

Systematic Review & Meta-Analysis of the Balanced Scorecard for Hospitals

M. Revathy¹, Dr. A. Bhooma Devi²

¹Research Scholar, Faculty of Management Sciences, Sri Ramachandra Institute of Higher Education and Research, Chennai

²Associate Professor, Faculty of Management Sciences, Sri Ramachandra Institute of Higher Education and Research Chennai

¹revathymohan727@gmail.com

²bhooma.ganesh@gmail.com

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Abstract

This paper is directed towards the idea of in-depth explanation of the balance scorecard highlights the application in the hospital and medical environment. Performance is a key indicator and enrichment factor that allows us to assess the goals and their pre-defined status in an effective way. In various academic research, the performance factors are measured on factor-wise dependency rather than measuring with a collective standpoint. Very limited studies have directly answered 'How an organization's overall performance can be measured and enhanced in a systematic method'. It is noted that in various empirical research papers, very few even try to evaluate the entire organizational performance based on these factors as a construct on a dependent measure. Balanced Scorecard or BSC is a leading and most popular frameworks for overall performance analysis. Though BSC is widely acknowledged and utilized tool, it has revolutionized to be a critical part of tactical change management.

Method: Balanced Scorecard is a simple yet powerful tool that offers unparalleled strategic improvements with an easy to use and implement interface. The design of the scorecard is evolved according to the requirements of the organization. The utilization of the base or primary factors of the scorecard design allows for proper attention to various interdependent domains related to the organizational management in lieu of just the core or fundamental pillar. The financial domain is covered pertaining to the overall revenue stream, internal domain, including the internal processes and know-how to meet external requirements while continuous innovative solutions can be devised for an enhanced learning and knowledge building experience all while adhering to the meet its strategic expectations determined by the organization while also focusing on the customer centric domain of an organization.

Result: This paper delivers an overall view of the systematic review and meta – analysis of the balanced scorecard along with the existing application to the healthcare industry and how it can be further optimized thereby enabling new ways to build better value to the quality of service offered, building better in-house learning outcomes within organization metrics.

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INTRODUCTION

Healthcare has evolved in the modern era not only just as a service but also as contributor to a billion-dollar industry. The performance of a healthcare organization has a direct role on the economy and the customer-relationship to the respective service. It plays a pivotal role in the unification of various processes fundamental to various domains. The effective functioning of healthcare organization is key to continual top-notch service quality. The key aspect for great track record regarding the service offered is proper performance analysis and management.

"A particular result obtained in management, economics, marketing, etc. that print features of competitiveness, efficiency and effectiveness of the organization and its procedural and structural components" (Verboncu I, 2005)

While the act can be subjective, the entire idealization of performance is to have an optimized or efficient takeaway from any given situation or circumstance. The performance measuring earlier was solely based on various other entities that only provided a singular outcome rather than focusing collectively for a required organization. These factors could be interlinked on a deeper dive but could not assess the overall performance of the organization as a standalone approach.

The following research study shows the definition and factors of performance (Pintea & Lect, 2010) (Jianu, 2007)

"Georgopoulos and Tannenbaum (1957) consider performance as equivalent of organizational effectiveness, which represents the degree to which an organization as a social system and considering certain resources and limited means, reaches its goals without excessive effort by its members. The criteria used to assess performance are: productivity, flexibility, tensions inter-organizational. Bennis (1962) highlights the following criteria for assessing performance: adaptability, capacity, sensitivity. Caplow (1964) estimates performance based on these criteria: stability, integration, implementation. Katz and Kahn (1966) consider organizational performance as maximizing revenue that the organization can get from its operation through effective and efficient means, economic and technical, but also through political means and propose these criteria for assessing performance: growth, storage, survival, and control environment.

Dubois (1979) is not concerned with performance definition but its evaluation using the five dimensions of economic and financial performance:

- Increase $(\text{value added } t - \text{value added } t-1) / \text{value added } t-1$;
- Profitability: gross operating surplus / turnover;
- Productivity: value added / gross fixed assets value;
- Debt: financial debt / self-financing capacity;
- Solvency: financial debt / net carrying amount of fixed assets."

The basis thereby states that empirical studies were carried out selective factors in detail that are complex but pertain to a single domain of performance analysis like economy, finance, technology practices and methods. The basis of performance management can be summarized as an action of subsequent events that are interlinked.

