**Determinants of Medical Center Campus Development Patterns: A White Paper**

**Introduction.** The Bookin Group LLC (TBG) and THA Architects have been retained by the Portland Bureau of Planning and Sustainability (BPS) to provide assistance in its Institutional Campus Growth Policy Project. Task 3 of the work scope is as follows:

3. Research national trends and best practices including:

   b. Identify the programmatic, fiscal, demographic and technical factors that drive campus development. Translate these into development trends and best practices that permit full build-out of campuses including, but are not limited to, increased density/intensity including structured parking; outward expansion; development of satellite campuses, and other options.

Prepared by TBG, the purpose of this white paper is to provide information about the factors that drive the design of medical centers; THA is developing a companion white paper related to the development of college/university campuses.

**Brief History of Medical Center Planning in the US.** In the first decade of the 21st century, the health industry experienced an unprecedented building boom to upgrade/replace aging hospitals; accommodate new technologies and treatment modalities including a major shift to outpatient care; and address patient and physician preferences. In 2010 alone, the healthcare industry spent about $20 billion in new and renovated facilities¹.

The typical post-war community hospital has evolved in the past seven decades into a complex medical center with the inpatient hospital as the core facility. The modern medical campus contains a wide array of administrative functions; sophisticated inpatient/outpatient diagnostic and treatment services; on-campus office buildings for private and employed physicians and allied medical professionals; medical/nursing schools; research laboratories; fitness centers; and retail services such as cafes, gift shops, optical shops and pharmacies. As a result, the campuses of community-based as well as tertiary and university medical centers have grown rapidly both upward and outward in recent years.

Because of concerns about patient safety and treatment efficacy, a wide range of state and federal agencies and national non-profit organizations regulate medical centers and inpatient/specialty centers on aspects of construction, operation, staffing and equipment. For example, the Facility Guidelines Institute (FGI), a joint venture of the American Institute of Architects Academy of Architecture for Health and US Department of Health and Human Services (DHHS), has responsibility for preparing Guidelines for Design and Construction of Health Care Facilities. DHHS requires adherence to these guidelines² for...


² According to Thane Eddington, AIA, health care architect at PKA Architects and Planners, the State of Oregon uses its own guidelines that are very similar to these but is about to adopt TBGI’s updated guidelines (Visit on 4/21/12).
purposes of federal Medicare reimbursement, which virtually all healthcare facilities receive. The federal government also has outsourced the accreditation of medical facilities to a non-profit organization, the Joint Commission on the Accreditation of Healthcare Organizations (JACHO). Every healthcare facility undergoes a very rigorous re-accreditation review every three years.

It is not necessary for land use planners to understand these regulatory/accreditation requirements in depth – to a certain extent, healthcare facilities are “black boxes” -- but it is important to understand that medical center development occurs at the intersection of medical industry requirements and land use regulation.

**Future Trends Affecting Delivery of Health Care in the US.** Health care in the US is undergoing major changes. As the focus from inpatient to outpatient care continues to accelerate, future design of new and renovation of existing medical centers will be influenced by the following big “four”:

- New, advanced methods of health care delivery;
- New technologies and treatments;
- Changes in health care reimbursement;
- Evolving social, cultural and environmental factors.

Specifically, program planning and architectural design will be significantly determined by the following “global” trends:

- Proportion of patients admitted for inpatient treatment will continue to decline, shaped by new treatment modalities/technologies, cost reduction/reimbursement pressure and patient preference.

- As a result those patients who are admitted will be of higher acuity – e.g., frailer and sicker – and, thus require a higher level of care and possibly longer lengths of stay. This will be compounded by the aging of the US population since the elderly often have multiple diagnoses/illnesses. Thus, projecting total beds is difficult as factors cut both ways, e.g., lower proportion of inpatient admissions due to technological advances, patient preference and reimbursement pressure offset by growing aged population with higher medical acuity.

- At same time, inpatient care is moving to more patient-centered focus including 1) treating the patient vs. the disease; 2) providing diagnosis/treatment at the bedside to minimize patient transport to other locations; and 3) increasing integration of family members as informal caretakers.

- There is a continued move to single-bed rooms for variety of reasons including need for privacy, noise reduction, infection control and space for families.

- Inpatient rooms will increase in size to accommodate “universal acuity”, that is, a room of sufficient size that it can be converted into a higher-acuity (intensive care/coronary

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care) level to accommodate larger number of caregivers, provide electronic monitoring capability (telemetry); wiring for complex equipment for later installation; and room/facilities for family caregivers. All single rooms will have private toilet and shower facilities.

- As a result, there will be a modest increase in additional inpatient beds and on-going remodeling of existing nursing units to provide “universal acuity” rooms and accommodate new equipment and techniques.

- At the same time, there will be increasing use of transitional sub-acute (nursing home) stays and home-health services to reduce length of expensive hospital stays.

- There will be continued concentration of specialty-related outpatient services on medical center campuses where highly-specialized equipment – e.g., MRIs – can be used for both inpatients and outpatients. This includes office space for private and hospital-employed physicians particularly in the procedure-driven medical and surgical subspecialties, who need access to their hospitalized patients on a daily basis, access to sophisticated diagnostic/treatment equipment and services; and other subspecialists for patients with multiple medical diagnoses. At the same time, primary care physicians – internists, family practitioners and pediatricians – who provide patients with preventative and routine health care, do not need all of the subspecialty services offered on a medical campus and therefore, can be clustered in off-campus centers with basic support services such as laboratory, diagnostic imaging and physical therapy.

