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Abstract: Hospital productivity has been a research topic for over two decades. We expand on this research to include measures of dis/economies of scope. By using the Free Coordination Hull (FCH) we are able to determine if hospitals in our sample can become more efficient if they provide more services (diseconomies of scope) or if two smaller hospitals with a reallocation of resources could become more efficient (economies of scope). Using data from the American Hospital Association for the years 2004-2007, we found variations among hospital markets (measured by the Core Based Statistical Area). We can determine whether dis/economies of scope exist by comparing the results from two linear programming problems. Focusing on four markets: Los Angeles, Philadelphia, Madison, WI , and New Orleans we found variations in how best these hospitals operating in these markets could change in order to increase both scale and scope efficiencies. This approach could be used by policy makers and managers in order to reduce costs by sharing, reducing, or expanding services in hospitals. Findings from a study such as this should aid reform programs by providing more information on the sources of hospital inefficiency.

Keywords: Hospital, Efficiency, Economies of Scope, Hospital Markets

1. Introduction

Health care's share of U.S. GDP was 16.2% in 2007 and is expected to be 17.6% in 2009 (Sisko et al., 2009). U.S. national health expenditures (NHE) totaled $2.2 trillion dollars in 2007; the largest single component of NHE, about one-third, was hospital care ($696.5 billion). Despite efforts to control costs, including the move from fee-for-service to prospective payment systems for hospital services and the introduction of managed care, there remains considerable evidence of inefficiencies in the provision of health care. Much of the literature on the efficiency in health care has examined hospital efficiency. (See Hollingsworth et al., 1999, Hollingsworth, 2003, and Hollingsworth, 2008, for surveys of the literature on the efficiency of health care.)

We contribute to the body of evidence on the efficiency of hospitals in two ways. First, we examine two aspects of hospital efficiency that have received little attention—size efficiency (Maindiratta, 1990) and the efficiency of service offerings. The first concept examines whether smaller or larger hospitals are more efficient; the second concept examines whether specialized or diversified service offerings are more efficient. Second, to examine size and service offering efficiency we use modifications of both Maindiratta's measure of size efficiency and of the free coordination hull (FCH)—a relatively new representation for technology—introduced by Green and Cook (2004).

The next section of the paper discusses the notions of size efficiency and the efficiency of service offerings and some of the health sector studies that examine these notions. Section 3 develops the model used to assess size and service offering efficiency, while section 4 discusses the data used in our analysis and the results we obtain. Section 5 concludes.

2. Methods

2.1 Literature Review

Most studies of hospital efficiency focus on the measurement and, possibly, the determinants of technical efficiency. Technical efficiency concerns how proficiently inputs are transformed into outputs. Many hospital efficiency studies also examine scale efficiency—a measure of the potential gain available by scaling a hospital's operation up (in the case of increasing returns) or down (in the case of decreasing returns) to "most productive scale size" (MPSS—i.e., constant returns to scale) in order to minimize the unit cost of production. Maindiratta (1990) introduced the related notion of size efficiency. Size efficiency addresses the question of whether a given level of output could be more efficiently produced (i.e., lower input usage) by a number of equally sized smaller firms that in aggregate produced the same level of output as the original, single larger firm.

For example, suppose that the MPSS were 800 units of output, with increasing returns when fewer than 800 units were produced and decreasing returns when more than 800 units were produced. Suppose that a hospital producing 1000 units of "output" was observed—the hospital would be scale inefficient because it is too large. To become scale efficient, the hospital would have to contract output to 800 units—but what becomes of the 200 units of output the hospital "shed" to become scale efficient? Size efficiency assumes that 1000 units of output need to be produced—it assesses whether the 1000 units are more efficiently produced using a single large (1000 unit) hospital, two 500 units hospitals, four 250 unit hospitals, etc. In assessing the "optimal apportionment" of output, scale efficiency assumes that production can be scaled by non-integer amounts, while size efficiency restricts re-scaling to integer values.

Maindiratta (1990) illustrated the concept of size efficiency using a random subset of the hospitals originally analyzed by Banker et al. (1986). Of the fifty-five hospitals in Maindiratta's sample, sixteen were smaller than or equal to MPSS; due to the convex nature of the technology he used in his model, these sixteen hospitals were all size efficient. The remaining thirty-nine hospitals operated above MPSS—they were hence scale inefficient, but were not necessarily size inefficient. Five of thirty-nine scale inefficient hospitals were found to be size efficient—re-apportioning output across a number of equally sized smaller firms would have resulted in input usage that exceeded that of the observed hospitals. However, thirty-four of the thirty-nine scale inefficient hospitals were also found to be size inefficient. For the size inefficient hospitals, input usage could have been reduced if in each case output had been re-apportioned among a number of equally-sized smaller hospitals. The number of hospitals among which observed output was re-apportioned ranged from two to seventeen, with a mean (mode) of 5.8 (2) smaller hospitals.

Chattopadhyay and Ray (1996) examined the technical, scale, and size efficiency of a sample of 140 nursing homes operating in Connecticut in 1982-1983. Fifty of the 140 nursing homes were larger than MPSS; of these, 39 were size efficient while 11 were size inefficient. Among the nursing homes operating over MPSS, the mean size efficiency was approximately 0.92. This compares with a mean scale efficiency score of approximately 0.97 for their full sample of 140 hospitals, suggesting that size inefficiency may be more costly than scale inefficiency.

The size distribution of U.S. hospitals "has changed dramatically over time" (Santerre and Pepper, 2000; p. 183). Santerre and Pepper (2000) report that throughout the twenty year period 1973 to 1993, the proportion of medium sized hospitals (100-299 beds) increased; changing from about 30% of all hospitals to almost 40% of all hospitals. The proportion of large hospitals (300 and more beds) increased from 1973 to 1983, but then declined from 1983 to 1993. Santerre and Pepper (2000) attributed the observed evolution of hospital size to various market factors (e.g., managed care) and regulatory changes (e.g., changes in CON laws).

Information on size efficiency can help guide policies that shape the U.S. hospital industry as it continues to evolve. If size inefficiency exists, then a larger number of smaller hospitals would be more efficient than would a smaller number of larger hospitals. Of course, size efficiency is just one of the determinants of "optimal" hospital size—other factors to consider include access to care, travel time, quality of care, etc.

While hospital size is one factor that affects costs, the number of services offered by hospitals is another cost influence. Technological advances and the services that they engender have been blamed for the increasing cost of hospital care (Cutler, 2000). To attract physicians and patients, hospitals may engage in non-price competition—competition on the variety and sophistication of services offered, for example.

