

Dutch Hospital Implements Six Sigma

EVEN SMALL
PROJECTS CAN
MAKE A BIG
DIFFERENCE.

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Red Cross Hospital in Beverwijk, the Netherlands, is a 384-bed, medium-sized general hospital, with a staff of 930 and a budget of \$70 million. In addition to being a general healthcare provider, Red Cross Hospital is the base for a 25-bed national burn care center that provides services to all of the Netherlands. In 2002, it admitted 11,632 patients, performed 8,269 outpatient treatments and received 190,218 visits to its outpatient units.

During the past four years, Red Cross Hospital's management and employees invested significant resources in building a quality assurance system, and at the end of 2000, the hospital was awarded an ISO 9002 certification. After that, management began undertaking quality improvement projects on a regular basis, but it was doing so without the benefit of Six Sigma's project management system.

Life Before Six Sigma

The hospital's initial quality improvement approach appeared to work reasonably well. However, management soon recognized its control of projects was less than effective:

- Project goals were often poorly aligned with the hospital's strategic goals.
- There was no systematic way to determine a project's relevance and contribution to the long-term strategy.
- There was no standardized procedure for evaluating a project's cost effectiveness.
- Management had difficulty making project go/no go decisions. Projects were generally initiated because management thought they would make a contribution to quality of care.
- Management was not able to access the potential savings of alternative projects.
- Once a project was started, management did not have reliable information about its status until it was finished. Each project had different milestones, and progress could not be evaluated and compared to other projects.

Management was basically navigating in the dark.

The management team and employees were frustrated because the hospital lacked a standardized project management approach. Time was frequently wasted—when each new project was started, the approach, project documentation and planning had to be developed from scratch. For that and other reasons, management had problems properly training its employees in project management. Though the hospital had organized training, the results were meager and disappointing.

Another problem was management expected employees to work on projects in addition to performing their usual duties. This might appear to be an inexpensive approach, but it seriously delayed potential savings. Ironically, management was mostly unaware of this unfortunate situation because of its poor management controls. Had management been in a position to determine the results of a project in advance, it would have been able to make more appropriate decisions about employee time allocations to projects. Fortunately, management learned employees should be relieved of some of their usual duties when working on a project.

Why Six Sigma?

Six Sigma incorporated a number of quality management techniques that helped resolve some of the problems at Red Cross Hospital. Management believed its implementation of Six Sigma was successful for several reasons:

- **Philosophy:** Because Six Sigma is based on scientific principles, decisions were based on facts and data instead of feelings and intuition. Projects were not initiated when estimated savings were below management defined thresholds.
- **Project management:** Projects were managed strictly according to the five phases of the define, measure, analyze, improve, control (DMAIC) methodology. Each phase was completed only after specific milestones were reached.¹ At any given time, it was possible to determine a specific project's progress in a unified way within departments and across the entire organization.
- **Well-defined roles and responsibilities:** Six Sigma assigned specific roles—Yellow Belt, Green Belt (GB), Black Belt (BB), Champion and Master Black Belt (MBB)—to those involved. Explicitly defined roles and expected contributions were important during the organizational change effort and contributed to the success of a project.
- **Tools and techniques:** Six Sigma employed a variety of tools and statistical techniques. Software tools were used to make the techniques available and accessible to people with little or no training.
- **Well-defined interfaces with the existing organization:** Six Sigma provided a detailed blueprint that linked it to the existing organization. Specifically, Six Sigma's tight project organization operated

across all hierarchical layers of the hospital. All relevant information and responsibilities could be brought together while the business continued to operate.

Six Sigma was not just an idea or another trick to organize improvement projects. Its set of well-defined and well-tuned managerial instruments enhanced the results of improvement projects and, ultimately, maximized the performance of the entire organization.

To implement Six Sigma at Red Cross Hospital, management had to customize and adapt some of the standard Six Sigma management concepts so they better applied to the healthcare industry. For example, adjustments had to be made because Red Cross Hospital was much smaller than the typical organizations that implement Six Sigma.

