ATTACKING WASTE AND VARIATION HOSPITAL-WIDE: A COMPREHENSIVE LEAN SIGMA DEPLOYMENT

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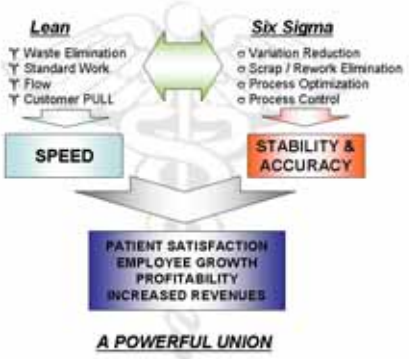
Abstract

Columbus Regional Hospital (CRH) is a 325-bed hospital providing care to a 10-county service area surrounding Columbus, Indiana. For the past two years, CRH leadership has been dedicated to the integration of Lean Sigma performance improvement into the way they normally do business. This case study describes the hospital's experience in the first two years of implementation and the initial results of their efforts in the areas of patient safety, satisfaction, and financial benefit.

Background

One of the most important competencies for a healthcare organization is that of driving change. You want to move your organization to a new level of performance. It does many things well, but something seems to be missing: productivity isn't where it should be; you're not growing fast enough and competition is overtaking you; margins are declining and revenues are harder to come by. In the heat and pressure of competitive change, you must build an organization that drives change quickly. One facility, Columbus Regional Hospital (CRH), is successfully addressing these issues by deploying Lean Sigma throughout the organization. In early 2005, CRH selected Sigma Breakthrough Technologies, Inc. (SBTI) as the consulting group to facilitate the Lean Sigma integration.

Lean Sigma



Lean Sigma is the integration of Lean and Six Sigma process improvement methodologies. Six Sigma and Lean are both business improvement methodologies, more specifically business process improvement methodologies. Their end goals are similar, better process performance, but they focus on different elements of a process. Unfortunately, there is confusion about their integration. Often, Six Sigma and Lean have been positioned as competitors when in fact they are wholly complementary.[1]

For the purpose of CRH's approach to process improvement:

- σ Six Sigma is a systematic methodology to focus on the key factors that drive the performance of a process, set them at the best levels, and hold them there for all time.
- σ Lean is a systematic methodology to reduce complexity and streamline a process by identifying and eliminating sources of waste in the process; waste that typically causes a lack of flow.

In simple terms, Lean looks at what we should not be doing and aims to remove it; Six Sigma looks at what we should be doing and aims to get it right first time and every time, for all time.

Lean Sigma is all about linkage of tools, and not using tools individually. In fact, none of the tools are new. The strength of the approach is in the sequence of tools.

There are many versions of the Six Sigma Roadmap, but not so many that fully incorporate Lean in a truly integrated Lean Sigma form. **Attachment 1** shows a robust version of a fully integrated approach. The roadmap follows the basic tried and tested DMAIC (Define, Measure, Analyze, Improve and Control) approach from Six Sigma, but with Lean flow tools as well as Six Sigma statistical tools threaded together throughout.

Lean Sigma approaches sustainable continuous improvement with the goal of improving patient care, safety, and satisfaction while simultaneously reducing costs and increasing revenues. Using Six Sigma, Columbus Regional Hospital analyzes variation and determines the root causes of that variation. Through Lean, participants eliminate non-value added activities and design new processes around steps that add value. Lean Sigma puts controls in place to sustain the gains and ensure continued success.

Full Deployment vs. Targeted Projects

Often, healthcare organizations elect to start small, implementing Lean Sigma in increments. This may be appropriate for some. CRH leadership determined that the advantages of organization-wide deployment outweighed the risks. Leaders did not want to appear tentative about the decision to deploy Lean Sigma, fearing it could turn into another "program-of-the-month." Leaders were on board and committed to a complete, well-disseminated pre-launch deployment plan.

The First 90 Days

The first three months in a deployment are critical.[2] Full deployments rely on everyone in the organization knowing what is going on. CRH leadership used that window to link strategy to the operating plan and to Lean Sigma projects simultaneously. With the big picture clear, informed department heads could energize their staff.

Eventually, six Black Belts and 18 Green Belts were trained. Executives and Champions were trained prior to launch. During the same period, and as part of training, Lean Sigma projects were selected and initiated. Champions were assigned from among hospital leaders, projects were chartered, and teams organized.

