peace of mind. Sufficient evidence indicates that anxiety, fear, and stress actually inhibit the patient's capacity to be cured, while positive visualization and relaxation enhance the treatment process. Stress may be subliminal to the patient, a product of unspoken environmental cues that create anxiety. The staff may be conditioned to create stress for the patient by mirroring these cues of the environment. Now that "cure rates" are relatively established in cancer care, such environmental factors need more attention.

Almost as an afterthought, the fish tank in the soft-textured waiting room and a chapel or meditation room have been added on to some centers. The best solutions to creating the therapeutic environment would go deeper. This study reviews current trends to "humanize" the cancer center. We will also explore physical issues at cancer centers.

The cancer patient is often sensitive to physical conditions around him: sights, smells, pedestrian traffic, light, and noise. Harsh or strong smells such as popcorn or fresh-cooked food can be nauseating to patients under chemotherapy. Strong lights are painful to the eyes of patients lying on a gurney or bed and gazing at the ceiling.

Furthermore, environmental factors of building infrastructure, safety, and air quality present obstacles to patient success and effective maintenance and operations at the hospital facility. The physical plant infrastructure and building issues will be addressed also, as these have a major impact on health programs and the well-being of patients, visitors, and staff.

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(EHS) at the University of Texas and was formerly Director of EHS at the University of Texas M. D. Anderson Cancer Center (1984-1998). He indicated that comprehensive cancer centers are unique because of "the diverse nature of programmatic areas integrated into one facility." Programs include patient care, research, education, and cancer prevention. Each program has different needs and desires and therefore different priorities related to physical plant and safety issues. For example, a research laboratory would not be placed next to a patient care area because flammable liquids could not be used in the lab. Certain laboratory procedures would be restricted, as would storage and use of hazardous chemicals.

Different programs should not be required to compete for the same space. This issue relates to the layout, the proximities, and the adjacencies of programs and their respective departments.

Obviously, the large healthcare facility such as a cancer center should be patient oriented. Wayfinding should be developed in the initial planning stages, not after the facility is already built. Corridors should be straight and free of convolutions. Planners and hospital staff should consider how the patients move through the facility and interact with the staff and the environment. In the multidisciplinary setting of the cancer center, the concept of "one-stop shopping" should be planned and designed for the patient. Therefore, program and department proximities should be carefully "stacked and blocked."

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A change in operations implied by "one-stop shopping" would call for reengineering of operations. When appropriate, the planner should encourage reengineering by the hospital leadership to change the division of labor in hospital operations. Such operational reengineering would then be reflected in the architecture, which follows the functions of the hospital or clinic. Gaming of the hospital should work closely with the departments to develop new ways to operate that encourage a human approach to patient needs.

With regard to infrastructure, the patient should not be intimidated by the infrastructure or the physical plant. Infrastructure should be as transparent as possible to the patient. Good concepts can be undercut by poor planning or excessive cost-cutting. Floor-to-ceiling heights and chases must be large enough to anticipate renovations, which are inevitable. Interstitial floors are a good answer to prevent worrisome infrastructure problems in large, complex facilities. Complex facilities may have high-technology laboratories, diagnostic and treatment equipment, and high air integrity systems requiring a huge amount of utility support that may even expand over the years.

The interstitial floors can be helpful for plant maintenance if enough vertical and horizontal space is allotted for mechanical, electrical, and piping (MEP); for adequate walk-through space; for access to equipment for maintenance and installation; and for expansion of services. Janssen suggested that computer-aided design (CAD) should be used to design and illustrate equipment clearances and the three-dimensional pathways for piping, electrical conduit, and ductwork.

When programming and designing a new facility, the participants (including occupants and management) should understand the basic benefit that sprinklers and a modern fire alarm system can provide the organization. The cost versus benefit of advanced fire alarm systems is not necessarily understood by the staff. Any fire alarm system has the potential to save lives and dollars, but the state-of-the-art system is integrated with verification circuits and addressable bases. This isolates the fire at the alarm device (not just the zone). In this way, the device is instantly pinpointed, the zone isolated, and the fire extinguished much more quickly and effectively. The entire building may not necessarily be evacuated-merely the zone or the zone and adjacent zones.

