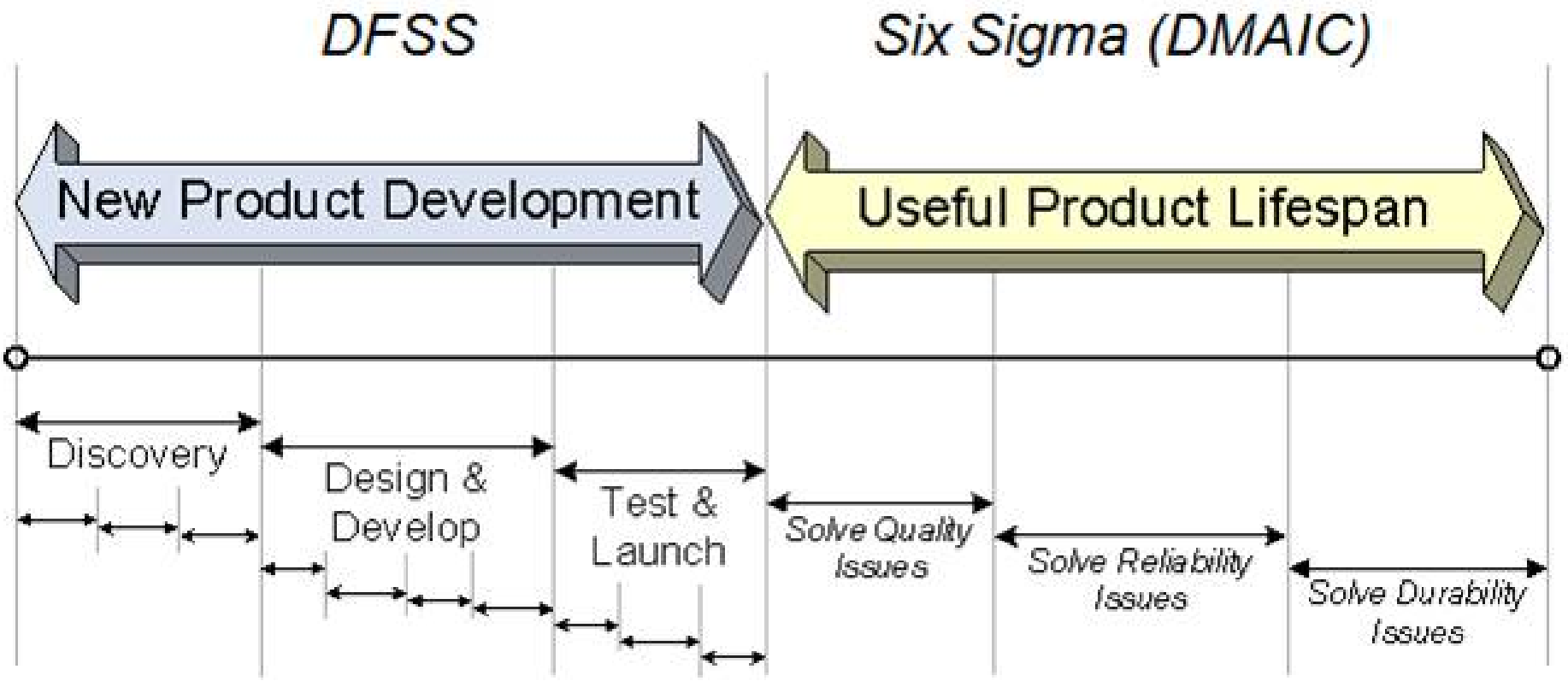
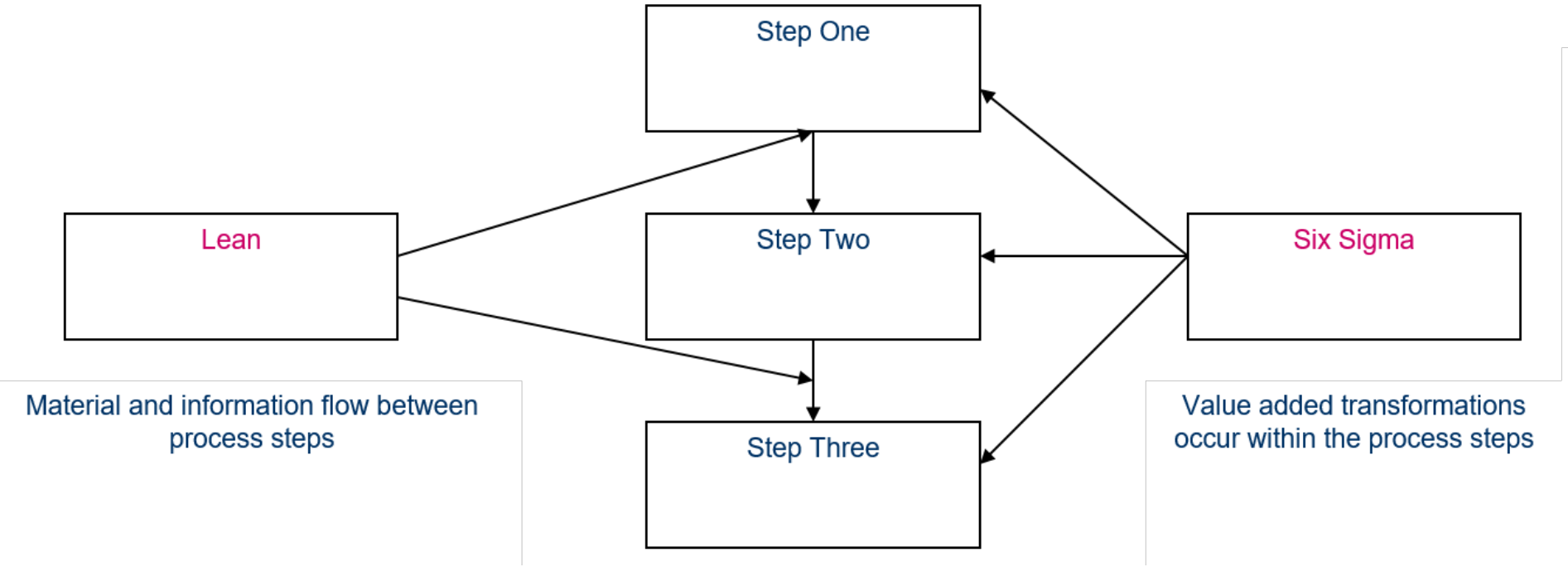
# Lean Six Sigma Project Examples

Henry Ford once said, *"Time waste differs from material waste because there can be no salvage."*

Six Sigma can be used in each stage of product development and implementation.



# Recall that Six Sigma focuses on reducing process variation



# Why 99% isn't good enough

| Example | 99% Good (3.8 Sigma) | 99.99966% Good (6 Sigma) |
|---|---|---|
| Unsafe drinking water per day | 14.4 minutes | 0.3 seconds |
| Electricity power failure per month (30 days) | 7.2 hours | 8.8 seconds |
| Severe turbulence on a 6 hour flight | 3.6 minutes | 0.1 second |
| Impurities in a kg of raw material | 10 grams | 0.0034 grams |
| Losses per $1,000,000 worth of business | $10,000 | $3.40 |
| Worker days lost per 10,000 employees | 100 man days | 480 minutes |

