Lean Hospitals: Healthcare Administrators v. Manufacturing Managers to the Rescue

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Abstract—The besieged state of the U.S. healthcare system has received much attention and for good reason; escalating costs exceeding inflation, medical procedures fraught with errors and quality of care in many segments at substandard levels are just a few of the challenges pressing leaders to seek unconventional remedies. It is as if Rube Goldberg created the operations benchmark by which healthcare organizations have strived to emulate. Recent practice suggests healthcare organizations are turning to engineering and manufacturing professionals to implement “lean” within their facilities due to their content expertise. However, industrial experts lack formal knowledge of the healthcare sector in order to be fully embraced by its community. This manuscript examines the cornerstones of “lean” practice and discusses implications for healthcare leadership. The paper concludes by offering a solution sponsored by Ferris State University’s College of Health Professions to provide an academic minor in Lean Healthcare that prepares healthcare systems administration baccalaureate students to be the next generation of lean experts.

Keywords - lean, six sigma, health administration, manufacturing management, engineering operations, university, college, degree program, curriculum, minor

I. INTRODUCTION

Lean and healthcare are diverging topics in most circles of discussion. However, pressure is increasing on healthcare to be more cost efficient and quality conscious like their counterparts in the manufacturing sector. Lean principles are derived from the Japanese manufacturing industry. The term was first coined by John Krafick in his 1988 article, “Triumph of the Lean Production System,” based on his master’s thesis at the Massachusetts Institute of Technology (MIT) Sloan School of Management [1]. Krafick was a quality engineer in the Toyota-GM NUMMI joint venture in California before coming to MIT for MBA studies. Krafick’s research was continued by the International Motor Vehicle Program (IMVP) at MIT, which produced the international best-seller book co-authored by Jim Womack, Daniel Jones, and Daniel Roos called, The Machine That Changed The World [2].

Lean manufacturing principles, introduced by the Japanese automotive industry—namely the Toyota Production System (TPS)[3], are being applied successfully in manufacturing as well as service arenas. Although conceptually simple, it is not easy to define “Lean.” The core philosophy is to continually improve a process by removing non-value added steps or waste (Japanese: “Muda”). The original wastes were defined by Taiichi Ohno for a manufacturing environment and have been revised for the healthcare environment to illustrate healthcare examples, as shown in Table 1 [4].

<table>
<thead>
<tr>
<th>Transportation</th>
<th>Waste: Congregating workers on the floor of various departments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory</td>
<td>Waste: Excess stock in supply rooms.</td>
</tr>
<tr>
<td>Monena</td>
<td>Waste: Implementation of a pull system (KANBAN), resulting in just-in-time delivery.</td>
</tr>
<tr>
<td>Wastage</td>
<td>Waste: Unnecessary staff movement in order to accomplish tasks.</td>
</tr>
<tr>
<td>Waste</td>
<td>Waste: Patients and visitors backed up in emergency areas.</td>
</tr>
<tr>
<td>Overproduction</td>
<td>Waste: Ordering unnecessary procedures/meds.</td>
</tr>
<tr>
<td>Over-processing</td>
<td>Waste: Asking same patient information, multiple times.</td>
</tr>
<tr>
<td>Dilect</td>
<td>Waste: Excess inventory, surplus items.</td>
</tr>
<tr>
<td>Ceased Staff/Creativity</td>
<td>Waste: Longing, idle, and learning opportunities for new employees.</td>
</tr>
<tr>
<td>Lean</td>
<td>Waste: Implement standardized work.</td>
</tr>
<tr>
<td>Control</td>
<td>Waste: Activity and improvement projects, sustainable programs.</td>
</tr>
<tr>
<td>Creativity</td>
<td>Waste: Improving the process in order to achieve an efficiency.</td>
</tr>
</tbody>
</table>

Table 1 The Original Seven Wastes + One

Perhaps a more industry recognized manner of defining lean is through a five-step process [5] as outlined in Table 2. Utilizing lean tools, improvement ideas...

