OPERATIONAL EFFICIENCY ANALYSIS OF CORPORATE HOSPITALS IN INDIA

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INTRODUCTION

Hospital is basically a service based organization and it offers considerable advantages to both the patient and the society at large. Certain health problems require intensive medical treatment and personal care which normally cannot be made available at home or in the clinic of a doctor, but they are possible only in a hospital where a large number of professionally and technically skilled people apply their knowledge and skills with the help of world class advanced and sophisticated equipment. Healthcare industry in India has been growing at a tremendous pace in the past two decades and is expected to record a Compound Annual Growth Rate of 16.5 percent during 2008-2020. In order to provide world-class service, most of the corporate hospitals use high-end technology and high-end specialists for complex treatments like plastic surgery, cosmetic surgery, open heart surgery, joint replacements, neurosurgery etc. Corporate hospitals make use of the latest technology available and perform more complex procedures and treatments. They possess a large number of professionally and technically skilled people who apply their knowledge and skill with the help of world-class expertise, advanced sophisticated equipment's and appliances.

SIGNIFICANCE OF THE STUDY

The patients' expectations from the modern healthcare organizations have increased considerably. In the recent years they have shifted their interest to the availability of facilities in a hospital. Now, the patient trusts the hospitals with well-reputed doctors. In this context, it is necessary to have a separate cadre of administrators who combine some knowledge of medical system with sound management principles. In the present changed scenario, the public shows interest in the corporate hospitals which run their organizations on scientific principles. Some of the distinct features of these corporate hospitals are (a) provision of sophisticated services in various fields of specialization, (b) availability of all diagnostic facilities under one roof and (c) availability of different specialists without any delay or inconvenience. Corporate hospitals make these facilities possible only with proper administration of management functions, thereby leading to operational efficiency.If a patient visits the multi-specialty hospital, he is provided with the benefits including master check-up without searching for each and every specialized doctor's since they are readily available for all sorts of health problems. The importance of profit in judging and directing business affairs has been recognized both by economic thinkers and

accounting practitioners. The management of a hospital is generally eager to measure its operating efficiency of a firm and its ability to ensure adequate return to its shareholders depending ultimately on the profits earned. Moreover, the profits provide resources for expansion thereby creating health to the corporate hospitals and wealth to their shareholders.

STATEMENT OF THE PROBLEM

The World Health Report 2000 called attention to the importance of efficiency in the functions of a health system and ultimately in achieving the goals of health improvement, responsiveness and fairness in financing. Efficiency has been the subject of research in hospital services especially corporates. Operational efficiency can be defined as the ratio between the input to run a operation and the output gained. However, in practice, corporate hospitals also have some drawbacks. Basically, an average Indian citizen is not in a position to go to corporate hospital because of non-affordability. Middle-income group and low income group are not in a position to use this facility because of the high consultation and surgical fee charged. In this context, the question arises as to how many patients can utilize these services. Only higher income group can afford leaving all the other groups out of the reach. Still, there are huge corporate hospitals that provide services at affordable cost to become profitable. While improving the operational efficiency, the output to input ratio improves. In order to attain operational efficiency, the hospitals need to minimize redundancy and waste while leveraging the resources that contribute most to its success and utilizing the best of its workforce, technology and service processes. There are many potential measurements to identify the outputs of a hospital as the number of cases treated, the number of procedures performed, the number of inpatients and outpatients per day, bed turnover and bed occupancy among others. The output or combination of outputs to use depend on the objectives of the corporate hospitals and on the level of measurement activities.

OBJECTIVES OF THE STUDY

The study had been conducted with the following objectives to analyze the above problems:

1. To analyze the operational and technical efficiency of the corporate hospitals.
2. To evaluate the profit earning capacity of corporate hospitals and to identify the factors that determine their profitability.
3. To find out the influence of liquidity on the profitability of corporate hospitals.
4. To probe the solvency position and wealth-creation ability of corporate hospitals.
5. To suggest necessary measures to the policy-makers for better efficiency of the hospital industry.

HYPOTHESIS OF THE STUDY

The following hypotheses had been formulated and tested to fulfill the objectives of the study:

H_{o1}: The operational and technical efficiency of corporate hospitals are equal.

H_{o2}: The profit earning capacity of corporate hospitals are equal.

H_{o3}: The liquidity position of the corporate hospitals influence their profitability.

H_{o4}: The corporate hospitals are equal in terms of their solvency position and wealth creation capacity.

