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Factors associated with hospital closure and merger: A survival analysis of Dutch hospitals from 1978 to 2010

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Abstract

Health policy in most West European countries is directed at transforming the healthcare systems into more self-regulating and competitive systems. After a period of strong regulation, the Dutch government decided to step back and created conditions in which competition could lead to cost management and quality improvement. The question is whether mergers have contributed to the survival chances of hospitals. This paper describes the results of an analysis performed on the survival of all Dutch hospitals in the years 1978 to 2010. The survival of hospitals during this period was determined and their survival rates were calculated statistically. Furthermore, the relation between a hospital's lifespan and a number of predictive variables was investigated. In this study, more detailed consideration is given to the fact of whether a hospital merged with another hospital. Bivariate analysis shows that smaller hospitals in particular have been driven out of the market. The difference in lifespan between hospitals which had merged and those which had not, appeared to be significant. However, a multivariate analysis, when corrected for size, type, and location, showed that merging had no significant effect on hospital lifespan.

Keywords

Hospital mergers, market withdrawal, survival analysis

Introduction

The ultimate objective of every organization is survival, no matter its form. Earlier studies of the hospital care market structure analyzed market withdrawal.[1] Besides the ''personal'' drive of the hospital organization, there is a public interest in continuity of this kind of service. The public interest concerns healthcare utilization, healthcare accessibility, and health outcomes. Healthcare utilization has been connected to optimal utilization of health services and the greater efficiency of the remaining hospitals.[2,3] Other studies emphasized the effect of hospital closures on accessibility and mortality.[1,4] These studies differentiate between rural and urban areas. In rural areas, hospital closures could magnify inequalities of access in terms of travel time,[5] while in urban areas, the accessibility will not change significantly.[1]

It became evident that not every hospital was assured of survival. Inadequate financial performance, low occupancy rates, limited scale, and limited expertise to supply specialized care reduce the survival chances of hospitals.[1,6–8] The question is whether merging increased the survival chances of hospitals.[9–13] Studies suggest that mergers may be a survival strategy of small hospitals for improving economies of scale, expertise needed for continuing a certain level of specialized care, and bargaining power in relation to healthcare insurers.[3,9,14–16]

In this article, we will focus on hospital survival in The Netherlands. Our study concentrates on the question of whether mergers contribute to increasing survival chances. A survival analysis will be applied to data covering the period 1978 to 2010 pertaining to all Dutch hospitals. In the first part of the paper, we briefly describe the method of survival analysis that was

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used for this study. We then describe the influence of several factors on the lifespan of hospitals. The factors included in the analysis are the location of the hospital (proximity to the Randstad, which is the conurbation in the West of the Netherlands), its size, the type of hospital (teaching, general, or specialized hospital), and mergers. The final sections contain conclusions and discussion of our findings.

Background

In 2006, after a long period of preparation, the Dutch government introduced regulated competition into the healthcare system. After a period of strong government regulation resulting in mergers and increasing concentration in the hospital market, the government stepped back and created conditions in which regulated competition could lead to cost management and quality improvement.[9] From 1971 to 2006, the structure of the hospital market was determined by capacity planning legislation. The government regulated hospital capacity through the law on hospital provision (Wet Ziekenhuisvoorzieningen – WZV), and the regional clustering of hospitals was stimulated. In particular, the survival of small hospitals was threatened, because the legislation required a minimum capacity of 175 beds for new hospitals and a minimum was defined for the number of medical specialists per specialism.[17] As a result of this legislation, bed reduction measures were introduced in 1988 aimed at further reducing the clinical capacity of hospitals. In 2006, the capacity planning legislation was replaced by legislation that left the organization of hospital capacity within a framework that was based on negotiations between healthcare insurers and the hospitals.

