Safety & Quality & Process Improvement Model

“A System Engineering Perspective”

Prepared

By

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Training Outline

• Healthcare Crisis in US
• System Engineering Definition, Objective, Cycle
• Sources of Variation in a Process
• Waste Definition, Types and Examples in Healthcare
• Prioritization of Process Improvement Initiatives
• PDCA/Rapid Cycle Concept
• Problem Statement Definition and Brainstorming
• Systematic Root Cause Analysis: 5 WHY, Fishbone Diagram
• Data Analysis using Value Stream Mapping, Descriptive Statistics, and Pareto Chart
• Process Improvement Planning & Documentation: A-3 Report

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Healthcare Crisis in USA - Some Statistical Facts

Health spending per capita in the United States is much higher than in other countries – at least $2,535 dollars, or 51%, higher than Norway, the next largest per capita spender. Furthermore, the United States spends nearly double the average $3,923 for the 15 countries.

Health System Attainment and Performance Ranking

<table>
<thead>
<tr>
<th>World Health Report (WHO)</th>
<th>Health expenditure per capita; (rank)</th>
<th>Performance on level of health (rank)</th>
<th>Performance of overall health system (rank)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member State</td>
<td>United States</td>
<td>1</td>
<td>72</td>
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<tr>
<td>(rank out of 191 members)</td>
<td>Australia</td>
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<td></td>
<td>United Kingdom</td>
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</table>

According to the above comparison of selected “high income” industrialized countries, the U.S. ranks as the highest healthcare spender per capita of all 191 member states followed by Germany and France. However, when looking at “return on investment” (return for the per capita spending) the U.S. places 37th out of 191 with respect to the “performance of the overall health system,” and 72nd out of 191 in “performance on level of health,” or at the bottom in both categories among the selected eight countries.

The study used the following five metrics, and two aggregate metrics, to measure goal attainment and performance of each member country – “disability-adjusted life expectancy (DALE), health equality in terms of child survival, responsiveness level, responsiveness distribution, fairness of financial contribution, performance on level of health and overall health system performance.”
Healthcare Crisis in USA - Some Statistical Facts

What is driving health care spending?

- It has been estimated that 20 to 30 percent of medical expenditures may have had no meaningful impact. (Source: The Cost of Dying End-of-Life Care By CBS News)

- Approximately 50 percent of personal bankruptcies are due to medical expenses. (Source: Health Affairs)

- An estimated one-third of 2006 health care expenditures, about $700 billion or nearly 5% of GDP, did not improve health outcomes. (Source: Congressional Budget Office)

- Two-thirds of what we spend on healthcare is attributable to diseases that are preventable. “Of the $2.5 trillion America spends each year on health care, 75 percent of that money goes to fighting chronic diseases.” (CBS News)

- Administrative costs – At least 7% of health care expenditures are estimated to go toward for the administrative costs of government health care programs and the net cost of private insurance. (Kaiser Family Foundation, 2010.)
What is driving health care spending?

- 75% percent of total health care spending in the United States in 2007 went towards the treatment of chronic diseases, such as diabetes and asthma. (Source: CMS)
- In publicly funded health programs, spending on chronic disease represents an even greater proportion of total spending: more than 99% in Medicare and 83% in Medicaid (Source: Chronic Conditions: Making the Case for Ongoing Care, 2004)
- About 13% of high-risk adult patients developed hospital-acquired infections (HAI), according to the (Roberts, et al. 2010). The direct medical cost to the nation of HAI ranges from about $28 billion to $34 billion each year. HAI was found to double hospital cost. Medical Care, 48(11):1026-1035.
- Each year, more than 57,000 people die because they do not receive the care that the medical profession and health care community agrees they need. (Source: Kim D. Slocum, FHIMSS)
Healthcare Crisis in USA - Some Statistical Facts

The Need for Healthcare Reform

- Medication errors cause at least one death every day and injure approximately 1.3 million people annually in the United States.

Medication mishaps can occur anywhere in the distribution system:
- prescribing,
- repackaging,
- dispensing,
- Labeling,
- administering, or
- monitoring.