The workflow of process management system in Figure 1 explains the various sub-tasks that help govern the organization in the modern approach with respect to organizational standards and

metrics. These when combined give rise to certain performance metrics that enable better analysis for any given operation.

The primitive measuring practices comprising of single domains enables only to understand as-is state of the operation. For example, “Financial charts and figures only describe whether the given operation or outcome has met the requirement and if it is profitable or declining. The need to understand, investigate the reasons and take action is not possible.” (Smandek, Barthel, Winkler, & Ulbig, 2010)

As per (Have, Have, & Stevens, 2003) it is stated that “The usage of performance indicators determines only what has happened in past, leading to no learning outcomes and future actions that cannot be initiated.”

This leads to huge gap in the formulation of a system that enables a better analysis not just in the as-is state but also give potential outcomes on the to-be state for any given operation. The healthcare industry is heavily relied on the feedback of the existing processes, operations which pave way for future implications and iterations of various organizational mandates. A proper framework is thus required.

PERFORMANCE MEASUREMENT USING BALANCED SCORECARD

The balanced scorecard a tactical quality management indicator, is used to improve a variety of internal business processes and the effects they have on the external world. utilized to assess and provide feedback to organizations.

“The balanced scorecard (BSC) is a powerful and balanced strategic management system that facilitates the implementation of strategy, using measures to ensure that corporate vision and strategy are implemented and achieved” (Kaplan, 1996)

The Balanced Score Card has an important and diverse feature of emphasizing and interlinking various aspects related to the management implications of the organization. There are four major key aspects of balancing the performance in the organization.

The key viewpoints of Balanced Score Card

The balance scorecard has four key perspectives that enable for a wider managerial method for the organization. These can be adapted for better efficiency and comprehensive analysis for the given healthcare industry.

The four key factors present in the balanced scorecard are mutually interdependent and have a directly proportional effect on the outcome. However, it is important to balance the perspectives as they can give rise to a very large subset of factors. Therefore, the entire structure is balanced using different actions and tied to give a complete view of the organization. (Kaplan, 1996) (Taticchi, Cagnazzo, & Brun, 2010) The conceptual limitation of BSC as per (Norreklit, 2000) is “applied as an effective strategic management mechanism, the scorecard should be rooted in the management practice of an organization. ” It’s imperative that the BSC is to be adapted according to the requirement in the healthcare industry while adhering to the organizational mandates and policies for effective framework.

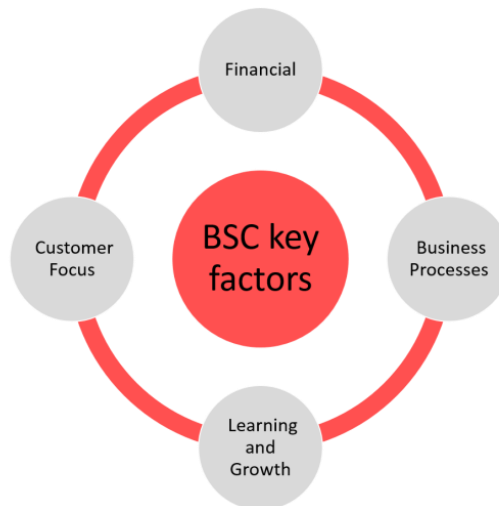


Figure 2 Four key perspectives of Balanced Score Card

Source : Kaplan R, Norton D. The balanced scorecard--measures that drive performance. Harv Bus Rev. 1992;70:71–9.

Source: Secondary data

METHODS

The required method to properly organize and effectively create a Balanced Score Card is shown in Figure 3.



Figure 3 Steps for a BSC

Source: Secondary data

The systematic review was conducted using the Eligible Studies Articles for Systematic Reviews and Meta-Analysis in addition to the standard technique for developing a Balance Scorecard. (PRISMA) (Liberati, Altman, Tetzlaff, Mulrow, Gøtzsche, & al., 2009)

Eligibility Criteria

The criteria set forward are as follows:

- Population: Any number of studies pertaining to healthcare organization with keywords hospital, hospital departments and health (MeSH Terms)
- Intervention: Healthcare performance assessment using scorecard to be considered with keywords quality indicators, scorecard and scorecard (MeSH Terms)
- Comparator: Implementation of BSC and observing the gross change from at least 8 months were considered.
- Outcome: Impact on financial indicators; influence on the profitability, patient satisfaction index, changes in Return on Investments (ROI) and Return on Assets (ROA) to be considered along with keywords patient satisfaction cost-benefit analysis, health care costs, staff development, knowledge management and efficiency [MeSH Terms]
- Study design: All study designs were considered with respect to time and type.