Furthermore, the manner in which hospitals were reimbursed also changed. Until 1982, hospitals were financed through cost-based reimbursement systems, based on patient days. Fees were set according to the National Health Tariffs Act (WTG) and had to be paid by all insurers. This output reimbursement system gave strong incentives for supplier-induced demand and weak incentives for improving efficiency.[18] In 1982, hospital reimbursement changed to a closed-end budget system. The budget was based on three components: availability, capacity, and production. In this period, hospitals had a strong incentive to enlarge their geographic market in order to enlarge the availability and capacity components. Therefore, it seems logical that mergers became an attractive way of attaining a better position in this budget system.[19] In order to promote more competition, the Health Insurance Act (HIA) was introduced in 2006. This put healthcare insurers in a position to influence the capacity and price of hospital care through selective contracting. Their position was strengthened even further by the fact that the market for health insurers became much more concentrated[20,21] during the last decade of the analysis period. The reimbursement system was partly replaced by a more output-based system. In this system, insurers were able to negotiate prices per Diagnosis Treatment Combination (Diagnose Behandel Combinatie – DBC) for a number of routine hospital services. This meant that hospitals were at greater risk of not receiving sufficient funds. Government and banks were no longer prepared to support hospitals in financial difficulties. In fact, the market is still in a period of transition from the budget system mentioned earlier to a case payment system based on decentralized negotiations.[22] This transition is expected to be completed in 2014. In that year, the budget system will be almost completely replaced by a reimbursement system based on a case mix.

Method and data

Method

The survival analysis presented in this article investigates the proportion of hospitals still operating over a certain period of time, based on the examination of individual, or groups of, hospitals in such a way that survival rates could be tested statistically. At the same time, the relation between a hospital's lifespan and a number of predictive variables was determined. To this end, we estimated a Cox Proportional hazards model. In this study, a merger indicator was used to determine whether merging was an important factor in hospital lifespan once corrections were made for other predictive variables. The survival analysis assumes that variables that have an influence on the survival rate of hospitals were constant over the investigated time period. The analysis includes all hospitals operational at 1 January 1978. The period covered is from 1978 to 2010. We differentiate between teaching, general, and specialized hospitals. This distinction is relevant because of the nature of the care and the target group of these hospitals. Teaching hospitals distinguish themselves by providing top clinical care for a broad target group and through innovation in medical technology. Specialized hospitals focus on a particular target group or a limited number of specialist treatments, for example, orthopedic surgery or lung diseases. General hospitals deal with a broad range of patients. General hospitals were further divided into top, central, and basic hospitals, since the level of specialization differs between hospitals. The so-called basic hospitals were the smallest hospitals, with a bed capacity of less than 250 but with the availability of all the basic clinical specialisms. Top hospitals had a bed capacity of more

than 500 beds. Hospitals located in the Randstad were also investigated as a separate group, because more hospitals were located in the Randstad regions and the concentration in the market was lower, so it was reasonable to expect that regional competition was greater, meaning that closures were more likely.[9] The number of beds in a hospital was used as a measure of hospital size. The expectation was that large hospitals with a relatively large market share in the region would have better survival chances, because of their better bargaining position in relation to healthcare insurers.[23] As mentioned above, a ''merged'' indicator is used for hospitals which merged between 1978 and 2010. A merged hospital is defined as a formal merger of two or more hospitals.

Variables

For a good understanding of the analysis, it is necessary to briefly consider the development in the number of mergers during the period 1978 to 2010. In this period, 191 hospitals were involved at least once in a merger. The vast majority (73%) of these had fewer than 400 beds. Eventually this resulted in the creation of 90 hospitals, most of them large. Most mergers took place in the period of the planning legislation (1971–2006). Especially during this period, many basic hospitals were involved in a merger. At the time of the bed reduction measures (from 1988), the number of mergers reached its maximum. Government measures encouraged these mergers. Dranove[3] also argues that economies of scale advantages can be achieved only through mergers between small hospitals. In the period from 1996, a relatively large number of top hospitals were involved. These mergers were inspired largely by medical and technological developments and the desire for further specialization in existing medical specialisms.

Analysis

The survival analysis focuses on survival in the market versus hospital closures. The number of hospitals at the beginning of the study period, i.e., 1978, was 243. At the end of the study period, in 2009, this number was reduced to 112. This decline was due to departures from the market and mergers. Our survival analysis takes into account only hospital departures from the market, given that these hospitals were active in 1978. We did not examine the decrease in the number of hospitals by virtue of merger. The reduction in the number of hospitals as a result of mergers is not considered as closures, because these hospitals, as merged hospitals, are still active in the market. Figure 1 shows the continuity of all hospitals from 1978. It indicates that, between 1978 and 2010, the number of hospitals decreased by about 12% as a result of closures. The number of hospital closures was particularly high during the first half of the investigated period. Between 1978 and 1993 (the first 15 years of the analysis), 22 hospitals ceased to exist. After 1993, the number of hospital closures dropped to 8.

