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CMS TRANSPLANT PROGRAM
QUALITY WEBINAR SERIES

QAPI Tools – Part 2

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Enhancing Quality Assessment and Performance Improvement Programs in Transplant Programs and Hospitals

October 14, 2015

CMS Webinar Series
Transplant Centers

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1. Introduction to the Transplant QAPI: Regulatory Overview
2. Worksheet Overview
3. Comprehensive Program and 5 Key Aspects of QAPI
4. Objective Measures
5. Performance Improvement Tools and Methods
6. Adverse Events
7. Transplant Adverse Event "Thorough Analysis"
8. QAPI Tools (part 1)
9. **QAPI Tools (part 2)**
10. Data display
11. Writing an effective Plan of Correction and Other QAPI Resources
12. Interpretive Guidelines

Disclaimer

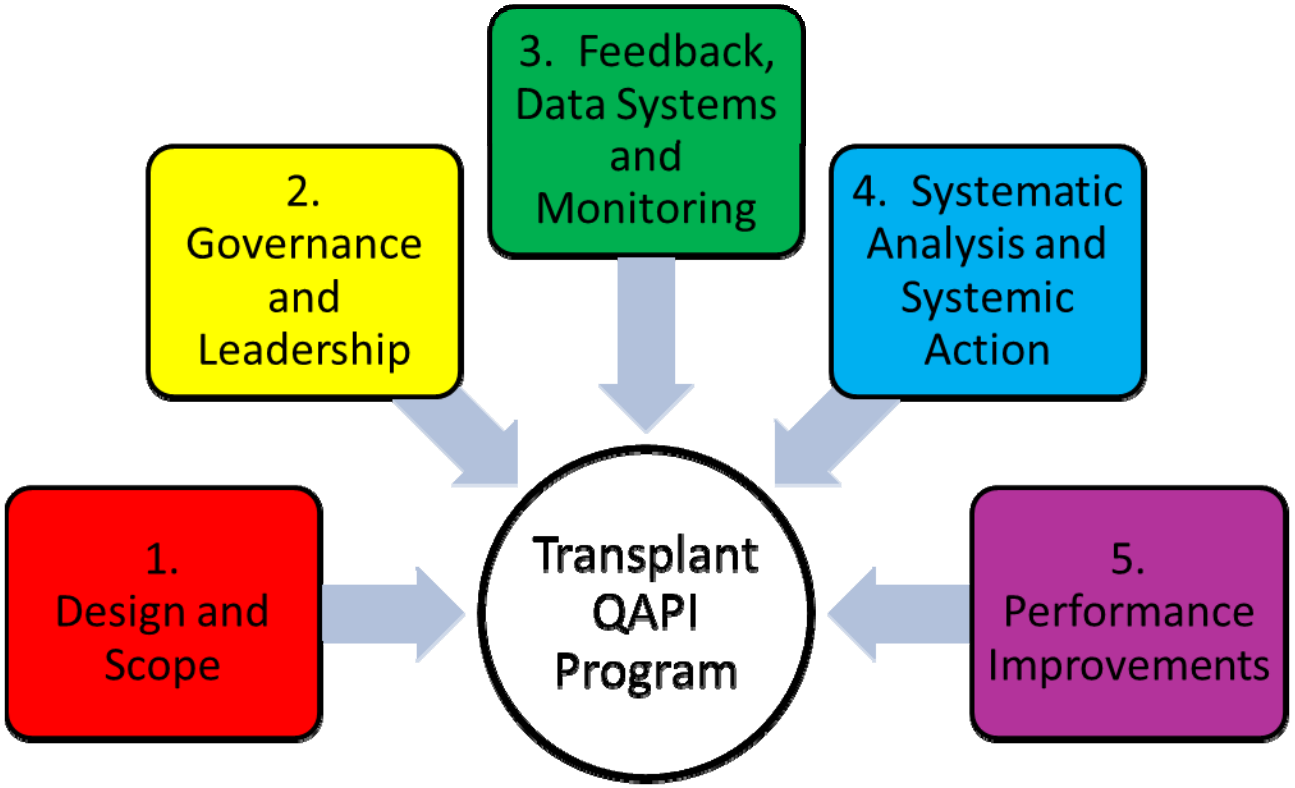
- This training series will contain Quality concepts, foundational Quality practices and historical perspectives of Quality Assessment and Performance Improvement methodologies (*as they were originally developed*) and guidance to help transplant programs meet compliance with the Conditions of Participation.

- CMS understands that: 1) Healthcare has various definitions of what Quality is, 2) There are many methods that can be employed, and 3) **There are many tools that can be utilized** within quality assessment and process improvement activities.

- CMS also understands that some organizations blend several quality concepts and tools together to provide for a more nimble and individualized QAPI program.

- This training series does not support or advocate any particular QAPI method or tool. This training fully supports that QAPI activities include **data driven decisions** that lead to sustained improved performance and ultimately improved patient outcomes.

The 5 Key Aspects of Transplant Quality



5 Key Aspects of QAPI

QAPI Tools are involved in:

- **Aspect 1** – Design-The program is **data-driven**, **reflects** the **complexity** of transplant services, and **addresses all systems of care and management** practices relevant to transplantation.
- **Aspect 2** – Governance - The **governing body ensures** that the QAPI program is implemented, ongoing, comprehensive, effective, and that adequate resources are applied to conduct QAPI efforts and operate in a **continuous** manner. The governing body **sets clear expectations for quality and safety**.
- **Aspect 3** – Feedback Systems - **Process and outcome indicators** reflecting the complexity of services within the program are defined, measured, analyzed and tracked.
- **Aspect 4** – Analysis - The transplant QAPI program must **analyze** collected **data**.
- **Aspect 5** – Improvements - Performance improvements are concentrated efforts that involve **systematic gathering of information** to identify issues or problems, and **subsequent** development of **interventions** to prevent recurrences.

Source: CMS "A Conceptual Framework for Medicare Requirements for Quality Assessment and Performance Improvement in Solid Organ Transplant Programs"

Purpose and Objectives

- The purpose of this training session is to enhance Quality Assessment and Performance Improvement activities through an increased knowledge of data tools and data analysis.

- Upon completion of this session, the participant will be able to:
  - Identify basic statistical tools useful for QAPI activities.
  - Select the tool(s) that can generate the data needed to analyze and address different kinds of QAPI issues.

7 Basic Statistical Tools

RUN CHART

HISTOGRAM

PARETO CHART

SCATTER DIAGRAM

CONTROL CHART

CHECKSHEETS

Starting Point: Information Needs and Questions

- The CMS regulation requires a data-driven QAPI program designed to monitor and evaluate performance of all transplantation services.
- The purpose of collecting, analyzing and displaying data is to turn it into information you can use to monitor, evaluate and improve care.
  - What information does your transplant QAPI program need in order to monitor, evaluate and improve performance and outcomes?
  - What opportunities for improvement does your program need to address?

Hypothetical Transplant QAPI Questions

- How can we monitor for delays from referral to wait list?
- Are we documenting ABO and other vital data verification practices correctly?
- Is care for all of our living donors being provided by all members of our multidisciplinary team?
- Our length of stay seems to be increasing. Does this correlate with ICU utilization?
- Are transplant patients receiving their post-op medications and laboratory tests timely?
- What are the factors underlying our ICU admissions and readmissions? Is there anything we can do to address them?

Check Sheet

- Consists of a list of items with some indication of how often each item on the list occurs, to document observations or counts of a process or elements of a process.
- In its simplest form, a tool that makes the data collection process easier by providing pre-written descriptions of the events or items to be counted.
- Design the check sheet from the user's perspective. Is it easily understood and usable? Does it clearly identify exactly what is to be counted, and how?
- The check sheet should have columns for totals as well as observation/counts and notes.

Check Sheet Scenario 1

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Documentation of donor and recipient blood type and other vital data. (Benchmark = 100%)	Recipient #1	Recipient #2	Recipient #3	TOTALS	Notes
"Transplant Pause Validation Checklist" completed	X	X		2	
Time recipient and organ arrived in OR documented (do not count if any element is missing)	X	X	X	3	
Incision time documented	X	X	X	3	
First anastomosis time documented	X	X	X	3	
Verification of ABO, UNOS#, Match ID# for Compatibility documented (do not count if any element is missing)	X		X	2	
Verification by transplanting surgeon and second licensed health care provider is signed with date & time; attests to date and time if visual verification (do not count if any element is missing)	X	X	X	3	
Documentation supports timing of verification met requirements	X	X	X	3	
TOTALS	7/7	6/7	6/7		

Check Sheet Scenario 1: Data Collection to Data Analysis

Data Collection

- 3 transplant procedures were performed last week.
- The check sheet was used to review each patient's medical record.
- Each correct and completed element is marked on the check sheet.

Data Analysis

- The data are totaled and converted to percentages. "The Transplant Pause Validation Checklist" required by this hospital's policy was used in 2 of 3 records reviewed (67%)
- Vital data verification elements were complete in 2 of 3 (67%). All other items were 100% complete.

Check Sheet Scenario 1: Data Analysis to Information and Action

Data Analysis to Information → **Information to Actions**

- Data revealed that 67% of the records reviewed were incomplete on 2 of the items assessed.
- Additional QAPI activities are needed to identify the specific factors interfering with correct implementation of the policies and procedures.

- Effective remedial actions can be developed after underlying factors contributing to performance have been identified.
- Implementation of the actions includes ongoing data collection and analysis to measure whether they were effective.

Check Sheet Scenario 2

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Count medical record entries by specified members of the multidisciplinary team caring for Living Donor. Mark only if documentation meets all hospital policy requirements for that phase of living donation: Phase 1-evaluation; Phase 2-donation Phase 3-discharge. (*Benchmark 100%*)	Recipient #1 PHASE 1	2	3	Recipient #2 PHASE 1	2	3	Totals	Notes
Independent Living Donor Advocate								
Living Donor Coordinator								
In-House Transplant Coordinator								
Dietician								
Pharmacy								
Social Worker								
TOTALS								

Scatter Diagram

- A scatter diagram or scatter graph is a type of mathematical diagram using coordinates to display values for two variables for a set of data. It is often used in the test of solutions process or data analysis process

- A scatter diagram can suggest various kinds of correlations between variables with a certain level of confidence. Correlations may be positive (rising), negative (falling), or null (uncorrelated)

- This tool would not be used in finalized QAPI documents or QAPI reporting structures without being accompanied by other information. Transplant program staff would need to explain which variable is under control and/or the correlation between variables.

Scatter Diagram Scenario

- Transplant Program 'Alpha' has identified that there has been an increase in transplant patient hospital length of stay (LOS) and in ICU length of stay.
- The Transplant QAPI committee requested more information from the team to determine whether increased LOS in the ICU is having an impact on the increase in hospital LOS.

2 Variable Correlation

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	Q1 09	Q1 10	Q1 11	Q1 12	Q1 13	Q1 14	Q1 15	Q2 09	Q2 10	Q2 11	Q2 12	Q2 13	Q2 14	Q2 15	Q3 09	Q3 10	Q3 11	Q3 12	Q3 13	Q3 14	Q3 15	Q4 09	Q4 10	Q4 11	Q4 12	Q4 13	Q4 14
Average Hospital Length of Stay	11.5	28.5	13.3	43.5	7	13	13	22.7	11.3	7.3	20.8	8	11	28.6	12.4	25	18	33.5	42	13	7	20	8	16.7	48.9	13	10
Average ICU Length of Stay	4.3	16.8	4.4	11.5	2	3.5	9	14	2	3.3	15.6	4	9.7	5.2	6	6.7	8.7	20	44	5.2	13	5	2	4	21.3	3.7	6.3

The program compiled raw data from 2009 to 2015 showing the average hospital length of stay and the average ICU length of stay for its transplant patients.

The questions to be answered are:

- Does the increase in ICU stay have an impact on the increase in hospital stay?
- If so, what can be done to decrease the ICU LOS?

