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Determinants of hospital closure in South Korea: Use of a hierarchical generalized linear model ☆

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Abstract

Understanding causes of hospital closure is important if hospitals are to survive and continue to fulfill their missions as the center for health care in their neighborhoods. Knowing which hospitals are most susceptible to closure can be of great use for hospital administrators and others interested in hospital performance. Although prior studies have identified a range of factors associated with increased risk of hospital closure, most are US-based and do not directly relate to health care systems in other countries. We examined determinants of hospital closure in a nationally representative sample: 805 hospitals established in South Korea before 1996 were examined—hospitals established in 1996 or after were excluded. Major organizational changes (survival vs. closure) were followed for all South Korean hospitals from 1996 through 2002. With the use of a hierarchical generalized linear model, a frailty model was used to control correlation among repeated measurements for risk factors for hospital closure. Results showed that ownership and hospital size were significantly associated with hospital closure. Urban hospitals were less likely to close than rural hospitals. However, the urban location of a hospital was not associated with hospital closure after adjustment for the proportion of elderly. Two measures for hospital competition (competitive beds and 1-Hirshman–Herfindalh index) were positively associated with risk of hospital closure before and after adjustment for confounders. In addition, annual 10% change in competitive beds was significantly predictive of hospital closure. In conclusion, yearly trends in hospital competition as well as the level of hospital competition each year affected hospital survival. Future studies need to examine the contribution of internal factors such as management strategies and financial status to hospital closure in South Korea.
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Keywords: Hospital closure; Hospital competition; South Korea

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Introduction

Closure of a hospital directly affects the availability of health care in many neighborhoods (Bindman & Keane, 1990; Rosenbach & Dayhoff, 1995; Samuels, Cunningham, & Choi, 1991), creates unemployment for health care workers, and thus is likely to affect the health of residents and employees (Jackson & Whyte, 1998). The locale's economy and related industry can be also affected by the closure of a hospital (Probst, Samuels, Hussey, Berry, & Ricketts, 1999), even though the closure may improve the operating efficiency of the remaining hospitals in the local health care market (Lindrooth, Lo Sasso, & Bazzoli, 2003). Understanding causes of hospital closure is important if hospitals are to survive and continue to fulfill their missions as the center for health care among their neighborhoods. For hospital administrators and others interested in hospital performance, knowing which hospitals are most susceptible to closure can be of great use.

Researchers have identified many factors associated with increased risk of hospital closure. Internal structural factors of a hospital such as bed size (Lee & Alexander, 1999; Lillie-Blanton et al., 1992; Lindrooth et al., 2003; Longo, Sohn, & Shortell, 1996; Succi, Lee, & Alexander, 1997), ownership type (Succi et al., 1997; Williams, Hadley, & Pettengill, 1992), and teaching status (Lee & Alexander, 1999) were predictive of hospital closure. Increased risk of hospital closure was found among hospitals located in certain areas where area socioeconomic status indicators were not good (Lee & Alexander, 1999; Longo & Chase, 1984) and/or inter-hospital competition was harsh (Lee & Alexander, 1999; Longo & Chase, 1984; Longo et al., 1996; Mayer, Kohlenberg, Sieferman, & Rosenblatt, 1987; Mullner, Rydman, Whiteis, & Rich, 1989; Succi et al., 1997). Process variables such as occupancy rate were suggested as a mediator between these risk factors and the outcome of hospital closure (Kennedy & Dumas, 1983; Lindrooth et al., 2003; Longo & Chase, 1984; Lynch & Ozcan, 1994). In addition, some researchers have explored the preventive effect of hospitals' strategic actions on hospital closure (Lee & Alexander, 1999; Longo et al., 1996; Succi et al, 1997). However, most of these studies are American and do not directly relate to the health care systems in other countries.

With the establishment of national health insurance in 1989, the demand for hospital services in South Korea has significantly risen with the increasing number of hospitals. Although the health insurance has supported South Korean hospitals financially, the South Korean medical community has claimed that the level of fee schedule is low. In addition, the high rate of hospital closure has been a major source of concern for the hospital sector. According to a report, 8.1% of all hospitals in 2001 were in the status of bankruptcy (Yang, 2002). Several Korean studies were performed to examine risk factors of hospital closure and to predict the hospital closure (Jung & Lee, 2000; Lee & Seo, 1998; Yang, 2002). Several financial indicators (i.e., profitability, liquidity, activity measures) were predictive of the hospital closure. However, these studies have limitations regarding the representativeness of the sample studied and failed to consider the environmental risk factors like inter-hospital competition.

Viability of a hospital is less likely determined by hospital distress at one time point. Closure of a hospital would be the result of successive long-term exposure of organizational and/or environmental risk factors rather than from cross-sectional exposure of those factors during short time periods. Several studies included information on exposure of risk factors at multiple time points and employed generalized estimating equations or Cox's regression model (Alexander, D'Aunno, & Succi, 1996; Lee & Alexander, 1999; Succi et al., 1997). In studies using longitudinal data with repeated measurement with the same subjects, correlation among these repeated observations should be considered in the analysis. In order to control correlation among repeated measurements, in this study we used a frailty model. The frailty model is an extension of Cox's model which allows frailties or random effects. The hazard function for each hospital may depend on observed risk factors, but usually not all such factors are known or measurable. This unknown factor of the hazard function is usually termed the frailty or random effect. When the repeated measurements of a particular type of event (closure) are obtained from the same hospital, frailty is an unobserved common factor for each hospital and is thus responsible for creating the dependence between repeated measures. This frailty is often regarded as a random quantity from some suitably defined population distribution of frailties. We used hierarchical generalized linear model (HGLM, Lee & Nelder, 1996, 2001) to implement the frailty model and examined determinants of hospital

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