



Management Case Study: Using Lean Methodology to Improve IV Medication Preparation in Pediatrics

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Disclosures

The program chair and presenters for this continuing education activity have reported no relevant financial relationships.



Learning Objectives



- Define concepts in relation to Lean and daily management systems
- Explain select lean tools to measure current and future state during process improvement kaizen events.
- List improvement strategies upon identifying waste within an IV admixture workflow

Self-Assessment Question 1



- Identify the 7 sources of waste during a waste walk
 - a. Transportation, Inventory, Motion, Waiting, Overprocessing, Overproduction, Defect
 - b. Transportation, Inventory, Motion, Waiting, Overanalyzing, Overproduction, Defect
 - c. Transportation, Inventory, Motion, Waiting, Overprocessing, Overproduction, Discussion
 - d. Transportation, Inventory, Monitoring, Waiting, Overprocessing, Overproduction, Defect

Self-Assessment Question 2



- During a lean process improvement kaizen event, all of the following lean tools can be used to measure current state except:
 - a. Spaghetti diagram
 - b. Waste walk
 - c. Value stream map
 - d. Team meeting

Self-Assessment Question 3



- During a kaizen event, excess IV waste is identified as being returned to the pharmacy. The current batch print time is 6 am and 6 pm. One strategy to reduce waste being returned includes:
 - Increasing total # of batches per day
 - Decreasing total # of batches per day
 - Educate providers and nurses about the waste
 - Recycle unused preparations being returned to pharmacy



Our purpose is to excel in healing, teaching and discovery.

- Value is defined by our patients.
- To excel in creating value, we must constantly improve.
- Improvement depends on standards and thoughtful innovation.
- Standards require doing the same work the same way every time.
- Innovation comes from planning, experimenting and observing.
- Problems are opportunities: The only failure is not trying to improve.
- For all of us to excel, each of us must learn, teach and lead.

Building excellence from the ground up.
Faculty and staff—their skills, focus and dedication—are the foundation of change. Learning and experimentation drives improvement; the health and well-being of our patients is balanced on the work we do to achieve the Triple Aim. Together with our purpose and philosophy statements, these are the building blocks of OHSU's performance improvement efforts.

Lean Assessment Tools

- ✓ Value Stream Mapping
- Waste Walk
- Spaghetti Diagram

Department vs Value Streams

Department View → Improvement Approach

Value Stream View → Value Stream (System) Approach

Building a Value Stream

Total Cycle Time

Total Process Time

Total Wait Time

Total Cycle Time = 110 Min
Total Process Time = 33min (30%)
Total Wait Time = 76min

Lean Assessment Tools

- Value Stream Mapping
- ✓ Waste Walk
- Spaghetti Diagram

Seven Types of Waste



Transportation Inventory Motion Waiting

Over-processing Overproduction Defects (poor quality, errors)

Rules for a Waste Walk

- Go to the Gemba (where the work is done)
- Create an inventory of the waste you find
- Talk to those that do the work – what gets in their way of providing value to their customers?

Waste Inventory Sheet

Date: _____ Observer: _____
Location: _____ Stream: _____

Description	Transportation	Inventory	Motion	Waiting	Over-processing	Overproduction	Defect/Quality

Lean Assessment Tools

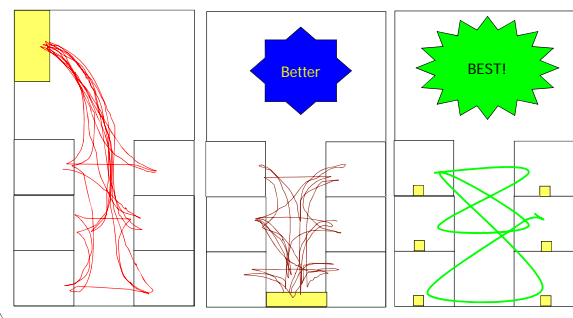
- Value Stream Mapping
- Waste Walk
- ✓ Spaghetti Diagram

