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**Successful Implementation of Lean and
Development of a Continuous Improvement Culture
at Valley Health/Page Memorial Hospital a 25-Bed
Critical Access Hospital**

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Summary

The implementation of Lean at Valley Health/Page Memorial Hospital (PMH), a 25-bed Critical Access Hospital in Luray, Virginia has progressed very efficiently and effectively, particularly in the development of the continuous improvement culture that is the hallmark of all true Lean organizations. Developing this culture requires "winning one heart and soul at a time", and the success in this small regional hospital offers many important insights into the issues that must be addressed by any organization undertaking this important change. From the standpoint of Lean Implementation, this organization provides an important "learning laboratory" on the systems, processes and approach that can work effectively for any organization striving to develop a continuous improvement culture.

The key elements in PMH's ability to rapidly implement and sustain an effective process improvement culture are:

- The existing sense of mission and friendly culture of this small regional organization
- The active engagement and support of leadership
- The selection, training and certification of highly capable Lean Facilitators from within the organization
- The hands-on mastery and effective utilization of proven Lean tools
- Engaging all employees in process improvement activities
- Focusing key process improvement activities on mission-critical issues
- Learning from every project



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PMH continues to expand and enhance its Lean Process Improvement activities. With the future development and implementation of the PMH Annual Planning Process, all of the elements will be in place that should enable the organization to sustain a culture in which every person is engaged in process improvement every day.

Page Memorial Hospital Facilities and Services

Valley Health/Page Memorial Hospital (PMH) is a 25-bed, licensed Critical Access Hospital located in Luray, Virginia (population 4,895). PMH has been an integral part of the community in Page County and the surrounding area since its founding in 1925. With a staff of 195, PMH is one of the largest employers in Page County.

Like all community hospitals, PMH provides nearby, convenient care to local residents but is challenged by the costs of new technology investment, facilities, and staff that are required to meet regional healthcare needs. To continue to support local needs effectively while having access to stronger financial resources and healthcare capabilities, PMH became an affiliate of Valley Health, Winchester, Virginia, in 2009.

Valley Health offers the broadest range of health services in a 4,000 square mile area of northwest Virginia, the West Virginia panhandle, and portions of Maryland. The organization focuses on providing the best care as close as possible to where people live. Valley Health has a combined 594 licensed inpatient beds and 166 long-term care beds. The system is supported by more than 5,300 employees, and a medical staff of over 500. PMH is one of six Valley Health hospitals and a component of a network of facilities and services designed to meet the needs of this regional population.

PMH's local facilities and services include an Emergency Department staffed 24/7 and serving approximately 14,000 patients per year; Cardiopulmonary Rehabilitation; Diabetes Management; Medical/Surgical; Infusion Therapy; Pharmacy; Laboratory; Radiology/Medical Imaging; Rehabilitation Services; Respiratory Therapy; Same-Day Surgical Procedures; Transitional Care; Telemedicine; and Wellness and Fitness Services.

In addition to its main campus, PMH operates satellite offices throughout the county to make healthcare more accessible to its residents. Services include preventive health maintenance, physical and sport examinations, specialty services, as well as diagnosis and treatment of acute and chronic health problems.

Lean Implementation History at PMH

Valley Health began its Lean Process Improvement effort by training over 250 Managers and Directors in Lean and then selecting 20 of those participants to enter the Lean Facilitator



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Training and Certification program. Two of the twenty Lean Facilitator candidates were members of the PMH team, which provided a foundation for the subsequent Lean activities described in this paper.

The initial Lean training for Managers and Directors consisted of a one-day Introduction to Lean course which relies on a simulation to provide hands-on, practical learning; a one-day Introduction to A3 Problem Solving; completion of a project on a problem in the participant's work area; and a Problem Solving Review session, where several projects were reviewed with co-participants and Lean instructors. The Problem Solving projects and Review sessions provided each organization with the opportunity to begin a sophisticated implementation of A3 Problem Solving immediately after the initial training.

