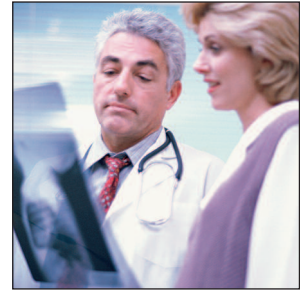


Pursuing Perfection in Healthcare With Six Sigma

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A White Paper from Six Sigma Qualtec



This paper is intended to help executives and other professionals in healthcare tap into the power of Six Sigma. It contains a brief overview of Six Sigma, a discussion on the impact and dynamics of problems facing healthcare organizations and the results obtainable through Six Sigma implementation.

Six Sigma Methodology in Healthcare

The fundamental objective of the Six Sigma methodology is the implementation of a measurement-based strategy that focuses on process improvement and variation reduction through the application of Six Sigma tools. Six Sigma holds the philosophy that every process can and should be repeatedly evaluated and significantly improved in terms of time required, resources used, quality performance, cost and other aspects relevant to the process. It prepares employees with the best available problem-solving tools and methods.

In a healthcare environment, Six Sigma is applied in the improvement of business processes (administrative and logistics) and in the improvement of medical outcomes processes (clinical and patient safety). The overall strategy is to achieve **“Excellence in Healthcare”** by aligning and optimizing processes and by the removal of process-generated errors and defects. “Excellence in Healthcare” is the mutual, co-dependent improvement of the hospital’s business processes and medical services delivery processes as depicted in **Figure 1**.

While both areas are focused on overall excellence, the business process area is primarily focused on optimizing cycle times, customer satisfaction, efficiency, costs/profits, administrative procedures, logistics and employee satisfaction. The medical process area is primarily focused on optimizing patient safety, protocol execution and effectiveness, elimination of errors, cycle times and risk management. Six Sigma is also focused on optimizing the common areas of these two segments of healthcare delivery.

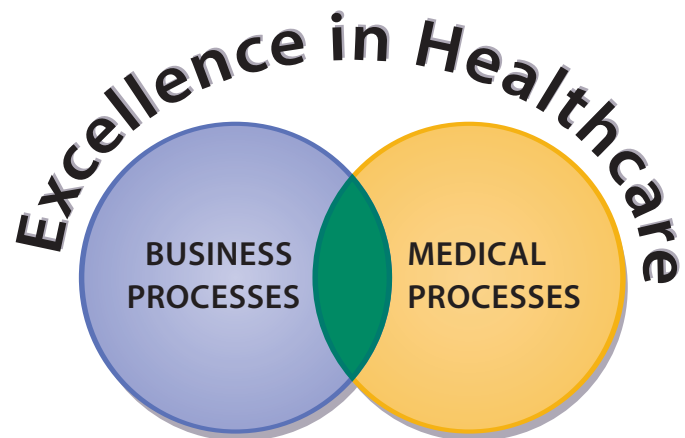


Figure 1.
Addressing the Needs of Healthcare

What Is Six Sigma?

The name Six Sigma is derived from a statistical heritage. Sigma is a Greek letter assigned to represent the amount of variation or inconsistency a measurable outcome exhibits. As a way of running a business, Six Sigma is a highly disciplined improvement system that helps individuals and companies eliminate costly problems, to develop and deliver near perfect products and services and to manage the company more strategically.

It establishes a leadership vision, framework and a set of metrics and goals to accomplish improved business results with a systematic five-phase problem solving methodology called **DMAIC: Define, Measure, Analyze, Improve and Control**.

Developed by Motorola in the mid-1980s as a way to improve quality, Six Sigma became better known after GE's Jack Welch made it a central focus of his business strategy in 1995. It is the culmination of many years of work by some of the best minds in business and management. The core of Six Sigma methodology is the application of statistical and other analytical tools in the context of a well disciplined, easy to follow methodology. The tools of the methodology are equally applicable in a "product" (operational, manufacturing) environment as well as in a "process" (transactional services) environment. Beyond the main core of the methodology and its tools, Six Sigma is an impressive management system.

