A Systemic Review of Hospital Operational Efficiency Studies

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Abstract- As such the health care systems in India is very complex and having various verticals. With the emergence of corporatization of hospital the measurement of efficiency has become the initial step in the process of individual performance audit of patient care centers. The term efficiency is largely used in the field of economics and it refers to the best utilization of resources. A very common example of operational efficiency is technical efficiency which means the effective use of resources (input) in producing outputs. In the Farrell framework, a hospital is judged to be technically efficient if it is operating on the best practices of the production frontier. Mainly there are two methods which are used in measuring operational efficiency. The first is Data Envelopment Analysis (DEA) which is a linear programming method enabling the measurement of efficiency consistent with the theoretically based concept. The role of DEA is to examine the relationship between inputs to a process and the outputs of that process. The second technique for assessing efficiency that is employed is Stochastic Frontier Analysis (SFA). However the DEA is used most commonly.

Index Terms- Efficiency, Operational efficiency, Hospital Efficiency, DEA

I. INTRODUCTION

In the older times the hospitals were considered as doctors workshop and more in charitable in nature hence they were not expected to be efficient or profitable though they consume vast variety and amount of resources in order to care patients.

Now with the passage of time and enhancement of resources used there is growing interest in examining and measuring its operational efficiency because the driving force for such efficiency is money. In the present day practice of demand and expectations of clients for quality seriveces at all the outlets of hospoital e.g OPD , IPD, diagnosics , Healthcheck etc. But at the same time the cost of care has also grown substantially which made mandatory supervision on the operational efficiency of the organization.

Over the past two decades, efficiency measurement has been one of the most intensely explored areas of health services research. The aim of this paper is to provide a detailed review of the concept of efficiency, its relevance in hospital industry, and review some related studies.

II. THE CONCEPT OF HOSPITAL OPERATIONAL EFFICIENCY

In the Farrell (1957) framework, a hospital is judged to be technically efficient if it is operating on the best practice production frontier in its hospital industry. Magnussen (1996) stated that measuring efficiency allows us to compare hospitals in terms of their real use of inputs and outputs rather than costs or profits. A hospital is said to be functionally operational efficient if an increase in an output requires a decrease in at least one other output, or an increase in at least one input. Or in other words it can be stated that a reduction in any input must require an increase in at least one other input or a decrease in at least one output.

In order to measure hospital's operational efficiency, it is mandatory to identify the hospital's output. These outputs can be identified as number of surgery done, number of admitted patients , number of patient days, bed turnover rate and bed occupancy rate, number of OPD patients, average length of stay etc. It depends on the level (organizational /departmental) at which these outputs are to be measured.

III. APPROACHES TO STUDY HOSPITAL EFFICIENCY

Recent academic research on measuring efficiency in various areas has shifted to frontier efficiency. Frontier efficiency measures deviations in performance from that of best practice firms on the efficient frontier. In general there are two main approaches a nonparametric piecewise-linear convex isoquant constructed such that no observed point should lie to the left or below it (known as the mathematical programming approach to the construction of frontiers); or a parametric function, such as the Cobb-Douglas form, fitted to the data, again such that no observed point should lie to the left or below it (known as the econometric approach).

The econometric approach specifies a production function and normally recognises that deviation away from this given technology (as measured by the error term) is composed of two parts, one representing randomness (or statistical noise) and the other inefficiency. The usual assumption with the two-component error structure is that the inefficiencies follow an asymmetric half-normal distribution and the random errors are normally distributed. The random error term is generally thought to encompass all events outside the control of the firm, including both uncontrollable factors directly concerned with the 'actual' production function (such as differences in operating

environments) and econometric errors (such as misspecification of the production function and measurement error). This type of reasoning has primarily led to the development of the 'stochastic frontier approach' which seeks to take these external factors into account when estimating the efficiency of real-world firm, and the earlier 'deterministic frontier approach' which assumes that all deviations from the estimated frontier represent inefficiency.
In contrast to the econometric approaches which attempt to determine the absolute economic efficiency of firm against, the mathematical programming approach seeks to evaluate the efficiency of a firm relative to other firms in the same industry. The most commonly employed version of this approach is a linear programming tool referred to as 'data envelopment analysis' (DEA).

Ferrier and Lovell (1990) illustrated that stochastic frontier analysis and data envelopment analysis may be used as crosscheck with each other.

IV. REVIEW OF HOSPITAL EFFICIENCY STUDIES

Valdmanis (1990) applied the DEA method to a group of hospitals and found that government-owned hospitals were more efficient. The other surprising result is that for profit hospitals tend to be disproportionately represented among highly inefficient hospitals (Ozcan 1992) and are inefficient compared to not-for-profit hospitals when output is measure by discharging.