Table 1 provides an overview of hospitals closed between 1978 and 2010 ranked by size (number of reported beds). This table shows only those hospitals

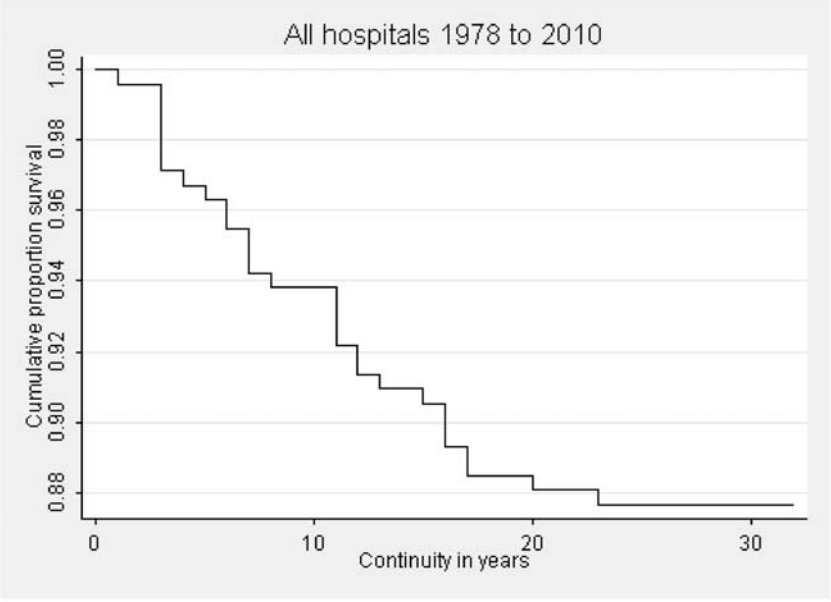

Figure 1. Survival analysis of all hospitals from 1978 to 2010.

Table 1. Survival percentage of Dutch hospitals by size and type, 1978–2010.

	All hospitals		Teaching hospitals		General hospitals		Specialized hospitals	
Size (by beds)	*N*, 1978	%	*N*, 1978	%	*N*, 1978	%	*N*, 1978	%
<100	28	46			4	50	24	46
100–199	66	85			47	87	19	79
200–299	43	88			36	92	7	71
300–399	48	100			47	100	1	100
400–499	18	100	1	100	17	100		
500–599	15	100			15	100		
600–699	7	100			7	100		
700–799	8	100	1	100	6	100	1	100
800–899	3	100	1	100	2	100		
900–999	5	100	3	100	2	100		
>1000	2	100	2	100				
Total/mean %	243	88	8	100	183	94	52	63

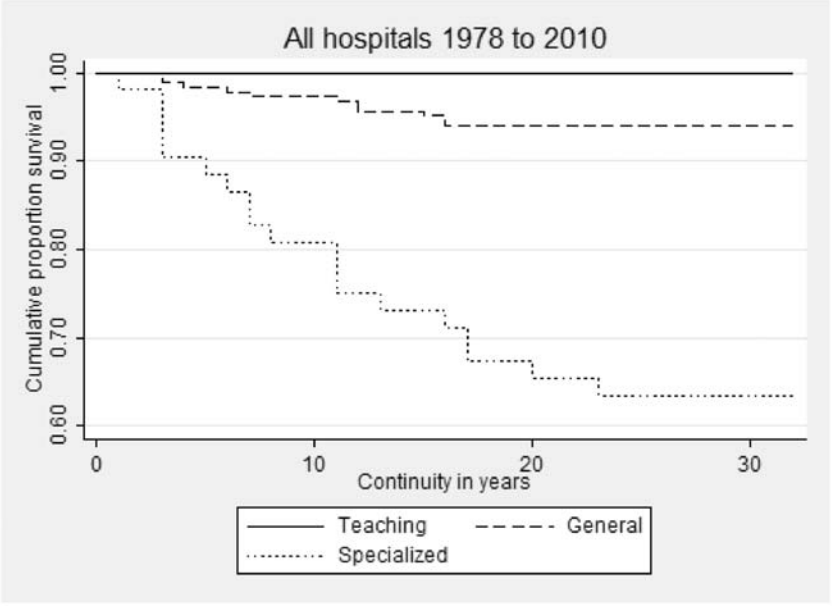

Figure 2. Survival analysis by Dutch hospital type, 1978–2010.