How to Create Scatter Graph

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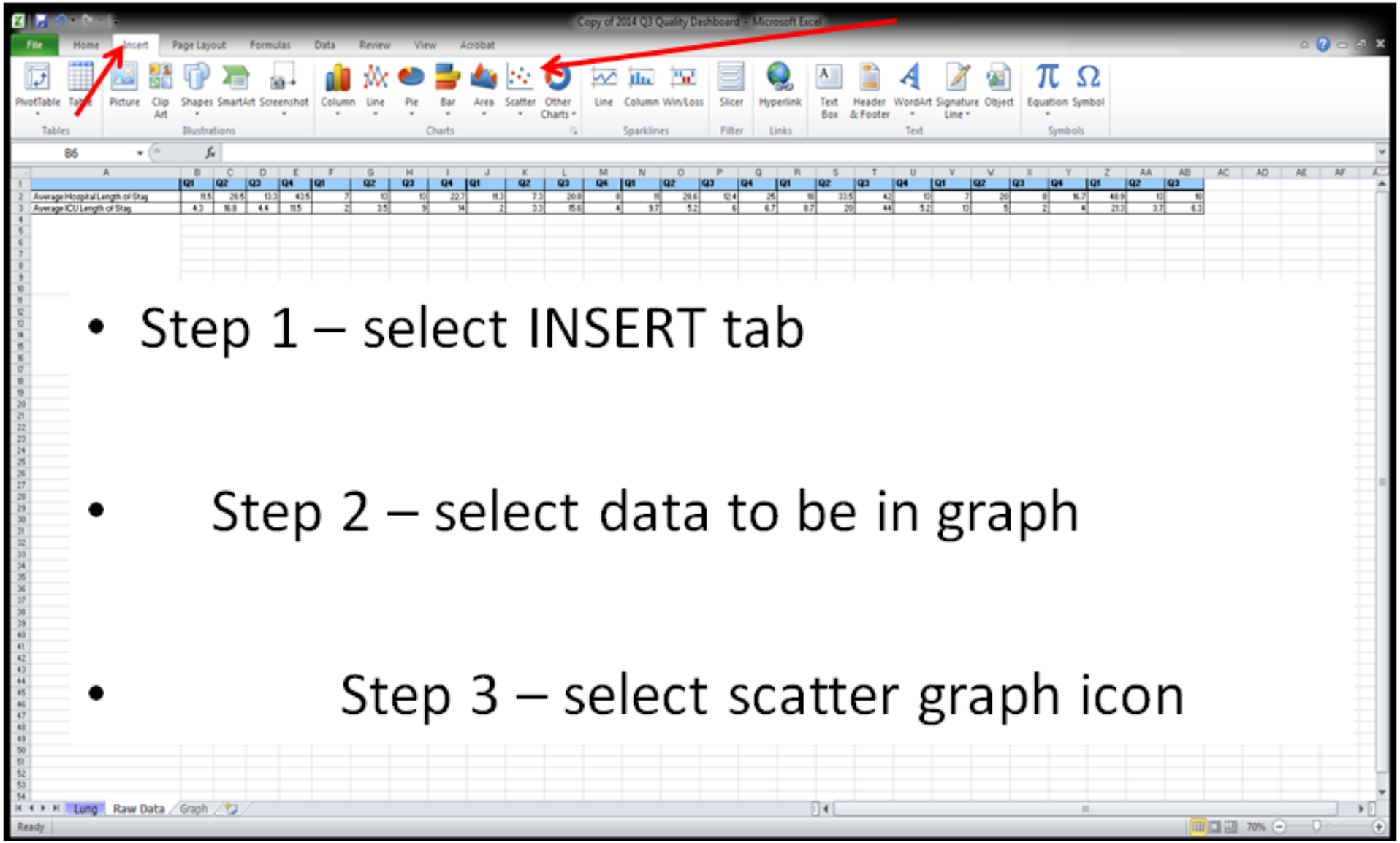
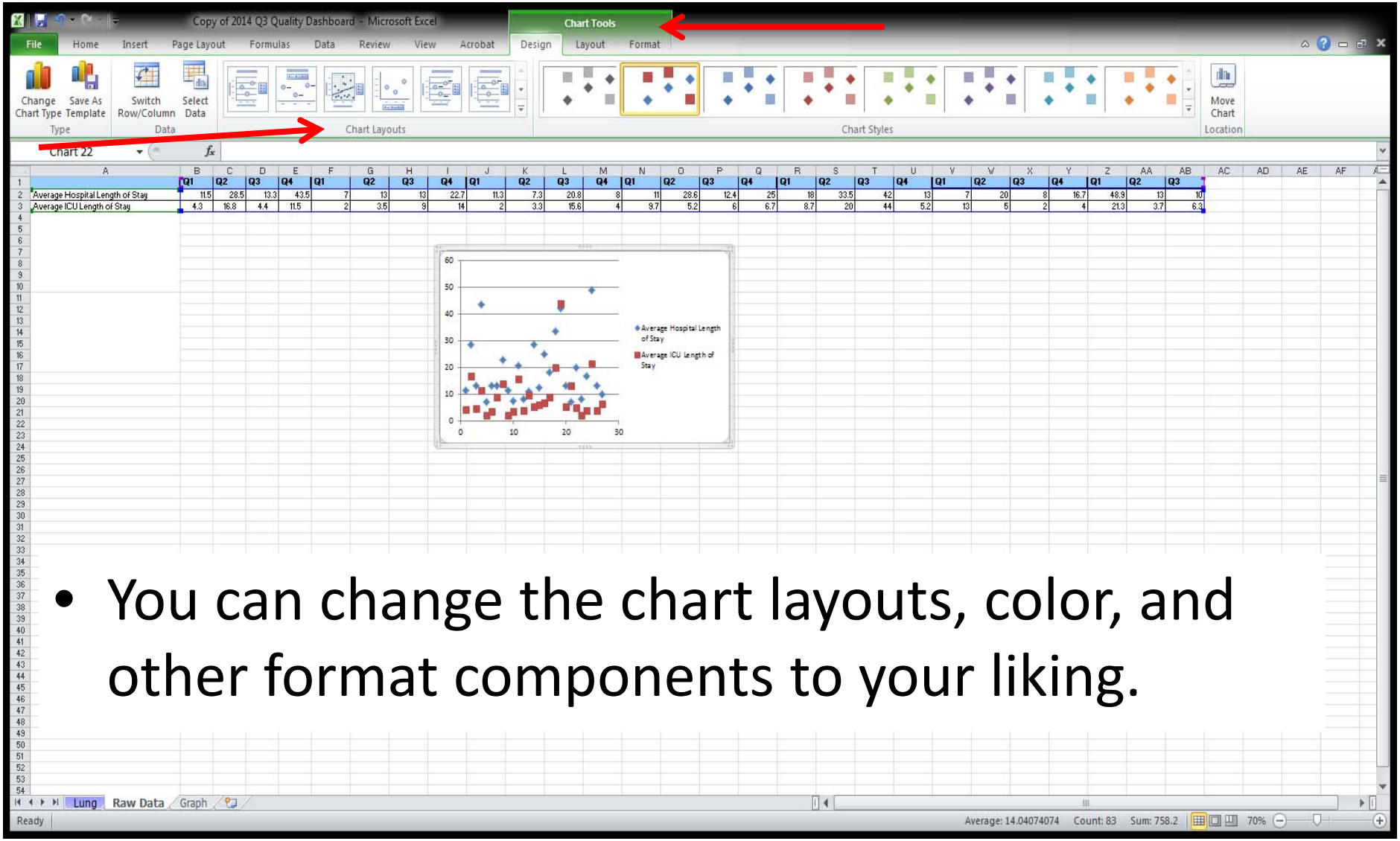


- Step 1 – select INSERT tab
- Step 2 – select data to be in graph
- Step 3 – select scatter graph icon

Finish the Graph



- You can change the chart layouts, color, and other format components to your liking.

Identifying a Correlation

- Correlation only suggest a possible connection between variables.
- Correlation is positive when the values increase together.
- Correlation is negative when one value decreases as the other increases.
- Correlation can have a value:
  - 1 is a perfect positive correlation
  - 0 is no correlation (the values don't seem linked at all)
  - -1 is a perfect negative correlation

Correlation Analysis

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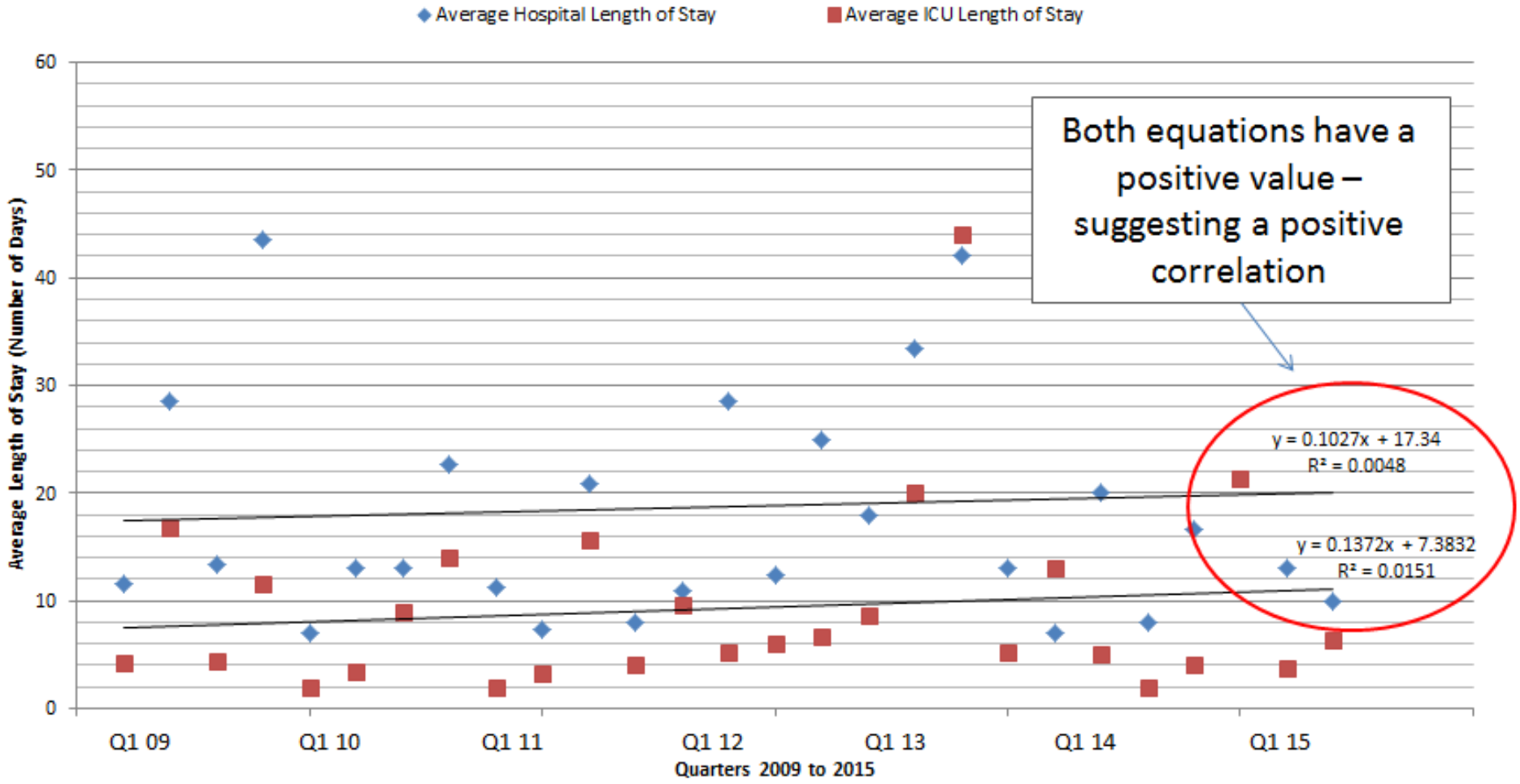
ICU Length of Stay Compared to Hospital Length of Stay (2009 to 2015)



Scatter Diagram: Final Analysis

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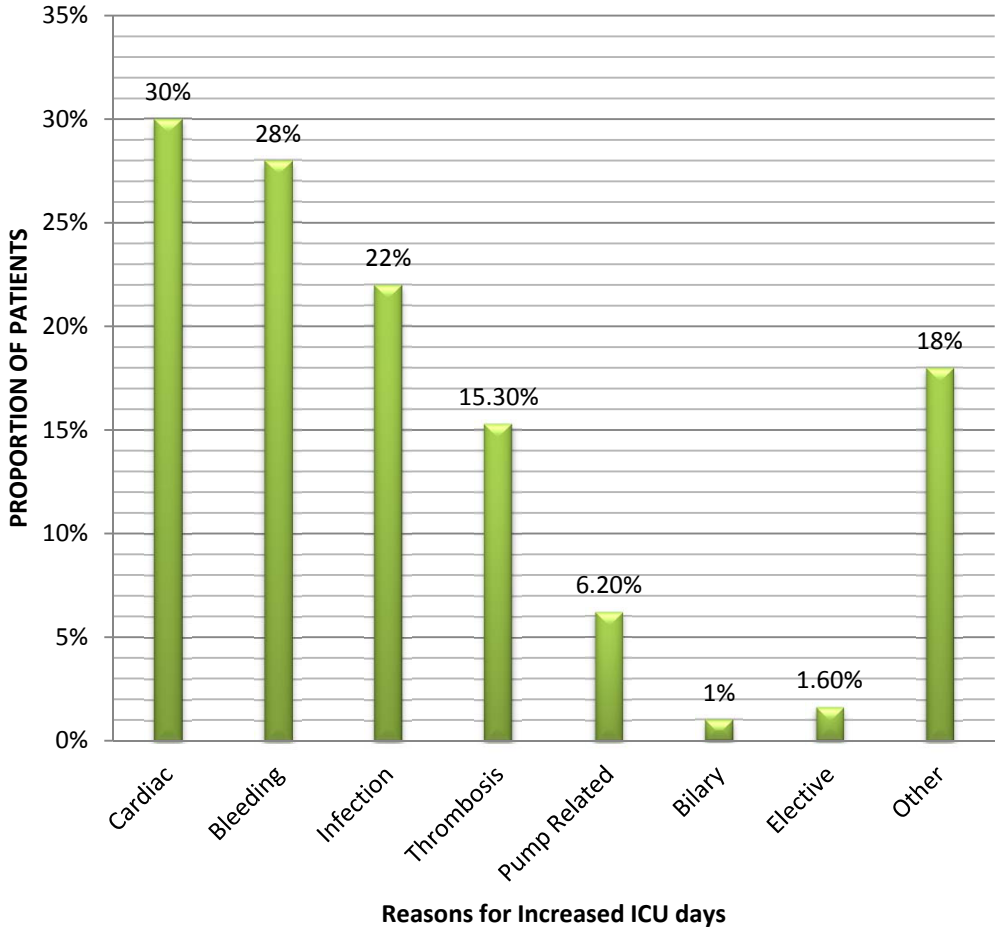
- A positive correlation exists.
- Correlation alone does not reveal the opportunities for improvement.
- Additional QAPI activities and data tools such as histogram or cause/effect diagram are needed to determine where action may be possible.
- This program identified cardiac, bleeding and infection as major reasons for increased ICU stays and the main opportunities for improvement.



Histogram

- A Histogram is a graphical representation showing a visual impression of the distribution of data. It is often used in data analysis and data reporting.
- A histogram consists of tabular frequencies, shown as adjacent rectangles, erected over discrete intervals (bins), with an area equal to the frequency of the observations in the interval.
- Histograms are effective tools to show the distribution among different categories or variables.
- This display provides insight to the program on which category or variable needs the most attention or is the greatest opportunity for improvement.

Histogram Scenario

- Transplant Program ‘Charlie’ has identified that 9 of the past 12 dashboard monitors for time from referral to listing did not meet benchmark performance.
- The Transplant QAPI committee wanted to know why the performance was not reaching the desired level.
- QAPI staff said they would attempt to identify the issues and respond back at the next meeting.

Creating a Histogram

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Step 1 – Identify, collect and validate needed data: in this scenario, referrals (total and by source) and median days from referral to listing.

REFERRALS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
TOTAL REFERRALS	16	11	20	13	27	20	16	21	7	13	17	18	199
CITY NEPHROLOGIST	14	9	15	10	23	15	11	20	7	7	15	14	160
OUTLYING NEPHROLOGIST	2	2	5	3	4	5	5	1	0	6	2	4	39

MEDIAN REFERRAL TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
(# DAYS)	157	329	128	83	95	68	165	117	222	92	88	169	**137.6**
Benchmark= 90 days													

Step 2 – Review initial data – 9 of the 12 months are not performing compared to the established benchmark.

Step 3 – Develop a check sheet to determine the reasons why patients have been delayed in the referral/listing/evaluation process.

Identifying Reasons

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Step 4 – In this scenario, a checklist was developed and used to count the reasons for delay.