Spaghetti Diagram

- A visual depiction of movement, motion, and transportation, in the current state
- Provides a foundation for physical changes to reduce waste and increase value in the future state

Spaghetti Diagram

Goal: Reduce Movement & Transportation



Daily Management Systems (DMS)

Patients, today and tomorrow

Safety **Quality** **Service** **Affordability**

Innovation | Education

Engagement

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Leader Roles and Time in the Workplace

Time in the Workplace

100% **Staff**

50 - 75% **Team Leads**

25% **Managers & Supervisors**

10 - 20% **Directors**

10% **C-Suite & VPs**

10% **CEO**

Flow of Information ↑

- Purpose
- True North
- Strategy
- Goals

Flow of Information ↓

- MESS Status
- Abnormalities
- Escalation
- PDCA Status
- Metrics
- Business Status

OHSU's DMS Huddle Structure

Readiness Huddle To end by 0800	Readiness Huddle What: MESS, Patient Flow, Census, Patient Safety, Issues Resolution Who: Oncoming Nurses, Off-going Charge RN, HUC, RSA (optional), Oncoming CNAs, EVS (T) When: Change of Shift (every shift) Where: Readiness Board
Unit Huddle 0815	Unit Huddle What: Escalated Abnormalities & Issues, Resolution to Older Issues Who: Manager, Charge RN, HUC, CNA (optional) When: 8:15am, Daily Where: Readiness Board
Multidisciplinary 0845 (0850 Perop)	Multidisciplinary What: Escalated Abnormalities & Issues, Resolution to Older Issues Who: Nursing Division Directors, Unit Managers, Facilities, Logistics, Division Pharm, IT (when/where applicable) When: 8:45am, Daily Where: Logical Locations
Healthcare Admin 0915	Healthcare Admin What: Escalated Abnormalities & Issues, Resolution to Older Issues Who: CNO, CMO, AOD, Division Directors, Directors of Facilities, Logistics, Lab, Pharm, IT When: 9:00am, Daily or weekly Where: Logical Location

Tiered Huddles

Daily Management Systems (DMS)

ASSESSMENT OF CURRENT PEDIATRIC IV SYRINGE CARTFILL WORKFLOW

Lam Nguyen, PharmD, MBA (Operations Manager)
Oregon Health & Science University

Lean Pharmacy Pediatric IV Cart fill Project Charter

Problem Statement: A twice daily pediatric IV syringe cart fill results in excess waste, missing labels and medication delays

Primary Objective: Reduce cycle time of IV syringe cart fill
Secondary Objective: Reduce total wait times for first dose and urgent medications; Reduce PSN reports related to medication delays; Reduce medication waste by 20%

Objectives:

- Identify potential steps within the pediatric cart fill workflow that will reduce wait time and overprocessing
- Optimize workflow
- Optimize IV technician total process time

In Scope	Out of Scope	Improvement Team
<ul style="list-style-type: none"> • Technician role • Processes occurring around RPH check • Peds IV syringe batch time • Room layout • First dose and re-dispense <ul style="list-style-type: none"> • Adult and pediatric • Anteroom dispense workflow • Overnight shift 	<ul style="list-style-type: none"> • No additional FTEs • Chemo label print time • Adult IV batch • Delivery station and delivery process 	Lead IV Room Technician IV Room Pharmacist Pediatric Clinical Pharmacist IV Room Technician Operations Manager Technician Manager