The Lean Facilitator Training and Certification program began with a class in "How to be a Lean Facilitator" and then involved the candidates in hands-on projects that exercised the two key analysis tools, the Value Stream Analysis Process and the A3 Problem Solving Process. Valley Health employs the Value Stream Analysis Process (VSAP), which is based on the methodology developed by Toyota when it began the Toyota Supplier Support Center (TSSC) in Kentucky in the early 1990's. This method is distinct from the "Rapid Improvement Event", or "RIE", used by many organizations because the VSAP focuses equally on transferring skills and knowledge to the workforce and on making process improvements. The output of a VSAP is an Implementation Plan that lays out the path for improvement for up to twelve to twenty-four months into the future. While many immediate improvements are made during the event itself, it is the steady work on improvement coordinated by the overarching blueprints developed in the VSAP and the engagement of the team over an extended period that are the foundation of long term sustainability.

The most essential ingredient in the success of a VSAP is having all the right people involved, and having them work together as a team. Many issues in healthcare require the participation of physicians and executives, but the fundamental operational issues in any process can only be improved if the people actually engaged in the day-to-day work are full participants. This may mean that individuals from the hospital transport team or from Environmental Services that clean the rooms, or who wash Operating Room instruments must be brought into the process and be fully engaged otherwise essential issues will be overlooked. The leadership paradigm that Valley Health Lean Facilitators use is based on a former Chairman of Toyota's model of "Go See; Ask Why; Show Respect." It is essential to see the process of the hands-on, day-to-day participants before true, sustainable process improvement can occur, and one of the key skills that Valley Health Lean Facilitators are taught is that a VSAP or Problem Solving Team is only fully productive when each and every member is participating fully and openly in all activities. It sometimes requires artful facilitation to have Environmental Services and transporters feel



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comfortable making recommendations with physicians or executives present, but this is essential to robust process improvement.

Figure 1 below is a picture of a PMH team engaged in a VSAP. In small, community-based organizations like PMH, a strong sense of the mission of serving the community permeates the organization. This friendly and mission-focused culture is the main reason that Lean can take hold in an organization like PMH so quickly, but even then, only if it is embraced and supported by the leadership team.



Figure 1. PMH Team Engaged in a VSAP

Even with a positive culture of support for Lean and with the small size of the organization, Lean Facilitators often have significant challenges to enable people from different parts of the organization to work seamlessly together. The integration of each team member's individual view of an overall process into one, integrated, commonly accepted picture of the entire process is the first essential step in improving an entire value stream.

Problem Solving

Valley Health Lean Facilitators are trained in the A3 Problem Solving Methodology described in “Understanding A3 Thinking: A Critical Component of Toyota’s PDCA Management System” by Art Smalley and Durward Sobek. This methodology requires a precise statement of the problem, rigorous analysis to find the root cause, development and implementation of a plan to correct the root cause of the problem, and then follow-up and readjustment if data shows that the problem has not been fully addressed.



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The A3 Problem Solving methodology follows Toyota's approach of reducing the entire problem solving to one page for analysis, communication and reporting purposes, working in pencil to accommodate the iterative nature of Plan-Do-Check-Act (PDCA), and to focus on solving the problem, not on making attractive visual presentations.

Figure 2 below is a typical A3 Problem Solving analysis sheet:

ValleyHealth Problem Solving A3

Date: February 2013 Title: ED Pain Reassessment

Problem Statement
Pain not re-assessed one hour after intervention in approx. 75% of patients vs. a goal of 95% of patients pain to be re-assessed in one hour to include pain scale and vital signs.

Background
According to TJC + ENA Standards of Care, all patients receiving an intervention for pain management should be re-assessed within one hour to include pain scale + vital sign documentation. In the ED, after reviewing two months of previous data it was discovered that 25% of pts. do not have documented reassessment after intervention. This leads to inadequate pain management and decreased patient satisfaction.

Current Condition

Target Condition

Countermeasures
Red/Green status flags to be mounted at each patient room door with an adjacent White Board. After pain intervention - nurse will open red status flag and document reassessment time on white board. This will provide a visual prompt to all ED staff members.