Common causes of such errors include:
- poor communication,
- ambiguities in product names, directions for use, medical abbreviations or writing,
- poor procedures or techniques, or
- patient misuse because of poor understanding of the directions for use of the product.
Systems Engineering

- Systems engineering focuses on coordination, synchronization, and integration of complex systems of personnel, information, materials, and financial resources.*
- This is achieved through the application of mathematical modeling and analysis techniques.

Systems Engineering Objectives

- **Improving Content of Care**
  - Evidence-based medicine (standards, protocols, guidelines)

- **Improving Process of Care**
  - Continual Quality Improvement
    - Continuous and gradual process improvement initiatives resulting in:
      - *Reduction in process variations (lack of performance consistency).* *Process variations affect quality of care* (ED overcrowding, medical errors, readmissions, infections, and mortality)
        (ex., if our patients wait time target to see a provider is 30 minutes, can we achieve and maintain this target every single month? If not, what causes the variations?)
      - *Process waste elimination* (hospitals waste 20 to 30 cents of every dollar they collect. What are the sources of this waste?)
System Definition and Its Concepts

What is A System?

• A system is a set of possibly diverse entities (patients, nurses, physicians, etc.), each performing some set of functions.
• As a system operates, it moves from one state to the next through the occurrence of enabled events.
• An event is enabled when the preconditions for its occurrence are met. An event occurs when its associated actions are performed.

For example, if an ICU has 30 beds, with 29 occupied and one available, and there is a patient in the emergency department requesting an ICU bed, then an ICU bed allocation event is enabled and can be performed. This event is performed when the bed is assigned to the patient. If another patient arrives needing an ICU bed, the ICU bed allocation event is not enabled because a bed is not available.
Systems Engineering Overview

**Inputs (Resources)**
- People
- Infrastructure
- Materials/Drugs
- Information
- Technology
- Patients’ Survey

**Activities (Processes)**
- What is done
- How it is done
- Where it is done
- Who is (are) doing it

**Outputs (Outcomes)**
- Health services delivered
- Change in health behavior
- Change in health status
- Patient satisfaction

Components of a System
1. Define System Scope & Purpose

2. Specify Required Data Collection Requirements

3. Design, Verify & Validate System Model

4. Study Model & Analyze System Output Results

5. Use Results to Improve System Model

6. Develop Implementation & Evaluation Plans

Systems Engineering Cycle
Process Improvement Principles

- Performance is a characteristic of a system.
- In order to improve, the system must be changed in ways that yield better results.
- Various inputs in a system yield improvement only to the extent they can affect change in that system.
- Three components of a system (input, process, outcome) along with the links between should be changed for improvement.

Sustained improvement (effective change) happens when we focus how parts of a system are coordinated and link together, rather than focusing on just one part!

Ex: If you believe staff skills or knowledge is the source of medication error, you may not solve the problem through training if the problem resides in the process.
Voice of customers (VOC), focus on:
- External Customers (patients)
- Internal Customers (people in your organization like physicians, nurses, staff).
  (internal customers benefit from system efficiency by being able to perform their jobs better, therefore better meeting the needs of our patients).

Understanding work as processes and systems.

Develop ideas how to improve the overall system.

Use reliable data to analyze processes, make changes to the system and test changes.

Use a team approach to problem solving.
Systems Engineering Methods & Their Applications in Healthcare

- Operations Research (OR)
  - Patient Flow Analysis
  - Inventory Control
  - OR Scheduling
  - Supply Chain MGMT
  - Clinic Site Location
- Engineering Economics & Financial Modeling
  - Project Cost Trade off
  - Capital Investment
- Statistical Modeling
  - Data Structure
  - Data Reliability
  - Correlations
  - Predictions
  - Forecasting
- Process Flow Modeling
  - Work Flow Visualization
  - Task Sequencing
  - Time Motion Studies
  - High Level Process Mapping
  - Value Stream Mapping
  - Spaghetti Diagram
  - Affinity Diagram

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Systems Engineering Methods & Their Applications in Healthcare

Project Management
- CPM
- PERT
- Project Milestones

Ergonomics & Human Factors
- Human-Machine Interaction
- Ergonomic Designs (Equipment/Tool)

Simulation
- Outcome Predictions
- OR Scheduling
- ER Patient Flow
- Patient Wait Time
- Discharge Process Optimization