REASONS FOR DELAY TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
MEDICAL CLEARANCE	1	1	2	2	1	3	1	2	0	3	2	2	**20**
DENTAL CLEARANCE	1	0	1	1	1	0	1	2	0	0	1	1	**9**
MISSED APPOINTMENTS	4	5	3	6	7	6	8	7	6	5	5	7	**69**
ILLNESS	0	1	0	1	0	0	1	0	1	2	1	1	**8**
OTHER	1	0	1	0	0	0	0	0	0	1	0	1	**4**

Step 5 – Create histogram to see which category is of greatest concern.

Selecting Data for the Histogram

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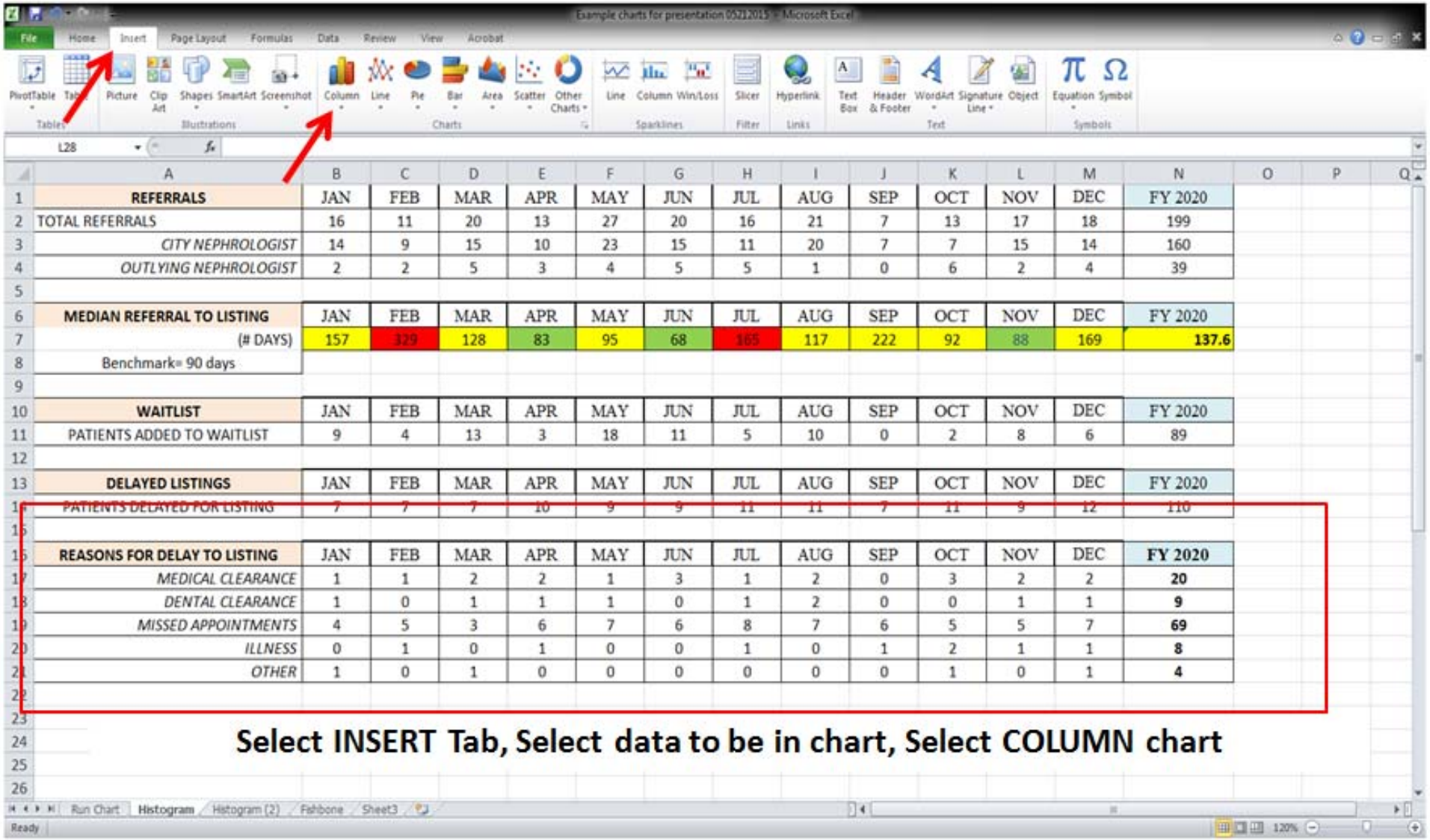

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	**REFERRALS**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
2	TOTAL REFERRALS	16	11	20	13	27	20	16	21	7	13	17	18	199
3	*CITY NEPHROLOGIST*	14	9	15	10	23	15	11	20	7	7	15	14	160
4	*OUTLYING NEPHROLOGIST*	2	2	5	3	4	5	5	1	0	6	2	4	39
5														
6	**MEDIAN REFERRAL TO LISTING**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
7	(# DAYS)	157	329	128	83	95	68	165	117	222	92	88	169	**137.6**
8	Benchmark= 90 days													
9														
10	**WAITLIST**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
11	PATIENTS ADDED TO WAITLIST	9	4	13	3	18	11	5	10	0	2	8	6	89
12														
13	**DELAYED LISTINGS**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
14	PATIENTS DELAYED FOR LISTING	7	7	7	10	9	9	11	11	7	11	9	12	110
15														
15	**REASONS FOR DELAY TO LISTING**	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	**FY 2020**
17	*MEDICAL CLEARANCE*	1	1	2	2	1	3	1	2	0	3	2	2	**20**
18	*DENTAL CLEARANCE*	1	0	1	1	1	0	1	2	0	0	1	1	**9**
19	*MISSED APPOINTMENTS*	4	5	3	6	7	6	8	7	6	5	5	7	**69**
20	*ILLNESS*	0	1	0	1	0	0	1	0	1	2	1	1	**8**
21	*OTHER*	1	0	1	0	0	0	0	0	0	1	0	1	**4**
22														
23														
24	**Select INSERT Tab, Select data to be in chart, Select COLUMN chart**													
25														
26														

Complete Histogram

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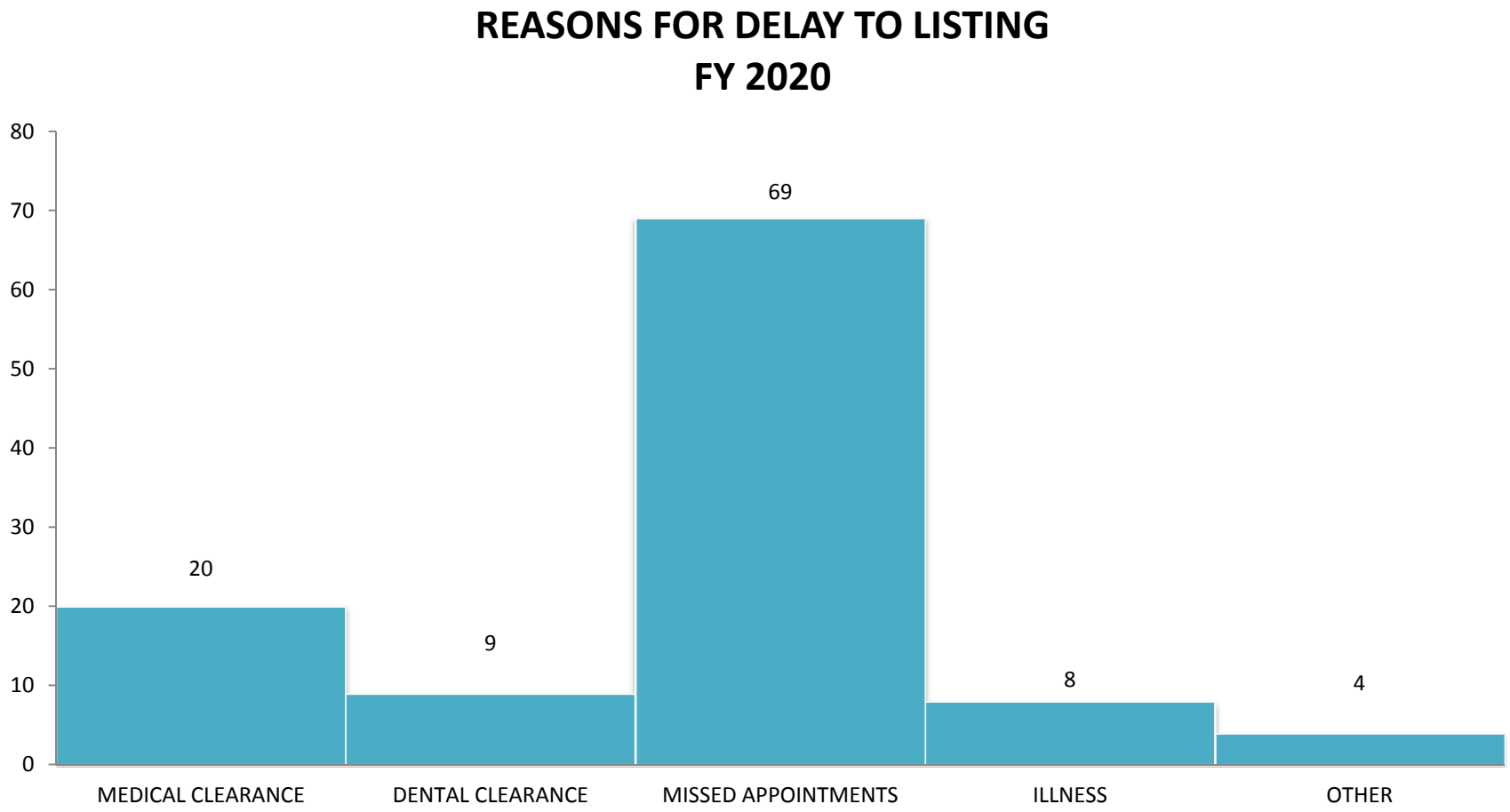

Reasons for Missed Appointments Histogram

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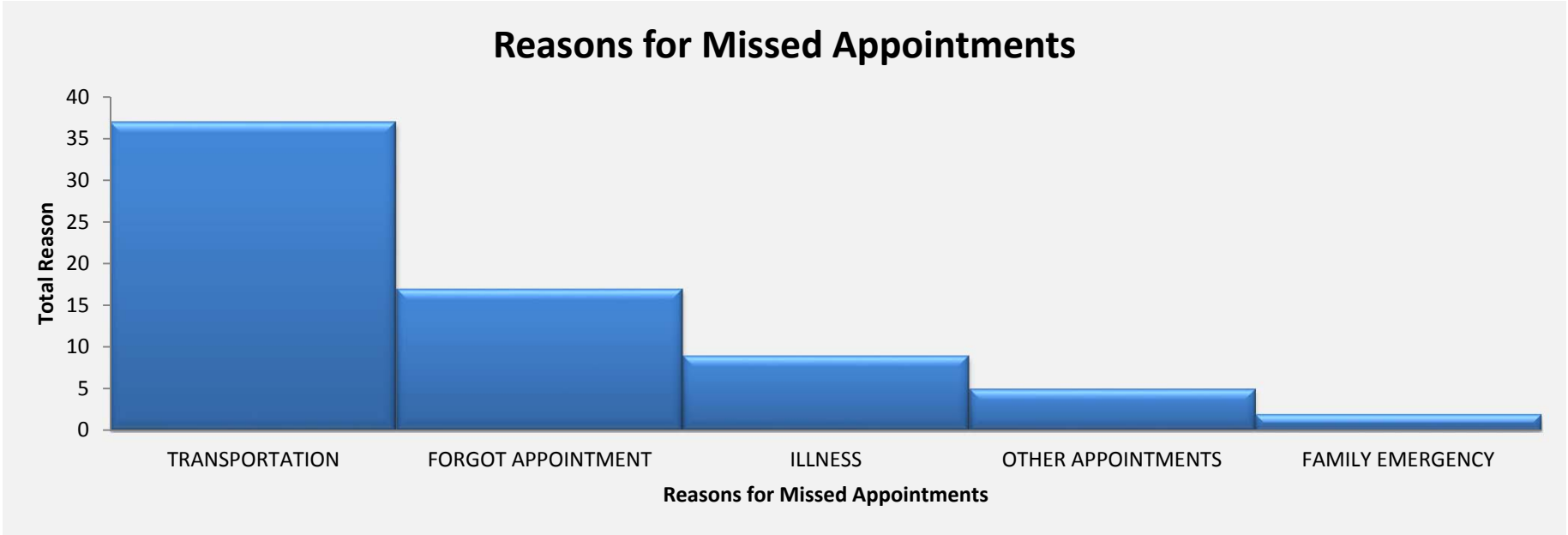
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
REASONS FOR MISSED APPOINTMENTS	4	5	3	6	7	6	8	7	6	5	5	7	69
FORGOT APPOINTMENT	0	1	0	1	2	0	2	3	2	1	2	3	17
TRANSPORTATION	2	3	2	3	4	3	5	3	3	4	2	3	37
ILLNESS	1	0	1	0	1	1	0	1	1	0	1	2	9
FAMILY EMERGENCY	1	0	0	0	0	1	0	0	0	0	0	0	2
OTHER APPOINTMENTS	0	1	0	2	0	1	1	0	0	0	0	0	5



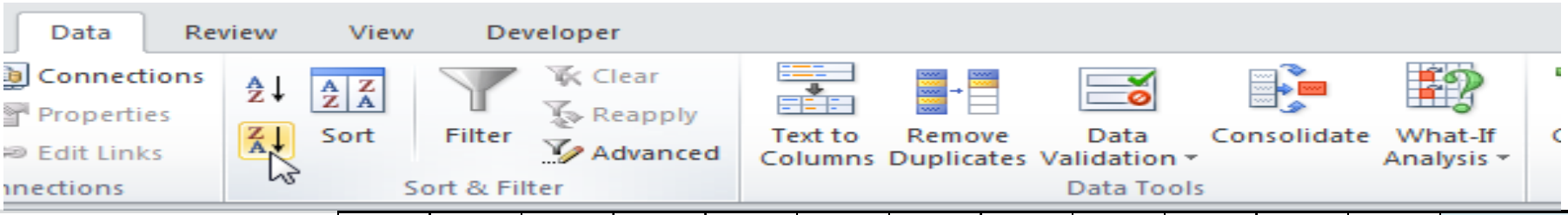
Pareto Chart

- A Pareto chart contains both bars and a line graph, where individual values are represented in descending order by bars, and the line represents the **cumulative total**. It can be used in data analysis and data reporting processes.
- The purpose of the Pareto chart is to highlight the most important among a (typically large) set of factors.
- Pareto charts are often confused with Histograms. The purpose of a Pareto chart is to categorize variables and aggregate the categories from the largest percentage to smallest percentage, never exceeding a total of 100%.

