

Lean Six Sigma

Why it's important, how it's being applied and some ways you can get involved moving forward

Jarrod McDonald

Project Manager, Health System Operations
UC San Diego Health

Melinda Hudson

Assoc. Project Manager, Health System Operations
UC San Diego Health

Learning objectives

1. Understand why Lean Six Sigma matters in healthcare
2. See how the methodology is being applied
3. Discover applications for “lean thinking” through a successful LSS healthcare anecdote
4. Learn how to facilitate everyday problem-solving with a few tips & tricks

Why LSS Matters in Healthcare

The state of US healthcare

1. What was the US total health care spend in 2016?

A. \$0.7 trillion

B. \$1.3 trillion

C. \$1.9 trillion

D. \$3.4 trillion

E. \$5.1 trillion

...or \$10,523 per person.
4.8% increase from 2015.

2. Rank these nations from best to worst in quality of health care systems:

39

A. Cuba

1

B. France

2

C. Italy

30

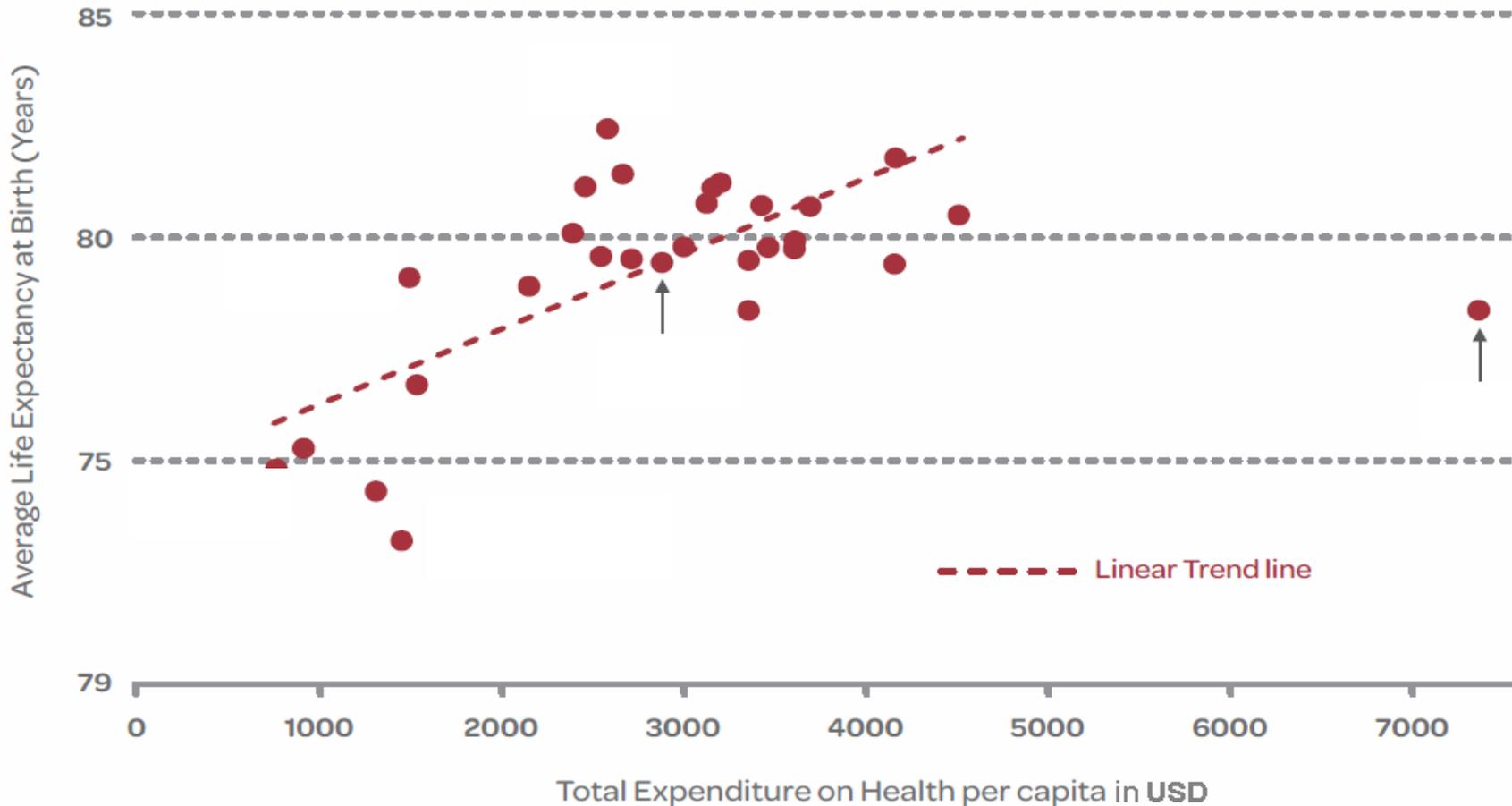
D. Canada

37

E. United States

Importance of improvement

Healthcare Spending per capita vs. Average Life Expectancy Among OECD Countries



Healthcare in the news

health inc.

To Cha
by CHRIS ARNOL

November 27, 20

Two hospitals win the 2013

Los Angeles Times

Healthcare overhaul leads hospitals to focus on patient satisfaction

Under healthcare overhaul, federal payments to hospitals are tied to patient satisfaction. Customer service efforts are underway.

July 20, 2013 | By Anna Gorman

On this new this year's Malcolm Baldrige National Quality Award, the nation's highest presidential honor for innovation and performance excellence, U.S. Commerce Secretary Penny Pritzker announced on Wednesday.

The change Dean is talking about is kind of like what happened when most companies stopped offering pensions. Instead, many just contribute money to their workers' retirement accounts.

With health care now, some companies are saying: "Here's \$300 to \$400 a paycheck. Go use that toward buying insurance on a 'private exchange.'"

Improvement is typically not taught in medical schools

Do you believe your instruction in the following areas was inadequate, appropriate, or excessive? (Answers from medical students)

GRADE	TOPICS
A	1. Disease management, privacy, pt interview, communication with pt, problem solving, professionalism
B	2. Clinical decision making, physical exam, ethics, teamwork, disease prevention
C	3. Physician communication, biostatistics, community medicine, culturally appropriate care, underserved populations
F	4. Health systems, health care quality improvement, policy, financing, managed care, economics, public health, community health

Changes in our environment

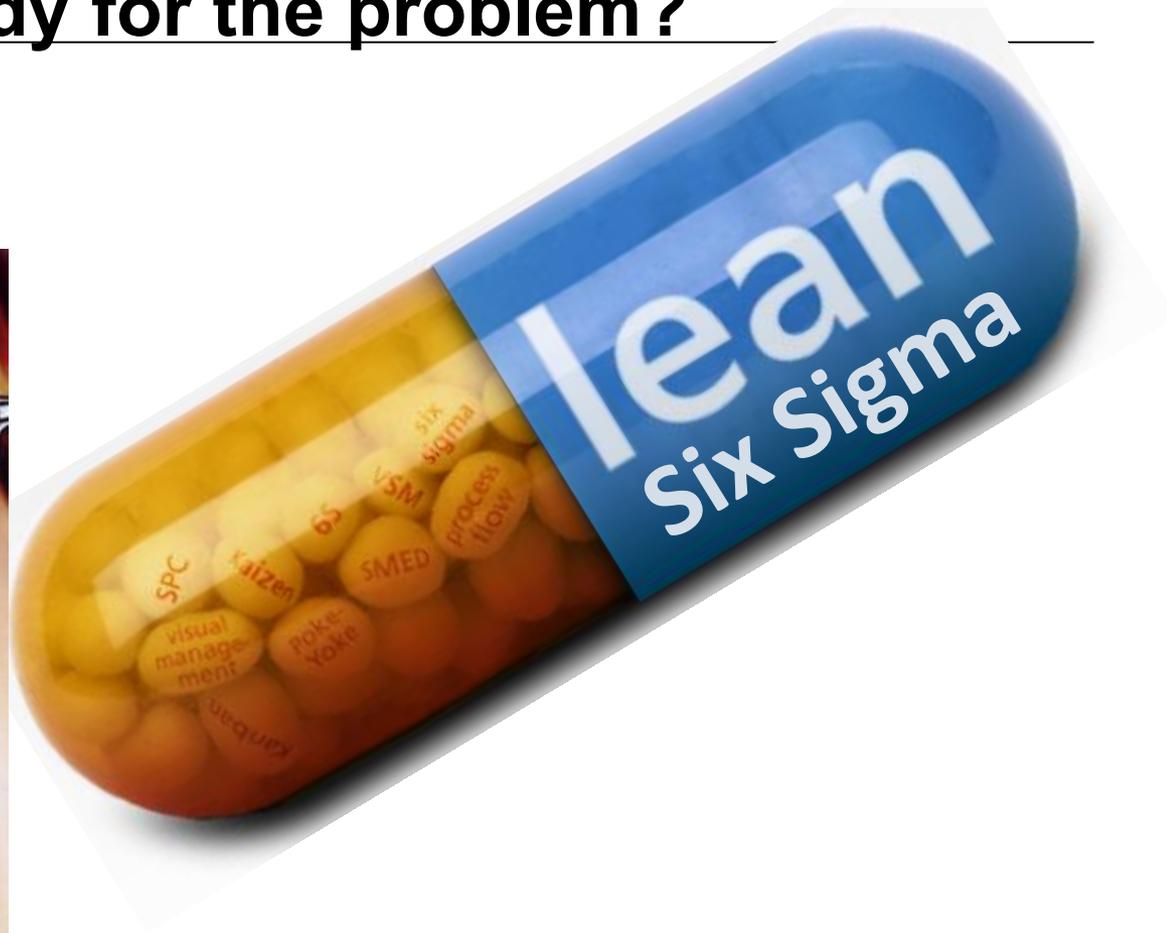
Healthcare Reform

We Now Compete on

- **Improved Patient Experience**
- **Lower Cost (Efficiency)**
- **Improved Quality (Outcomes)**



What's one remedy for the problem?



Lean Six Sigma optimizes the ability to problem solve and supports strategic initiatives with a new way of thinking

- **Performance Management** is enhanced with strong tools/methodology for problem solving, implementation, and sustainment
- **Patient and staff experience** improve with better outcomes, less re-work, and more value added tasks
- **Growth** occurs with better patient outcomes, increased capacity, and improved experience
- **Clinical excellence** is promoted by reducing process variation, eliminating waste/errors, and improving access

Lean Six Sigma is a **FOUNDATIONAL METHODOLOGY** that will drive:

1. **QI & COST SAVING INITIATIVES**
2. **STRATEGIC GOALS**
3. **A CULTURAL TRANSFORMATION**
4. **HIGH RELIABILITY**



LEAN SIX SIGMA
MENTOR • TRANSFORM • INTEGRATE



What is high reliability?