Six Sigma & Lean
- Performance Variations
- Statistical Process Control
- Process Sigma Level
- Process Waste/Defect
- Value-Added Tasks
- Efficiency & Effectiveness
- Mistake Proof Strategies
- Visual Management
- Process Standardization
- Work Load Leveling

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Gap Analysis: Current Performance Versus Actual Performance

Ideal Situation

Current Situation

Gap = Problem
Sources of Variations in a Process

**Variation Definition:**

The difference between the output of a process resulting from the influences of **five** main sources:

- **Man/People/Personnel:** physicians, nurses, technicians, staff, patients.
- **Machines:** equipment, database
- **Materials:** supplies, inputs
- **Methods:** procedures, standards, techniques
- **Measurements:** bias and inaccuracy in the data
Variation Types in a Typical Process

Variation Types:

• **Common Cause Variation/Random Variation:** it is primarily due to the normal fluctuations in the process. They are predictable and have no impact on the process performance. Let’s say, if a typical patient check-in to check-out time in a clinic takes approximately 60 minutes and we have a tolerance of +/- 5 minutes for the service. 8.3% time fluctuation ($5/60=8.3\%$) is acceptable (service time between 55 minutes to 65 minutes). **We cannot eliminate random variations, but we can manage them!**

• **Special Cause Variation:** it is caused by a circumstance out of the ordinary and it cannot predicted. If in a clinic, providers have different procedures to check in and check out patients, the process outcomes will be quite different. Source of these variations should be studied, investigated, identified and permanently removed from the process in order to make the process predictable and stable. **We must eliminate special cause variations!**
Variation Types in a Typical Process

BAD
Presence of special cause variations

GOOD
common cause variations

BEST
common cause variations
So What is Waste?

- Waste is any activity or resource in an organization that does not add value to an external or internal customer.
- External customers are our patients.
- Internal customers are our physicians, nurses and staff.
8 Types of Waste in a Typical Healthcare Facility

- Defects/Reworks
- Over processing
- Motion
- Transportation
- Incorrect Utilization of Staff
- Overproduction/Inappropriate Use of Clinical Services
- Inventory
- Waiting/Delays
Healthcare Expenditures & Waste

- Health care expenditures in the United States have tripled, from $714 billion in 1990 to over $2.3 trillion in 2008.*
- More than 50% of healthcare processes is essentially waste.
- Hospitals waste 20 to 30 cents for every dollar they collect.

* 2011 Institute for Healthcare Improvement study
Types of Waste

Overproduction of services or inappropriate or wrong use of clinical services or providers

Examples:

- Performing services patient doesn’t need, such as lab work.
- Percentage of surgical supplies picked and returned to shelf.
- Picking OR instruments but not using them and therefore they must be resterilized.
- Not identifying food service if diet changes and discharges.
- Repeatedly printing “face sheets” on nursing units. Unwanted end-of-life services.
- CT scan or MRI instead of X-ray.
- Unnecessary hospitalization and/or LOS (longer than expected length of stay).
- Inappropriate use of antibiotics.
Types of Waste

Defects and Reworks

Two Major Categories for Defects:

- Adverse events and complications in an inpatient setting
  Examples: readmissions, health-care associated infections
  (UTI, VAP, MRSA, blood stream infections, central line infection), Medication error, incorrect surgeries, and poor medical outcomes.
- Adverse drug events
  Examples: dialysis secondary to drug toxicity, anticoagulant bleeding, dehydration

Reworks:

Examples:
- Retesting.
- Rescheduling.
- Resubmitting lost or rejected insurance claims.
- Rewriting patient demographics.
- Creating duplicate MRNS for patients.
- Multiple bed transfers.
Types of Waste

Waits and Delays

Two Major Categories for Delays:

• Patient Flow Delays
• Clinical Care Delays

Examples:

• Waiting for medical appointments.
• Medical assessments.
• Test results.
• Patients wait for discharge placements.
• OR Rep.
• Rewriting patient demographic.
• Patient length of stay in ED.
• Beds held for surgical patient or medical patient.
• Expired patient in the bed waiting transfer to morgue.
• Rooms not cleaned on time.
• Surgery delays due to tests or consults not completed.
• Imaging procedures not able to be done or delayed.
• Retesting.
• Rescheduling.
Types of Waste

Transportation: Act of moving materials or information around clearly doesn’t add any value to the patient.