Data sources, search strategy, and study selection

The utilization of the PubMed database based on the PICO (Population, Intervention, Comparison, and Outcome) tool (Methley, Campbell, Chew-Graham, McNally, & Cheraghi-Sohi, 2014) using both MeSH (Medical Subject Headings) terms and keywords. Cochrane Central Register of Controlled Trials (CENTRAL), Embase, and Google Scholar databases, as per Cochrane's recommendations (Lefebvre, et al., 2021)

To lessen publication bias, Google Scholar and Google's search engine websites were searched for grey literature, pre-prints, and unpublished works. The EndNote X9.2 application was used to remove duplicate entries. To evaluate the quality of the included studies, a Risk of Bias (RoB) quality evaluation was completed.

RESULTS OF SYSTEMATIC REVIEW

The overall search strategy resulted in 3626 reviews. The reviews post duplicate check was screened based on their titles and abstracts. A total of 2674 literature reviews were removed based on the duplications, title, abstract and not relevant content under the domain and their outcomes were removed and an examination of the included reviews full texts was made along with removal of irrelevant studies; thus 31 studies remained. Eventually, these papers were added to the current systematic review. In the PRISMA flow-chart, specifics of the study selection procedure are displayed. (Figure.4)

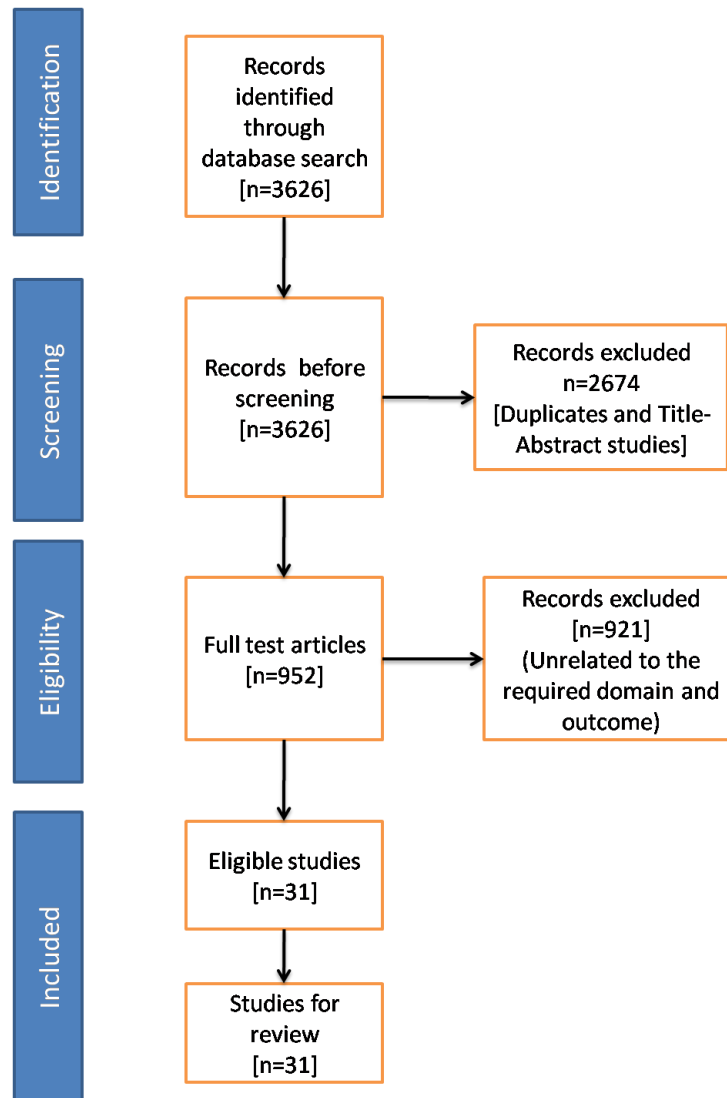


Figure 4 PRISMA Flow Diagram

Source: Primary Source

APPLICATIONS

The BSC has been applied to various industries and sectors extensively over the last couple years. Every application is rather unique to the sector or organization to which it is implemented. As the organizational mandates differ, so does the other factor in BSC with respect to the spectrum at which it is applied but they are in accordance to the balance of the four key perspectives.