Project Selection

Project selection was important because early success would encourage acceptance and establish the groundwork for future success. Leadership was fully engaged in project selection. A Hospital Core Process Map (A**ttachment 2**) was used to demonstrate the inter-connectedness of CRH departments and processes. The organization used key business documents to select the initial projects: the hospital's mission statement, strategic plan, operating plan, profit and loss statement, and quality indicators.

Project Clusters

CRH leadership selected three project areas to begin: surgery, emergency department, and medication administration.

Surgery

A Core Process Map (**Attachment 3**) was also developed for the Surgery Department. CRH leaders elected to apply one of the tools of Lean Sigma, a Kaizen event, to examine and re-design the scheduling and flow of patients and procedures. Kaizen is a focused, accelerated change event in which key staff spend 4½ days focused on mapping the current process, mapping the ideal future process, and implementing the bulk of the changes. Kaizen events achieve sustainable short-term wins that build program momentum and deliver measurable business results within one week.

This was amply demonstrated in the surgery project. Through careful planning and team selection, four kaizen events were launched simultaneously in the surgery department, addressing:

- Set-up, Clean-up, and Turnover
- Scheduling & Intake
- Surgery Procedure Flow
- Outpatient Surgery and Recovery

In five days, the CRH Turnover Kaizen team reduced surgery changeover time for orthopedic procedures from 43 minutes to 14 minutes. The team followed the Lean concept of SMED (single-minute exchange of dies) used in manufacturing to minimize equipment changeover time. After mapping the process at the time, the team implemented a pre-turnover check list and developed Standard Work requirements for changeover as well as standardized chart requirements for patients scheduled for surgery. They introduced "ASAP" and "Rapid" instrument cleaning/ sterilization forms and set up a prototype Anesthesia red cart to standardize all carts. Then they conducted mock surgery room turnover exercises.

The 67 percent reduction in changeover time had an immediate effect on the medical staff. Instead of intruding on the way they practiced, surgeons and anesthesiologists experienced a methodology that reduced downtime and increased the number of procedures they could realistically complete. The team went on to roll out the accelerated surgery turnover process across all procedure types.

The Intake Accelerators Kaizen team streamlined the flow-through for pre-admission testing and intake. The team arranged the pre-admission testing office for improved efficiency. The team enhanced the signage directing patients to the surgery waiting room and standardized the process of directing patients there. Within the department, specialized teams were formed: Admission Team; IV Nurse; Recovery Team; and Endoscopy Team. As a result, the workload was spread more evenly. Visual signals were placed outside each of the rooms so that staff could identify the room status quickly.

In addition, the team implemented a formal protocol for communicating with physicians' offices about referrals for outpatient surgery. Two days prior to the scheduled procedure, surgery staff fax a checklist to the physician's office verifying the procedure and requesting clarifications or any missing information. The result of the Intake Accelerators kaizen event was enhanced communication, a

27.6% increase in capacity, and improved accuracy of the information forwarded to surgery.

The Procedure Kaizen team standardized roles of staff during the procedure itself. The charge nurse was assigned a cell phone and staff were issued pagers to provide instantaneous communication. A simulation room was created where staff formalized, rehearsed, and communicated roles for each step in the process. Surgeons were taught to issue a 10-minute warning to the circulating nurse to signal the next sequence of events. As a result of these interventions, there was a 15.5% time savings in orthopedic surgeries. In addition, the team was able to address patient safety by integrating prophylactic antibiotic use and "time out" as a hard-wired part of the procedure.

The Outpatient Surgery and PACU (Recovery) Kaizen team applied the Lean tool of 5S to the department to improve efficiency. 5S is an organizing methodology taken from five Japanese words: Seiri (Sort); Seiton (Store); Seiso (Shine); Seiketsu (Standardize); and Shitsuke (Sustain). The team established a point-of-use inventory of supplies available at the bedside. Wireless phones were assigned to team leaders and rooms were divided and teams assigned for Endoscopy, Admission, and Recovery. Standing Orders for anti-emetics were processed through the Surgery Committee and blood pressure cuffs were standardized through the entire process. Overall, the team reduced outpatient surgery cycle time and recovery release time by 50%, improving capacity in both areas.

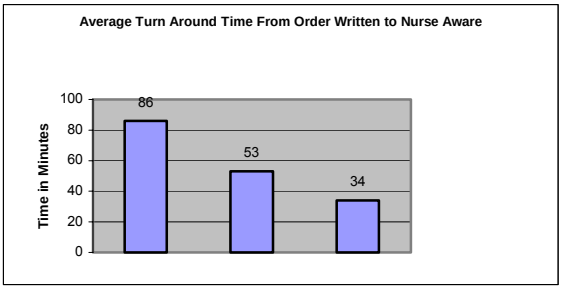
The four Surgery Kaizen teams evolved into longer-term Lean Sigma projects, each with its own charter but with leadership oversight to assure that inter-dependencies were recognized and considered in project resolution.

