



## KEY POINT SUMMARY

### OBJECTIVES

The purpose of this exploratory study was to determine whether net-to-gross ratios for the design of major hospital departments, mainly emergency, surgery, imaging, acute inpatient units, and intensive care units, had changed significantly during the recent period of rapid change in the field.

## Analysis of Departmental Area in Contemporary Hospitals: Calculation Methodologies & Design Factors in Major Patient Care Departments

Allison, D., Hamilton, D. K., Weinhoff, S., Gerend, M. & Grant, J. 2008 | *Final Report: January 24, 2008*

### Key Concepts/Context

Ratios used to calculate proposed departmental gross square footage constitute key information used in the process of programming, planning, and design. The ratio of net [usable] square footage to departmental gross square footage is commonly called the “net-to-gross ratio.” It is used by programmers, planners, and consultants to project the total area of proposed departments based on programmed net square feet required to perform the proposed workload of the department. This multiplying ratio, or grossing factor, is intended to estimate the amount of unprogrammed space needed to effectively organize the net, or programmed, spaces within each department before the final design is known and the actual area for these elements can be determined.

There is little documented and less researched on this topic. With substantive changes occurring in healthcare practices and technologies in recent years there is a question if the net-to-gross ratio has changed. This exploratory study was conducted to provide the healthcare design and construction field a more consistent and standardized method for area calculation and calculation of hospital departmental net-to-gross ratios.

### Methods

#### Sample

The sample included 91 departmental floor plans.

#### Setting



### DESIGN IMPLICATIONS

This pilot study produced interesting data and raised interesting questions. While the implications of the study's limitations must be kept in mind, practitioners will be able to compare their own projects to those in the study. Practitioners will be able to compare the findings, along with their own evaluations of the departmental planning associated with the specific designs, to their own projects in potentially meaningful ways.

The study examined 91 departments representing a cross-section of work from at least eight architecture firms and 23 hospitals located in 14 states plus the District of Columbia.

### Metrics and Measurement

Data collected on the floor plans included both the range and mean of departmental net-to-gross area ratios.

### Confounding Variables

None identified

### Data Analysis

Once takeoff protocols were defined, departmental net and gross calculations were performed by graduate students from Clemson University and Texas A&M. The methodology to calculate the net-to-gross ratio for each department employed Autodesk Architectural Desktop (ADT) software. The method eliminates any error from manual transfer of square footages from the floor plans into Microsoft Excel to generate the net-to-gross ratio.

### Findings

While the mean net-to-gross ratio for each department or unit type fell close to predictable factors, the range in departmental grossing factors within the sample was higher than might be expected. This seems to be a result of departmental/unit configuration, departmental/unit size, and the variation in amount of infrastructure elements within some departments.

The low-grossing factors within each departmental category, except surgery, were particularly surprising.

### Emergency Services

The mean ratio of net square feet to departmental gross was 1.58, with a standard deviation of .11.

### Imaging

The net-to-gross ratios in the study pool ranged from 1.34 at George Washington Hospital to 1.67 at Providence St Joseph's Medical Center.

### Surgery

The net-to-gross ratios ranged from a low of 1.46 at UC Davis to a high of 1.80 at Providence St. Joseph's Medical Center.

### Intensive Care Units (ICU)



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The highest net-to-gross ratio found was 1.96 at Providence Hospital Northeast, which involved a perimeter access corridor for families and a central staff work area, along with separate 8-foot-wide staff and patient corridors. The lowest net-to-gross ratio at 1.34 was found at George Washington University Hospital, a single-suite unit with 12 beds arranged in a triangular shaped suite.

### Acute Inpatient Units

While not central to this study, the DGSF per-bed ratio in the acute care sample was examined along with the net-to-gross ratio. Efficiency in acute care units may be measured in terms of both the net-to-gross ratio and DGSF per bed. These ratios did not necessarily match in the study group, except that the unit with highest net-to-gross ratio also had one of the higher DGSF/bed ratios [708 SF] and the unit with the lowest net-to-gross ratio had the lowest DGSF/bed ratio [353 SF]. The smallest unit – 12 beds – stood out for having one of the lower net-to-gross ratios [1.44] and the highest DGSF/bed ratio [792 SF]. The average DGSF/bed ratio across the sample pool was 598 SF per bed. The highest net-to-gross ratio found was 1.79 at Providence Hospital Northeast, which is a bowed racetrack plan with what appears to be large central open areas. These open areas were counted in the DGSF. This planning concept obviously contributes to its high ratio.

### Limitations

The limitations of this study were as identified by the authors as follows: The study is based on a small sample size. While numerous firms were asked to participate, only a small number contributed. The number of the sample [n] and the emphasis on plans from one firm reduces the ability to generalize and the reliability of the study findings, as does the variation in project types within the small sample. Also, the types from small, rural facilities to community hospitals and huge academic medical centers make direct comparison of the findings somewhat problematic unless they can be sorted by categories, and that would result in even smaller sample sizes. The study was not structured to ask detailed questions of the participating firms.

In each case the researchers do not know whether the architects agreed with the target ratio or whether they were satisfied with the result. The researchers had not collected documentation of the program, the design intent, post-occupancy evaluation, or the perception of the plan's performance. Important information about the resulting data may be missing.