- Other factors influencing the provision of health care, and, thus, the physical settings in which it is provided include:
  - Changing types of nursing care/support by moving to less-trained providers such as licensed nursing assistants.
  - Increasing reliance on electronic medical records that allow access to a patient’s charts from various locations.

**Medical Campus Design.** The development of institutional campuses is driven by:

- **Programming:** What goes on inside various buildings including human and technological requirements and required internal “adjacencies”.

- **Urban design/context:** How the campus buildings are arrayed on the physical landscape including local factors such as land availability, topography, climate, and indigenous architectural styles.

- **Land use regulations:** How local zoning and other codes shape development through imposition of development, design and performance standards.

As a basic planning principle, “all good planning is from the inside-out”. This is especially true for a medical center campus that has a critical hierarchy of facilities from the “core” outward:
- Inpatient nursing units
- Ancillary services that support only inpatient units
- Emergency department/ancillary services that serve both inpatients and outpatients
- Outpatient offices for private/hospital-employed specialty/primary care physicians and allied medical providers.
- Parking

**Basic Considerations.** There are several basic planning principles that underpin medical campus design, starting with the inpatient hospital:

- Community need, e.g., demographics, service availability/deficiencies.
- The health, safety, comfort and satisfaction of patient, staff and medical professionals.
- Accommodation of evolving technology and treatment modalities
- Environmental considerations, e.g., water/energy usage, waste disposal, building siting/materials.
- Efficiency, e.g., time/energy to for patients, staff and equipment to move within buildings and throughout campus.

**Inpatient Nursing Units.** The core of a hospital is the nursing unit tower, which contains all of the inpatient beds for a full range of acuities, e.g., critical care, general medicine/surgical and specialty units for adults, children and/or infants. Because of overnight occupancy, the inpatient hospital has the highest requirements of any campus building for life-safety, seismic and handicapped accessibility and most complicated service requirements, e.g., water, power, medical gases, ventilation, infection control.

Several health care standards of care and code requirements dictate the configuration of typical nursing units:

- As of 2012, virtually all inpatient hospitals have moved to private rooms, even converting old two-bed rooms to single occupancy for a wide range of reasons described above. Moreover, in new and renovated nursing units, there is a move to “universal acuity rooms”. As illustrated in Figure 1, such rooms average 240 gross square feet (gsf), about 40-50% bigger than typical patient rooms, as necessary to accommodate future trends in inpatient care described above.

- All patient rooms must have an outside window, whether operative or not, to provide natural light. As a result, patient rooms must be on an outside wall with all support services – central and decentralized nursing stations, clean/dirty utility rooms, equipment storage – clustered in the middle.

- The ideal unit configuration is one with the shortest distances from the nursing station(s) to all patient rooms to promote patient safety and reduce staff travel time and fatigue. Typical nursing units have 2-3 pods of 10-12 beds for a total unit size of 24 – 30 beds. Larger hospitals may have two or three nursing units per floor with as many as 60-72 beds. Time/distance efficiency is so critical that:
The cost of construction is but a small part of the cost of the daily operation of a hospital. Over the lifetime of the building, construction costs have averaged only 6 percent of operating expenditures. It can be demonstrated (in today’s [2006] dollars) that the savings of one nursing staff member or equivalently salaried employee can save a million dollars in construction costs. The reductions in staff possible with new construction of efficient units can often pay for the unit.¹

- These basic requirements have resulted in several unit configurations to maximize the number of inpatient beds in a unit while minimizing collective distances travelled. Several of these are illustrated in Figure 2.

- Even in many community and suburban hospitals, nursing units are stacked in multi-floor towers to 1) provide the maximum outside wall surface and 2) vertically stack plumbing, power, and ventilation and elevator shafts. A key consideration is the movement of inpatients, who by definition are ill, injured and/or frail; staff and equipment efficiently in terms of both time and energy. Moving vertically utilizing elevators is more efficient than moving the same distance horizontally on foot.

**In-hospital inpatient/outpatient ancillary services.** In addition to inpatient units themselves, inpatients need a full range of diagnostic, treatment and support services during their stays. The facilities that exclusively serve inpatient units or serve inpatients/outpatients must be located in the inpatient hospital, so that care providers and other staff have immediate physical accessibility to inpatients units and/or inpatients who must be transported to these facilities – surgical suite, diagnostic imaging – can do so through internal points of access. The physical co-relationship of inpatient units to various ancillary services, known as adjacencies, are very complex, as illustrated in Figure 3.