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are pursued and implemented in a systematic manner. Lean thinking drives out wastes so that performed work adds value and serves intended needs. In assessing improvement

1. Specify the value desired by the customer.
2. Identify the value stream for each product/service providing that value and challenge all of the waste steps.
3. Make the product flow continuously. Standardize processes around best practice allowing them to run more smoothly, freeing up time for creativity and innovation.
4. Introduce “pull” between all steps where continuous flow is impossible. Focus upon the demand from the customer and trigger events backwards through the value chain.
5. Manage towards perfection so that non-value adding activity will be removed from the value chain so that number of steps, amount of time and information needed to serve the customer continually falls.

Table 2 The Five Lean Principles

opportunities, it should be noticed that problems might result from people doing their job incorrectly or from incorrect work procedures. Lean methods are relatively low cost tools that help organizations reduce costs, increase quality, and enhance timely delivery of services [6]. By reducing or eliminating waste, lean focuses on value-added activities as perceived by customers. Therefore, lean aims to improve care by eliminating waste activities that undermine efficient treatments. Moreover, lean enhances the quality of care by reducing delays and waiting for care, and by speeding up processes such as delivery of tests/therapies to the patient. While these efforts may lead to cost savings, profit must not be the motivating factor in healthcare; efforts should be oriented toward improving the quality of care [7].

As Radnor et al. [8] so succinctly stated, “Lean as a management practice is based on the philosophy of continuously improving processes by either increasing customer value or reducing non-value adding activities (muda), process variation (muri), and poor work conditions (muri).” Radnor et al distinguished three aspects of the lean activities: assessment, improvement, and performance monitoring. Assessment activities which include reviewing the performance of existing organizational processes in terms of their waste, flow or capacity to add value, such as “waste walks” or more formal process/value stream mapping exercises. Improvement activities to support and improve processes, e.g. Rapid Improvement Events (RIE’s, also referred to as “Kaizen Event” or “Kaikaku Events”) which are held over 3-5 days and involve interdisciplinary staff evaluating, developing and redesigning processes through forms of problem solving or housekeeping tools, such as “SS” (which comprises of Sorting, Setting Order, Sweeping, Standardizing and Sustaining). Finally, monitoring to measure the processes and improvements made, which include visual management tools that feature highly visible information on process flows, standard operating procedures (SOP’s), and performance metrics.

II. LITERATURE

Over the last two decades, there has been a rapid increase in the implementation of lean in healthcare. In a recent literature search narrowly defined on the use of process improvement methods/practices in the public sector, 56% of publications focused on lean and 38% of the total articles focused on lean in healthcare. Indeed, lean in healthcare appears to have become widespread, especially in the U.S., UK and Australia [9]. Where lean is being practiced, tangible benefits have been reported such as reduction of processing or waiting time, increase in quality through a reduction in errors, a reduction in costs [10], alongside intangibles such as increased employee motivation and satisfaction, and increased customer satisfaction [11]. Chang et al. [12] showed that quality and efficiency can be improved simultaneously in hospitals. However, it is also important to note that many of these implementations have been confined to a single process or ward rather than a complete patient system which limits the scope of lean to improve healthcare processes [8]. Bliss [13] suggests that Lean is one of those “easy to say, hard to do” things. Lean can help root out waste and increase quality and patient safety, but will take concerted and collaborative effort to pull it off [14]. Waring and Bishop [15] argue that lean might not be the easy remedy for making both efficiency and effectiveness improvements in healthcare, citing three dimensions of social practice: rhetoric, ritual and resistance. True, healthcare staffs in many U.S.-based organizations have been slow to accept lean practices citing what may work for manufacturing should not be applied to healthcare, a human-based enterprise. Employees have been quick to add that, we are not manufacturing automobiles here, but rather, providing medical care.