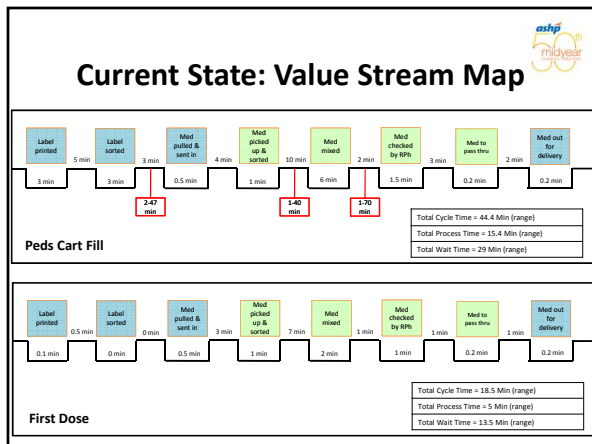
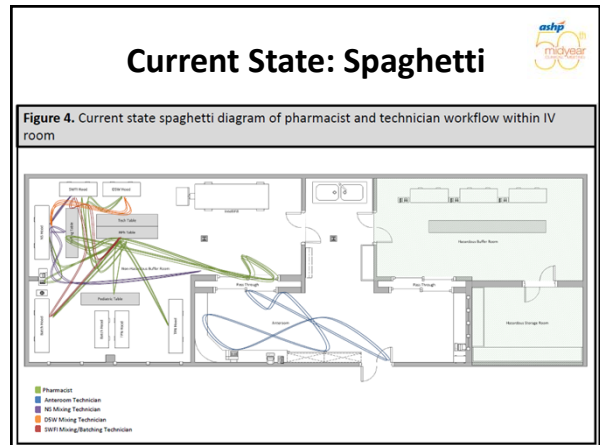
Project Sponsor: Jason Christensen
Process Owner(s): Lam Nguyen, Patricia Sullivan
Facilitators: Steve Lam, Linda Nguyen

Methods for Observation

- Timed First Dose orders and Cart Fill orders
 - From time label is printed until medication is placed in delivery bin outside of anteroom
 - Observe anteroom technician, IV room technicians and pharmacist to record workflow activities

Current State: Cartfill

Cart Name	Label Print Time	Dispense Interval
IV (Adult)	0400	0900-0959
	0600	1000-1059
	0700	1100-1159
	0800	1200-1259
	0900	1300-1359
	1000	1400-1459
	1100	1500-1559
	1200	1600-1659
	1300	1700-1859
	1500	1900-2059
1700	2100-0859	
Syringe (Pediatric)	0805	1200-2359
	1905	0000-1159



Observations of Waste

- **Waiting**
 - Waiting to be sent into the IV room
 - Waiting to be mixed
 - Waiting to be checked
 - Waiting to be sent out after mixed
- **Overproduction**
 - Making same product twice
 - Making discontinued orders
- **Overprocessing**
 - Sorting medication multiple times
 - Pulling wrong medications for mixing
- **Transportation & Motion**
 - Walking to pass-through to pick up and send off medications

Kaizen Prioritization

IMPACT

		Low	High
IMPLEMENTATION	Easy	Parking Lot	To Do
	Hard	No	Later

Kaizen Prioritization

	High Impact
Easy Implementation	<ul style="list-style-type: none"> Standardization of preparation of ICU batch drips <ul style="list-style-type: none"> What par levels? Kanban card? Cartfill time change → q 1 hour, informatics required Designate locations for urgent/routine Develop DMS Standards for daily check in 5S (Sort, Set in Order, Shine, Standardize, Sustain) Add 2nd RPH computer Add 2nd printer for batch in chemo area of anteroom IV Room “charge tech” role Visual/sound for urgent medication (door bell)

Kaizen Prioritization

	High Impact
Hard Implementation	<ul style="list-style-type: none"> Change room layout/hood + Automation Standardize bins (different colors, same size) Set up technician <ul style="list-style-type: none"> Decrease interruptions ED first doses have higher priority Add discontinue printer in iv room near mixers Change practice of “doses due now” without allowing preparation time Purchase new repeater pump with labels that print/show volume pumped Standardization of table height/length – add second tier

Implementation

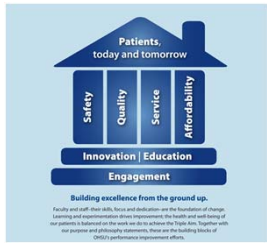
- Daily charge technician
- Daily management system
- Just-In-Time- Production
- Kanban cards for ICU batch drips
- Visual controls: colored clip system

Implementation

Daily Charge Technician

- Responsible for directing workflow in collaboration with pharmacist
- Responsible for requesting reallocation of resources
- Responsible for surfacing any concerns or issues