Examples:

- Excessive medical records pickups and deliveries.
- Staff copies patient chart for transfer between facilities. Extra hand-offs.
- Transporting patients to temporary locations (virtual location/sites) before the final destination.
- Percentage of surgical supplies picked and returned to shelf.
- Everyone running the same queries and reports.
Types of Waste

Unnecessary Motions

Examples:

• Searching for equipment.
• Poor workplace layout requiring long walks.
• Hard to reach places for clean ups or document retrieval requiring unnecessary time and effort.
• Walking intermittent samples to lab and going to get prescriptions.
Types of Waste

Excess Inventory

Examples:

- Duplication of supplies in storage areas or patient rooms.
- Excessive ordering due to not knowing the minimum but safe levels of supplies.
Types of Waste

Excess Processing: Extra unneeded steps used to achieve the result.

Examples:

• Multiple patient registrations.
• Excessive paperwork and creation of duplicate information.
• Duplication of physical assessment of triage and in treatment area.
• Too many meetings going over the same information.
Types of Waste

Incorrect utilization of staff

Examples:

• Using the wrong level of staff for a certain task.
• Understaffing or overstaffing within the organization.
• Not fully utilizing employees skills and potentials.
• Having numerous RN doing certain operating room tasks that could be performed by OR Techs.
Examples of Waste Reduction

Standardization of patient room layout for the needed supplies at the point of use

Objective: Reduction in the need to return to the central supply room

Waste Category: Motion, Transport

Before

After

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Examples of Waste Reduction

Improve the flow of work in the lab room

Objective: Reduction in the search time to find needed items

Waste Category: Motion

Before

After
Examples of Waste Reduction

Reduction of the changeover in the O.R.

Objective: Increase in the O.R. turnaround time

Waste Category: Motion, Transportation, Waiting

Before

After

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Prioritizing Process Improvement Initiatives

The initiatives should embody the following guidelines:

1. Linking improvement efforts to customer expectations.
2. Focusing on prevention, as well as correction of activities.
3. Emphasizing the areas with the greatest potential for improvement.
4. Working on a manageable number of projects.
5. Using facts, not perceptions for selection of projects.
6. Ensuring constancy of purpose.
Prioritizing Process Improvement Initiatives

1- Patient Safety

• When a new process/procedure is developed or an existing process/procedure needs to be re-evaluated when patient safety is concerned.

2- Federal/State/Local Regulation Mandates

• When there is a gap between mandated performance target and actual performance. Example is CG-CAHPS

3- Patient Satisfaction

• Patient surveys, Press-Ganey Scores.
  ➢ Objectives are to retain our patients and attract potential new patients to use our services.
Prioritizing Process Improvement Initiatives

4- Cost Saving
- Any initiatives aimed at the elimination of process waste, an increase in process throughput (LOS reduction, less wait time, increased ER bed availability), an increase in OR room availability, reduction in materials/supplies usage, a decrease in energy cost, a decrease in overhead expenses, etc.

5- Task Simplification
- Any initiative that eliminates confusion in completing a task or a series of tasks, simplification of any task or a series of tasks that frees up time for employees to focus on value-added and productive tasks, any initiatives boosting employee morale and job satisfaction.
Prioritizing Process Improvement Initiatives

1- Look for opportunities that do not require a lot of time or money.

2- Pick internal over external opportunities.
   (The ones you or your group have the greatest control on the outcomes)

3- Start with easy opportunities with high impact.
Prioritizing Process Improvement Initiatives

Start With These Categories
# Project Selection Template

## Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Project 1</th>
<th>Project 2</th>
<th>Project 3</th>
<th>Project 4</th>
<th>Project 5</th>
<th>Project 6</th>
<th>Project 7</th>
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</table>

## Project (Idea) Selection Index

<table>
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<tr>
<th>Project 1</th>
<th>Project 2</th>
<th>Project 3</th>
<th>Project 4</th>
<th>Project 5</th>
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</table>

*Select the top 3 projects with the highest values at the bottom.*
The PDCA/Rapid Cycle: A Practical Problem Solving Approach

1. Plan → Determine what to improve
2. Do → Develop a plan to address the problem
3. Check → Evaluate the devised plan to ensure it solves the stated problem
4. Act → Apply the devised plan
The PDCA/Rapid Cycle: A Practical Problem Solving Approach
Problem Identification - Brainstorming

- Simply list all ideas put forth by a group in response to a given problem.