In a recent benchmark study of 12 American hospitals ranging in size from 130 to 710 inpatient beds, there was an average of 2,670 gsf/inpatient bed in the institutions’ main hospitals. To put it another way, of total space in the main hospital, 35 – 40% is occupied by inpatient units; 35 – 40% diagnostic and treatment services; and 15 – 25% non-medical support and administrative services.²

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¹Ibid., Page 181.
²HKS Architects, in a study for an unnamed West Coast medical center, 2010.
FIGURE 1
EXAMPLE OF UNIVERSAL ACUITY PATIENT ROOM

1. 6'-0" Opening
2. Staff Zone
3. Staff Charting
4. Supply Storage
5. Sink / Storage
6. Equipment Storage
7. Head Wall
8. Side Table
9. Patient Wardrobe
10. TV (Flat Screen)
11. Storage Shelf / Flowers
12. Accessible Toilet / Shower
13. Family Zone
14. Family Desk
15. Sleep Sofa
16. WAC Critical Care Rqmts

Source: Clark-Kjos Architecture, Inc., for Good Samaritan Community Hospital, Puyallup, WA.
FIGURE 2
EXAMPLES OF INPATIENT NURSING UNIT CONFIGURATIONS

Source: Building Type Basics for Healthcare Facilities. Pages 141, 156, and 150, respectively.
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FIGURE 3
INPATIENT HOSPITAL ADJACENCIES

Source: Building Type Basics for Healthcare Facilities. Pages 180 and 13, respectively.
At the same time, the costs of equipping and staffing ancillary services – emergency room, surgical suite, diagnostic imaging -- are so high that it is necessary that outpatients as well as inpatients be served there. For example, only about 10 – 15% of ER visits result in hospitalization with the remainder outpatient visits of various acuities. With advances in surgical technique, about 70% of all surgeries now are performed as outpatient procedures. Similarly, outpatients make up about 90% of all diagnostic imaging procedures. Added to this are the adjacency requirements among ancillary services, e.g., the emergency room must be in close proximity to diagnostic imaging, surgical suites and ICU/CCU units. As a result, the only way to provide close physical proximity for so many activities is to stack them. Again, there are significant efficiencies in moving patients, staff and equipment vertically via elevators than doing so horizontally on foot.

Thus, these ancillary services are generally located on the first 2-3 floors of the inpatient hospital, often in a broad-based podium with inpatient units contained in a multi-story tower above. The ground floor also provides other patient/visitor/staff retail activities such as gift/flower shops, optical shops, pharmacies, durable medical equipment rentals/sales, medical resource centers, cafes, coffee vendors, public waiting areas and the like. The lower level is generally reserved for non-public functions such as materials management, housekeeping and some administrative functions. Other non-patient-centered uses such as administrative offices and cafeterias also may be located on lower floors. The architectural rendering below illustrates the typical big-city inpatient hospital, St. Luke’s Medical Center in Milwaukie, including a three-story podium for ancillary, support and administrative services topped by a six-story nursing tower.

Source: Building Type Basics for Healthcare Facilities. Page 151

Based on utilization studies undertaken at several medical centers by Beverly Bookin.
As an alternative, some medical centers develop hybrid mixed-use specialty buildings immediately adjacent to the inpatient hospital with inpatient/outpatient specialty services provided on the first 2-3 floors with physician offices on upper floors. These buildings can be internally-connected to the inpatient hospital, share common entrances/lobbies or be connected by an above-grade skybridge across an intervening private or public street.

**On-Campus Medical Office Buildings (MOBs).** Also sometimes referred to as Physician Office Buildings (POBs), these are typically multi-story buildings designed to house offices of physicians and other allied medical professionals, e.g., physical therapists, podiatrists. These medical providers may be in private practice or, increasingly, employed by the hospital or health care system. Regardless of affiliation, these providers are on the medical center’s professional staff with admitting privileges to the inpatient nursing units. Both by construction code and use, these are office buildings specifically designed to accommodate various types of primary care and subspecialty physicians exclusively serving outpatients. The typical MOB may also have a small number of support services such as a blood-draw station and outpatient pharmacy.

There are multiple benefits to accommodating outpatient medical offices on the medical campus for both providers and patients in terms of convenience, synergy and trip reductions:

- Physicians and other allied medical professionals can care for both their outpatient patient loads and their inpatient/emergency room admissions on the same site, both saving time and improving responsiveness. The added benefit is that trips between office and the impatent hospital are done on foot rather than by vehicle, as was the case in the past when most physicians maintained their offices off-site. Physicians and their staffs also can take advantage of on-campus services - food, fitness facilities, educational/training seminars - and formal and informal opportunities to consult with their colleagues. One transportation engineer estimates that the number of internal on-foot trips between on-campus MOBs and the inpatient hospital conservatively reduces vehicular trips by 25%.

- This configuration also provides patients with opportunities to use several services in one visit to their physicians, including referral to other on-campus physicians, laboratory and diagnostic imaging services; pre-surgical admission work-ups; and on-campus services such as pharmacy, food/beverage service, durable medical equipment sales/rentals and medical resource centers. Also, if warranted, an outpatient can be immediately admitted to an inpatient bed if an emergency should arise, greatly improving patient safety. Again, these intra-campus trips are made on foot, eliminating vehicle trips that would be required if these patients were to come to the inpatient hospital from off-site.

**Parking.** Because of the mix of activities, the typical medical center generates a significant amount of parking demand, especially related to the high turn-over of outpatient visits and relatively high ratios of employees/patient on the inpatient side. This is ameliorated by two factors:

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7 Michael Ard, PE, Lancaster Engineering in telephone conversation on 4/26/12.
The impatient component operates 24/7, so the number of inpatient employees at any one time is reduced. However, the weekday shift is the single-busiest shift, when most non-inpatient and administrative staff also are on campus, followed by the swing, evening and weekend shifts. On the other hand, there has been a significant move toward compressed work weeks for inpatient employees. For example, many nurses and other allied health professionals work three 12-hour shifts a week, reducing their weekday work trips by 40% from the typical five-day workweek.