SCOPE OF THE STUDY

The present study mainly focused on the operational efficiency and profitability analysis of corporate hospitals. Only those corporate hospitals that raise their share capital through public, listed in stock exchange and multi-specialized in nature alone were considered for the study. Similarly, the researcher used Questionnaire for collecting primary data required for analyzing the technical efficiency. The questions were confined to the data required for analysis.

RESEARCH METHODOLOGY

Sample Selection

Out of the eight corporate 'Hospitals/diagnostics' listed in Bombay Stock Exchange, only four were multi-specialized hospitals, the rest being either single-specialty or diagnostic. Therefore, all the four hospitals had been selected as the study units.

Sample Units

The sample units selected for the study were:

Table 1.1 List of Sample Units

S.No	Corporate Hospitals
1	Apollo Hospital Enterprises Limited (AHEL)
2	Indraprastha Medical Corporation Limited (IMCL)
3	Fortis Healthcare Limited (FHL)
4	Kovai Medical Center Hospital (KMCH)

PROFILE OF THE STUDY AREA

The Hospital is an integral part of social organization. Its function is to provide complete healthcare to the sick and injured without any social, economic or racial discrimination. Apollo Hospitals, widely recognized as the pioneer of private healthcare in India, was the country's first corporate hospital. The first Apollo Hospital was opened in Chennai during the year 1983. It was founded out of the determination to lead a complete transformation in Indian healthcare. Apollo's Founder Chairman, Dr. Prathap C Reddy was the driving force behind the inception. Credited as the architect of modern Indian healthcare, Dr.Prathap C Reddy started Apollo with the mission of bringing world-class healthcare to India, at a price point that Indians could afford.

The Apollo Hospitals Group, which was started as a 150-bed hospital, operates 9200 beds across 64 hospitals today.

Indraprastha Medical Corporation Limited (IMCL) was incorporated in 1988. It operates the Indraprastha Apollo Hospitals (IAH), a 695-bed multi-specialty institute in New Delhi, which is a part of the Apollo Hospitals group. IMCL was the first hospital in India to be internationally accredited by the Joint Commission International (JCI), a US-based healthcare services accreditation body, in June 2005. It has plans to set up five satellite centres.

Fortis Healthcare Ltd was incorporated on 28th February 1996 as Rancare Ltd. The name of the hospital was changed to Fortis Healthcare Ltd., on 20th June 1996 and it was renamed as Fortis HealthCare Ltd on 6th March 2012. The registered office is located at Okhla Road in New Delhi.The equity shares of the company were listed at the Bombay Stock 63 Exchange(BSE) and National Stock Exchange(NSE). Fortis Healthcare is a part of the Ranbaxy Group and was promoted by Malvinder Mohan Singh and his brother Shivinder Mohan Singh. The former is the Chairman of the company and his brother is the Managing Director.

KMCH was incorporated on 29th August 1985. The company has been promoted by Dr. N. G. Palanisawami and associates comprising several doctors practising in the USA, UK and many other countries including India. The main objectives of the company include establishment and running of multi-speciality hospital. The company has setup a modern 250 beds multispeciality hospital near Coimbatore in Tamilnadu with support from internationally acquired professionals backed by leading Indian doctors and well- trained support staff.

TECHNICAL EFFICIENCY ANALYSIS OF CORPORATE HOSPITALS - DEA

Data Envelopment Analysis (DEA) provides a means of calculating apparent efficiency levels within a group of organizations. The efficiency of corporate hospitals is calculated relative to the groups observed best practice. DEA is often used to calculate the technical competency of hospitals. Data envelopment analysis is used for measuring and evaluating the performance of set of entities called Decision Making Units (DMU). DEA has become a widely used technique for efficiency measurement. It is mainly based on the earlier concept of Frontier Analysis and it became popular in assessing the relative efficiency scores of a particular set of Decision-Making-Units (DMU), which produce a variety of outputs by using several inputs. The first DEA model developed by Charnes et al. (1978), named the CCR model, was based on the assumption of Constant Return to Scale (CRS). Later, Banker et al. (1984) enhanced the CCR model and developed the BCC model using the Variable Return to Scale (VRS), in 1984. Consequently, Nayar and Ozcan (2008) concluded that DEA is constructive technique for healthcare managers to investigate opportunities in accordance with the improvement of efficiency.

DEA MODELS

Constant returns to scale

For the input oriented case, the conversion of the ratio model into a linear programming model is carried out by maximizing the numerator of the objective function and setting the denominator of the objective function equal to one. For the output oriented case, the linearization is obtained by minimizing the denominator of the objective function and setting the numerator of the objective function equal to one.