Creating a Pareto Chart

The steps in creating a Pareto chart are similar to creating a histogram. The difference is that the categories are arranged from largest amounts to smallest amounts.

First, sort your data in descending order. To achieve this, **highlight the data to be sorted**, on the Data tab, click ZA.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	FY 2020
REASONS FOR MISSED APPOINTMENTS	4	5	3	6	7	6	8	7	6	5	5	7	69
TRANSPORTATION	2	3	2	3	4	3	5	3	3	4	2	3	37
FORGOT APPOINTMENT	0	1	0	1	2	0	2	3	2	1	2	3	17
ILLNESS	1	0	1	0	1	1	0	1	1	0	1	2	9
OTHER APPOINTMENTS	0	1	0	2	0	1	1	0	0	0	0	0	5
FAMILY EMERGENCY	1	0	0	0	0	1	0	0	0	0	0	0	2

Cumulative Counts

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	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Count	Cumulative Count
REASONS FOR MISSED APPOINTMENTS	4	5	3	6	7	6	8	7	6	5	5	8	**70**	
TRANSPORTATION	2	3	2	3	4	3	5	3	3	4	2	3	37	37
FORGOT APPOINTMENT	0	1	0	1	2	0	2	3	2	1	2	3	17	54
ILLNESS	1	0	1	0	1	1	0	1	1	0	1	2	9	63
OTHER APPOINTMENTS	0	1	0	2	0	1	1	0	0	0	0	0	5	68
FAMILY EMERGENCY	1	0	0	0	0	1	0	0	0	0	0	0	2	70

In the far right hand column, the cumulative count is achieved by adding the totals of each reason in a descending order. Utilize the SUM formula for this - =SUM(N4:N5) and so on.

Cumulative Percentage

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	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Count	Cumulative Count	Cumulative Percentage
REASONS FOR MISSED APPOINTMENTS	4	5	3	6	7	6	8	7	6	5	5	8	**70**		
TRANSPORTATION	2	3	2	3	4	3	5	3	3	4	2	3	37	37	52.9
FORGOT APPOINTMENT	0	1	0	1	2	0	2	3	2	1	2	3	17	54	77.1
ILLNESS	1	0	1	0	1	1	0	1	1	0	1	2	9	63	90.0
OTHER APPOINTMENTS	0	1	0	2	0	1	1	0	0	0	0	0	5	68	97.1
FAMILY EMERGENCY	1	0	0	0	0	1	0	0	0	0	0	0	2	70	100.0

- Cumulative Percentage is calculated with the formula: =(O4/O8)*100
- The O4 is the first cumulative count cell, divided by the absolute cell (which is the last cumulative count cell, multiple by 100.
- Format the cell to a number with 1 decimal point (do not format this cell to a percentage)

Build the Pareto Chart

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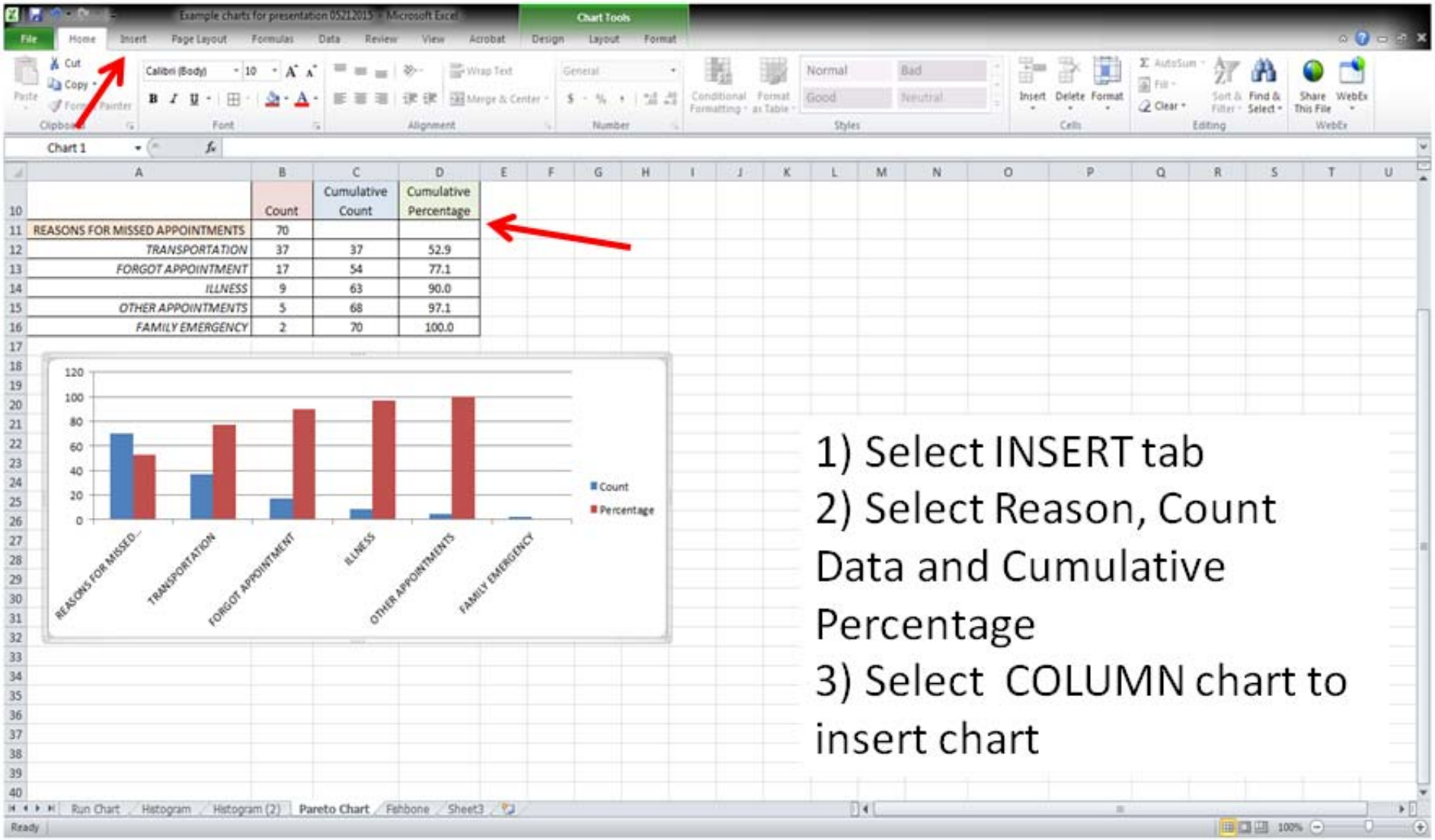
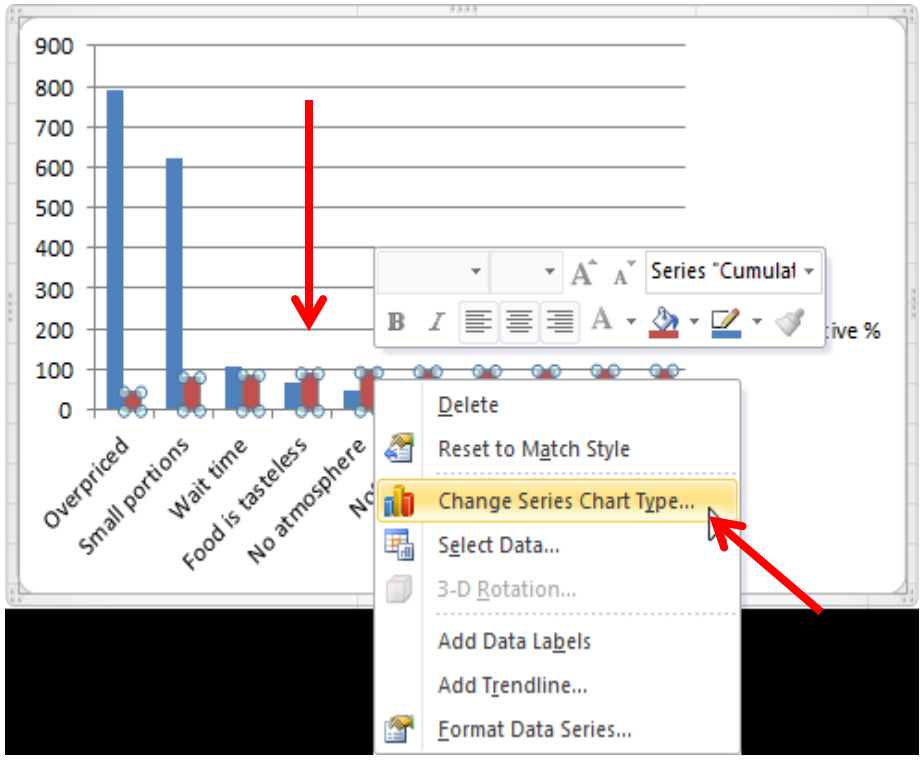
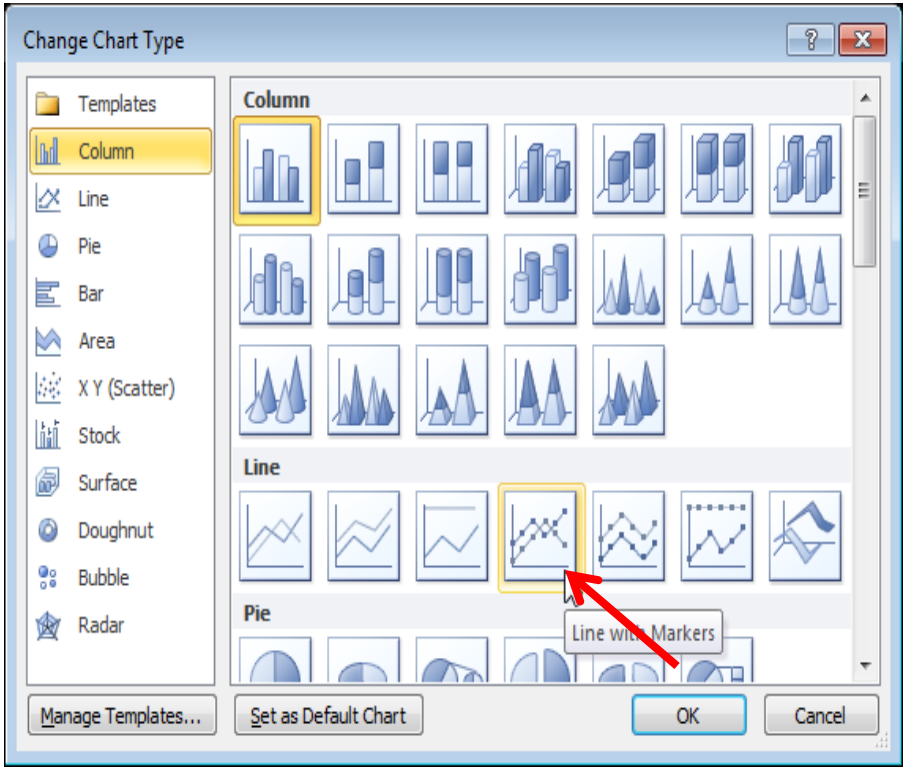


Change Bar to Line Chart

- Right click on Percentage column data (select Change Series Chart Type)
- Select Line Chart from new category