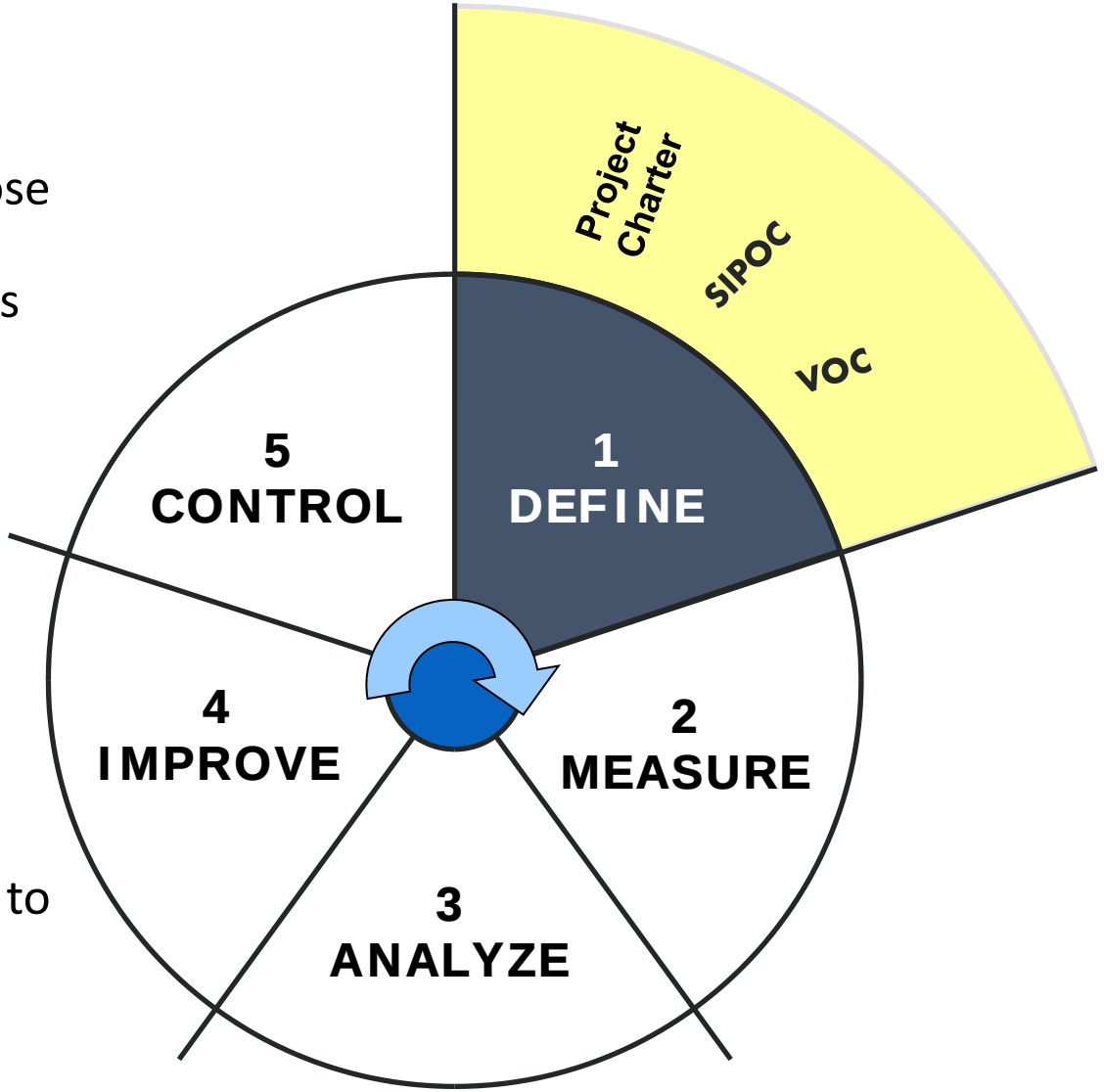
# Outline Step 1: DEFINE

*Goal*

- Define the project's purpose and scope and get background on the process and customer

*Output*

- A clear statement of the intended improvement and how it is to be measured
- A high level process map
- A list of what is important to customer



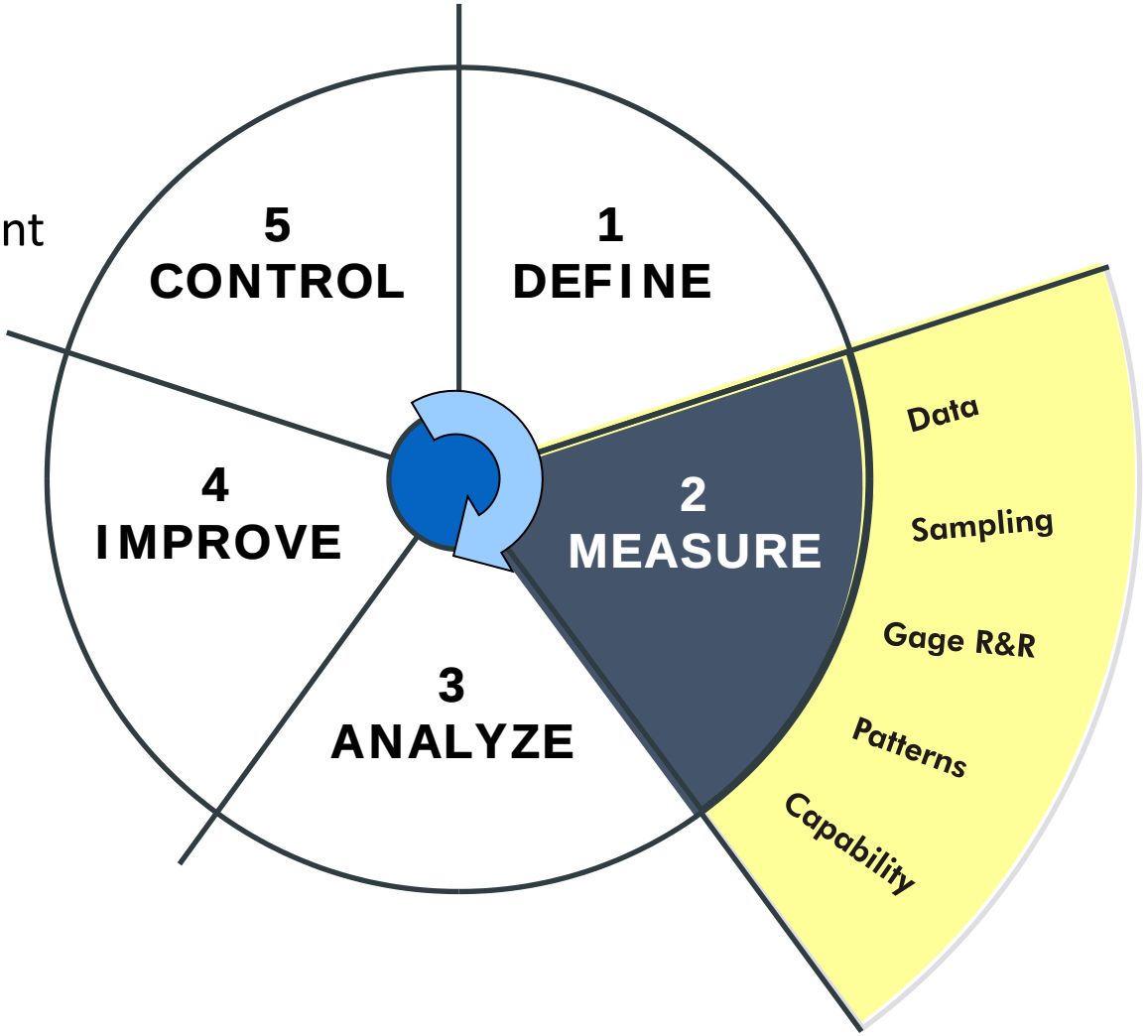
# Outline Step 2: MEASURE

*Goal*

- Focus the improvement effort by gathering information on the current situation

*Output*

- Baseline data on current process performance
- Data that pinpoints problem location or occurrence
- A more focused problem statement



# Outline Step 3: ANALYZE

*Ask*

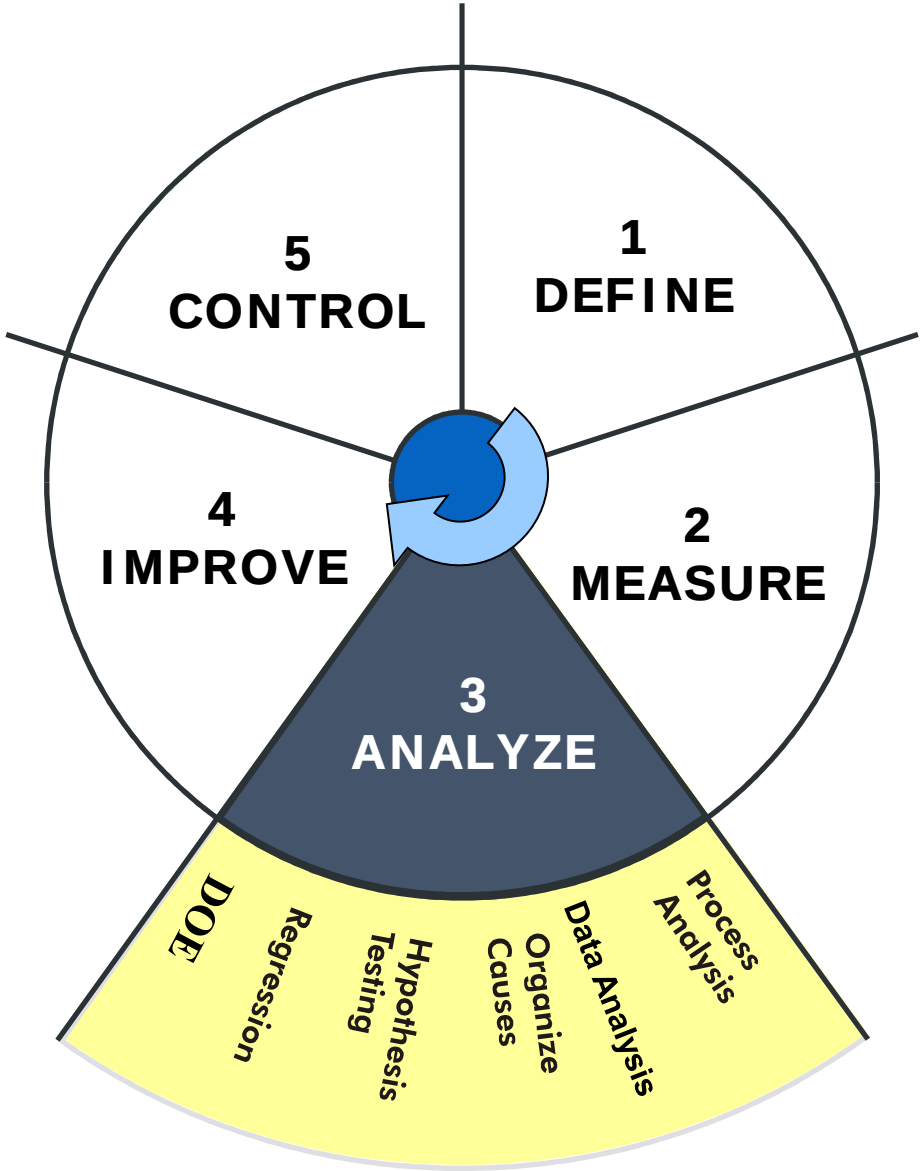
- What vital few process and input variables affect CTQ process performance or output measures?