Six Sigma leverages today's computer and software technologies with an organizational infrastructure to support the methodology, knowledge to improve employee capability, and goals and metrics to manage and measure the business to. Six Sigma is designed to deliver breakthrough level improvements at a significantly faster rate of improvement than conventional methods.

From a "quality" perspective, achieving Six Sigma means a specific output from an isolated process must produce no more than 3.4 defects per million opportunities, where an opportunity is defined as a chance for nonconformance, or not meeting the required specifications. To achieve Six Sigma from a "business results" perspective, waste – the **Cost of Poor Quality (COPQ)** – must be reduced in order to improve net profit margins 20 to 40 percent or more.

Six Sigma is a roadmap and a management framework for rapidly achieving reduced costs, higher quality, lower cycle times, improved overall customer satisfaction and a lower investment in equipment and inventory; all leading to increased market share, revenue, profits, and ultimately shareholder value.

The History of Six Sigma

In the mid-1980s an American company, Motorola, decided it was time for a change. Motorola Chairman Bob Galvin decided that traditional quality levels, about Three to Four Sigma, simply weren't sufficient. Motorola set a new standard of Six Sigma and began developing the means to achieve it. Motorola's efforts paid off with impressive results. Over the years following the initiation of its effort, Motorola improved quality levels and, in the process, reportedly also improved the business' financial performance by over a billion dollars.

Several years later, enamored by Motorola's success, other companies such as Texas Instruments began a similar pursuit. But it wasn't until late 1993 that Six Sigma really began to transform business. That's when Allied Signal's Larry Bossidy adopted Six Sigma. At Allied Signal, Six Sigma began to take shape as more than just a quality system — it became a systematic approach to overall business improvement and management.

Not only was a Six Sigma quality goal the mantra; an entire system of leadership and support systems began to form around the statistical problem solving tools.

Not long after Allied Signal began its pursuit of Six Sigma quality, Jack Welch, then chairman and chief executive officer of General Electric, began to study Six Sigma. After a little time and a great deal of contemplation, Welch, who was not a proponent of quality “programs,” saw the difference in Six Sigma and aggressively implemented it. GE began to vigorously apply Six Sigma not only in operational areas of the business but also within transactional areas. Over the following years, GE has claims to have saved billions of dollars with Six Sigma. The incredible success of Six Sigma at General Electric prompted a number of other companies to adopt Six Sigma by the end of the 1990s.

The Benefits of Six Sigma

The benefits of Six Sigma are endless, but the most apparent results are the significant financial returns that result from the optimization of processes and the elimination of defects produced from these processes. Many notable companies report financial returns in the hundreds of millions of dollars. These companies also report major changes in their underlying corporate cultures. This cultural change towards objective, data-driven decision-making, coupled with a process orientation in thinking, has changed the way the world approaches the management of business.

A number of studies by institutions such as Harvard University and notable quality gurus Dr. Edward Deming and J.M. Juran estimate that a typical company suffers an annual profit loss due to poor quality that is on the order of 25 percent or more of its revenues. Six Sigma provides the opportunity and the capability to reduce these annual losses.

In the final analysis, Six Sigma results include:

- More Capable Employees
- Reduced Defects
- Reduced Cycle Times
- Lower Inventory Levels
- Higher Efficiency and Lower Costs

Achievements in these areas ultimately lead to increase overall customer satisfaction, employee satisfaction, higher market share and greater profits.

The Role of Six Sigma in Healthcare

The pressures on healthcare organizations – and the healthcare industry in general – are tremendous and appear to be increasing. Patients are demanding better service, litigation is on the rise, third-party payers are paying less and less for services, and regulatory agencies want hospitals to “show compliance.” Help is needed in the healthcare industry, just as in other industries, to meet these increasing challenges and pressures.