The BSC implementation is done for minimal processes like basic cost-cutting to major continuous improvement and ideation processes. The framework of BSC gives a rather holistic and interdependent approach regarding the various parameters with regards to healthcare from the way the services are carried out, to the procurement of medical devices, learning and adaptability of staffs, proper training and facilitation, administration, and customer organization relationship management.

REVIEW OF LITERATURE

Table 1 - BSC on Healthcare Literature Review

S.No	Title and Author	Method	Gap
1	“Developing Strategic Healthcare Key Performance Indicators: A case Study on a Tertiary Care Hospital” by Mohamed Khalifa et.al.,	Qualitative survey method conducted through semi structured interviews	It is possible to include more relevant indications, giving an option to choose the lower level indicators.
2	“Key Performance Indicators in hospital based on balanced scorecard model” by Hamed Rahimi et.al.,	Mixed method study	The framework can be used for evaluating hospitals performance, identifying the functional weakness of hospitals. Therefore, it is recommended in future this model should be used to evaluate and compare the hospitals performance.
3	“Lives in the balance : An Analysis of the balanced scorecard (BSC) in Healthcare Organizations” by Bruce Gurd et.al.,	Qualitative survey method	Organizations that use BSC strive for harmony and balance. The lack of patient needs communication to the BSC in healthcare is a source of concern.
4	“Indicators of Hospital Performance Evaluation: A Systematic Review” by Hamed Rahimi, et.al.,	Systematic review from literature’s	The findings showed that quantitative indicators are used in assessing performance was of greatest interest to evaluators. For accurate hospital monitoring, hospital management are advised to choose a mix of quantitative and qualitative indicators.
5	“Development of Key Performance Indicators to Implement Balanced Scorecard to Small and Medium Size Dental Clinic” by Sangseok Kim, et.al.,	Delphi technique	Developed KPI’ suitable for introducing BSC to small and medium-sized dental clinics and developed complex weights.
6	“Dashboard Visualization For Healthcare Performance Management:	The methodology's primary goal is qualitative research and it comprises gathering indicators are collected	The viewpoints of respondents throughout a specific time period are included in this book. The results of this study need to be constantly revisited because the Indian healthcare

	Balanced Scorecard Metrics” by Stephen Victor et.al.,	from literature organizing them using the Delphi Method and further ranking them	system is quite dynamic and changes frequently.
7	“Hospital Service Quality Assessment and Analysis: A Multi-Perspective Approach” by Joy Mari S. Bautista et.al.,	Developed a framework using the fundamental service components of structure, procedure, and outcome. In addition to qualitative research of data collection, SEM was used to quantitatively to prove the model fit for the proposed dimensions.	Deeper research on more specific aspects for each service unit or department inside the hospital can be used to conduct more investigations. Usability of the service as well as outside variables like cultural aspects affecting stakeholders may be utilized.
8	“The Use of Balanced Scorecard to Support Achievement of Business Plan in Digestive Endoscopy Center” by Abdullah, Murdani et.al.,	Quantitative method and cross-sectional studies.	Further studies can be carried out using analytical comparison of customer satisfaction within years.
9	“The Use of the Balanced Scorecard as a Strategic Tool in Public Institutions: A Systematic Review. European Journal of Business and Management Research” by Juliana Verçosa de Freitas, et.al.,	Systematic Literature review using PRISMA	Sample size can be made larger and the analyzation of the impact can be focused also on the private sector.
10	“Balanced Scorecard: Literature Review and Implementation in Organization” by Deni Ahmad Taufik, et.al.,	Literature review	Further application into production process, healthcare, finance, information technology.
11	“Scoping review of balanced scorecards for use in healthcare settings: development and implementation” by Victoria Bohm, et.al.,	Systematic analysis using KPI’s pilot-tested forms	Further studies must enable adaptation to framework for healthcare context; inclusion of patients/families with highly feasible and valid performance measures.

