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Right Sizing Hospitals for the New Millenium

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In recent years there have been major divergences developing in the sizing of hospitals. Wasteful is not too strong a word to describe the building programs undertaken by some hospitals.

Until the last 10 to 15 years, hospitals were fairly tightly aligned in terms of space usage. Currently, there seems to be no consensus as to the appropriate sizing of hospitals. With the discrediting of square feet per bed as an indicator of size for both the total hospital and departments, we have even lost the vocabulary for addressing this issue.

This paper reflects on the past methodologies for sizing hospitals, and explores some new approaches for setting benchmarks for required hospital space. As hospitals struggle to stay afloat under the pressures of managed care and capitated payment rates, building cost effective facilities will become an imperative.

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A Proclamation of Need

A recent article in *Health Care Strategic Management* magazine by Cynthia Hayward, is a wake up call for healthcare architects to seize the initiative and lead the charge of right sizing the hospital for the next millennium. A synopsis of her points best illustrates the need:

- "Because so much has changed in just the past decade-particularly with 180-degree shifts in popular trends and financial incentives-it is not surprising that we have so many inappropriate and unnecessary health care facilities."
- "Historically, the facility planning process focused on the wish lists of physicians and managers and often ignored the impact on operational costs and relevance to strategic planning initiatives. With design architects often leading the planning effort, there was little incentive to look for creative ways to avoid overbuilding."
- "With double digit inflation, confusing legislation and building codes, and easy access to capital, aggressive architects and contractors convinced hospital leaders that it was cheaper to build surplus space, and let it sit empty until needed, than to postpone construction."
- "A more comprehensive facility planning process is needed to ensure that alternate ways of allocating resources are thoroughly evaluated, and that the impact on operational costs is fully understood, prior to spending money on bricks and mortar."

Ms. Hayward's diagrams of the "comprehensive facility planning process for multi-hospital systems" calls for "setting benchmarks and monitoring long-range facility needs." After first reading this article, I was quite disappointed with Ms. Hayward A.I.A., a colleague of mine for almost 20 years. How could she so blatantly attack our shared professional community of architects. After some reflection, however, I found myself agreeing with almost everything she was saying. There were, however, some gross over generalizations in her finger pointing and criticism of architects.

The fact is that the majority of space programming has been done by hospital consultants and not architectural firms, over the

past 25 years. Architects have gradually relinquished this role to a category of specialized professionals known as Hospital Consultants. On balance though, she correctly identified price competition as a "sea" change in the healthcare industry. She further described a number of conceptual remedies as it relates to healthcare facilities being adapted to this new environment.

Missing, however, were identified and quantified benchmarks in Ms. Hayward's solid documentation outlining the current state of affairs in hospital space planning. True, there was a reference to the quantity of excess beds correlated to excess space. But this provides little guidance to the hospital planner, trying to establish the detailed numeric programmatic needs, for a hospital facility that will be responsive to a healthcare environment of relentless cost cutting and price competition.

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Historic Perspective

From the late 1950's to the early 1970's E. Todd Wheeler was a recognized authority on hospital space utilization. During this period, he authored two books that in part contained the results of his exhaustive surveys of square foot areas occupied in existing hospitals. These surveys were detailed space takeoffs of hospitals that ranged from small to large institutions and included gross hospital area and a breakdown of space by department.

Mr. Wheeler's research essentially served as the standards and guidelines, albeit, an unofficial methodology, for sizing hospitals until the early 1970's. Around this time explosive growth in the healthcare industry began. This growth brought into question the validity of Mr. Wheeler's historical data. Parallel with this concern was the rise and acceptance of industrial engineering, a pseudo-scientific approach to process and rational decision making.

When fear develops a prophet will surely appear. In this case, Chi Systems with a logical methodology for determining hospital space requirements, became recognized as a leader in creating a rational if not scientific approach for sizing hospitals. It not only worked for today's needs, but could easily be used to project needs in the future by simply adjusting the numbers for projected vs. historical demand. The foundation of Chi Systems' approach was calculating space drivers as a function of workload data and utilization assumptions.

The two approaches can be classified as "top down" in the case of Mr. Wheeler and "bottom up" in Chi's method. The first identifies aggregate space both at the hospital and departmental level, while the other is based on incremental units of space. Both approaches have strengths and weaknesses.