It has long been argued that non-price competition leads to "slack" in both the capital and labor that hospitals employ; one argument was that physicians could then substitute the extra hospital inputs for their own time (Pauly, 1980). As an example of slack in capital equipment, Brown et al. (1990) reported that by 1990 the estimated number of dedicated mammography machines would be almost four times the demand for the machines. The noted that "[t]he current condition of excess supply is probably unsustainable over the long term" (Brown et al., 1990, p. 547). This excess supply has not disappeared with time—Günes et al. (2004) cite a 2002 GAO study that estimated that only two-thirds of mammography machine capacity was being utilized.

Kessler and McClellan (2000) have argued that the non-price competition waged among hospitals is tantamount to a "medical arms race," which leads to a reduction in social welfare due to higher costs, excess capacity, and perhaps lower quality of care. In a study of Florida hospitals, Fournier and Mitchell (1992) concluded that while price competition had increased in the hospital industry, cost-raising non-price competition was still evident. To combat the increasing rate of hospital cost growth, the Medicare Program introduced the Medicare Prospective Payment System (PPS). Evaluation of this program demonstrated that hospital cost growth was slowed by removing the financial incentives for hospitals to increase admissions, length of stays, and other inpatient treatments that could be substituted with outpatient care (Sloan et al., 1998). In addition to the imposition of a government cost reducing plan, Bamezai et al. (1999) found that over the period 1989-1994 the rise of PPOs and HMOs helped to reduce the duplication of amenities and services that non-price competition had previously existed, though only in "competitive hospital markets." Devers et al. (2003), on the other hand, argued that between 1996-1997 and 2000-2001 there was a shift in hospitals' competitive strategies, whereby "a new medical arms race is emerging" with an attendant increase in "service mimicking and one-upmanship."

The American Hospital Association's *Annual Survey of Hospitals* for fiscal year 2007 lists 124 different services that could be provided by a hospital. These services range from palliative care and social services to sophisticated radiological diagnostics, intensive care for a variety of patients (psychiatric, adult, and pediatric), and transplant surgeries. The proliferation of services made possible by advances in medical technology and adopted in part due to the "arms race" among hospitals is likely to have led to higher health care costs. Without a commensurate demand for services, hospitals wishing to compete by offering a wide array services would still incur the costs associated with investing in and promoting the services. Excess capacity would increase overall costs without any offsetting revenues. Conversely, with greater specialization, fewer hospitals would offer any given service, which would increase patient demand per hospital for the service and would likely lead to lower average costs and in turn lower prices. Hospitals are labor intensive institutions; this is often cited as a reason why the hospital sector lags behind the rest of the U.S. economy in terms of productivity gains (Lichtenberg, 2003). By specializing, hospitals could focus on their core competencies, thus improving productivity.[1] One role of hospitalists, a growing medical specialty in the U.S., is to help hospitals manage the utilization of sophisticated, and expensive, technologies (David et al., 2009)

Since lower costs are a major objective in health care reform, ascertaining the optimal size and scope of services hospitals offer into the viable policy options available as part of health care reform. In other words, our approach has practical applications since this information would provide hospital administrators and policy makers' practical strategies that could lead to improved efficiency.

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[1] Greater specialization among hospitals would increase each hospital's volume of services offered, which would increase capacity utilization and, potentially, quality (Kraus et al. 2005)

Of course, the provision of multiple services by a single provider may be cost advantageous—there may be cost "complementarities" among the services, the "integration" of services within a hospital may reduce transactions cost, etc. The notion of "economies of scope" (Panzar and Willig, 1981) was developed to determine whether joint production of products is more cost effective than the separate production of the outputs by multiple firms. Panzar and Willig (1981) considered an extreme case—completely joint vs. completely disjointed production. Like many others, we use the term economies of scope more loosely; we are concerned with whether greater specialization (fewer services) or greater diversification (more services) is the more efficient production arrangement.

For example, Prior and Solà (2000) analyzed economies of scope using data envelopment analysis (DEA) on a sample of Catalan hospitals. They split their sample into hospitals with "balanced" output mixes and those that were more specialized in some of the outputs. Using a two step application of DEA to various subsets of the data, they found that costs could be reduced through the diversification of the output mix offered. However, Prior and Solà (2000) note that because they used DEA, the reference hospitals serving as the benchmarks in their analysis are only theoretically possible; this same problem plagues other studies using the DEA approach.

Kittelsen and Magnussen (2003) also used DEA to examine economies of scope in hospital production. Using a sample of Norwegian hospitals, they were interested in whether greater specialization should have been adopted as hospital ownership was transferred from the county to the state level. To overcome the convexity limitation of DEA,[2] Kittelsen and Magnussen (2003) split their sample into output based quintiles—the top and bottom quintiles were deemed specialized, while the middle quintiles were deemed diversified. They found some evidence of economies of scope, though average efficiency was higher for specialized hospitals than for diversified hospitals (which they noted may be an artifact of the DEA methodology).

In a related study, Lee et al (2008) used a two step procedure to examine the relationship between specialization and hospital efficiency. They first performed as DEA

[2] Earlier studies have proposed ways to measure economies of scope using the nonparametric method DEA (e.g., Ferrier et al. (1993), Morita (2003)); unfortunately, DEA imposes convexity on the reference technology. The drawback of convexity is that there can be no measure of efficiency improvements by specialization gains because, by construction, the convex combination of two or more production plans is always on or below the efficient frontier.

analysis and classified hospitals as either efficient or inefficient. They then used an information theory based index of hospital (case—mix) specialization as an explanatory variable in a logistic regression (the dependent variable was "1" if a hospital was efficient and "0" if a hospital was inefficient). Lee et al. (2008) found that more specialized hospitals were more likely to be efficient, suggesting that there was a benefit to specialization.

Finally, Preyra and Pink (2006) reported that the Province of Quebec had recently undertaken a massive restructuring of its hospital sector, closing some hospitals, merging others, and transferring programs among the remaining hospitals. Preyra and Pink (2006) analyzed data from Quebec's hospital sector in the years prior to the restructuring in order to gauge the potential economies of scale and scope available from the restructuring. Estimating non-frontier cost functions, they found evidence of potential efficiency gains due to scale and scope economies existed prior to the restructuring. It is hoped that our approach can provide further insight into potential efficiency gains in the hospital sector.