12	“Performance Measurement for Health System Improvement Experiences, Challenges and Prospects” by Peter C. Smith et.al.,	Literature reviews and case study analysis	Improvement scope includes addressing and assigning key attributes and indicators.
13	“A balanced scorecard for assessing a strategic plan in a clinical laboratory” by Luisa Alvarez et.al.,	Formulation of a strategic map of perspective objective’s.	The theoretical objectives can be adapted more to the clinical requirement according to the demographic.
14	“A balanced scorecard for assessing a strategic plan in a clinical laboratory Evaluation of Hospital Performance with Balanced Scorecard Approach: Case Study in National Brain Center Hospital” by Tety Herawaty et.al.,	Descriptive analysis using data in a specified time period	The perspectives and KPI are to be adapted further in alignment to the strategic visions of the organization.
15	“Balanced Scorecards for Small Rural Hospitals: Concept Overview & Implementation Guidance” by The Mountain States Group (The Mountain States Group)	Strategy Map with KPI’s	The strategy map can be adapted as per the requirements and demographic.
16	“Adapting the Balanced Scorecard into the HealthCare Industry: A Literature Review, New Insight and Future Directions” by Kim-FattKhiew et.al.,	Comprehensive literature reviews and formulation of a general framework	The model has to be adapted with testable propositions for an empirical test.

17	“Hospital Performance Monitoring and Improvement Manual” by Federal Democratic Republic of Ethiopia Ministry of Health .	Comprehensive KPI’s and strategic frameworks	The framework focuses solely on various KPI’s that can be adapted with a scorecard perspective.
18	"Relationship between human resources strategies and organizational performance based on the balanced scorecard in a public hospital in Iran: a cross-sectional study" by Ebrahim Nafari et.al.,	Cross-sectional study with two self-reported questionnaires. It was analyzed using the statistical tools like Pearson correlation coefficient and multivariate regression	The sample size can be increased and cultural indicators or perspectives can be added for a deeper understanding.
19	“Developing a Strategy Map to Improve Public Hospitals Performance with Balanced Scorecard and DEMATEL Approach" by Hamed Rahimi et.al.,	The study uses the Decision making trial and evaluation laboratory (DEMATEL) method and strategy map construction	Utilization of multiple dimensions can lead to a better evaluation and factoring of decision making.
20	“Are performance indicators used for hospital quality management: a qualitative interview study amongst health professionals and quality managers in The Netherlands” by Daan Botje et.al.,	Qualitative interview study	The sustainable integration of performance evaluation information into quality management processes can be the subject of future research. The various methods of data collection and reporting could lead to significant problems with hospital comparison. Not using the internal quality management in its mission to raise the standard of care would be a waste.
21	“Development of Balanced Scorecard for healthcare using Interpretive Structural Modeling and Analytic Network Process” by Kailash Meena et.al.,	ISM-ANP- quantitative approach is used for the expansion of balanced scorecard. The data is collected using the literature.	The effectiveness of the proposed approach might be improved further by computer coding development of more complex interface integration.

22	“Performance Evaluation of Community Hospitals in Thailand: An Analysis Based on the Balanced Scorecard Concept” by Somnuk Aujirapongpan et.al.,	A statistical analysis is done to find out the percentages, means and standard deviations.	52 community hospitals' 16 KPIs and performance patterns over the previous five years were examined using the BSC framework. The community hospitals should concentrate on how to enhance patient satisfaction, waiting time for further development by cultivating a high performance healthcare system.
23	“Building hospital balanced scorecard by using decision support” approach by Ufuk Cebeci	An integrated hospital BSC approach is developed from vision to action. It has 10 stages. The new framework designed for decision support helps the managers of the hospitals to design the scorecard effectively.	Having a clear vision is important, but it also needs to be implemented at every level of management and supported by the workforce. It is also possible to conduct research on a few other hospital departments.
24	“Development of a balanced scorecard as a strategic performance measurement system for clinical radiology as a cost centre” by Ulf Teichgraber et.al.,	BSC has six steps .Starting with Creating a “Strategy Map” about the perspective and continues	Future study can be carried out on expanding to other departments.
25	“Performance Measurement Using Balance Score Card and its Applications: A Review” by Shradha Gawankar et.al.,	Systematic Reviews from various literatures	Using techniques like SEM future study may identify the variables associated with each of the perspectives discussed in the paper and link them to organizational effectiveness over the short and long term.

