DERLEME / REVIEW **Sağlık Yönetimi /** Healthcare Management

Six Sigma Approach and Examples from Healthcare Organizations

Mesut Çimen[1], Serkan Deniz[2]

[1]Acıbadem University, Faculty of Health Sciences Department of Healthcare Management, İstanbul, Turkey
[2]Yalova University, Termal Vocational School,Yalova, Turkey

Mesut Çimen, Assoc. Prof.
Sekan Deniz, Dr.

ABSTRACT

The need for scientific studies focusing on obtaining efficiency in healthcare services, using resources accurately, increasing patient satisfaction, and preventing waste and instability has been increasing due to the financial crises in the sector and the changes in patient expectations. One of the instruments that can be used in the healthcare sector to solve these problems is Six Sigma approach. In this study, the definition and the importance of Six Sigma approach, methodologies used in Six Sigma, Six Sigma roles and responsibilities, and examples related to Six Sigma implementations in healthcare organizations are discussed.

Keywords: six sigma, sigma level, healthcare organizations

ALTI SIGMA YAKLAŞIMI VE SAĞLIK KURUMLARINDAN ÖRNEKLER

ÖZET

Sağlık hizmetlerinde verimliliğin sağlanması, kaynakların doğru kullanılması, değişkenliğin ve israfın önlenmesi, hasta memnuniyetinin yükseltilmesi ile ilgili bilimsel çalışmalara giderek daha fazla ihtiyaç duyulmaktadır. Bu ve benzeri konularda ortaya çıkan sorunların çözümünde sağlık sektörünün başvurabileceği önemli araçlardan biri de altı sigma yaklaşımıdır. Çalışmada altı sigma yaklaşımının tanımı ve önemi, yaklaşımda kullanılan metodolojiler, Altı Sigma Rolleri ve Sorumlulukları ile Sağlık Kuruluşlarında Altı Sigma Uygulamalarına ilişkin örnekler verilmiştir.

Anahtar sözcükler: altı sigma, sigma düzeyleri, sağlık kurumları

Correspondence:
Assoc. Prof. Mesut Çimen
Acıbadem University, Faculty of Health Sciences Department of Healthcare Management, İstanbul, Turkey
Phone: +90 216 500 41 91
E-mail: mesutcimen@yahoo.com

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Recent years have witnessed increased competition, new technological developments, increased and differentiated consumer preferences, and turbulent environmental conditions, which made decision-making more difficult. Therefore, organizations have started to rely on new management tools in order to survive. Six Sigma is considered one of these management tools (1). This study aimed to clarify the concept of Six Sigma, and to examine its applicability in the healthcare sector.

Six sigma approach

Six Sigma approach was developed by the Motorala Company in the 1980s (2). Six Sigma is based on continuous improvement of work performance and customer satisfaction through redesigning and improving work processes, and it aims to

reach excellence (3). According to another definition, Six Sigma is a statistics-based and project-focused approach, which aims to decrease waste, defects, and variance in the product, process and operations (4). Statistically, Six Sigma means 3.4 defects per million opportunities (DPMO) (5). It refers to 99.99966 percent process efficiency (6).

Many of the world's top corporations have used Six Sigma approach as a powerful business strategy in order to improve quality, decrease costs, and increase performance by creating value for the customers (7). Some of the top corporations using Six Sigma are Motorola, GE, Ford, Citibank, Quantum, Pirelli, Toshiba, Samsung, Ericsson, Hyundai, Sony, Kodak, Shell, Jaguar, Volvo, Fiat, Dupont, Xerox, LG, and Siemens (8). Sigma level of the process in Six Sigma approach is determined by defect per million opportunities (DPMO). As the sigma level increases, the defects decrease (9).

Table 1. Sigma level table

Sigma level	*Defects Per Million Opportunities (DPMO)*
6	3,4
5	233
4	6.210
3	66.807
2	308.538
1	691.462

Source: Fursule, Bansod and Fursule, 2012 (10).

In Six Sigma approach, two main methodologies are used. First is the DMAIC process (define, measure, analyze, improve, and control) (11). The purpose of the define stage is to clearly identify the process. The purpose of the measure stage is to collect data related to the process and to evaluate the current performance. The purpose of the analyze step is to identify the root cause. In the improve stage, the main aim is to test and implement solutions to the problem. Finally, in the control stage, the main aim is to monitor solutions and improvements (12). Second is the DFSS methodology (design for Six Sigma) (11). DFSS methodology involves developing new products, processes, and procedures in order to satisfy customer needs and expectations (13). Individuals participating in Six Sigma implementation have different roles and responsibilities, depending on their training and experience. These roles are summarized in Table 2.