Outpatient trips peak from 11 AM – 1 PM in what are off-peak hours for the typical AM and PM peak travel times.

Even in outer urban and suburban locations, medical centers are much more likely than other land uses to build parking structures supplemented by surface parking lots, despite the significant increased cost of structured parking stalls. Again, this is driven primarily by internal programmatic concerns and only secondarily by land cost/availability. Especially with the aging of the population, medical centers accommodate many frail, ill and/or injured patients who must be moved from their vehicles to several on-campus access points. It is much more efficient to stack such parking in structures, minimizing the time, distance and energy expended compared to that of the same amount of parking arrayed horizontally. Such parking structures vary from two stories to as many as 9-10 stories.

In the effort to meet critical adjacencies, parking structures have the lowest priority so these are generally located on the perimeter of the site where they maximize access from the public street system and minimize distance to building entrances. Some medical centers segregate parking facilities for patients/visitors, who are given more advantageously-situated parking, and employees/physicians, parking for whom are located further away. In other cases, parking structures are stratified with patient/visitor parking on the lower floors, where it is more convenient and with shorter travel distances, and staff parking on upper floors. In these configurations, the lower floors have the preponderance of disabled-accessible and carpool parking spaces. In addition, many medical centers offer valet parking at the entrances to the inpatient hospital and MOBs and/or provide dedicated parking immediately outside entrances of treatment areas – cancer, physical therapy, emergency room -- which cater to physically-impaired patients.

**Overall Campus Design/Infrastructure Considerations.** The typical medical center campus shares these characteristics:

- Ideally, medical centers are located on major arterials and often at freeway interchanges. This provides both out-sized roadway capacity and visibility, particularly for emergency rooms. Such freeway access is not feasible for some medical centers that have developed in traditional residential neighborhoods before such uses developed regional service areas and, thus, became so traffic-intensive. It is also important to recognize that patients currently arrive primarily by private automobile either alone or with family members and that this is not expected to change substantially in coming decades.
High-capacity transit also is an asset, providing an important alternative to driving particularly for medical center employees. In Eastern and Midwestern American cities, many medical centers already are located adjacent to stations on older, well-established rapid transit lines. In cities with newer rapid transit systems, medical centers often are identified by planners as important regional attractors/employment centers and, therefore, appropriate locations for new stations.

Off-site directional signage is a critical component directing patients and visitors to the medical center campus in the most direct way. This is particularly true for those who need to find the emergency department for the critically ill and injured. The Manual on Uniform Traffic Control Devices establishes the standardized signage permitted in the public right-of-way, dictating its design, specifications and location.

Because of its size and function, the typical medical center campus must have at least two entries to facilitate circulation to/from the local street network and through the campus. At least one of these entrances must provide direct access to the emergency room, separating emergency traffic related to both ambulances and private vehicles, from general traffic. On-campus vehicular circulation needs to be direct, safe and “easily-read” even by first-time visitors.

Because they provide integrated inpatient, outpatient and emergency services across several buildings, medical center campuses by definition have comprehensive, highly-developed pedestrian circulation systems that are broad, well-lit, fully handicapped-accessible and grade-separated from vehicular circulation. Many centers have secondary, circulation systems below-grade via tunnels or above-grade via one or more skybridges. Grade-level pedestrian ways often feature covered arcades to provide all-weather protection.

Open space plays an important but secondary role on a medical center campus because virtually all medical functions occur indoors with outdoor space used primarily as brief respite by patients, visitors and staff. In recognition of the healing power of nature, many institutions have inviting open spaces including courtyards, healing gardens, roof gardens and water features. Landscaping also plays an important role in softening the facility’s scale and an increasingly important role in stormwater management.

Average campus size varies widely, many times a function of historic location. However, a new medical center needs at least 20 acres and many health care systems acquire 30 - 50-acre sites to land bank for future expansion. Based on the programmatic drivers described in detail above, medical centers are typically the most intense of all land uses outside downtowns. Floor-to-area ratios (FARs) vary widely depending on site size and the center’s type, age and maturity, but can typically range from about 0.5 to more than 3.0.

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8 According to Thane Eddington (ibid.), European hospital planners increasingly are integrating open space into campus designs, which may eventually affect thinking about this in the US although it is not clear in what ways.

9 Telephone interview with LeeAnne Wrenn, Facility Director (retired), OHSU (4/26/12).
Maximum building heights required for medical centers are generally the highest for any land use outside downtowns because the buildings tend to be in the range of 4 – 10 stories. The inpatient hospital drives the maximum height because this facility has the highest floor-to-floor dimension, about 16’ to accommodate the large amount of ductwork, cabling and other infrastructure in the ceilings between floors. Thus, a new or replacement six-floor inpatient hospital tower will require 100’ excluding roof-top mechanical, allowing 20’ for the ground floor and 16’ for each of the five above-grade floors. Using this methodology, a nine-story patient tower requires about 150’. MOBs and outpatient specialty buildings require about 13.5’ per above-grade floor, again because of additional infrastructure in the space between floors, but this results in heights that are less than that of the inpatient hospital[10]. By comparison, a typical commercial building has a floor-to-floor distance of about 12’. Parking structures have a typical 10’ floor-to-floor requirement.