- Creativity is encouraged by not allowing ideas to be evaluated or discussed until everyone has run dry; any and all ideas are considered legitimate and often the most far-fetched are the most fertile.

- Structured brainstorming produces numerous creative ideas about any given "central question". Don’t reject ideas until there is data to back up that decision—fact-based decision making.
Problem Identification - Brainstorming

• Done right, brainstorms help answer specific questions such as:
  ➢ What opportunities face us this year?
  ➢ What factors are constraining performance in Department X?
  ➢ What could be causing problem Y?
  ➢ What can we do to solve problem Z?

• However, a brainstorm cannot help you positively identify causes of problems, rank ideas in a meaningful order, select important ideas, or check solutions.
To conduct a successful brainstorm:

- Make sure everyone understands and is satisfied with the central question before you open up for ideas.
- You may want to give everyone a few seconds to jot down a few ideas before getting started.
- Begin by going around the table or room, giving everyone a chance to voice their ideas or pass.
- After a few rounds, open the floor.
A Problem Statement Should Address The Following:

- What’s the problem.
- How do we know it is a problem.
- How frequently does this problem occur.
- How long this problem has existed.
- What are the effect(s) of this problem.
- How will we know when it is resolved. (Set Target)
A Problem Statement Should Be Concise, Clear and Specific.

Example:

• **What’s the problem.** A shortage of ARI drugs exists for children under 5.

• **How do we know it is a problem.** Drugs run out by the third week of the month.

• **How frequently does this problem occur.** The shortage occurred every month.

• **How long this problem has existed.** For the past nine months.

• **What are the effect(s) of this problem.** Patients develop complications.

• **How will we know when it is resolved.** When ARI drugs last until the end of the month.
WHAT IS THE ROOT CAUSE????

Error Proofing Techniques

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Systematic Root-Cause Analysis

Principle of Several Causes

- Nonconformities and other quality problems are seldom, if ever, the result of a single cause.
Variations or undesired events happen in a typical healthcare facility in the following areas:

- Patient
- Material
- Measurement
- Machine/Equipment/Software
- Personnel/Staff
- Method/Practice
There are several techniques/tools to conduct a root cause analysis. We will only focus on two of them:

- **5 WHY**
- **Fishbone (Ishikawa) Diagram**
### Systematic Root Cause Analysis and 5 WHY

<table>
<thead>
<tr>
<th>What It Is</th>
<th>A root cause tool</th>
</tr>
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<tbody>
<tr>
<td>Goals</td>
<td>Use 5 why tools to get to a root cause</td>
</tr>
<tr>
<td>Skills</td>
<td>Understand line of questions to drill down to a root cause</td>
</tr>
<tr>
<td>Used In</td>
<td>Problem solving for root cause(s)</td>
</tr>
<tr>
<td>Why?</td>
<td>The find root causes when they are not immediately apparent and to avoid selecting possible root causes that are not controllable.</td>
</tr>
</tbody>
</table>
Systematic Root Cause Analysis and 5 WHY Tool

• Asking “Why?” is an elegant and simple process that can solve most problems by peeling away the layers that can lead to a root cause.

• Plus it connects people to the actual place -- important in decision making.

• Remember that there typically isn’t a single root cause for a problem – but potentially several. This applies to all problem solving.
Systematic Root Cause Analysis and 5 WHY Tool

After defining the problem and asking why 5 times, you’ve probably identified the root cause. Now you need to do the change and document the change!

Define the problem

Why?
Why?
Why?
Why?
Why?

Root cause identified
Implement actions

The patients on the 10th floor in the internal medicine department at Hospital XYZ have received incorrect medicine 40% of the time during 2013.