Variable Returns to Scale

The Constant Returns to Scale (CRS) assumption is appropriate when maximal productivity is attainable for all the scale size ranges. However, in some cases, maximum productivity is limited to a specific scale size range. Consequently, some DMUs may be either too small or too large to achieve the maximum productivity. In these cases, the appropriate assumption is the existence of variable returns to scale. The Variable Returns to Scale (VRS) specification allows calculating technical efficiency measures accounting for scale effects. It ensures that inefficient DMUs are only compared with DMUs of similar size such that the productivity levels observed in the peers are achievable by the DMU under assessment.

Scale efficiency

Scale efficiency is a measure of how much the scale of operation of a DMU has impacts on its ability to achieve the maximum productivity. Comparing the distance between the CRS and VRS frontiers

corresponding to the evaluation of a given DMU, it is possible to define a measure of scale efficiency. The scale efficiency of DMUj0 can be calculated as shown below:

$$\text{Scale efficiency of DMUj0} = \frac{\text{CRS efficiency score of DMUj0}}{\text{VRS efficiency score of DMUj0}}$$

Technical efficiency

Efficiency involves a comparison of the actual location of a DMU within the PPS with the optimal input and output levels corresponding to the points located in the production frontier. The first measure of technical efficiency dates back to the work of Debreu and Farrell. The Debreu's measure of efficiency is called the “coefficient of resource utilization”.

Malmquist Productivity Index

The Malmquist productivity index (MPI) evaluates the productivity change of decision making units (Corporate hospitals studied) between inputs and outputs. It can be defined as the product of Catch-up and Frontier-shift terms. Catch-up or recovery is related to the degree in which a decision making unit (DMU) improves or worsens efficiency. Frontier shift (or innovation) is a term which reflects the change in the efficiency of frontiers between the two time periods (Cooper et al., 2007). The productivity change of corporate hospitals could be due

to either change in technical efficiency or change in the technology technological progress in the industry or both. The total factor productivity change is the product of technical efficiency change and technologicalchange. Technical efficiency change is decomposed into pure technical efficiency and scale efficiency change.The Malmquist productivity index can be interpreted as a measure of total factor productivity (TFP) growth. Improvement in productivity, efficiency and technology, is indicated by values greater than one, whereas value less than one indicates regress.

Table 1.2

Malmquist Index Summary of Annual Means

Year	Technical efficiency Change (TEC)	Technological Change (TC)	Pure Technical Efficiency Change	Scale Efficiency	Total Factor Productivity Change (Malmquist)
2004-2005	1.000	1.036	1.000	1.000	1.036
2005-2006	0.995	1.014	0.996	0.999	1.009
2006-2007	0.985	0.874	1.004	0.981	0.861
2007-2008	1.019	1.105	1.000	1.019	1.126
2008-2009	0.979	1.011	1.000	0.979	0.990
2009-2010	1.018	1.202	1.000	1.018	1.224
2010-2011	1.005	1.147	1.000	1.005	1.152
2011-2012	1.000	0.821	1.000	1.000	0.821
2012-2013	1.000	0.377	1.000	1.000	0.377
2013-2014	1.000	1.135	1.000	1.000	1.135
2014-2015	0.990	1.151	1.000	0.990	1.139
MEAN	0.999	0.950	1.000	0.999	0.950

The year 2004 was taken as the technology reference using the Malmquist Total Factor Productivity (TFP) index to analyze differences in productivity overtime. It was to be noted that all the values for total factor productivity (TFP) or any of its components that were greater than 1 indicated progress in efficiency and values less than 1 regresses and a value of 1 signifies no change.

Table 1.2 showed the estimates of the Malmquist total factor productivity and its components. The analysis reveals that, on an average Malmquist productivity or total factor productivity increased by 5 percent during 2004-2005 to 2014-2015. This suggested that Corporate hospitals had experienced or achieved moderate productivity growth during the period. The total factor productivity had been highest in 2009-2010 (TFP=1.224) and the lowest in 2012-2013 (TFP= 0.377).

As indicated in Table 4.16 and Chart 4.1 the results of Malmquist indices showed that productivity had fluctuated during the period 2004-2005 to 2014-2015. The year 2012-2013 recorded highest decline in productivity at 62.3 per cent while years that reported productivity progress of 3.6 per cent, 0.9 per cent, 12.6 per cent, 22.4 per cent, 15.2 per cent, 13.5 percent, 13.9 percent during the years 2004-2005, 2005-2006, 2007-2008, 2009-2010, 2010-2011, 2013-2014, 2014 -2015 respectively.