that were active in the market in 1978. New hospitals set up in this period ($n = 8$) therefore have no effect on the data in the table. It can be seen that only hospitals with fewer than 300 beds were affected by this trend. This is a strong indication that hospital size plays an important role in hospital survival. The results of differentiation by hospital type are presented in Figure 2. It can be seen that the survival rate of teaching hospitals was 100% and that of general hospitals was 94%. The largest number of closures concerned specialized hospitals. Almost 37% of such hospitals were closed between 1978 and 2010. Two factors seem to cause the overrepresentation of this group. Some of these focused hospitals, such as hospitals for chronic obstructive pulmonary disease care and lung diseases, were not able to adapt to innovations in the area of medical technology. Others, such as clinics for cardiac and neurological diseases, had insufficient scale to continue their specialism.

Table 1 presents the number of general and specialized hospitals that ceased to exist between 1978 and 2010, ranked by size. Here too it can be seen that small hospitals in particular were forced to close. This applies to both general and specialized hospitals. The

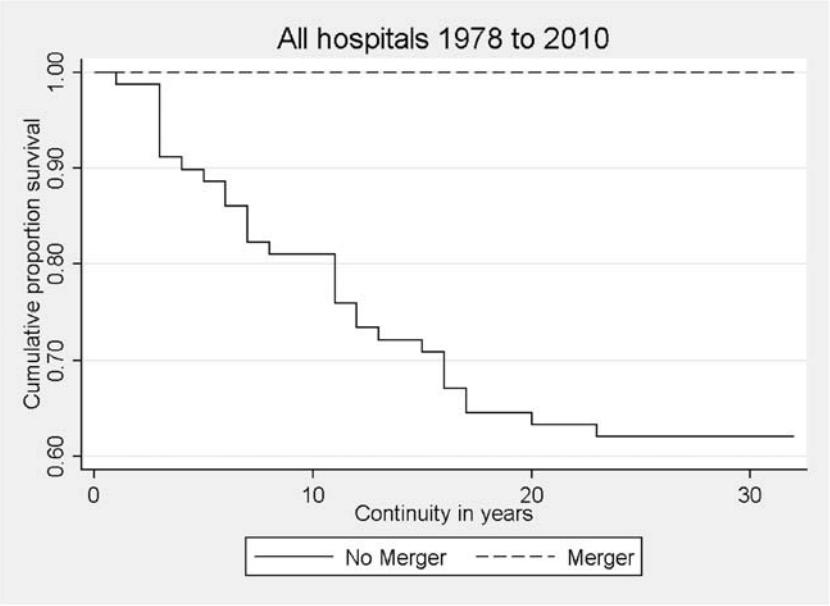

Figure 3. Comparison of Dutch hospital survival based on whether they merged, 1978–2010.

relative number of closed hospitals is notably larger among specialized than among general hospitals. It is noteworthy that, in terms of percentage, there were more specialized hospitals that ceased to exist in the 200–299 category than in the 100–199 category. When differentiated according to basic, central, and top, it appears that all general hospital closures were of basic hospitals, except for a single central hospital. All closures of basic hospitals took place during the period of national capacity planning policy and reduction of the number of beds. These findings confirm an effective government policy.

Results

We investigated the effect of mergers on hospital closures. This was done using the Kaplan-Meijer method, which was applied to all hospitals. Figure 2 indicates, by type, the number of hospitals that ceased to exist. It appears that specialized hospitals in particular, and to a lesser degree general hospitals, suffered most. Variance by type was tested and appears significant since $\alpha \leq 0.01$ ($\chi^2 = 39.46$; df = 2). Note that, during the last decade, only specialized hospitals ceased to exist. Figure 3 shows the difference in survival for all hospitals based on whether they merged. Every hospital that merged between 1978 and 2010 survived, while only roughly 63% of those that did not merge survived the same period. The variance is significant since $\alpha \leq 0.01$ ($\chi^2 = 76.51$; df = 1).