- **6σ = 99.9997% compliance.** It is a process that produces no more than 3.4 defects per 1 million opportunities!
- Let's conceptualize that....



6σ = Miss only 3.4 free throws out of 1 million shots



6σ = Hit a strike all, but 3.4 times if you bowled 1 million frames



6σ = For every 1 million patients that visited a clinic or hospital, only 3.4 would experience a medication error

- **Certain situations may call for different sigma goals**
 - *Pharmaceutical company – always at risk for wrongful death lawsuit*
 - *ED Left Without Being Seen – inevitable that some people will get triaged and walk out before seeing a physician (i.e. they feel better)*

Applying LSS in Healthcare

Understanding the difference

Lean

- Remove waste
- Increase process speed
- Eliminate non-value added steps and time in process
- Fix connections between steps
- Improve process efficiency

↓ **Waste**

↑ **Speed**

*Drive
Performance
Management*

Six Sigma

- Reduce variation
- Improve quality and accuracy
- Optimize remaining process steps
- Improve process effectiveness

↓ **Defects**

↑ **Accuracy**

DMAIC Process

Improve the efficiency and effectiveness of existing services and processes



SIX SIGMA
Gather information on nature and extent of problem

Identify and measure potential causal factors

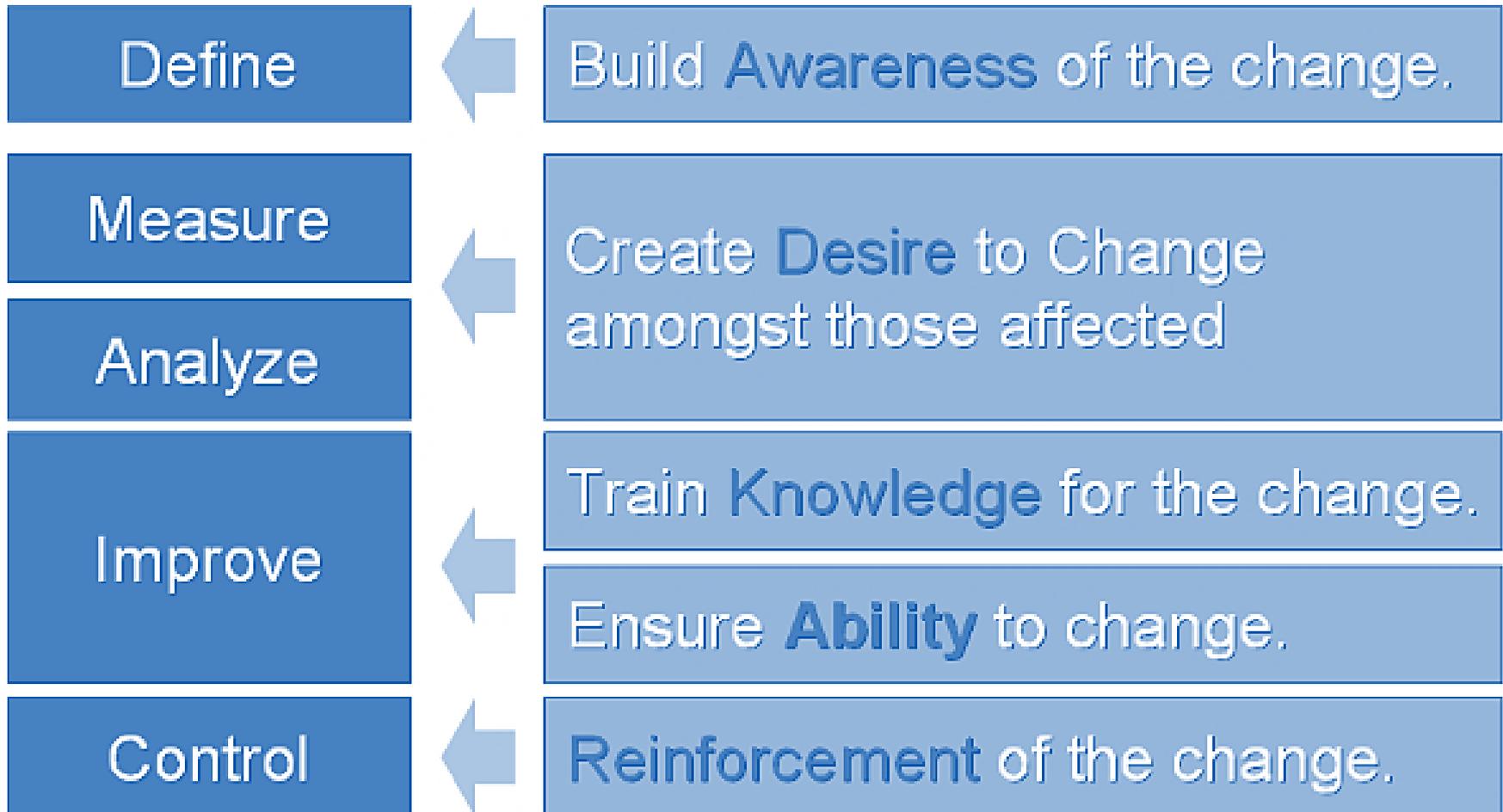
Study the data to determine root cause(s)

Pilot interventions and assess improvement

Create Control Plan and follow-up

Lean Six Sigma = Six Sigma + Lean

DMAIC vs. Change Management



How is Lean Six Sigma like clinical care?



Obtain patient history & symptoms & set the goal for plan of care - **DEFINE**



Perform physical and diagnostics (e.g. blood work, x-ray, etc...) - **MEASURE**



Study findings and diagnose root cause - **ANALYZE**

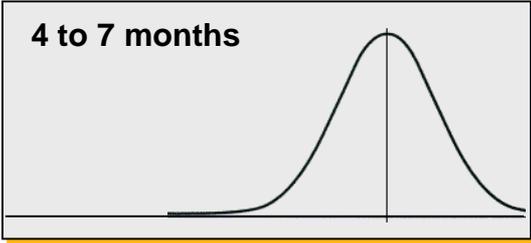
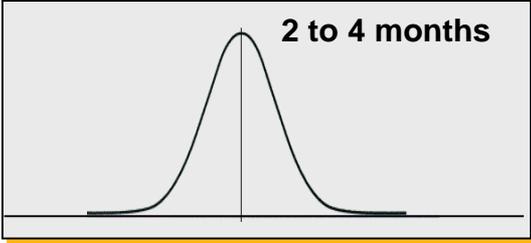
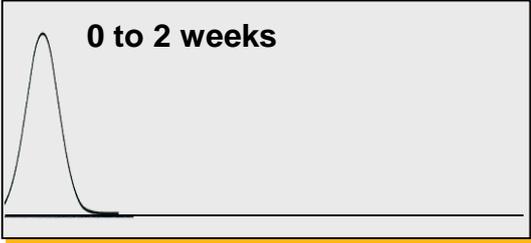


Implement treatment and assess patient improvement- **IMPROVE**



Prescribe treatment plan and follow-up with patient - **CONTROL**

Different projects require different tools

Scope	Methods	Duration	Expected ROI per Project
Big projects	<p>More formal</p>  <p>Black Belt</p>	<p>4 to 7 months</p> 	\$500K – \$1 million
Small projects	 <p>Green Belt</p>	<p>2 to 4 months</p> 	\$100K - \$250K
Day to Day	 <p>Go See Think Do</p> <p>Less formal</p>	<p>0 to 2 weeks</p> 	\$1K or more

Application of the methodology

DMAIC Level

Black Belt DMAIC



Green Belt DMAIC

Go See Think Do



Problem related to multiple service lines or the entire hospital. Heavier statistic analysis.

Problem related to multiple areas or a department, requiring complex problem solving tools. Little to no statistics.

Problems that are smaller in scope (i.e. one unit or area). Require minimal data collection.

5%*

15%*

80%*

* Directional percentages. May vary depending on the area and year.

LSS Healthcare Anecdotes

LSS examples in healthcare

1. Throughput improvement / capacity optimization (i.e. length of stay)
2. Reducing infection rates / infectious diseases (e.g. sepsis, CDI, CLABSI)
- 3. Improving EVS turnaround times**
4. Reducing medication errors (e.g. chemotherapy, medical waste)
5. Reducing OR cancellation % and turnaround times
6. Revenue cycle optimization and payment authorization turnaround time reduction
7. Reducing # of hypoglycemic events in ICUs
8. Outpatient clinic optimization (e.g. reduce wait times / no-shows)
9. Reducing overtime utilization through elimination of waste
10. Reconfigure sterile processing

EVS Bed Turnover Reduction: DEFINE

EVS Room Turnover Time Reduction - Project Charter

Project Name	Room Turnover	Department	EVS, Facilities		Date Start / End	2/17-7/17		Status	
Project Sponsor	Carl Solomon and Margaritta Baggett	Team Members	Carl Solomon	Landon				On Track	
Project Leads	Kelvin, Geoffrey, and Landon		Blanca D.	Kelvin					
Lean Facilitator	Melinda Hudson		Toranda						

Situation / Problem Statement	Improvement Measures			Timeline			
	Metric	Current	Target	Activity	Due	Who	Status
Evs staff not able to meet room turnover demand in appropriate amount of time during their shift. Nursing and NHS feel patients are waiting for available beds.	Room Turnover Time (mins) La Jolla	60	75	Process map	March	EVS team	100
	Room Turnover Time (mins) Hillcrest	52	60	Audit transport prob	March	Nursing Work Group	2

Background & Benefits	Goals/Objectives	Risks & Mitigation Strategy
Patient able to be roomed quicker. Benefit to staff- improved employee ergonomics and morale.	Improve multidisciplinary communication. Reduce waste in turnover process to improve turnover times closer to national benchmark.	Notify unions of bed stripping responsibility for Nursing and EVS. Reached out to other UC campuses who have this shared responsibility between those two departments.