Action Plan

What	Who	When
• Purchase Status flags	Pam Gray	2/21/13
• Purchase White Boards	Pam Gray	2/21/13
• Staff Education	Engineering	2/27/13
• Staff Education	Pam Gray	2/25/13
• Physician Education	Pam Gray	2/25/13
• Chart Audits	Tammy Leate Lynsey Boyd	Monthly Ongoing

Follow Up
30 monthly random chart audits to be completed for verification of pain re-assessment and proper documentation beginning March 2013

Plan	Actual
99.5% after 9 months - Goal of 95% met	96.7%
Team to meet to initiate PDCA cycle for improvement opportunities.	
	96.7%

Facilitator: _____ Operational Owner / Sponsor: _____

Figure 2. PMH Team Member A3

Facilitator Certification Process

Once candidates completed their instruction in the Roles and Responsibilities of a Lean Facilitator, they participated in a VSAP led by experienced Lean consultants. The candidates worked directly with Lean systems, processes, tools and techniques, and observed how they were used by an experienced Lean Facilitator. Lean Facilitator Candidates then co-led a VSAP with a fellow Lean Facilitator Candidate under the observation and coaching of experienced Lean practitioners, followed by a written examination and an oral board examination conducted by experienced Lean consultants, including a former Toyota Vice President and Chairman of the Shingo Prize Board of Governors. This method of certification provides dual benefits, as the



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VSAP's are producing process improvements at the same time that Lean Facilitator Candidates are mastering the skills that will help sustain the effort for the long-term.

Selecting Lean Facilitator Candidates from within the existing organization ensures that the individuals selected have substantial healthcare credentials and experience, are already respected members of the organization, and have demonstrated their interest in and capability for process improvement work during the training program.

Beginning the Process Improvement Effort at PMH

The initial VSAP at PMH that was used to train Lean Facilitator Candidates involved medication reconciliation, where participants from nursing, pharmacy, quality and other support services worked together in a three-day event to map the current state, identify improvement opportunities, visualize an improved future state, and develop an Implementation Plan. Coaching sessions were provided to the Lean Facilitator Candidates at the end of each day's work to help candidates develop the skills and knowledge to lead future events. This particular VSAP provided an excellent opportunity to address the challenges so widespread in healthcare of inter-department collaboration, and required the team to work through some challenging crossdepartment interactions to arrive at impactful, integrated process improvement solutions.

The Current and Future States of this process are illustrated in Figures 3 and 4 below.