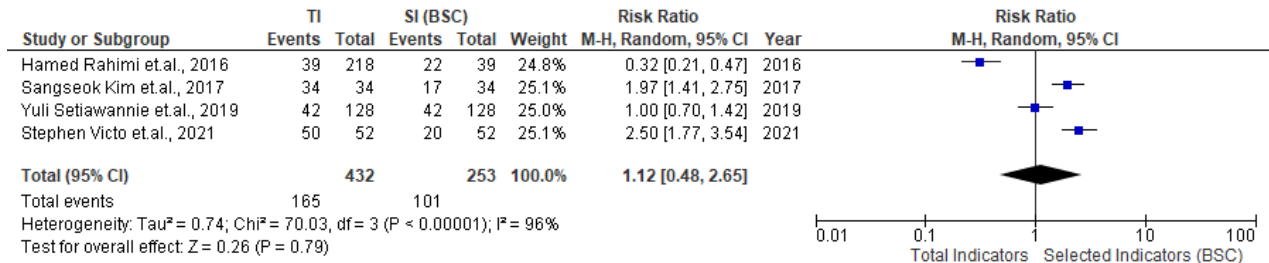
26	“Balanced performance measurement in research hospitals: the participative case study of a haematology department” by Simona Catuogno et.al.,	Participative case study performed by external investigators	This is the first study to demonstrate how the scorecard approach may be customized to meet the unique requirements of public research hospitals.
27	“Balanced scorecard-based performance evaluation of Chinese county hospitals in underdeveloped areas” by Hongda Gao et.al.,	Quantitative method with structured delphi method	The performance of hospital departments will be evaluated in ongoing studies adopting this system. For more complete suggestions for hospital growth and decision-making, these performance results will be coupled with management data.
28	“Industry 4.0 applications in medical field: A brief review” by MohdJavaid et.al.,	Research articles were reviewed in medical and related fields	Future prospects for innovation employing integrated inventive design, production, and services will be demonstrated by Industry 4.0. It will be important to meet the medical requirements during research and development.
29	Evaluation of Hospital Performance with Balanced Scorecard Approach: Case Study in National Brain Center Hospital” by Tety Herawaty et.al.,	Descriptive analysis using data in a specified time period	The perspectives and KPI are to be adapted further in alignment to the strategic visions of the organization
30	“Health 4.0: On the Way to Realizing the Healthcare of the Future” by Jameela al-Jaroodi et.al.,	Systematic Literature reviews	The successful Health 4.0 deployment, as well as prospective healthcare applications might be included in the system.

META ANALYSIS

In order to find the answers to a particular topic, a systematic review makes an effort to compile all accessible empirical studies. The statistical method of assessing and combining data from numerous related studies is called a meta-analysis. A quantitative, formal study method known as a "meta-analysis" is used to carefully evaluate the findings of earlier research in order to draw conclusions about that body of work.

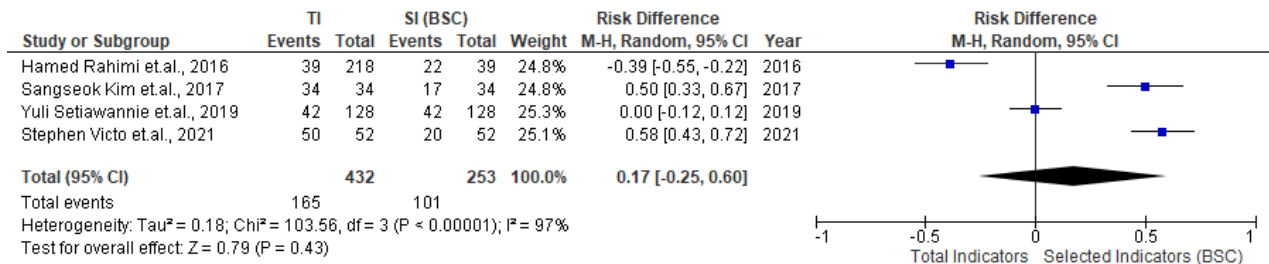
Four papers were selected for the meta-analysis which included a comparison between the Total indicators (TI) and Selected indicators (SI) for the study by using the Balanced Scorecard concept. The outcome was created using the data type Dichotomous. The analysis that was used was Mantel – Haenszel. The confidence interval and total confidence interval were fixed 95% for this study. The model used was random effect and the effect measure is odds ratio.