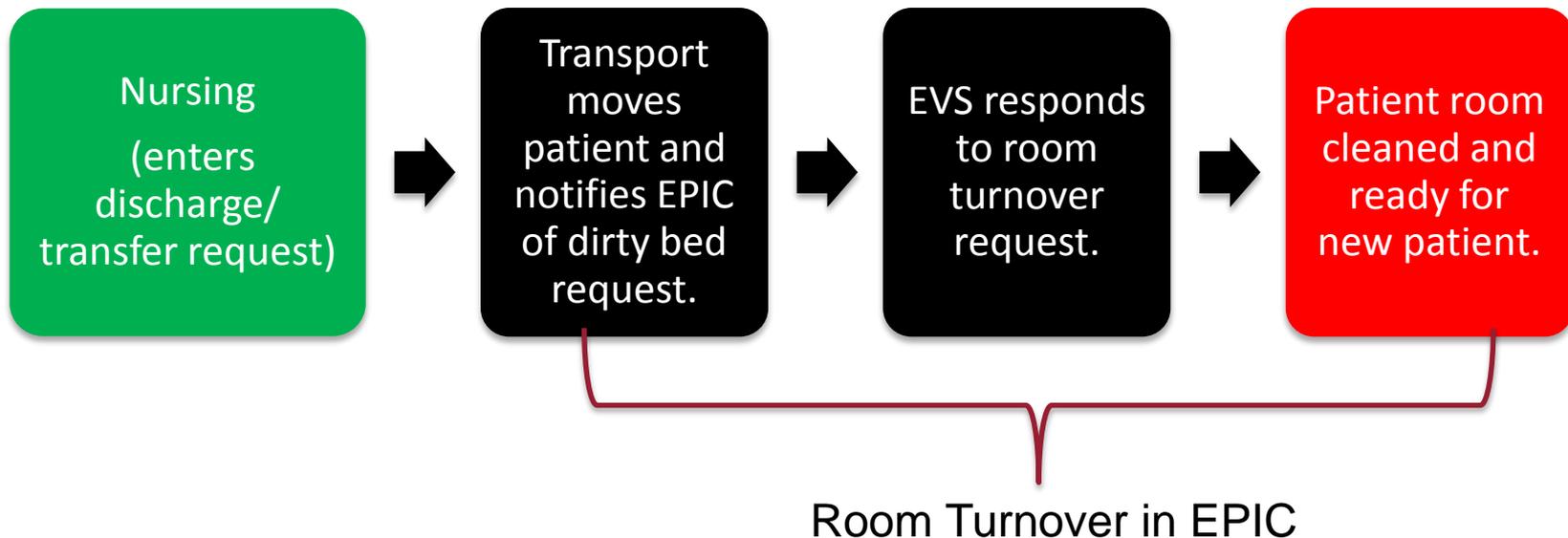
Scope	Constraints / Assumptions	Next Steps
From the time that a nurse discharges a patient to the time the room is marked clean in EPIC for the next patient.	Bed stripping owned by Nursing Department. It is a large root cause to delaying EVS start times.	Quarterly Report to Nursing Exec team about turnover times. Maintain Weekly Status Report on turnover times, by stage.

It was important to have a clear problem statement and scope defined by various stakeholders.

The problem statement:

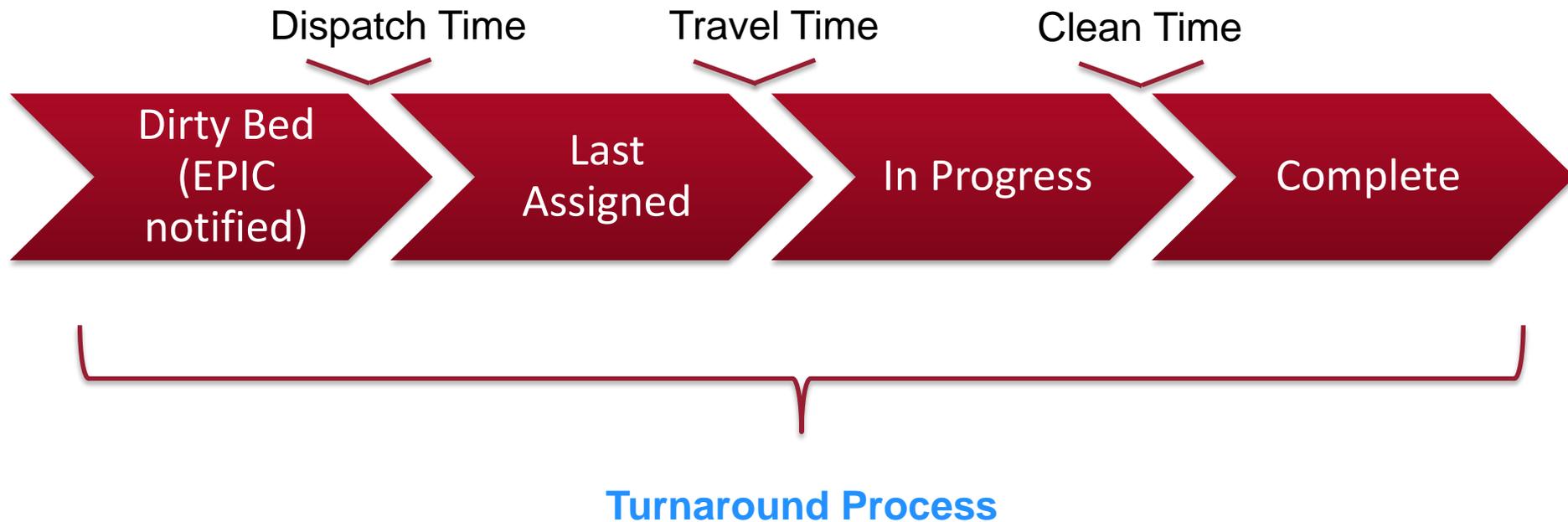
- Inpatient rooms were being turned over too slowly, which could lead to a downstream effect of not being able to admit patients in a timely manner
- EVS staff did not have a formalized process for how to handle STAT requests with their current staffing model
- Poor communication between multidisciplinary departments regarding the room turnover process

The scope of room turnover is from when nursing requests a discharge/transfer order in EPIC to when the room is marked cleaned/complete in EPIC.



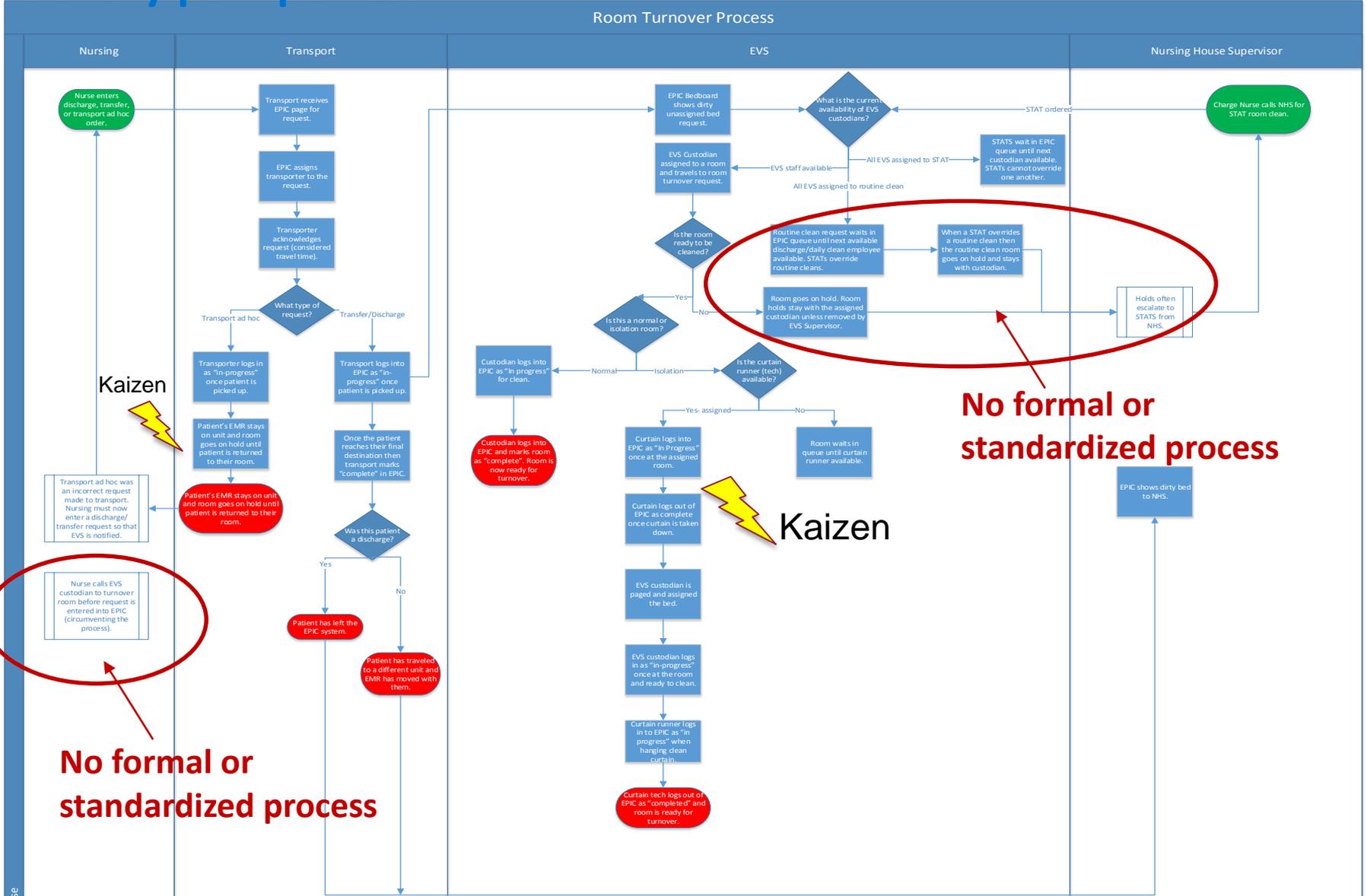
Terms for this project were uniformly defined for all three departments: EVS, Patient Flow, and Nursing