III. LEAN HEALTH APPLICATIONS

Lean has been embraced across public services, including healthcare, central government and local government organizations [16]. From an historical perspective, lean first appeared in the UK health service in 2001 and in the U.S. in 2002. Al-Araidah et al. [7] investigations showed significant accomplishments have been reported in healthcare environments worldwide using lean process tools. Van lent et al. [17] applied a lean thinking approach for a hospital-based chemotherapy day unit. The method improved process design and led to increased efficiency and more timely delivery of care. Bisgaard and Does [18] provided an example of the
application of lean six sigma to healthcare. They investigated reducing the length of stay of patients with chronic obstructive pulmonary disease. Obtained results illustrate the possibilities of improving quality while at the same time reducing costs. Dickson et al. [19] used lean manufacturing techniques in the emergency department (ED) in an effort to enhance patient and staff satisfaction. The implementation followed a six-step process of lean education, ED observation, patient flow analysis, process design, and new process testing. Results showed a slight decrease in length of stay and a significant increase in patient satisfaction without raising the cost per patient. Other studies focused on improving efficiency [20], developing and using quality indicators [21], and reducing medical errors [22].

However, Radnor [8] suggests considerable variability in the implementation of lean with differences in approach and scope. Implementing lean healthcare gives rise to numerous issues including creating islands of lean [23]. Balle and Regnier [24] suggest that the three years needed for a lean project to succeed is too long a period for services with vulnerable people and changing leadership. Human Resources difficulties can be considerable and opportunities for experimentation rare [25]. Caldwell et al. [26] suggest that only 50% of time saved in lean exercises is crystallized into money saved. Lodge and Bamford’s [27] study of patient database integration in an English National Health Service Trust emphasizes that without staff training and support, lean exercises fail. The wider the lean footprint, as Papadopoulos and Merali [28] argue, the longer the implementation time to build new networking arrangements. Information processing in lean healthcare is an under-researched issue, noting Fillingham’s [29] argument that only system-wide lean initiatives, including information systems, can succeed. Radnor and Walley [30], however, insist that whole system approaches to lean including rapid improvement events are both valid. Many healthcare organizations have sought the support of lean to improve their efficiency. Examples in the U.S. include Virginia Mason Medical Center, Thedacare, Inc., The Clearview Cancer Institute, Mayo Clinic Division of Cardiovascular Diseases, Mercy Medical Center-North Iowa and the University of Pittsburgh Medical Center. These and more examples and studies can be accessed through the URL’s of the American Society for Quality, U.S. national Library of Medicine (PubMed) and the Lean Enterprise Institute.

IV. IMPLICATIONS FOR PRACTICE
Spear [31], in his article, “Learning to Lean at Toyota,” talked about how leadership education and expectations are different at Toyota from those at most companies. Spear followed a U.S. manager through his training journey, which took him to a Japanese factory where he is indoctrinated into the ways of Toyota leadership. He learned to see how the work is done, how his role in leadership supports the work, and how real-time problem solving can be done at the workplace. In the U.S., most healthcare organizations are looking to manufacturing for lean experts. Many hospitals have actively pursued manufacturing engineers, operations engineers and industrial engineers with certification in lean due to a lack of expertise in healthcare professional ranks, namely graduates of healthcare administration programs. While engineering and operations transplants are eager to implement practices within the healthcare environment, they are meeting with mixed success. Much of the limited success can be attributed to social factors as it relates to organizational behavior. Simply stated, manufacturing and operations engineers are having difficulty being accepted by caregivers, especially when these so-called lean experts arrive into the organization armed with authority to right the ship when U.S. manufacturing in the last decade has experienced its own share of problems from a quality, profit, and operations perspective. Reinforcing this stance is the fallout of the automotive company bailouts and 2008 summons for the Big Three Chief Executive Officers to appear before the U.S. Congressional Hearings to explain operational inefficiencies resulting in bankruptcy. It is therefore understandable, the contempt healthcare providers would have for this wave of manufacturing professionals hired to improve operations in an environment they are unfamiliar with. Enter, Ferris State University’s College of Health Professions (FSU-CHP).