Medical centers require the most robust public and private infrastructure, again driven by the technical and regulatory requirements of the inpatient hospital:

- Significantly higher demand for water given the density of people/gsf, number of fixtures and use of water for infection control; this also requires larger gray and black water systems.

- Mechanical systems must be very robust as frequent air exchanges, a minimum of six an hour, are required for infection control and patient comfort.

- High demand for electricity given that inpatient facilities operate 24/7 and power a large array of technically-sophisticated equipment. All hospitals have automatic back-up power systems to operate the lights and life-sustaining equipment in the event of a power failure. Consideration is now being given nationally to requiring all hospitals to have back-up power systems for their HVAC systems as well[11].

- There is a unique requirement for the provision of medical gases such as oxygen and nitrous oxide to all patient rooms and other patient-treatment areas.

This infrastructure requires a large number of and over-sized pipes, conduits and shafts that add to the cost and complexity of construction. The most efficient delivery of these services is vertically in uninterrupted runs, yet another driver for vertical rather than horizontal development, especially in the design of inpatient nursing units.

- The infrastructure requirements for freestanding specialty inpatient/outpatient services are somewhat more robust than typical office construction, whereas MOBs and other office functions have essentially the same requirements as any other commercial building.

[10]Ibid.

Like other industries, the health care industry has embraced sustainable practices in the construction, renovation and operation of medical centers. Many medical center campuses have centralized utility plants for power, hot/chilled water and the like. Given that medical centers are large consumers of water and power, there is substantial opportunity to improve efficiency as systems are renovated or replaced. There are also opportunities for the adoption of cutting-edge technologies such as cogeneration and use of recycled water.

Decentralized Services

Patient-Related. As noted in the discussion above, there are many adjacencies and shared facilities that dictate the placement of a full-range of inpatient, outpatient specialty and emergency services on the same campus, hence the evolution of the traditional hospital to a full-service medical center. However, given the size and complexity of such campuses and pressures on outward expansion due to “town-and-gown” conflicts, there has been a trend to move more basic primary care functions off of medical campuses and into decentralized centers. These primarily service patients who require preventative services and routine care and, don’t require the more sophisticated services offered at the medical center. This means that patients can receive care closer to home or work and without the inconvenience encountered on a more congested medical center campus.

These freestanding facilities often house the offices of primary care physicians – internists, family practitioners and pediatricians – who typically have few hospitalized patients and whose patients only require basic diagnostic testing. These centers may also include such support services as blood-draw stations; pharmacies; outpatient diagnostic imaging, e.g., mammography; and outpatient physical therapy. These centers can be small clinics or more substantial 3-4 story buildings. In some cases, these centers have a far wider range of primary, specialty outpatient, and urgency services, virtually everything short of inpatient beds. In addition to the benefits of such decentralized facilities for care providers and patients, moving non-essential primary care functions off campus allows the vacated space to be used for the development of inpatient and specialty outpatient services that require proximity to one another.

Administrative/Support. To preserve on-campus space for critical functions, medical centers and especially regional health care systems also have developed off-site locations for administrative functions, regional laboratories, information-technology, research and warehousing. These typically are located in commercial or light industrial zones.

In Summary

- As noted in the foregoing discussion, programming – from the “inside out” – dictates the overall campus design. Requirements for internal adjacencies create a hierarchy of buildings with the inpatient hospital combining inpatient nursing units and support facilities at the core, followed by buildings providing inpatient/outpatient diagnostic/treatment facilities, physician/allied medical profession offices and parking. It is the physical array of these buildings that determines the campus’ design.

12 All but the most basic lab tests are sent to a hospital-based or regional laboratory for analysis.
Regional differences appear to have little impact on campus form. For example, a 400-bed tertiary-care medical center in Portland looks and functions much the same as a similar facility in Cincinnati, Atlanta, Boston, Minneapolis or Denver. Other factors – historical locations in residential areas, land constraints in inner-city locations and so-called “town-and-gown” conflicts – influencing campus development are similar in all medium and large American cities.

In mid-sized and larger American cities, inpatient hospitals and on-campus outpatient facilities and professional offices will continue to develop at high densities at a minimum of 3-6 stories and as many as 9-10 stories, primarily driven by the physical needs of increasingly elderly/frail patients; staff efficiency; and required physical adjacencies. Land cost/availability and push-back from neighbors play a secondary role in the decision to “go up rather than out”.

Because of the complex adjacencies, it is likely that most expansion of inpatient beds will occur at existing facilities. The rule-of-thumb is that a new bed at an existing facility, where there is adequate support capacity, costs $1 million, whereas at a new facility, where all of the support services need to be replicated, will cost $2 million per bed. This is not to say that there will not be new medical centers to replace outdated facilities where renovation is not practical and in rapidly-growing, under-served suburban areas. In inner cities, relocation is complicated by the lack of sufficiently-sized sites but renovation in place while keeping the facility operational also poses major difficulties.