In this paper we model hospital production using the Free Coordination Hull (FCH) proposed by Green and Cook (2004). The benefit of FCH over DEA is that FCH does not impose the convexity assumption that Kittelsen and Magnussen (2003) noted was problematic when assessing economies of scope. By using the FCH approach we can generalize the Panzar and Willig (1981) concept of economies/diseconomies of scope in order to determine whether diversification of hospitals that provide more technological/health care services increases efficiency or whether more community oriented hospitals (i.e., fewer technological/health care services per hospital) would improve hospital efficiency. Furthermore, by using the additivity feature of FCH, we can determine whether reapportionment of existing hospitals into smaller more community oriented hospitals or diversification into larger, more technologically advanced hospitals (economies of scope) is the more viable policy alternative to improving productivity and efficiency which are necessary conditions for cost reductions. While Maindiratta's (1990) economies of size measure was limited to comparing an existing hospital to replications of a single smaller hospital, our approach allows reapportionment across any number of smaller hospitals. Therefore, we can inherently assess the effectiveness of mergers/or sharing services by two of these more community hospitals would provide good policy for reducing costs.

Given the interest in controlling health care costs and the inconclusive evidence on the role of size and scope on hospital costs, we hope to provide new insights into how hospitals services might be more efficiently provided by examining both the size efficiency and service offering efficiency of hospitals operating in the largest U.S. markets. We do so by modifying

Maindiratta's (1990) notion of size efficiency and by employing a modification of the FCH model. We examine the potential optimal reapportionment of hospital activities by measuring efficiency under two different assumptions on technology. Under our first assumption, we constrain the technology in order to compare the evaluated hospital with reference hospitals having the same activity level but with fewer technological services. Any inefficiency arising from this comparison could be interpreted as diseconomies of scope since it would show that the same activity could be done with fewer inputs and fewer technological services. Under our second assumption, we constrain the technology to hospitals that offer more services. We can then compute economies of scope where efficient referents have a larger scope of specialized activities in order to determine which assumption dominates the hospitals being evaluated by identifying the case (assumption one vs. assumption two) where the potential gain in efficiency is the largest.

2.2. The FCH Methodology

We assume that hospital production involves the transformation of *N* inputs into *M* outputs, where $x = \left(x_1, \dots, x_N\right) \in R_+^N$ is the vector of inputs and $y = \left(y_1, \dots, y_M\right) \in R_+^M$ is the vector of outputs. The transformation of inputs into outputs is governed by technology, which can be represented by:

$$T\left(x, y\right) = \left\{y : y \; can \; be \; produced \; from \; x\right\} \qquad (1)$$

The "best-practice" technology can be estimated from a sample of observed hospitals. Suppose that there are *k* = 1,…,*K* hospitals in the sample. In many hospital efficiency studies, the technology is represented by the variable returns to scale data envelopment analysis (DEA) model (Banker et al., 1984):

$$T^{DEA} = \left\{ (x, y) : \sum_{k=1}^{K} \lambda^k y_m^k \geq y_m, \forall m \in M, \sum_{k=1}^{K} \lambda^k x_n^k \leq x_n, \forall n \in N, \lambda^k \geq 0, \sum_{k=1}^{K} \lambda^k = 1 \right\} \qquad (2)$$

Note that this is a convex technology—a linear combination of observed hospitals forms the reference technology, with the weight assigned to the k^{th} hospital in the linear combination given by λ^k. Furthermore, there is no limit to the number of production plans that form the reference technology; however, the sum of the weights on reference production plans must sum to unity. Under DEA, a "composite" hospital formed as the convex combination of sample hospital is used to assess the efficiency of each hospital in the sample.

An alternative representation of technology is given by the free disposal hull (FDH) model (Deprins et al., 1984):

$$T^{FDH} = \left\{ (x,y) : \sum_{k=1}^{K} \lambda^k y_m^k \geq y_m, \forall m \in M, \sum_{k=1}^{K} \lambda^k x_n^k \leq x_n, \forall n \in N, \lambda^k \in \{0,1\}, \sum_{k=1}^{K} \lambda^k = 1 \right\} \quad (3)$$

The FDH technology does not impose convexity, so only observed hospitals (and not composites of observed hospitals) define the best-practice frontier relative to which efficiency is assessed. However, under FDH only a single observed hospital serves as the benchmark against which efficiency is assessed; this can be seen by the restrictions on λ^k—the value must be 0 or 1 for each hospital and the values must sum to 1.

A more recent representation of technology is the free coordination hull (FCH) technology (Green and Cook, 2004):

$$T^{FCH} = \left\{ (x,y) : \sum_{k \in K} \lambda^k y_m^k \geq y_m, \forall m \in M, \sum_{k \in K} \lambda^k x_n^k \leq x_n, \forall n \in N, \lambda^k \in \{0,1\} \ \forall k \in K \right\} \quad (4)$$

Unlike DEA, but like FDH, the FCH technology does not impose convexity. Unlike DEA, but like FDH, "whole" observed hospitals rather than fractions of observed hospitals form the reference technology (i.e., $\lambda^k \in \{0,1\}$ as in FDH rather than $\lambda^k \geq 0$ as in DEA). However, like DEA, but unlike FDH, multiple hospitals form the reference frontier (i.e., the summation restriction on λ^k that appears in the DEA and FDH technologies does not appear in the FCH technology). With the FCH reference technology, a hospital can be evaluated in terms of other observed hospitals added together.

Because we want to measure the potential gain from the reapportionment of activities, we are interested in finding the frontier, or envelope, of the technology. Following Shephard (1953, 1970) and Farrell (1957) this frontier can be derived using a distance function, which under standard assumptions provides a complete representation of technology. By using an input orientation, observations interior to the envelope of the technology must contract their inputs until they are projected onto the technological frontier. In particular, we use a directional input distance function, which can be written as:

$$\vec{D}_i(x, y; g_x) = \sup_{\delta} \left\{ \delta \in R_+ : (x - \delta g_x, y) \in T \right\}, \quad (5)$$

From (4) and (5), using the FCH representation of technology, the inefficiency of hospital j is given by the solution to the following linear program:

$$
\begin{aligned}
&\vec{D}_i\left(x^j, y^j;\, g_x\right) = \max_{\delta,\lambda}\ \delta \\
&\text{s.t.} \\
&\sum_{k\in K} \lambda^k y_m^k \geq y_m^j \quad \forall m \in M \qquad\qquad (6) \\
&\sum_{k\in K} \lambda^k x_n^k \leq \left(x_n^j - \delta\cdot g_x\right) \quad \forall n \in N \\
&\lambda^k \in \{0,1\} \quad \forall k \in K
\end{aligned}
$$

where δ measures the maximal reduction of inputs required for projection onto the frontier. If $\delta = 0$, the hospital being evaluated is efficient in the sense that neither the observed hospital nor the addition of smaller hospitals could produce the same level of output with fewer inputs.

