

Streamlining Inpatient Pharmacy Operations: The Lean Six Sigma Approach

A presentation for HealthTrust members
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Learning Objectives

1. Recall Lean Six Sigma Principles for process improvement
2. Recognize strategies for using Lean Six Sigma methodology in a pharmacy operations project
3. Identify potential solutions to address common challenges in pharmacy operations

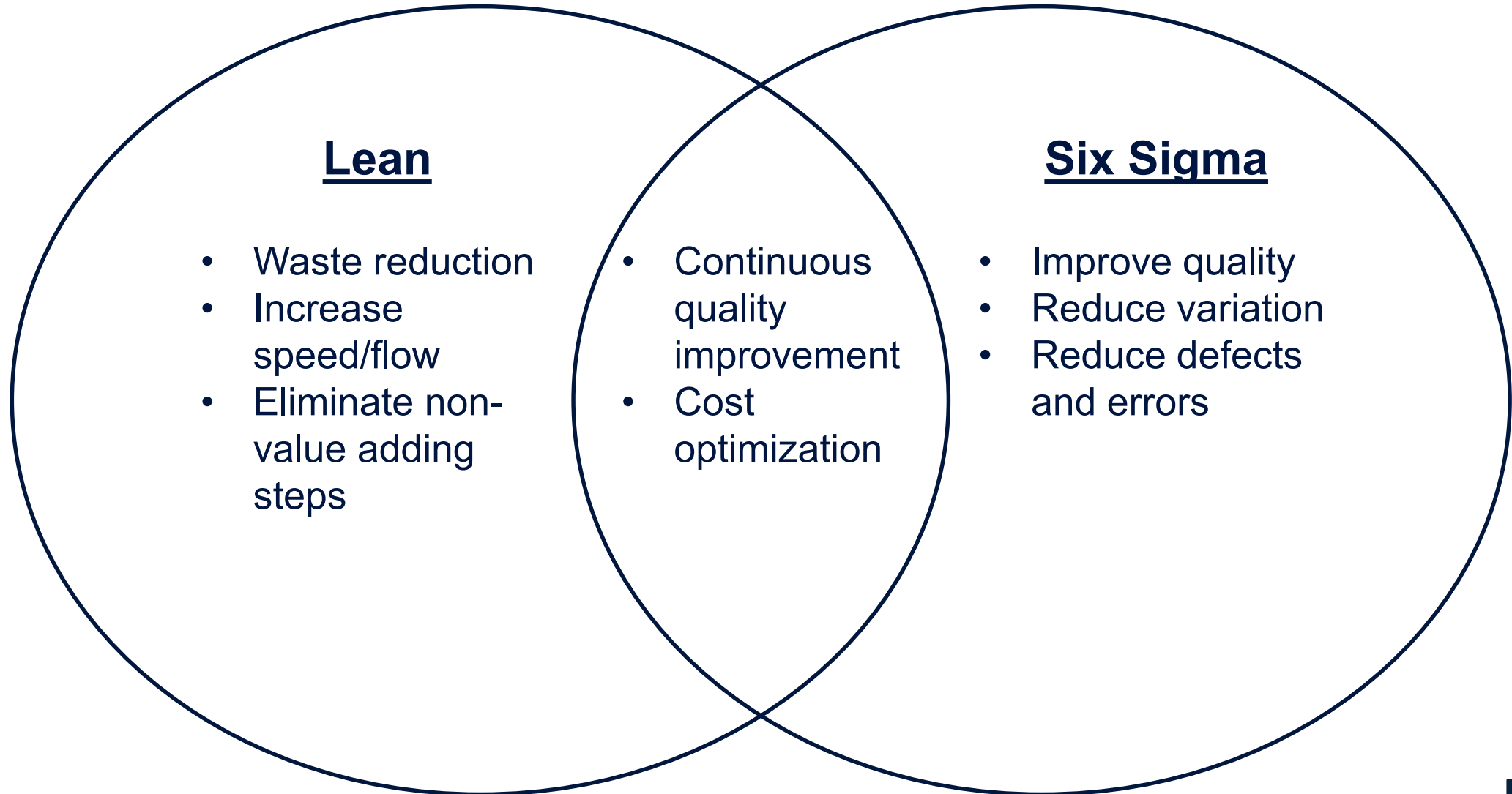
Challenges in Inpatient Pharmacy Operations

- Medication errors
- Inventory management issues
- Regulatory compliance
- Patient safety
- Patient satisfaction