Management also had to address concerns regarding the culture of its nonprofit, service organization and the differences between it and an industrial for-profit company's explicit focus on financial results. Fortunately, it was relatively easy to convince the skeptics by explaining that more money for the hospital means happier and healthier patients. In this respect, Red Cross Hospital's experience parallels the implementation of Six Sigma at Thibodaux Regional Medical Center in Louisiana.²

The Implementation

Six Sigma was initiated at Red Cross Hospital by an external consulting company during a one-day training session for upper management at the end of 2001. The management team consisted of two directors and the managers of the hospital's four divisions. The quality manager was introduced to Six Sigma in January 2002, and she enthusiastically went through intensive BB training that spring.

After the quality manager completed her BB course, 16 employees enrolled in in-house GB training provided by the consulting company in September 2002. Though all GB trainees were required to participate in one Six Sigma project, one hospital director also participated in the first wave of GB projects.

During the course of two separate, three-day periods, every participant was required to produce documented results. No GB project was allowed to proceed to the subsequent phase until the preceding phase was completed. Participants had to present their results twice in front of the entire group, the second time being a presentation of their final results.

THE DATA DRIVEN APPROACH WAS HELPFUL IN ESTABLISHING SUPPORT DURING THE IMPLEMENTATION OF THE RESULTS. THE DATA PROVED CONVINCING AND, IN MANY CASES, MINIMIZED EMOTIONAL RESISTANCE.

Because of the hospital's small size, teams were made up exclusively of GBs, each typically spending two days a week on the project. Considering the hospital's budget and savings potential, management used \$25,000 estimated savings as its financial threshold for initiating a project. After completing the first wave, management immediately started a second group of 15 GBs in February 2003, a third group of 13 GBs in September 2003, a fourth group of 14 GBs in February 2004 and a fifth group of 17 GBs in September 2004.

The Six Sigma approach was well received by employees. The teams believed it supported them throughout the entire process of a project. The data driven approach was helpful in establishing support during the implementation of the results. The data proved convincing and, in many cases, minimized emotional resistance.

Initially, the hospital's BB performed the role of MBB on a part-time basis. This quickly proved inadequate as the number of GBs increased. Since management wanted to deploy Six Sigma relatively quickly, it decided to hire a full time MBB from outside the hospital. Fortunately, it was able to hire a BB with previous experience from DAF, a Dutch truck manufacturer now owned by Paccar. Management was comfortable employing a MBB with experience from outside the healthcare sector because the language of Six Sigma is universal and independent of industry type. Red Cross Hospital even received an offer from 3M, a company with a reputation for having successfully implemented Six Sigma, to support it in further developing its Six Sigma organization.

Outstanding Results

The first group of 16 GBs were initially involved with seven projects. One project was terminated during the course of the training because it didn't run well. This was a nice change, because in the pre-Six Sigma phase of the hospital's quality improvement initiative, such a project would have dragged on forever. The other six projects were successfully completed in February

2003. They are described briefly below. More details about these and other projects can be found in a recent article in *Quality and Reliability Engineering International*.³

Shortening the length of stay of COPD patients: Patients with chronic obstructive pulmonary disease (COPD) were admitted to either the pulmonary or internal medicine department due to capacity problems in the former. A statistical analysis done by the first team showed a significant difference in the admission time between the two departments. The average stay in the pulmonary department was two days shorter than that in the internal medicine department. A further statistical analysis showed this difference was not due to patient characteristics or physicians. The pulmonary department was just better at treating pulmonary patients.

The hospital rebalanced the bed capacity so all COPD patients could be to be admitted to the pulmonary department. After this change, in-patient days were saved and more admissions were possible. The annual savings was estimated at \$40,000.

Reducing errors in invoices from temp agencies: After an intensive investigation, the second team discovered a considerable number of incorrect invoices from temporary agencies. The errors consistently fell in favor of the agencies and cost the hospital a lot of money to fix. The hospital designed and implemented an improved declaration form that is now required by all agencies contracting with it. In addition to the annual savings estimated at \$75,000, Red Cross Hospital experienced a one-time savings of \$35,000 due to a refund from the agencies.