Add Second Axis

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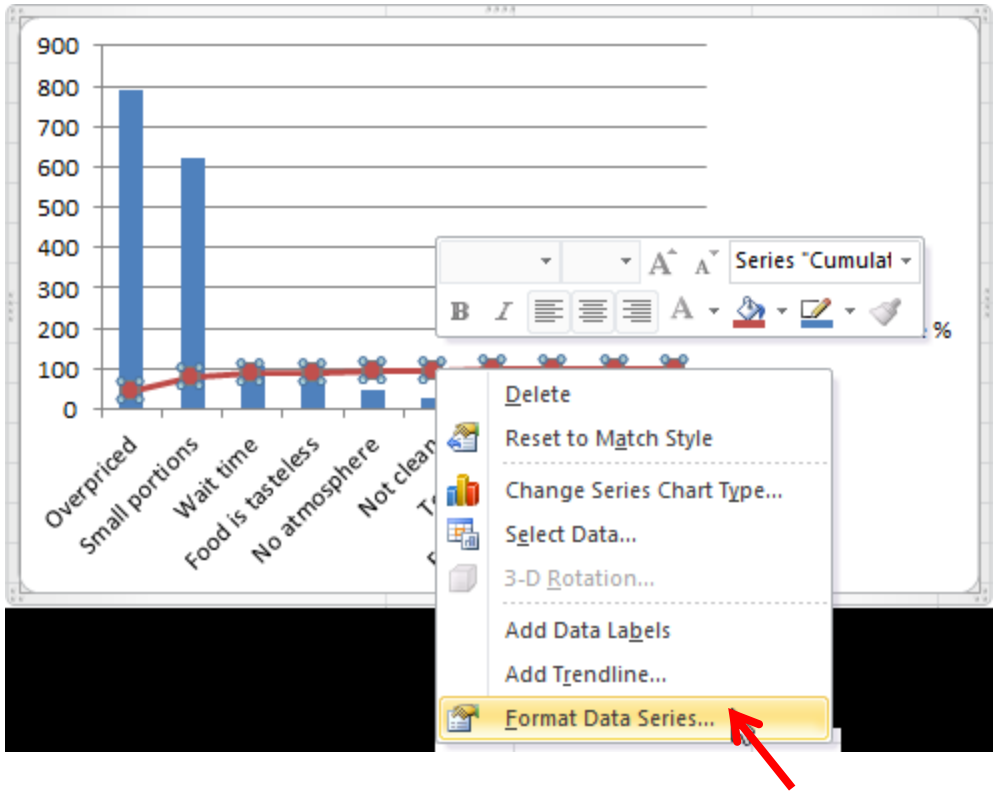
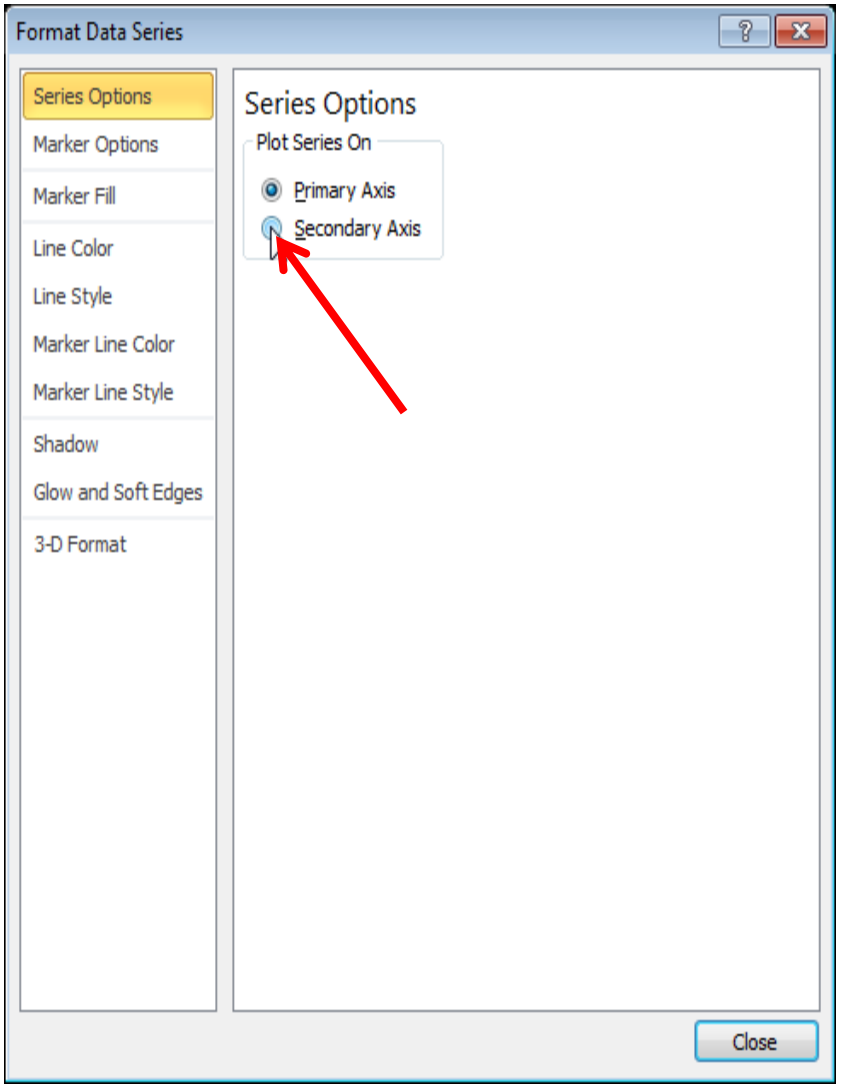
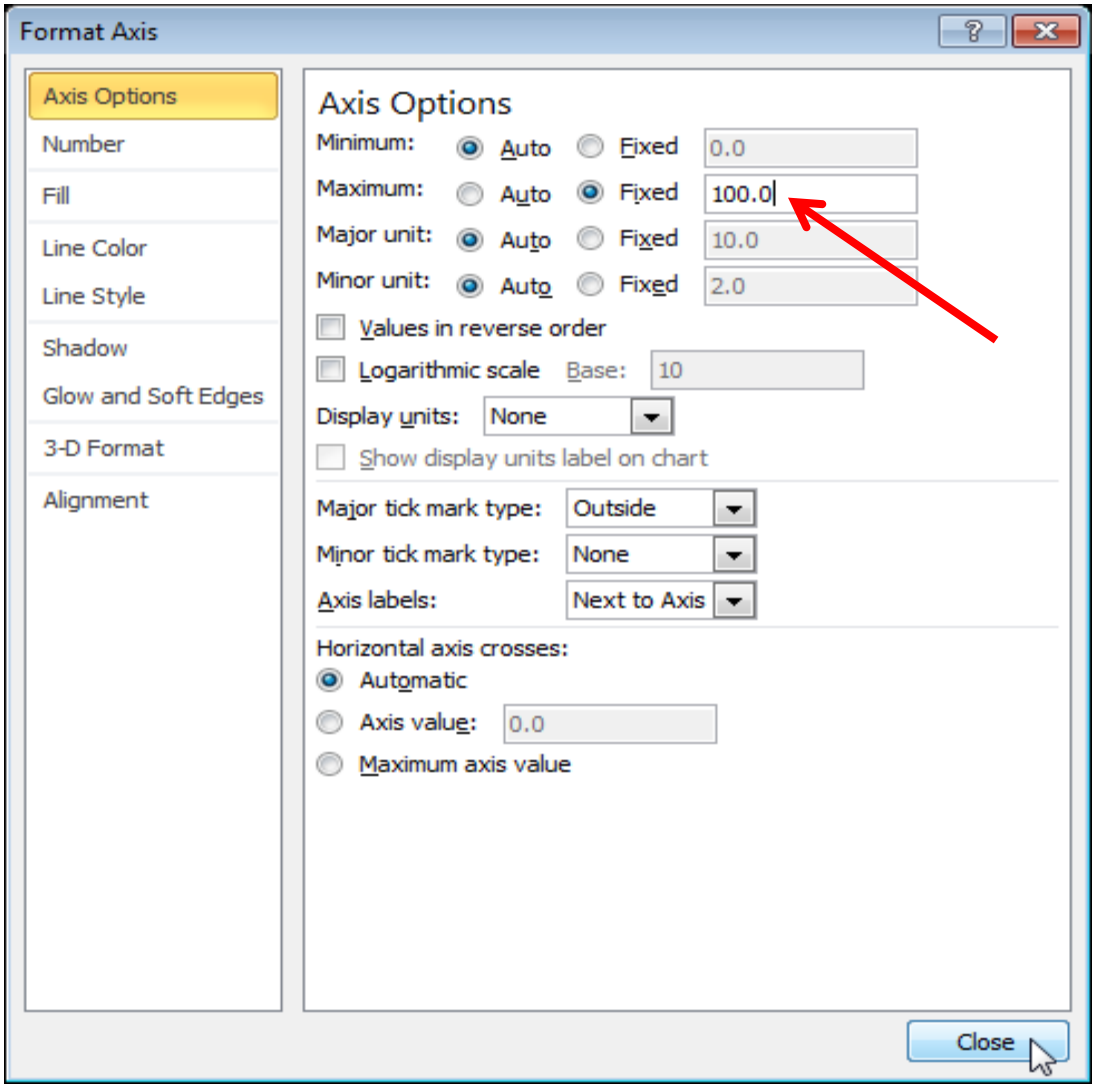
Right Click on Percentage Line and select Format Data Series



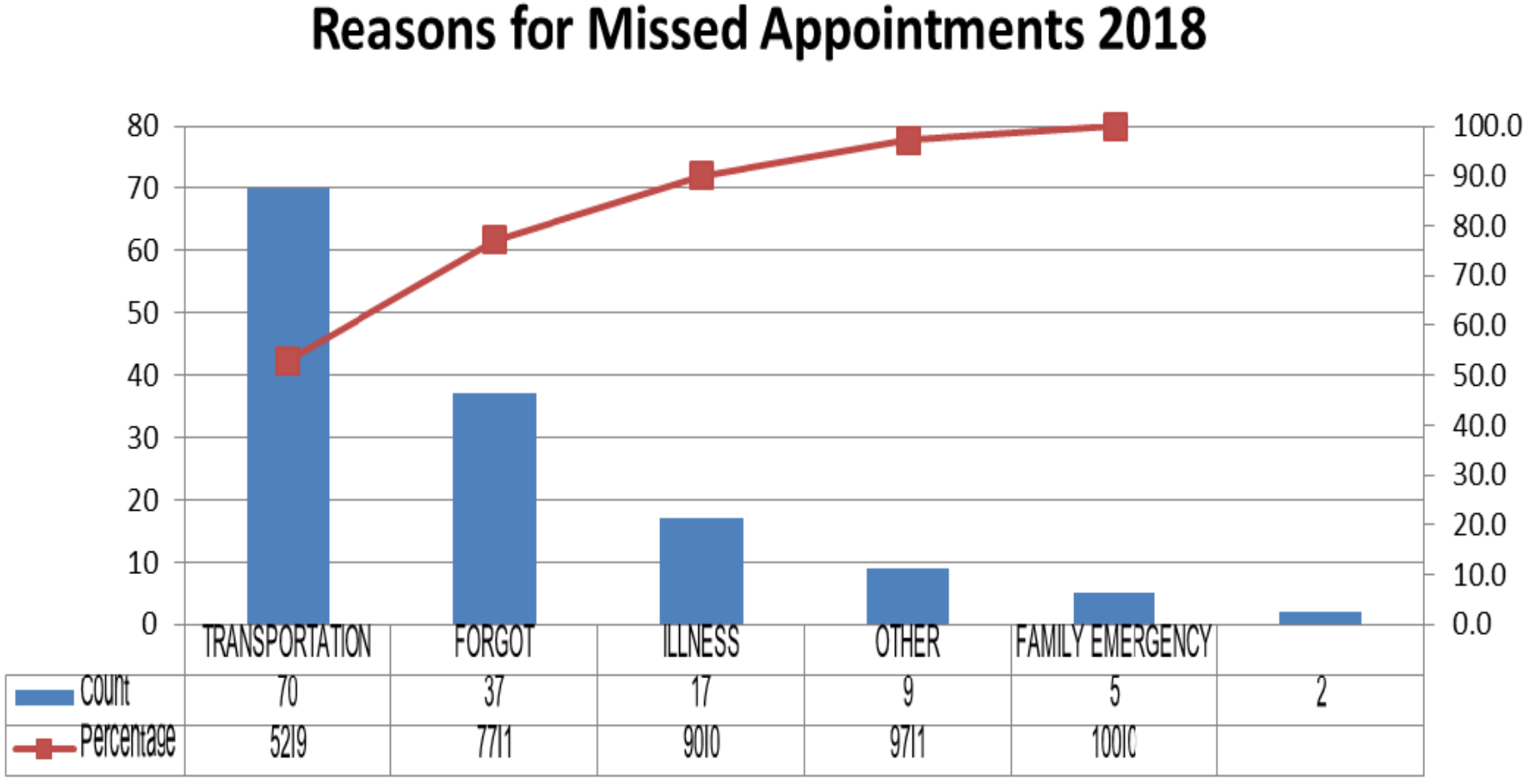


Change Second Axis

Right click the percentages on the chart, click Format Axis, set the Maximum to 100 and click Close



Complete Pareto Chart



Flowchart

- A type of diagram that represents an algorithm or process, showing the steps (as boxes of various shapes) and the order in which they occur (by connecting the boxes with arrows).
- Flowcharts, also known as process maps, causal maps and flow maps, can be used in various improvement activities to analyze, design, document or manage a process or program. For example, in order to understand how and where a given process can be improved, the process should be mapped to identify the gaps or delays.
- This tool can also provide a visual of the connections or relationships with other processes in a larger system. The tool should be easily followed with **decision points** (*triggers when action is required by staff)* **clearly identified**.

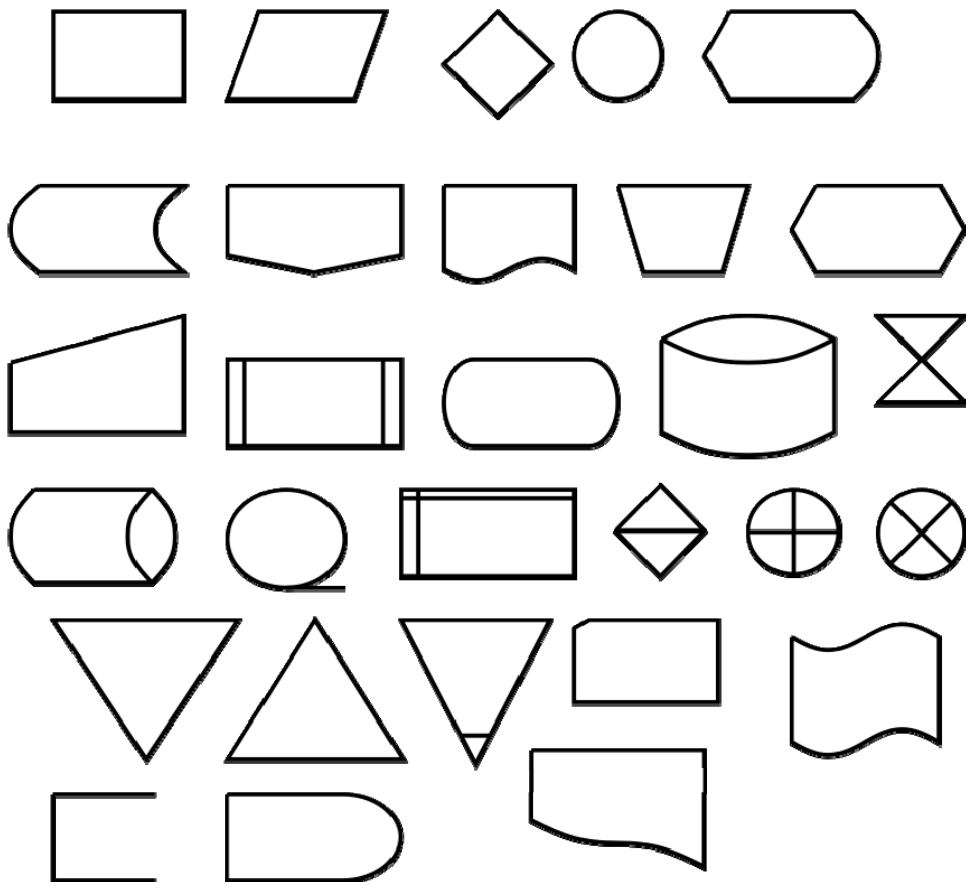
Flowchart Scenario

- The Transplant program has recently acquired a new Medical Director and Transplant Manager.
- The new leadership wants to understand some key processes within the transplant program that may affect patient safety.
- A PI activity was designed to understand (through mapping) the laboratory processes around immunosuppressive therapy, admission/re-admission processes and medication administration processes.

