Measuring Performance of Hospitals in Nepal: Using Management Approach

A running head: Hospital performance in Nepal

Category: Research article

Abstract words: 147

Key words: Management Practices, Hospital, Performance, Nepal,

Article (text only): 3767 (including tables in the text)

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Abstract

The paper seeks to measure management practices from the employer perspective of Nepal's hospitals and to explore the relationship between management practices and output indicators. Management practices are scored using a double-blind survey. After complted the management survey of the hospitals, we administrated pre-designed and pre-tested the questionnires to collect the data from 100 hospitals related to production of services, quality of services and hospital charecteristics. Ordinary least squares method used to establish the relationship between management practices and outtputs of the hospitals. The result suggests that management score is slightly higher for private hospitals (2.08) than public hospitals (1.94); however, this difference is not statistically significant. The results show that better management practices are strongly associated with the indicators of performance of the hospitals.

The paper concludes that management score is not only associated with total services but also associated with the quality of service delivery.

Introduction

In practice, two general approaches: a nonparametric (or data envelopment analysis- DEA) and a parametric (the stochastic frontier approach- SFA) are popular to measure the hospital performance [1]. Each method has particular strengths and weaknesses and potentially measures different aspects of efficiency [2]. For example, a nonparametric approach assumes no statistical noise, but it is likely to be sensitive to the influence of outliers. A parametric approach captures random fluctuations and overcomes the shortcoming of the deterministic cost frontier; however, it requires strong assumptions as to the form of the frontier [3]. Strong assumptions and several limitations of econometric analysis may produce bias results. Measures of quantity of output may neglect differences in quality across hospitals, which may bias estimates of economies of scale. The choice of an appropriate method is of critical importance. Recently a new method of measuring and understanding the performance of hospital using management approach has been developed [4]. A method to quantify the set of management practices has been implemented in thousands of manufacturing firms including hospitals in Europe, Asia and US. Management scores were found to be correlated with firm's performance. Improving management practice is also associated with large increases in productivity and output of the firms. Measuring firm performance using management approach is increasing popular since last few years in manufacturing and service sectors [5-7]. This paper contributes to the literature to provide the useful method in terms of appropriateness and policy relevance to measure the hospital performance in low income countries. The paper has twofold objectives: to measure management practices from the employer perspective of both publicly and privately funded

hospitals of Nepal and to explore the relationship between management practices and output indicators of the hospitals by utilizing data collected from primary survey.

Methods and Materials

Study Design

We focused to construct a robust measure of management practices in the hospitals with paying attention to: scoring management practices, collecting accurate responses, and obtaining interviews with managers. We applied a new survey methodology to quantify and measure management practices in four broad dimensions: operational management, monitoring, target setting and people management developed as suggested by the previous studies [4]. The four dimensions are organized into an interview based evaluation tool that defines and scores from 1 ("worst practice") to 5 ("best practice") based on 18 basic management practices, details are found in Bloom et al [5]. A high score represents a best practice in the sense that a hospital that has adopted the practice will, on average, increase their performance and productivity. The higher average of these 18 scores reflects "good management". Scoring of management practice using a double-blind survey (researcher don't know the performance indicators of the hospital before conducting the survey and respondents are not aware in advance that they are being scored) is a key element while measuring the management practice. The paper explains the relationship between management practices and performance of hospitals. It provides alternative approach to measuring performance of the hospitals that is relevant to low income country. The paper provides evidences about the robustness and usefulness of management practice measurement tool developed by Bloom et al [6] in context of Nepal.

Sample size

Hospitals were primarily the unit of analysis. In the sampling process, first of all, districts were identified based on availability of both public and private hospitals. Thirty three districts where both public and private hospitals were available, out of 75 districts were selected for the survey. Sampling frame of the hospitals was collected from Department of Health Services (DoHS) along with some basic information like year of establishment, number of beds and annual reporting status. Inclusion criteria for selecting the hospitals were: a) number of beds greater than 15 (minimum number of beds to consider hospitals), b) hospital should be operating at least 2 years before the survey, c) hospitals should provide, at least, outpatient, emergency, indoor and surgical services, d) it should regularly be reporting at district health office. From the final list of the hospital, one hundred nine hospitals were randomly selected for this study.

At the first stage, double blind survey was conducted; the response rate was 91.74 %. Now total sample of the hospitals for this study was 100.

Management survey

As mentioned in previous literature [5], the management survey includes 18 questions from which the overall management score was computed. The tool includes variables describing the process of the interview, characteristics of respondent and features of the hospitals. Double blind survey methodology was adapted in order to score management practices. Telephone interview with managers was conducted without telling the respondents that they were being scored. This enabled scoring to be based on interviewer's evaluation of the hospitals' actual practices, rather than their aspirations, the respondent's perception or the interviewer's impression. The methods and procedures were strictly followed as suggested in previous studies [5].