In EPIC, Turnaround = dirty unassigned bed to cleaned bed



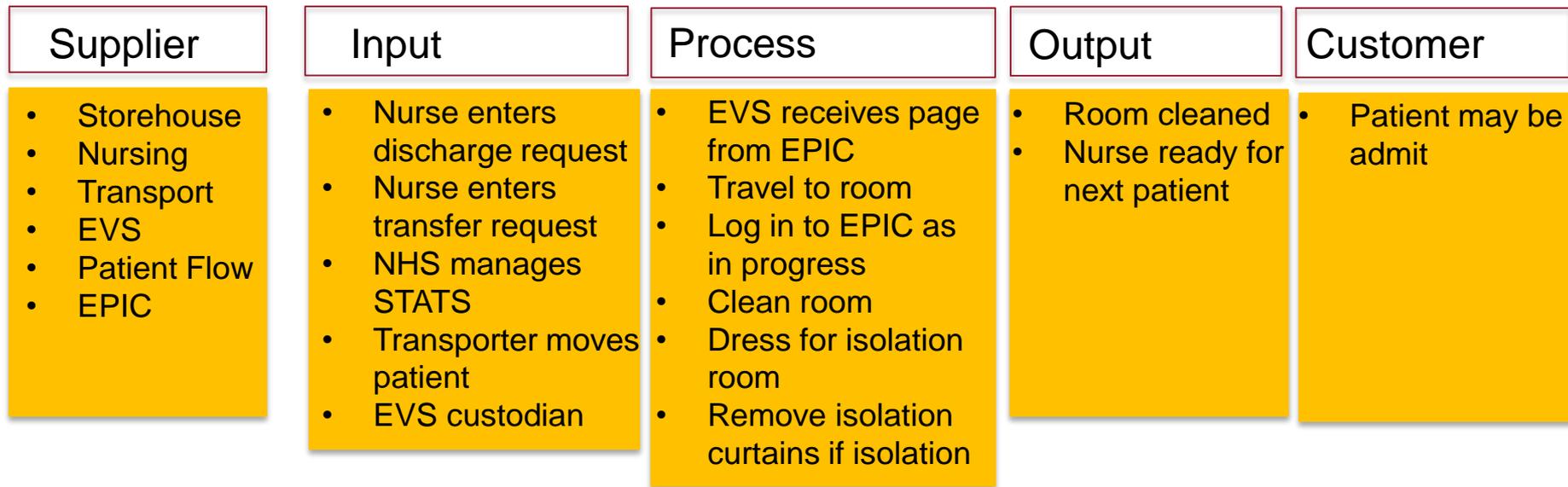
EVS Bed Turnover Reduction: MEASURE

Stakeholders created a current state room turnover process map to identify pain points.



Our team used various tools to measure the complexity of the process.

SIPOC



The team established baseline metrics and compared them to other UCs and industry standards. Routine Clean times were drilled down into by shifts.

Location & Shift	Routine Clean Turnaround Time in Minutes
CVC	52
Day	49
Evening	58
Overnight	52
Hillcrest	67
Day	55
Evening	76
Overnight	72
JMC	79
Day	69
Evening	88
Overnight	77

Location & Shift	Routine Clean Turnaround Time in Minutes
Thornton	58
Day	57
Evening	61
Overnight	41
Total	65

Key Takeaways:

- Routine cleans took 67 mins. for Hillcrest and 63 mins. for La Jolla.
- These averages were higher than industry standards.
- Evening shifts had the highest turnover times

In order to continue to track our progress we created a measurement tool that was sent to all key stakeholders.



EVS Weekly Dashboard

Hillcrest Summary - Normal

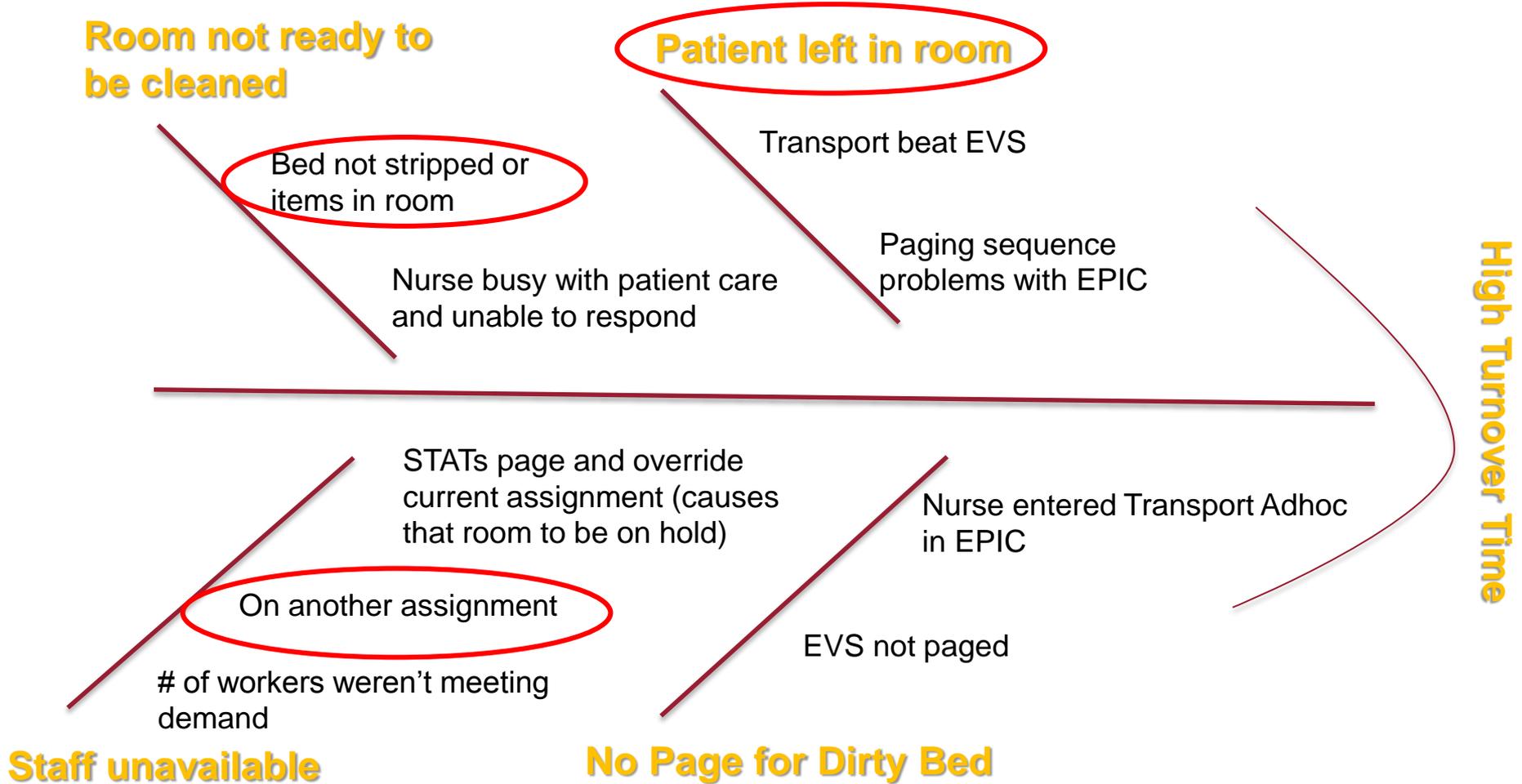
	8/27/2017	9/3/2017	9/10/2017	9/17/2017	9/24/2017	10/1/2017	10/8/2017	10/15/2017	10/22/2017	10/29/2017		Feb to Date	Baseline	Goal
Average Daily Requests	66.43	63.57	59.43	65.43	66.00	63.00	70.57	64.57	67.00	59.00		65.72	65.79	
Average Daily Holds	5.14	2.86	1.57	2.71	6.29	3.71	3.29	2.43	3.86	4.86		4.74	6.21	
Percent Stat Requests	9%	4%	9%	9%	12%	8%	10%	11%	11%	14%		11.77%	20%	15%
Percent Next Requests	0%	3%	0%	0%	1%	0%	0%	0%	0%	1%		0.62%	1%	
Average of Notify to Last Assign	17.58	19.12	17.98	24.53	23.13	21.50	22.86	21.94	16.85	15.70		21.70	39.78	30
Average of Last Assign to In-Progress	7.63	7.89	9.21	7.85	8.42	8.26	9.42	8.46	8.46	8.68		8.32	8.80	10
Average of Turnaround Time	49.44	51.82	51.95	57.24	56.62	55.09	54.32	53.93	49.95	49.12		53.84	69.71	60
Average of Cleaning Time	24.73	25.35	25.43	25.41	25.69	25.89	22.56	24.08	25.20	25.56		24.45	21.85	30
Average of Stat Turnaround	35.11	37.31	38.70	45.44	41.91	40.72	35.58	41.62	42.31	40.60		42.33	49.07	45

Highlights volume, daily vs. stat cleans and breaks down various steps in process to identify areas of opportunity

Compared results to date to baseline

EVS Bed Turnover Reduction: ANALYZE

We created a fishbone diagram to identify root causes and asked the 5 Whys for each.



Our team was able to prioritize the top problems contributing to the root causes.