- The prescription was wrong
- The doctors made the wrong decision
- The lab technician phoned the results to the receptionist, who forgot to tell the nurse
- Lack of proper training/time management
- The doctors didn’t have complete information in the patient’s chart
- The doctor’s nurse didn’t enter the latest lab report
- Nurses were in hurry taking care of several patients at a time
- The lab technician phoned the results to the receptionist, who forgot to tell the nurse
- Lack of proper training/time management
5 Why Analysis

Initial Problem Perception
(Large, Vague, Multiple Problems)

Clarify the Problem

Problem Defined

Most Likely Cause

Five Why’s?
Investigation to Root Cause

Why?
Direct Cause

Why?
Cause

Why?
Cause

Why?
Cause

Why?
Root Cause

Why?

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The CE (or Ishikawa) diagram is used to assign certain causes (patient, machine, method, etc.) for an effect or problem.

The person or group then brainstorms about how those causes might lead to the effect or problem.

Once the largest cause has been identified, you can act on that to reduce or eliminate the effect.
Systematic Root Cause Analysis and Fishbone Diagram

Ishikawa (Cause and Effect) Diagram

Possible Causes (Red X)

METHOD/PRACTICE
MEASUREMENT
PATIENT
MATERIAL
PERSONNEL
MACHINE/EQUIPMENT/SOFTWARE

PROBLEM STATEMENT (EFFECT)
Systematic Root Cause Analysis and Fishbone Diagram

• When would you draw a CE or Ishikawa diagram?
  – When looking to find a root cause

• What role does brainstorming play?
  – It opens up the potential from team members and allows for greater input

• What do you do when you find multiple causes?
  – Circle the one you will investigate first!
Gathering and Analyzing Data & Developing Countermeasures

There are several techniques/tools to gather and analyze data but we will focus on the following techniques:

- Process Mapping/Value Stream Mapping
- Descriptive Statistical Analysis
- Pareto Chart
What Is a Value Stream Map?

- A **visual** tool used to **document the flow** of products or services through a system taking into account not only the activity of the product, but the management and information systems that support the basic process.
- It visualizes processes, provides a snapshot of performance and helps to **determine which steps are adding value or not.**
- The point of Value Stream mapping is not the map, but understanding the flow of information and material.
A value stream is the steps in a process that the customer (patient) is willing to pay for in order to bring a service through the main flows essential to producing that service.

- Value stream mapping takes a high-level look at a hospital’s flow of services from patient to patient.
- Value stream mapping identifies waste within and between processes.
- Value stream mapping helps hospitals avoid randomly making improvements by identifying their value streams.
3 Types of Values in a Process

1. Value-Added Activities
   • In a typical process, these activities are essentials to the process and the patient is willing to pay for. Example: a clinical consultation is essential and is a value-added activity.

2. Non-Value-Added Activities
   • In a typical process, these activities don’t add any value to the service quality a patient is willing to pay for. These activities are “Waste”. They need to be identified and eliminated permanently from the process. Example: too many hand-offs in a process, any duplication of work, any delays in the process, etc.

3. Non-Value-Added But Required Activities
   • In a typical process, these activities don’t add any value to the service quality a patient is willing to pay for but are required by the regulatory agencies, compliance issues, or are performed as part of precautionary measures for patient’s safety.
How to Do Value Stream Mapping

• Form a team. Get all appropriate stakeholders involved.

• Walk the process. “Go Gemba”

• Create a current (“as is”) state map showing how the process starts, how the process delivers values to its patient/customer and how it ends.

• Validate the map with the stakeholders.

• Identify value-added and non-value added activities.

• Create a future state map showing the reduction of waste, defects (nonconformities), and the effects of the changes.

• Implement the proposed changes in the process. Investigate the results.
Value Stream Mapping & Opportunities for Improvement

- Patient Safety & Risk Mitigation.
- Process Delay Reduction (waiting of all sorts).
- Process /Equipment Reliability and Accuracy Enhancement.
- Increase Process Throughput (LOS Reduction).
- Supply/Material Waste Reduction.
- Increase Capacity.
- Overhead Cost Reduction.
Descriptive Statistics

There are usually used to give a summary of your data sample. Therefore, your sample size plays an important role in your data analysis.