Facility survey

Those hospitals provided complete response to management interview were included in the facility survey. A survey tool was prepared in order to capture the data related to hospital characteristics, service and quality indicators, and hospital expenditure among others. The data collection tool was finalized after pre-testing in the hospitals. In the first part, data about hospital characteristics and human resource were collected from general hospital administration. Expenditure details were obtained from account section based on audited report. For service related indicators, medical record section was contacted with hospital recorders to get the key indicators as per National Health Management Information System (HMIS)-34. For the private sector, same HMIS format was asked for in order to collect the information about hospital services. For the IP practice, standard guideline published by MoHP [10] for the hospitals was used.

Data management and performance indicators

Collected data were managed and analyzed by using R and STATA software. Data analysis included descriptive analysis where distribution and basic statistics of management scores and other covariates were presented. Management score was presented in terms of average over 18 management questions. All questions were provided equal weightage while preparing single index of management score. The average score was then displayed as bivariate distribution across other hospital characteristics. Management score was standardized in order to include it in further analysis, for examples, z-score for each management question was calculated as a deviation from the mean value. Then, z score for each question was averaged, and at last z-score was calculated for this average score.

Manufacturing sector economists generally use labor or total factor productivity as a measure of organizational performance. In the case of hospitals, it is so difficult to measure output, particularly where multi-services are available. It is not straightforward to develop a single summary measure of hospital performance and data restrictions limit the indicators that are available on a consistent cross-hospital basis. We developed five separate indicators that reflect one or more set of policy goals of providing health services particularly related to low income countries: Total Impatient Days; 2) Infection Prevention (IP) practice score; 3) Bed Occupancy Rate; 4) Impatient days per technical staff; and 5) Recurrent expenditure per Impatient day. A total impatient day was selected as absolute measure of performance particularly for three reasons. First, impatient care is the prime objective of all the hospitals. Second, impatient services represent the bulk of services within the hospital that consume greatest proportion of total available resources in the hospitals. Third, the available literature [11] supported to use impatient days as output indicators while evaluating performance of hospitals. There is a positive relationship between better management practices and higher number of impatient days.

IP practice score was used to represent the process quality of services. It is based on national standard for quality improvement developed by MoHP. It is an observation checklist that includes 48 aspects to be monitored in order to evaluate the standard IP practice in the hospitals. A single index is required for the IP practice indicator. Most popular option is to use Principal Component Analysis based composite index. Kaiser-Meyer Olkin (KMO) measure of sampling adequacy for the correlation matrix requires 80 percent [12]. A total of 48 variables were used with addressing the requirements to create a composite index for IP practice. IP practice is increased as increased in score of management practices.

Bed occupancy rate was widely used as performance indicator for the hospitals in national and international literature. The bed occupancy rate is frequently used as prime indicator for evaluating performance and efficiency analysis of hospitals [11]. Better management practices and bed occupancy rate should have a positive relationship. The impatient days per technical staff can be an indicator output that represents the services against the available technical staff. This indicator suggests the efficiency of technical human resource to produce the services [11]. The per capita services in terms of impatient days of the technical staff have a positive relationship with management practices. Annual recurrent expenditure indicator provides the efficiency in use of recurrent resources in order to produce one unit of impatient day. A gross-costing approach was used to measure the total annual recurrent expenditure from accounting records. Performance of the hospital increases as decreased in unit cost of impatient day. Therefore, there will be a negative relationship between management practices and unit cost of impatient days.

All five indicators were collected in different scale. In order to make them comparable, variables were standardized by calculating standard z-score. In the further analysis, z-score of these performance indicators is used. The principle component score was used a single index. However, KMO measure of sampling adequacy for the correlation matrix for the five performance indicators is 63% which is below the cut-off level as suggested by the literature [12] as adequate for creating single index using principle component analysis. So, we averaged the z-score of five performance indicators to create a single measure of performance.

Measuring Hospital performance and management practice

After developing reasonable measure of hospital performance and descriptive statistics of management score, the study checks whether management score is robustly correlated with external performance measures. To explain whether a higher management score is correlated with a better performance or not the following regression equation is estimated.

$$y_i^k = \alpha M_i + \beta' X_i + u_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where y_i^k represents k^{th} performance indicator for hospital i. M_i represents average management score for i^{th} hospital. X_i represents a vector of hospital characteristics, community characteristics and noise controls. u_i represents error specific to i^{th} hospital. Performance indicators like total impatient days, impatient days per technical staff and recurrent expenditure per impatient day were highly left skewed. Therefore, these variables were transformed to ensure the normality of errors. Impatient days and recurrent cost per impatient day was log transformed while impatient days per technical staff were transformed using square root function. Equations were checked for the presence of heteroskedasticity and robust standard errors were used for inference. As already mentioned, standardized management score and performance indicators were used in the regression analysis, so the coefficients in the table can be read as the association of one standard deviation of management on the outcome.