Flowchart Symbols

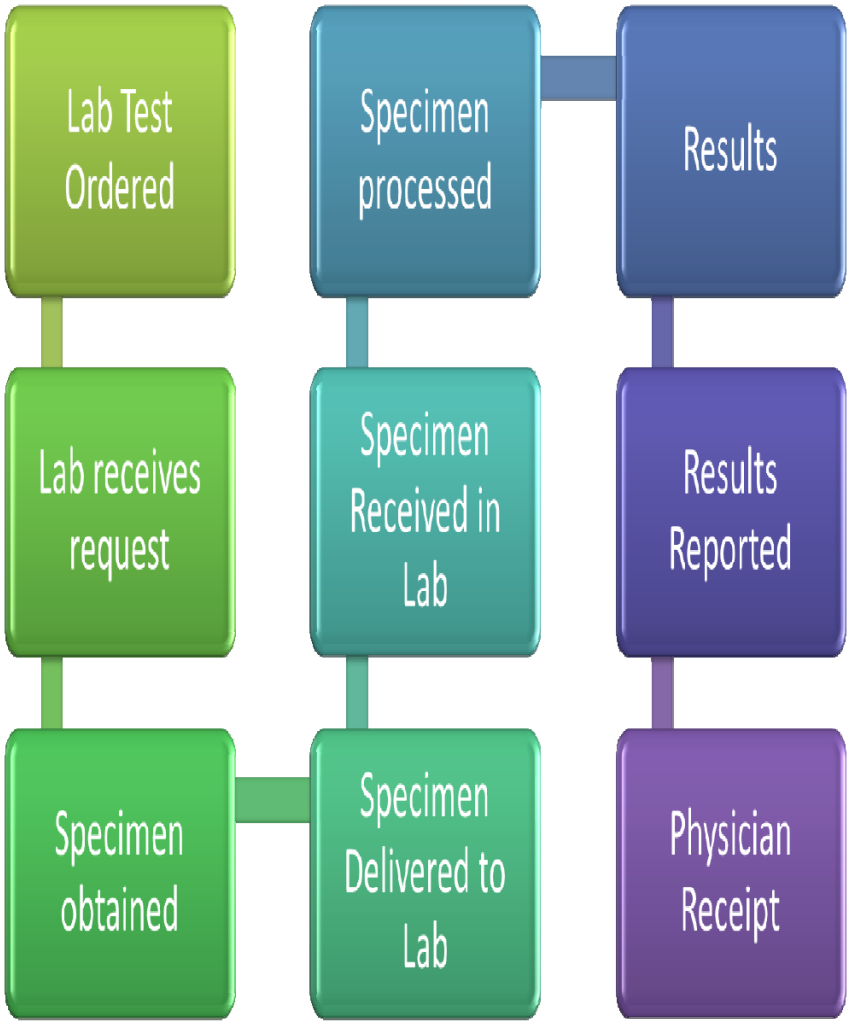
Many software programs contain templates with Flowchart symbols; for example:

1) Visio
2) Excel SmartArt
3) Flowgorithm
4) Raptor
5) LARP
6) Visual Logic



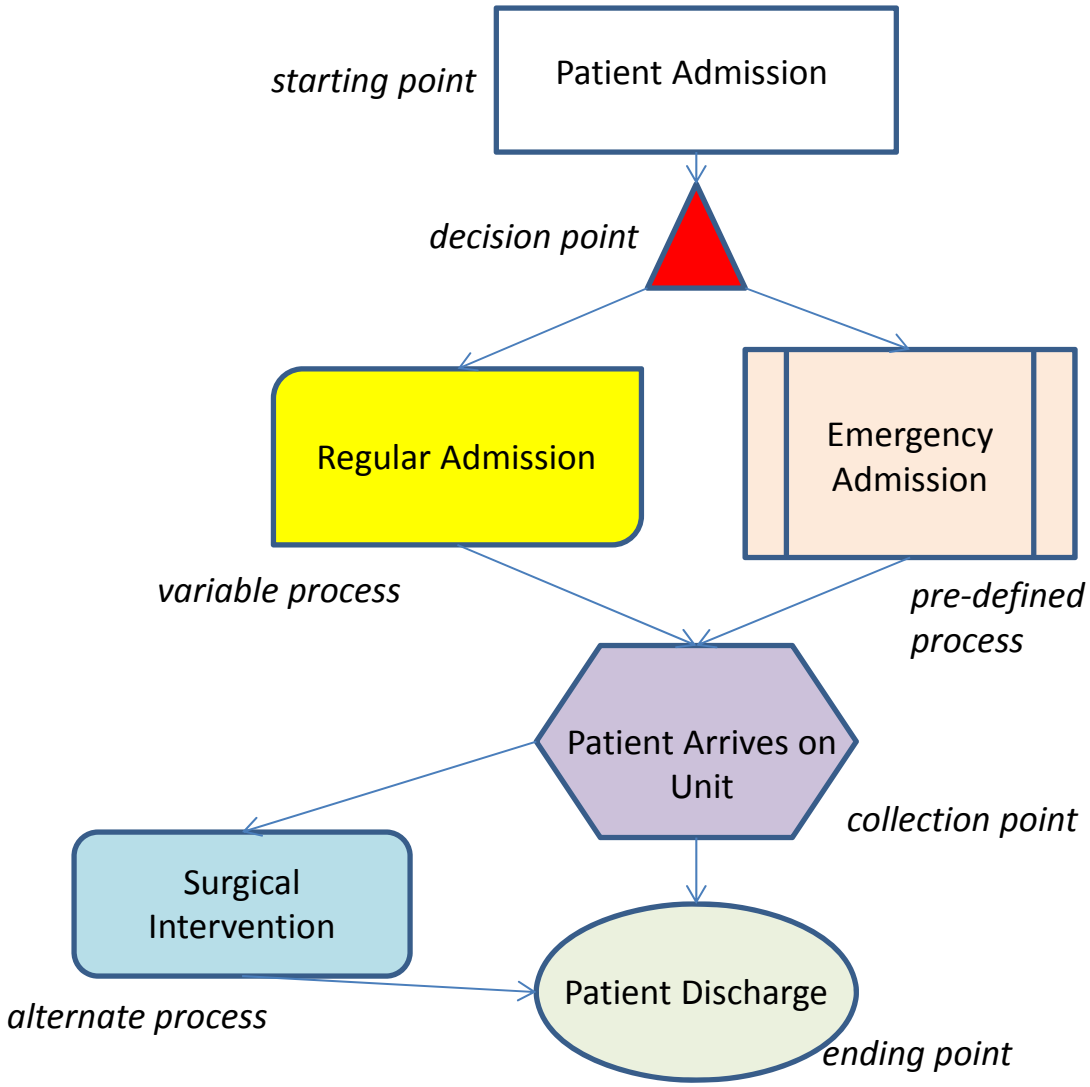
Flowchart Scenario: Lab Process

SmartArt within Power Point contains basic flow maps that can outline the flow of a particular process. This example does not illustrate symbols for decision points and data.



Flowchart Scenario: Admission Process

Both Word and Excel contain SmartArt as well as the ability to INSERT shapes to create a process map or flowchart.



Visio Flowchart Example

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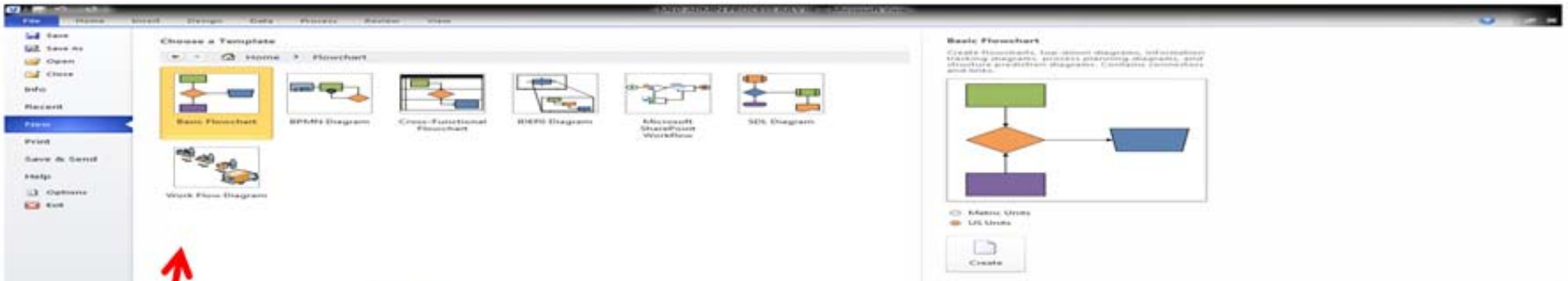
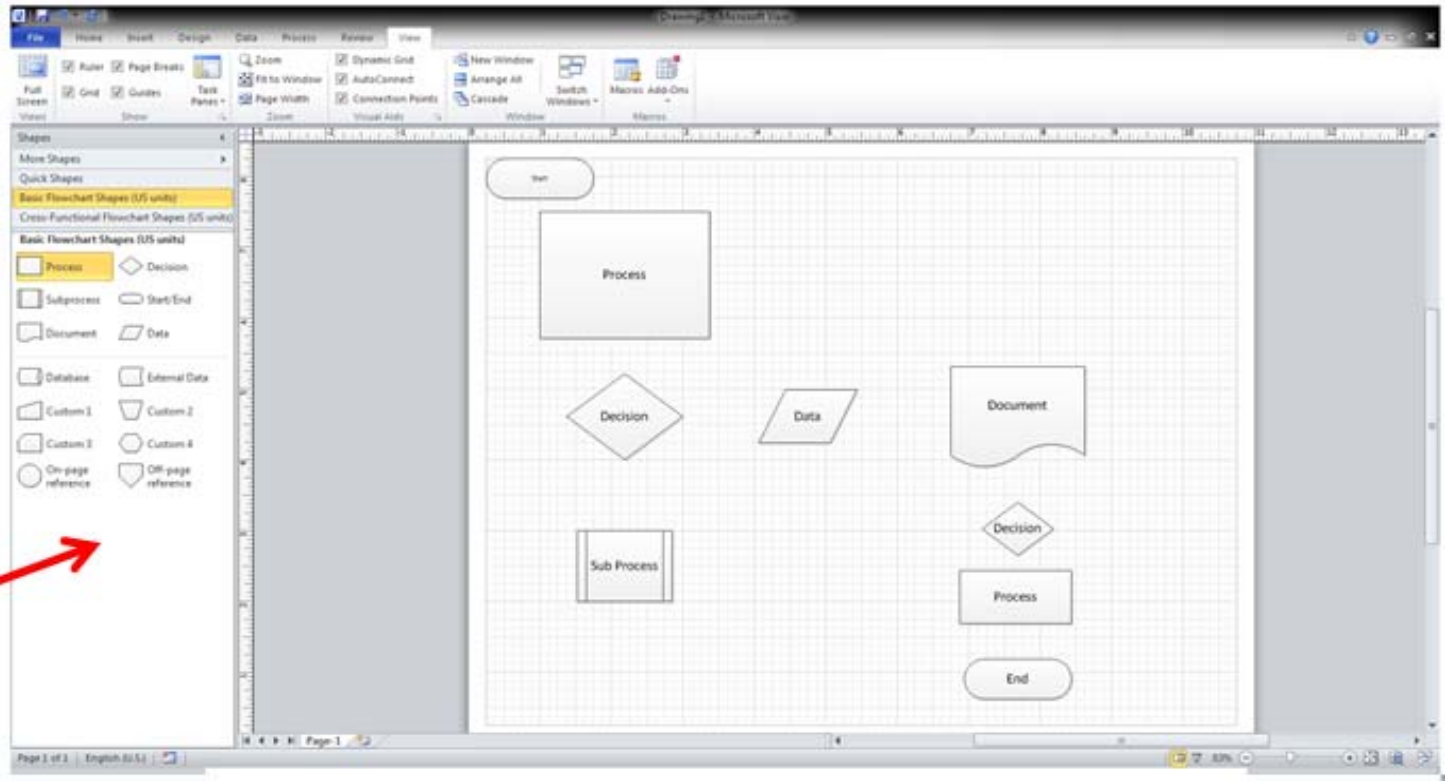


Creating New Visio Chart



Symbols within Visio and creating a flowchart

Flowchart Scenario: Medication Process

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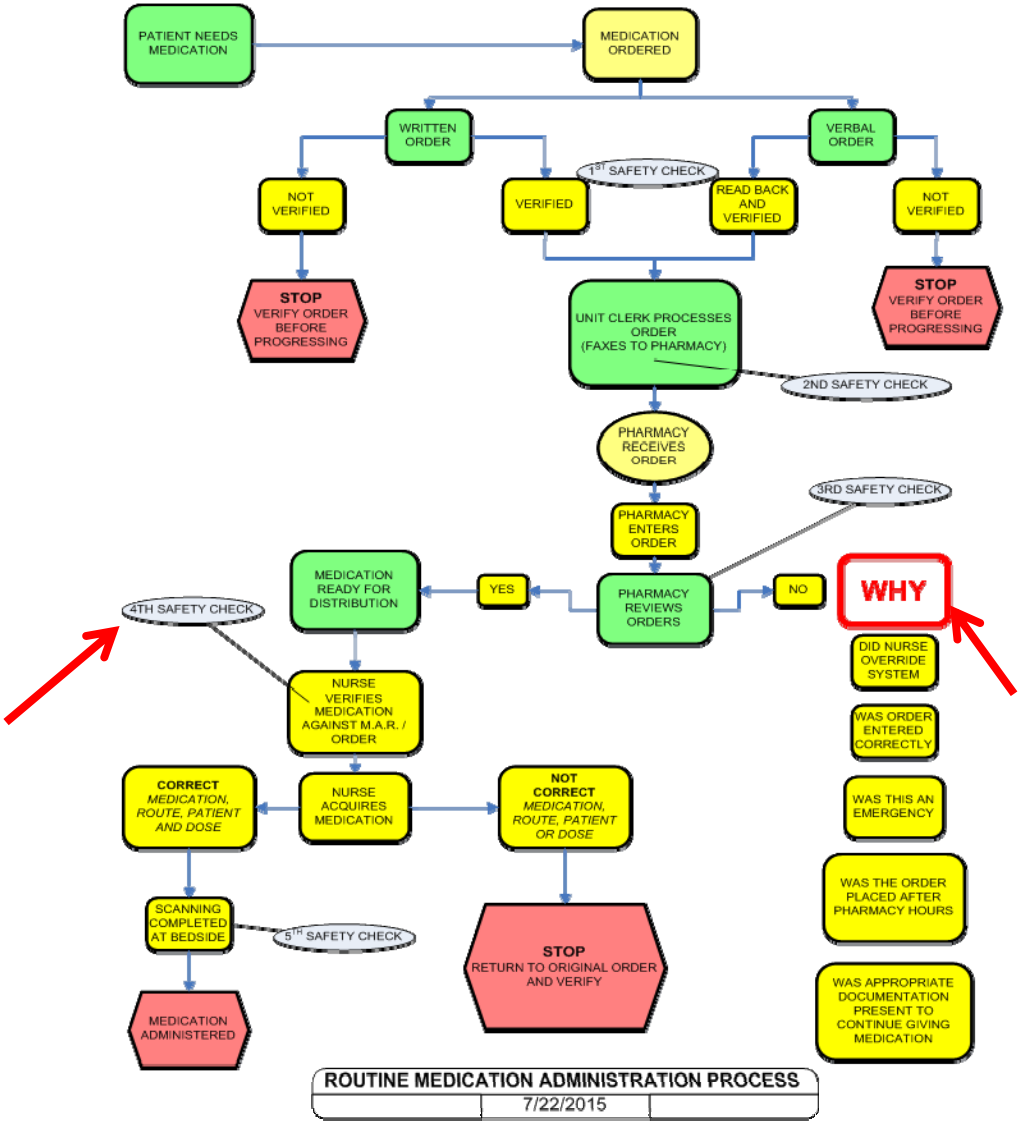
This flowchart represents a basic medication administration process. Decision points and automatic safety checks are identified to help determine why **work arounds** were occurring.