*Goal*

- Develop theories of root causes
- Confirm them with data

*Output*

- A theory that has been tested and confirmed



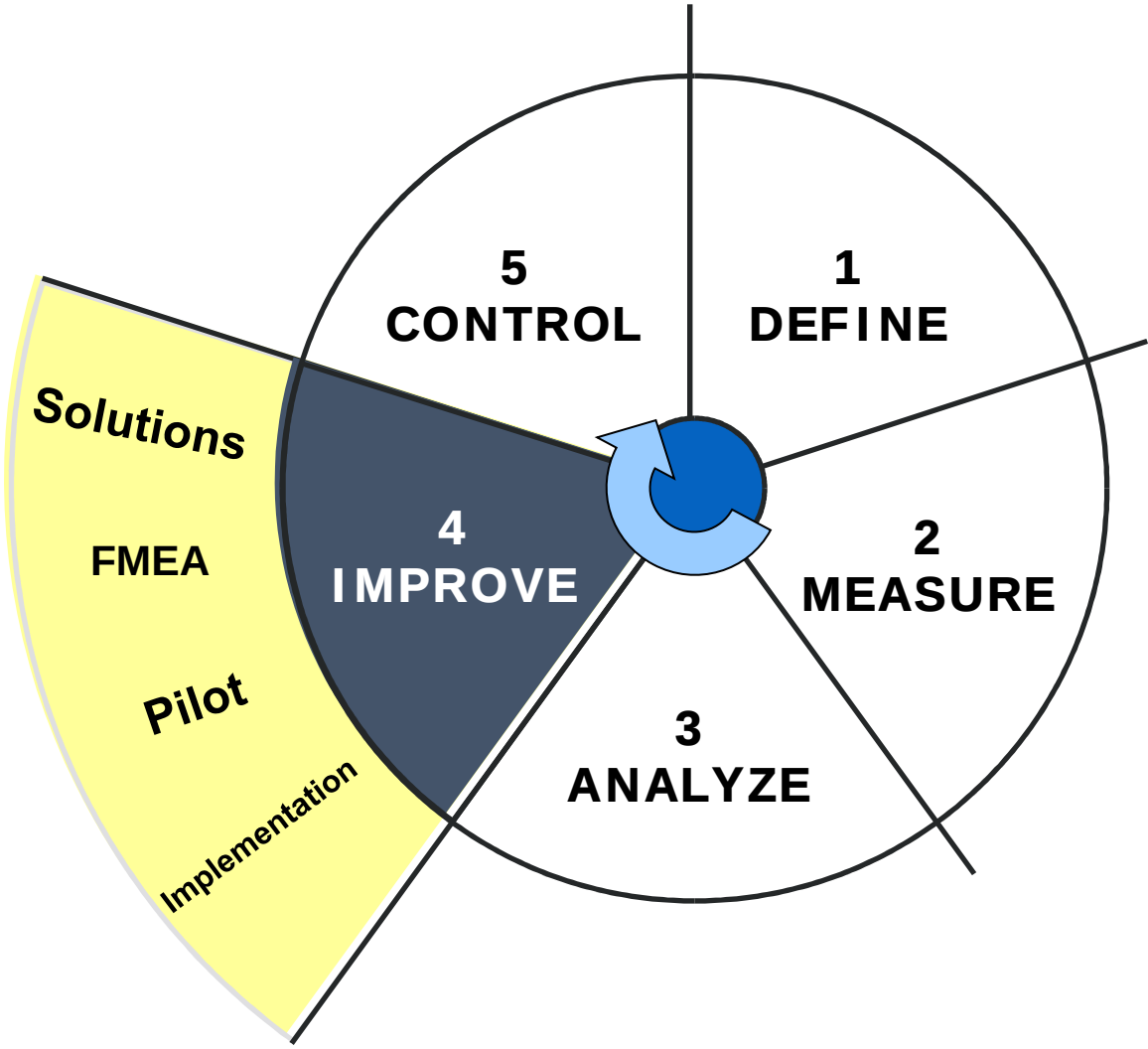
# Outline Step 4: IMPROVE

*Goal*

- Develop, try out, and implement solutions that address root causes

*Output*

- Planned, tested actions that should eliminate or reduce the impact of the identified root causes



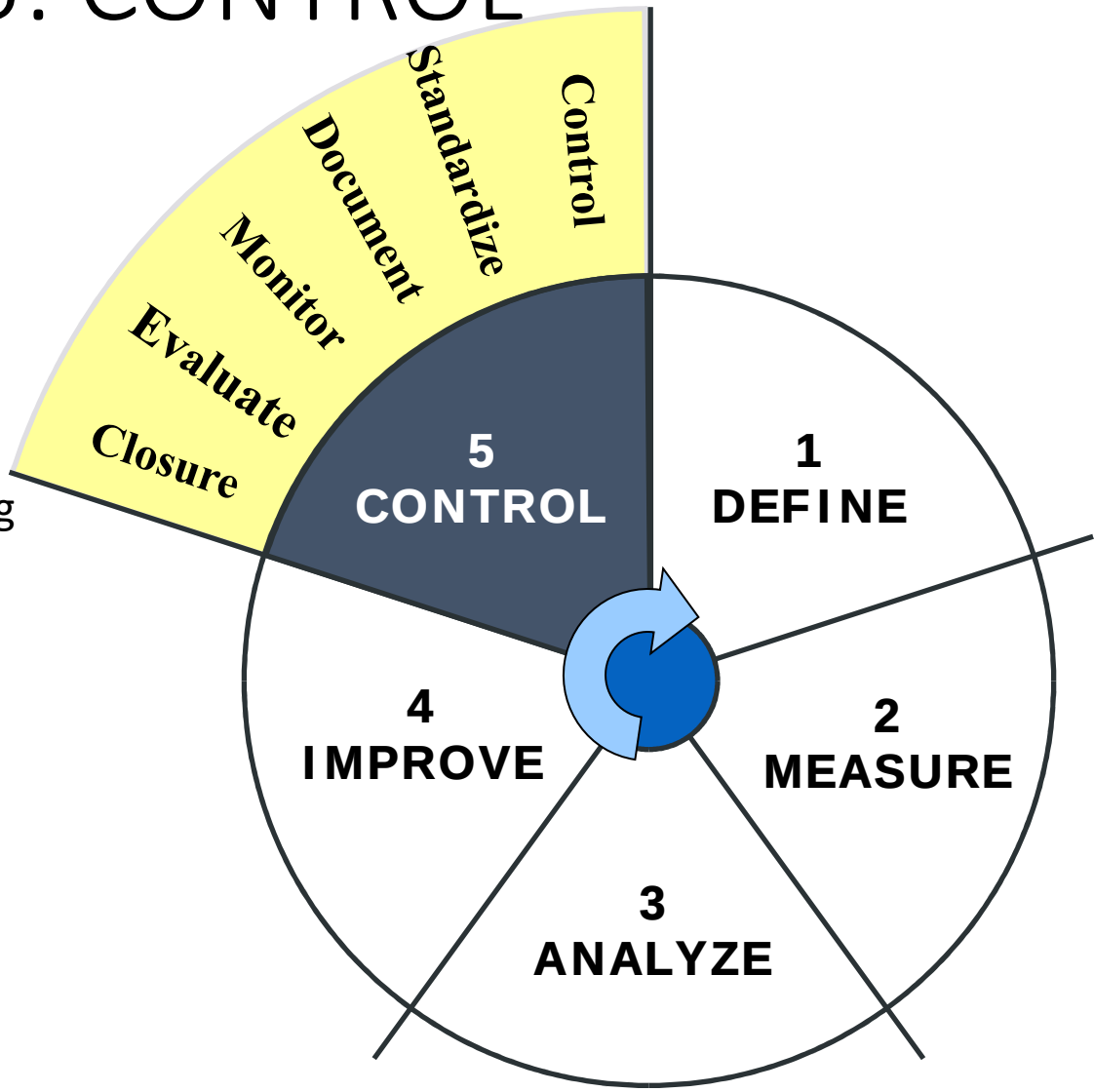
# Outline Step 5: CONTROL

## *Goal*

- Use data to evaluate both the solutions and the plans
- Maintain the gains by standardizing processes
- Outline next steps for on-going improvement including opportunities for replication

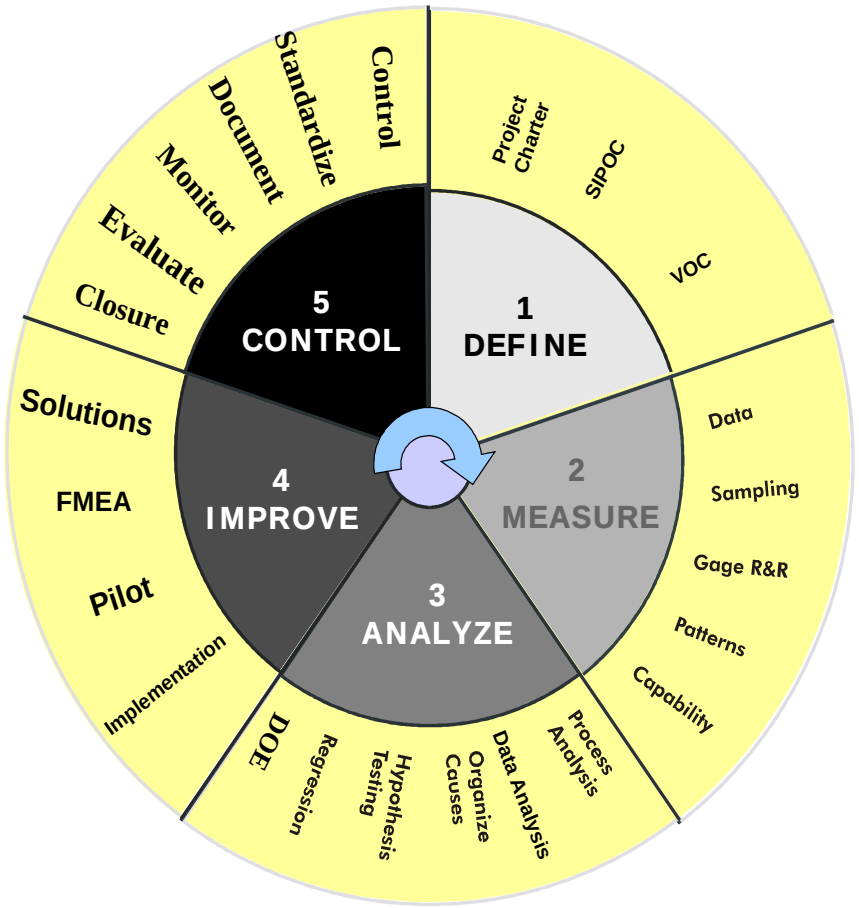
## *Output*

- Before and After analysis
- Monitoring system
- Completed documentation of results, learning's, and recommendations