Daily Management System



Just-In-Time Production

Cart Name	Label Print Time	Dispense Interval
IV (Adult)	No Change	No Change
Syringe (Pediatric)	0230	0830 -1029
	0630	1030-1129
	0730	1130-1229
	0830	1230-1329
	0930	1330-1429
	1030	1430-1529
	1130	1530-1629
	1230	1630-1829
	1430	1830-2029
	1630	2030-2229
	1830	2230-0829

Kanban Cards for ICU Batch

ICU BATCH KANBAN

Product: Epinephrine

Strength: 0.02 mg/mL

If there are 4 or fewer Epinephrine 5 mg/250 mL bags,
batch for the corresponding day.

Mon - 24, Tues - 12, Wed - 6, Thurs - 56, Fri - 48, Sat - 36, Sun - 30

Place this card in front of 4 bags

Kanban Cards for ICU Batch

Visual controls: Colored Clip

Yellow = First Dose Red = Urgent

Results

Table 1. Pediatric medication costs before and after implementation of workflow improvements

Cost Items	Pre Implementation (Current State)	Post Implementation
CF Labor Cost	\$ 750.00	\$ 200.00
FD/Urgent Labor Cost	\$ 220.00	\$ 170.00
Wasted Drug Cost	\$ 3,400.00	\$ 3,000.00
Total Weekly Cost	\$ 4,300.00	\$ 3,300.00
Estimated Annual Cost	\$ 230,000.00	\$ 170,000.00
Estimated Annual Cost Avoidance	\$	60,000.00

CF = Cartfill
FD = First Dose

Results

Figure 1. Total wasted patient-specific medication for adult and pediatric units 7 days pre (A) and 7 days post (B) lean implementation.

A

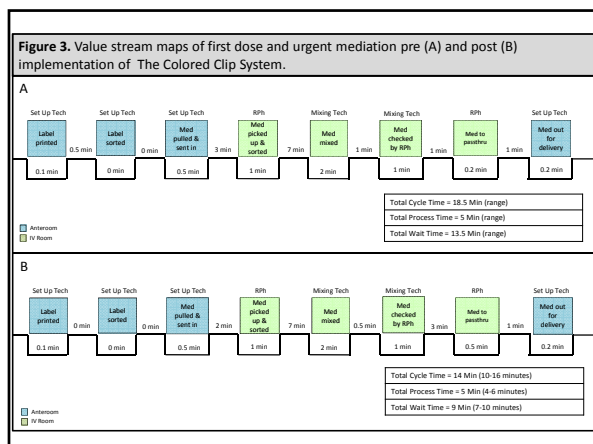
B

Legend: General Medicine Unit A, General Medicine Unit B, Oncology Unit A, Oncology Unit B, PICU Unit, NICU Unit A, NICU Unit B

Figure 2. Value stream maps of cartfill medications pre (A) and post (B) implementation of Just in Time pediatric cartfill.

A

B



In Summary

- **Primary objective:**
 - Reduction of total cycle time for cartfill via JIT production by 10 minutes
- **Secondary objective:**
 - Reduction of actual medication waste by 23%
 - Estimated medication waste avoidance (\$60,000)
 - Reduction of total cycle time for first dose and urgent by 4.5 minutes
 - No difference in reported medication delays pre/post

Key Takeaways

- **Key Takeaway #1**
 - Engaging frontline staff in identifying and undertaking process improvement efforts is critical to the overall success of those efforts
- **Key Takeaway #2**
 - Lean analysis tools are an effective strategy to step back from daily work to see the waste
- **Key Takeaway #3**
 - Who is TIM WOOD? He hides in all areas of your Health-System – seek him out!

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Answer: a

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Answer: d

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 - d. Recycle unused preparations being returned to pharmacy

Answer: a

Discussion



- How many Health- Systems present today are currently engaged in using Lean to optimize your daily work?
- What barriers exist that prevent you from engaging your leadership and frontline staff in adopting Lean for continuous quality improvement?