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Operational Performance and Lean Healthcare in the Healthcare Sector: Review on the Dimensions and Relationships

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Abstract

Numbers of evidence have shown operational level in the healthcare sector is predicted to make some changes in operational performance that help to improve cost, quality, flexibility, efficiency, effectiveness and other measures of the organization. Further, the implementation of lean healthcare seen as one of the best practices to accelerate productivity growth and facilitated the organizations to eliminate waste. Moreover, it helps to have a better health outcomes, to reach efficiency and optimize resources by improving work processes in the organization. Therefore, the purpose of this study is to discuss the dimensions of operational performance and lean healthcare and hence, to review numerous article on the relationship between lean healthcare and operational performance in the healthcare sector.

Keywords: Dimensions, Operational Performance, Lean Healthcare, Healthcare Sector, Private Hospital.

Introduction

Operational focus refers to operational level is predicted to make some changes in operational performance that help to improve cost and quality of the organization (Capkun et al., 2012). However, a strong pressure such as to improve operational performance by giving a high quality service at low cost usually encountered in the healthcare industry (Abdallah, 2014; & Gomes et al., 2010). If fail to perform, productivity certainly will be affected and decreased the quality of care (Tucker, 2004). Arguably, the challenge to provide the best service among hospitals is quite competitive due to difficult to maintain revenues and market share (Capkun et al., 2012). Especially, the establishment of Emergency Department (ED) an each hospital has made the number of patients/customers increased every day and now getting more intricate to enhance operational performance (Sinreich & Jabali, 2007).

In Malaysia, for example, it has been found increasing cost was the main cause in the healthcare system especially in the private healthcare (Nerminathan, Adlan, & Nerminathan, 2014),

particularly in the aspects of technology, infrastructures, equipment, and scientific advances. Additionally, high cost is also a major issue that impede patients from registering in private hospitals (Muhammad Butt & Cyril de Run, 2010). It is proven that the number of private hospitals and beds decreased between 2011 – 2015, while the number of admissions continuously soared, except in 2015 the number has dropped to 1,064,718, as displayed in Table 1 (*Health Facts 2015, 2015*). In fact, private hospitals as money-making organizations have to face competition from public hospitals, which are often the first choice made by Malaysian patients to receive the best medical treatment (Muhammad Butt & Cyril de Run, 2010). Public healthcare is generally not seen as a competitor to private healthcare, and they are substantially subsidized by the government (Suki, Lian, & Suki, 2011). Therefore, Nerminathan et al. (2014) proposed that to minimize expenditure and any rising costs related to healthcare, healthcare providers need to consider reducing waste.

Table 1 illustrates the statistics on number of private hospitals, number of beds and number of admissions from the year 2011-2015 and it has shown inconsistencies of numbers which genuinely has led to waste based on the Health Facts report.

Table 1: Statistics on Number of Private Hospitals, Number of Beds and Number of Admissions.

Year	No. of private hospitals	No. of beds	No. of admissions
2015	183	12,963	1,064,718
2014	184	13,038	1,083,201
2013	209	14,033	1,020,397
2012	214	13,667	971,080
2011	220	13,568	904,816

Source: *Health Facts 2016, 2016; Health Facts 2015, 2015; Health Facts 2014, 2014; Health Facts 2013, 2013; & Health Facts 2012, 2012*

Wastes from healthcare institutions can be classified into the following types; clinical waste, radioactive waste, chemical waste, pressurized containers, and general waste (Department of Environment, 2009). Nelson (2011), on the other hand, has underlined eight types of waste in healthcare organizations which include transportation, inventory, motion, waiting, overproduction, overprocessing, errors, and waste of talent. These different classifications of waste were introduced by Taiichi Ohno at Toyota in the 1940s, where seven types of wastes were discovered within the manufacturing sector (Radnor, 2011). Subsequently, research by Malaysia Productivity Corporation, or MPC (2014), summarizes issues and challenges that affected twelve Malaysian private healthcare providers that lead to waste as depicted in Table 2.