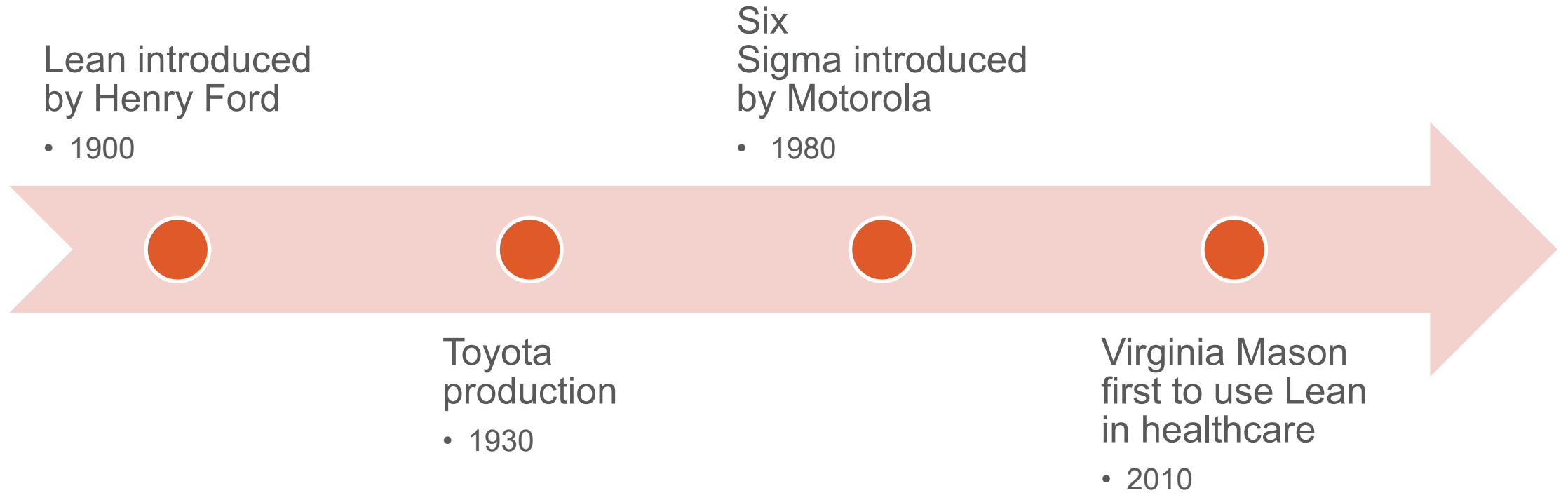
What is Lean Six Sigma?

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What is Lean Six Sigma?



History of Lean and Six Sigma



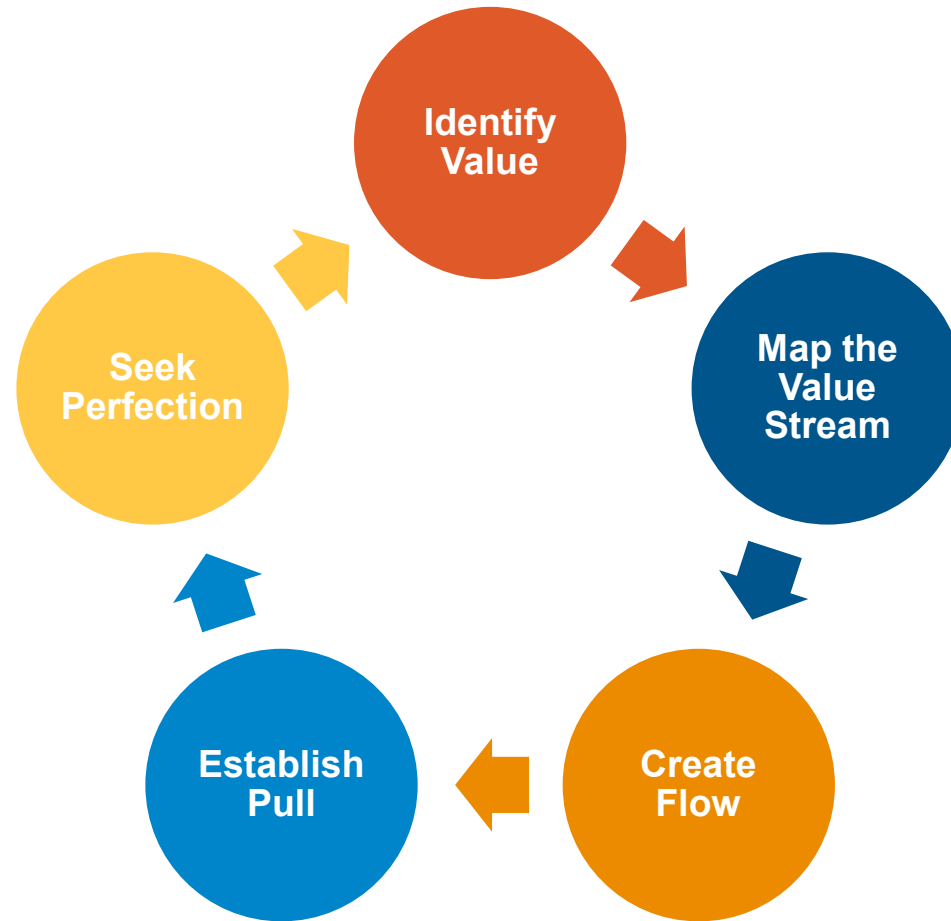
Goals of Lean Six Sigma

- Respond to the voice of the customer
 - Internal customer
 - External customer
- Minimize variation
- Increase quality
- Continuous improvement
- **Eliminate waste**
- **Increase efficiency**



Image source: <https://www.barnesconti.com/blog/wp-content/uploads/2013/09/goal.jpg>

5 Principles of Lean Six Sigma



Assessment Question #1

Which of the following best describes the primary principle of Lean Six Sigma for process improvement in an inpatient pharmacy setting?