Zuckerman et al. (1994) used a cross-sectional stochastic frontier model to derive hospital- specific measure of inefficiency. The existence of high profits for some hospitals and losses for others, lead the authors to question whether profitable institutions are efficient and those experiencing losses are not. If this is the case, it follows that inefficient hospitals should cut their costs and profitable hospitals should expand production.

According to their findings, the authors concluded that inefficiency accounts for 13.6 percent of total hospital costs' and that the PPS which rewards efficiency and penalizes inefficiency, provides hospitals with appropriates incentives. This is because a reduction in inefficiency reduces costs. Hofler and Folland (1991)suggested that SFA is important in assessing hospital costs and efficiencies, because other methods do not necessarily identify what minimum costs should be. The authors suggested that DEA is not entirely satisfactory because it ignores random fluctuations present in the data observations. Ozcan and Bannick (1994) used DEA to study trends in Department of Defense hospital efficiency from 1998-1999 using 124 military hospitals and data from the American Hospital Association Annual Survey. These studies were conducted at the strategic level under a different operational paradigm, prior to the large-scale adoption of managed care.

Ozcan and Luke (1993) used the DEA technique to conduct a national study of the efficiency of hospitals in urban markets. Four variables were analyzed in this study: hospital size, membership in multihospital system, ownership and payer mix. Ownership and percent Medicare were consistently related to hospital efficiency. The Medicare percent was related negatively to technical efficiency. Government hospitals were more efficient and for profit hospitals less efficient than other types of hospitals. Other variables like hospitals size, and membership in a multihospital system were related positively to efficiency. In 1998 Linna investigated the development of hospital cost efficiency and productivity in Finland by comparing both parametric and non-parametric panel models.

Parkin and Hollingsworth (1997) used a constant return to scale to measure efficiency of 75 Scottish acute care hospitals. They use an input vector consisting of three capital and three labor variables and output vector consisting of four categories of inpatient discharges as well as emergency attendances and outpatient attendances.

Also, panel data models require fewer assumptions because repeated observation on a number of decision making units, such as hospitals, can take the place of strong distributions assumptions.

Coppola (2003) conducted a DEA study of military hospital using 1998-2002 data. In his study he selected the following input variables: costs, number of beds, number of service offered. For output variables, he used surgical visit, ambulatory patient visit, emergency visits, and live birth. This study is focused on workload as the primary measure for efficiency, a point of view not fully congruent with the current operation of military hospitals.

Mangnussen (1996) measured the production efficiency of 46 Norwegian hospitals using labor and capital inputs and specifying various output vectors. Notably, he examined treated patients and patient days as alternative units of measurement for inpatient activity and found the rank correlation between the models to be 0.67, implying substantial differences between the two measurement specification. As well, he examined the disaggregation of outputs based on patient complexity and the type of activity and found the rank correlation between the models to be 0.78 again revealing significant sensitivity to the model specification.

Street (2003) provided another application of SFA to the hospital sector using cross-sectional data for English public hospitals. More specifically the author compared the results obtained using corrected ordinary least square with results obtained using the SFA cost function. There are two alternative resulted obtained for the SFA model since the model is run under two assumptions of the distribution of the inefficiency term. One of the SFA models assumed a half-normal distribution, and the other an exponential distribution.

Another study is by Stanford's (2004) examination of the performance by using DEA of 107 Alabama hospitals in the treatment of acute myocardial infarction patients because it too examined clinical efficiency and quality of care. Cross efficiencies were used to improve the efficiency discrimination between hospitals.

Bates (2006) used data envelopment analysis and multiple regression analysis to examine empirically the impact of various market-structure elements on the technical efficiency of the hospital services industry in various metropolitan areas of the United States. Market-structure elements include the degree of rivalry among hospitals, extent of HMO activity, and health insurer concentration. The DEA results showed the typical hospital services industry experienced 11 percent inefficiency in 1999.

Moreover, multiple regression analysis indicated the level of technical efficiency varied directly across metropolitan hospital

services industries in response to greater HMO activity and private health insurer concentration in the state. The analysis suggested the degree of rivalry among hospitals had no marginal effect on technical efficiency at the industry level. Evidence also implies that the presence of a state Certificate of Need law was not associated with a greater degree of inefficiency in the typical metropolitan hospital services industry.

V. CONCLUSION

The research methodology through the review of literature on the specific process of the hospital management is an effective and efficient approach to go further for the studies. The review of literature guide the researcher in understanding the complexities of the functioning of healthcare sector. However the researcher should make an guanine effort to have suitable blend of qualitative as well quantitative methodologies as and where necessary. The operational efficiency is the key factor in the success of the hospital hence the analysis of hospital operations should be done carefully by using suitable method of analysis.

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