Nursing Unit Medication Delivery

Another Lean Sigma project improved medication delivery time, functionally defined as the time from written order to when the nurse is aware the medication is available on the unit. Working with pharmacy, the team centralized order entry and applied 5S and other Lean tools to standardize the process. For example, visual cues were added to the fax machines to avoid faxing orders to departments other than Pharmacy. In addition, the staff began faxing only original orders and discontinued use of multiple copy order forms. The order entry location was centralized in the Pharmacy and moved to a quiet location, with instructions that persons completing order entry were not to be disturbed. Additionally, the responsibility for order entry was reassigned to trained Pharmacy Technicians, freeing the Pharmacists. Order verification was moved from the nursing unit to Pharmacy and completed when the Pharmacist verifies the orders entered by the Pharmacy Tech.

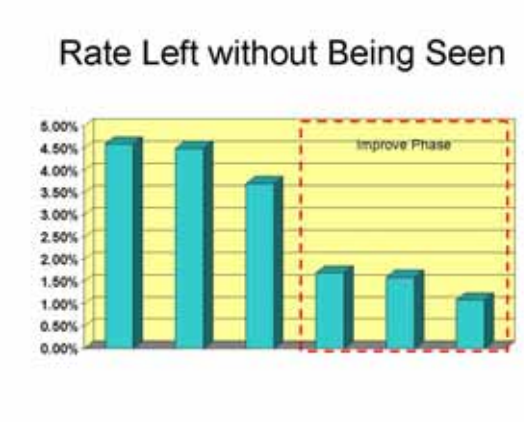
The team increased the capacity of the acu-dose dispensing system and added a supply tower for IV fluids. As with the surgery improvements, the team introduced a wireless communication system to notify nursing staff of the availability of medications on the unit.

As a result, the hospital reduced average medication delivery time by 60% and improved accuracy of the first dispensed dose from 93.6% to one error in 18,329 opportunities (5.37 Sigma). In addition, the increased IV maintenance resulted in an annualized charge recovery of $203,000.



Emergency Department

A third project area addressed the Emergency Department (ED) length of stay. In addition to 5S, the team standardized the registration and triage processes, specified roles for the staff, revised acuity level assignment, and implemented triggers to accelerate patient flow. When the patient enters the Emergency Department, a quick registration is completed with a 5-Data Elements Form, a temporary ID bracelet is given, and the patient is triaged. Full registration can be completed by the Registrar at the bedside (triage room or treatment room). If the patient is not in a room and one is available, the Registrar will take the patient to the room. The Registrar labels and assembles the chart once registration is complete. In the end, lengths of stay in the ED were reduced, by acuity level, between 26% and 38%. In addition, the rate of patients who left the ED without being seen decreased by 75.6%, increasing patient satisfaction. An annualized increase in revenue was projected to be over $800,000.



Conclusions and General Results

Columbus Regional is continuing to deploy Lean Sigma throughout the hospital. Electing full deployment has allowed CRH to add projects that supplement the improvements seen in the original projects selected. For example, in the Emergency Department, patient lengths of stay in the ED are being further lessened by three additional Lean Sigma projects ongoing in collaboration with other parts of the hospital: improving radiology throughput; reducing the time required for an inpatient service to receive an ED transfer; and decreasing the time necessary to discharge a patient from an inpatient nursing unit.

Other chartered Lean Sigma projects in the hospital include centralized scheduling, meal tray processing, laboratory requisition/reconciliation, and a birthing pre-assessment visit.

The key to deployment success is multi-factorial. Leadership was actively engaged in promoting the program, selecting the right people to be trained, and selecting the right projects. Project selection was driven by organizational imperatives: financial, clinical, and operational. Champions are held accountable for the pace and outcomes of projects and are charged with removing any organizational impediments. Another factor has been the early successes. At the start of the deployment, projects were selected and resources applied to get "quick hits," improvements that were quickly apparent to everyone in the organization.