Deming, a notable international quality guru, has also observed the need for systematic approach to improving quality in healthcare. Comprehensive, systematic business and quality improvement can only be made using sound methods of measurement and statistical analysis. Although some application of these techniques has already taken place in the healthcare system, it has been far from comprehensive or systematic.

In all business organizations, there are invariably more problems than people have time to deal with. At best, this leads to situations where employees are continually working around the problems, consuming time and resources, and minor problems are ignored. At worst, the efficiency of the organization is poor and chronic fire fighting consumes a sizable portion of an organization's resources.

Companies with complex or lengthy processes are particularly prone to fire fighting and living with the resultant inefficiencies. Managers and employees rush from task to task, not completing one before another interrupts them. Serious problem-solving efforts degenerate into sub-optimized "patching." Productivity suffers, and managing becomes a constant juggling act of deciding where to allocate overworked people, or which incipient crisis can be ignored for the moment.

It has been observed that companies suffering from poor problem solving and the resultant fire-fighting syndrome are best characterized with a collection of symptoms. You're a victim of poor problem solving if three of the following elements exist within your business unit or division.

1. **There isn't enough time to solve all the problems.** There are more problems than the problem solvers – the employees and managers – can deal with properly.
2. **Solutions are incomplete.** Many problems are patched, not fully solved. That is, the superficial effects are dealt with, but the underlying causes are not fixed.
3. **Problems recur and cascade.** Incomplete solutions cause old problems to reemerge or actually create new problems, sometimes elsewhere in the organization.
4. **Urgency supersedes importance.** Ongoing problem-solving efforts and long-range activities, such as developing new processes, are repeatedly interrupted or deferred because fires must be extinguished.
5. **Many problems become crises.** Problems smolder until they flare up, often just before a deadline. Then they require heroic efforts to solve.
6. **Performance drops.** So many problems are solved inadequately and so many opportunities forgone that overall performance is low.

In other words, work becomes far less efficient precisely when the most work needs to get done. The longer the backlog, the more things bog down. Employees start spending time away from normal work, stuck in meetings to set priorities about which fires to fight next; they're rushing around dealing with customer needs and issues; they're solving problems that later get "overtaken by events." In general, they are dealing with the chaos and information overload that ensue when fire fighting is rampant. But that's not the worst of it.

The really bad news is that under these conditions, pressures push employees to solve problems not just inefficiently but *poorly*. They don't work on a problem long enough to uncover its root cause, they just make a "gut feel" diagnosis. Then, instead of testing their hypothetical diagnosis off line, they introduce a hasty change in the process. And if the quick fix doesn't solve the problem completely (it is usually unclear whether it helped or not), they leave it in place and try another solution. They don't solve the problem because they don't take the time to approach it systematically. At best, this superficial problem solving, or patching, takes more time than systematic problem solving.

When changes are introduced haphazardly, they are frequently institutionalized without careful study. There are many instances where an individual implemented a temporary measure to counter an existing issue and it was forgotten, thereby becoming carved in stone to create an issue later on. Patching can be justified in a few situations, but there is usually a cost penalty associated with it. For example, it's common to add another inspection step when an unresolved problem exists so the defect doesn't move downstream. This weeding out raises costs, but it avoids passing on some of the defects.

Such superficial solutions are acceptable only in the few instances where *no action* is worse than *some action*. With those exceptions, patching problems is destructive behavior. Solution rates fall and the number of hidden problems rises. The new problems that patching has created, in addition to the old ones the patch failed to solve, act up more and more, until a large fraction of the incoming problems are actually old ones returning. The employees' environment becomes increasingly chaotic, which makes it harder for them to effectively perform their responsibilities. One of the key costs that infrequently gets considered is the employee's time.

Fortunately, there are ways to avoid reaching such a crisis point and to significantly reduce the firefighting syndrome. They can be loosely sorted into three categories: tactical, strategic, and cultural.