The difference in the number of hospitals that ceased to exist in and outside the Randstad is presented in Figure 4. It appears that initially only hospitals outside the Randstad ceased to exist. Thereafter, however, the number of hospitals in the Randstad that ceased to exist quickly exceeded the number of those outside it. More than 91% of the hospitals in the non-Randstad regions survived the investigated period, against 84% in the Randstad regions. This result seems to confirm our earlier hypothesis that the conditions in the latter regions are more competitive. However, variance in the survival rate of these categories is not significant since $\alpha \leq 0.01$ ($\chi^2 = 2.78$; df = 1).

Forecasting survival

Taking account of a number of predictive variables, we have considered whether, between 1978 and 2010, hospitals increased their chances of survival by merging. Here too the analysis was performed for all hospitals. The Cox regression tests whether merging contributed to the survival of either group. In addition to having merged, other predictive variables including size, type, and location were included in this model. For the analysis, we have included a dummy for teaching hospitals and a dummy for specialized hospitals. The reference group is general hospitals. Table 2 presents the results of the Cox regression and shows a mixed picture. On the one hand, the likelihood ratio test changed significantly with the addition of merger (model 2) as a survival predictive category ($\chi^2 = 113.0$; df = 5; $p = 0.00$). On the other hand, based on the Wald test, merging caused no significant change when corrections were made for other predictive variables (Wald test 0.00; $p = 1.00$). For a similar test situation, Tabachnick and Fidell[24] report that the Wald test is more reliable and

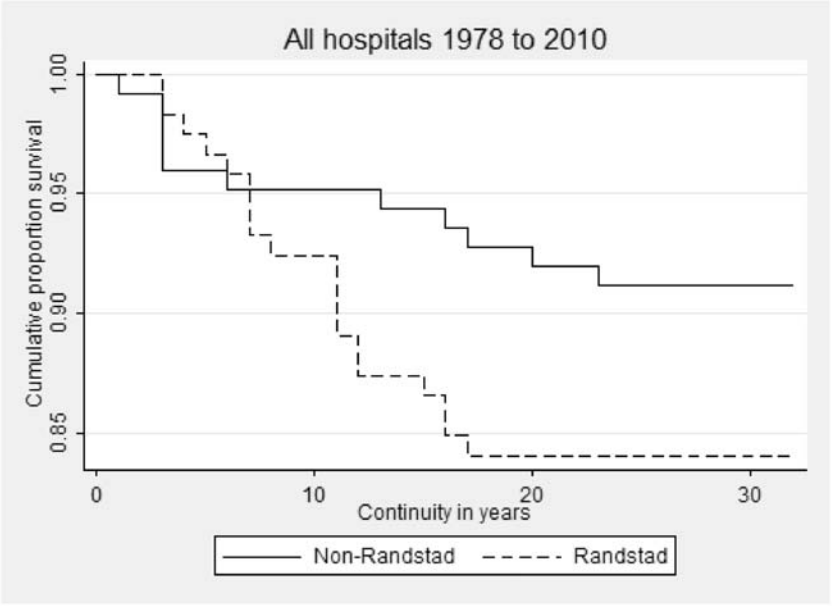

Figure 4. Comparison of Dutch hospital survival in and outside Randstad, 1978–2010.

Table 2. Cox regression analysis of the influence of various factors on the lifespan of all Dutch hospitals, 1978–2010.