Since we are interested assessing a community type hospitals versus hospitals offering more services, we can vary the specification of the technology by which hospitals should be evaluated. One option is to split the sample among hospitals as a function of the technological diversification—this this would be based on the number and types of services each hospital offers. Alternatively, hospitals that have fewer technological services, but may focus on a particular "specialization" such as extensive diagnostics, for example, would only be compared with other hospitals sharing this distinction.

To develop an index of scope, we include the counts of services provided by the hospitals. Recall that we are interested in the comprehensive nature of hospital services. We partition the full set of services into L broad categories. We now introduce a vector of services, $s = \left(s_1, \ldots, s_L\right) \in R_+^L$, which contains a count of services in each of the L grouping (In Table 1, we provide the groupings of services). For each evaluated hospital we can now partition the reference set into more or less diversified technologies regarding a constraint on the variable '*s*'. (Specific services by groupings are listed in Appendix 1.) We also evaluate hospitals at the CBSA level[3] which are aggregations of the largest cities, since this allows comparisons across hospital markets. The technology, however, is still defined as the hospital level.

The inefficiency due to diseconomies of scope within hospitals in each CBSA is evaluated by the following program:

[3] A new definition of the metropolitan areas, the "Core Based Statistical Area," or CBSA, replaced the "Metropolitan Statistical Area" (MSA), after the 2000 U.S. Census.

$$\vec{D}_i^-\left(\sum_{j\in CBSA} x^j,\ \sum_{j\in CBSA} y^j;\ \sum_{j\in CBSA} x^j\right) = \max_{\delta,\lambda}\ \delta$$

s.t.

$$\begin{aligned}
&\sum_{k\in K} \lambda^k y_m^k \geq \sum_{j\in CBSA} y_m^j \quad \forall m\in M \\
&\sum_{k\in K} \lambda^k x_n^k \leq (1-\delta) \sum_{j\in CBSA} x_n^j \quad \forall n\in N \\
&\sum_{k\in K} \lambda^k s_l^k \leq \sum_{j\in CBSA} s_l^j \quad \forall l\in L \\
&\lambda^k \in \{0,1\} \quad \forall k\in K
\end{aligned} \tag{7}$$

The interpretation of the results given LP (7) is that for the hospital being evaluated to become more efficient it needs to offer fewer services.

The potential gain in efficiency due to economies of scope of hospitals in an evaluated CBSA is evaluated by the following linear program:

$$\vec{D}_i^+\left(\sum_{j\in CBSA} x^j,\ \sum_{j\in CBSA} y^j;\ \sum_{j\in CBSA} x^j\right) = \max_{\delta,\lambda}\ \delta$$

s.t.

$$\begin{aligned}
&\sum_{k\in K} \lambda^k y_m^k \geq \sum_{j\in CBSA} y_m^j \quad \forall m\in M \\
&\sum_{k\in K} \lambda^k x_n^k \leq (1-\delta) \sum_{j\in CBSA_i} x_n^j \quad \forall n\in N \\
&\sum_{k\in K} \lambda^k s_l^k \geq \sum_{j\in CBSA} s_l^j \quad \forall l\in L \\
&\lambda^k \in \{0,1\} \quad \forall k\in K
\end{aligned} \tag{8}$$

In other words, for the hospital being evaluated using LP (8), the hospital should increase the number of services.

We infer whether there are economies or diseconomies of scope within each CBSA by comparing the optimal solutions to the linear programming problems given by equations (7) and (8):

1) If $\vec{D}_i^- = \max\{\vec{D}_i^-, \vec{D}_i^+\}$, then diseconomies of scope prevail and the activity in the evaluated CBSA could be maintained by reducing the total resources by δ and by reducing the number of technological services.

2) If $\vec{D}_i^+ = \max\left\{\vec{D}_i^-, \vec{D}_i^+\right\}$, then economies of scope arise and the activity could be maintained by reducing the total resources by δ and by increasing the number of technological services.

The standard directional input distance function approach given by equation (6) only considers the inputs and outputs associated with a hospitals production technology. By augmenting the standard directional input distance function by including constraints on the numbers of services offered within service categories (equations (7) and (8)), our empirical analysis adds a degree of complexity that allows us to discern whether there are economies or diseconomies of scope associated with service offerings.

2.3. Data

To study productivity and inefficiency due to either technical, size, or lack of specialization, we employ data drawn from the American Hospital Association's *Annual Survey of Hospitals* for the four years 2004-2007. We use these data since the AHA is the most comprehensive data set of all hospitals operating in the U.S.

At the hospital level, the total sample size is 1,940. This sample is broken down to 75 CBSA over 4 years (2004-2007); see Table 2. To model the productive process in our sample, we specify inputs to include: the numbers of licensed and staffed beds, bassinets, operating rooms, full time equivalency (FTE) registered nurses, FTE licensed and practical nurses, FTE physicians, FTE residents and other medical trainees, and FTE other personnel.

We focus only on the hospital side of the operation rather than including both the hospital and the nursing home component operating within the hospital. Outputs include the total numbers of case-mix adjusted admissions (the Medicare case mix index multiplied by the number of admissions), inpatient surgeries, outpatient surgeries; emergency room visits, outpatient visits, and births.

3. Results

As explained above, economies or diseconomies of scope will depend on $\min\left\{\vec{D}_i^-, \vec{D}_i^+\right\}$. Over the 4 years 2004-2007, 57 CBSAs (19%) are efficient with respect to both the less and more diversified technologies. Thus, hospitals operating in these CBSAs are size-efficient in the sense of Maindiratta (1990). They are also scope-efficient in the sense that they should not split their activities among more or less diversified hospitals. Among the remaining observations, 153 CBSAs (51%) are inefficient with respect to both the less and more diversified technologies (i.e., they are inefficient with respect to both linear program (5) and (6)) indicating that they are inefficient with respect to both size and diversification. The majority of these CBSAs (102 of the 153) would benefit from becoming more diversified; the remainder of these "doubly inefficient" CBSAs (51 of 153) would benefit by becoming less diversified.

Ninety of our 300 observations are efficient with regards to one of the two technologies, but are inefficient with respect to the other. Almost all of these, 89 of 98 CBSAs, appear efficient relative to the less diversified technology, but inefficient with respect to the more diversified technology. We have, therefore, evidence suggesting the presence of economies of scope in this case. However the converse is not true. Only one CBSA appears efficient regarding the more diversified technology and inefficient compared to the less diversified; suggesting a potential gain from becoming less diversified. Overall, the results indicate that more, not less diversification, is needed to improve performance.

Table 6 presents the findings on scope economies for each CBSA for each year in our sample. Because of the specificity of our sample set, we focus our discussion of the results on four CBSAs representing four regions of the U.S.: East (Philadelphia, PA), South (New Orleans, LA), Midwest (Madison, WI) and West (Los Angeles). Interpretations of the other CBSAs are left to the reader.

