Keeping Hospitals Healthy: Focus Centers Translate into Greater Net Revenue

WILLIAM R. PRATT

Abstract. The author explored the relation between focus centers in multihospital systems and net revenue. Research included related topics such as the multihospital system as a response to regulatory banning of specialty hospitals and the relations between the number of focus centers, median income, bed size, morbidity rates, net revenue, and patient days. To conduct the analysis, the author examined 20 randomly selected multihospital systems. The results of this study support the premise that focus centers contribute to greater net revenue for hospitals.

Keywords: financial, focus center, hospital success, net revenue, patient days, quality improvement

Healthcare costs have continued to increase for both consumers and hospitals, whereas hospital net revenues have declined. Industry financial reports show that net revenue of all U.S. hospitals has decreased by 44.6% from 2002 to 2005 (Factiva 2005; Hoovers 2005). Hospitals are desperately searching for ways to increase their net revenues. The need to increase net revenue is of growing importance in this dynamic industry for both profit and nonprofit organizations. Can the focus center, as both a tool and an essential service, increase hospital net revenue?

For the purpose of this study, I provide definitions of the four major types of hospitals. *General hospitals* provide basic full-service care and include for-profit, nonprofit, and government-controlled institutions including university systems. *Specialty hospitals* offer limited service and typically focus on one major area such as cardiac (heart hospitals), orthopedic, surgical, or psychiatric. In that only one or two types of care are provided, these hospitals are deficient in providing full-service care (Stienwald 2003). *Critical access hospitals* are typically rural community hospitals that receive cost-based government reimbursement. These three definitions of hospital types are widely acknowledged.

I introduce a fourth type of hospital, which is called the *focus center hospital*. Focus center hospitals offer services identical to that of general full-service hospitals but with supplementary focused care. Focus centers are recognized by titles such as cancer center, trauma center, primary stroke center, cardiovascular center, and others. In essence, the focus center is one or more specialty centers in a full-service general-care hospital. To earn the title *center*, hospitals must meet nationally established criteria as outlined by organizations such as the American College of Surgeons (criteria for a majority of centers such as trauma and burn), American Board of Pediatrics (pediatric and neonatal centers), Joint Commission on Accreditation of Healthcare Organizations (JCAHO; accreditation for primary stroke centers), and the Commission for Cancer of the American College of Surgeons.

The author thanks D. Hemley, S. Palmer, S. Stockly, and J. Stockmyer, as well as the reviewers of this article for their helpful comments and time. **William R. Pratt** is a doctoral candidate in finance and international business at the University of Texas-Pan American, Department of Economics and Finance, in Edinburgh. He is also a research associate at the Institute for Population Health Policy at University of Texas-Pan American.

There is a close connection and sometime overlapping certification between the focus center and the centers of excellence (COE); however, the two should be distinguished. The title *COE* is earned on the basis of performance, patient outcome, and experience (BlueCrossBlueShield 2007; Hutcher 2006; Connecticut General Assembly 2006). The title *center* is awarded to facilities that provide specific types of care and staffing levels, although there is not an evaluation of patient outcome or complication involved (American College of Surgeons 2007). Additionally, the title COE is sometimes awarded by insurance providers, and conflicts of interest can be involved (BlueCrossBlueShield; Connecticut General Assembly). For the purpose of this study, I included only trauma, pediatric, neonatal, and similar centers that offer level I or II services. Level I and II centers are required to provide a greater amount of immediately available care and have a higher level of personnel on staff; these facilities have specialty care characteristics and focus on customer care (American College of Surgeons). Level III and IV centers, unlike level I and II centers, do not provide differentiating specialized care or represent a focus center. However, the term *focus center* has not yet achieved widespread acceptance in the medical community.

