



## Do you have the right tools in your toolbox?

### *Lean Planning in Healthcare*

Healthcare providers today are facing issues of expanded insurance coverage, financial incentives focused on patient outcomes, transformation of care delivery models, margin compression and at the same time industry wide consolidation. These pressures place a greater emphasis on doing more with less and maximizing every healthcare dollar invested in capital improvement projects which support the transition from volume to value. Many forward thinking providers are benefiting from lean planning, techniques and design tools that can expose waste in care delivery and create a safer, more efficient patient centered care environment. Healthcare executives are recognizing that the built environment is an essential component in the efficiency equation.



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## Key Lessons

- A lean culture driven by organizational leadership is essential for sustained success
- Plan on more time front loading the design process to define performance metrics of the future state. It will ultimately save time by avoiding rework.
- Utilize lean tools to make production preparation and process visible. Real innovation will result.
- Post occupancy evaluations may need 12 months to validate improvement results.
- Share successes with the broader team for cross pollination.

## Background

The concept of lean planning and design has its roots in the manufacturing process improvement system, which was developed in the 1950s by Taiichi Ohno with the Toyota Production System. These tools were adapted and refined into a statistical framework known as Six Sigma by Motorola and General Electric in the 1990s. Healthcare providers began utilizing these tools to improve the cost of service delivery, environment of care and patient loyalty.

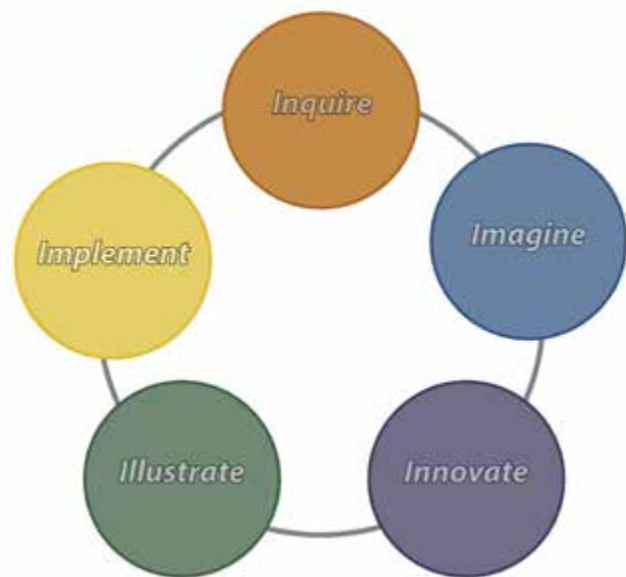
In the healthcare setting these process improvements positively affect people where waste can be found and eliminated in defects, duplication, waiting confusion, transportation, inventory and movement processing.

According to one reference, "The unnecessary processes and inefficiencies found throughout hospitals... are thought to be responsible for 30 to 60 percent of hospital costs."<sup>1</sup> The Affordable Care Act has also placed a renewed emphasis on elimination of waste through such policies as avoiding readmissions. As providers focus on performance improvement through elimination of "waste," a feedback loop can be realized, where increased efficiency leads to further measurable improvements we refer to as performance metrics.

## A Process and a Culture

Lean as a process is based on continuous improvement along with a respect for the people at the core of the work. Process improvement is not a short term fix but an ongoing organizational commitment to fundamentally transform the culture of care delivery by continually examining performance as a learning organization and improving what is "standard work."

Physical space can either support or be a barrier to clinicians as they engage and treat patients in either inpatient or outpatient care environments. This optimization of the environment of care begins with planners and clinicians understanding the current state, imaging an ideal future state, innovating to achieve desired outcomes, illustrating the plan to support improvement, implementing the plan and measuring performance, handling process change and cross pollinating results.



<sup>1</sup>The Advisory Board. *Use of Lean or Six Sigma in Facility Design Processes*. September 12, 2008

The early phases of this design phase is sometimes referred to as a 3P Process for production, preparation and process which occurs before designers begin programming and schematic design. Thus, more time needs to be budgeted to understand standard work flow and process which will enroll clinicians in creating a vision for the future state and saves time later in the process avoiding expensive rework.

Champions within the Healthcare Organization need to be identified to define the current state and define the measurable outcomes desired along with facilitating communications amongst the team. Complicated processes such as care delivery are best understood when they are visualized with the team defining the components that maybe efficient or wasteful.

### DMAIC and DMADV Processes

The Six Sigma methodology follows a series of phases referred to as the DMAIC process. To break down a wasteful condition, the problem is DEFINED, current state MEASURED, that data is ANALYZED, performance is IMPROVED, and the new state is CONTROLLED. This is generally implemented for a process already in place, wherein before and after states can be documented. The customer defines the goal for improvement, but generally a change of state on the magnitude of 25% or better is considered a success.