Our four example CBSAs are very different and inefficiencies that arose were due to different sources. From our results, hospitals in Los Angeles can gain efficiency to a much larger degree by incorporating more diseconomies of scope. Having more diversified hospitals rather than more community oriented hospitals would have served this hospital market better. Conversely, our findings for Philadelphia suggest that improving efficiency in this market would come about with more community based rather than highly diversified hospitals. The hospitals operating in Madison are relatively efficient and practicing at the correct scale and scope in all four years of our sample. This finding corresponds to another related finding, that average Medicare reimbursements in Madison are lower than for the rest of the state of Wisconsin—$5,213 for Madison hospitals as compared to $5,407 state-wide. In both Los Angeles and Philadelphia, Medicare reimbursements to these CBSA hospitals were $9,752 (California average $7,424) and $8,344 (Pennsylvania average $7,424) respectively. We point this out to demonstrate earlier studies using non-parametric approaches, that more efficient practices are less costly, ceteris paribus.

Our last case example, New Orleans is reviewed because of the wide spread destruction and hospital closures caused by Hurricane Katrina in 2005. In 2004, hospitals in the New Orleans CBSA were only 4% inefficient, due to less economies of scope. However, after Hurricane Katrina, particularly in 2007, we note a change—hospitals became relatively more efficient (2%) than in 2004. Eliminating this small inefficiency could be achieved via diseconomies of scope.

A summary of the distribution of "scope" economies by year appears in Table 7. In 2004, 17 (23% of) CBSA could gain from diseconomies of scope that it is they could improve their efficiency by reducing the number of activities (i.e., providing a smaller range of activities). 14 (19%) were efficient while the majority (59%) could benefit from economies of scope i.e., increasing the number of services. The results are quite stable with time. We can conclude than economies of scope are the main source of improvement in CBSA efficiency. But given our findings from the four example CBSAs, this is not generalizable across all cities, and individual care should be given when assessing specific market areas.

4. Summary and Conclusions

In this paper we utilized the Free Coordination Hull (FCH) representation of technology to examine the size and scope efficiency of the hospital market in 75 U.S. metropolitan areas (CBSAs) over four years, 2004-2007. We found that, in general, hospital productivity would be enhanced if service offerings were expanded—i.e., for the vast majority of inefficiency CBSAs, performance would improve expanding the availability of services in the metropolitan area. However, when assessing four separate examples, we found contrasting results. Therefore, for efficient hospital coordination leading to lower costs is to occur, the policy prescription is different in Los Angeles (more diseconomies of scope or a concentration of more services in the hospitals) from what would be effective in Philadelphia. In this case, more economies of scope – fewer services in community oriented hospitals rather than a concentration of diversification. Madison hospitals appeared efficient in all four years, and interestingly, this finding corresponds to another related finding, that average Medicare reimbursements in Madison are lower than for the rest of the state of Wisconsin— $5,213 for Madison hospitals as compared to $5,407 state-wide. In both Los Angeles and Philadelphia, Medicare reimbursements to these CBSA hospitals were $9,752 (California average: $7,424) and $8,344 (Pennsylvania average: $7,424) respectively. We point this out to demonstrate earlier studies using non-parametric approaches, that more efficient practices are less costly, ceteris paribus. Whereas the causes of the relatively small inefficiencies in New Orleans changed from more community oriented hospitals (economies of scope) to more diseconomies of scope, i.e., diversified hospitals. The required degree of diversification in New Orleans, however, may have arisen from the closure of Charity Hospital (the large and diversified public teaching hospital) and if re-opened to its former status may eliminate the diseconomies of scope in the New Orleans CBSA.

Applying the findings from previous studies, we can surmise that Philadelphia hospitals would be more efficient if resources were reallocated throughout the CBSA, particularly with so many teaching hospitals in the Philadelphia area, each providing the most technologically advanced type of care. In other words, sharing services among hospitals, as advocated by Bamezai et al. (1999), could increase efficiency and thereby lower costs. Conversely, the hospitals operating in the Los Angeles area may benefit by having more diversified i.e., the offering more services, would increase efficiency as suggested by the findings of Prior and Solà (2000). Our finding in regards to Los Angeles hospitals may be due to the large population in the Los Angeles CBSA and the distance patients may have to travel for sophisticated care.

Our purpose in this paper was to demonstrate a novel approach in assessing the potential gains in hospital efficiency from either diversifying or reallocating services to more hospitals thereby saving costs via economies of scope. A limitation of this study, however, was the lack of any quality of care measures. Once more quality outcomes can be assessed at the hospital level, a more concise relationship between diversification and hospital efficiency can be gleaned.

Even in light of the shortcoming in our modeling and presenting methodology used here, this approach can be adapted to use quality based measures (when available on as large a scale as AHA hospital data) and allow hospital managers and health policy makers to determine the optimal size and number of services available across a CBSA. By using a more rigorous approach such as the one presented here, policy makers can identify how best to provide the necessary services at lower a main objective of health care reform.

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Table 1: Groups of services
Group 1: General hospital characteristics
Group 2: Types of short stay care
Group 3: Types of special short stay care
Group 4: Types of medium term care
Group 5: Types of Long term care
Group 6: Dedicated programs
Group 7: Other types of services
Group 8: Equipments

Table 2: Number of hospitals by CBSA and Year

CBSA	2004	2005	2006	2007	Total
Akron	2	2	2	2	8
Albuquerque	4	5	4	3	16
Anchorage	2	3	2	3	10
Atlanta-Sandy Springs-Marietta	9	8	8	6	31
Austin-Round Rock	6	6	8	10	30
Bakersfield	6	5	3	4	18
Baltimore-Towson	12	11	13	13	49
Baton Rouge	2	3	2	5	12
Birmingham-Hoover	9	8	4	7	28
Boston-Quincy	5	6	6	5	22
Buffalo-Niagara Falls	2	3	2	3	10
Charlotte-Gastonia-Concord	5	5	5	5	20
Chicago-Naperville-Joliet	24	21	20	15	80
Cincinnati-Middletown	6	7	6	8	27
Cleveland-Elyria-Mentor	8	9	10	11	38
Colorado Springs	2	2	1	1	6
Columbus	6	5	6	6	23
Corpus Christi	2	1	2	2	7
Dallas-Plano-Irving	12	11	14	17	54
Denver-Aurora	8	7	8	6	29
Detroit-Livonia-Dearborn	6	6	6	5	23
El Paso	6	7	7	6	26
Fort Wayne	3	4	4	3	14
Fort Worth-Arlington	9	9	10	10	38
Fresno	3	3	3	4	13
Greensboro-High Point	1	1	1	1	4
Honolulu	5	5	5	4	19
Houston-Sugar Land-Baytown	18	18	19	18	73
Indianapolis	2	3	4	5	14
Jacksonville	4	5	5	5	19
Kansas City	8	8	6	6	28
Las Vegas-Paradise	5	6	5	6	22
Lexington-Fayette	5	5	5	4	19