Literature Review

As the concept of the focus center is new, the research regarding net revenue and focus centers is limited. In the literature, Herzlinger (Shactman 2005) indirectly referred to focus centers in multihospital systems. A *multihospital system* is defined as the combination of two or more hospitals that are owned, leased, sponsored, or managed by a single corporate entity (American Hospital Association [AHA] 2004; Fennel and Alexander 1993). Shactman summarizes Herzlinger's concept of the focus center as follows:

> Herzlinger, from the Harvard Business School, began the concept of "focused factories"[1]: hospitals that are organized and managed to concentrate on specific surgical procedures or to specialize in particular diseases. Services are managed around the experience of the particular patient or disease and not around the physical assets of the facility. Such facilities become exceptional in their area of expertise, not only because of economies of scale, but also because of concentrated focus of management. (869)

Shactman identifies *focused factories* as a term without a solid definition that may apply to both specialty and general hospitals. Though Shactman argues that specialized facilities can provide greater quality of care, the impact of specialty hospitals on community hospitals still has not been studied. Because the profession has not established a clear delineation between specialty hospitals and general hospitals, the focus center concept can be used to distinguish general hospitals that provide focused care from specialty hospitals.

Success Measurements

Researchers in the healthcare industry have used hospital profitability and a variety of ratios as measures of success (Cody, Friss, and Hawkinson 1995; Kim et al. 2002). However, for the purposes of this article, I do not use profitability and success ratios because profitability is influenced by a host of factors such as management effectiveness, operations efficiency, government appropriations, donations, and corporate investments. As an alternative, I use net revenue as the primary measure for hospital success. Net revenue removes extraneous inputs from the analysis, providing a better measure of hospital success.

Optimal Efficiency

Harrison and McDowell (2005) reported several factors, such as per capita income, number of services, and occupancy rate, that reflect the demand for hospital services and competition. According to Feldstein (1998), hospital optimal efficiency as defined by profit is between 200–300 beds. Additionally, Kim et al. (2002) found that medium-size hospitals (200–300 beds) are most efficient from 223 to 238 beds, after which profits decrease with an increase in bed count. Large hospitals begin to increase profit at 560 beds and more. Efficiencies can be found when hospitals operate on a large-scale basis or offer multiple costs that are substantially determined by service configuration (Fournier and Mitchell 1992).

More competitive hospitals employ more capital and equipment and perform more surgical procedures (Luft and Robinson 1985; Luft et al. 1986; Nother 1988). Fournier and Mitchell (1992) reported patients frequently travel considerable distances for more specialized services. Therefore, increasing services will not only increase operational costs but should enable hospitals to reach more customers by attracting new patients and improving competitive position.

Ownership

Competition eliminates performance differences among hospitals with different ownership status (Picone, Chou, and Sloan 2002). Ownership status of a hospital refers to whether it is operated as a for-profit or nonprofit entity. Picone, Chou, and Sloan found there was no lasting change in hospital quality when ownership changed from nonprofit or government ownership to for-profit status and vise versa. Additionally, Clement and McCue (1996) found that profit levels after hospitals merged did not change. Thus, I did not remove hospitals that changed ownership status during the period of the study. For-profit and nonprofit hospitals that are located in the same area have a tendency to serve a similar percentage of uninsured patients (Norton and Staiger 1994). Researchers have shown church affiliation has no significant effect on consumer demand (Cody, Friss, and Hawkinson 1995). Additionally, Picone, Chou, and Sloan and Clement and McCue found ownership status and religious affiliation do not significantly affect net revenue.

Perceived Quality

Kim et al. (2002) reports that the crude death rate is generally considered a health-status index for the community and found that higher median income and a low crude death rate in the community are positively associated with hospital profit. Brosco (1999) identified the child death rate as an indicator of community health, among others. Cleverly and Harvey (1992) found that perceived quality can translate into greater profitability, with quality defined by facility mortality.

Method

There is some evidence that hospitals with focus centers generate greater revenue than hospitals that do not have focus centers (Shactman 2005). In this study, I tested five hypotheses that dealt with the relationship between focus centers and accepted hospital performance measures. The following hypotheses were tested to explore the focus center and its potential impact on hospitals and provided services:

Hypothesis 1 (H_1): Hospitals with focus centers will produce greater net revenue than hospitals without focus centers.