Table 2. Six sigma roles and responsibilities

Six sigma roles	*Management roles*	*Responsibilities*
Executive Leadership	CEO and members of top management	• Strengthen other roles, • Providing freedom and resource for new ideas, • Building the appropriate environment for breakthrough improvements
Champions	Managers	• Taking responsibility for disseminating Six Sigma to organization, • Focusing on determining Six Sigma projects, • Mentoring other belts.
Master Black Belts	Six Sigma Coaches	• Devoting his-her entire time to Six Sigma projects, • Helping champions, • Coaching and mentoring black belts and green belts, • Ensuring consistent implementation of Six Sigma across departments and functions, • Focusing on determining Six Sigma projects.
Black Belts	Operates under Master Black Belts	• Implementing Six Sigma methodologies to projects, • Devoting considerable time to Six Sigma projects, • Executing projects.
Green Belts	Employees operate under Black Belts	• Participating in Six Sigma implementations, in addition to his-her other responsibilities, • Working under the guidance of black belts.
Yellow Belts	Employees	Showing limited participation in projects.

Source: Jenab and Staub, 2012 (14).

Six sigma in healthcare organizations and successful examples

six Sigma is a powerful quality improvement tool, which could be used in healthcare organizations to meet the needs and expectations of patients, as well as to improve profitability and cash flow. Providing many opportunities, Six Sigma is a relatively new approach for the healthcare sector. Six Sigma approach can be used in numerous fields. For instance, it can be used in triage operations in emergency service. It can also be used to decrease the time patients spend in the emergency room, and Six Sigma can also be applied to discharge patients quicker. Six Sigma can also be used to optimize the scheduling of time for testing equipment such as MRI machines and the resources to operate this equipment. Similarly, it can be used to plan higher priority services for patients in need (13). Briefly, in healthcare organizations, Six Sigma

approach can be used to improve treatment, laboratory, radiology, nursing, support, hospitality, and technical and managerial services.

By using Six Sigma in healthcare organizations, the following benefits might be obtained (15).

- Relying on valid data may help prevent managers from acting emotionally or using personal judgment when decision-making. Thus, efficient decision-making can be achieved, and costs related to false guidance and incorrect solutions can significantly decreased.
- Critical characteristics related to patient services, which have the highest impact on patient satisfaction and patient loyalty, can be understood.
- Organizational culture can transform from passive to active structure.
- The culture of teamwork within the organization can improve.
- Patient satisfaction can increase. Therefore, patients' recommendation to friends and relatives, of the hospital in which they were treated, might increase.

Examples related to the use of Six Sigma in healthcare organizations and its benefits are discussed below (16).

- Charleston Area Medical Center applied Six Sigma to its surgical supply chain management, and obtained a $1 million saving.
- Virtual Health focused on its congestive heart failure patients. After implementing Six Sigma, variation in the patients' length of time to recover was reduced.
- Scottsdale Healthcare organization applied Six Sigma to its emergency room process, and decreased the time needed to transfer a patient to an inpatient hospital bed. The result was a $1.6 million increase in its profits in a year.
- Stanford Hospital and Clinics applied Six Sigma to its coronary artery bypass graft operations process, and obtained a savings of $15 million per year. Moreover, mortality rates decreased from 7.1 percent to 3.7 percent, and costs were reduced by 40 percent. Furthermore, average time spent in intensive care was decreased by eight hours, and average intubation time was reduced from 12-16 hours to 4-6 hours. Stanford Hospital and Clinics standardized its purchasing processes through other Six Sigma projects, and implemented other process improvements. As a result, Stanford Hospital and Clinics saved $25 million annually through these improvements.

One of the limited number of studies about Six Sigma implementations in Turkey was done by Özveri and Dinçel (17). In their study, Özveri and Dinçel discussed the criteria used in Six Sigma project selection, and the application of these criteria in a private hospital. The private hospital in which the study was conducted was established in 2007 in Izmir. The hospital had an advanced technological infrastructure and offered healthcare service to approximately 500 patients per day. Three Six Sigma projects to be implemented in the hospital were determined through using project selection criteria, and it was decided to implement the project of "Quota and Capacity increase of Physical Therapy and Rehabilitation Polyclinic." As a result of implementing this Six Sigma project and two new physiotherapists, the number of daily patient treatment was increased from 32 to 64. Moreover, treatment start time was reduced from 3-4 months (due to the fully booked appointments) to less than one month, and waiting time of the patients in the hospital was reduced from 2.5 hours to 20 minutes. After all these improvements, the number of patients was doubled, and thus, the profit of the polyclinic was increased 100 percent.

Conclusion

In the recent year, due to increases in healthcare expenditures, and changes in patients' needs and expectations, the healthcare services industry has experienced significant disruptions. These disruptions have created significant problems that must be solved for both healthcare organizations and patients. At this point, performing efficient and effective services becomes necessary for healthcare organizations. To realize this aim, it is necessary to get maximum efficiency from employees, benefit from opportunities, reduce costs, inferiority, repetitive transactions and waste ratio, invest in technological infrastructure, prevent medical errors, and increase healthcare quality and patient numbers. Six Sigma approach is one of the most important tools that could be used to achieve these goals. In this study, even though there were a limited number of studies about the benefits obtained from Six Sigma implementation in healthcare, it was demonstrated that Six Sigma approach is an important improvement methodology that can be used in the healthcare sector, and it was aimed to create awareness for further studies.

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