Lincoln	2	2	2	2	8
Los Angeles-Long Beach-Glendale	39	39	34	30	142
Louisville	5	5	4	5	19
Lubbock	3	3	3	3	12
Madison	3	2	3	3	11
Memphis	5	4	2	1	12
Miami-Miami Beach-Kendall	9	6	10	8	33
Milwaukee-Waukesha-West Allis	7	7	7	5	26
Minneapolis-St. Paul-Bloomington	6	7	5	5	23
Modesto	3	3	2	2	10
Montgomery	1	1	3	3	8
Nashville-Davidson--Murfreesboro	6	5	6	4	21
New Orleans-Metairie-Kenner	4	2	3	5	14
New York-White Plains-Wayne	31	28	29	34	122
Newark-Union	4	5	4	3	16
Oakland-Fremont-Hayward	2	3	2	3	10
Oklahoma City	7	7	8	7	29
Omaha-Council Bluffs	4	4	5	5	18
Philadelphia	12	10	10	10	42
Phoenix-Mesa-Scottsdale	15	16	18	17	66
Pittsburgh	8	8	8	8	32
Portland-Vancouver-Beaverton	6	6	6	6	24
Raleigh-Cary	3	3	3	3	12
Riverside-San Bernardino-Ontario	5	4	3	3	15
Rochester	4	3	2	3	12
Sacramento--Arden-Arcade--Roseville	6	6	6	6	24
San Antonio	6	7	7	7	27
San Diego-Carlsbad-San Marcos	6	6	5	6	23
San Francisco-San Mateo-Redwood City	8	7	6	7	28
San Jose-Sunnyvale-Santa Clara	5	5	5	3	18
Santa Ana-Anaheim-Irvine	7	5	5	6	23
Seattle-Bellevue-Everett	6	5	6	6	23
Shreveport-Bossier City	4	2	2	2	10
St. Louis	12	12	12	12	48
Stockton	2	2	2	2	8
Tampa-St. Petersburg-Clearwater	8	8	6	8	30
Toledo	4	4	4	4	16
Tucson	6	6	4	5	21
Tulsa	5	5	5	6	21
Virginia Beach-Norfolk-Newport News	6	6	6	6	24
Washington-Arlington-Alexandria	4	4	5	5	18
Wichita	3	2	2	4	11
Total	**499**	**483**	**476**	**482**	**1940**

Table 3: Descriptive statistics of the inputs

	2004		2005		2006		2007	
Inputs	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Beds	362.5	241.5	367.7	249.0	366.6	246.1	365.3	259.8
Bassinets	26.6	24.3	26.9	25.0	26.1	25.6	26.0	25.2
Operating Rooms	16.1	13.2	16.6	12.9	17.2	13.3	17.3	14.1
FTE_Doctors	55.4	165.1	56.6	175.5	62.6	189.0	63.7	191.4
FTE_Trainees	94.3	208.6	93.6	205.7	95.7	209.3	106.2	228.2
FTE_RN	581.6	506.0	615.3	533.1	634.2	555.7	667.7	591.0
FTE_LPN	42.9	49.2	41.0	47.0	37.4	44.5	37.3	47.6
FTE_Other Labor	1452.4	1415.5	1529.4	1431.1	1222.5	1220.6	1553.2	1491.6

Table 4: Descriptive statistics of the outputs

	2004		2005		2006		2007	
Outputs	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Births	2275	2142.6	2289	2153.9	2316	2231.0	2349	2283.2
CMI-Adjusted Admissions	29526	4465.2	30168	4708.2	30307	4605.4	30493	4933.1
Surgery Inpatients	5544	8335.9	5662	8752.9	5718	8675.8	5789	9066.0
Surgery Outpatients	7400	6103.8	7804	6534.2	7509	6866.3	7780	7176.0
Emergency Outpatients	47021	4462.0	48188	4542.4	49471	4686.7	50804	4958.6
Other Outpatients	197473	6457.0	205640	9167.0	218710	7377.7	217651	7572.2

Table 5: Efficiency of CBSAs under LP (5) and LP (6)

		LP (6)		
		# (%) Inefficient	# (%) Efficient	**Total**
LP (5)	# (%) Inefficient	153 (51%)	1 (0%)	**154** (51%)
	# (%) Efficient	89 (30%)	57 (19%)	**146** (49%)
	Total	**242** (81%)	**58** (19%)	**300**

Table 6: Potential Gain Associated with Dis/Economies of Scope by CBSA by Year

CBSA	2004		2005		2006		2007	
	Ineff.	Type[1]	Ineff.	Type	Ineff.	Type	Ineff.	Type
Akron	0.13	ECO	0.13	ECO	0.01	ECO	0.03	ECO
Albuquerque	0.00	EFF	0.00	EFF	0.02	ECO	0.17	ECO
Anchorage	0.00	EFF	0.03	ECO	0.00	EFF	0.03	ECO
Atlanta-Sandy Springs-Marietta	0.23	ECO	0.20	ECO	0.18	ECO	0.16	ECO
Austin-Round Rock	0.07	ECO	0.10	ECO	0.02	ECO	0.09	ECO
Bakersfield	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Baltimore-Towson	0.15	DIS	0.16	ECO	0.10	DIS	0.15	DIS
Baton Rouge	0.13	ECO	0.23	ECO	0.04	ECO	0.15	ECO
Birmingham-Hoover	0.23	DIS	0.25	DIS	0.25	ECO	0.20	ECO
Boston-Quincy	0.11	ECO	0.15	ECO	0.11	ECO	0.12	ECO
Buffalo-Niagara Falls	0.00	EFF	0.14	ECO	0.00	EFF	0.28	ECO
Charlotte-Gastonia-Concord	0.20	ECO	0.16	ECO	0.15	ECO	0.16	ECO
Chicago-Naperville-Joliet	0.26	DIS	0.29	DIS	0.29	DIS	0.28	DIS
Cincinnati-Middletown	0.10	ECO	0.12	ECO	0.10	ECO	0.14	DIS
Cleveland-Elyria-Mentor	0.20	ECO	0.16	ECO	0.14	ECO	0.19	ECO
Colorado Springs	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Columbus	0.19	ECO	0.19	ECO	0.06	ECO	0.10	ECO
Corpus Christi	0.09	ECO	0.13	ECO	0.13	ECO	0.04	ECO
Dallas-Plano-Irving	0.23	ECO	0.24	ECO	0.23	ECO	0.27	ECO
Denver-Aurora	0.25	DIS	0.28	DIS	0.30	DIS	0.31	DIS
Detroit-Livonia-Dearborn	0.11	ECO	0.10	ECO	0.08	ECO	0.04	ECO
El Paso	0.02	ECO	0.03	ECO	0.09	ECO	0.00	EFF
Fort Wayne	0.24	ECO	0.22	ECO	0.15	DIS	0.22	DIS