Table 2: Types of Wastes Occurred in Malaysian Private Healthcare Organizations

Original wastes	Private healthcare issues	Consequences
Waiting	It takes time to resolve certain issues due to requirement of having it made in official writing.	Time consuming and causes delays.
Overproduction	Tonnes of paperwork required to fulfill a request, such as certified copies of reports.	Inefficiency that can lead to higher costs. In addition, numerous interaction across units in order to meet certain requirements.
Errors	Requirements' revisions that were done without any communication and information given.	Errors that existed due to misunderstandings which causes difficulties in achieving agreement.
Waste of talent	The deficiency of experienced and skills among nurses. Restricted from employing foreign nurses to focus on hiring unemployed graduates.	Hospitals being saddled with low-quality graduate nurses by the Nursing Board.

Source: MPC (2014)

These situations have been reported by a number of healthcare institutions around the world. For instance, study done by Chen (2014), which used medical error as an example of error wastage that appears often within the United States (US) healthcare sector, and resulted in great losses across the country, amounting to USD17.1 billion in 2008 alone (Chen, 2014). Approximately 5 million patients were severely affected because of medical errors annually (Woodward-Hagg et al., 2013). All these issues have brought practitioners, professionals, and staff who work in healthcare to find a possible solution in ensuring better operational performance in the healthcare sectors. If the issues continue, it can have an adverse effect on patient's health and well-being, the environment, as well as public safety (Department of Environment, 2009).

Therefore, Gowen III, McFadden, & Settaluri (2014) have proposed a lean approach in the healthcare sector that will support a continuous quality improvement to reduce waste, since other transformational approaches such as six sigma, total quality management (TQM), and business process re-engineering seems to have less than desirable results when it comes to sustainability, as is apparent in the US and UK healthcare systems (Grove, Meredith, MacIntyre, Angelis, & Neailey, 2010). The implementation of lean healthcare will assist organizations to eliminate waste, and is seen as one of the best practices to accelerate productivity growth (Economic Planning Unit, 2015b). Hence, it helps to have a better health outcomes, to reach efficiency and optimize resources by improving work processes in the organization.

Motivated by above discussion, this study intends to review the diverse literature of operational performance and lean healthcare based on previous research. The implementation of lean in the healthcare sector is quite complicated and a better understanding is needed compared to

manufacturing sector due to several challenges; how to reduce cost and reduce inefficiency in the aspect of operational performance (Hwang et al., 2014) which if the organization fail to curb the problem, waste will certainly emerge. Therefore, these two elements; lean healthcare and operational performance are very important to determine the successful of the healthcare organization.

Literature Review

Operational Performance

Numbers of studies have put an effort to measure operational performance in the healthcare sector and according to Capkun et al. (2012) dimensions of performance will determine how better the organization is. For example, Li & Benton (1996) have characterized the performance of healthcare sector into two criteria; internal measures and external measures which involved two dimensions; cost or financial status and quality performance. While Elg, Palmberg Broryd, & Kollberg (2013) have identified three distinguish approaches in measuring performance for healthcare organization that constitute management accounting, operational performance and strategic control. Conversely, Nerminathan et al. (2014); Elg et al. (2013); Capkun et al. (2012); Stock & McDermott (2011); & Gares (2011) have analyzed operational performance using average length of stay (ALOS) or length of stay (LOS) that calculate number of days patients stays at the hospital.

Subsequently, Elg et al. (2013); & Pillay et al. (2011) have embraced category of processes to measure performance, which cover waiting time (examination and surgery) and lengthy waiting time based on the various department. Lengthy waiting time currently has become a major problem in the healthcare setting and now the phenomenon is worldwide including healthcare in Malaysia (Pillay et al., 2011). They further recognized some of the factors existed such as heavy workload, lack of facilities and finally supervision and management problem that given the negative impact towards hospital performance. Thus, it has been proposed by Elg et al. (2013), continuous follow-up for managers and professionals is a central concern to reduce waiting time among patients.

Correspondingly, Davis et al. (2013); H.-C. Chen (2013); Elg et al. (2013); Caballer-Tarazona et al. (2010); & Gomes et al. (2010) have counted efficiency was considered as operational performance in the healthcare organization because operational performance has been viewed as the critical element to quantify efficiency of action (Elg et al. 2013). Moreover, it has given significant relationship between managerial level and operations (Elg et al., 2013). Subsequently, Gomes et al. (2010) have measured operational performance using three indicators; availability, quality and efficiency and incorporated with Healthcare Operational Effectiveness (HOE).