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Large healthcare complexes tend to adjoin buildings with expansion corridors. Visitors and patients may not be aware that they are passing from one building to the next as they cross the tell-tale expansion joints and the corridor fire doors that are usually standing open. However, for maintenance of building-air integrity and safety in the use of hazardous chemicals, such connections are not "transparent" to physical plant and EHS staff. There should be a major separation between buildings with regard to utility infrastructure, fire protection, and air integrity. Buildings should not be adjoined by common corridors. Connections, if any, should be made via a bridge or passage that has an airlock. Air space should not be shared between buildings.

Utilities should not be comingled. For example, if one building needs to be demolished, its utilities should not be feeding a newer or better building that would hinder or stymie operations in the better facility.

Master planning of the complex should promote the physical integrity of basic programs. For example, the aforementioned research laboratories should be separate from patient care. Contaminant labs, hazardous materials labs, animal labs, and animal housing should not physically communicate with patient facilities. Distinct, dissimilar programs should be maintained in separate buildings.

While energy conservation is important and should involve the use of a reputable hospital engineering consultant, energy conservation programs can sometimes forget about indoor air quality. For example, when outside air is hotter or colder than normal due to the weather, intake air may be shut down. There can sometimes be a limited perception of the need to maintain the quality of the fresh air intake. It would be ideal to completely separate building exhausts and motor zones (e.g., exhaust outlets, loading docks, parking garages) from fresh-air intakes.

Local air balancing (at the mixing box) in HVAC zones may cause harm to air quality by creating negative pressure where positive pressure should be maintained. Such negative pockets can pull in contaminants from surrounding zones.

Air changes should account for the program function, allowing for clean circulation and removal of contaminants in patient rooms, operating rooms, and laboratories, each with their own specifications. Fume hoods and special lab conditions call for distinct air replacement systems that require good laboratory design. Clean rooms and "bubble" rooms for bone marrow transplantation patients require utility design and construction that is segregated from the rest of the physical plant.

In the large complex, multiple factors can cause problems with

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indoor air quality. Some of these may not be readily amenable to a solution, even with the most advanced diagnostic tools and air quality consultants. The maintenance staff and departmental staff should be aware of products that may be introduced into the work space. These potential pollutants may be paints, sprays, cleaning agents, and gases. In a multibuilding complex where air space is shared between buildings and across programs with differing functions, the problem can be most complex.

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Technology may offer some solutions to the very complex campus where disposal and maintenance of hazardous material are important. For example, Janssen indicated that incinerators will be "radically changed" in the next few years. Very few pollutants will actually be absorbed into the atmosphere. Much of the discharge will be water vapor and clean air. Thermal destruction will be more self-contained to reduce the impact of pollution. Currently, the best high-temperature incinerators have a tall stack. At best, the discharge occurs in high, unoccupied space.

With the above observations in mind, waste disposal should be modern and efficient. The incinerator should be high temperature with an adequate stack. As much as possible, corridor traffic should not cross service areas, especially waste disposal and sterile supply.

Building codes would, it may be assumed, resolve many of the problems indicated above. This is not always the case, even when building codes and JCAHO standards are met. The building codes do not cover every angle of the problems of building integrity and safety. Furthermore, the codes may even conflict with each other. Janssen said that he refers to the Life Safety Code and NFPA Code primarily, with Life Safety Code serving as a good base. When these codes do not directly apply to a situation, the UBC, the city code, and the Uniform Electrical Code may be utilized.

Architectural design can now accommodate changes in function and operation, even in diagnostic areas, where thick concrete and lead once prevailed. At John and Dorothy Morgan Cancer Center (Lehigh Valley Hospital) in Allentown, Pennsylvania, the radiation shielding at the linear accelerator vaults can be removed. Radiation therapy can eventually be replaced by a future treatment program in the same space without the physical limitations of the typical concrete linac vaults.