Figure 5 : Forest plot for risk ratio – random



A total of 4 articles initially were reviewed for meta-analysis. The forest plot for the random effect model of risk ratio was determined to be z = 0.26 (P=0.79) (95% confidence interval, I²= 96% , Chi square -value= 70.03, df = 3, and p< 0.001) (Figure 5).

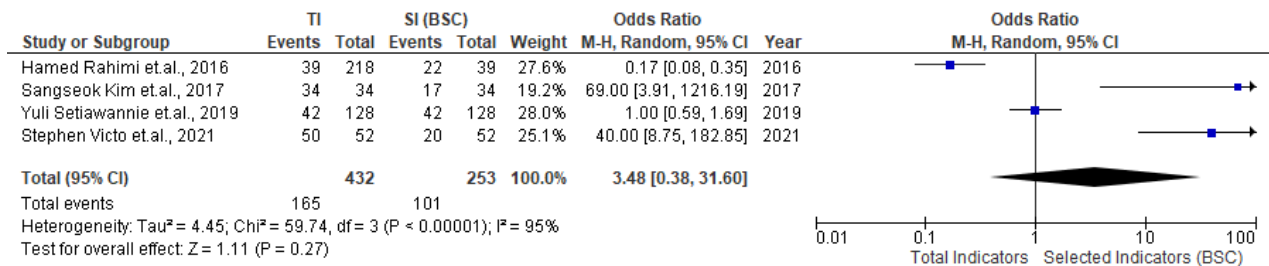
Figure 6: Forest Plot for risk difference – Random



Source : Primary Source

The forest plot for the random effect model of risk difference was determined to be z= 0.79 (P=0.43) (97% confidence interval, I²= 97% , Chi square -value= 103.56, df = 3, and p< 0.001) (Figure 6).

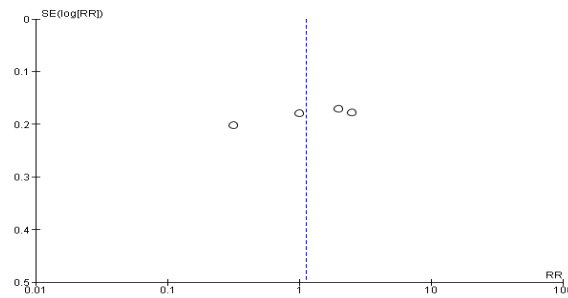
Figure 7 : Forest plot for odds ratio – random



Source : Primary Source

The forest plot based for the random effect model of odds ratio was determined to be z= 1.11 (P=0.27) (95% confidence interval, I²= 95% , Chi square -value= 59.74, df = 3, and p< 0.001) (Figure 7).

Figure 8 : Funnel Plot



Source : Primary Source

Figure 8, Funnel plot shows that there is no symmetry in gathered data.

CONCLUSION

Based on the discussion described from the systematic review and meta- analysis, the balanced scorecard makes a significantly positive effect on the Key Performance Indicators . The healthcare industry has been a key stakeholder in the business market that grows ever so competitively. Healthcare organizations are enabling newer procedures, strategies, and technology into the domain. This competitive scenario creates rise to a dire need that can enable smoother functioning, better organizational and structural workflow, adaptable quick strategies that help an organization stay on the competitive edge amongst its peers and other industries in a different track. Markets are now driven by value rather than costs thereby shifting the priority to quality of services offered and customer relationship.

It is to be noted that performance management and analysis is not a one-time effort whereas it is an integral and continual part of any well performing healthcare organization. The mandatory factor being quality can only be achieved with proper optimization of the workflow and various other attributes. This paper has illustrated various performance measurement methods where the utilization of Balanced Score Card has proven to be effective and adaptable as per the requirements of healthcare industry.

The shortcomings addressed can be revolutionized with a more flexible and adaptive framework using BSC. The usage of BSC gives a great insight into the managerial implications. BSC allows for a divisive restructuring of the strategic plans that can be aligned with organizational goals while adhering to the a more customer centric approach. The implications of external and internal factors with respect to past performance indicators and future performance indicators.

The usage of structural equation modelling and other empirical methods can be utilized further with BSC while confining to more dynamic attributes and indicators.

The optimization of any process, be it the very basic to the most complex one is the ultimate roadmap to attain success in the healthcare industry. The constant upgradation of policies in-tune with strategic goals of the organization and continual improvement, training of the workforce is key to attaining the overall efficiency with a given adaptive Balanced Scorecard approach.

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