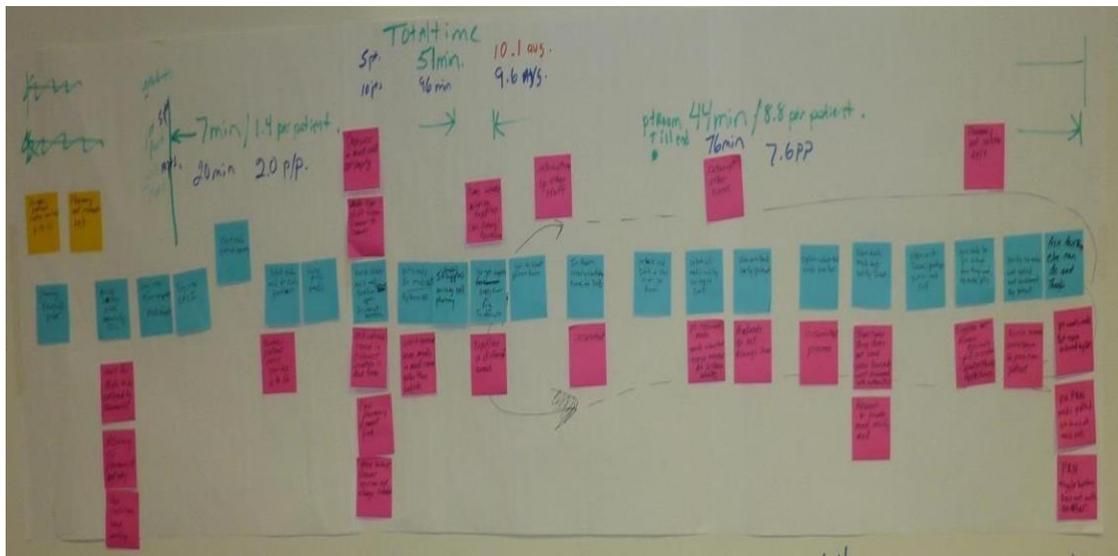


Figure 3. PMH VSAP Current State



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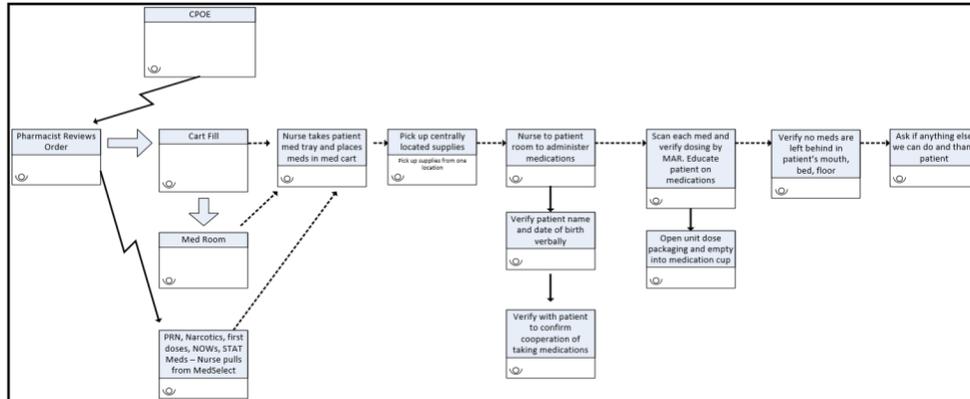


Figure 4. PMH VSAP Future State

This VSAP accomplished two key objectives simultaneously – it furthered the training and certification of PMH’s Lean Facilitator Candidates and it achieved the following performance improvements in Medication Reconciliation:

Metric	Baseline Data	Data Post Transformation Plan	% Improvement
Reduce average nurse time for pulling medications from medication room at 10am by 10%	Average 1.7 min/patient	Average 1.5 min/patient	13%
Reduce number of National Drug Code warnings by 50%	Average 22 scanned warnings/day	Average 2.8 scanned warnings/day	87%

Table 1. PMH VSAP Improvements

Ongoing Process Improvement Efforts at PMH

PMH has conducted over 40 process improvement projects in two years since introducing Lean at PMH. All department leaders of the PMH organization are comfortable with the A3 Methodology and the PDCA Cycle, and new projects are undertaken by Problem Solving Teams on a regular basis. In 2013 all PMH managers were trained in A3 Problem Solving. PMH inculcated the Lean philosophy into the culture by requesting all departments (intradepartmental) perform an A3 during the first six months of the year. For the second six months of the year, the departments worked with another department (inter-departmental) to improve processes using



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A3 problem solving. All A3s were presented by the project team to the hospital Performance Improvement Committee. The A3 improvement results were communicated to the PMH Board of Directors who supports Lean efforts. Table 2 below summarizes a few of the projects undertaken in 2013 with the improvements achieved.

Project	Improvement
Patient Transfer from the Emergency Department unit to Med/Surg unit	Transfer in <30 minutes of time of admission with 100% hand-off communication
Lab Re-work of Referral Specimens	> 80% of specimens accepted by lab vs. < 25%. Goal is 100%
Hospital Acquired Wound Infections	Achieved goal of 0 in 2013 vs. 3 in 2012
Radiology Supply Storage	85% of supplies in one location vs. <50% baseline
Med Surg Utilization of “Ask Me Three” to assist in managing patient health	47% positive Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) score for question ‘understood managing of health’ vs. 30.6% baseline
Respiratory Pulmonary Function Test (PFT) Reports –	100% of PFT reports are available at physician’s office when needed vs. 25% baseline
Emergency Department – Patient Pain Reassessment	Pain is reassessed in 83% of patients within one hour after an intervention vs. 77% baseline
Emergency Department (ED) Flow	96% of patients have an ED arrival to discharge length of stay (LOS) of < 155 minutes vs. 94% baseline
Beer’s Criteria with High Risk for Fall Patients	100% of non-compliant high risk falls patients are evaluated using Beer’s Criteria vs. 0%
Operating Room (OR) Charging	99% of OR charges are captured vs. 72% baseline
Annual Rural Healthcare (RHC) Evaluation	37 pages of paper reduced from 1,248 pages of paper printed for annual review which are then thrown away
Wasted Motion in Materials Management Department	Reduced 75 feet and 20 seconds round trip to 2 feet and 3 seconds
Primary Care Office Inventory	100% inventory system developed with par levels to reduce overstock