H_2: A positive relation exits between the number of focus centers present and net revenue.

H_3: Hospitals with focus centers will have more patient days than hospitals without focus centers.

H_4: As prior researchers have identified, the optimal bed count ranges between 223 and 238 beds and a focus center will increase the optimal bed count for a hospital.

H_5: Hospitals with focus centers will have a lower morbidity count per patient day.

H_1, H_2, and H_3 tested for changes in hospital performance owing to increased services. Similarly, increasing the number of services provided will change a hospital's service configuration; I test how a change in service configuration affects hospital efficiency with respect to bed count in H_4. I examined H_4 to test if the efficient bed-count range changes. Hospitals running at excess capacity could more efficiently use their capacity if focus centers increase the efficient bed range.

Data Collection

Twenty multihospital systems were randomly selected from a population of 130 multihospital systems ranked by patient net revenue (Modern Healthcare 2005). I applied random selection with random number generation using Microsoft Excel. The total population of the 20 multihospital systems was composed of 280 individual hospitals (American Hospital Directory 2005). The 20 multihospital systems ranged in size from 2 to 56 hospitals. The hospitals in the systems varied in size as well, ranging from 30 to 886 beds in a facility.

I removed all critical access, rural, and specialty hospitals from the data set. Six critical access hospitals were removed because they applied different reimbursement methods and amounts. I removed 13 rural hospitals from the data set. Critical access and rural hospitals are not subject to the same competitive pressures as hospitals with immediately surrounding competitors and thus have less incentive to provide better and more costly patient care. Fourteen specialty hospitals were removed from the data set because they do not provide basic full-service care. Specific services such as cardiac, psychiatric, and obstetrical care are individually provided by specialty hospitals; however, these hospitals do not provide a full range of services beyond the emergency room, unlike a general hospital (Stienwald 2003). I removed an additional 35 hospitals from the data set owing to incomplete or unavailable data. The end data set used for analysis comprised 212 hospitals, with

140 hospitals having at least 1 focus center. Picone, Chuo, and Sloan (2002) and Clement and McCue (1996) found that changes in hospital status and ownership change do not affect hospital profitability; therefore, hospitals that have been obtained through merger were not removed from the final data set (see Figure 1).

At the time of this writing, applicable data on child death rates were not available. Data on crude death rates are limited to state and county information and are therefore a poor measure of assessing care provided by a single hospital in a multihospital province. Data on hospital finances, morbidity, patient days, and bed count were obtained from annual hospital reports submitted to the departments of health in every state, the Center for Medicare and Medicaid Services (CMS), and the American Hospital Directory database. Year 2000 census data were used for median income, but a complete time series could not be obtained. For the purposes of this study, corporately owned nonprofit hospitals and government-controlled (national, state, county, and city) nonprofit hospitals are clustered together as nonprofit ownership status. I also obtained for-profit, nonprofit, and government ownership status from CMS. I obtained religious affiliation from hospitals' Web site information. I obtained focus center data from hospitals' Web sites, CMS service data, and American Hospital Directory database information.

Procedure

I used multiple regression analysis to test the hypotheses. The primary dependent variable was hospital net revenue, measured by the net revenue of both inpatient and outpatient services for each hospital and proportionally adjusted by beds per hospital. I selected seven variables to assess the overall effect on net revenue. An additional variable, focus center count, was tested only against hospitals with focus centers. Focus count did not apply to hospitals without the presence of a focus center. Hospital characteristics and primary service area demographics were independent variables. Hospital characteristics consisted of ownership status, religious affiliation, morbidity, size by bed count, and number of focus centers. I used median income as a control to assess availability of quality of care, where individuals obtain the best healthcare affordable. I examined ownership status and religious affiliation variables in the regression to rule out sources that could potentially explain variation in net revenue.