The DMADV process follows a similar method and structure. However, since no prior state exists, the final two steps include DESIGN by a project team, and conclude by VERIFYING that the

end condition meets the customer's intent.

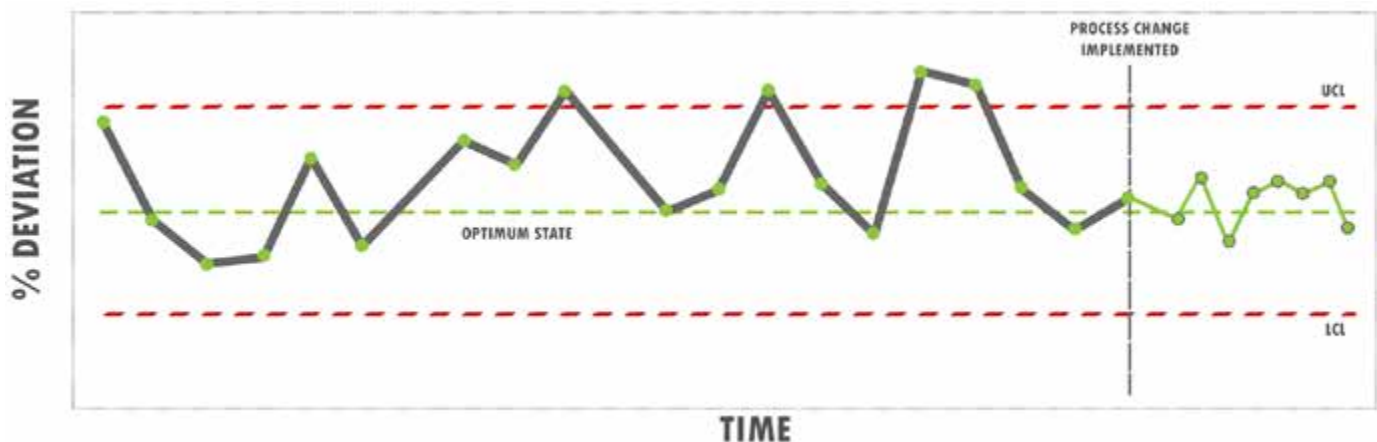
Since the basis underlying Six Sigma is the near-elimination of errors to within a controlled range, projects generally rely on extensive data collection and its translation into run charts for statistical analysis.

These are valuable, and in many cases, essential tools. When data is appropriately utilized, invisible processes reveal much information about how well a system is performing. However, in the particular instance charted below, six months worth of data collection was necessary to attain sufficient information for establishing the process state and its subsequent improvements.

### Tools and Strategies

In many instances, business practices evolve organically over time, with no thought given to highest efficiency or optimal staffing requirements. The Lean Six Sigma approach breaks down these processes and rethinks in terms of eliminating the various forms of waste. Complicated processes often need to be visualized to be comprehended, with participants defining the components that may be either efficient or wasteful.

Frequently, a project program establishes components that are intended to meet current needs, and often times, capacity for growth. However, initial assumptions can be incorrect, or needs are based upon inefficient utilization of existing resources. These tools can also expose opportunities for more efficient



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operation without the need for costly expansion of existing facilities. For example, a perceived need for additional surgical operating rooms might be easily addressed by scheduling longer hours of utilization.

In most healthcare settings, the patient (customer) spends the vast majority of his/her time waiting for the next step in a diagnostic or treatment process to occur. If patient flow is accelerated, satisfaction increases, and outcomes are improved, since opportunities for errors are reduced.

The following examples explain some of the tools that simplify understanding of process improvement targets so that a project meets the end user's goals. While a full Lean Six Sigma initiative can often entail months of deliberation and data collection, these tools were all utilized quickly during the beginning stages of a project to help improve communication and common understanding by all participants, including the design professionals.