- A) To increase the number of medications dispensed
- B) To reduce waste and improve process efficiency
- C) To enhance customer service through longer hours
- D) To expand the range of services offered

Assessment Question #1: Correct Response

Which of the following best describes the primary principle of Lean Six Sigma in an inpatient pharmacy setting?

- A) To increase the number of medications dispensed
- B) To reduce waste and improve process efficiency**
- C) To enhance customer service through longer hours
- D) To expand the range of services offered

Lean Thinking

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Identifying Waste

- Anything that does not contribute to the value of the services provided to the patient or the employees of the organization
- Lean principles focus on reducing waste, thereby freeing up resources to increase value
- Most waste falls under 1 of 8 categories

8 Types of Waste (DOWNTIME)

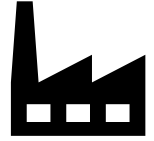
1. **D**efects
2. **O**ver-Production
3. **W**aiting
4. **N**ot Clear (Confusion)
5. **T**ransporting
6. **I**nventory
7. **M**otion
8. **E**xtra Processing

DOWNTIME: Defects



- Work that contains errors, rework, or lacks a necessary value component
- Does not meet the standards set by the customer
- Defect waste in pharmacy:
 - Sterile compounding errors
 - Mislabeling prescription
 - Entering order incorrectly

DOWNTIME: Over-Production



- Producing too much product or performing redundant tasks strains available resources
- Over-production waste in pharmacy:
 - Batching more oxytocin bags than will be used, taking up too much storage space or leading to expired product
 - Redundant paperwork

DOWNTIME: **W**aiting



- Inactivity downstream or an improper balance of workflow
- Waiting waste in pharmacy:
 - Meds waiting to be tubed
 - Pharmacy waiting on provider clarification

DOWNTIME: Not Clear (Confusion)



- When workers are unsure how best to accomplish tasks
- Confusion waste in pharmacy:
 - Different pharmacists having different preferences for how pharmacy technicians prepare medications
 - Unclear orders from a provider
 - Look-alike drug packaging

DOWNTIME: Transporting



- Post-production movement and handling of meds, supplies, or even patients without adding value
- Transportation waste in pharmacy:
 - A technician having to take multiple trips to fill the same ADC because they can't carry everything at once
 - Nurse having to take crash cart all the way down to the pharmacy for a refill

DOWNTIME: Inventory



- Having more materials on hand than what is required to perform work
- Inventory waste in pharmacy:
 - Over-production of batched IV compounds taking up too much space
 - Ordering too many bottles of a rarely-used medication

DOWNTIME: Motion



- Pre-production physical movement of people or materials that does not add value
- Highly visible type of waste; can be large or small
- Motion waste in pharmacy:
 - Disorganized layout of drugs and supplies
 - Multiple trips in and out of IV room because required supplies were not gathered

DOWNTIME: Extra Processing



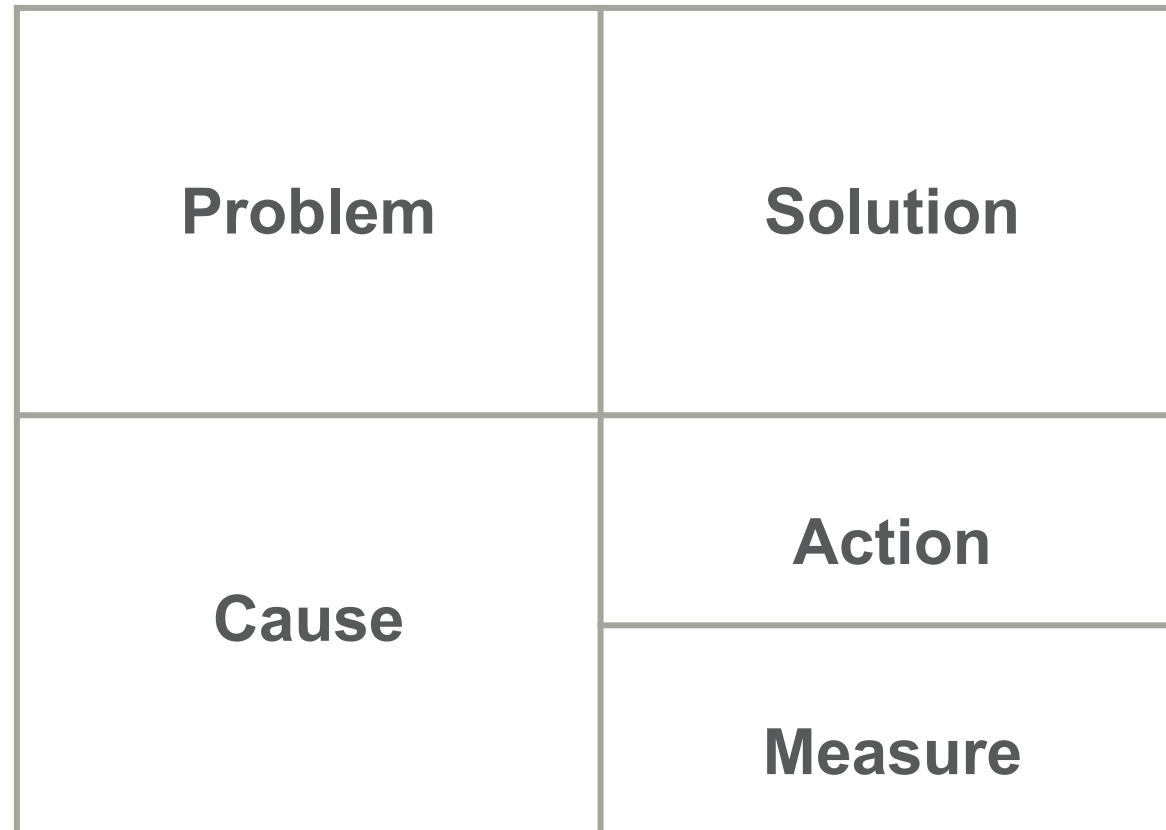
- Over-designed systems or extra steps in a process that do not add value from the perspective of the customer
- Extra processing waste in pharmacy:
 - Order clarifications
 - Missing meds in ADC
 - Redundant charting