EVS

42% Working on another request

17% Assigned another request in same room

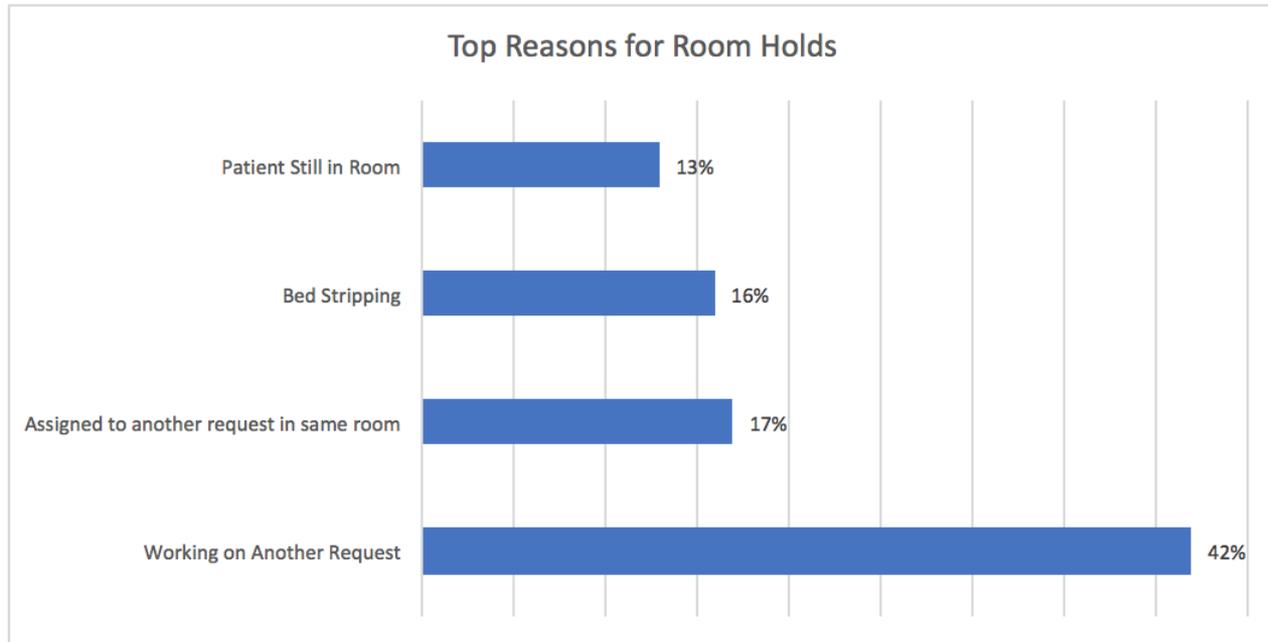
Nursing

16% Bed Strip

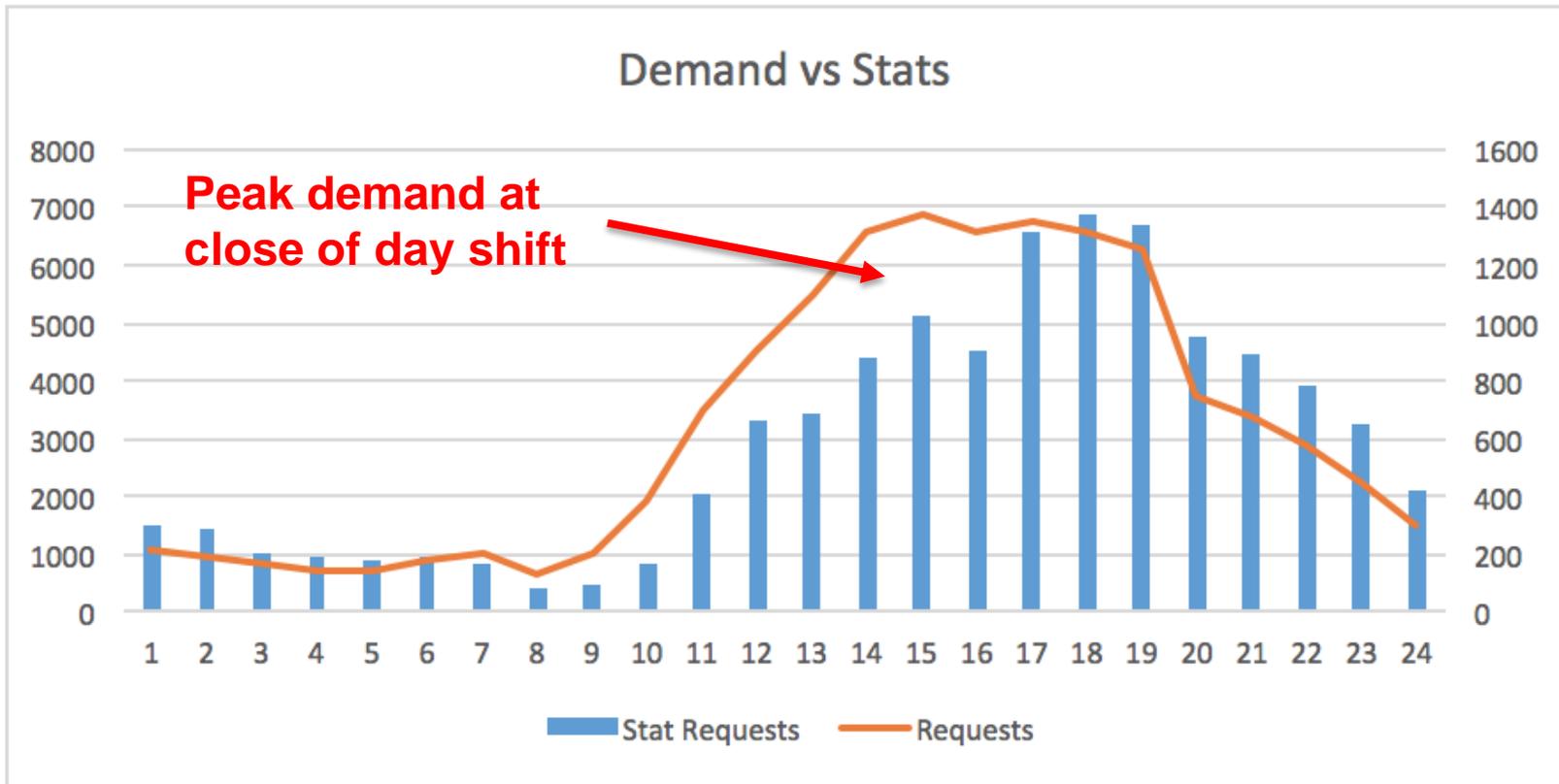
Transport

13% Patient Still in Room

Top Reasons for Room Holds

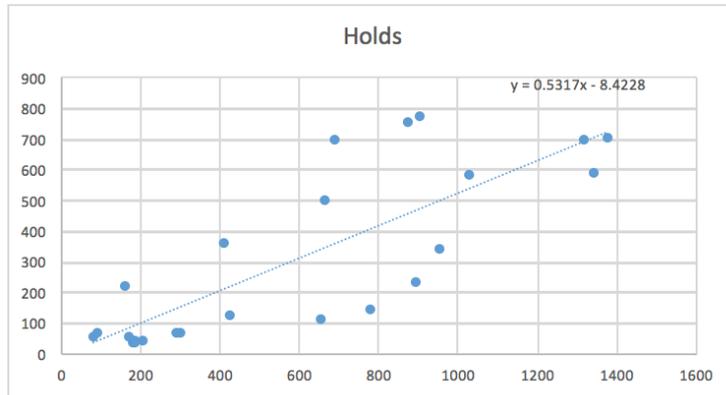


An analysis was completed regarding supply and demand. We found that STATs caused a problem with staff's ability to be available.

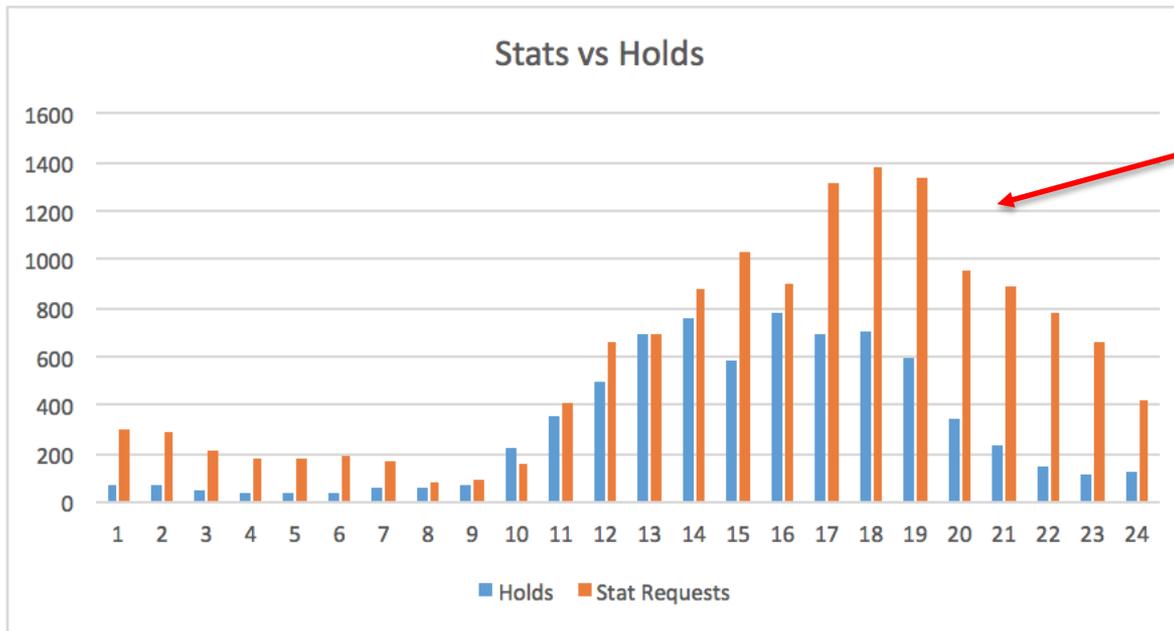


- During handoff between the day and evening shifts, the peak demand time was around 3:00 p.m. Unmet requests were inappropriately being escalated to STATs, which caused further confusion among staff.

STATs led to room holds, which slowed down the process. Often room holds became ordered as STATs. That was a cyclical pain point in the process.



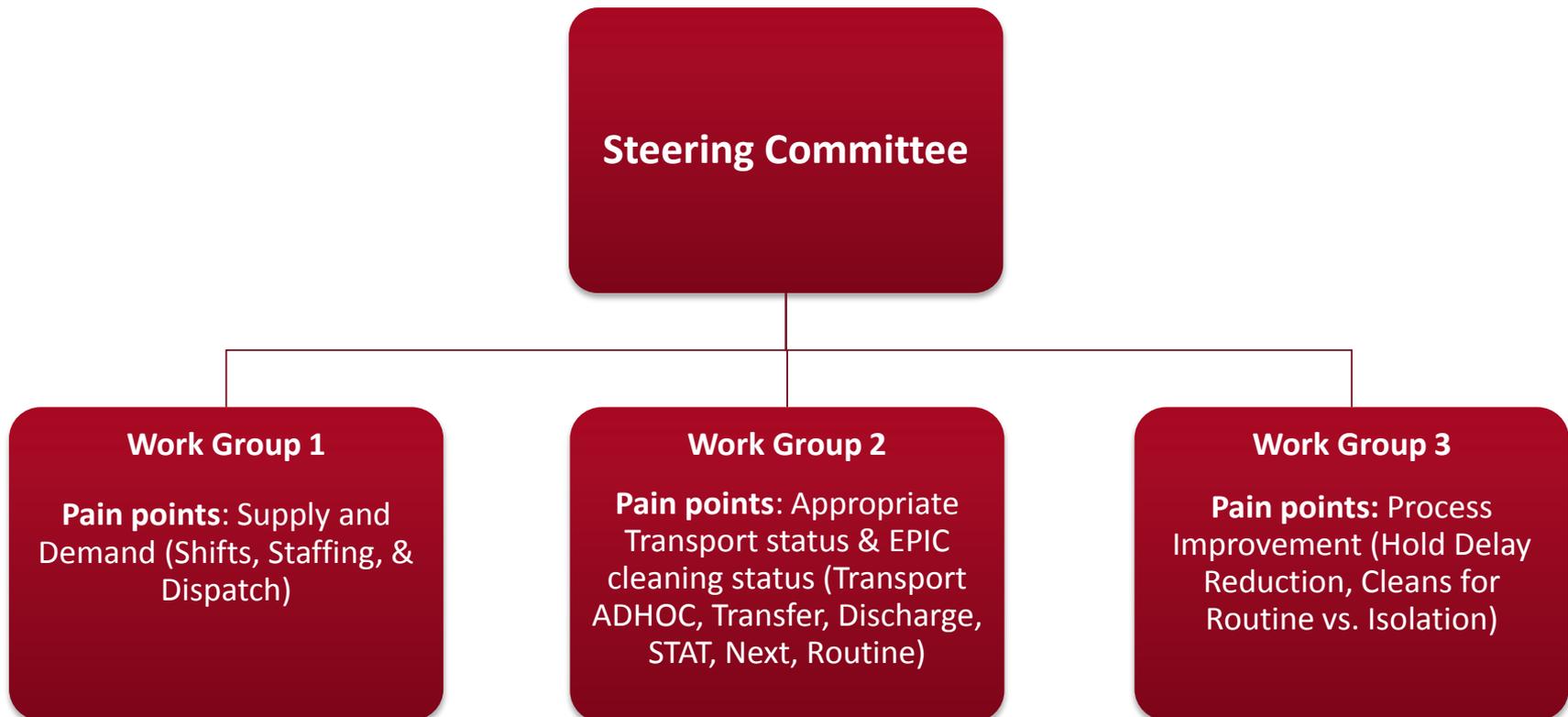
Correlation between STATs and Holds



STATs are overused

Work groups were broken out by pain point topics that were discovered during the team's analysis.