Fort Worth-Arlington	0.21	DIS	0.22	ECO	0.17	ECO	0.18	ECO
Fresno	0.02	ECO	0.00	EFF	0.00	EFF	0.02	ECO
Greensboro-High Point	0.25	ECO	0.20	ECO	0.17	ECO	0.14	ECO
Honolulu	0.10	DIS	0.17	ECO	0.16	DIS	0.18	ECO
Houston-Sugar Land-Baytown	0.23	ECO	0.23	ECO	0.22	ECO	0.25	DIS
Indianapolis	0.30	ECO	0.26	ECO	0.25	ECO	0.36	ECO
Jacksonville	0.13	ECO	0.19	ECO	0.15	ECO	0.21	ECO
Kansas City	0.25	DIS	0.32	DIS	0.33	DIS	0.19	DIS
Las Vegas-Paradise	0.00	EFF	0.05	ECO	0.05	ECO	0.11	ECO
Lexington-Fayette	0.04	ECO	0.13	ECO	0.07	ECO	0.07	ECO
Lincoln	0.04	ECO	0.00	EFF	0.04	ECO	0.01	ECO
Los Angeles-Long Beach-Glendale	0.29	DIS	0.31	DIS	0.32	DIS	0.29	DIS
Louisville	0.19	ECO	0.18	ECO	0.10	ECO	0.16	ECO
Lubbock	0.18	ECO	0.22	ECO	0.13	ECO	0.18	ECO
Madison	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Memphis	0.29	ECO	0.29	ECO	0.01	EFF	0.00	EFF
Miami-Miami Beach-Kendall	0.32	DIS	0.33	ECO	0.27	ECO	0.31	ECO
Milwaukee-Waukesha-West Allis	0.09	DIS	0.14	ECO	0.07	DIS	0.12	EFF
Minneapolis-St. Paul-Bloomington	0.13	DIS	0.17	DIS	0.17	DIS	0.19	ECO
Modesto	0.03	ECO	0.00	EFF	0.00	EFF	0.01	ECO
Montgomery	0.00	EFF	0.00	EFF	0.04	ECO	0.04	ECO
Nashville-Davidson--Murfreesboro	0.15	ECO	0.08	ECO	0.13	ECO	0.00	EFF
New Orleans-Metairie-Kenner	0.04	ECO	0.00	EFF	0.00	EFF	0.02	DIS
New York-White Plains-Wayne	0.17	ECO	0.16	ECO	0.12	ECO	0.11	ECO
Newark-Union	0.12	ECO	0.04	EFF	0.00	EFF	0.00	EFF
Oakland-Fremont-Hayward	0.00	EFF	0.00	EFF	0.00	EFF	0.15	ECO
Oklahoma City	0.21	ECO	0.28	ECO	0.28	ECO	0.27	DIS
Omaha-Council Bluffs	0.20	DIS	0.23	ECO	0.15	DIS	0.14	DIS
Philadelphia	0.20	ECO	0.20	ECO	0.17	ECO	0.17	ECO
Phoenix-Mesa-Scottsdale	0.07	DIS	0.08	ECO	0.08	ECO	0.09	ECO
Pittsburgh	0.17	ECO	0.12	ECO	0.15	ECO	0.20	ECO
Portland-Vancouver-Beaverton	0.08	ECO	0.09	ECO	0.06	ECO	0.09	ECO
Raleigh-Cary	0.00	EFF	0.04	ECO	0.00	EFF	0.00	EFF
Riverside-San Bernardino-Ontario	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Rochester	0.17	ECO	0.18	ECO	0.00	EFF	0.14	ECO
Sacramento--Arden-Arcade--Roseville	0.15	ECO	0.09	ECO	0.00	ECO	0.10	ECO
San Antonio	0.21	ECO	0.19	ECO	0.23	ECO	0.21	ECO
San Diego-Carlsbad-San Marcos	0.15	ECO	0.23	ECO	0.13	ECO	0.08	ECO
San Francisco-San Mateo-Redwood City	0.10	DIS	0.18	ECO	0.17	ECO	0.31	ECO
San Jose-Sunnyvale-Santa Clara	0.05	DIS	0.08	ECO	0.10	ECO	0.07	ECO
Santa Ana-Anaheim-Irvine	0.00	EFF	0.00	ECO	0.00	EFF	0.00	DIS

Seattle-Bellevue-Everett	0.13	ECO	0.11	DIS	0.16	DIS	0.17	ECO
Shreveport-Bossier City	0.30	ECO	0.22	ECO	0.20	ECO	0.13	ECO
St. Louis	0.27	DIS	0.28	DIS	0.27	ECO	0.22	DIS
Stockton	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Tampa-St. Petersburg-Clearwater	0.25	ECO	0.20	ECO	0.18	ECO	0.18	ECO
Toledo	0.23	ECO	0.21	ECO	0.15	DIS	0.15	DIS
Tucson	0.00	EFF	0.00	EFF	0.00	EFF	0.00	EFF
Tulsa	0.03	ECO	0.08	ECO	0.13	ECO	0.16	ECO
Virginia Beach-Norfolk-Newport News	0.16	ECO	0.13	ECO	0.06	ECO	0.06	ECO
Washington-Arlington-Alexandria	0.18	DIS	0.22	ECO	0.19	ECO	0.20	DIS
Wichita	0.11	ECO	0.13	ECO	0.08	ECO	0.15	ECO
Total	0.13		0.14		0.11		0.13	

1: Gain in Diseconomy of scope: DIS
Efficient: EFF
Gain in economy of scope: ECO

Table 7: The Distribution of Economies and Diseconomies by Year

	2004	**2005**	**2006**	**2007**
DIS	17 (23%)	8 (11%)	12 (16%)	15 (20%)
EFF	14 (19%)	14 (19%)	17 (23%)	12 (16%)
ECO	44 (59%)	53 (71%)	46 (61%)	48 (64%)