There is an active effort to move primary care outpatient activities to free-standing locations to open up land on medical center campuses for higher-priority inpatient/outpatient specialty and emergency services. In addition, many other administrative and support functions also are being moved to freestanding locations. These uses typically are located in commercial and/or light industrial zones when they are allowed by right.

Case Studies. To illustrate many of the concepts described in this white paper, three case studies are offered:

- **Good Samaritan Community Hospital (GSCH):** The upgrading of a community hospital in Puyallup, Washington, to a full-service regional medical center.

- **Kaiser Permanent Westside Medical Center (KPWMC):** Now under construction, this Hillsboro facility is based on the Kaiser Permanente “template” medical center, which has been developed and refined over the past decade. The case study features the Phase 1 and full build-out plans for an unusually small, 14.9-acre, site.

- **Typical West Coast Inner-City Medical Center:** Originally established in 1920, this inner-city medical center on the edge of the downtown of a large West Coast city currently has 1.3 million gsf of development on a 7.5-acre site, for an FAR of 4:1.
CASE STUDY A:  
GOOD SAMARITAN COMMUNITY HOSPITAL (GSCH)  
PUYALLUP, WASHINGTON

**History.** GSH was established in 1952 when the Lutheran Home and Welfare Society assumed management of Puyallup General Hospital. The hospital moved to its current location east of downtown Puyallup in 1958; the facility has been expanded several times since as it has acquired surrounding properties. Puyallup lies about 20 miles east of Tacoma via Highway 512, on the road to Mt. Rainier National Park.

In August 2006, Good Samaritan Community Health (GSCH), GSH’s parent entity, became affiliated with MultiCare Health System (MCHS), the single largest provider of healthcare in Pierce County, Washington. GSH becomes the MCHS’ fourth medical center in a system that also includes three medical centers in Tacoma. In addition, the system operates six ambulatory surgery centers, six urgent care centers, 28 multi-specialty clinics and a home health/hospice service. Shortly after the merger, MCHS embarked upon a 10-year master plan for GSCH to replace the aging inpatient hospital and upgrade the campus to a regional medical center.

**Base Case Conditions.** At the time of the master planning effort, the GSCH owned nearly 35 acres on seven blocks on a site south of Highway 512. Much of the campus lies within a special Medical (MED) zone, which recognizes the medical center’s presence. The campus is surrounded by a variety of commercial and low-/medium density residential land uses.

At the start of the planning effort, the medical center campus consisted had 666,000 gross square feet (gsf) of development of medical use including the Main Hospital (321,000); three small MOBs; Outpatient Children’s Therapy Unit and Outpatient Cancer Center; and support services including administration, education, child care and maintenance. The floor-to-area ratio based on the developed portion of the campus, as opposed to land-banked property, was 0.4.

The center had an on-campus parking supply of about 1,430 spaces, primarily in surface parking lots and on-street parking within the campus boundary, resulting in a parking ratio of 2.9 spaces/1,000 (1,430 spaces ÷ 484,000 gsf ÷ 1,000 gsf). An aerial photograph (Figure A1) illustrates the existing campus in 2007. The Main Hospital lies on the northern superblock just south of Highway 512 with the center’s two major outpatient facilities – children’s unit and cancer center – lying two blocks to the southeast on the south side of 16th Avenue SE, leaving two large intermediate blocks between available for medical center expansion.

**Proposed Master Plan.** GSCH used all of the principles governing typical medical center design described in this white paper in developing its two-phase master plan, which the City of Puyallup approved in 2007. The first phase was completed in late 2011 and full-build-out is now scheduled to be completed by 2016. At full build-out, the facility will have a total of up to nearly 1.6 million gsf, a 140% increase, for a build-out FAR of 1:1.

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14 Source: Good Samaritan Community Hospital 2007 Conditional Use Master Plan Application, The Bookin Group LLC (2/07).
Primarily to be provided in new parking structures, the total parking supply is projected to be 2,060 spaces for a projected parking ratio of 2.8/1,000.

Figure A2 illustrates the concept plan with critical inpatient/emergency functions fanning outward to MOBs, specialty outpatient services and parking. Figure A3 illustrates the full build-out plan that includes:

- Create a two-block superblock by means of selective street vacations.
- Construct a new inpatient hospital with 10-story nursing tower upon a broad three-story podium containing inpatient/outpatient diagnostic and treatment services and new four-story parking structure (PS-2) in the southwest corner, primarily to serve the hospital.
- Renovate the old hospital using the west wing, the newest construction, for additional inpatient/outpatient services, connected to the new hospital via two second-floor skybridges. Demolish a portion of the old east wing and renovate the remainder for non-patient-related administrative and support functions and storage.
- Construct a new five-story Medical Office Building (MOB) in the southeast corner of the superblock with a five-story parking structure (PS-3) to the east connected via a third-story skybridge. A future MOB site lies to the north of PS-3 but is not included in the 10-year plan.
- Realign the new entry gateway to 16th Avenue SE (new “Front Street), via a major arterial, Meridian Street South. This provides direct access to the new inpatient hospital entry to the north as well as major existing outpatient facilities to the south. The major gateway drive allows vehicles to drop patients off at the main entrance and then travel back to the entrance of PS-2 to park without re-entering the public street system.
- Place emergency room entrance is to the west via Meridian Street South, with separate ambulance and private auto access. The entry drive leads to the emergency room entry on the south end of the hospital’s second floor, due to grade changes. Again, after dropping off patients, motorists can then loop around and enter PS-2 at the second floor level to park without re-entering the public street system. Although not labeled, the main loading dock for the facility is located in the northwest corner at the intersection of Meridian Street and 14th Avenue SE.
FIGURE A1: EXISTING DEVELOPMENT AT GSCH (2007)