## Examples

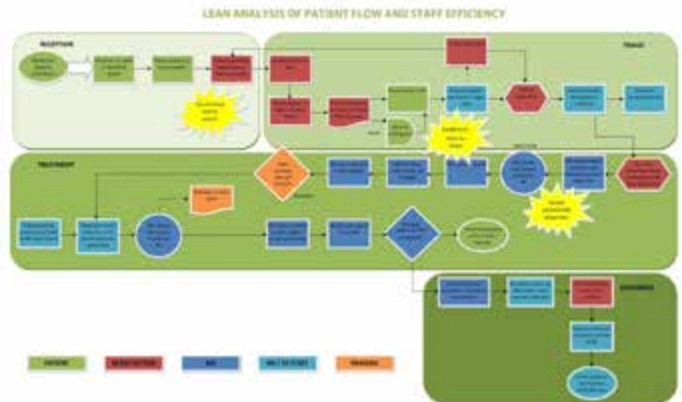
### Cause / Effect (Fukuda) Diagram

For this review of an internal process, an understanding of the causes for project errors and omissions was generated from a previous brainstorming session. A disparate collection of random ideas was organized into four general categories, and then a follow up review identified ways in which each of

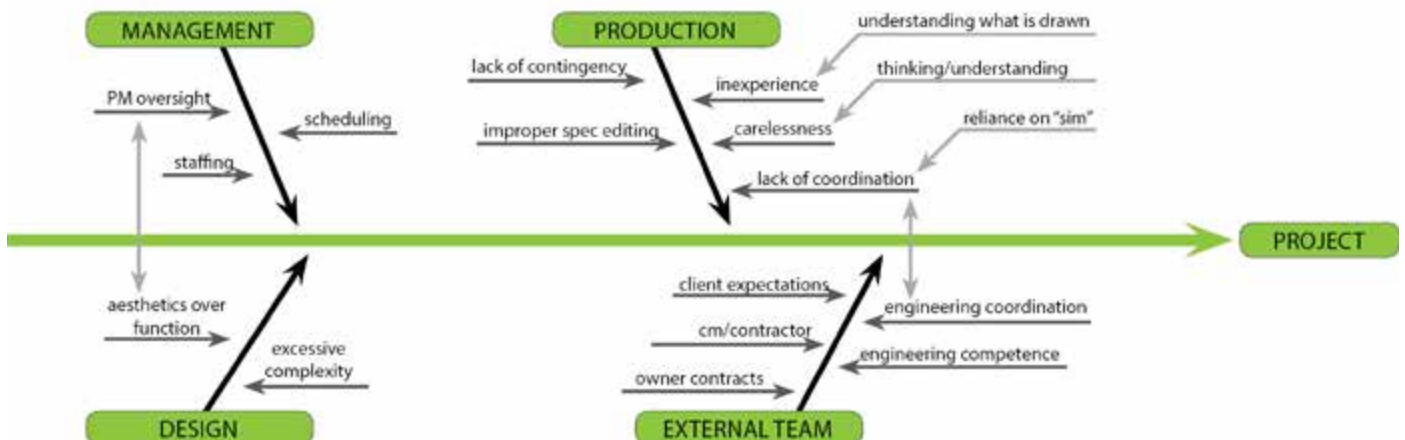
these "mistakes" could potentially be eliminated. In this way, a complicated topic is converted into a structured diagram, and primary sources of problems could be identified and targeted for further review.

### Value Stream Mapping

The flow of the patient and interactions with staff in an emergency department setting were diagrammed to identify where bottlenecks and delays have the potential to occur. These are indicated by the "bursts" in yellow above. Those areas can be refined into a diagram showing the future or idealized state, which then provides the basis for space planning.

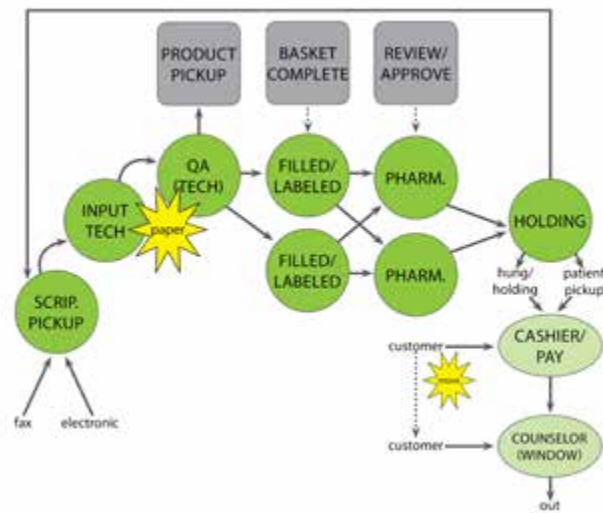


Another advantage to this type of tool is the ability to define in color the primary participants in each activity. Where these colors are not grouped, we would need to consider whether circulation, work flow, and handoffs are being most effectively utilized.



## Process Flow Analysis

In the Illustrate phase a discussion of programmatic requirements was followed by creation of a process flow diagram that identified the steps in filling a prescription for the customer. Once drawn, the “Voice of the Process” led to a realization that two staff work positions had been inadvertently excluded from the draft program.