Returning to the crucial patient factors that make the comprehensive cancer center effective as a healing environment, the best approach would involve attention to the details. The basic treatments that patients undergo tend to traumatize the patient physically and mentally. These trauma points can be minimized with more positive and practical environmental provisions.

The architect, master planner, and hospital leadership should review the potential obstacles to patient success that can be avoided in the following activities encountered by the patient:

- Parking
- Patient drop-off
- Registration and processing

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- Wayfinding and circulation
- Patient and family waiting
- Counseling and spiritual needs
- Entry into multiple practice treatments (perhaps currently being reprocessed at each step of treatment)
- Undressing and gowning
- Storage of patient clothing and articles
- Special physical and emotional problems of diagnosis and treatment
- Patient billing.

The gowning area should help the patient feel that he or she has a measure of personal control over basic tasks and issues. The tasks and issues include some patient control over privacy, a secure place to store personal belongings, a boundary to keep the public out, and a means of passage that does not expose the patient to the anxiety of public exposure. The planning of this area can still consider the relatively small space usually programmed for gowning, as well as the above considerations.

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In exam and treatment rooms, special attention should be paid to the physical side of patient comfort and practical needs, as well as the mental/emotional security of the patient. Chemotherapy can make the patient very nauseous. Vomiting in exam and treatment rooms is common. The patient may also be incontinent. Carpeting would not be practical in these rooms. A flexible and nonabsorbent flooring would be appropriate for these rooms. The staff could work more efficiently in rooms that allow for loss of various bodily fluids.

Regarding the mental and emotional side of examination and treatment, the patient needs to focus on something pleasant and relaxing. Humanizing "mental escape" devices are needed in the most critical areas, where the patient encounters the intimidating machine, probe, or scalpel. Natural settings cannot be emphasized enough, primarily in exam, treatment, and waiting areas, but also in as much of the facility as practical. Artistic nature scenes or a private view of actual outside scenery through windows would be very conducive to relaxing the patient. High-technology equipment could also be decorated or otherwise presented to make the machinery less intimidating, more personal.

The facility should be planned to include natural lighting in treatment and diagnostic/imaging areas, even in rooms that of necessity are located in the basement. For example, in the basement public area, full-size trees could be planted in an atrium waiting area that has natural light from an alcove bay-an excellent example of a more natural setting. The extra attention and care to design not only gives comfort, but also indicates to the patient that this organization thinks the patient and cancer care are important and that success is expected.

Patient drop-off and parking can be big obstacles. This is a smaller part of the very big issues of image, visibility, and public access that the campus presents to the community at large. Campus master planning addresses not only the entire campus layout, but the accessibility of traffic ways leading to and into the campus. The patient or visitor should be able to find the campus, find the garage or surface parking, and have a convenient means to be dropped off and assimilated into the correct building for the first step in the relationship with the healthcare organization. This is a simple fact that can easily be complicated by the very large, complex campus. During the planning process, special rooms could be programmed to accommodate the needs of cancer patients. Such amenities are not necessarily typical of all cancer centers, even comprehensive centers, and should therefore be developed with hospital leadership.

Some vital functional and operational areas that relate to patient

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needs are not necessarily considered part of the architectural layout. Again, not all cancer centers adopt these programs. In the planning process, the cost and benefit of these areas should be weighed and plans made to accommodate those programs chosen. Of course, special programs require space that is planned for the function. The areas of special patient interest include:

- Adopting a patient bill of rights, a policy of open disclosure, and a patient advocacy program
- Training the staff in conveying both good and bad news regarding diagnosis and treatment
- Providing translators for the major languages of patients who are clients
- Providing a beauty shop and staff or volunteers to assist patients with grooming and wigs in order to develop a proactive self-image for patients who lose hair or physically deteriorate from the disease or the treatments.

The space for "conveying both good and bad news" would be a counseling area that is private or semiprivate for all counseling. The patient needs to find the place friendly to return to on repeated outpatient or inpatient visits. The patient needs to feel that he or she is an active participant in the treatment and that progress is being made. Such a space would also be a safe place for venting, for taking bad news, or for rejoicing in progress. A consistent "human" space for regular updates would be very helpful to patients.