- This work group structure encouraged standardization among different locations by having multidisciplinary teams address issues across the entire health system.



EVS Bed Turnover Reduction: IMPROVE

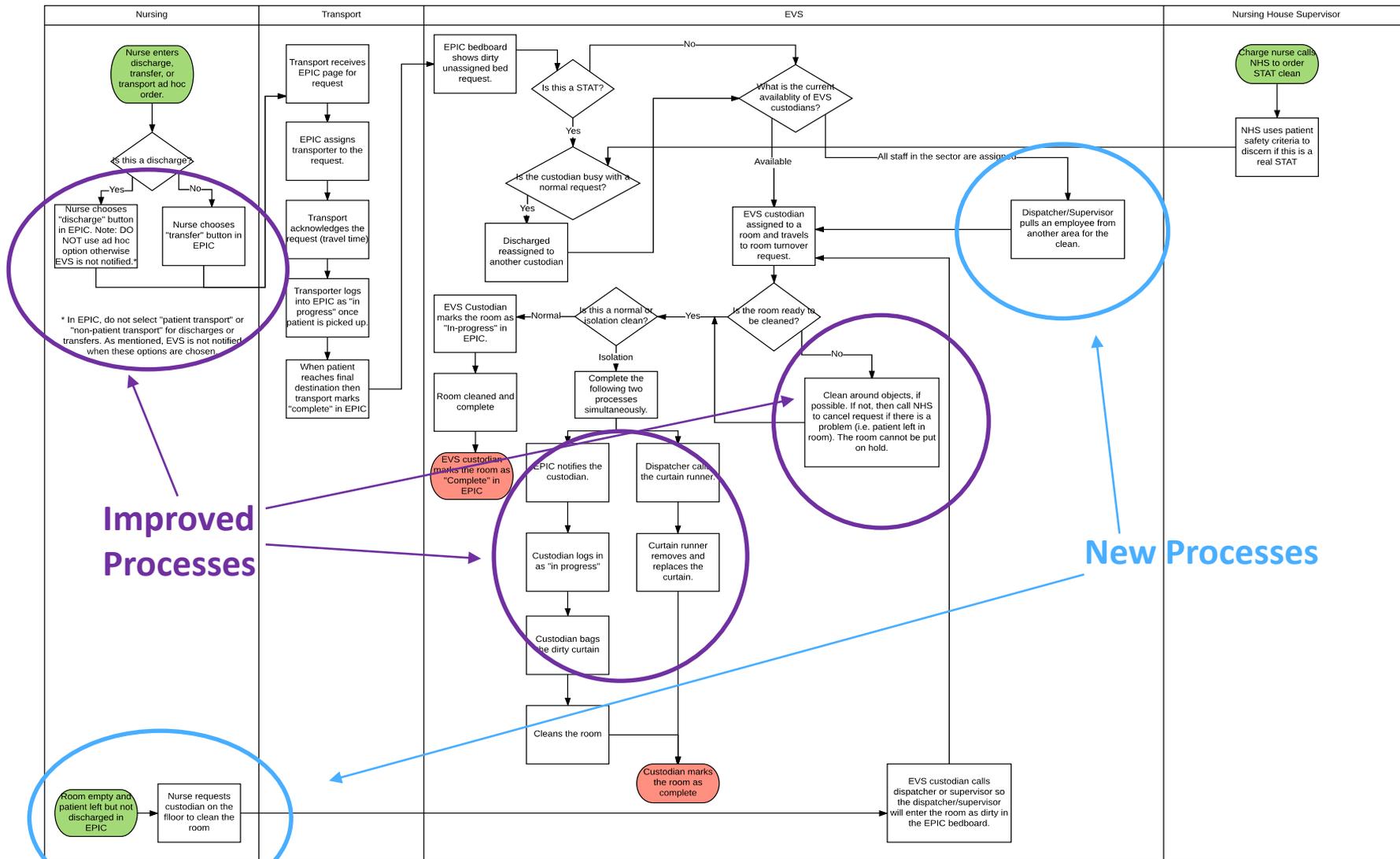
The work groups helped EVS, Nursing and Patient Flow implement the following improvements.

1. UCSD Health notified labor unions that EVS would help Nursing with bed stripping
 - This removed a root cause contributing to clean delays
2. Cross trained EVS custodians to better meet demand during peak times.
3. Streamlined the cleaning process for isolation rooms- the team removed non-value added steps regarding curtain removal and replacement.
4. Nursing directors and managers re-educated the nursing units about how to request transfers and discharges in EPIC so that EVS is always notified

New Current State Process Map

CURRENT STATE ROOM TURNOVER PROCESS

Melinda Hudson | October 16, 2017



Overall, we saw progress in reducing our routine clean times since the project began in Feb. FY17.

EVS plans to improve CVC and Thornton times by adopting some of Hillcrest's best practices.

Routine-room turnover time averages by month							
Location:	Baseline	February	March	April	May	June	July
Hillcrest	70	64	52	57	53	50	50
CVC	59	57	60	67	65	62	63
JMC	79	77	81	70	69	64	70
Thornton	68	65	75	74	65	62	65
Goal (Hillcrest, Thornton, CVC)	60	60	60	60	60	60	60
Goal (JMC)	75	75	75	75	75	75	75

*Baseline pulled post JMC opening in Nov. FY17 - Jan. 29 FY17

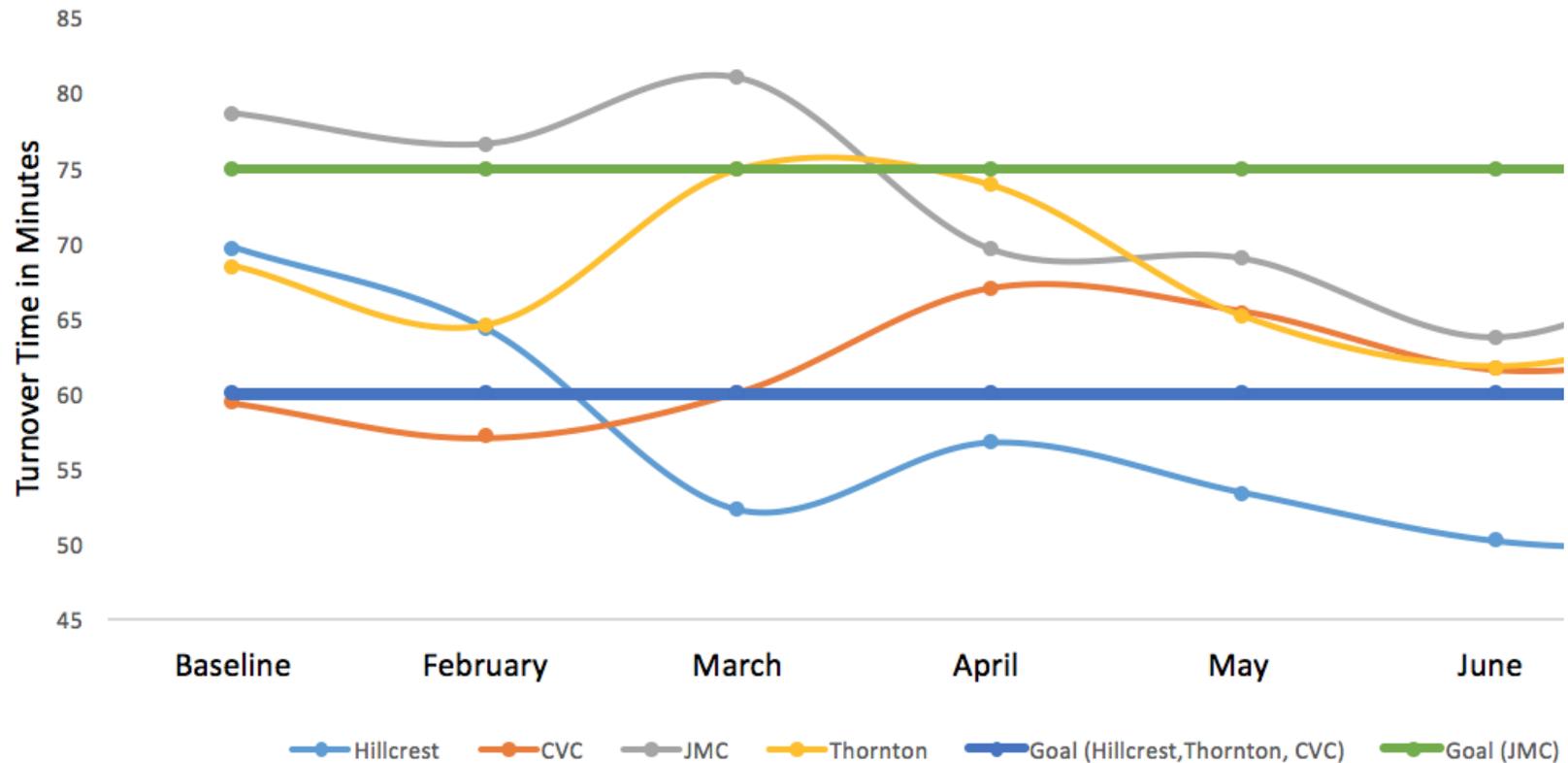
Isolation-room turnover time averages by month							
Location:	Baseline	February	March	April	May	June	July
Hillcrest	83	81	69	71	70	68	66
CVC	72	64	77	79	93	77	95
JMC	92	105	101	117	91	91	92
Thornton	79	73	91	95	75	76	83
Goal (Hillcrest, Thornton, CVC)	75	75	75	75	75	75	75
Goal (JMC)	95	95	95	95	95	95	95