A3 Thinking: The Lean Approach

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What is A3 Thinking?

- Named after the size of paper originally used to map this process out



A3 Thinking: Problem

Problem	Solution
Cause	Action
	Measure

- **Define the problem**
 - Keep it purely factual – do not attempt to determine cause yet
- Should answer why this problem is important to assess
- Focus on cost of poor quality
- Set a desired goal/outcome and provide reasoning

A3 Thinking: Cause

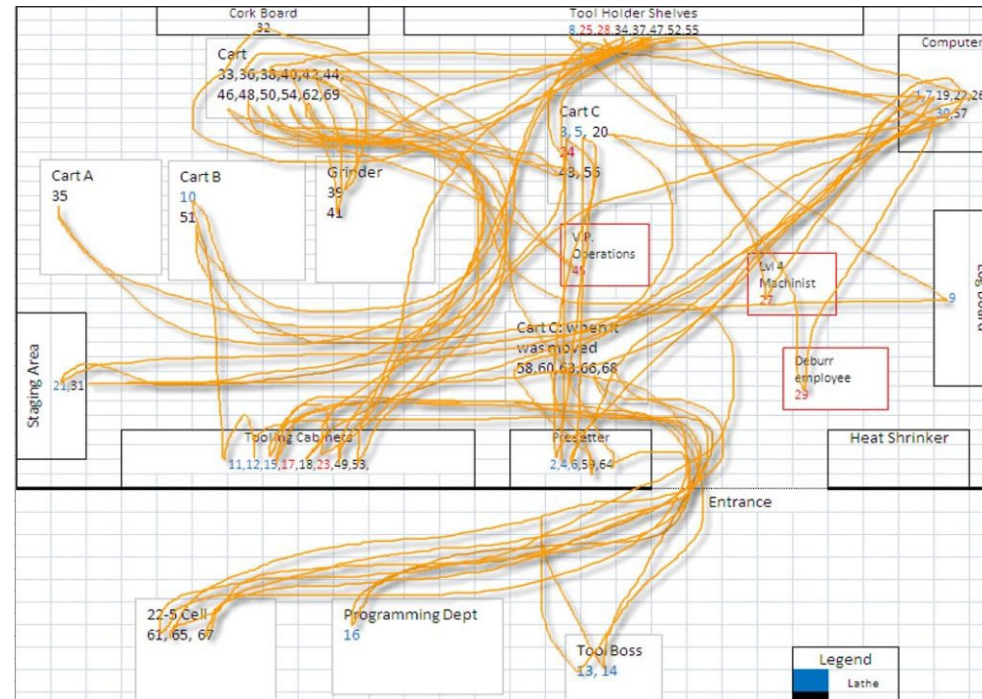
Problem	Solution
Cause	Action
	Measure

- **Determine the cause**
 - Describe the current state and identify potential areas of improvement
- Several techniques may be employed here depending on the type of problem
- Some techniques include:
 - **Spaghetti Diagrams**
 - Value Stream Mapping
 - **The 5 Whys**

A3 Thinking: Spaghetti Diagram

Problem	Solution
Cause	Action
	Measure

- Visualizes motion waste
- Created by following a worker and mapping out their movements within their workspace



A3 Thinking: The 5 Whys

Problem	Solution
Cause	Action
	Measure

- Interrogative stepwise approach to a **root cause analysis**
- Question why a problem happens, receive an answer, then question that answer. **Repeat!**
- Does not have to be exactly 5 whys; ask as many times as needed to get to the root cause
- **REMEMBER:** Always ask the 5 **WHYs**, never the 5 **WHO**s

A3 Thinking: The 5 Whys Example

Problem	Solution
Cause	Action
	Measure

Problem:

The nursing protocol for heparin IV drip is not always followed

Why? Because providers are telling nurses differently

Why? Because the protocol is not always clinically appropriate

Why? Because the protocol is based on outdated guidelines

Why? Because the protocol has not been updated in several years

Why? Because P&T was unaware of the new guideline updates

Why? Because nobody oversees DVT prophylaxis guidelines

A3 Thinking: The 5 Whys Example

Problem	Solution
Cause	Action
	Measure

- We could have stopped at the first why and disciplined nurses who did not follow the protocol, but the problem would have kept occurring
- Instead, finding the root cause via asking the 5 whys unveiled a serious oversight in the structure of the P&T committee
- Note that we have only identified the root cause; we have not yet developed a solution to said cause

A3 Thinking: Solution

Problem	Solution
Cause	Action
	Measure

- **Develop the ideal state**
 - Using data from the current state, create a diagram of the best possible version of the current system
- Commonly accomplished by creating idealized versions of tools used during Cause step (e.g. Spaghetti Diagram, Value Stream Mapping, etc.)