	B (coefficient)	Wald	Odds ratio (Hazard)
Model 1			
Size	−0.012	16.031[a]	0.989[a]
Randstad	0.497	1.656	1.644
dumTeachingHosp	−27.760	2.92 E–12	8.83 E–13
dumSpecHosp	0.468	1.035	1.597
χ^2 compared to smaller model (G^2)	56.57[a]		
N		243	
Model 2			
Size	−0.011	17.344[a]	0.989[a]
Randstad	0.178	0.215	1.194
dumTeachingHosp	−30.050	1.20 E–13	8.87 E–14
dumSpecHosp	0.796	3.270	0.451
Merging	−38.710	1.62 E–12	1.54 E–17
χ^2 compared to smaller model (G^2)	113.00[a]		
N		243	

[a]Significant $\alpha < 0.01$.

thus preferable. Based on this, model 1 demonstrates that the set of the other variables is a significant predictor of survival since $\alpha \leq 0.01$ ($\chi^2 = 56.57$; df = 4; $p = 0.00$). If $\alpha \leq 0.01$ is presumed, then only hospital size is significant (Wald test 16.03; $p = 0.00$). Thus, hospital size in particular is a determinant of survival. The larger the hospital, the smaller the chance of closure. The odds ratio for size is 0.99. Each additional bed increases chances of survival by 1%. The type of hospital and the proximity to the Randstad had no significant effect on lifespan. It is possible that there was a correlation between merger and hospital size. Such correlation would mean that there was multicollinearity in the model. To test this, we performed a *t*-test to determine whether there was a difference in the average size of the merged hospitals and the non-merged hospitals. We did not find a significant difference ($t = -1.56$; df = 241; $p = 0.12$).

A key assumption of a Cox model is proportional hazards, i.e., the effect of the covariates is constant

over time. To test this assumption, we used the Schoenfeld residuals method. In each of the above models, we performed such a test for the covariates and accepted the null-hypothesis of proportional hazard ($\alpha \leq 0.01$).

Conclusion

The results of our study indicate that mergers had no significant effect on hospital survival, once we take size, type, and location into account. We also found no significant effect resulting from location in the urbanized Randstad area or not. Furthermore, the type of hospital had no significant effect on lifespan. However, hospital size correlated positively with lifespan and functions as a strong condition for survival. This matches findings by Scott et al.[10] which were based on American data.

We would associate this ''size effect'' with the usual public or ''system'' function of larger hospitals (too big to fail). When considering these empirical results for the Netherlands, we should be aware that the survival of smaller hospitals was affected predominantly by government policy focused on reducing clinical capacity in the first part of the analysis period, rather than by economies of scale and their lack of bargaining power relative to big hospitals in the region. This also indicates that, in that period, the national reduction of cost rather than accessibility of hospital services was the most important driver.

Discussion

Our analysis is based on the assumption that those variables that influenced survival at the beginning of the test period were still doing so at its end. We also assumed that all other conditions remained static.[24] In this study, the last assumption in particular is tenable only to a limited degree. This means that the results of this survival analysis on the relation between lifespan and a set of predictive variables must be interpreted with the requisite caution. Government policy has played a significant role in the increasing concentration in the market. In the period after 1998, most of the mergers involved large hospitals (top, center, and teaching hospitals). This kind of merger was not stimulated by the government but was a result of the increasing possibilities of concentrating specialties and increasing power to bargain with healthcare insurers. This was an offence strategy on the part of hospitals rather than a defense strategy. The consequence was an increasing concentration in the hospital market. With a focus on quality policy, the government stimulated the concentration of specialities within healthcare regions. As a result, concentration in the market increased, and a patient's freedom of choice became limited. These seemingly paradoxical government measures mean that merger assessment must draw a careful balance between the stimulation of market dynamics and the necessary provision of public services by hospitals. This dilemma also relates to the rationale for merger regulation as formulated by the CCP in the UK.[25] On the one hand, these guidelines are intended to improve patient choice and competition; on the other hand, mergers have the potential to play an important role in improving clinical quality and efficiency. At this moment, the latter is an important issue in selective contracting by healthcare insurers in the Netherlands. In fact it is expected to generate a new incentive for merging as a defense strategy, especially for the smaller general hospitals. Finally, this empirical research shows that the regulation of national healthcare systems, especially when third parties are involved, demands interactive policy making and permanent monitoring. It seems to be a necessary condition for balancing public and organizational interests.