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Among operational programs that are typical, an effective patient transportation system would be vital. Patient transportation should have pick- up and drop-off points as well as adequate storage for wheelchairs, gurneys, and equipment. The architecture should not encourage an employee to leave the patient waiting in the corridor for a lengthy period of time. Planned space should prompt the staff to remember the patient that is waiting. Reminders would include properly trained staff, call signals, and view ports or windows. The architecture should not exacerbate the problem of patient waiting with poorly planned hiding places, especially for a wheel-chaired or "gurneyed" patient caught between one location and another.

The planner, the architect, and the entire A/E team should plan for the life of each building-that is, they should provide for the progressive maintenance schedule, change in building function as the building ages, and the eventual demolition of any given building as it obsolesces. The schedule should not catch the organization by surprise. Ideally, the life of the building should be scheduled so that the organizational leadership can fully understand the process of capital development and recycling. This concept is foreign to many hospital administrators who plan as if the physical plant is basically static or only in need of an occasional renovation.

Applying "numbers" and design to the many recommendations above can be a challenge. The planner and the architect should work with codes and authorities to settle on size and quantity standards that constitute a good modern design. In many ways these principles are well established. For example, eight-foot corridors are fairly standard. However, design applications of the "race track," double-loaded single corridor, pods on a triangular floor, or a Planetree model are major floor variations that are still undergoing design experimentation. Good planning and design should go beyond simple size and configuration standards to very efficient use of space that is still patient friendly.

Cost savings in one area can offset the extra expense of outstanding design in patient care and research areas where the cost runs much higher per square foot. By placing service areas in lower cost buildings, the construction cost is lowered. Reengineering and outsourcing of some functions can also help to lower overall space use and building costs. The Planetree model is still relatively new, but thus far requires up to 20 percent more space on patient floors. Planetree and other aspects of the "humanized" space may be worth the extra investment in delivering a healing environment to the cancer patient.

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Women's & Infants Services

Trends, Planning Guidelines, Case Studies, & Lessons Learned

Abstract

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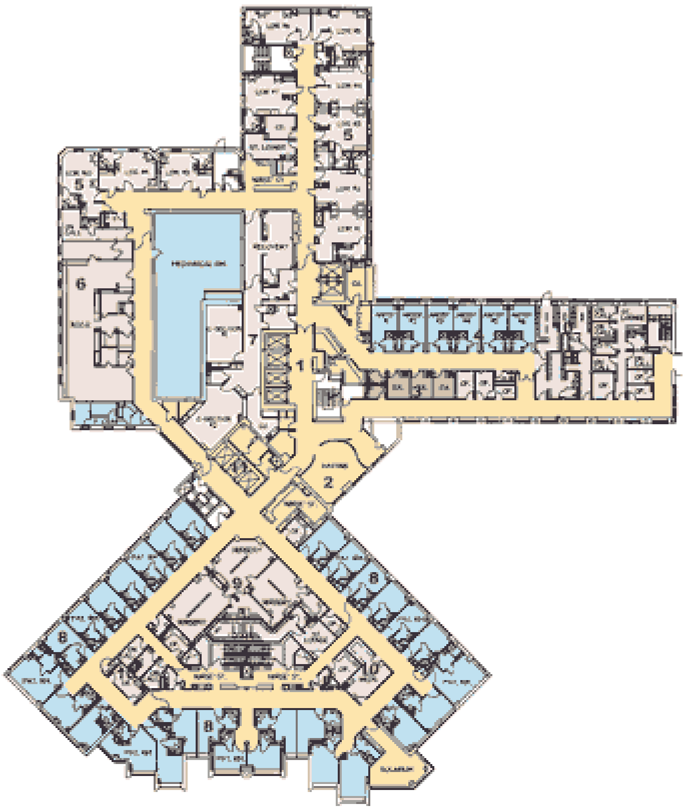
Overlook Hospital