1. **Tactical Methods.** Tactical methods can be put into effect quickly without making high-level policy changes. A typical tactical approach is to assign the problem to a task force or tiger team. Such approaches tend to have limited results, but can help to relieve the pain level.
2. **Strategic Methods.** Strategic approaches to fire fighting syndrome take longer to implement than tactical methods, but they pay off across a range of projects and over long periods. The most common strategic approach is to develop highly effective and dedicated problem solvers. This has been one of the factors inherent in the Six Sigma improvement system. Employees that have not been required to have statistical competence are trained as Master Black Belts and Black Belts to solve in-depth and complex problems, while others, called Green Belts and Yellow Belts, are trained to solve less complex problems. Yellow Belts, not trained as complex problem solvers, provide vitally important process management skills to support the effort.
3. **Cultural Methods.** Cultural changes require shifts in the mind-set of the whole organization and in the behavior of senior managers. Cultural changes require that a company's executive team demonstrate the leadership and stamina to affect a new set of values and behaviors. Cultural changes require new knowledge and the repetitive use of the new knowledge before it becomes the natural way to work. As a result, cultural changes take time to occur. The systematic approach of Six Sigma, its widespread training to bring the knowledge to a variety of the employees with its repeated successes, will in 18 to 30 months affect a cultural change in a company.

Business and quality improvement is not new. It originated primarily in the manufacturing industry many years ago. Quality and business improvements have been known by many names. Prior to Six Sigma, industries attempted to use an approach called Total Quality Management, or TQM. TQM has made improvements, but most TQM efforts have fallen short of expectations, not because of the ideals of this method, but because of the approach. TQM was a philosophical approach of "Quality is the right thing to do, so everyone must carry the flag of Quality". Unfortunately, TQM lacked the structure and the methodology of Six Sigma to form a powerful and a repeatable system of improvement. It also fell short of expectations because it focused on delivering many small incremental (continuous) improvements, which generally were unrelated to each other and could not substantially move the performance of the organization.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) refers to quality improvement efforts as “Improving Organizational Performance” (IOP) and has a section of standards called the PI (Performance Improvement) standards relating to Quality concepts. JCAHO’s PI standards use the terminology of continuous improvement; Six Sigma can substantially expand the capability and the rate of improvement suggested in these standards through its capability for breakthrough levels of improvement.

Traditionally, healthcare has only emphasized Quality Assurance (QA), not an organization wide business and process optimization effort. One of the main reasons for this was that in the past, JCAHO and other certification agencies placed a great deal of importance on QA. Several years ago, JCAHO changed some of its standards to reflect an emphasis on PI rather than QA. Traditional QA is much different than Six Sigma. The QA focus is not on the “big picture” of continuously improving the way things are done with breakthrough levels of improvement, but rather on choosing specific things to monitor and regularly checking for compliance. There is a place for some of these initial QA efforts; however, the emphasis of organizations today should be on using methods that are less concerned with mere compliance and monitoring and more on true process optimization and defect removal in order to exceed the current medical practice standards.

Healthcare Success Stories

Why should the healthcare industry vigorously pursue the use of Six Sigma? First, as a business made up of people, products and services, and with a need for financial viability, healthcare faces problems and challenges similar to all organizations. There is an increasing pressure on healthcare organizations to lower costs. The tools of Six Sigma help to lower costs by improving overall operating efficiencies. Second, by reducing defects, optimizing processes and having readily available statistically valid data, the potential for malpractice litigation decreases. Third, employees will benefit through the reduced amounts of rework, crisis and associated anxieties, thereby allowing higher levels of job satisfaction and enrichment. Fourth, and to the benefit of society as a whole, for the improvement in the consistency, predictability and quality of health care itself.

Healthcare, like any other business, has literally of differing types of problems. Following are several typical day-to-day issues faced in virtually every hospital environment, and the results of implementing Six Sigma to improve performance. These problem summaries represent the range of Six Sigma’s ability to influence performance, and suggest to the reader possible areas in which he or she will find benefit from using Six Sigma in their particular environment.