By decomposing the Malmquist index, it was possible to determine the sources of productivity growth. As explained previously, technical efficiency change (TEC) and technological change (TC) were the efficiency changes (movement of corporate hospitals towards the frontier-catching up) and technological changes (frontier shift) respectively. The results of the analysis showed that the main source of growth in total factor productivity of corporate hospitals was attributed to technical efficiency change. The decomposition of total factor productivity show that the mean technical efficiency change (TEC) decreased by 0.1 percent whereas mean technological change has showed an increase of 5 percent during that period. This implied that the growth for total factor productivity of the hospitals was due to the technical efficiency change. The corporate hospitals efficiency decreased by 0.1 per cent and technological change i.e., innovation also regressed by 5 per cent.

Table 1.3

Malmquist Index Summary Mean of Corporate Hospitals

Corporate Hospitals	TEC	TC	PTEC	SEC	TFP(MI)
AHEL	1.000	0.858	1.000	1.000	0.858
IMCL	1.000	0.925	1.000	1.000	0.925
FHL	0.996	0.978	1.000	0.996	0.974
KMCH	1.000	1.053	1.000	1.000	1.053
MEAN	0.999	0.950	1.000	0.999	0.950

Table 1.3 provided summary of the annual geometric mean values of the Malmquist Productivity Index (Corporate hospitals) and its components for each hospitals. Majority of the hospitals (nearly 80 percent) showed positive productivity growth (Corporate Hospitals>1). AHEL, IMCL, FHL and KMCH have registered total factor productivity growth of 14.2%, 7.5%, 2.6% and 5.3% respectively. The productivity growth of FHCL was due to the technological change only. Meanwhile, productivity growth of IMCL and KMCH were due to the improvement in efficiency only i.e., the result of technical efficiency change (TEC>1). The productivity growth of AHEL was explained by both improvements in efficiency and technological change.

Further, as in Table 1.3 corporate hospitals had an average pure technical efficiency change (PTEC) score of one. AHEL, IMCL, FHL and KMCH have registered a pure technical efficiency change score of one, indicating no change of inefficiency at those corporate hospitals during the period. The average pure technical efficiency change score for the entire sample was 1.000 implying that pure technical efficiency change score increases technical efficiency change.

Turning to scale efficiency change (SEC), three corporate hospitals have scored scale efficiency change score of one. AHCL, IMCL and KMCH possess a scale index value of one, meaning that the scale of production does not contribute to the total factor productivity. On the other hand, the score of FHL is found to be less than one. This indicated that FHL contribute negatively to the productivity change of 0.4 per cent respectively. The average scale efficiency change score of the entire sample is 0.999, indicating that the scale of production on an average increase efficiency change by 1.1 percent.

CONCLUSION

The analysis of technical efficiency revealed that Apollo Hospitals Enterprise Limited had achieved high service growth during the study period. Indraprastha Medical Corporation Limited and Kovai Medical Center Hospital had shown improvement in Technical Efficiency Change. Fortis Healthcare Limited and Apollo Hospitals Enterprise Limited had deterioration in technological innovation. All the four study units had achieved pure technical efficiency, while the scale efficiency were achieved except by Fortis Healthcare Limited. For technical efficiency change, the result showed that during the study period the corporate hospitals have experienced mainly an increment of pure technical efficiency (improvement in management practices) rather than an improvement in optimum size.

FINDINGS

- ✓ The Malmquist productivity or total factor productivity of corporate hospitals increased by 5 per cent between 2004-2005 and 2014-2015. This stated that while Apollo Hospitals Enterprises Limited had experienced greater productivity among the study units, the other hospitals had achieved moderate productivity growth.
- ✓ Kovai Medical Center Hospital alone had shown improvement in technological change, while the other hospitals had exhibited a 5 per cent decline and disclosed the fact that there had been deterioration in the performance of the best practicing corporate hospitals.
- ✓ The pure technical efficiency showed 1.00 per cent increase while scale efficiency contributed on an average increase of 0.1 per cent. This implies that during the study period the corporate hospitals mainly experienced an increment of pure technical efficiency (improvement in management practices) rather than in improvement in optimum size (scale efficiency change).

SUGGESTIONS

- The result of technical efficiency change disclosed that the corporate hospitals had experienced mainly an increment of pure technical efficiency (improvement in management practices) rather than an improvement in optimum size (scale efficiency change).
- As a result the important policy /strategic implication for the corporate hospitals is that they need to pursue a technological progress in order to meet the dual objectives of reaching many poor people and attaining financial sustainability.

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