Mr. Wheeler's top down benchmarking of space used a single common denominator of space usage. All space was presented in relation to a single hospital bed. It is interesting to note that in Mr. Wheeler's first book the average community hospital averaged approximately 650 S.F per hospital bed. The size had grown to 800 S.F. per bed at the time of his later book. Most experts agreed the size had grown to 1000 S.F. during the 1980's. Interestingly, almost no hospital planner will quote a number today because this measurement has been largely discredited. The primary shortcoming of this approach is its lack of giving insight into the details of space requirements on a room by room basis.

The major appeal of Chi System's method deals with the problem just described. It justifies space at the room level. Unfortunately, the traditional Chi methodology doesn't apply to much more than 5% of hospital space, if we exclude the bed demand analysis which determines the program for patient rooms. While the Chi

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format presents certain relationships such as so many recovery spaces per operating room, the majority of space is presented as a list of spaces that support the "space drivers." A large proportion of these support spaces are driven by code requirements. Add to these functions all the new spaces dreamed up by end users and you find that a very small amount of space is quantifiable. This has resulted in ballooning space demand in the absence of overall departmental and hospital space benchmarks as determined in a top down approach.

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Many Opinions and No Consensus

Today, for a variety of reasons, anything goes when it comes to sizing a hospital. First and foremost, is that hospital facilities have continued to be cost based reimbursed by the feds (currently being phased out), while at the same time, every other hospital expense is carefully scrutinized in today's managed care, capitated, price competitive environment. This has diminished the perceived need to economize in the area of capital development. Some hospitals erroneously believe this remains one area where profligate spending can continue unpenalized. These hospitals will have a rude awakening when cost based reimbursement for facilities is completely phased out and they are left with a mountain of debt to support with shrinking revenues and margins.

Another reason for substantial variations in hospital sizes is the concept of differentiation. One popular idea is the "center of excellence" concept. This concept almost demands an expression of excessive facilities as measured both quantitatively and qualitatively, in order to demonstrate the "center's" superiority. Naturally, architects love this need for image enhancement. Care should be taken however, not to overindulge in grandiose and financially problematic ideas.

One other factor creating major divergence's in facility utilization is the explosion of authorities with wide ranging opinions on the need for space. Thirty years ago, there were a handful of specialized hospital planning and design firms that were tightly aligned when determining space needs for hospitals. Today there are literally hundreds of so called experts that include architects, planners, and hospital consultants. Add to this the highly regarded marketing pitch, that casts both the consulting firm and the client as highly unique entities, and you have a formula that is ideal for justifying excess in setting forth space needs. This partnership of organizations with "special" needs and ideas, sets the stage for idiosyncratic facility solutions and rationalizing almost unlimited extremes of facility requirements.

In addition to the "top down" and "bottom up" approaches described a third factor influencing the sizing of hospitals is financial feasibility. For all intents and purposes this serves as an independent check and balance on capital expenditure plans. This process red flags irresponsible proposals that cannot be supported by sound financials. While financial feasibility work has served as a brake against run away development it is not a panacea for rational capital asset planning.

One short-coming is the focus on the proposed project, versus a more holistic analysis of the long term facility and capital resource needs. Hospitals unlike almost any other piece of real estate, is a complex patchwork of building components. These components have significant differences in terms of function,

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cost, condition, and age. The normal results of these conditions are project budgets that are established by current debt capacity analysis with no view to the future. These funds are then, in many cases, used for piecemeal plans with low priority needs deferred to some future date. The real problem is that high priority needs are often addressed with over-sized high cost solutions at the expense of low priority needs. The lack of a balanced and idealized overall plan for facilities and the needed resources is the reason there is such a need for hospitals to establish long range capital asset plans.

Another shortcoming of financial feasibility work is its single minded attention on the institution's ability to pay as opposed to assessment of need. This has led to a situation where tax or philanthropic supported institutions in particular, are able to rationalize excessive facility development programs due to unlimited support from taxpayers and gift givers. What is more troubling is that these inflated projects are then viewed as setting a new legitimate standard of facility provision. The following illustrates the reality of this situation.

For healthcare facilities there are almost no accepted or practical industry guidelines for planning, design, and feasibility requirements. Any planner or architect who claims to know industry norms by way of experience is in fact not very experienced. To the contrary, a truly experienced healthcare planner/architect regrettably accepts the fact that every client will expect and demand very different provisions to the exact same need. The following example exemplifies this situation.