# Lean Six Sigma in Healthcare

*Combining the <u>Quality</u> of Six Sigma with the <u>Process Speed</u> of Lean to drive improvement and achieve the best competitive position*

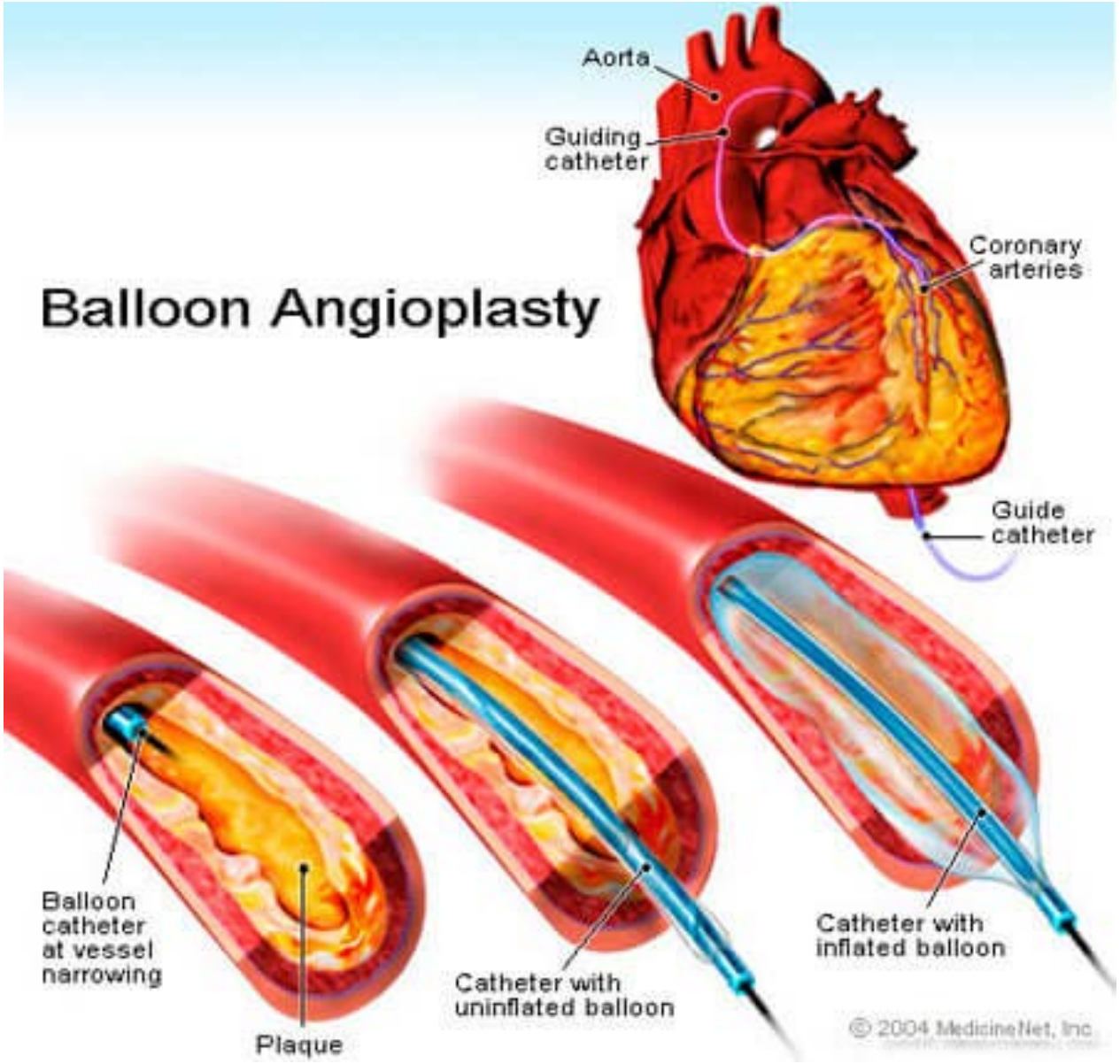


# Door to Balloon RIE

# Sample case study: Thrombolysis In Myocardial Infarction (TIMI)

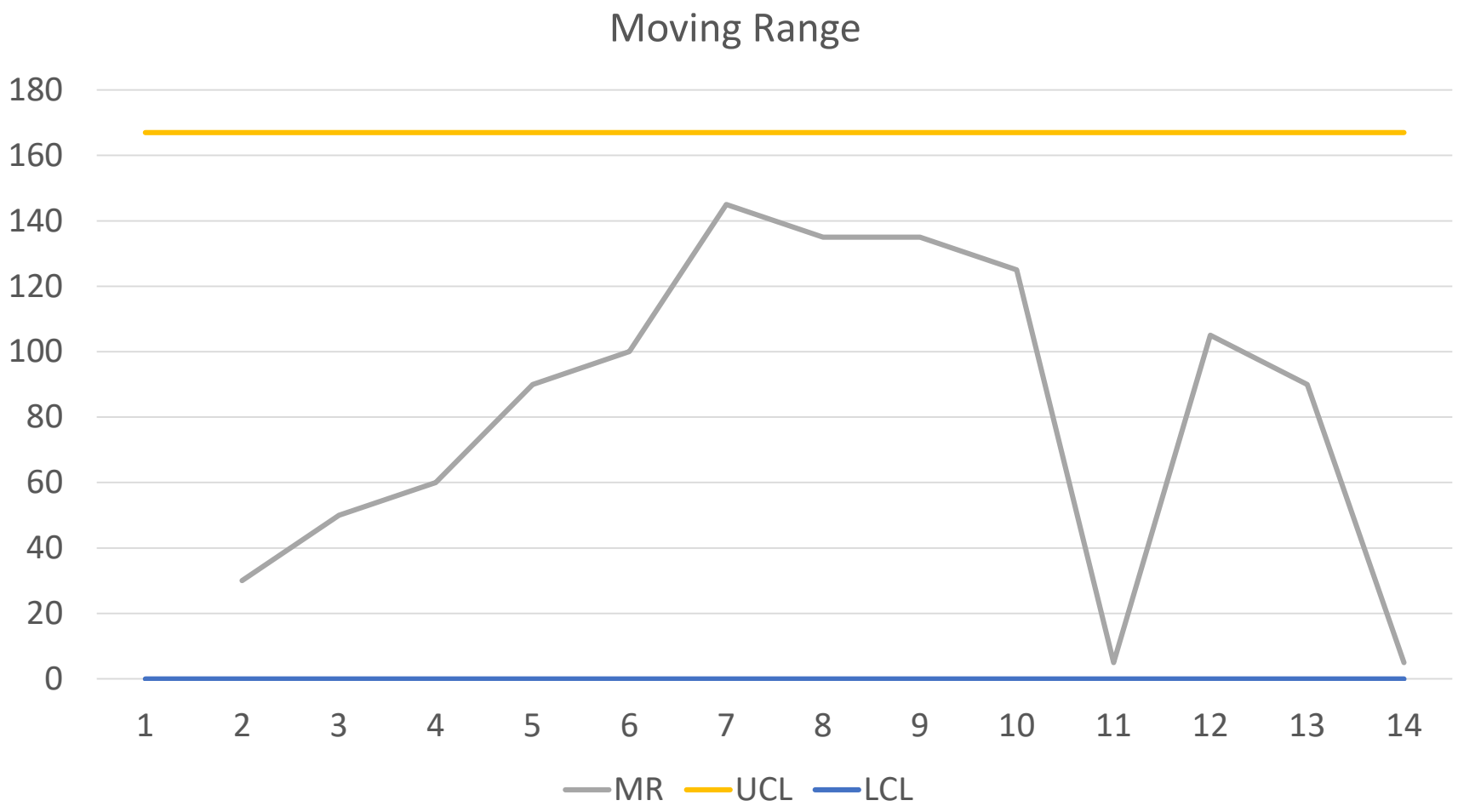
'TIMI Grade Flow' is a scoring system from 0-3 referring to levels of coronary blood flow assessed during percutaneous coronary angioplasty:

- TIMI 0 flow (no perfusion) refers to the absence of any antegrade flow beyond a coronary occlusion.
- TIMI 1 flow (penetration without perfusion) is faint antegrade coronary flow beyond the occlusion, with incomplete filling of the distal coronary bed.
- TIMI 2 flow (partial reperfusion) is delayed or sluggish antegrade flow with complete filling of the distal territory.
- TIMI 3 is normal flow which fills the distal coronary bed completely