In the equation 1, hospital specific controls were hospital size proxy–total number of technical staff and total beds, private hospital dummy–and volume of services (total number of patients served by hospital). Besides this, some community controls were also used in the regression such as prevalence of diarrhoeal disease in the community as reported by Annual Health Report, Department of Health Services. The purpose of this indicator is to reflect the fact that worse outcomes are likely if hospitals are located in a community with high rate of ill health. Geographical regional dummies were also adjusted for the geographical differences.

Results

Summary results:

Among the total hospitals, 33% were public hospitals while 67% private hospitals. Average management score was found 2.04. The management score is slightly higher for private hospitals (2.08) than public hospitals (1.94). However, this difference was not statistically significant. Fifty nine percent of hospital managers were of clinical background. Similarly, an average tenure of manager was 3.58 years. Average number of technical staff was found 56 with the standard deviation of 41. Total numbers of approved beds were found 58.36. Average bed occupancy rate was 43% and average IP practice score was found 82%. This means that, on average, hospitals maintain 82 percent of total standard IP practices as per the Government guideline. Average number of impatient days per human resource was found 124. Similarly, recurrent expenditure per impatient days was found Nepalese rupees 606.6. Average number of OPD visits as 28,228 annually. There is, however, high variation among the public and private sector as well as according to the scale of hospitals. Average number of indoor visit was found 3228 per year. This figure has standard deviation greater than its mean which means that there is huge variation in number of both impatient served and OPD visits.

Figure 1. Distribution of Management Score

Table 1. Descriptive statistics of variables included in the study Score

Management score is presented in histogram (Figure 1) shows the distribution. It can be observed that majority of hospitals lie between the management score of 1.5 to 2.5 with an average of 2.03. Distribution of management score averages around 1.94 for public institutions while for private sector, it is 2.08. On average, it can be seen that management practice scores are higher in private sector as compared to public sector. However, this difference is not statistically significant.

Table 2 shows average management practice across four different areas of management. The scores are also compared across public and private hospitals. Mean score for operational management is higher for private sector; however, the mean difference is not statistically significant. Mean score for monitoring and

Table 2. Average management practice across four components management practices

target setting aspects were not that different and the differences are not statistically significant. People management practices are found relatively better in private hospitals, this is statistically significant as well.

Figure 2 resents similar graph, cut slightly differently. The composite performance score was divided into four quartiles which show the average management score in each bin. There is a clear upward sloping relationship: management score in first quartile was 1.75 and 2.4 in fourth quartile.

Figure 2. Management score and performance quartiles

Hospital Performance and Management Practice

In Table 3, five performance indicators were regressed against the management score with some control variables. First thing to note while looking at the first row of the table is that average management scores are associated with better hospital performance indicators across all the measures of performance and this relationship is statistically significant in every case except for recurrent expenditure per impatient day (but it is almost statistically significant at 10 percent level). The results demonstrate that the measure of management is not simply cheap talk, but also has informational content. Additionally, each regression model has r-squared value greater than 40%, which also represents reasonable fitness of equation with data-set. All regression models are statistically significant at 1 percent level. At last, dependent variables and management score has been standardized (i.e. used z-score of original variable) in the regression equation. Therefore, the coefficients will be interpreted as one standard deviation change in management score is associated with 0.34 standard deviation change in dependent variable in case of bed occupancy rate.

Figure 3. Hospital performance and management practices

In the first column of table 3, bed occupancy is regressed on the management score after controlling for a wide number of confounding influences as described in section 2.4.2. As can be seen from the coefficient, higher management score is associated with significantly higher bed occupancy rate of each hospital. In the same vein, improvement in the management score is also associated with greater number of impatient

days served. In the third column, IP-practice score is regressed against management scores. The coefficient shows that one standard deviation increase in management score is associated with 0.19 standard deviation increase in IP-practice score. This also indicates that management score is not only associated with total services but also associated with the quality of service delivery. Fourth column presents the regression result between impatient days per technical staff and management score. The result indicates that improvement in management score is also associated with increasing number of impatient-days served per technical staff. In the last column, recurrent expenditure per impatient day is regressed against management scores. The coefficient sign shows that increase in management score is associated with decrease in recurrent cost per impatient day. The coefficient has expected sign; the association is statistically significant at almost 10 percent level of significance (details of the results are provided in the table 4).

Figure 4. Hospital performance and management practices with control variables

Discussions and Conclusions

. Average management practice for the hospitals in Nepal was found 2.03; differences in management practices are minimal between public and private sector and the difference is not statistically significant. Management practices are positively correlated with the performance indicators.