Flowchart Scenario: Analysis

- The PI activity resulted in 3 different flowcharts that mapped the processes related to immunosuppressive therapy, admission / re-admission and medication administration.
- The Transplant QAPI committee and Leadership can now evaluate these processes independently to determine if they are at the ‘ideal state’ and evaluate these processes from a ‘systematic’ and ‘systemic’ view to ensure that the processes integrate into the overall patient care structure.

Examples of Transplant Processes

- Process is defined as “a series of actions or steps taken in order to achieve a particular end.” A Flowchart may be useful when a Transplant QAPI program is reviewing processes such as:
  - Referral to waitlist; waitlist review and management
  - ABO and other vital data verification
  - Patient flow through clinic and inpatient admission
  - Immunosuppressive therapy & laboratory testing
  - Discharge planning and education
  - Recipient or Living Donor follow-up post-discharge

Cause and Effect Diagram

- Ishikawa diagrams (also called fishbone diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa) are diagrams that show the causes/contributing factors related to a specific event. They are often used in the beginning of the solution identification process, before action plan development, to help determine the relationship between factors underlying an event or process.
- Each cause or reason for imperfection is a source of variation.
- Causes are usually grouped into major categories to identify these sources of variation.
- This tool helps users understand relationships/connections and how selected factors either impact the problem or reduce the problem.

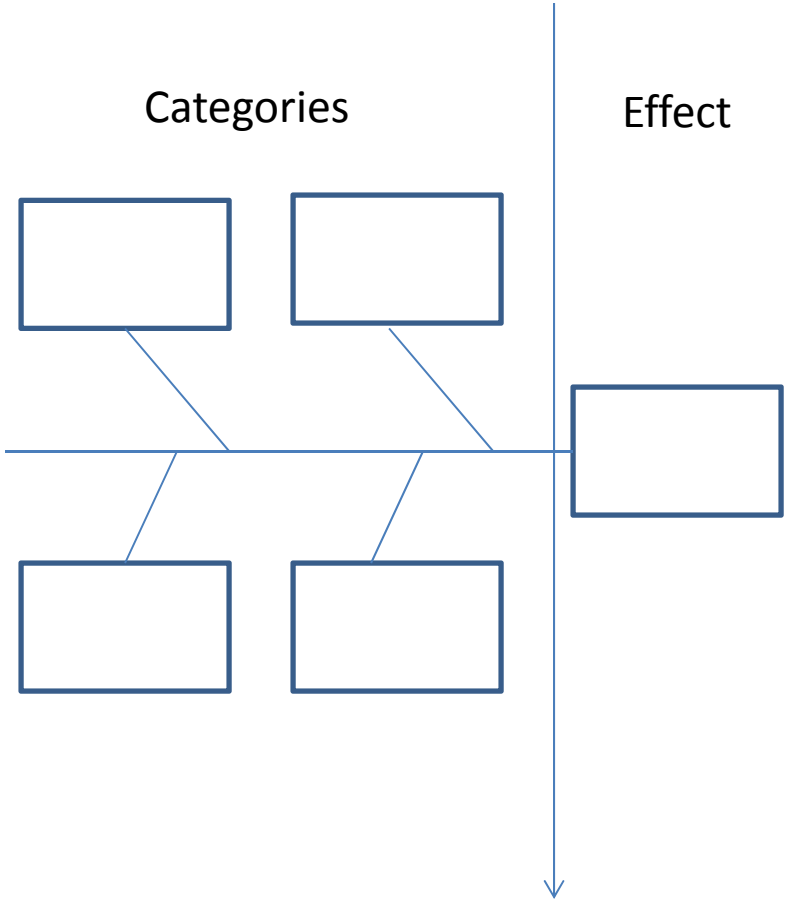
Cause and Effect Scenario

- The transplant program has been experiencing some increased patient re-admissions that are of concern to program leadership.
- After a report from the Transplant QAPI committee to the Hospital QAPI committee, both agreed they needed a better understanding of the reasons for these re-admissions to determine if any are or were potentially preventable.

Cause and Effect Categories

The categories typically include:

- **People**: Anyone involved with the process. **Patient** is sometimes a separate category, to incorporate factors such as medical condition, response to plan of care.
- **Methods**: How the process is performed and the specific requirements for doing it, such as policies, procedures, rules, regulations and laws
- **Machines**: Any equipment, computers, tools, etc. required to accomplish the job
- **Materials**: Raw materials, parts, pens, paper, etc. used to produce the final product
- **Measurements**: Data generated from the process that are used to evaluate its quality
- **Environment**: The conditions, such as location, time, temperature, and culture in which the process operates



Opportunity for Improvement Identified

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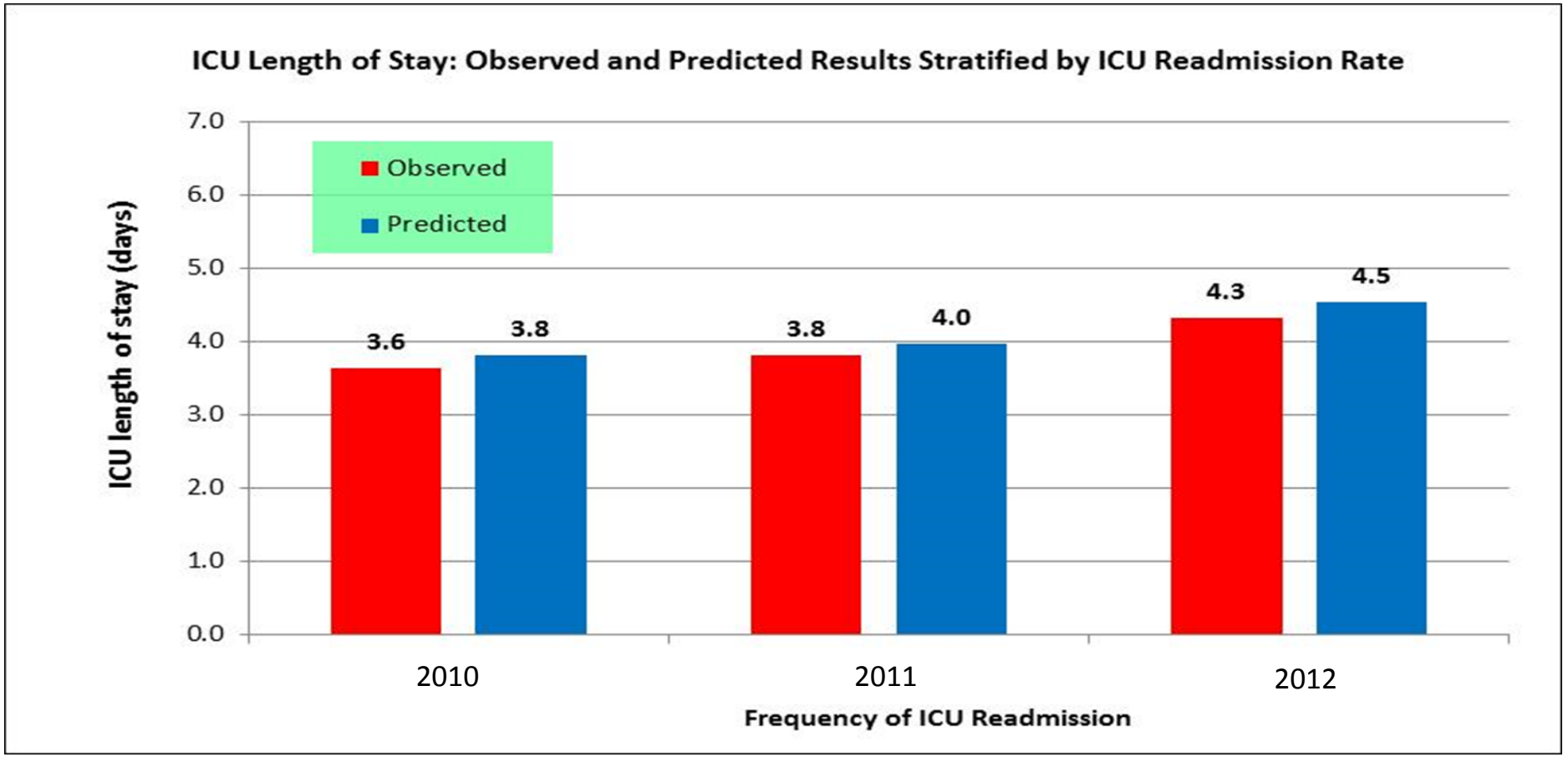
Data reported to a QAPI Committee



Step 1 of Analysis

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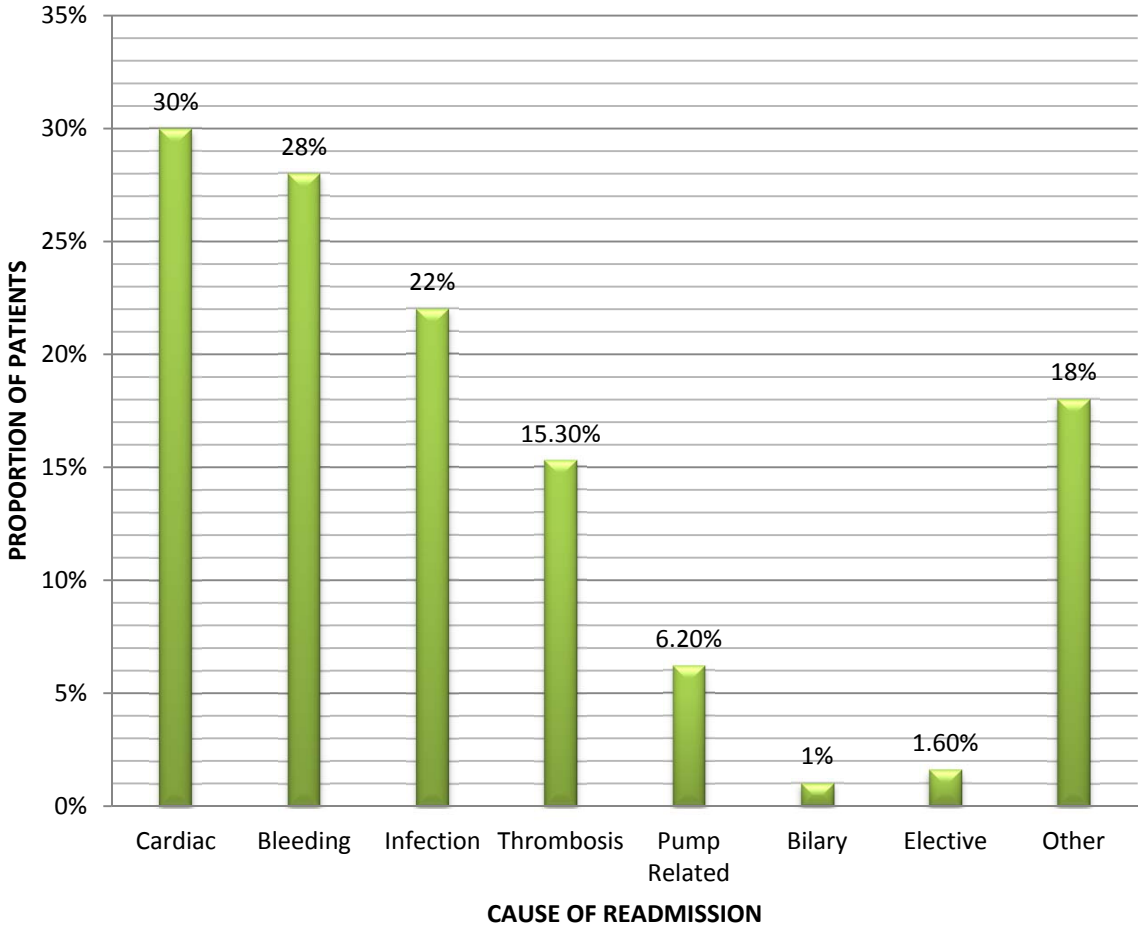
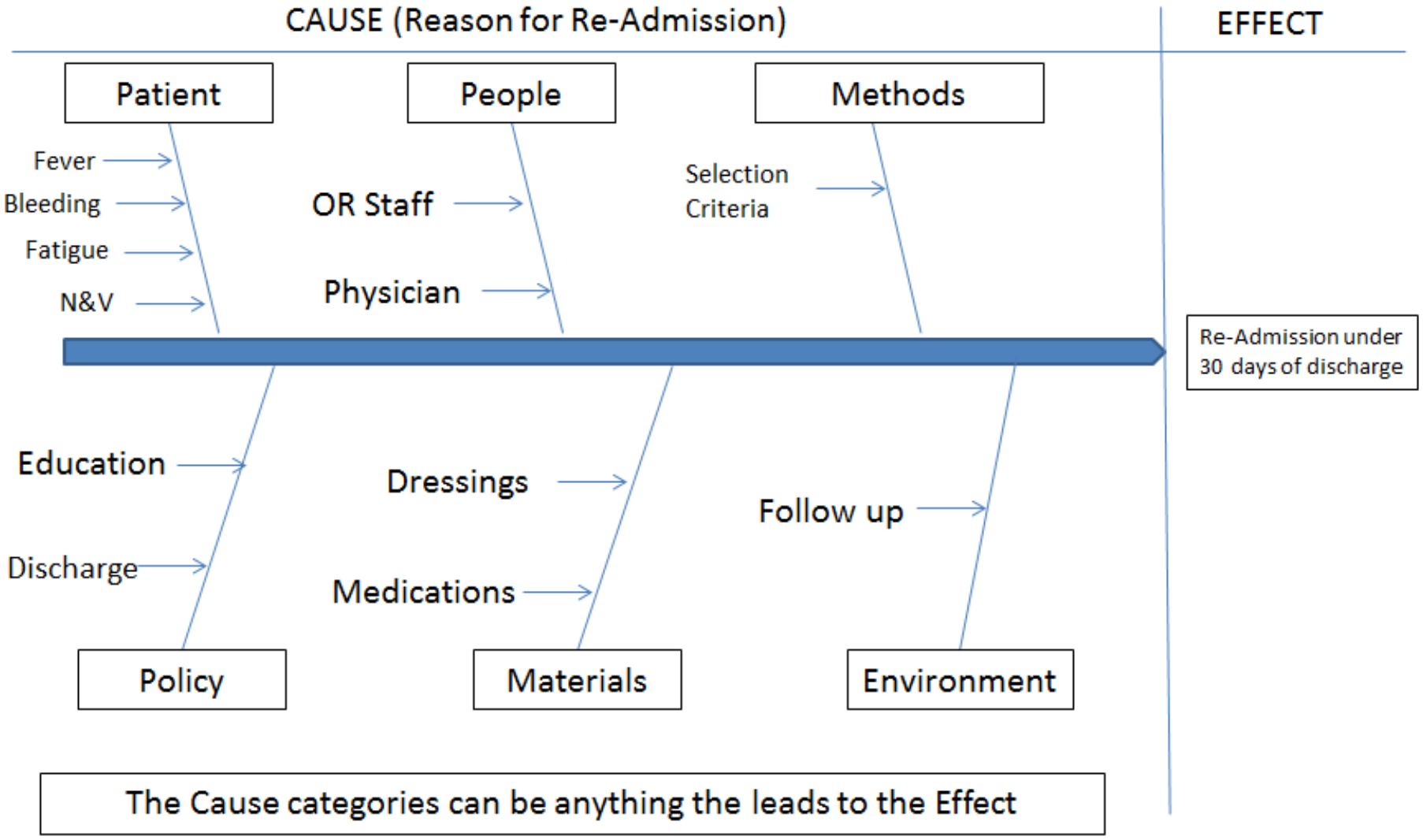
Utilize the existing data or conduct further chart audits to determine re-admission diagnosis or the cause of the re-admission.