The regression models assessed each hospital's net revenue over a data pool of 5 years from 2000 to 2004. The regression models were likely to reveal a significant contribution from focus centers to hospital net revenue, rather than an anomaly that occurred in a single year. Variable identification is presented in the Appendix.

Results

Table 1 presents the results for the first regression model. The R^2 ranged from .377 to .543 with a significant F statistic at the .000 level ranging from 17.662 to 34.608 over the 5-year period, providing the model statistical significance and goodness of fit. The t statistics for coefficients of the bed count, patient days, and focus were all statistically significant at $p \leq .001$. Thus, I rejected

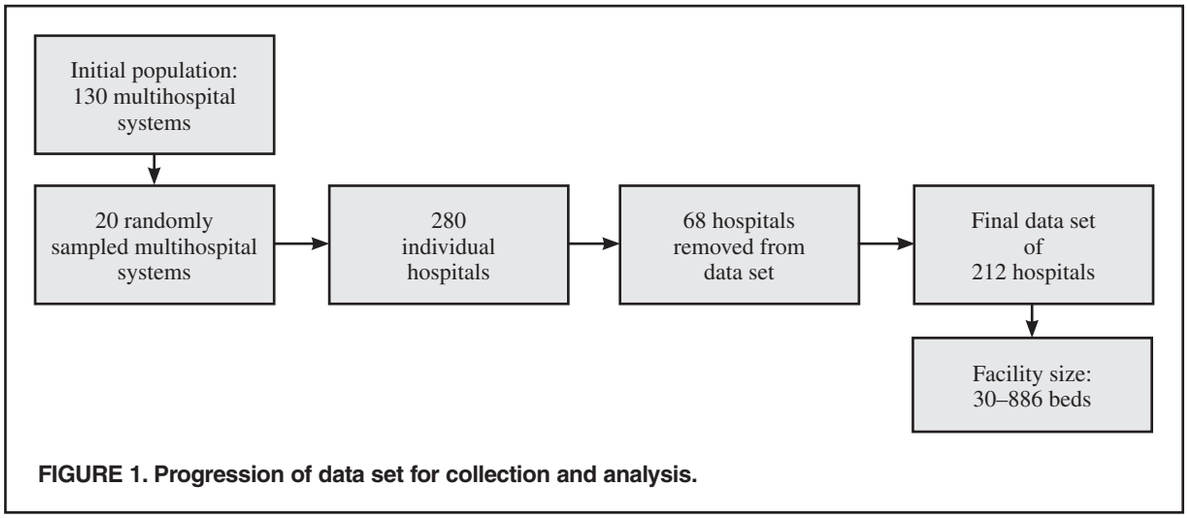

FIGURE 1. Progression of data set for collection and analysis.

TABLE 1. Regression Results of Series Analysis (*t* Statistic)

Measure	2004	2003	2002	2001	2000
R^2	0.377	0.491	0.543	0.482	0.519
Constant	4.694***	5.534***	6.434***	6.151***	6.566***
Focus	4.261***	3.974***	3.879***	4.011***	4.410***
Patient days	7.242***	10.996***	12.752***	10.855***	11.483***
Morbidity	–0.864	–2.627**	–2.751**	–1.912	–2.513*
Median income	0.926	0.711	0.589	0.361	–0.052
Bed count	–5.854***	–7.727***	–9.514***	–8.315***	–8.314***
For-profit or nonprofit	–0.971	–0.541	–0.914	–0.877	–1.206
Affiliation	0.16	0.735	0.124	0.054	0.875

*$p < .05$. **$p < .01$. ***$p < .001$.

the null hypothesis of H_1 and found that focus centers produce greater net revenue. Morbidity was composed of mixed results with statistical significance of .05 or better in three of the five periods. Median income, ownership status, and religious affiliation did not demonstrate statistical significance over the 5 years.