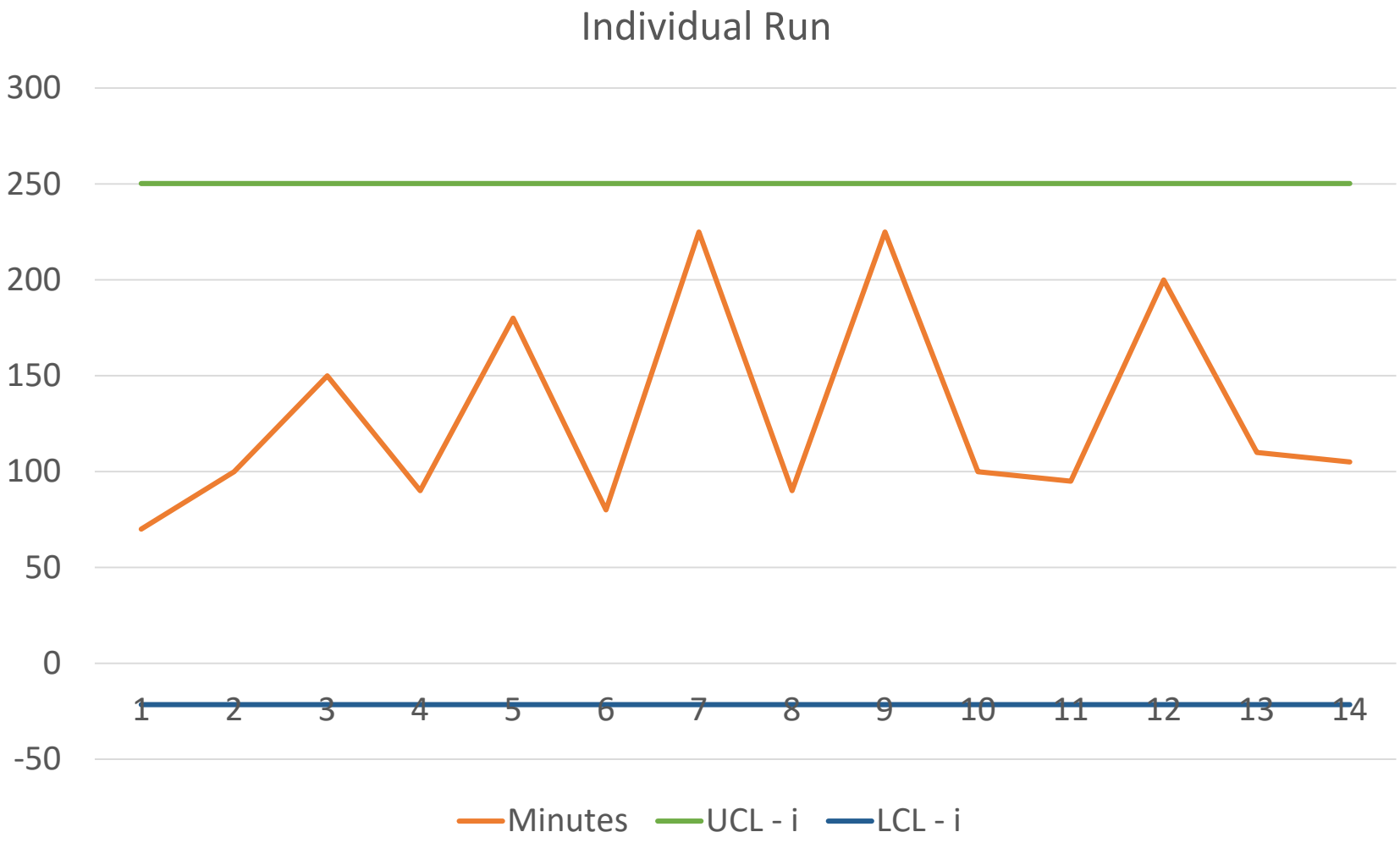



Door-to-balloon time = from the moment a heart attack patient arrives in the ER to when the blocked artery is opened with an angioplasty balloon.