Table 2. Sample of 2013 PMH A3 Lean Improvement Projects

Use of Lean to Plan Operations in a New Facility

One of the most powerful uses of Lean Process Improvement methods at PMH has been the use of the tools to layout and organize operations in the new facility the organization is moving into in the Spring of 2014. The current infusion therapy service requires patients to stop at several locations prior to walking to the infusion center without directions. Prior to the patient coming to the hospital for infusion, there is much communication between departments in preparation for the infusion. At times the communication is not received creating delays for the patient. Additionally, the patient may require laboratory testing immediately prior to infusion adding more wait time for the patient. A VSAP was organized to improve patient and process flow utilizing the new hospital floor plan. To best illustrate the current and future state patient and communication flow, spaghetti diagrams were utilized.

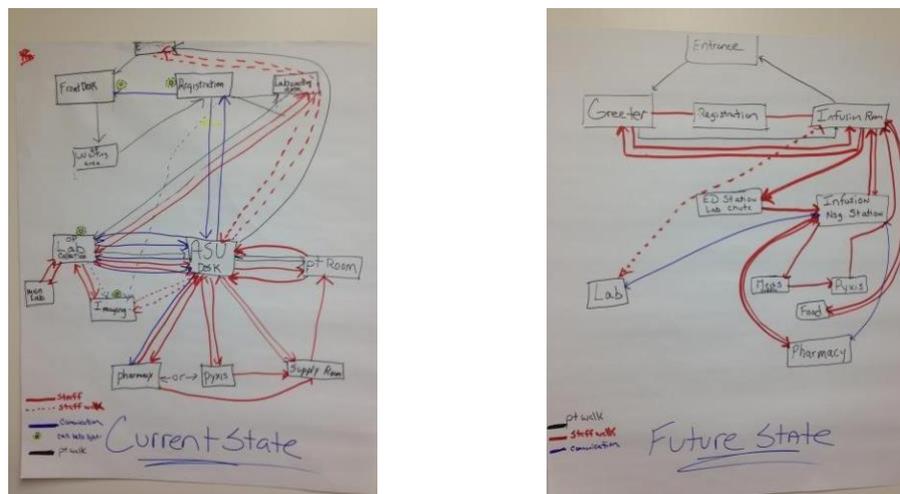


Figure 5. Spaghetti Diagrams of New Hospital Infusion Patient Flow

The new hospital floor plan will permit the patient to walk into the hospital and within 15 steps be directed to the infusion room immediately beyond the entrance. The registration staff will register the patient in the infusion room and the nurse will begin patient preparation including specimen collection for laboratory testing. The patient will no longer wait in queue at registration or at the laboratory for specimen collection prior to walking to the infusion center. The new information system will provide needed information to departments in advance of the scheduled patient infusion as well as notify departments of patient arrival; thus improving communication and reducing wait times for the patient.

Metric	Current State	Future State Target
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Number of patient steps taken from front door to infusion room	447 steps	50% reduction
Number of staff steps taken to provide service	403 steps	50% reduction
Percentage of times patient with staff escort	0% escort	75% improvement

Table 3. New Hospital Infusion Center Target Improvements

Leadership Engagement

All successful, sustaining implementations of Lean Process Improvement engage front-line employees and are effectively supported by the leadership team. Plans are underway at PMH to train frontline staff on A3 Problem Solving. In the first three months of 2014, fifteen frontline staff personnel including a physician were trained in A3 Problem Solving. The culture at PMH has long embraced “walk around leadership,” and teams are accustomed to having leaders observing ongoing activities. Specific leadership actions that support Lean include informal questioning on posted A3 Problem Solving activities; active participation in VSAP’s, and making structured Lean Management rounds to learn from and support ongoing process improvement activities throughout the organization.

Conclusion

In the best organizations, every employee is engaged in process improvement in their work area every day, with the whole coordinated by an effective Annual Planning Process and supported by active engagement from the leadership team. This is the ultimate definition of a Lean organization.

Page Memorial (PMH) in Luray, Virginia is well advanced in achieving these objectives less than two years after beginning its Lean journey. The supportive culture of a small, regional healthcare organization is an important element in this efficient and effective adoption of Lean, but the steps in the process are the same for any organization. Organizations attempting to develop a sustainable Lean culture can benefit greatly from the lessons learned at PMH.