Testing of H_2 revealed partial support. Regression analysis showed a positive slope with significance at the .05 level or better with an R^2 of .029 to .063 over the period of the study. When not limited to a linear plot, a flattened curve was presented with a regular climax between a focus center count of three and four. Owing to fragile validity, prudence demanded that I fail to reject the null hypothesis of H_2. The data did not allow for speculation that optimal focus count is between three and four focus centers, prompting consideration that focus count and bed count need to be analyzed together. A bivariate correlation test of bed count and focus count supported such a consideration ($r = .689$, $p = .000$).

Regression analysis in Table 1 with respect to patient days was statistically significant at $p \leq .001$ with upward slope, indicating that patient days are significantly affected by the presence of a focus center. Therefore, I rejected the null hypothesis of H_3 and found that focus centers produce a greater number of patient days. An independent samples *t* test with group statistics further supported H_3; statistics illustrated hospitals with focus centers have a greater mean of 33,000 (53,043.55 vs. 19,601.35) patient days per bed than general hospitals without focus centers ($t = –5.850$ to $–6.638$, $p = .000$). Furthermore, I found that there are more patient days per morbidity with focus centers than nonfocus centers; thus I rejected the null hypothesis of H_5, finding that focus centers have a lower morbidity count per patient day; independent samples *t* test $t = –5.605$ to $–6.870$, $p = 000$.

Testing H_4 also generated mixed results. Past researchers have suggested an optimal bed count is between 200 and 300 beds, more specifically, from 223 beds to 238 beds. The regression analysis showed a positive slope with $p \leq .05$ level or better, but in only two of the five intervals with an R^2 of .005 to .076 over the period of the study. The analysis of variance (ANOVA) provides further validity doubt with significant critical F scores in 3 of the 5 years with a range of .708 to 11.503; thus the null H_5 fails.

Additional testing of patient days as a dependent and focus center presence resulted in an R^2 of .146 to .172 with $p = .000$ and an *F* range of 34.217 to 43.150. The strong bivariate correlation also supports the notion that the focus center is a contributor to patient days ($r = .373$ to $.412$, $p = .000$).

Discussion

This study found the focus center has statistical significance with regard to net revenue. Presence of a focus center also has a significant effect on patient days. I suggest three possibilities: (*1*) The focus center directly influences net revenue, (*2*) the focus center directly impacts patient days—the focus center indirectly influences net revenue by increasing the number of patient days—and (*3*) the focus center directly impacts the net revenue of the hospital and offers ancillary benefits by affecting patient days.

The presence of a focus center results in increased net revenue by increasing the level of care provided

by the facility. This is not surprising when services offered in a hospital are thought of as products. A strategic firm will increase a profitable product line to improve market share and replace old products whose life cycles have ended (Pearce and Robinson 2007). Therefore, it is logical to expect an increase in net revenue with an increase in the level of care and services offered. This coincides with Cleverly and Harvey's (1992) finding that an increase in perceived quality is associated with greater profitability.

Data results indicate ownership status and religious affiliation do not significantly affect net revenue, which is consistent with Picone, Chou, and Sloan (2002); Cody, Friss, and Hawkinson (1995); and Clement and McCue (1996). Incongruent with results from Kim et al. (2002), median income did not significantly affect the success (net revenue) of a hospital. The significance of bed count influencing net revenue was reinforced by this study.

Other variables that were not found to be significant were median income, religious affiliation, and for-profit versus nonprofit status. The focus center better explains variances in net revenue. Once more, Kim et al. (2002) found that a hospital's profitability was directly linked with median income of the community. The results of the study indicated that a hospital with at least one focus center is not as dependent on median income. It is possible that patients outside the primary service area of the hospital are traveling to acquire specialized care. In practical application, the focus center may present a valuable tool for hospitals located in areas of lower median income wanting to increase net revenue. Likewise, the addition of a focus center reduces the influence of religious affiliation and for-profit versus nonprofit status on net revenue; in essence, competitive barriers can be reduced.