Overlook Hospital - 6th Floor - Maternity

Figure 9: Floor plan

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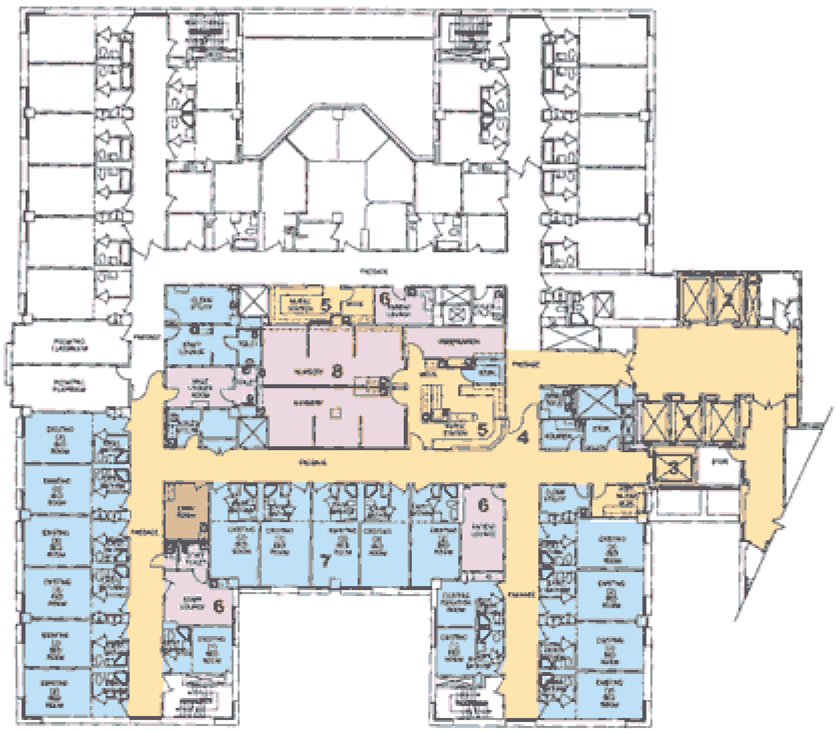
New York Methodist Hospital



New York Methodist Hospital

Figure 10: Floor plan

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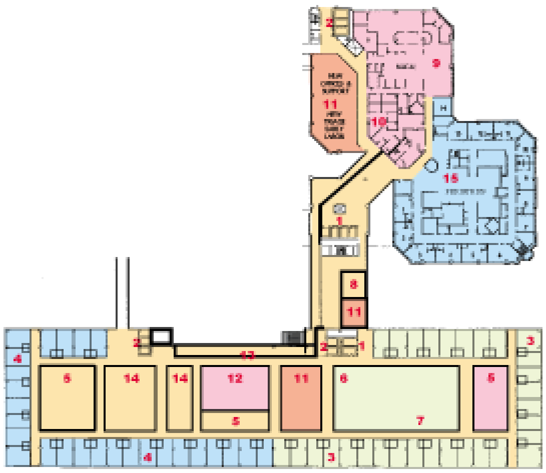
York Hospital



York Hospital - Maternity

Figure 11: Floor plan

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Hospital of the University of Pennslyvania