# Let’s try to see what the process looks like…is it in control?



# Are there any special causes?



# Define: Door to Balloon

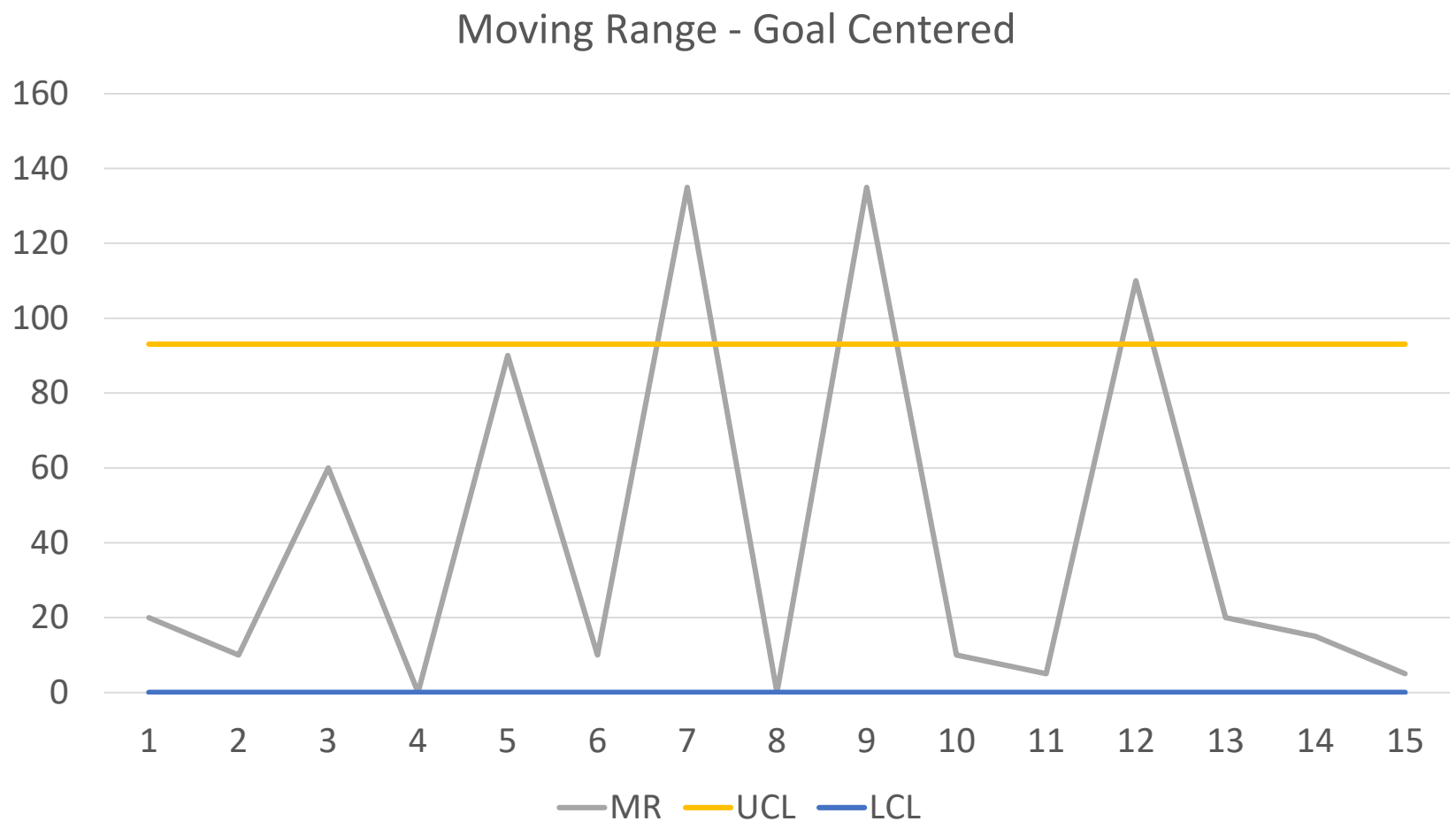
*Project goals:*

Achieve Door to TIMI 3 perfusion time of less than 90 minutes for all patients

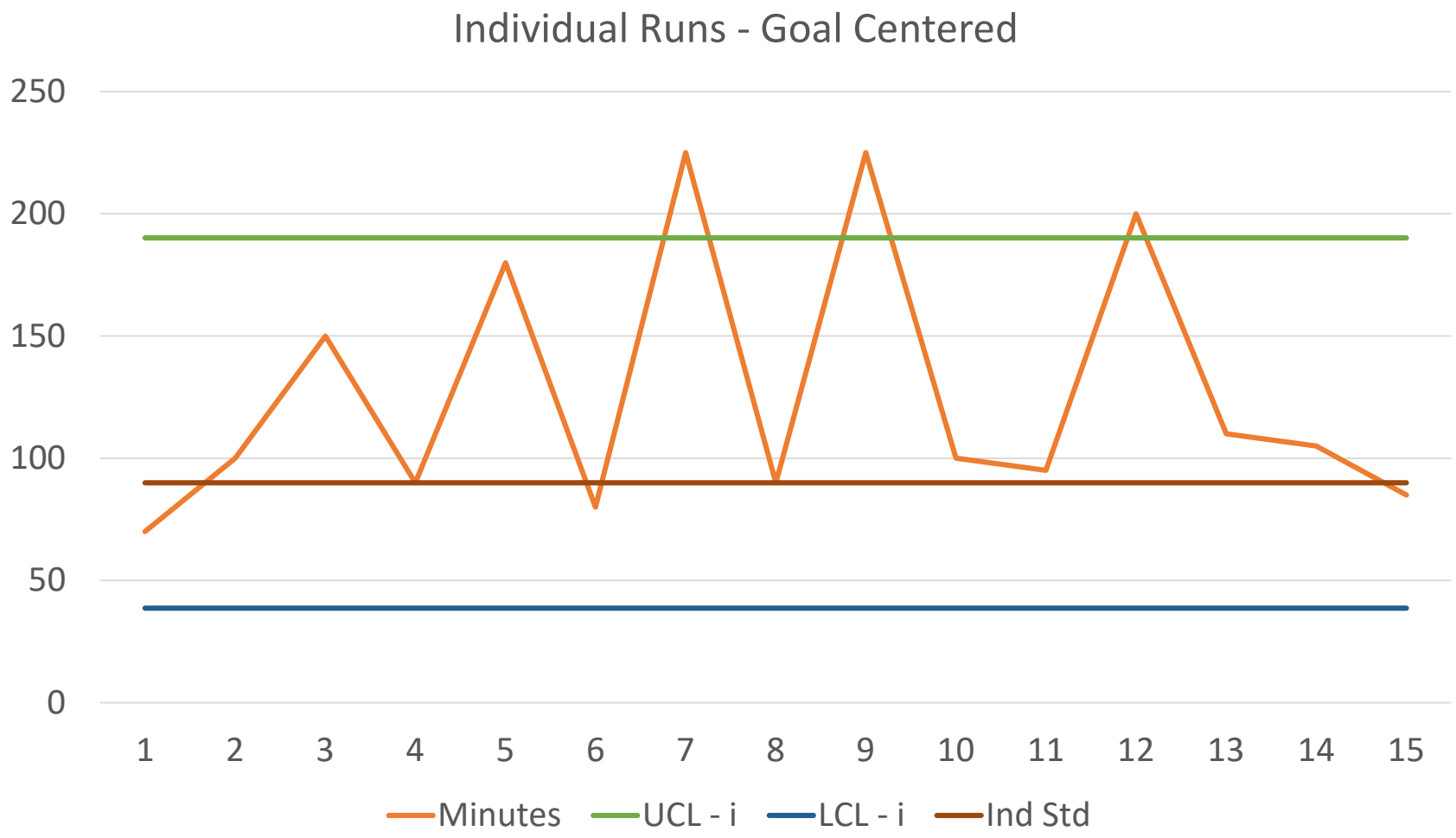
Project scope:

Start – Patient arrival at ED
Stop – Establishment of TIMI 3 Flow
Includes – ST elevated, non-transfered
Excludes – All other cases