1A. Main Hospital / West Wing
1B. Main Hospital / East Wing
2. Puyallup Valley Medical Center
3. South Hill MOB
4. Parking Structure (PS) 1
5. Education Building (Original Hospital)
6. Maintenance Building / Central Plant
7. IT Services Building
8. Child Care
9. Child Care
10. Child Care
11. Childrens Therapy Unit (CTU)
12. Cancer Center
13. Executive Offices
14. 4th Street Medical Office Building (MOB)
15. House
16. House
17. House

GSH owned 'block'
BACKGROUND. Kaiser Permanente/Northwest closed its older Portland facility, Bess Kaiser, in the 1990s because of the infeasibility of bringing the aged facility up to then-current health care and seismic standards. The northeast Portland campus has since been repurposed as the North American headquarters of Addidas. For many years, Kaiser expanded its inpatient capacity at its remaining flagship facility, Kaiser Sunnyside Medical Center (KSMC), and by leasing unused capacity at other Portland hospitals, e.g., Providence Portland and St. Vincent Medical Centers, Southwest Washington Medical Center. In the early 2000s, Kaiser decided to phase out these out-of-system contracts by building a new medical center on the Portland region’s west side. After considering the alternatives, the system decided to use the 14.9-acre site it owns in Hillsboro, Oregon, for its new Westside Medical Center (KPWMC), although this site is somewhat smaller than the optimal minimum 20 acres. The site was largely vacant with the exception of the Sunset Medical Office Building (MOB), Kaiser’s primary care clinic in Hillsboro.

SITE. The site is located in the Tanasbourne Town Center in eastern Hillsboro. The closest major intersection is at NW Cornell Road/NW 185th Avenue. The site is bound by NW Stucki Avenue (east); NW Evergreen Parkway (north); NW 194th Terrace (west); and NW Venetian Drive to the south. Surrounding uses include three-story residential complexes to the east and west; Standard Insurance Sunset Office Park to the north; and Streets of Tanasbourne Lifestyle Center to the south. These mix and density of uses support a new full-service medical center at this location, despite the smaller-than-optimum site.

PROPOSAL. Kaiser Permanente proposes to construct a full-service, tertiary-care medical center at this location. At full build-out in 2040, the medical center will feature nearly 250 inpatient beds with a total build-out of 1,275,000 gsf, for an FAR of nearly 2:1. The proposed layout is based on Kaiser’s “template hospital”, which has been used for the past decade for all of its new facilities.

- In the inpatient hospital, a three-story “diagnostic/treatment (D/T) block” will provide all inpatient-related direct and support services, the equivalent of the “podium” in most hospitals. The main entrance of the hospital is on the north end of the D/T block, accessible from NW Stucki Avenue, and emergency department on the south end, accessible from NW Venetian Drive. This illustrates the principal that the main and emergency entrances must be separated.

- Rather than place the nursing tower on top of the D/T block, the template places three, four-story triangular towers along the western edge. This provides the optimum configuration of maximizing the number of beds with the shortest average distance within the nursing unit and to other support services. There are two triangular internal courtyards/healing gardens between the three towers. The first two towers will be built in Phase 1, now under construction, with the third build out in Phase 3.

Source: Request for Planned Unit Development Approval for Kaiser Permanente’s Westside Medical Center, The Bookin Group LLC (10/08)

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The first Hospital Support Building (HSB) will be built on the north end of the inpatient hospital and feature space for inpatient/outpatient services, specialty physician offices and administrative functions. The hospital and HSB have a common entry with a shared internal lobby. The gateway entrance from NW Stucki Avenue, a neighborhood collector, provides drop-off access to both with the switch-back option into the eight-story parking structure containing 1,910 parking spaces at full build-out.

A second HSB is scheduled to be built in Phase 2, to house additional specialty physician offices. It will be located on the north side of the gateway drive so that all main entrances are accessible from a single location; this greatly reduces the area on site devoted to internal roadways, particularly important on such a small site. Until HSB 2 is needed, the existing primary care Sunset MOB and its surface parking lot will be retained in the northeast quadrant of the site. These primary care functions will be relocated to another site when HSB 2 is constructed.

The master plan contains master palettes of architectural and plant materials, master outdoor furnishings catalogue and master sign program to ensure the development of a cohesive, aesthetically-pleasing campus design.