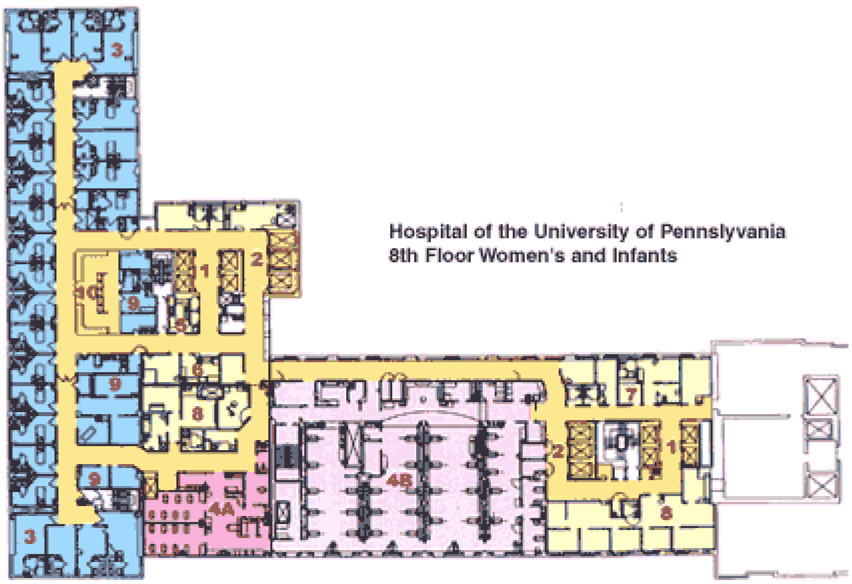

Figure 12: Floor plan-8th Floor Women's and Infants

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Reading Hospital

Figure 13: Floor plan

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Milford Memorial Hospital

Figure 14: Floor plan

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St. Elizabeth Hospital

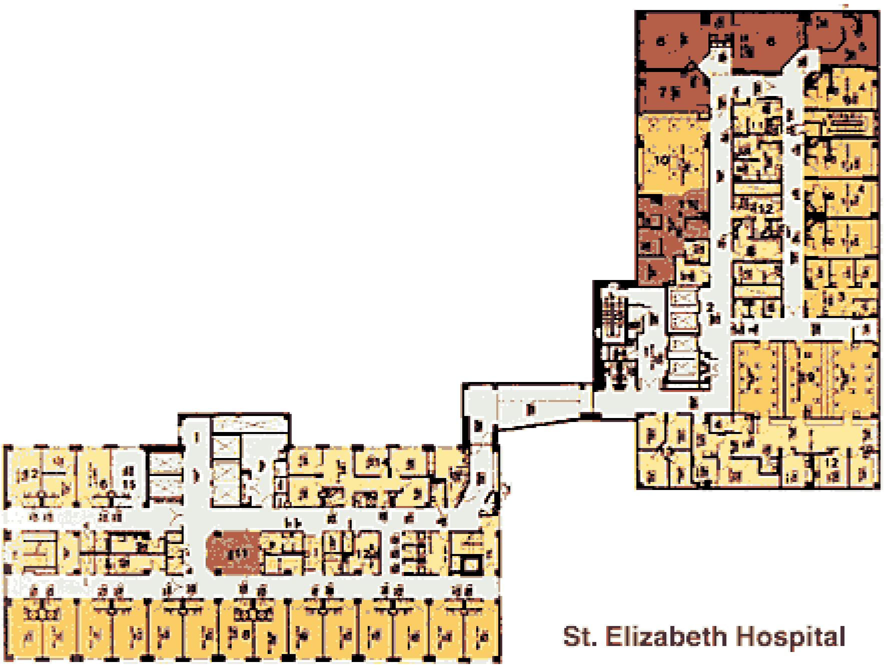

Figure 15: Floor plan

