



Integrating hierarchical balanced scorecard with fuzzy linguistic for evaluating operating room performance in hospitals

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ARTICLE INFO

Keywords:

Operating room
Performance evaluation
Balanced scorecard
Fuzzy linguistic approach

ABSTRACT

Health care organizations are operating in a complex environment. The competitive and dynamic health care sector has spurred hospitals into delivering greater flexibility and quality of services. An efficient performance evaluation system is essential for controlling, monitoring and improving service quality in health care organizations. The performance evaluation of operating room (OR) is a useful work for managers to control the operational process of OR team so as to promote the performance. This paper explores the use of a management tool: balanced scorecard (BSC), which facilitates managers to meet multiple strategic goals, and fuzzy linguistic method for evaluating OR performance. BSC is a strategic planning and management system that is used extensively in business and industry, government and nonprofit organizations. First, a model is developed for measuring the acceptable performance of OR based on the interaction financial, customers, internal business process and learning and growth perspective. After that, BSC structure integrated with fuzzy linguistic is proposed for measuring and improving the service. The aim of this study was to build a performance evaluation system for OR and use a fuzzy linguistic to convert the subjective cognition of managers into an information entity and confirmation of improvement. This research results are able to help the organisation to evaluate and revise its strategy and generally to adopt modern management approaches in every day practise.

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1. Introduction

Efficient and accurate performance measurement systems serve as a useful tool enabling managers to control, monitor and improve health care processes and performance. The health care industry currently faces considerable strategic challenges and strong pressure to become more responsive to customers' demands by simultaneously improving quality and efficiency (Chow, Ganulin, & Williamson, 1998; Lorden, Coustasse, & Singh, 2008). This situation imposed the traditional performance measurement and management control systems are insufficient guides for achieving multiple strategic objectives. As a consequence, organizations such as hospitals are required to improve their performance for multiple stakeholders and deliver an integrated care that means to work effectively, be innovative and organize efficiently (Lupi et al., 2011). In this way, hospitals increasingly adopt sophisticated and comprehensive management information systems, such as the

balanced scorecard, to achieve their strategic goals (Fottler, Erickson, & Rivers, 2006; Yang & Tung, 2006).

Performance measurement is a multidimensional structure involving the various components which contribute differently to overall hospital performance. It is difficult and complex to make performance measurement. Since evaluators lack widely recognized performance measurement tools and well-defined criteria for making accurate measurements. Constructing and possessing available performance measurement tools not only increases evaluation efficiency but also saves costs. Traditional performance measurements generally use financial aspects to measure performance. The most significant limitation is that they emphasize the operational results, but not the internal process, which would result in ignoring forecasting function and lacking a long-term orientation.

BSC is a customer-based planning and control system that helps managers to translate strategy into an integrated set of financial and nonfinancial measures (Kaplan & Norton, 1996, 2001). Recent studies illustrated the adoption of BSC by a broad range of health care. Grigoroudis, Orfanoudaki, and Zopounidis (2012) presented BSC methodology for public health care organizations and generally adopted modern management approaches in every day practice. Huang and Chang (2004) use BSC to improve the

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performance of an emergency department. Kocakülâh and Austill (2007) discussed BSC generally from theoretical and technical views, and why BSC should be used by health care organizations. They argued that BSC is particularly applicable to hospitals, clinics, and other health care companies. Josey and Kim (2008) used BSC to improve performance and maintain competitive advantages. The results were impressive. Operational measures improved during the first year of the implementation, and they led to a significant increase in revenues and profit. Chang, Tung, Huang et al. (2008) implement BSC fully for the entire organization in hospital to enhance its competition. Verzola, Bentivegna, Carandina et al. (2009) implement and evaluate the use of BSC in two departments of the St. Anna University Hospital. Rabbani, Jafri, Abbas et al. (2010) applied a modified Delphi to design a BSC for a tertiary care hospital. Managers who are considering adopting a BSC for their organizations should research the topic thoroughly and, above all, know what they hope to achieve before they start the project. To be successful, especially in health care, the BSC will require the long term commitment characteristic of other major organizational changes (Voelker, Rakich, & French, 2001).

Hospital performance measurement requires more intangible assets include patient satisfaction, process innovation capability, etc. The non-financial information is crucial in hospital. But numerous non-financial indicators are difficult to quantify, yet they can significantly impact overall hospital performance measurement.