The approach of HOE can be used systematically by operational managers and healthcare administrators that enable to monitor operational performance in every aspect, as well as to make an improvement. Similarly to Purbey, Mukherjee, & Bhar (2007) have quantified efficiency with the sub-indicators such as cost reduction and resource utilization to measure operational performance. However, H.-C. Chen (2013), had argued efficiency does not indicate the patients

were fully recovered or in short, it was inappropriate to measure healthcare output. Therefore, he proposed delivery, cost reduction and quality should take into account to measure efficiency.

Besides, effectiveness (service quality, customer satisfaction, growth, and safety) were also deliberated in measuring operational performance (Davis et al., 2013; Elg et al. 2013; & Purbey et al. 2007) and it was found, quality dimension was predominantly discussed among scholars. Quality does not just to produce the best product, but according to Collins & Joyce (2008), quality concerned to deliver the greatest treatment, at the right time for the right cost. Hence, Gomes et al. (2010) have described quality presenting the capability of operational healthcare to deliver services as to fulfill the quality expectations among patients. Moreover, quality services and resource utilization are the crucial elements to improve healthcare across the countries (Caballer-Tarazona, Moya-Clemente, Vivas-Consuelo, & Barrachina-Martínez, 2010).

Conventionally, quality measurement has narrowed on structural outlooks such as the quantity of services provided, facilities and equipment as well as hospital size (Chang, Hsiao, Huang, & Chang, 2011). In subsequent work, Chang et al. (2011), have claimed, healthcare quality generally being measured using three step framework; structure, process and outcome which similar to input, process and output in the manufacturing setting. Likewise Dey, Hariharan, & Clegg (2006) have quantified operational performance using AHP approach based on ICU at three different hospitals (Barbados, Trinidad and India). The elements of structure, process and outcome based were combined together to see does the result have an effect towards operational performance.

In contrary, Hadid et al. (2016) have categorized internal and external customer satisfaction, waste elimination and process time reduction as an indicator of operational performance in the service sector. While, Cho (2014) had used operational capabilities which consist of cost, quality, speed, and flexibility to measure business performance in the hospitality industry. Traditionally, these dimensions have been applied in measuring operational performance at the manufacturing level. It can be seen previous studies from Wiengarten & Longoni (2015); Nawanir et al. (2013); Chavez, Gimenez, Fynes, Wiengarten, & Yu (2013); & Rahman, Laosirihongthong, & Sohal (2010) have considered cost, quality, delivery, inventory minimization, productivity and flexibility to measure operational performance. These dimensions were also have highlighted as traditional issues of quality of care, cost-effectiveness and patient involvement in the healthcare sector (Liaropoulos & Goranitis, 2015).

However, according to Yasin & Gomes (2008) it was proven publication on operational performance (efficiency, quality, flexibility, and reliability) in service setting appears to be main focus among scholars compared to the other categories. Further, they argued, less research has been conducted empirically, concerning performance issues.

Therefore, this research should ideally concerns on operational performance and lean healthcare practices, simultaneously. In summary, the researcher illustrated the dimension of operational performance in the healthcare sector as displayed in Table 3.

Table 3: Dimension of Operational Performance in the Healthcare

Operational Performance	Li & Benton (1995)	Dey et al. (2006)	Gomes et al. (2010)	Purbey et al., (2007)	Yasin & Gomez (2008)	Collins & Joyce (2008)	Stock & McDermott (2011)	Gares (2011)	Chang et al. (2011)	Capkun et al., (2012)	Elg et al. (2013)	Davis et al. (2013)
Outcome		x										
Structure		x										
Process		x										
Productivity												
Medical staff												
Patients satisfaction												
Efficiency	x		x	x								
Waiting time											x	
Availability			x									
Quality	x		x			x			x			
Effectiveness				x								x
Flexibility				x								
Average length of stay (ALOS)							x			x		
Risk-adjusted mortality rate							x					
Overall assessment								x				
Personal issues								x				
Overall satisfaction								x				
Patient safety											x	
Incoming referrals											x	
Resources utilization											x	

Lean Healthcare Practices

The implementation of lean practices, approaches or tools still underlying on the principles of lean thinking introduced by Womack and Jones (1996) and yet, it is exceptionally relevant to other sectors (Burgess & Radnor, 2013). Furthermore, the used of term lean practices, tools, techniques or others keep on changing among scholars and it is argued, does these terms similar or different from one another. Thus, this section will analyzed the common lean healthcare based on previous studies.