It appears that focus centers produce greater net revenue; however, it is not clear if there is an optimal number of focus centers per bed count or if continuing to add focus centers will incrementally increase net revenue. In this study, the number of focus centers within a hospital was limited to five, with the majority of hospitals having two or three. A study including hospitals with greater than five focus centers could improve understanding in this area. There are a number of probable explanations for inconsistent findings, including that large hospitals have too few focus centers, small-bed-count hospitals are not properly equipped to handle a larger number of focus centers, general services are not performing competitively and focus center services are keeping a poorly operated hospital afloat, and more. To arrive at a valid conclusion, researchers need to conduct a thorough analysis of each hospital's efficiency.

Economic theory indicates that there are different points of efficient operation; more analysis is needed to identify those points with respect to the focus center. Future researchers should analyze each type of focus center and explore the impact on the facility. Considering a majority of the hospitals in the study have two or three centers, there could be unidentified combinations that provide more benefit than others. For example, a trauma center may be beneficial for increasing inpatient days and a cancer center for outpatient days. This study partially supported the potential of the focus center to increase hospital bed count efficiency from the 223 to 238 bed range. Again, more analysis is needed to identify efficient points of operation.

The data revealed that focus centers probably have a lower mortality rate. This can be both an intuitive and a counterintuitive logic with respect to the focus center in reference. For instance, a cancer center is likely to have a proportionally larger amount of outpatients than a trauma center. Therefore it makes sense that the cancer center will not incur as many deaths within the facility because outpatients probably stay at home, whereas the patients who seek a trauma center for specialized care are more likely to die in the facility. Other centers such as burn, cardiovascular, and stroke may increase or decrease hospital mortality per patient day, creating a need for more research on this topic.

Conclusion

The results of this study suggest that focus centers significantly impact hospital net revenue and patient days. Additional research on the focus center concept is needed for further understanding. I suggested that follow-up research be conducted in five areas: (*1*) hospitals with more than five focus centers; (*2*) comparative analysis of hospitals with similar bed count and focus count; (*3*) confirmation of causal links between focus centers, patient days, and net revenue; (*4*) post–focus center count increases and conversion (nonfocus to focus) analysis; and (*5*) comparative analysis of focus center types (trauma vs. cancer, cancer vs. burn, etc.) and their individual effect on hospital performance. In summary, this study indicates that hospitals can

use focus centers as a value-added service and tool to provide greater quality of service while increasing net revenue.

NOTE

1. Skinner (1974) introduced the term "focused factories."

REFERENCES

American College of Surgeons. 2007. Hospital levels. http://www.facs.org/trauma/hospitallevels.pdf (accessed March 14, 2007).

American Hospital Association. 1983. *Directory of multihospital systems*. Chicago: American Hospital Association.

———. 2004. *Annual survey*. Chicago: American Hospital Association.

American Hospital Directory. 2005. http://www.ahd.com (accessed December 30, 2005).

BlueCrossBlueShield. (2007) Centers of excellence. http://www.bcbsm.com/home/where_you_can_go_for_care/centers_of_excellence.shtml (accessed March 14, 2007).

Brosco, J. P. 1999. The early history of infant mortality rate in America: A reflection upon the past and a prophecy of the future. *Pediatrics* 103:478–85.

Clement, J. P., and M. J. McCue. 1996. The performance of Hospital Corporation of America and Healthtrust hospitals after leveraged buyouts. *Medical Care* 34 (7): 672–85.

Cleverly, W. O., and R. K. Harvey. 1992. Is there a link between hospital profit and quality? *Healthcare Financial Management* 49 (9): 40–56.

Cody, M., L. Friss, and Z. C. Hawkinson. 1995. Predicting hospital profitability in short-term general community hospitals. *Health Care Management Review* 20 (3): 77–87.

Connecticut General Assembly, Senate, Public Health Committee, Report on bills favorably reported by the committee: An act covering health insurance coverage for medical services and treatment for morbid obesity. March 17, 2006. SB-579 File no. 338.

Factiva. 2005. Industry financial report: Dow Jones and Reuters. http://www.factiva.com (accessed November 22, 2005).