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Mount Carmel Hospital

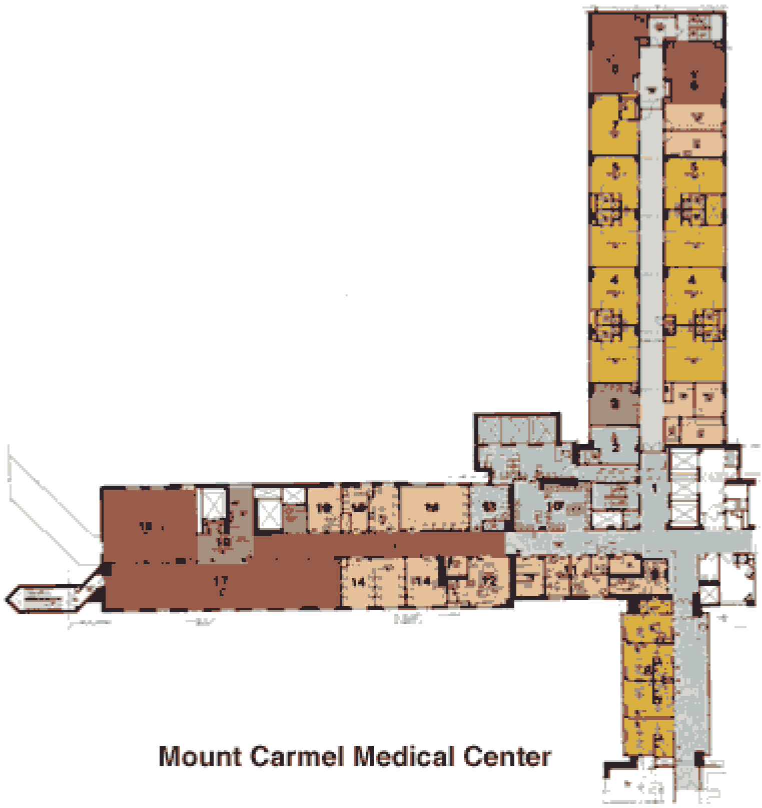

Figure 16: Floor plan

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Bryn Mawr Hospital

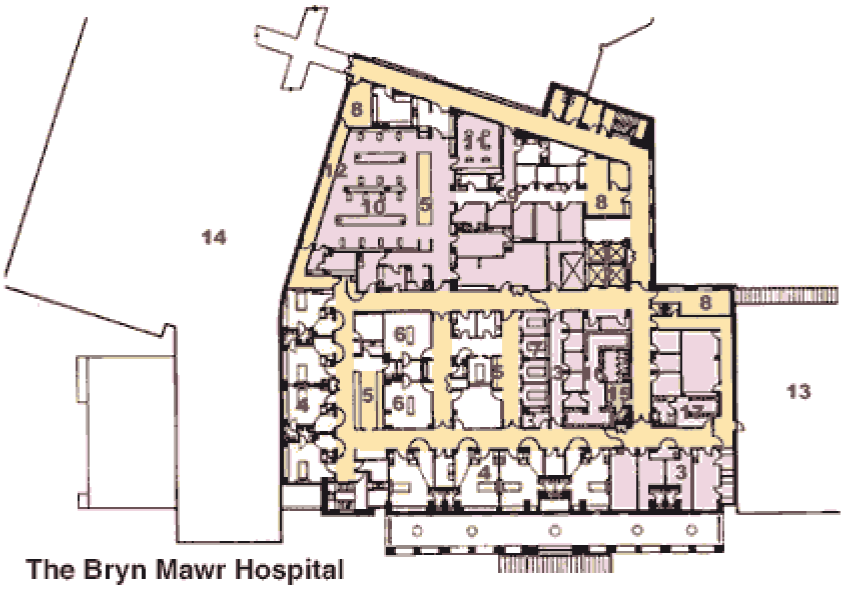

Figure 17: Floor plan

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Jersey City Medical Center

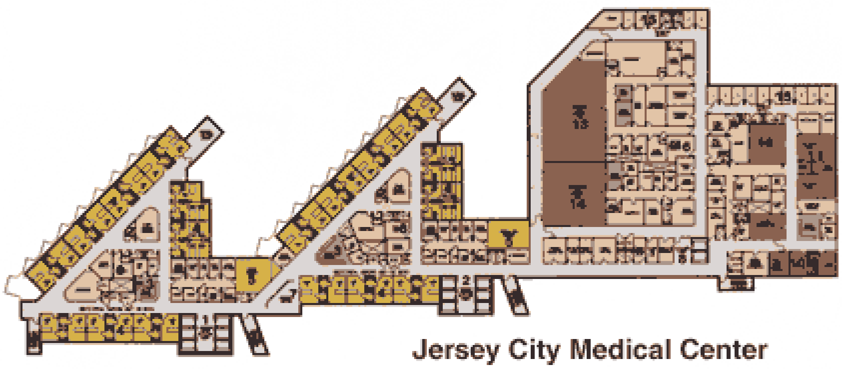

Figure 18: Floor plan

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