A3 Thinking: Action

Problem	Solution
Cause	Action
	Measure

- Ask the following:
 - How do we implement our action plan?
 - What steps should we take?
 - Where should we first focus our efforts?
 - Who should be responsible for implementation?
- **Create an action plan**
 - Focus on specific, actionable areas of waste identified in previous steps
 - Create a **SMART** goal

A3 Thinking: **SMART** Goals

Problem	Solution
Cause	Action
	Measure

- All action plans should follow the **SMART** goal framework
- **SMART** stands for:
 - **S**pecific
 - **M**easurable
 - **A**chievable
 - **R**elevant
 - **T**ime-bound

A3 Thinking: Measure

Problem	Solution
Cause	Action
	Measure

- **Create a follow-up plan**
 - A plan to measure how effective the solution is
- **Ask the following:**
 - What types of data will show success or failure?
 - How will this data be collected?
 - How often should we analyze this data?

Assessment Question #2

When implementing a lean process for locking up IV drips in the ICU, a significant time waste was identified: If the previous person who accessed the lockbox misplaced the key, the next person has to stop what they are doing to find it. What would be the BEST solution to reduce this time waste?

- A) Conduct an investigation to identify & discipline the individual(s) responsible for not putting the key in the correct location
- B) Remove IV drips from the ICU lockbox so nurses can access them faster
- C) Switch to keyless, PIN-based lockboxes to eliminate this step entirely
- D) Store lockbox keys in the pharmacy and tell ICU nurses where they are

Assessment Question #2: Correct Response

When implementing a lean process for locking up IV drips in the ICU, a significant time waste was identified: If the previous person who accessed the lockbox misplaced the key, the next person has to stop what they are doing to find it. What would be the BEST solution to reduce this time waste?

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- D) Store lockbox keys in the pharmacy and tell ICU nurses where they are

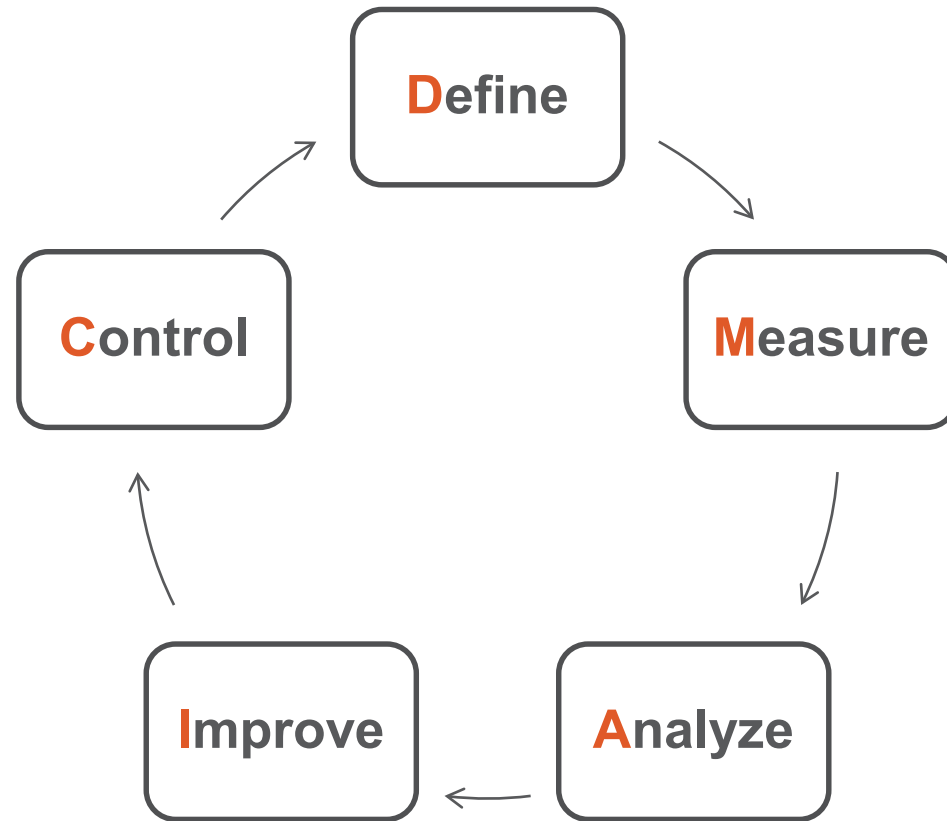
DMAIC: The Six Sigma Approach to Problem Solving