# Now if we change how we evaluate the process, are we still in control?

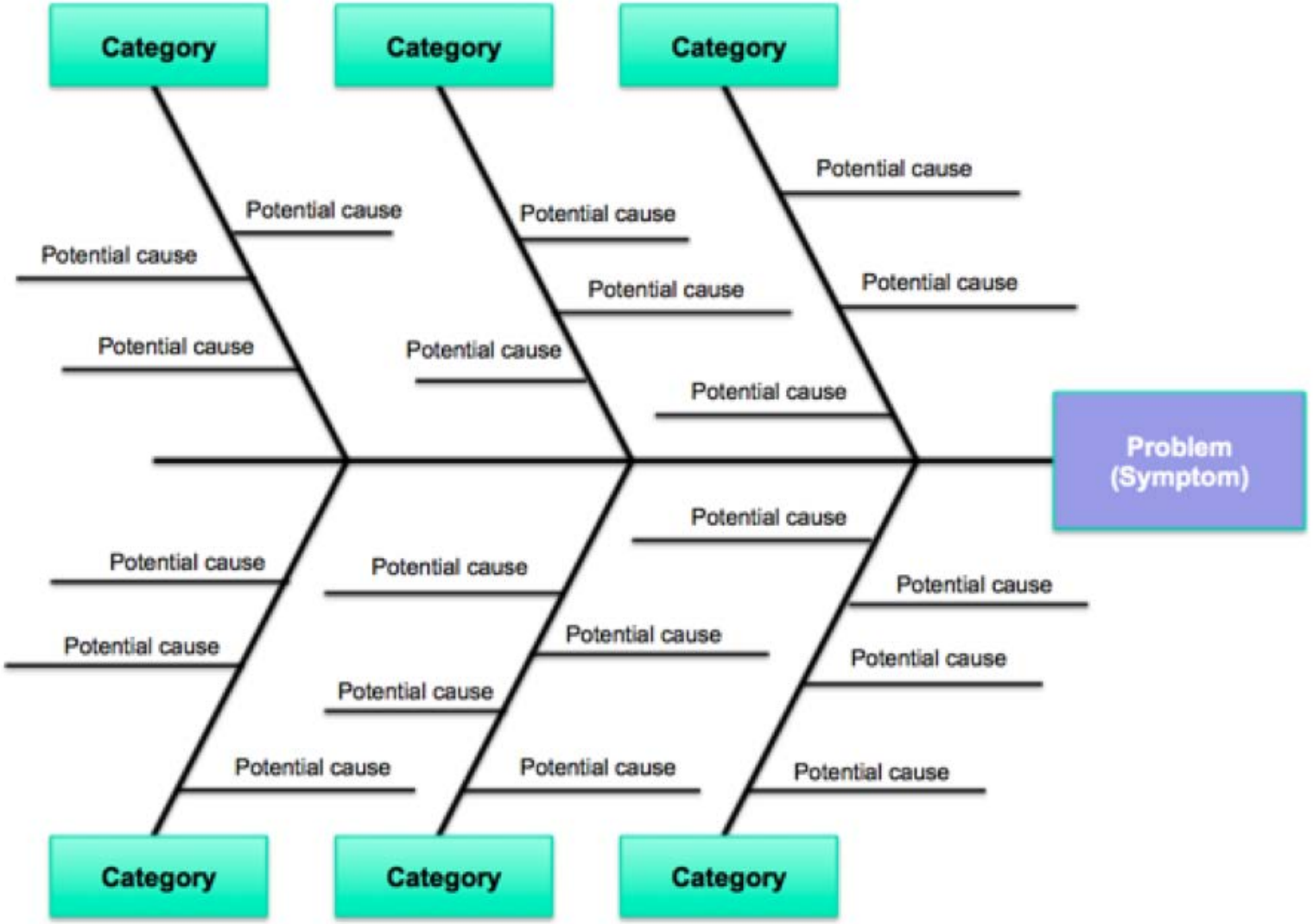


# And do we have any special causes?

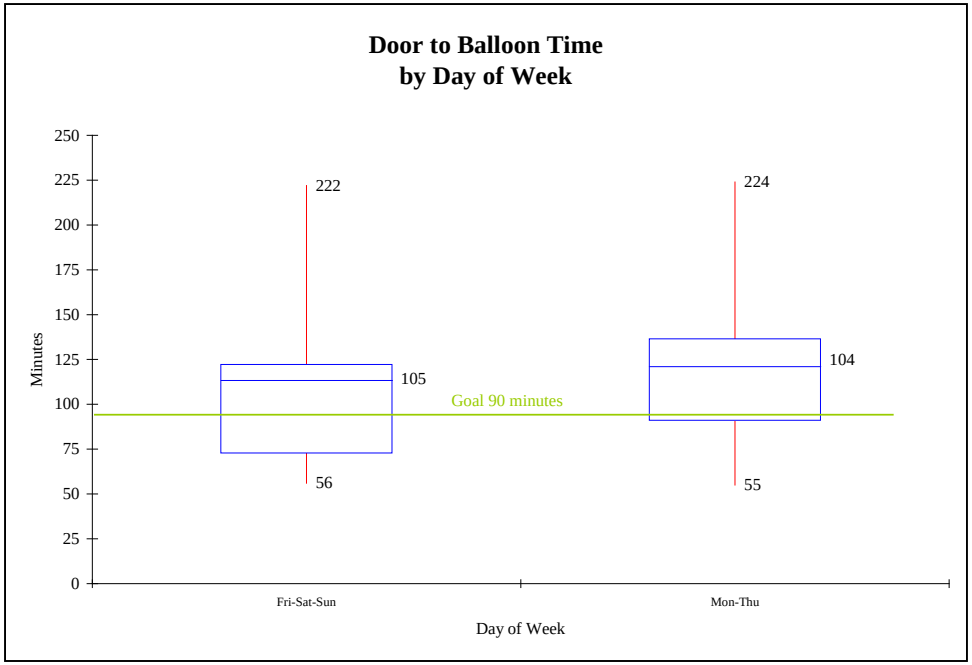


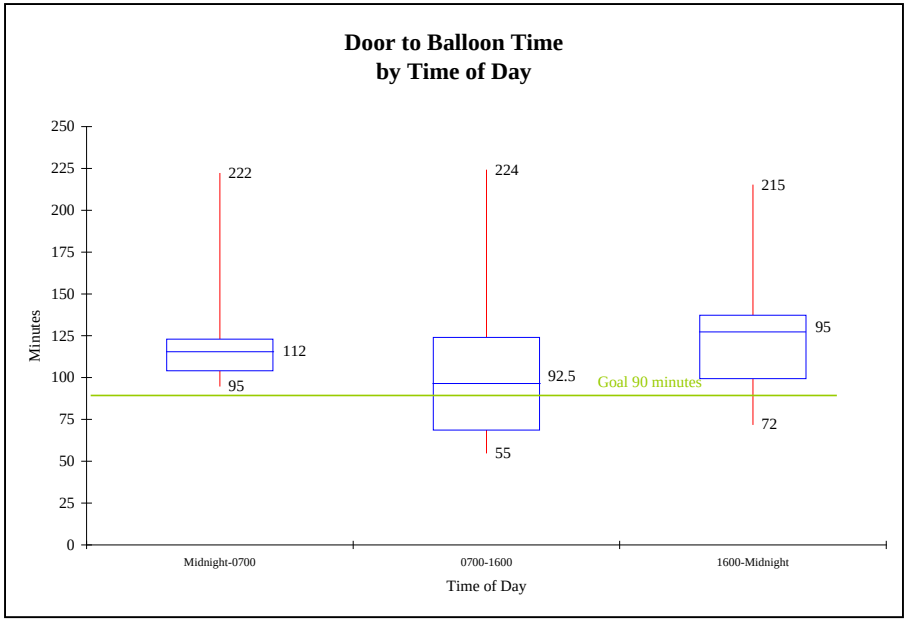
| Patient | EMS | ED | Cardiology | Cath Lab |
|---|---|---|---|---|
| Seks medical attention | | | | |
| patient having MI | | | | |
| | Get 12 lead EKG, IV, O2 | | | |
| | Call MD | | | |
| | Transport patient to ED | | | |
| | Report to RN and MD at arrival | | | |
| | | Additional IV, 15 lead EKG | | |
| | | Start Chart | | |
| | | Start meds, call IR | | |
| | | Additional meds waiting on IR | | |
| | | | See patient in ED | |
| Consent | | | Informed consent by RN | |
| | | | Cath Lab called | Call confirms call |
| | | RN gets patient ready for transport | | cath lab setup |
| | | Cath lab calls when ready | | Calls ED when ready |
| | | | | patient arrives in Cath Lab |
| | | | | Patient prepped |
| | | | IR enters Cath Lab | |
| | | | Cath placed | |
| | | | Imaging done | |
| | | | Baloon placed | |

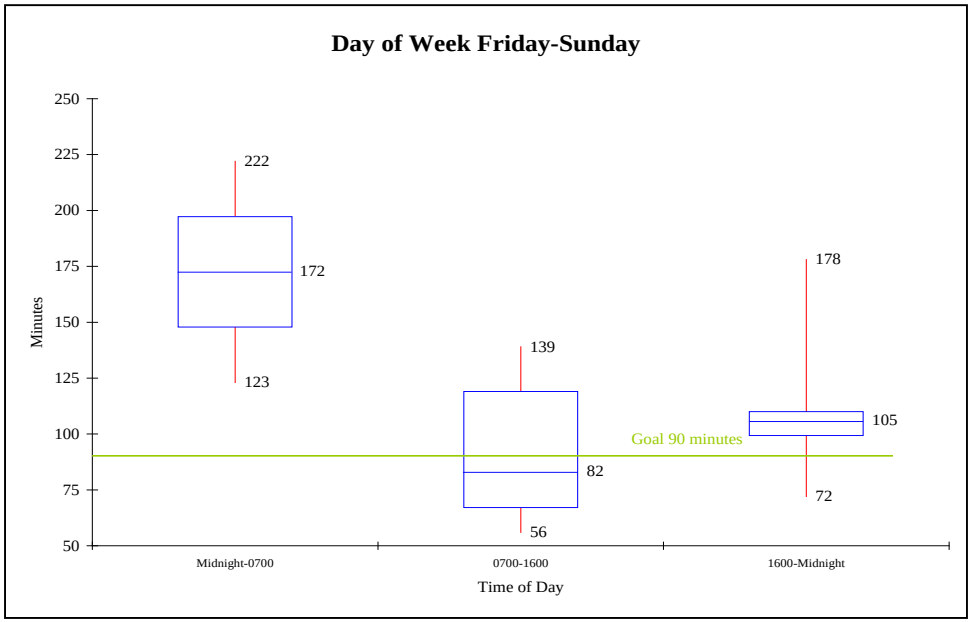
# A fishbone diagram can be a good way to explore and document potential causes.



# Analyze : Door to Balloon Project



# Analyze: Door to Balloon

The D2B Alliance has developed six strategies to reduce door-to-balloon times:

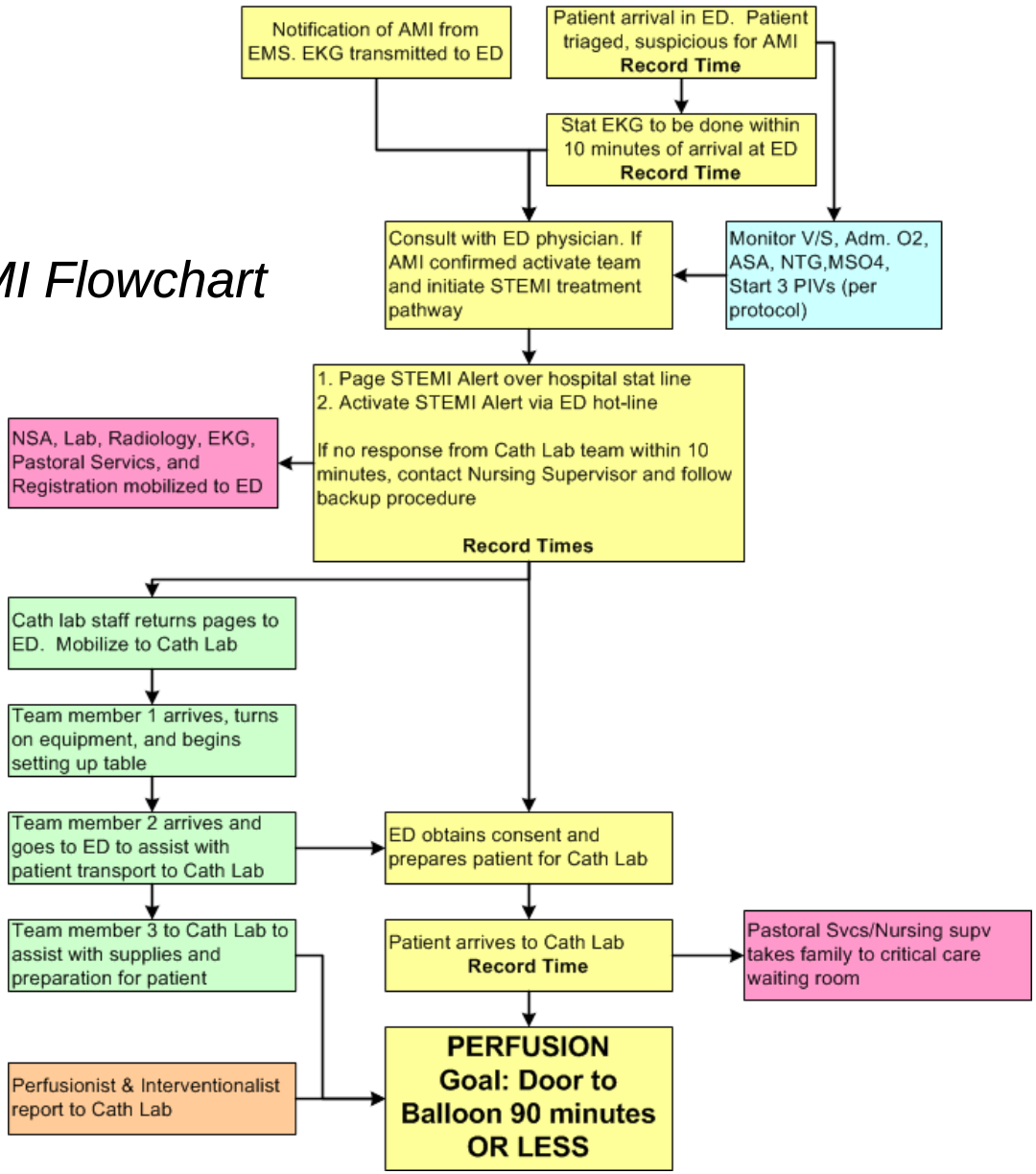
1. Have attending Interventional Cardiologist always on-site
2. Have ED and Cath Lab staff use real-time data feedback
3. Have ED activate the Cath Lab while the patient is still en route to the hospital
4. Cath Lab team arrive and be ready to start procedure in 20 minutes
5. ER medicine Physician activates the Cath Lab
6. A single call to a central page operator activates the Cath Lab and Interventional Cardiologist

# Strategy 2: Have ED and Cath Lab staff use real-time data feedback

- *Benefit*
  - 8.6 minutes faster door-to-balloon time
- *What it will take to implement*
  - Modify Chest pain and Quality records
  - Copy of the completed form to the Cath Lab Director
- *Barriers to implementation*
  - Staff education
  - Compliance
  - Trust and teamwork between all staff
  - Legibility of information on the form

# Improve: Door to Balloon

*STEMI Flowchart*



# Sustain: Surgery room changeover reduction

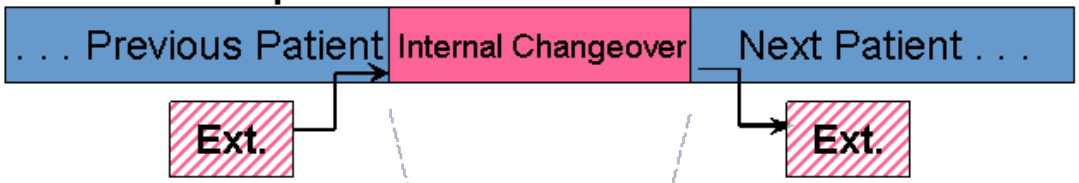
## Changeover reduction process

1. Observe the Process

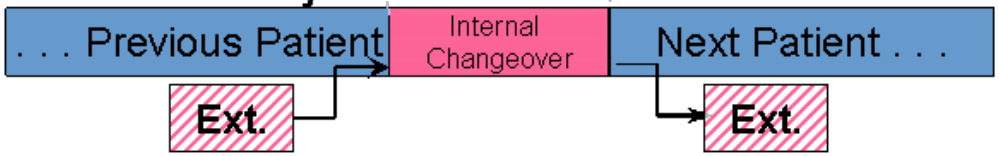

2. Measure the time to complete each step


3. Separate 'Internal' from 'External' activities


4. Convert 'Internal' steps to 'External'




5. Reduce the time to carry out 'Internal' tasks



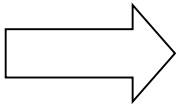

6. Continually improve the startup time

# Lean Six Sigma Project Examples

Henry Ford once said, *"Time waste differs from material waste because there can be no salvage."*