In the same project as the previous example, a 3D model was quickly created in SketchUp. Views were manipulated so that staff could easily visualize the space before the design concept was approved, virtually eliminating the potential that costly changes would be necessary during construction.

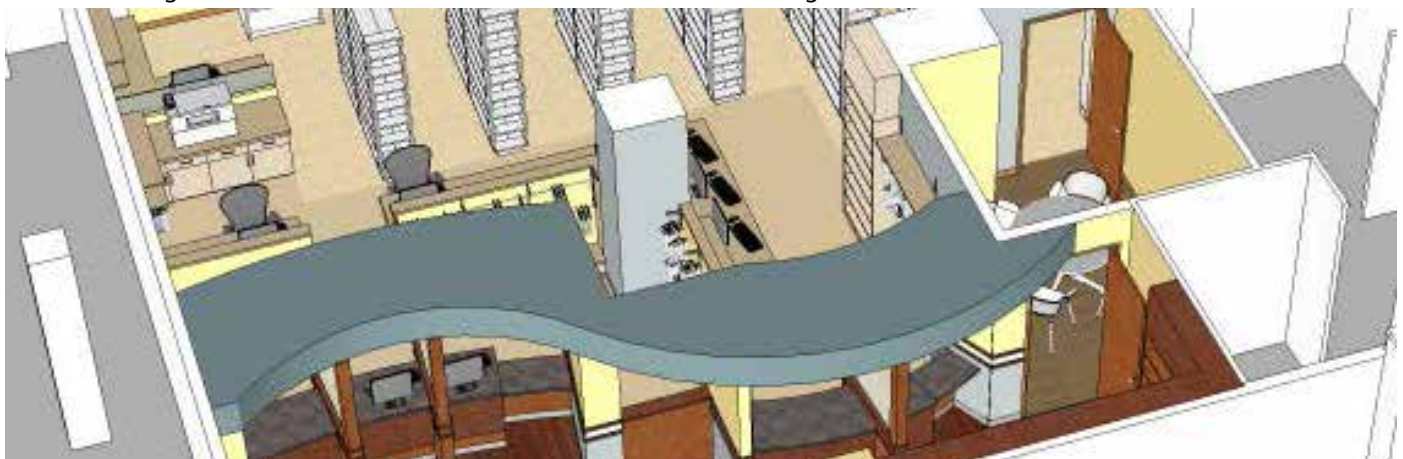
## Spaghetti Diagrams



## 3D Visualization

Often times, architects assume that the users of the project understand and can translate a two dimensional floor plan. This presents the possibility of miscommunication and dissatisfaction when the built result does not align with expectations. Undoubtedly, the most commonly used tools in architectural practice for lean-related applications are related to 3D modeling.

Another waste in healthcare is excessive walking. Therefore, it is critical when a construction project is undertaken that design does not “build in” unnecessary staff circulation. Visualization of travel distances and flow resulted in creation of a primary circulation spine through this cancer center resulting in patient travel distances being reduced by 16%. Just as important, the major circulation spines simplify wayfinding through the building.



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## Conclusion

The use of Lean and Six Sigma has been commonplace in manufacturing and the service industry for several years and is now prevalent in healthcare and construction sectors. Lean tools have been proven effective in delivering improved care with greater efficiency with enhanced patient experience. However, lean must be rooted in an organization's culture to be sustainable. Facility planners can change thinking, processes and practices, but management's commitment to continuous improvement will provide the platform for enduring progress.

However, these tools are only beginning to be implemented in architectural design to complement our clients' efforts to improve existing processes and work-flows, ensuring that more efficient, higher quality, and better patient experiences can be delivered.

## References / Related Links

Arthur, Jay (2011). [Lean Six Sigma for Hospitals: Simple Steps to Fast, Affordable, and Flawless Healthcare.](#)

Lean tools and templates at iSixSigma. [www.isixsigma.com](http://www.isixsigma.com)

Miller, Jessica, and Travis, Julia. "Use of Lean or Six Sigma in Facility Design Processes." The Advisory Board Company, 12 Sept. 2008. Web. 9 Apr. 2014. [www.advisory.com/Research/Marketing-and-Planning-Leadership-Council/Original-Inquiry/2008/09/Use-of-Lean-or-Six-Sigma-in-Facility-Design-Processes](http://www.advisory.com/Research/Marketing-and-Planning-Leadership-Council/Original-Inquiry/2008/09/Use-of-Lean-or-Six-Sigma-in-Facility-Design-Processes)



Above: Existing Pharmacy  
Right: Renovated Pharmacy utilizing Lean concepts



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