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Tale of Two Hospitals

The following facts represent a rare opportunity to compare virtually identical institutions that recently replaced their existing facilities. Riverside County Medical Center opened in April 1998 and San Bernardino County Medical Center opened in October 1998. The two replacement facilities represent an incredible difference in space, fit-out, construction cost and resulting operating costs.

Chart 1.

	San Bernardino County Medical Center	Riverside County Medical Center
Prereplacement Similarities (2)		
Type Control	County	County
Type Care	Teaching	Teaching
Mission	Indigent care	Indigent care
Patient Days	56,323	51,031
A.P.D.	76,538	78,579
Available Beds	238	239
Hospital Size/S.F.	345,033	298,544
S.F./Bed	1,450	1,250
S.F./A.P.D.	4.5	3.8
Postreplacement Differences (3)		
New Beds	293	363
Hospital Size/S.F.	850,000	517,000
S.F./bed	2,900	1,425
S.F./A.P.D. (4)	11.1	6.6
Project Cost	$430,000,000	$200,000,000
Cost/Bed	$1,467,576	$550,965
Annual Depreciation/Interest	$40,000,000	$16,666,666 D.
Existing to New Increases		
Beds	23%	52%
Hospital Size	146%	73%
S.F./Bed	100%	14%

This example while extreme is not unusual and vividly defines

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the problem. On the one hand, we ask how could hospital planners and owners have such different perspectives of what is necessary in the way of space needs and capital resources which in the San Bernardino County Medical Center must surely be classified as wasteful. On the other hand, what kind of reliable financial modeling could support the above illustrated extremes of debt and the long term resulting impacts on financial performance.

To resolve this problem there are two approaches that might begin to improve the identification of facility needs and the rational long range demand for capital resources.

A Case for Benchmarks

One of the most significant problems in right sizing hospitals is the lack of consensus among planners on any kind of sizing benchmarks. The old rule of thumb of square feet per bed has almost universally been discredited as a reliable planning indicator. The reason most often given for ignoring the bed as a common denominator for space is the ascent of outpatient services. More important is the fact that the bed is not what it used to be. With hospitals running at slightly over 50% occupancy and many beds being converted to long term care, the bed count, to be reliable, must be adjusted if measured against space. This is a complexity Wheeler did not face in his research of hospital space per bed.

Although the bed, if adjusted properly, can serve as a useful space guideline, a more precise measurement would be the adjusted patient day. This measurement that is readily available through a variety of sources including the American Hospital Association is extrapolated from inpatient days to cover outpatient workload. In other words, both inpatient and outpatient services are combined into a common unit of measure. This number can be calculated against space to arrive at a ratio similar to square feet per bed.

Facility Performance Measurements

It is our thesis that eventual competition between healthcare providers will force hospitals to align their capital outlays and in turn right size their facilities. General Motors could not stay in business if it built plants twice the size of Ford plants to do the same job. Hospitals will eventually learn this simple rule of business as healthcare restructures.

An important step in this process is to revisit Wheeler's top down approach of researching performance standards and establishing targets for both total hospital and departmental space. This is not to say that the bottom up approach of workload analysis and calculating space drivers such as number of beds, operating rooms, delivery rooms, emergency treatment rooms and X-ray rooms, etc. is not appropriate and in fact, essential. However, just as no business would be competitive by setting prices for a new product or service by simply adding up all its expected expenses. A "space budget" will not be competitive without setting and working within competitive industry norms, i.e., space benchmarks.

Wheeler's process for establishing space guidelines in the fifties and sixties was a slavish and painstaking process of manually measuring many hospitals. Today this information and much

more is readily available through public agencies.

While many of the states collect extensive hospital data along with Medicare cost reporting, the California Office of State Healthcare Planning and Development (OSHPD) collects and makes available to the public the most extensive range of statistical information. With over 500 hospitals reporting, it represents a broad cross section of hospitals that collectively account for almost 10 percent of all U.S. hospitals. This data can be retrieved off the Web at www.oshpd.cahwnet.gov.

The OSHPD data provides a broad spectrum of data both for the entire hospital operation as well as at the departmental level. The annual reports include complete general, financial, patient discharge, physician, and departmental workload, staffing and space utilization information.

The analysis of this data can produce some startling results. At the hospital level there are some interesting divergent trends. In the demographic and use rate chart we see California hospital utilization declining even in the face of rising population. The space utilization is even more perplexing with dramatic increases in both square feet per bed and square feet per adjusted patient day occurring while every measurement of hospital utilization is declining.