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References

1. Buchmueller TC, Jacobson M and Wold C. How far to the hospital? The effect of hospital closures on access to care. *J Health Econ* 2006; 25: 740–761.
2. Lindrooth RC, Lo Sasso AT and Bazzoli GJ. The effect of urban hospital closure on markets. *J Health Econ* 2003; 22: 691–712.
3. Dranove D. Economies of scale in non-revenue producing cost centers: implications for hospital mergers. *J Health Econ* 1998; 17: 69–83.
4. Dranove D, White WD and Wu L. Segmentation in local hospital markets. *Med Care* 1993; 31: 52–64.
5. Rosenbach ML and Dayhoff DA. Access to care in rural America: impact of hospital closures. *Health Care Financ Rev* 1995; 17: 15–37.
6. Protopsaltis G, Fulop N, King AM, et al. All pain and no gain? A study of mergers of NHS Trusts in London: two-year post-merger findings on the drivers of mergers and processes of merging. In: Dopson S and Mark LM (eds) *Leading health care organizations*. Basingstoke: Palgrave Macmillan, 2003, pp.214–231.
7. Bogue RJ, Shortell SM, Sohn MW, et al. Hospital reorganization after merger. *Med Care* 1995; 33: 676–686.
8. Kennedy L and Dumas MB. Hospital closures and survivals: an analysis of operating characteristics and regulatory mechanisms in three states. *Health Serv Res* 1983; 18: 489–512.
9. Janssen RTJM and den Hartog M. More market, less competition and more strategy in the hospital market. In: Malek M, Rasquinha J and Vacani P (eds) *Strategic issues in health care management*. Chichester: John Wiley and Sons, 1993, pp.189–210.

10. Scott WR, Ruef M, Mendel PJ, et al. *Institutional change and health care organizations*. Chicago: The University of Chicago Press, 2000.
11. Bays CW. The determinants of hospital size: a survivor analysis. *Appl Econ* 1986; 18: 359–377.
12. Mobley LR and French HE. Firm growth and failure in increasingly competitive markets: theory and application to hospital markets. *J Econ Bus* 1994; 1: 77–93.
13. Vita MG, Langefeld J, Pautler P, et al. Economic analysis in health-care antitrust. *J Contemp Health Law Policy* 1991; 7: 73–115.
14. Cereste M, Doherty NF and Travers CJ. An investigation into the level and impact of merger activity amongst hospitals in the UK's National Health Service. *J Health Org Manage* 2003; 17: 6–24.
15. Lee S and Alexander JA. Consequences of organizational change in U.S. hospitals. *Med Care Res Rev* 1999; 56: 227–276.
16. Ferguson B, Goddard AC and Stano M. The case for and against mergers. In: Ferguson B, Sheldon PA and Posnett J (eds) *Concentration and choice in healthcare*. Cambridge: RSM Press/Hoddle Doyle Meadow, 1997, pp.87–92.
17. Schut FT, Greenberg W and van de Ven WPMM. *Antitrust policy in Dutch health care; relevance of EEC competition policy and US antitrust practice*. Rotterdam: Erasmus University, 1990.
18. Janssen RTJM, van Doorslaer E and Wagstaff A. Health insurance reform in the Netherlands and the progressivity of health care finance. *Econ Soc Rev* 1994; 25: 303–320.
19. Janssen RTJM, Leers Th, Meijdam LC, et al. Bureaucracy versus markets in hospital care, the Dutch case. *Publ Choice* 2003; 114: 477–489.
20. Boonen LHHM. *Consumer channeling in health care: (im)possible?* Academic thesis, Erasmus University, Rotterdam, 2009.
21. Halbersma RS, Mikkers MC, Motchenkova E, et al. Market structure and hospital-insurer bargaining in the Netherlands. *Eur J Health Econ* 2011; 12: 589–603.
22. Varkevisser M. *Patient choice, competition, and antitrust enforcement in Dutch hospital markets*. Academic thesis, Erasmus University, Rotterdam, 2009.
23. Porter ME. *Competitive strategy*. London: Simon & Schuster Ltd, 2004.
24. Tabachnick BG and Fidell LS. *Using multivariate statistics*. Needham Heights: Allyn & Bacon, 2001.
25. Cooperation and Competition Panel. Merger guidelines, http://www.ccpanel.org.uk/reports-and-guidance/ (2013, accessed 28 April).