Our findings are consistent with the available literature and empirical application of the methodology in international arena. Average management score was found slightly higher than those for Indian hospitals (1.9), and strikingly lower than western countries [13]. Management practices, on average, are similar between private sectors and public hospitals. This finding is different from the evidences from available literature [5, 7, 14]. However, people management component is significantly better among the private hospitals as compared to public hospitals. Public hospitals didn't found to have well rewarding systems for the good performers. Similarly, though mechanism exists to punish the poor performers, managers' report many hindrances to use authority and in many cases (based on level of hospital). The managers don't have full authority to punish the employees. On the other hand, private hospitals were found to have better scores in these two components. Private hospitals have several mechanisms like providing/financing academic and training opportunities to the talented people in order to retain them in hospitals in long run. Similarly, private sectors are found to constantly trying to attract the talented technical staff like specialists

and doctors with better financial opportunities. However, managers in public sector are not well authorized to use such measures. These factors derived comparatively better people management practices in private sector than public sector.

District specific averages of management score also shows the districts that are good performers in terms of management practices are also more efficient hospitals [15]. This result supports external validity to the approach of measuring management practice.

The positive association between management practices and hospital performance indicators has several implications to discuss. First, this positive association provides evidence for the fact that management practices matter in deriving the performance of the hospitals. This finding is also consistent with the results of previous researches [5, 6, 8,11]. Second, as discussed above, management score is positively correlated with the use of capital resources (number of beds) and human resources, this finding indicates the fact that better managed hospitals are also efficient. However, robust evidence in this respect needs further productivity and efficiency analysis together with management practices using appropriate tools and methods as suggested in previous studies [16,17]. Third, management practices are also associated with quality of service provision which, in our case, is proxied by IP-practice score. This finding is also supported by the literature [5,7]. Additionally, it also provides evidences that better management practices not only indicate improvement in efficient behavior but also improves quality of services. Quality and efficiency, the two aspects that the policy makers are mostly considering as principle goal of providing health care services. Fourth, local policy makers are always looking for the ways to improve the efficiency and quality of services together; improving management practices seems better strategy to achieve these goals jointly. Fifth, analyzing management practices and performance of the hospitals together provides a new approach to explain the performance of hospitals because management practice in hospitals was something that was in shadow for long time in past while analyzing hospital performance [5].

These interesting findings are not free from limitations. First, we could not measure the recurrent expenditure using micro-costing approach. Our approach was the gross costing where we relied on total recurrent expenses in the audit report. This might be reason why the association is not significant at 5 percent level even though the coefficient is correctly signed. Second, we could not use instrumental variable approach for establishing the association between hospital competition and management practice as there is plenty of literature [4-7] rendering hospital density as an endogenous variable. So, it is likely that identification assumption is broken which might have resulted in the biased coefficient estimates for this covariate. Again, we couldn't use the case-mix as an important control in the regression equation examining association between performance and management practice. This information was not

unanimously available from the hospital records. We used it with total number of services provided by the hospitals as a control in the equation. However, it still warrants attention while interpreting the results.

Despite these limitations, the paper quantifies management practices of hospitals in Nepal which provides robust results when compared with results of previous studies. Management practice is well correlated with the performance indicators. The findings of this study ensure that management approach is a tool to assess the performance of hospitals in the countries with similar socio-economic status like Nepal.

Financial & competing interests disclosure

Financial support for the survey of this study was provided by Private Enterprise Development for Low-Income Countries (PEDL) that is a joint research initiative of the Centre for Economic Policy Research (CEPR) and the Department for International Development (DFID), UK. Grant number:LOA_EGLIC_1754. The first author is also post-doc student in Chulalongkorn University at Bangkok, Thailand.

We have declared that we have no conflict of interest in connection with this paper. The opinions expressed by authors contributing to this journal do not necessarily reflect the opinions of the Chulalongkorn University, Thailand, Tribhuvan University, Nepal and Institute for Nepal Environment and Health System Development, Nepal with which the authors are affiliated.

No writing assistance was utilized in the production of this manuscript.

Key Issues

- **Traditionally, two general approaches: a nonparametric and a parametric are popular to measure the hospital performance; moreover, measuring hospital performance using management approach is a recently developed concept .**
- **Output indicators of the hospitals are quite different in low income countries as compared to high income countries. This paper contributes to improvements through identifying the appropriate performance indicators of the hospitals such as bed occupancy rate, impatient days per technical persons, per capita cost of services among others.**
- **The result suggests that management score is slightly higher for private hospitals (2.08) than public hospitals (1.94); however, this difference is not statistically significant.**
- **The results show that better management practices are strongly associated with the indicators of performance of the hospitals in terms of total impatient days; infection prevention practice score, bed occupancy rate, impatient days per technical staff and recurrent expenditure per impatient day.**

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