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Six Sigma

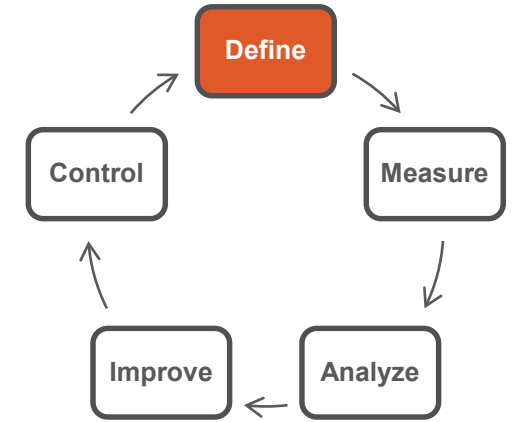
- Data-driven methodology
- Emphasis on process improvement by reducing variability and defects
- Goal is to achieve near perfection in process performance
- Tools and techniques (Fishbone diagrams, Pareto charts, control charts, etc.)
- Follows the DMAIC framework

DMAIC: The Cycle



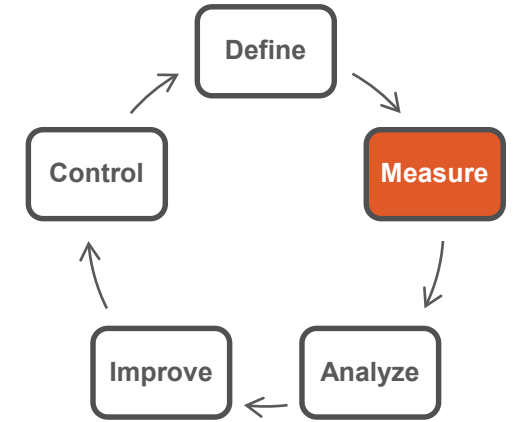
DMAIC: Define

- What is the problem?
- What improvements can be made?
- Why is this problem important?
- Why should time and effort be invested into this problem?
- Voice of the customer



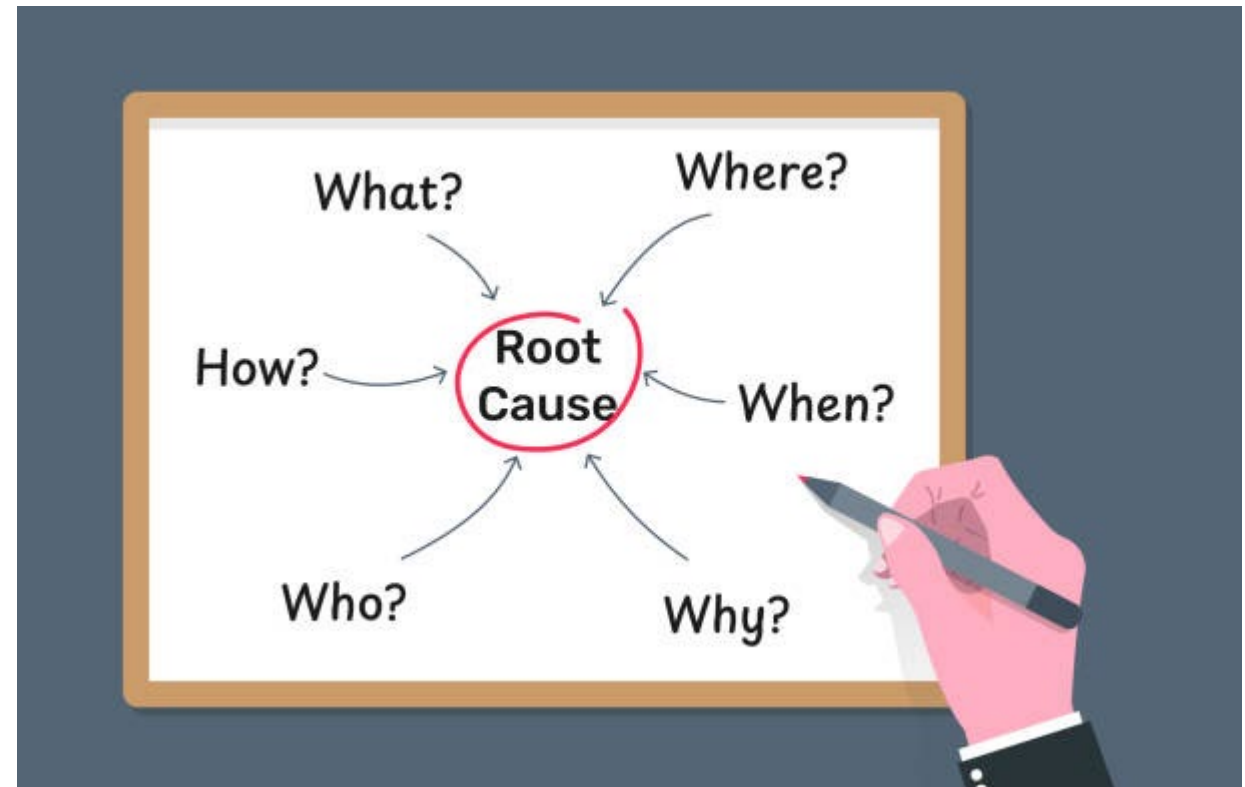
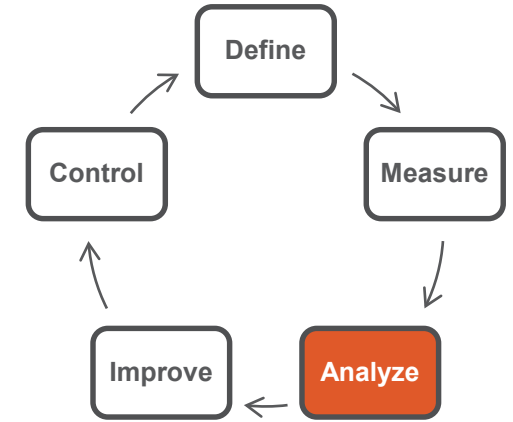
DMAIC: Measure