In the first years of Lean Sigma integration, the hospital has realized both a financial and cultural return on investment. Staff no longer accept inefficiency and waste as inevitable and are engaged in their elimination. There is better communication across the hospital and a shared vision of its future. It can seem overwhelming, but Columbus Regional's aim is to be an exemplary hospital. To be exemplary requires hard work from many people. In the case of Columbus Regional, a hospital-wide deployment of both Lean and Six Sigma was the better strategy. A hospital-wide deployment helped communicate the commitment of hospital leadership and build team-work focused on improvement.

References

1. Wedgwood, I. D. (2006). *Lean Sigma: A Practitioner's Guide.* Upper Saddle River, NJ: Prentice-Hall.
2. Zinkgraf, S. A. (2006). Six *Sigma: the First 90 Days*. Upper Saddle River, NJ: Prentice-Hall.

Biographical Sketch

Drs. Johnson, Allen, and Wedgwood are affiliated with Sigma Breakthrough Technologies, Inc. (SBTI), a performance improvement professional services organization in San Marcos, Texas.

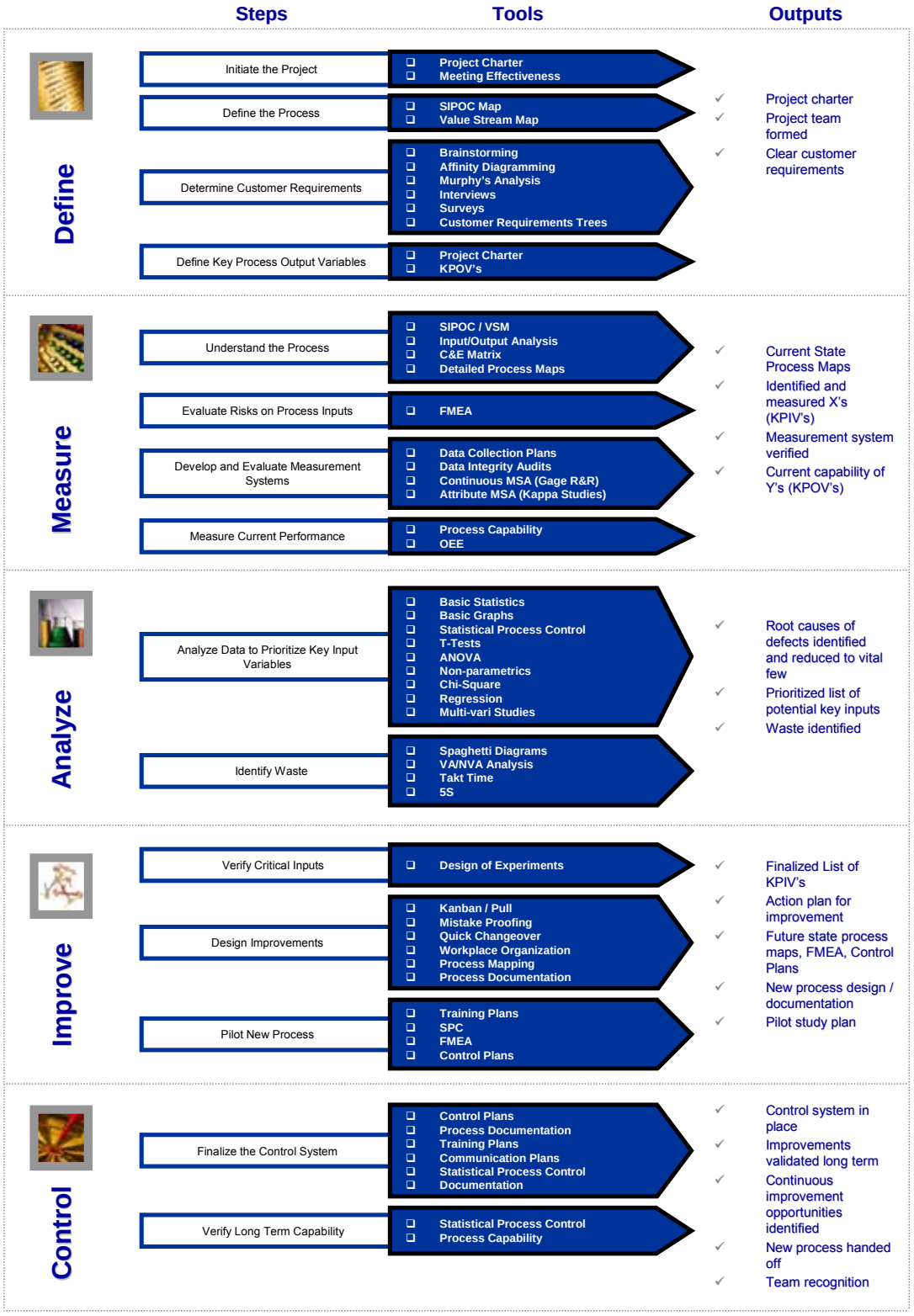
Dr. Charles Johnson is a retired associate professor from Texas State University. He is the creator of the Texas State graduate program in Health Services Research – a curriculum that is focused on statistical process improvement and the introduction of management science tools, such as Six Sigma and Lean to healthcare. Dr. Johnson designed this innovative graduate program in 1980, and has been a long-time supporter of industrial engineering tools in the improvement of healthcare. He is now Vice President for Curriculum Development for SBTI.