Chart 2.

Demographic and Use Rates				
Years	California Pop.	Pat. Days	Adj. Patient Days	Occup. Rate
1990	29,758,000	18,456,425	23,048,125	53%
1996	31,878,000	16,272,352	21,927,366	50%
Change	7.1%	(12%)	(4.9%)	(6%)

Chart 3.

Hospital Space Utilization						
Years	Total Space	Lic. Beds	SF/Lic. Beds	Avail. Beds	SF/Avail. Beds	SF/APD
1990	86,634,694	92,952	932	86,892	997	3.7
1996	101,839,918	89,400	1,140	80,742	1,261	4.6
Change	17.5%	(3.8%)	22.5%	(7%)	26.5%	24%

Just as important as an overall guideline or rule of thumb for the total hospital are performance standards and benchmarks for individual departments.

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Square Feet per Bed

This is the oldest rule-of-thumb indicator for sizing hospital departments. It measures departmental space relative to hospital beds. Today it is not viewed as a reliable indicator, due to the significant increase in outpatient services. Still, many people use it because it's familiar and well-documented.

Square Feet per Adjusted Patient Day

We believe this should replace square feet per patient bed as an indicator of departmental space measured against overall hospital workload. Adjusted patient days can be seen as the one common denominator of hospital workload, since it measures both inpatient and outpatient activity. This is particularly important due to the fact that the typical hospital's aggregate outpatient workload has grown from approximately 10% to as much as 40% of the total workload.

Units of Service (Workload) per Square Foot

This is the most relevant indicator, as it measures the amount of work accomplished in a unit of space. In general, the greater the units of work, the higher the utilization of space. Another relationship to compare, however, is cost per unit of service (workload) to insure that high utilization of space does not become extreme to the point of increasing overall costs, thus creating an inverse relationship between space utilization and overall cost effectiveness.

Square Feet per F.T.E. (Person)

This is a very common rule of thumb that organizations use to estimate their needs for commercial office space. It also has a use as a secondary indicator for medical and support related departments in a hospital. Staff is a similar expression of workload and should correlate to Units of Service per square foot. The lower the square footage per person indicates higher space utilization.

Total Direct Expenses per Square Foot

This is another secondary indicator of space utilization. Higher expenses reflect higher utilization of space. You might ask why not measure gross revenues, net revenue or net income against space. First, this measure would only apply to revenue producing departments, rather than non-revenue producing departments such as dietary, administration and materials management functions. Secondly, the practice of shifting charges between revenue producing departments, such as artificially lowering room rates which are then compensated for by extremely high markups on medical supplies and drugs, distorts the numbers. Finally, because setting charges for various departments is somewhat arbitrary, we find revenue/income to be a less than reliable indicator when doing comparative analyses between hospitals.

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Total Direct Expenses per Unit of Service (Workload)

This is a measurement of productivity. When correlated to total direct expenses per square foot it serves as an indicator of possible space shortage. Architects have long held that over-utilization of space results in lower staff productivity. Statistical analysis at Fishback & Associates has rarely found this to be the case.

Measurement Analysis

The following chart illustrates the use of OSHPD data in determining the competitive performance between hospitals. The column designated Average Ratio can be used for setting rules of thumb or benchmarks. In determining space allocations as measured against a variety of factors. The hospitals surveyed are all owned by one system and are considered to be in the same peer group, yet there are significant variations in terms of space utilization/productivity.

Chart 4 will help analyse the data.

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Long Range Capital Asset Financial Modeling

Every hospital planner needs to understand the basics of financial feasibility for capital asset projects. This will allow a rough approximation of project scope(space) and budget to be prepared before programming a room or drawing a single line.

A good working knowledge of feasibility work will also significantly improve the facility planner's position and relevancy as a valued member of the project team. Finally right sizing the hospital will depend greatly on fitting into the financial context of an institution.

Unfortunately, most hospitals today are not operating at a level to sustain the business (capital asset needs). A hospital unlike most other types of real estate is a rapidly depreciating asset. In a sense, a hospital facility is nothing more than a large piece of medical equipment albeit with a somewhat longer life. The closest parallel to a hospital would be a manufacturing plant or factory that steadily becomes obsolete over time.