- Collect baseline data to understand current performance
- Identify key process metrics and key performance indicators (KPIs)
- Utilize process maps and flow charts to visualize processes
- Gemba walk



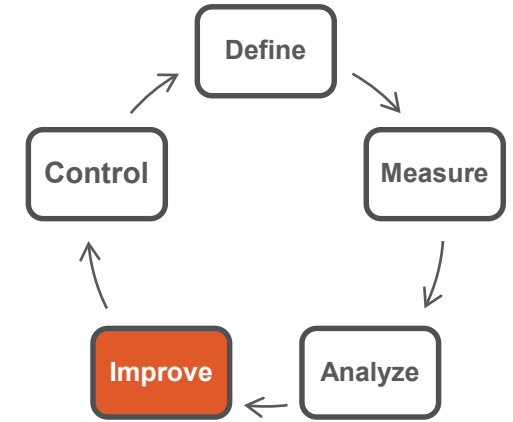
DMAIC: Analyze

- Identify root causes of inefficiencies or defects
- Utilize six sigma analysis tools
 - Fishbone diagrams
 - Pareto charts
 - Kaizen
 - The 5S system
 - Five Whys



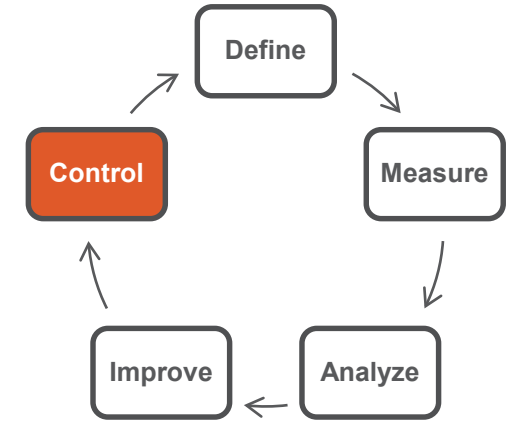
DMAIC: Improve

- Brainstorm
- Design and implement improvement solutions to eliminate root cause
- Test improvements through a pilot phase



DMAIC: Control

- Establish plans to sustain improvements
- Train staff on new processes and procedures
- Monitor process performance
- How not to fall back into old habits



Combining Lean and Six Sigma

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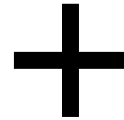
Implementing Lean Six Sigma in Inpatient Pharmacy Operations

- A mid-sized hospital has been utilizing batched epidural fentaNYL/ROPIvacaine for pain management in labor and delivery
- However, the pharmacy administration has identified several issues with this approach, including high wasted batched epidural fentaNYL/ROPIvacaine and delays in administration