Dr. Rick Allen is Health Care Program Manager for SBTI. He has been Vice President of Accreditation and Outcomes Management for Harris Methodist Health System headquartered in Forth Worth, Texas as well as Director of Quality Improvement for Mental Health Network, Inc. in Austin, Texas. Dr. Allen holds a Doctor of Public Health degree and is a Six Sigma Black Belt as well as a Certified Professional in Healthcare Quality.

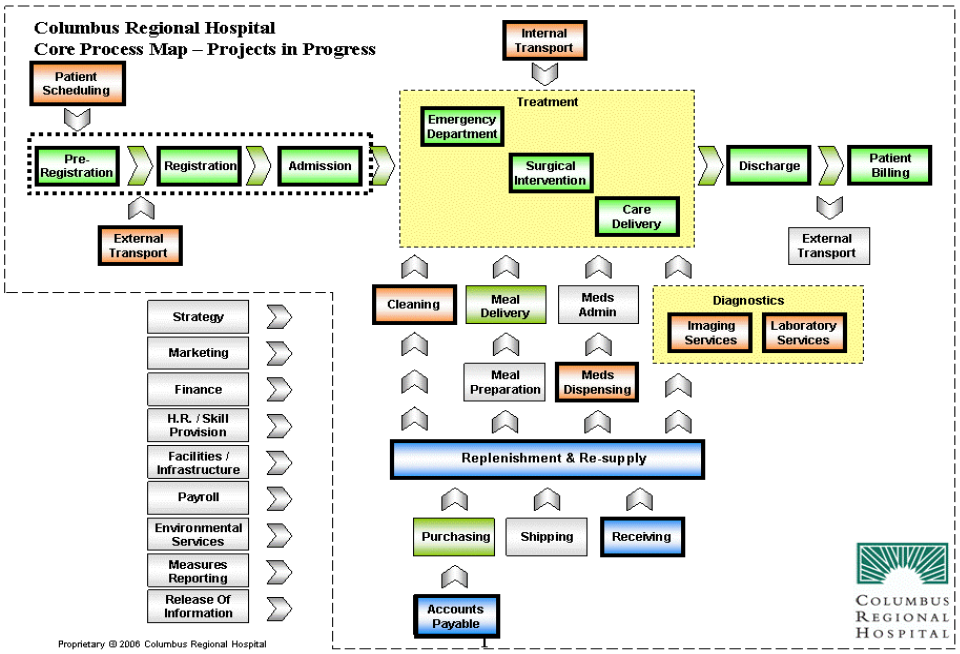
Dr. Tom Sonderman is the Vice President and Chief Medical Officer at Columbus Regional Hospital in Columbus, Indiana. Dr. Sonderman received his medical degree from the Indiana University School of Medicine. He is a Fellow of the American College of Emergency Physicians, a Diplomate in the American Board of Emergency Physicians, and Certified in Medical Management. In addition to his duties as Chief Medical Officer, Dr. Sonderman is an attending emergency physician.

Dr. Ian Wedgwood is Healthcare Executive Director for SBTI, responsible for working with clients, consultants, and home-office staff to ensure client success and continued business development. Dr. Wedgwood has led a number of deployments in industries ad diverse as electronics, engineered materials, medical devices, chemicals, and health care, and has trained and mentored numerous Executives, Champions, and Belts in DFSS, Six Sigma, and Lean. Dr. Wedgwood has a strong product development background and co-developed SBTI's Lean Design, Lean Sigma, and Healthcare methodologies and curricula. He holds a Ph.D., and a first-class honors degree, in applied mathematics from Scotland's St. Andrew's University.

Attachment 1
DMAIC Roadmap – Lean & Six Sigma Tools



Attachment 2
Hospital-Wide Core Process Map



Attachment 3