*Baseline pulled post JMC opening in Nov. FY17 - Jan. 29 FY17

Hillcrest Best Practices:

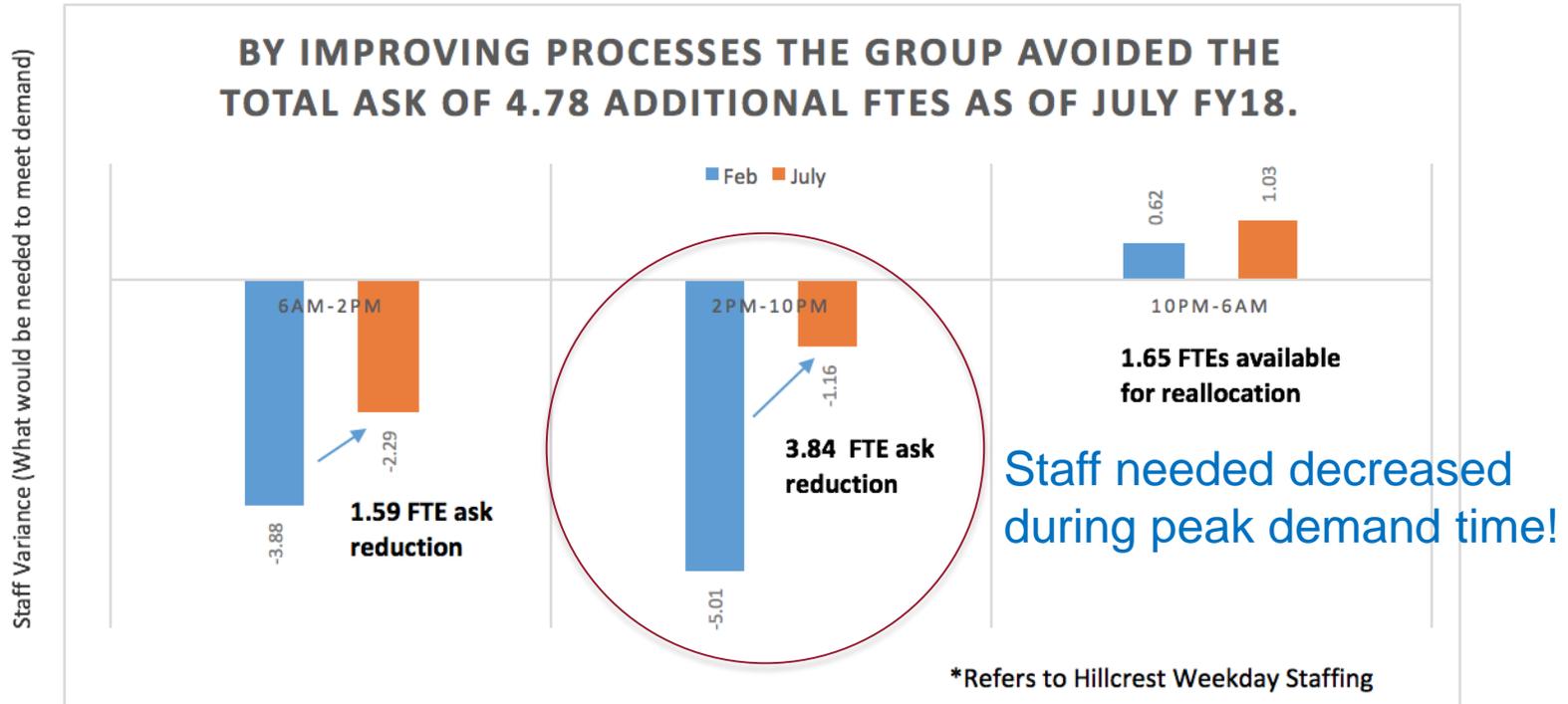
- Cross train and pull daily clean or police employees whenever necessary.
- Don't allow EPIC to impede work flow. Empower staff to begin working on a room as soon as possible.
- Managers should consistently be monitoring the board to resolve potential dispatch problems.

Routine Clean times are meeting or trending towards goal times.



The group revisited the initial FTE request from Feb. and found an overall decrease in staff needed to meet the demand due to improved processes and productivity.

Month	Shift	Current Staffing	Staff Needed	Staff Variance
July	6AM-2PM	0.25	2.54	-2.29
	2PM-10PM	4.63	5.79	-1.16
	10PM-6AM	1.88	0.84	1.03
Feb	6AM-2PM	0.25	4.13	-3.88
	2PM-10PM	4.63	9.63	-5.01
	10PM-6AM	1.88	1.26	0.62



Take away: there was a cost avoidance of \$286,800 (4.78 FTEs X \$60,000 annual custodian salary, including benefits)

EVS Bed Turnover Reduction: CONTROL

To maintain progress, room turnover stakeholders implemented the following controls and new processes.

1. Removed the “hold” function from EPIC. Created a process for EVS staff and the Nursing House Supervisor to communicate the immediate need rather than putting a room on hold
2. A weekly dashboard continues to be sent to EVS from the Patient Flow Department that shows turnover times during the different stages of the processes by location.
3. Quarterly calls are held between the Patient Flow, Nursing and EVS Departments to monitor turnover times.

Tips & Tricks

When identifying solution strategies...

Considerations:

- Eliminate the variable
- Automate the variable
- Standardize the process
- Education/Training

Strongest



Weakest

Some problems are “Just Do Its”

Some solutions are clearly just MANAGEMENT DECISIONS.
Don't force the use of tools when it's not appropriate!



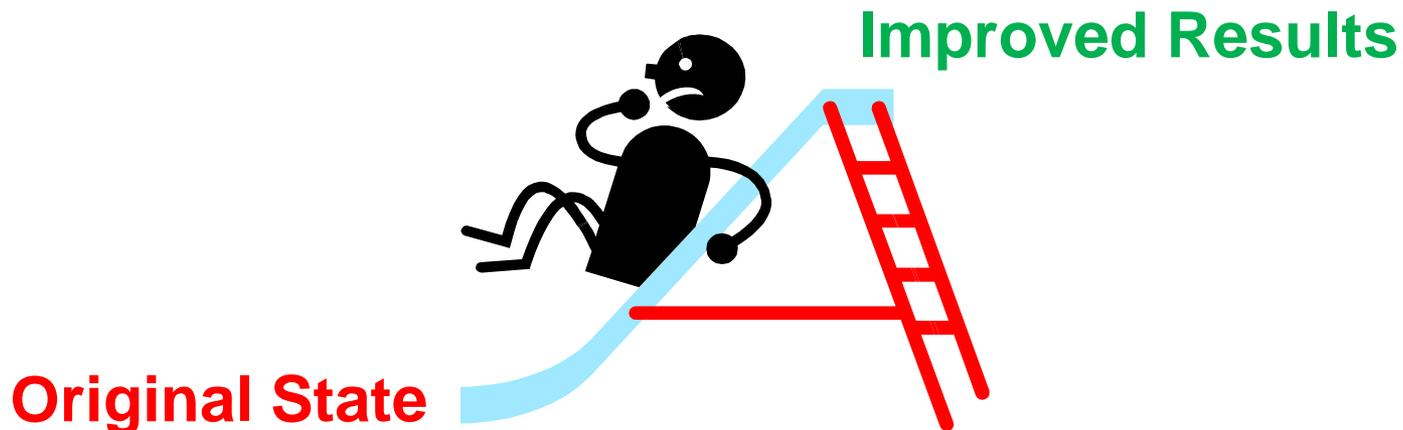
Consider Using Change Management

Control plans are very important!

Most important phase of DMAIC is CONTROL

- This is the difference between Lean Six Sigma and other “flavor of the month” fixes

“Maintain the gains”



What Leads to Control Breakdowns?

- Lack of clear accountability
- No formal handoff from LSS expert to identified Process Owner
- Not establishing data gathering plan for key project measure and/or project benefits after project has concluded
- No formal reporting process once the project ends. Includes reviewing dashboard on a regular basis

***Don't fall
short during
the handoff
process!***



Go See Think Do is a quick and easy to learn tool that can be used to solve everyday problems

Go See Think Do



No formal project charter

Triggered by day to day problems/events

Perfect tool for launching an individual quality improvement project

Triggered by gaps from shiftly and daily measures e.g.

- Uncommon occurrences
- Safety or quality events
- Equipment breakdowns
- Other non-conformities

Lead by almost anyone

Short duration (1 hour to 2 weeks)

A small group of frontline staff coming from the same team or cross functional team

DMAIC



Has formal project charter

Triggered by recurring issues, trends or escalated problems and planned through the improvement routine

Triggered by gaps from weekly and monthly measures

Possible sources of project identification include:

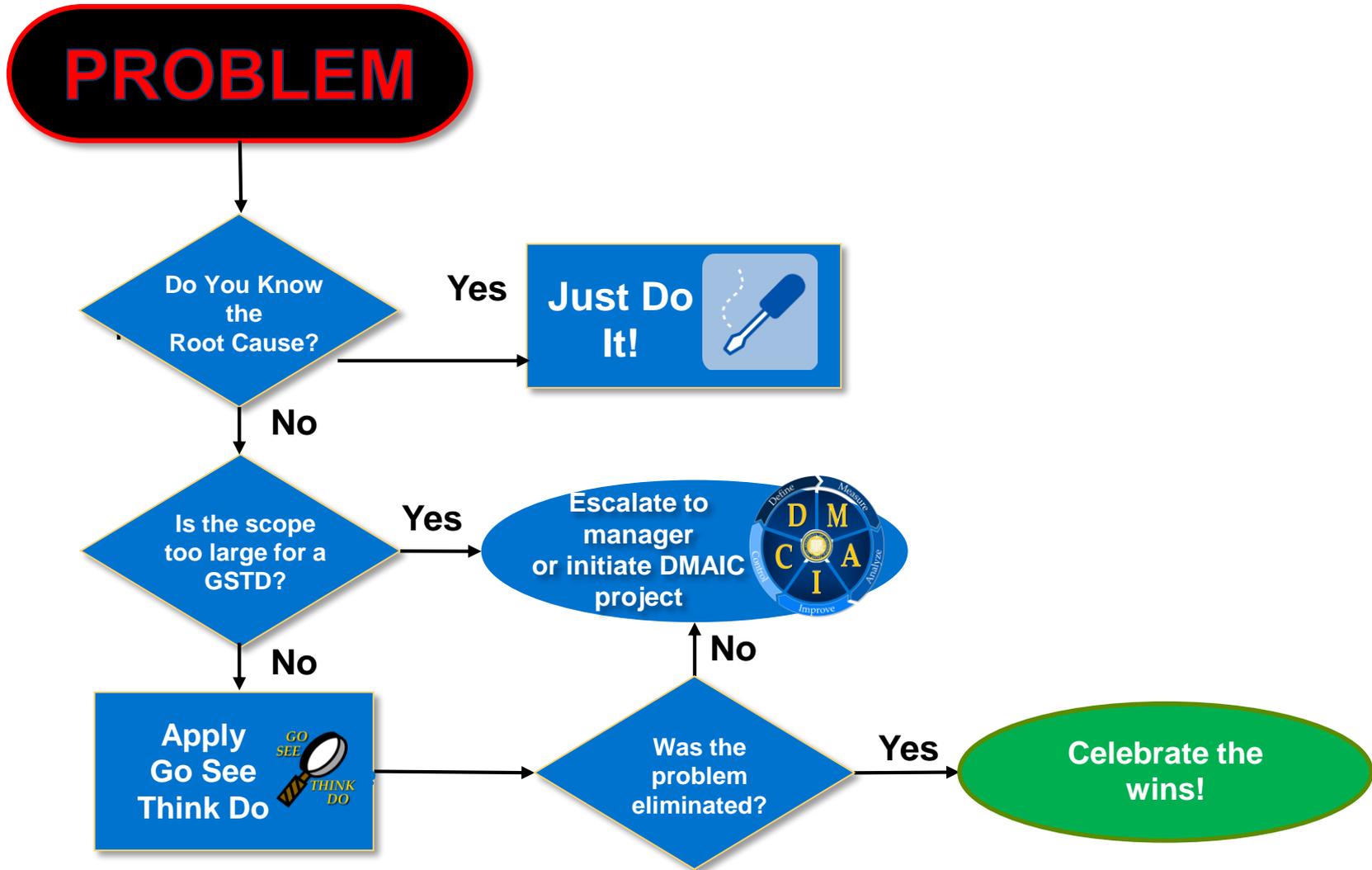
- Hospital priorities as identified by ELT
- Operational Executive Steering Committee
- Recurring problem that impacts specific area

Lead by certified Black & Green Belts

Long duration (approximately 3-6 months)

Always a cross functional team of frontline staff

When to use a GSTD



Purpose and Outputs

Purpose:

- Understand the problem

Output:

- Problem area pinpointed
- Goal is defined
- Process is mapped

1

Purpose:

- Brainstorm root causes & validate with data when appropriate

Output:

- Verified root causes

2

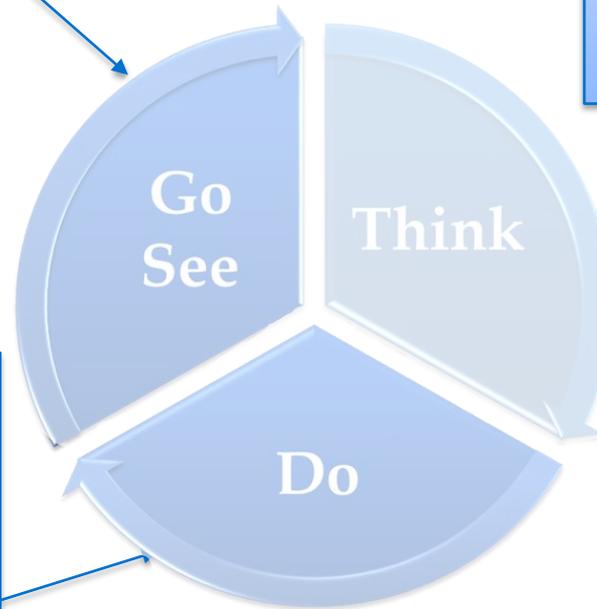
Purpose:

- Implement and standardize solutions

Output:

- Actionable solutions identified and implemented
- Results positively impacted
- Standard created or updated

3



Go See Think Do – Form

UC Irvine Health **Go See Think Do**
Everyday Problem Solving

Yellowbelt: _____ Process Owner: _____ Date Started: _____
Candidate: _____
Team Membership: _____
(list names & titles)

What areas are impacted? (check all that apply) Quality & Safety Patient Experience Waste Reduction Throughput/Capacity

PROBLEM STATEMENT:
Template: From DATE-DATE, the UNIT/AREA experienced a BASELINE METRIC (i.e. problem) resulting in DESCRIPTION OF IMPACT to UC Irvine.

GOAL STATEMENT:
Template: Reduce METRIC from BASELINE to GOAL by DATE

Go See

Process Map _____
Outline Process, Information, Material, and/or Patient Flow

THINK

Think

Fishbone Diagram
Brainstorm Potential Root Causes, then circle the causes that require verification

Potential Causes (K, X, X, etc.)

PEOPLE (Client & Non-Client) PATIENTS

Effect

Project Problem (Big Y)

PLACE (Environment) PROCESS

UC Irvine Health **Go See Think Do**
Everyday Problem Solving

Think

Data Collection: Dig Deeper to Find the True Root Causes (Attach graphs when applicable)

Ref #	Question to Answer <i>(Phrase from root causes identified on Fishbone Diagram)</i>	Sample Size <i>(# or Date)</i>	Who Collects	Tools to Use <i>(e.g. bar graph, line graph, pareto)</i>	Stratification Variables <i>(if applicable)</i>	Was the Potential Cause Verified?
1						
2						
3						
4						

IMPROV STRAT

List of TRUE Root Causes <i>(Pull from Process Map, Fishbone Diagram, and Data Collection)</i>	Brainstormed Solution(s) for Solving Root Cause	Pros of Solution	Cons of Solution

IMPLEMENTATION & COMMUNICATION PLAN

Task to Implement Solution	Assigned To	Due Date	Task Status <i>(Red, Yellow, Green)</i>

Do

RESULTS

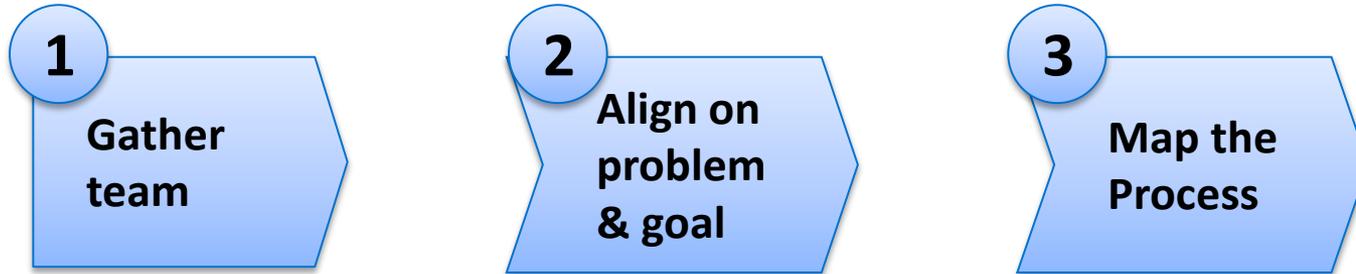
Metrics	
Project Baseline:	Insert baseline data from problem statement here
Project Goal:	Insert goal from goal statement here
Project Results:	Insert achieved project results here

Insert graph that illustrates your project results here. Donote pre vs. post implementation.

Control Plan

Metric <i>(Take weekly/quarterly/monthly/annual process capability)</i>	Frequency of Measurement <i>(e.g. hourly, daily)</i>	Who is Responsible for Measuring/Monitoring?	Metric Threshold for Taking Action?	Action To Be Taken <i>(e.g. Monitor, Adjust, Restart, etc.)</i>

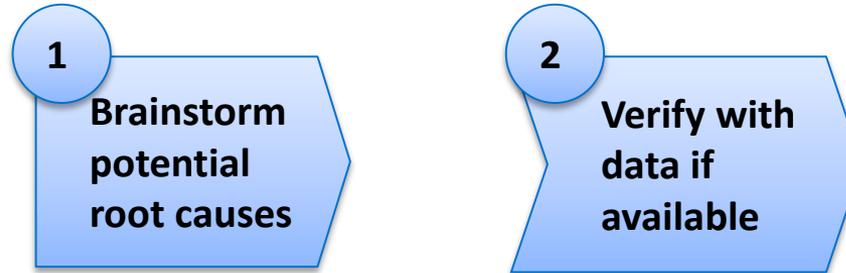
Step 1 - Outline problem & goal [Go See]



Objectives:

- Identify and assemble project team
- Build your focused problem statement (Use M.O.M.S Criteria)
- Align on your goal statement (Use a S.M.A.R.T Goal)
- Map the process
- Record observations seen at the site of the problem

Step 2 - Determine the Root Cause *[Think]*



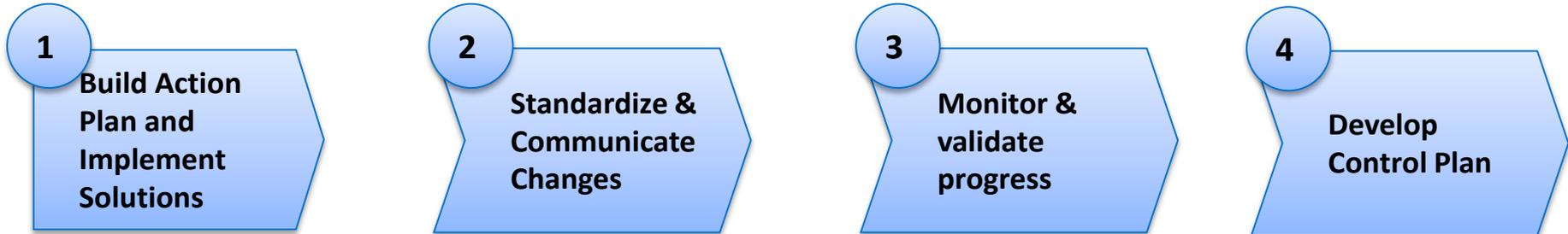
Objectives:

- Brainstorm potential root causes
- List and group similar potential causes in a clear and visual way

Tools to Use:

1. Brainstorming or Brain writing
2. Cause & Effect Diagram
3. Data Collection Plan

Step 3 – Implement the Solutions – [Do]



Objectives:

- Brainstorm solutions
- Weigh pros & cons for each solution
- Develop implementation/pilot plan
- Monitor results and validate goal was achieved
- Standardize, develop control plan, and hand off to process owner

Tools to Use:

1. Brainstorming or Brain writing
2. Implementation Plan
3. Communication Plan
4. Graphs
5. Control Plan

That's all Folks!