Lean

A3 Thinking

- Concise
- Single-page report
- Quick problem solving
- Waste reduction



Six Sigma

DMAIC

- Data driven
- Comprehensive
- Complex problems
- Variation reduction

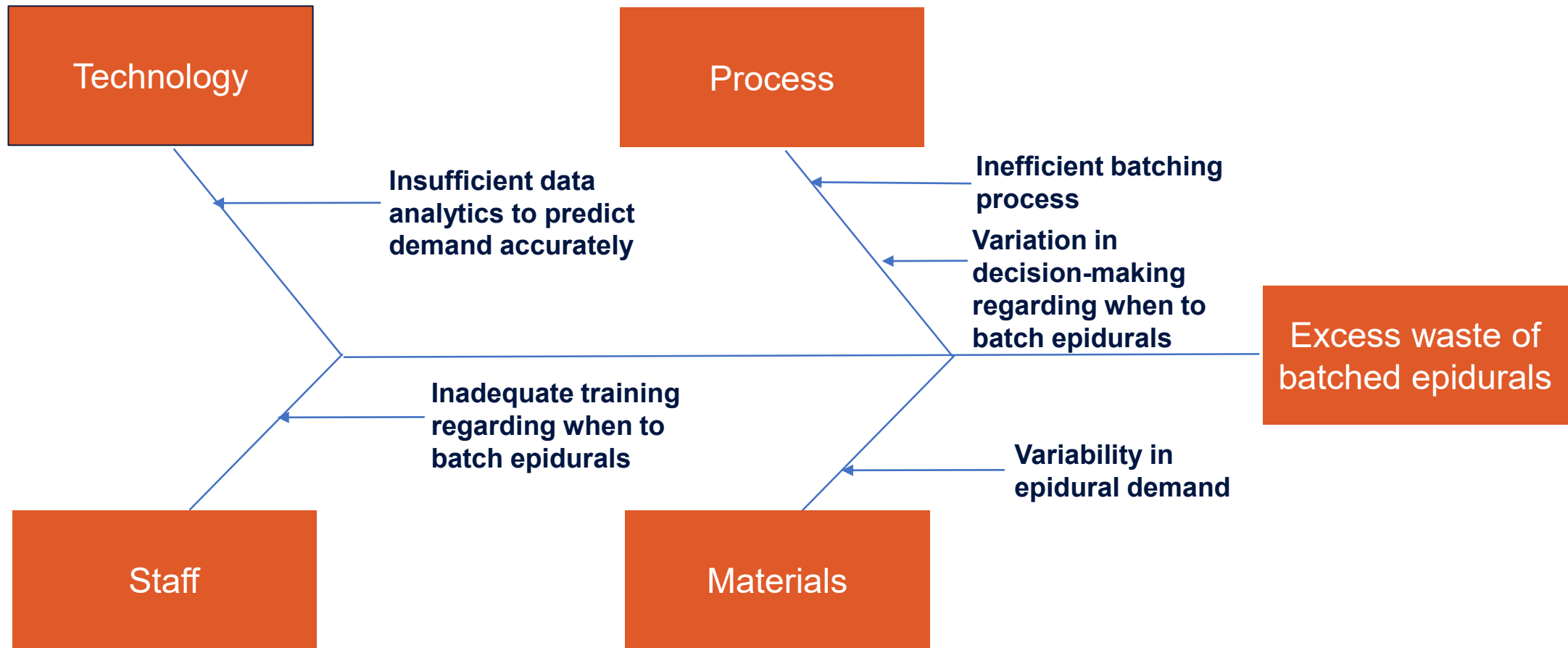
DMAIC – Define Using A3

<p style="text-align: center;">Problem</p> <ul style="list-style-type: none">High levels of wasted batched epidural fentanyl/ropivacaine result in substantial financial losses for the hospital. Additionally, delays in epidural administration can lead to increased patient discomfort and dissatisfaction.	<p style="text-align: center;">Solution</p>
<p style="text-align: center;">Cause</p>	<p style="text-align: center;">Action</p>
	<p style="text-align: center;">Measure</p>

DMAIC – Measure

- Measure the volume of batched epidurals that are wasted over a specific time
- Record the average time taken to batch epidurals in the pharmacy
- Measure the time from when the epidural is ordered to when it is administered to the patient

DMAIC – Analyze



DMAIC – Improve

- Change epidural batch process to a just-in-time preparation model
- Change batch epidurals to manufacturer prepared pre-mixed ROPivacaine bags
- Re-evaluate inventory tracking for batched epidurals
- Collaborate with labor and delivery to ensure goals are aligned

DMAIC – Control

- Establish key performance indicators (KPIs) to monitor and sustain improvements, such as waste reduction rates and average time from order to administration
- Encourage staff to report issues or suggest further improvements
- Schedule regular audits of the new process to identify any emerging issues promptly

Assessment Question #3

What is the first step in applying Lean Six Sigma to pharmacy operations?

- A) Collect data on current pharmacy processes
- B) Train staff on Lean Six Sigma Principles
- C) Develop and implement solutions to enhance the process
- D) Identify and define the problem area(s) in the pharmacy workflow

Assessment Question #3: Correct Response

What is the first step in applying Lean Six Sigma to pharmacy operations?

- A) Collect data on current pharmacy processes
- B) Train staff on Lean Six Sigma Principles
- C) Develop and implement solutions to enhance the process
- D) Identify and define the problem area(s) in the pharmacy workflow**

Benefits of Combining Lean and Six Sigma

Enhanced efficiency

Improved quality

Cost reduction

Data-driven insights

Holistic approach

Sustainable improvements

Conclusion

The integration of Lean and Six Sigma methodologies offers significant benefits for inpatient pharmacy operations including:

- **Enhanced efficiency:** Streamlining processes to reduce waste and optimize workflow
- **Improved quality:** Improving the standard of care through consistent and reliable practices
- **Cost Reduction:** Identifying and eliminating unnecessary expenses to maximize resource utilization
- **Data-Driven Insights:** Leveraging data analytics to inform decision-making and drive continuous improvement
- **Holistic approach:** Addressing operational challenges comprehensively to ensure all aspects of pharmacy services are considered
- **Sustainable Improvements:** Establishing practices that foster long-term enhancements in performance and patient care

References

1. Sallam M. Enhancing hospital pharmacy operations through lean and six sigma strategies: a systematic review. *Cureus*. 2024;16(3):e57176.
2. Kallal A, Griffen D, Jaeger C. Using lean six sigma methodologies to reduce risk of warfarin medication omission at hospital discharge. *BMJ Open Qual*. 2020;9(2):e000715.
3. National patient safety goals effective January 2024 for the hospital accreditation program. The Joint Commission. Published October 4, 2023. Accessed November 18, 2024.
https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/2024/npsg_chapter_hap_jan2024.pdf
4. Downen J, Jaeger C. Quality improvement of intravenous to oral medication conversion using lean six sigma methodologies. *BMJ Open Qual*. 2020;9(1):e000804.
5. Schweikhart SA, Dembe AE. The applicability of lean and six sigma techniques to clinical and translational research. *J Investig Med*. 2009;57(7):748-755.
6. Kim CS, Spahlinger DA, Kin JM, Billi JE. Lean health care: what can hospitals learn from a world-class automaker? *J Hosp Med*. 2006;1(3):191-199.

Thank You!!

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