Study by Plytiuk et al. (2013) identified lean healthcare practices by reviewing eleven selected articles which purposely described lean intervention in the healthcare system. They analyzed the

practices based on nineteen categories that frequently cited among scholars and it has been revealed about six practices predominate among the result. Meanwhile, Aoun (2015) postulates lean practices into two dimensions; lean strategies and standardization. Lean strategies include *kaizen*, *kanban*, *JIT*, *andon*, *jidoka*, *poka yoke*, quick changeover and *Hoshin Kari*, while standardization solely focuses on 5s. The purpose of this study is to enhance innovation skills among hospital providers in Labanese.

Correspondingly, lean tools has been used by Machado et al. (2014) as an instrument to describe the implementation of lean philosophy that help to solve the waste problem and associate hospital to make a decision. They concise about eleven tools from preceding scholars as exhibited in Table 4. Andrea (2013) proved in her study, the effectiveness of using lean tools within departments, wards and outpatient clinics in a large Italian public hospital such as VSM, spaghetti chart and activity worksheet enable to solve patient transportation. Hence, lean tools managed to achieve reduced waste of times and cost by shifting the patient from the emergency room to hospitalization or discharge. Likewise, Radnor (2011) claims, is an adequate to use simple techniques or tools in the public hospital by considering 5s, VSM, visual management, process mapping and *kaizen*. Radnor (2011) was also proposed lean implementation program in the form of short term workshop known as Rapid Improvement Events (RIE's) or a *kaizen* event in order to sustain for a long period.

Further, study led by Gowen III et al. (2014), lean tools in lean management implementation (LMI) consist of *JIT*, process and VSM, *kaizen* and 5s has extraordinarily found to improve patients safety due to lean management tools easily being implemented and manage to provide quick result. However, it is argued the implementation of lean tools does not reach the level of competitiveness because the deployment of lean is quite limited. While, study directed by Elshennawy et al. (2012) disclosed, approximately 80 percent hospital managers reported that they adopted lean activities and tools comprises; waste elimination, continuous improvement, five whys, VSM, types of waste, and 5s in running the activities. As recent study by Jorma et al. (2016), PDSA cycle, *kaizen*, VSM and root cause analysis were found the most adopted lean tools in the Finnish public healthcare, whereas, 5s, visual control and *kanban* were reported the least adopted lean tools.

In contrary, study conducted by Chadha, Singh, and Kalra (2015), demonstrates lean healthcare model (LEAN-HC) empower to integrate lean methodology and queuing theory in enhancing patient satisfaction and quality care. They further revealed, *JIT*, customer oriented practices and value-added specialty practices as an appropriate lean approach to apply in the walk-in clinics due to avoid long queue and waiting among patients (Chadha et al., 2015). In subsequent work, Ezzeddine (2006) with his comprehensive research had used the method of case study in the 29 Minute Emergency Department Initiative at Sinai-Grace Hospital by taking several lean indicators such as continuous improvement, *JIT*, zero defect, elimination of non-value activities, multifunctional teams to measure organizational performance. Further, Joosten et al. (2009) measures organizational performance using lean thinking in the context of operational aspects. Application of this aspect is focused at the operational level of hospital by distinguishing value and non-value adding activities. While, another study conducted by Yurtkuran, Özdemir,

Yurtkuran, and Emel (2017), applied lean production techniques to overcome problem of cost reduction and time in the Bursa’s public hospital.

Typically, the interpretation of lean practices, tools or approach remain the same, but the above arguments emphasized more on technical or operational aspects as presented in Table 4. Hence, lean healthcare practices in this context can be defined as the process improvement in reducing waste at the organizational level as a whole.