- Within a hospital’s **HIM Transcription Services department**, 20 percent of in-house transcribed reports and 14 percent of outsourced transcribed reports required manual matching due to missing key dictation elements. An ongoing problem for years, the additional work resulted in delays in record completion, coding and availability of transcribed reports in clinical areas. Within the four-month period of a Six Sigma implementation, the number of reports that needed to be manually matched was reduced by 70 percent, and created a cost saving of \$306,000.
- Neither physicians nor a hospital’s **neonatal clinic** were doing any professional billing for services provided to the clinic’s newborn babies. Other charges to new mothers and infants were not being entered accurately. During a review of obstetrical charges, it was determined that more than 20 percent of the clinic’s deliveries were missing related professional charges. A focused effort to identify inaccuracies and missed opportunities decreased that number to six percent, allowing additional professional charges for the neonatal clinic to be captured and yielding a revenue increase of \$189,000.

- Insurance reimbursements for **Diagnosis Related Group (DRG) 358** at a hospital facility were lower than entitled. Upon examination during a Six Sigma project, 66 percent of charts reviewed from the prior fiscal year showed conditions consistent with the definition of blood loss anemia and treatment for such, but lacking the physician documentation required in the medical record to assign the codes for this complicating condition. Specific efforts to improve clinical documentation to accurately reflect inpatients assigned to DRG 358 resulted in a 70 percent improvement shift and additional insurance reimbursements of \$216,000.
- Delivery of **inaccurate case carts** to an operating room on a daily basis was creating rework and procedural delays. Six Sigma analysis indicated defects per million opportunities (DPMO) as 142,558. Resulting changes in the process for case cart preparation reduced DPMO to 42,700 and created a saving of \$66,000.
- A hospital's **HR hiring manager** was frustrated by a 35 day cycle time from receipt of applications to time of offer to candidates. Further, potential employees and other applicants were expressing great dissatisfaction in the process. A systematic review of the entire transactional process resulted in establishing a baseline cycle time of 10.5 days and contributed \$156,000 in cost savings.
- An Emergency Care Center found it was on **Diversion Status** an average of 38.3 hours per month. A full 50 percent of that time was attributed to bottlenecks in the inpatient bed assignment and transfer process. Analysis of the process found opportunities for improvement and streamlining that reduced Diversion Status hours to an average of 24.9 per month. More than \$170,000 was re-captured in revenue as a direct result of the ER's increase in capacity.

Summary

Through the use of advanced electronic communication and computer technologies, today's hospitals and businesses are inundated with vast amounts of data, which is typically stored in high-speed computers. In its raw form (e.g., long lists of numbers, names, places), this data is of little value. However, when manipulated with statistical tools, the data can be transformed into valuable information (numeric and/or graphic). This knowledge is vital for drawing conclusions and making decisions. Since statistical tools are required to gain useful information or knowledge from data, the Internet Age of today is rapidly generating the Statistical Age of tomorrow. Interestingly enough, English author H.G. Wells predicted this trend some time ago when he said "Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."

There is now a growing demand in healthcare to apply the concepts of Quality and Six Sigma methods that have been successfully implemented in other industries, due to its incredible power to deliver results. Previous developments and advancements in Six Sigma have created a major advantage for healthcare today. We know what works and what doesn't. Many of the tools of Six Sigma have been in use for more than 70 years. Their effectiveness has been shown in many organizations with multiple applications. Software packages have been developed to support these tools; healthcare doesn't have to start from ground zero.

Six Sigma and its related methodologies are continuing to emerge as the most significant business reengineering and improvement system to date, and Six Sigma will continue to dramatically alter the capability of employees and companies. No other business improvement approach has had the systematic, mathematical and management underpinnings that have positioned Six Sigma to be the most capable methodology for accelerated improvements in quality, productivity and overall operating efficiencies.



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