# What is Lean Six Sigma?
# How does it apply in Healthcare?

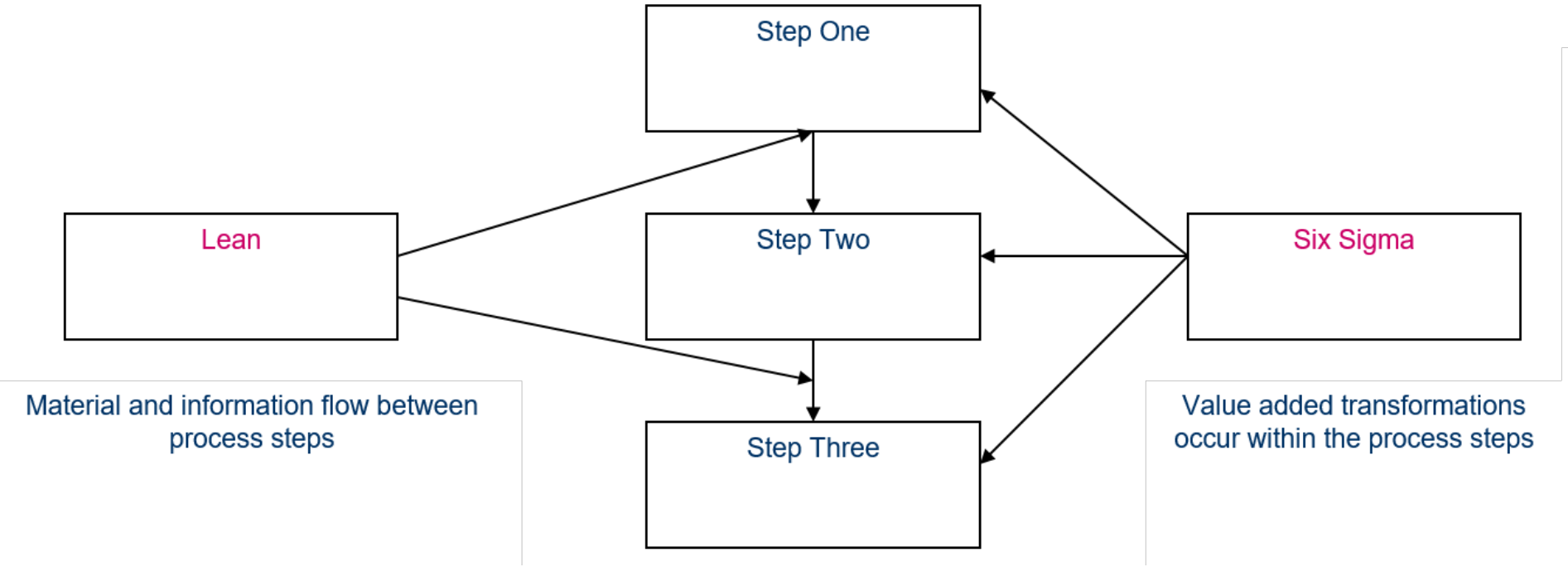
- Smooth operations
- Ensure patient safety
- Provide quality care
- Effective patient treatment
- Utilized staff and resources



What that leads to:

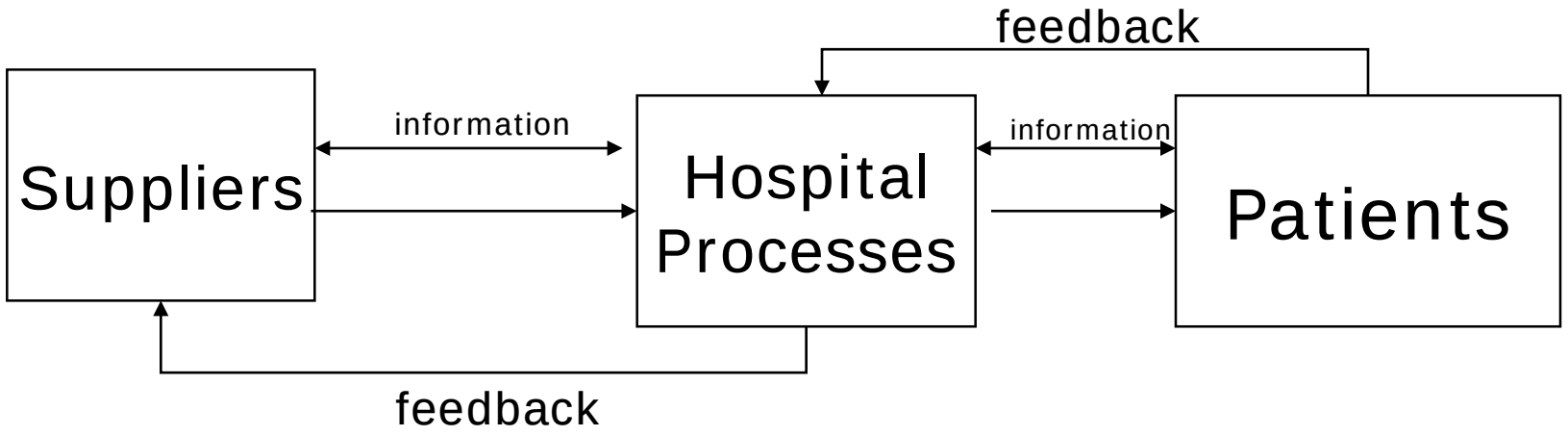
- Available and prompt care
- Better patient outcomes
- Increased patient satisfaction
- Improved financial viability
- Improved patient throughput
- Improved publicly reported information
- Higher employee involvement and satisfaction
- Reduced LOS

# Recall that Six Sigma focuses on reducing process variation



# Lean Six Sigma Basics

The Hospital as a System:




All work is a process . . .

this is true of a hospital too!

# 7 Kinds of waste

Inventory - unneeded stock or supplies

Motion - movement of staff and information

Overproduction - unnecessary tests

Overprocessing - filling out extra paperwork

Transportation -movement of patients or equipment

Rework/Correction - paperwork, med errors

Waiting - delays in diagnosis and treatment

# CT and 7 Kinds of Waste

**Inventory**

- Set up tray for unneeded procedures
- Expired IR stock
- Wasted contrast

**Motion**

- Transporting patients
- Walking between procedure room and control room
- Getting onto computer

**Overproduction**

- Supplies/tray
- Protocols
- Making contrast and Patient consumption of contrast

**Overprocessing**

- Paperwork
- Films vs. disk
- Multiple systems - RIS, PACS,etc

**Transportation**

- Patients
- Ordering syringes and having extra boxes to store
- Taking oral contrast to the floor
- IV lock

**Rework/Correction**

- Duplicate work
- Phone calls to communicate with departments or units

**Waiting**

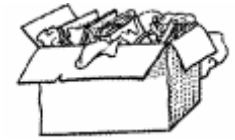
- On Toshiba scanner
- Waiting on ED patients to be ready
- On oral contrast

# 5S Workplace Organization

***Before 5S***

**S1: Sort**
**(Seiri)**

**Not Needed**

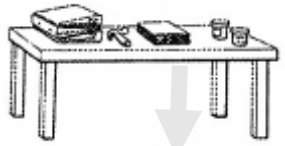


**(Red Tagged)**

**Remove from Workplace**

**Discard after a defined time**

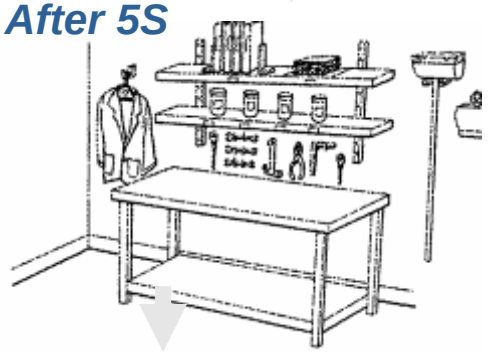
**Needed**



**Create Visual Workplace**

- **S2: Set In Order (Seiton)**
- **S3: Shine (Seiso)**
- **S4: Simplify & standardize (Sieketsu)**

***After 5S***



**-S5: Sustain (Shitsuke)**

*A place for everything and everything in its place*

# 3PCW Nurses station before 5S

# Sort and Set in Orde


# Shine (Clean)


Room
Patient
Nurse
3301-1
3301-2
DF
3303-1
LR
3303-2
CD
3304
LB
3305-1
3305-2
EG
3307-1
3307-2
Km
3308
RS
3309-1
HM
3309-2
RB
3310-1
TH
3310-2
Dusty

# After - Sustain

# Storeroom before & after color coding


Before

After

# Six Sigma in Industry – R&D/Product Design

- Examples of applicability
  - Reduce time to market
  - Reduce rework through linking R&D efforts to customer needs
  - Improving overall performance and quality from start
  - Minimize failures through robust deisng
  - Improving qualiry of experiemnets by providing experimental design and multivariable studies
  - Focus on data-driven design reviews

# Six Sigma Applications in Industry-Manufacturing

- Reduce waste
- Optimize inventory
- Reduce rejections in designs
- Improve reliability by identifying and optimizing critical factors