Table 4
The Dimensions of Lean Healthcare Practices

Lean healthcare	Radnor, 2011	EIshennawy et al., 2012	Andrea, 2013	Plytiuk et al, 2013	Machado et al , 2014	Gowen et al, 2014	Aoun, 2015	Chadha et al., 2015	Joma et al., 2016	Yurtkuran et al., 2017
Continuous improvement teams: Kaizen/quality circles	x	x			x	x	x		x	x
Continuous improvement tools: PDCA, pareto diagrams, design of experiments				x					x	
Waste elimination		x								
Mistake proofing: Error proofing, poka yoke, check sheets					x		x			x
Root cause analysis: 5 whys/fishbone diagrams, checksheets, design of experiments, spaghetti chart		x							x	
VSM: Value stream mapping: true north, process mapping, flow charts	x	x	x	x	x	x			x	x
Quality at the source: Autonomation, jidoke, line stoppage							x			
Kanban: Card system, supermarket /pull system					x		x		x	
Line balancing; Takt time					x					

Conversely, limited research has been found in the relationship between lean healthcare practices and operational performance in the healthcare setting. However, it has been proposed to examine the relationship between lean management and hospital improvement such as cost, quality, safety and delivery (Roszell, 2013). For instance, recent study has shown, the adaptation of lean in a nursing unit managed to eliminate operational failures which has led to costs reduction around \$200,000 annually per unit (Kotchevar, 2015). Operational failures such as scheduled medication not delivered on time and adjourning patient care that can cause patient harm have been identified as a major error or disruptions to system functionality. While Miller & Chalapati (2015) have proven lean tools such as root cause analysis and VSM are able to reduce waste dramatically and improves productivity at the Indian hospital.

Cost reduction was also has been highlighted in the efficiency dimensions, instead of resource utilization (Purbey et al., 2007). They pointed out, it is important for the hospital management to use the funds or resources wisely in order to produce a good output. Besides, the ability to control production costs has to look seriously as to avoid any possible waste in the organization (Cho, 2014). Subsequently, it has been revealed, less cost incurred if average length of stay (ALOS) is shorter, while lower cost associated with higher number mortality rate (Stock & McDermott, 2011). Hence, this analysis does verify operational performance have a positive correlation on the overall hospital costs performance. Meanwhile, Gares (2011) had discovered LOS was significantly associated with patient overall satisfaction. The study conducted in acute inpatient medical/surgical nursing unit whereby this study had restricted to patients who were 18 years old or above and discharged to go home less in seven days or less.

Nevertheless, it has been debated by Nerminathan et al. (2014), if discharge patients too early, the deficiency in monitoring and supportive care certainly exist because the intention of hospital to avoid any additional cost. Thus, they have suggested, lean management need to employ within the hospitals in order to cutting out waste in the aspect of bed occupancy, turnover interval and ALOS. Furthermore, study by Capkun et al. (2012) have indicated, the reduction amount of patients spent their time in the hospital has enhanced operational performance because the number of medical doctors and staff has increased in Austrians public hospitals.

Thus, the results have shown, the improvement of operational performance, which can be seen the reduction of staff has made low patients length of stay, as well as reduced hospital costs because principally, lean goals based on Toyota House, attempts to reduce costs, lead times, provides best quality, safety and high morale (Suryadevara, 2015). Another staffing issues, also has been a major problem in the ED at Israel's hospitals because they have to work shifts and overtime that might involve extra costs. Hence, Sinreich & Jabali (2007) have proposed the strategy of restructure and downsize of ED's workforce that aim to reduce costs of hospital and increase hospital efficiency.

Conclusion

In summary, past research indicates, the dimensions of operational performance of healthcare is still an unsettled issue as well as the dimensions of lean health care practices. This is due to many scholars unable to establish general agreement on the construct of both variables and yet most

of the construct are mixed with one another. Nevertheless, from the review, it was found operational performance has strongly associated with lean healthcare practices. However, various scholars have debated lean management comprehends a set of complementary of operating practices with the intention to eliminate unnecessary activities throughout the organization (Hajmohammad et al., 2013), but unfortunately according to Joosten et al., (2009), sociotechnical aspects generally being overlooked to make an intervention at the operational level due to most of the research mainly concentrate on the operational aspects. Therefore, future research should consider does lean healthcare in the context of operational aspects and sociotechnical aspects have a relationship with the operational performance in the Malaysia's private hospital.

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