Appendix 1: Grouping of hospitals services

Group 1: General hospital services

G1	GENERAL MEDICAL AND SURGICAL CARE (ADULT)
G1	GENERAL MEDICAL AND SURGICAL CARE (PEDIATRIC)
G1	CRITICAL ACCESS HOSPITAL
G1	RURAL REFERRAL CENTER
G1	SOLE COMMUNITY PROVIDER
G1	EMERGENCY DEPARTMENT
G1	CERTIFIED TRAUMA CENTER
G1	LEVEL OF TRAUMA CENTER
G1	LONG TERM CARE

Group 2: Short stay care

G2	OBSTETRICS CARE
G2	PHYSICAL REHABILITATION CARE
G2	AUXILIARY
G2	PAIN MANAGEMENT PROGRAM
G2	ONCOLOGY SERVICES

Group 3: Special short stay care

G3	NEONATAL INTERMEDIATE CARE
G3	MEDICAL/SURGICAL INTENSIVE CARE
G3	CARDIAC INTENSIVE CARE
G3	NEONATAL INTENSIVE CARE
G3	PEDIATRIC INTENSIVE CARE
G3	BURN CARE
G3	OTHER SPECIAL CARE
G3	OTHER INTENSIVE CARE
G3	CHEMOTHERAPY
G3	HEMODIALYSIS SERVICES
G3	BONE MARROW, HEART, KIDNEY, LIVER, LUNG, TISSUE, & OTHER TRANSPLANT

Group 4: Medium term care

G4	ALCOHOL/DRUG ABUSE OR DEPENDENCY INPATIENT CARE
G4	PSYCHIATRIC CARE
G4	PSYCHIATRIC CHILD/ADOLESCENT SERVICES
G4	PSYCHIATRIC CONSULTATION/LIAISON SERVICES
G4	PSYCHIATRIC EDUCATION SERVICES
G4	PSYCHIATRIC EMERGENCY SERVICES
G4	PSYCHIATRIC GERIATRIC SERVICES
G4	PSYCHIATRIC OUTPATIENT SERVICES
G4	PSYCHIATRIC PARTIAL HOSPITALIZATION PROGRAM

Group 5: Long term care

G5	SKILLED NURSING CARE
G5	INTERMEDIATE NURSING CARE
G5	ACUTE LONG TERM CARE
G5	OTHER LONG-TERM CARE
G5	OTHER CARE

Group 6: Dedicated programs

G6	ADULT DAY CARE PROGRAM
G6	AIRBORNE INFECTION ISOLATION ROOM
G6	ALCOHOL/DRUG ABUSE OR DEPENDENCY OUTPATIENT SERVICES
G6	ALZHEIMER CENTER
G6	AMBULANCE SERVICES
G6	ARTHRITIS TREATMENT CENTER
G6	ASSISTED LIVING SERVICES
G6	BARIATRIC/WEIGHT CONTROL SERVICES
G6	BIRTHING ROOM/LDR ROOM/LDRP ROOM
G6	BREAST CANCER SCREENING/MAMMOGRAMS
G6	CASE MANAGEMENT
G6	CHAPLAINCY/PASTORAL CARE SERVICES
G6	CHILDREN WELLNESS PROGRAM
G6	CHIROPRACTIC SERVICES
G6	COMMUNITY OUTREACH
G6	COMPLEMENTARY MEDICINE SERVICES
G6	CRISIS PREVENTION
G6	DENTAL SERVICES
G6	ENABLING SERVICES
G6	HOSPICE
G6	PALLIATIVE CARE PROGRAM
G6	ENROLLMENT ASSISTANCE PROGRAM
G6	FITNESS CENTER
G6	FREESTANDING OUTPATIENT CENTER
G6	GERIATRIC SERVICES
G6	HEALTH FAIR
G6	HEALTH INFORMATION CENTER
G6	HEALTH SCREENINGS
G6	HIV-AIDS SERVICES
G6	HOME HEALTH SERVICES
G6	HOSPITAL-BASE OUTPATIENT CARE CENTER/SERVICES
G6	LINGUISTIC/TRANSLATION SERVICES
G6	MEALS ON WHEELS
G6	NEUROLOGICAL SERVICES
G6	NUTRITION PROGRAMS
G6	OCCUPATIONAL HEALTH SERVICES
G6	ORTHOPEDIC SERVICES
G6	OUTPATIENT SURGERY
G6	PATIENT CONTROLLED ANALGESIA
G6	PATIENT EDUCATION CENTER
G6	PATIENT REPRESENTATIVE SERVICES
G6	PHYSICAL REHABILITATION OUTPATIENT SERVICES
G6	PRIMARY CARE DEPARTMENT

Group 7: Other types of services

G7	ADULT DIAGNOSTIC/INVASIVE CATHETERIZATION
G7	PEDIATRIC DIAGNOSTIC/INVASIVE CATHETERIZATION
G7	ADULT INTERVENTIONAL CARDIAC CATHETERIZATION
G7	PEDIATRIC INTERVENTIONAL CARDIAC CATHETERIZATION
G7	ADULT CARDIAC SURGERY
G7	PEDIATRIC CARDIAC SURGERY
G7	FERTILITY CLINIC
G7	GENETIC TESTING/COUNSELING
G7	RETIREMENT HOUSING
G7	SLEEP CENTER
G7	SOCIAL WORK SERVICES
G7	SPORTS MEDICINE
G7	SUPPORT GROUPS
G7	SWING BED SERVICES
G7	TEEN OUTREACH SERVICES
G7	TOBACCO TREATMENT SERVICES
G7	TRANSPORTATION TO HEALTH SERVICES
G7	URGENT CARE CENTER
G7	VOLUNTEER SERVICES DEPARTMENT
G7	WOMEN'S HEALTH CENTER/SERVICES
G7	WOUND MANAGEMENT SERVICES

Group 8: Equipment

G8	IMAGE-GUIDED RADIATION THERAPY
G8	INTENSITY-MODULATED RADIATION THERAPY (IMRT)
G8	ELECTRON BEAM COMPUTED TOMOGRAPHY (EBCT)
G8	MAGNETIC RESONANCE IMAGING (MRI)
G8	POSITRON EMISSION TOMOGRAPHY (PET)
G8	POSITRON EMISSION TOMOGRAPHY/CT (PET/CT)
G8	SINGLE PHOTON EMISSION COMPUTERIZED TOMOGRAPHY (SPECT)
G8	COMPUTED-TOMOGRAPHY (CT) SCANNER
G8	DIAGNOSTIC RADIOISOTOPE FACILITY
G8	MULTISLICE SPIRAL COMPUTED TOMOGRAPHY < 64 SLICE
G8	ULTRASOUND
G8	SHAPED BEAM RADIATION SYSTEM
G8	EXTRACORPOREAL SHOCK-WAVE LITHOTRIPTER (ESWL)