Feldstein, P. J. 1998. The market for hospital service. *Health care economics.* Vol. 5. Albany, NY: Delmar.

Fennel, M. L., and J. A. Alexander. 1993. Perspectives on organizational change in the US medical care sector. *Annual Review of Sociology* 19:89–112.

Fournier, G. M., and J. M. Mitchell. 1992. Hospital costs and competition for services: A multiproduct analysis. *Review of Economics and Statistics* 74 (4): 627–34.

Harrison, J. P., and G. M. McDowell. 2005. A profile of US hospital mergers. *Journal Of Health Care Finance* 31 (3): 15–24.

Hoovers. 2005. Industry financial report: Dunn and Bradstreet. http://www.hoovers.com (accessed November 22, 2005).

Hutcher, N. 2006. Response to medicare endorsement of bariatric surgery. *American Society for Bariatric Surgery.* http://www.asbs.org/html/about/ncdletter362006.html (accessed March 14, 2007).

Kim, Y. K., S. H. Glover, C. H. Stoskopf, and S. D. Boyd. 2002. The relationship between bed size and profitability in South Carolina hospitals. *Journal of Health Care Finance* 29 (2): 53–63.

Luft, H. F., and J. C. Robinson,. 1985. The impact of hospital market structure on patient volume, average length of stay, and the cost of care. *Journal of Health Economics* 4 (4): 333–56.

Luft, H. F., J. C. Robinson, D. W. Garnick, S. C. Maerki, and S. J. McPhee. 1986. The role of specialized clinical services in competition among hospitals. *Inquiry* 23:83–94.

Modern Healthcare. 2005. Healthcare systems ranked by 2004 net patient revenue. *Modern Healthcare.* http://www.modernhealthcare.com (accessed November 14, 2005).

Norton, E. C., and D. O. Staiger. 1994. How hospital ownership affects access to care for the uninsured. *Rand Journal of Economics* 25 (1): 171–85.

Nother, M. 1988. Competition among hospitals. *Journal of Health Economics* 7 (3): 259–84.

Pearce, J. A., and R. B. Robinson. 2007. *Strategic management: Formulation, implementation, and control.* 10th ed. Boston: McGraw-Hill.

Picone, G., S. Y. Chou, and F. Sloan. 2002. Are for-profit hospital conversions harmful to patients and to medicare? *Rand Journal of Economics* 33 (3): 507–23.

Shactman, D. 2005. Specialty hospitals, ambulatory surgery centers, and general hospitals: Charting a wise public policy course. *Health Affairs* 24 (3): 868–73.

Skinner, W. 1974. The focused factory. *Harvard Business Review* 52 (3): 113–22.

Stienwald, B. 2003. *Report to Congressional requesters: Specialty hospitals—geographical locations, services provided, and financial performance.* Washington, DC: Government Accountability Office.

APPENDIX
Definitions of Variables for Regression

NETREV: Annual net revenue within each individual hospital from 2000–2004
PtDays: Number of inpatient and outpatient days within each individual hospital from 2000–2004
Morbidity: Morbidity count (total deaths) in each individual hospital from 2000–2004
Bed: Bed count of each individual hospital
Focus: Dummy variable indicating presence of one or more focus centers in a hospital; 0 = no focus center, 1 = focus center
FocusCount: Value count of focus centers in a hospital; used in focus-center-only regression
FPorNFP: Dummy variable indicating ownership status as for-profit or nonprofit; equals 0 for for-profit and 1 for nonprofit
Affiliation: Dummy variable indicating religious affiliation; equals 0 for nonreligious affiliation and 1 for religious affiliation
Regression Model 1: NETREV = *f* (PtDays, Morbidity, MedianIncome, Bed, Focus, FPorNFP, Affiliation)
Regression Model 2 (*Only Focus Center Hospitals*): NETREV = *f*(PtDays, Morbidity, MedianIncome, Bed, FocusCount, FPorNFP, Affiliation)