FSU-CHP has, for quite some time, been recognized as the leader in the State of Michigan for producing the most highly regarded baccalaureate graduates of healthcare systems administration (HCDSA) programming [32]. The curriculum has been continuously improved since its inception in 1972, led by passionate, dedicated faculty and a rotation of advisory board members linked directly to some of the most well respected healthcare organizations in the Midwest U.S. Total graduates number in the thousands. Until recently, lean content exposure has been limited to distinct lectures spread across several courses in the curriculum. While many public and private entities, including colleges and universities offer non-credit lean training, the FSU-CHP has embarked on a baccalaureate Minor in Lean Healthcare to meets the needs of healthcare organizations globally. This minor is a 19 semester credit collaboration between the FSU-College of Health Professions and the FSU-College of Business, Table 3. The attractiveness of the lean healthcare minor is to equip healthcare systems administration graduates with lean
knowledge in order to meet the needs of prospective employers. Employers will gain by hiring new administrators that will possess healthcare sector knowledge and lean content expertise such that they will be leading rapid improvement/kaizen events and will most likely be accepted by their healthcare colleagues more readily than their manufacturing/operations counterparts. The graduates gain by being able to immediately assume the role of continuous improvement champion and thereby, being a more attractive hire. Plans are already underway to develop and offer a credit-bearing lean healthcare certificate that may be offered fully online to meet the needs of currently employed healthcare providers.

Table 3  Lean Healthcare Minor

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGAT 492</td>
<td>LEAN SERVICE ENTERPRISE LEADERSHIP</td>
<td>3</td>
</tr>
<tr>
<td>MGAT 402</td>
<td>SIX SIGMA PROCESS MANAGEMENT OR LEAN ACCOUNTING</td>
<td>3</td>
</tr>
<tr>
<td>MGAT 412</td>
<td>LEAN CULTURE AND SKILLS DEVELOPMENT</td>
<td>3</td>
</tr>
<tr>
<td>HCSA 425</td>
<td>LEAN HEALTHCARE APPLICATIONS</td>
<td>3</td>
</tr>
<tr>
<td>HCSA 336</td>
<td>HEALTHCARE SUPERVISORY PRACTICES</td>
<td>4</td>
</tr>
<tr>
<td>MRS 209</td>
<td>QUALITY MANAGEMENT IN HEALTHCARE</td>
<td>3</td>
</tr>
</tbody>
</table>

**TOTAL CREDITS**  19

V. CONCLUSION

As we consider how lean can help transform the way healthcare is provided, lessons we have learned in other sectors of industry can be invaluable. The confluence of information over the last few years about medical errors, rising costs, the uninsured, and many others topics has raised the expectation that positive change is needed to ensure the availability of quality, affordable healthcare in the future. As has been discussed, many healthcare organizations have sought out methods such as lean and Six Sigma to address the issues. And as we have seen in the literature the answer is yes, but it won’t happen quickly and it won’t happen without changing the way we work together, the way we serve our patients, and the way we provide care.

As Bliss [12] points out, “healthcare is still changing from a craft industry (every patient is different and must be cared for differently) to more of a process industry (most things we do for patients are repeatable). Perhaps this may be better stated that healthcare is moving more to an evidence-based model and further reinforced by strict guidelines for reimbursement, requiring set codes and procedures in the delivery of patient care. While every patient is different, a high percentage of the things we do for one patient (register, diagnose, test, medicate, discharge) are done for nearly every patient. So with a mindset shift to looking at processes, which in the “lean world” termed value streams, we can focus on issues such as handoffs between care-givers and departments; communications; delays in treatment; and, unsatisfactory service. We can see that, though a service department is improving internally and a patient care department is improving internally, the two departments may not be working together to improve the overall service to each other. The first step is to be able to see it; the second step is to be able to see that something can be done about it; and the final step is to recognize the cultural barriers that may prevent the caregivers from creating a solution that can be sustained.

REFERENCES


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