**SUMMARY OF BUILDING INVENTORY FOR FULL BUILD-OUT OF KPWMC**

<table>
<thead>
<tr>
<th>FACILITY</th>
<th>LEVELS</th>
<th>TOTAL GSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital / Inpatient Bed Towers 1-2 and</td>
<td>4 + B</td>
<td>465,600</td>
</tr>
<tr>
<td>Diagnostic/Treatment (DT) Block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital Support Building 1 (HSB 1)</td>
<td>4 + B</td>
<td>131,400</td>
</tr>
<tr>
<td>Hospital Support Building 2 (HSB 2)</td>
<td>4 + B</td>
<td>131,400</td>
</tr>
<tr>
<td>Visitor/Staff Parking Garage</td>
<td>7+Roof</td>
<td>516,600</td>
</tr>
<tr>
<td>Central Utility Plant (CUP)</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td><strong>TOTAL FULL BUILD-OUT</strong></td>
<td></td>
<td><strong>1,275,000</strong></td>
</tr>
</tbody>
</table>

|                              |          |           |
| TOTAL SITE SIZE (14.9 Acres)  |          | 650,000   |
| TOTAL FAR (1,275,000 ÷ 650,000)|          | 1.96 : 1  |
| TOTAL LOT COVERAGE (275,000 ÷ 650,000) |          | 42%       |
| PARKING RATIO (2,050 ÷ 728,400 PARKING-GENEATING SPACE) | | 2.8/1,000 |

Figures B-1 and B-2 illustrate the campus build-out at the end of Phase 1 and full build-out, respectively. Figure B-3 presents a three-dimensional view of the new medical center at full build-out.
FIGURE B-1
SITE PLAN OF KPWMC AT THE END OF PHASE 1 (2013)

FIGURE B-2
SITE PLAN OF KPWMC AT FULL BUILD-OUT (2040)
FIGURE B-3
THREE-DIMENSIONAL VIEW OF KPWMC AT FULL BUILD-OUT (2040)
CASE STUDY C: TYPICAL WEST COAST DOWNTOWN MEDICAL CENTER\textsuperscript{16}

**Introduction.** Case Studies A and B involve medical centers that at full build-out will achieve an floor-to-area ratio (FAR) of 1:1 and 2:1, respectively. The staff of the Bureau of Planning and Sustainability (BPS) also requested a case study of a downtown medical center with a higher FAR to understand better how major facilities on constrained sites can “push the limits” on upward development. Thus, TBG identified a medical center on the edge of downtown of a major West Coast city; the institution and its location must remain unnamed as the information presented here is proprietary.

**Description.** Founded in 1920 in its current location, the medical center has been redeveloped and expanded in place so that as of 2010 it contains 1.3 million gsf of development on a 7.5-acre site as follows:

### SUMMARY OF BUILDING INVENTORY

<table>
<thead>
<tr>
<th>BUILDING TYPE</th>
<th>SIZE (GSF)*</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Hospital</td>
<td>525,800</td>
<td>41%</td>
</tr>
<tr>
<td>Outpatient Services</td>
<td>413,000</td>
<td>32%</td>
</tr>
<tr>
<td>Research</td>
<td>110,000</td>
<td>8%</td>
</tr>
<tr>
<td>Support Services/ Administration</td>
<td>133,100</td>
<td>10%</td>
</tr>
<tr>
<td>Family Lodging</td>
<td>48,500</td>
<td>4%</td>
</tr>
<tr>
<td>Structured Parking**</td>
<td>69,800</td>
<td>5%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,300,200</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

| TOTAL SITE SIZE (7.46 ACRES)    | 324,500     |
| TOTAL FAR (1,300,200 ÷ 324,500) | 4:1         |
| PARKING RATIO (@1,100 ÷ 1,230,400PARKING-GENEATING SPACE) | 0.9/1,000 |

Source: SRG Partnership
*Rounded to nearest 100 gsf.
**Does not include below-grade, on-street or remote parking.

Figure C-1 illustrates the current campus build-out. Figure C-2 illustrates the maximum heights assigned to the campus in the city’s zoning code to accommodate such intense vertical development.

- As is typical of downtown facilities, this institution has developed within the existing small-block street grid typical of West Coast city centers, rather than on a self-contained campus. This complicates the movement of patients, staff and equipment between buildings across public thoroughfares.

\textsuperscript{16} Source: HKs Architects 2010 benchmark study for unnamed West Coast inner-city tertiary medical center; used by permission of SRG Architects Inc.
- At an FAR of 4:1, there is virtually no ground-level usable open space. This compares to KPWMC (Case Study B), which, at an FAR of 2:1, has building coverage of only about 40%, with a resulting 30% of passive and active open space.

- Both GSCH (Case Study A) and KPWMC have parking ratios of 2.8/1,000 within the typical range of 2.5 - 3.0 spaces/1,000. In contrast, this downtown medical center has a parking ratio of only 0.9/1,000. This underscores the advantage that downtown facilities have – rich transit availability and nearby high-density housing – that is not the case for the typical institution located in a smaller community or suburban area.
FIGURE C-1
TYPICAL DOWNTOWN MEDICAL CENTER

Family Lodging
Latest Hospital Addition
Proposed Campus Expansion
Hospital East Addition
Original Hospital
Hospital West Addition
Outpatient Clinic South
Outpatient Clinic North
Parking Structure
Research Institute
Administrative Support
Specialty Outpatient Services
Outpatient Health Resource Center
FIGURE C-2
MAXIMUM HEIGHT PROFILE
FOR TYPICAL DOWNTOWN MEDICAL CENTER

EXISTING
BUILDING AREA:
1.3 million sf

PARKING:
1100 spaces

FAR 4