Managed care and capitation have negatively impacted hospital bottom lines in a major way. Many hospitals are even operating in the red and living off cash flow provided by the paper loss of depreciation. Most importantly, this erodes the balance sheet which is the opposite of what is required to maintain future viability. It is essential for hospitals at a minimum to save enough money that there is sufficient equity to support borrowing that will be needed and used to replace obsolete facilities and equipment in the future. This is called funded depreciation and should at least equal actual depreciation on buildings and fixed equipment.

Funding Depreciation: How Much Is Enough?

Saving at the rate of current depreciation is not ideal. The accrual of funds is a long term process and over time a divergence occurs between the value of investments, along with the associated depreciation, made in the past and the current and future inflated costs to replace the obsolete plant and equipment. The solution to this is to fund depreciation at replacement value. For example, public utilities in California have recognized this need and have built this cost into their rate structure. It is relatively simple to arrive at an annual replacement value funded depreciation amount.

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Even more difficult

What is much more difficult is to match the aggregate value of the funded depreciation and obsolescence of the overall hospital and equipment. This is due to the fact that virtually all hospitals, with the rare exception of relatively new full replacement facilities, are built in multiple phases along with piecemeal renovations and containing many different functions that become obsolete at different rates.

In lieu of a full blown facility assessment there is a somewhat crude accounting formula that establishes the age of facilities. The formula is as follows:

- Accumulated depreciation divided by annual depreciation expense equals the age of the facility. It should be noted that a facility that has been purchased will have a distorted amount of accumulated depreciation and therefore a distorted age.
- The aggregate sum of the replacement value funded depreciation account should then be the replacement value divided by the average expected life of plant and equipment say 30 years multiplied times the age of the facility. The replacement value of a facility will naturally vary by type of institution and geographic location. The following example should be considered in this context and is only for illustrative purposes based on rough rules of thumb.

Beds	**Square Feet per bed**	**Total Square Feet**
500	x 1,250	625,000
Total Square Feet	**Cost per Square Foot**	**Total Cost**
625,000 sq. ft.	x $175.00	$109,375,000
Total Cost	**Project Cost Multiplier**	**Total Project Cost**
$109,375,000	x 1.65	$180,468,750
Total Project Cost	**Average Age of Plant & Equipment**	**Annual Funded Depreciation**
$ 180,468,750	÷ 30	$6,015,625
Annual Funded Depreciation	**If Age Equals 12 years**	**Total Funded Depreciation**
$6,015,625	x 12	$72,183,000

Most hospitals are not reserving the money to replace obsolete facilities and therefore will be forced to "make do." Even to "make do" will require substantial borrowing. Understanding the limits of borrowing is another key area to understand as it relates to project financial feasibility.

There are three very important financial indicators to understand:

- Debt Capacity (Capitalized Value of the Operation)
- Debt to Equity Ratio
- Debt Service Coverage

The planner who has a good grasp of the financial performance and indicators just described will be able to construct long range capital asset planning models and scenarios. This knowledge forms the basis of an important message to share with hospital administrations. It is a message concerning long range survival. It is a story that needs telling since hospitals have become completely preoccupied by daily operations and the imperative to just survive another day.

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Alignment of Space Performance - A Must

As competitive pressures continue and hospitals recognize the long term need to rebuild obsolete facilities, a massive restructuring of the healthcare industry will ensue. The old song that American healthcare is the best in the world and is justified in spending a greater percent of national resources doesn't ring true anymore. For those who know the level of quality being provided in many foreign countries, at a fraction of the cost of U.S. medicine, it is perfectly evident that U.S. healthcare expenditures can still be greatly reduced. The problem is political in that most of the expense reduction falls into the category of staff.

Although having less impact on the bottom line, facilities must be planned in the most economical way. Planners must be careful not to give erroneous rationales such as "providing more space will allow greater operational efficiency." There is no evidence of this old planning axiom.

Ms. Hayward, in her article, made the comment "nature abhors a vacuum." It is also a fact of nature that everything seeks equilibrium between extremes. This law will inevitably force hospitals to bring their facilities in line with competitors thus avoiding the extreme anomalies cited here. Recognition of this will require planners to find common ground and encourage consensus rather than being in a race to propose unique extremes.

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3. Data gathered from project documents. San Bernadino data adjusted to exclude psychiatric beds and associated costs to normalize comparison.
4. 1996 Adjusted Patient Days (A.P.D.) is used in this calculation due to lack of projected values. In fact, current A.P.D. will probably be lower than earlier years due to drop in utilization.

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