• **Average or Mean** ---------- The *sample mean* is the average and is computed as the sum of all the observed outcomes from the sample divided by the total number of events.
  
  • Advantage: Easy to Use
  
  • Disadvantage: If sample is too small (usually less than 30), not a good measure. If outliers are present, the average is not a good measure for your analysis. If the your data follows a non-normal distribution, it is not a good measure.

• **Median** ------------------- The middle number in the dataset. It is a good measure if your data has outliers or your data follows a non-normal distribution.

• **Mode** ---------------------- The number with the highest frequency in your dataset.

• **Standard Deviation** -------- A measure of how far the data is spread apart.
The following information represents the total patient wait time in a clinic:

- **Wait Time Sample:** 32
- **Unit of Measurement:** Minutes

- **Average/Mean Time:** 56 minutes (in Excel “=average(range of data)”)
- **Median:** 48.5 minutes (in Excel “=median(range of data)”)
- **Mode:** 44 minutes (in Excel “=mode(range of data)”)
- **STD:** 16 (in Excel “=stdev(range of data)”)

Which measure better describes the typical patient wait time in the clinic?

**Answer:** First, you need to investigate the outliers (100 and 102 minutes). If these times are legit, the mean is a good measure, otherwise median is the better choice.
Histogram and Normal Distribution

Normal Distribution

Frequency

normal

0 2 4 6 8 10 12
The 80/20 Rule means that in anything a few (20 percent) are vital and many (80 percent) are trivial. 20% of nonconformances (defects) contribute to 80% of your quality issue.

Let’s look at the following example:

We are investigating the patient vitals measurement wait time at 4 clinics. We calculate the average and median values for each clinic. Our target wait time is 15 minutes. We need to decide which clinics should be the prime candidates for process improvement.
By looking at the data, clinics C and D have the longest wait time. Therefore, we need to send our process improvement team over there. *Is it the right decision?*
Clinics A and B contribute to 87% of the defect (going over 15 minutes target). They should be investigated first!
An A3 report is a simple and structured business plan on a single sheet of paper that offers all the information necessary for the identification, analysis, and elimination of problems.

In its simplest form, an A3 is a legal size sheet of paper split into 6 boxes, and used to document and assign accountability for a PDCA cycle.
Why use an A3 Report?

• To help get to a deeper analysis.
• Ability to understand root cause of problem with this presentation.
• Simple, structured approach to reporting solutions.
• Leads to the identification & elimination of waste, in order to control processes.
Process Improvement Planning & Documentation: A-3 Report

1. Clarify The Problem
2. Break Down The Problem
3. Set a Target
4. Analyze The Root Cause
5. Develop Countermeasures
6. See Countermeasures Through
7. Evaluate Both Results and Processes
8. Standardize Successful Processes

Plan
Do
Check
Act
## Team Selection

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<th>Countermeasure</th>
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### Process Improvement Planning & Documentation: A3 Report

### A3 Problem Solving

1. **Clarify the Problem**
2. **Break Down the Problem**
3. **Set a Target**

### Problem Statement:

- **What**
- **Where**
- **When**
- **Extent**

### Root Cause(s) - Problem Analysis (Pareto, Cause and Effect, 5 Why, etc.)

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### Evaluate Both Results and Processes (Measurables, KPIs etc.)

### Standardize Successful Processes / Future Steps

| 1 | 1 | | |
| 2 | 2 | | |
| 3 | 3 | | |
| 4 | 4 | | |
| 5 | 5 | | |
Process Improvement Planning & Documentation: A3 Report Steps

- Clarify the problem.
- Breakdown the problem.
- Set the target (goal).
- Analyze the root cause(s).
- Develop countermeasures with assigned owners and due dates.
- Evaluate the results after applying countermeasures.
- If the results are satisfactory, standardize the process. If not, repeat the PDCA cycle.
- Share the best practice(s).
Kiss Principle

Any improvement/problem resolution should follow two major guidelines:

- **Keep It Simple & Standardized**
- **Initiatives/Solutions should be:**
  - Easily understandable and explainable.
  - Sustainable.
  - A reliable measurement system is needed to verify their sustenance.