Recently, many researchers have been developed and modified fuzzy linguistic approach in order to apply in diverse domains. Awasthi, Chauhan, and Goyal (2010) present a fuzzy multi-criteria approach for evaluating environment performance of suppliers. They used linguistic assessment to rate the criteria and the alternatives, and then combined through fuzzy TOPSIS to generate an overall performance score for each alternative. And the proposed approach can be practically applied in evaluating environmental performance of suppliers. Huang, Yeh, Lin, and Lee (2009) propose an effective and convenient performance evaluation model based a fuzzy AHP for implementing SPC in the Taiwanese LCD industry. The study demonstrates that the proposed model is an effective and convenient tool that can be used to analyze and improve the performance of an existing SPC system or to enhance success in implementing a new SPC system while working within constraints of time and costs. Fan, Bo, and Suo (2009) propose a fuzzy linguistic method for evaluating collaboration satisfaction of NPD team using mutual-evaluation information. The method is suitable to process linguistic information and could be embedded in decision support system to support managers/decision-makers in the process of NPD. Hu, Lee, and Yen (2010) use fuzzy linguistic approach to analyze out-patient service quality gaps in hospitals. They verify whether fuzzy linguistic is a better solution than the Likert scale and evaluate patients' feedback towards hospital service quality using fuzzy linguistic analysis.

In consideration of the significance of the non-financial information in hospital performance measurement. This research proposed an effective and efficient OR performance evaluating procedure by combining the BSC structure with a fuzzy linguistic to convert the subjective cognition of managers into an information entity. OR is one of the most critical and expensive resources in hospital. It is a crucial hospital resource, as 60–70% of all hospital admissions are caused by surgical interventions and it has been estimated that it accounts for more than 40% of the total expenses of a hospital (Denton, Viapiano, & Vogl 2007). Maynard and Bloor (1995) have shown that the utilization of OR largely affects the overturn of the surgical patients in hospital. Even a small problem in the process of OR will influence the quality of hospital management. So, as an important place of treatment for patients and scientific research, the process design and management plays an important role in hospital management (Van Tilburg, Leistikow,

Rademaker, Bierings, & van Dijk, 2006). Inefficiencies in an OR can occur during and between cases and lead to multiple problems including delays in the delivery of patient care. Ultimately, delays are associated with dissatisfaction among patients as well as health care providers. Many hospitals are affected by this problem and expend their resources to find opportunities to improve efficiency (Harders, Mark, Weight, & Sidhu, 2006).

The research based on the analysis of OR in hospital A which locates in Shanghai China. A study on the development of performance system for OR was done during July 2008 and December 2009. The study was divided into 4 phases. Phase 1 was literature review. We reviewed a great deal of literature at home and abroad to comprehend the application of BSC in process evaluation and the constitution of the process performance evaluation in hospital (Dexter, Epstein, & Marsh, 2001; Maresi, Thomas, & Alexander, 2008). The second phase was the drafting of performance evaluation system subsequently validated by specialists in OR and managers of hospital and researchers. Phase 3 was revising of BSC structure for the OR process performance. The fourth phase was using a fuzzy linguistic to convert the subjective cognition of managers into an information entity and confirmation of improvement.

2. Material and methods

The research based on the analysis of OR in hospital A which locates in Shanghai China. The hospital was built in 1920. Presently, it has more than 100 senior professional experts, 1800 staff members, 850 beds and 50 clinical and technical departments. It integrates medical treatment, prevention, education and research all together, and is on its highway of standardization and sustainable development (URL1).

This paper explores the use of BSC with fuzzy linguistic theory to evaluate OR performance. Based on the interaction financial, customers, internal business process and learning and growth perspective, the performance indicators system is developed for measuring the acceptable performance of OR. After that, fuzzy linguistic is proposed for measuring and improving the service. It aims to convert the subjective cognition of managers into an information entity and confirmation of improvement.

3. Theory

3.1. Balanced Scorecard

BSC was originally developed by Kaplan and Norton as a performance measurement tool for managers to obtain a quick, yet comprehensive view of how their businesses were operating (Kaplan & Norton, 1992). It added strategic non-financial performance measures to traditional financial metrics to give managers and executives a more 'balanced' view of organizational performance. It is used extensively in business and industry, government, and non-profit organizations worldwide to align business activities to the vision and strategy of the organization, improve internal and external communications, and monitor organization performance against strategic goals (Kaplan & Norton, 1992).

The success of BSC or a similar device will depend on the clear identification of non-financial and financial variables and their accurate and objective measurement and linking the performance to rewards and penalties. The aim of BSC is to direct, help manage and change in support of the long term strategy in order to manage performance. In general, a BSC system is considered to be a performance measurement system, a strategy evaluation system, and a communication tool, at the same time, defined by the following four distinct perspectives (Kaplan & Norton, 1996a). Kaplan and Norton (1996d) argued that the BSC program is a cause-and-effect

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