Revision of the terms of payment: An analysis by the third team revealed the hospital's suppliers were paid under a variety of terms due to the lack of a uniform payment policy. A standard policy was established, and a number of improvements were implemented. The total savings so far is \$35,000 and continues to increase.

Reducing the number of mistakes in invoices: Red Cross Hospital issues 250,000 invoices to patients and insurance companies a year. The fourth team

discovered 9% of the invoices were refused and sent back due to the hospital's mistakes. Given the large number of invoices and mistakes, the true statistics lovers saw their finest hour during this project. More than 100 percentage points of improvement were identified, a number of which are still being worked on today. At this time, less than 1% of the invoices are refused, and the savings has exceeded \$200,000.

Rooming-in in the children's department: A data analysis done by the fifth team revealed a child's length of stay decreased when parents were permitted to stay with their hospitalized children over night. Measures were then implemented to facilitate the presence of parents. Armed with the data, insurance companies agreed to pay 80% of the cost for the extra services. The significant decrease in the number of admission days allowed the hospital to admit more children and boost its revenue. The total annual savings was estimated to be about \$30,000.

Reducing the number of patients on intravenous antibiotics: Intravenous antibiotics are much more expensive than oral medication. The sixth team found a number of patients who used intravenous antibiotics could have been transferred to oral medication earlier than they were. An analysis showed the internal medicine department was better than the surgical department at managing this process. Further analysis revealed the internal medicine department had a strictly followed standard operating procedure (SOP) for switching between intravenous and oral medication, and the surgical department did not have an SOP. The protocol developed and used by the internal medicine department was adopted as the SOP throughout the hospital. The total annual saving was estimated at \$25,000.

Although each of these savings individually may seem relatively modest, they added up to a significant amount. Each required only minor changes and adjustments to the operation and management of the hospital, and more importantly, all the improvement projects provided significant but less tangible benefits to the hospital's management and its customers—the patients.

The six improvement projects illustrate a \$25,000 minimum level of revenue per project can easily be met, and much larger amounts are also possible. Projects in patient care and the administrative departments are also feasible. Because employees are free to suggest ideas for projects, management expects an improved selection of projects will further enhance revenue in the future.

The results at Red Cross Hospital are encouraging.

The hospital's management experienced no significant problems implementing Six Sigma in the nonprofit service organization, and employees were enthusiastic and considered its use a major advantage in managing and executing improvement projects. There is no doubt Red Cross Hospital will continue to use Six Sigma and ISO 9000 as the core of its quality management system.

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REFERENCES

1. Mikel Harry, *The Vision of Six Sigma*, Tri Star, 1997.
2. Greg Stock, "Taking Performance to a Higher Level," *Six Sigma Forum Magazine*, Vol. 1, No. 3, pp. 23-26.
3. Jaap van den Heuvel, Ronald J.M.M. Does and M.B. Vermaat, "Six Sigma in a Dutch Hospital: Does It Work in the Nursing Department?" *Quality and Reliability Engineering International*, Vol. 20, No. 5, pp. 419-426.

BIBLIOGRAPHY

- Barry, Robert, A.C. Murcko and C.E. Brubaker, *The Six Sigma Book for Healthcare*, Health Administration Press, 2002.
- Does, Ronald J.M.M., Edwin R. Van den Heuvel, Jeroen De Mast and Søren Bisgaard, "Comparing Nonmanufacturing With Traditional Applications of Six Sigma," *Quality Engineering*, Vol. 15, No. 1, pp. 177-182.
- General Electric's website, www.gehealthcare.com/prod_sol/hcare/sixsigma.
- iSixSigma's website, <http://healthcare.isixsigma.com>.
- Kabcenell, Andrea, and Donald W. Berwick, "Pursuing Perfection in Healthcare," *Six Sigma Forum Magazine*, Vol. 1, No. 3, pp. 18-22.
- Stahl, Richard, MD, Bradley Schultz and Carolyn Pexton, "Healthcare's Horizon," *Six Sigma Forum Magazine*, Vol. 2, No. 2, pp. 17-26.

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