Step 2: Determine Categories



Step 3: Complete Analysis

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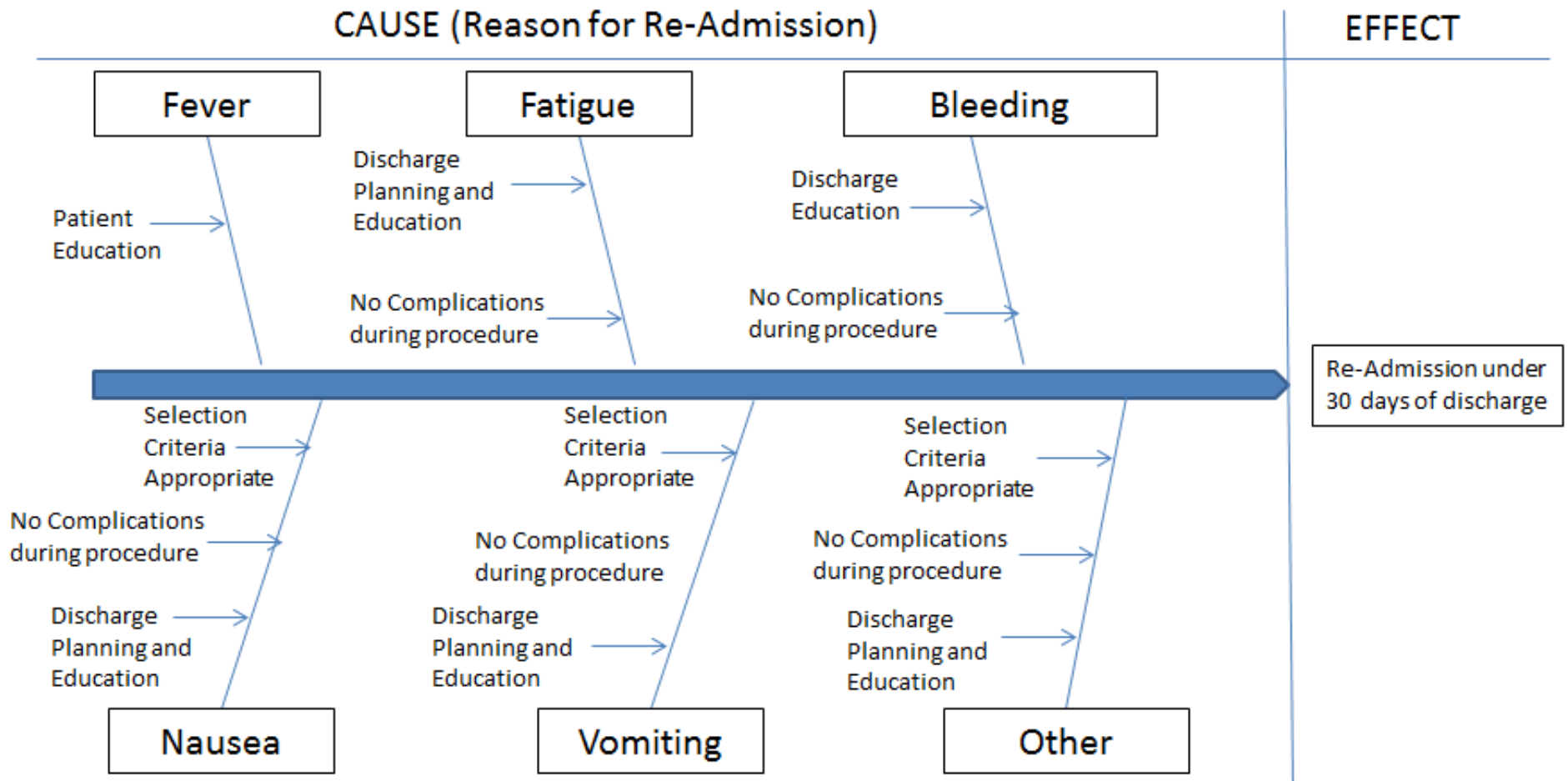

The Cause categories can be anything the leads to the Effect

Cause and Effect Analysis

- Histograms showed an increase of 0.7 days in ICU stay from 2010 to 2012.
- A deeper analysis was conducted, which revealed that the re-admissions were related to medical conditions - mostly cardiac, bleeding and infection.
- A review of cause/contributing factors found no selection criteria or care delivery issues, and that the reasons for re-admission were not preventable.
- Data analysis did suggest that the transplant program could improve the discharge education process and follow patients more closely during the initial days after discharge.

Control Chart

- Statistical process control (SPC) is a method of quality control that uses statistical methods to help drive action over time in relation to addressing particular types of variation in a given process.
- Control charts help to identify variation and distinguish “Special" sources of variation from “Common" sources.
- Using control charts is a continuous activity, ongoing over time.
- This tool can be effective in documenting the program’s performance, as it identifies the mean (average) and sets control limits to easily identify when the process has experienced variation.

Control Chart Scenario

- Transplant Program ‘Charlie’ has identified that 9 of the past 12 dashboard monitors for time from referral to listing did not meet benchmark performance.
- The Transplant QAPI committee wanted to know why the performance was not reaching the desired level.
- QAPI staff said they would attempt to identify the issues and respond back at the next meeting.

Creating a Control Chart

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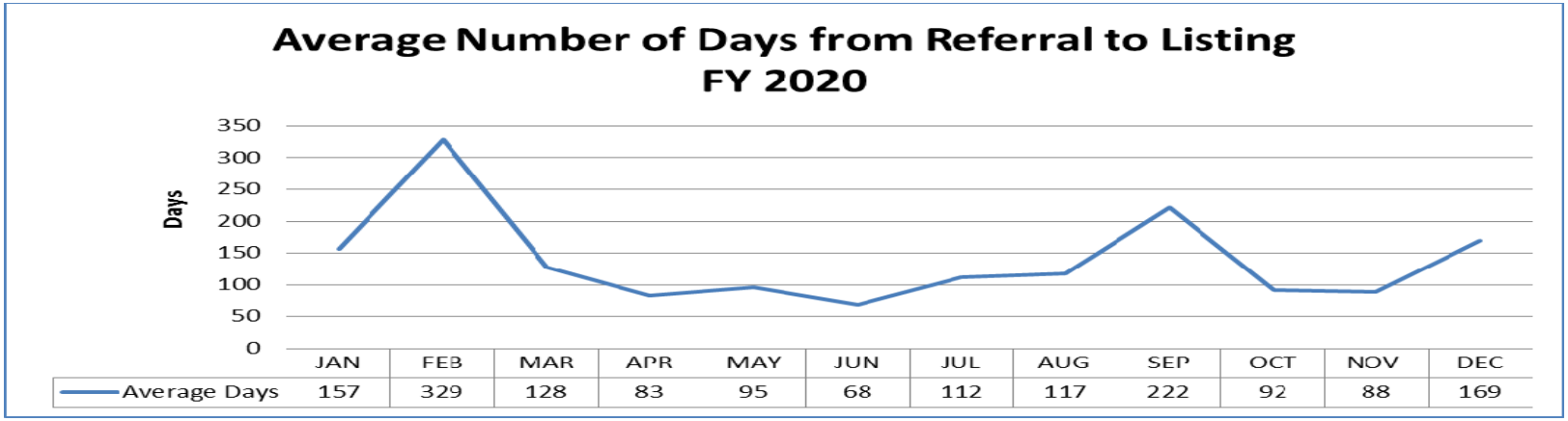
Control Charts are effective at identifying variation and controlling actions toward improvement over time.

MEDIAN REFERRAL TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year Avg
DAYS	157	329	128	83	95	68	112	117	222	92	88	169	138.3

1 year of data – can be the start of a control chart, but more data provides a better insight into possible sources of variation



Gathering Enough Data

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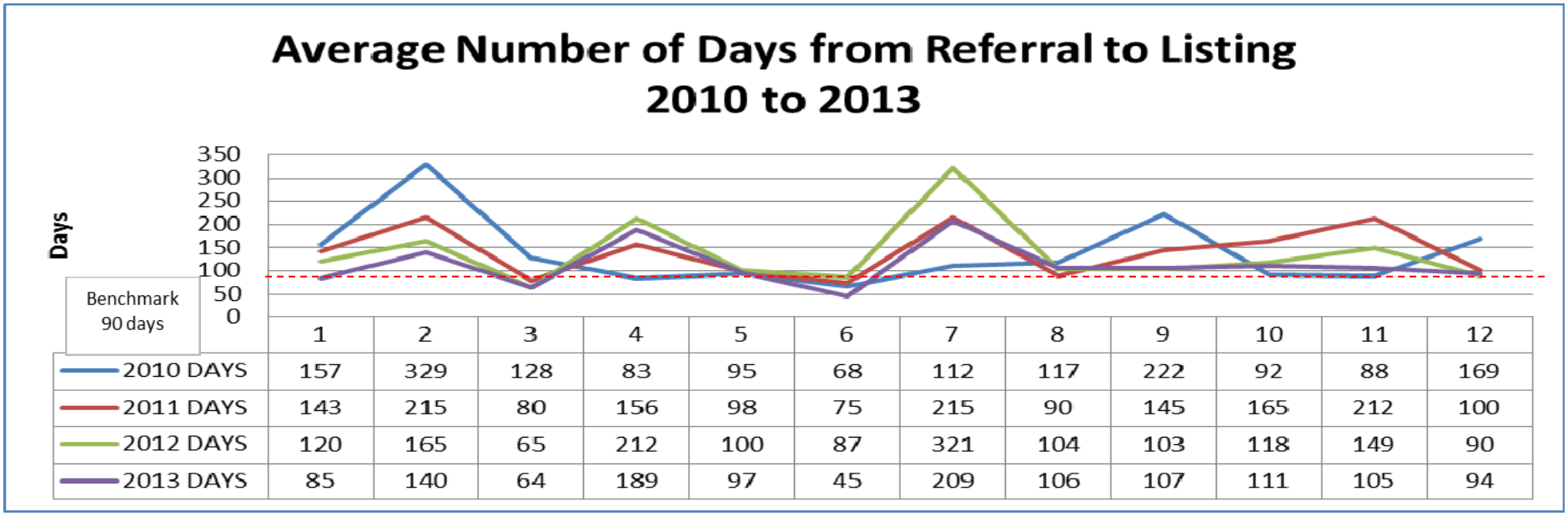
MEDIAN REFERRAL TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year Avg
2010 DAYS	157	329	128	83	95	68	112	117	222	92	88	169	138.3
2011 DAYS	143	215	80	156	98	75	215	90	145	165	212	100	141.2
2012 DAYS	120	165	65	212	100	87	321	104	103	118	149	90	136.2
2013 DAYS	85	140	64	189	97	45	209	106	107	111	105	94	112.7
Benchmark = 90 Days	**126.25**	**212.25**	**84.25**	**160**	**97.5**	**68.75**	**214.25**	**104.25**	**144.25**	**121.5**	**138.5**	**113.25**	**132.1**

Gather as much data as available with controls charts – this will be beneficial when creating the standard deviations and the upper / lower control limits.



	1	2	3	4	5	6	7	8	9	10	11	12
2010 DAYS	157	329	128	83	95	68	112	117	222	92	88	169
2011 DAYS	143	215	80	156	98	75	215	90	145	165	212	100
2012 DAYS	120	165	65	212	100	87	321	104	103	118	149	90
2013 DAYS	85	140	64	189	97	45	209	106	107	111	105	94

Understanding Current Performance

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MEDIAN REFERRAL TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year Avg
2010 DAYS	157	329	128	83	95	68	112	117	222	92	88	169	138.3
2011 DAYS	143	215	80	156	98	75	215	90	145	165	212	100	141.2
2012 DAYS	120	165	65	212	100	87	321	104	103	118	149	90	136.2
2013 DAYS	85	140	64	189	97	45	209	106	107	111	105	94	112.7
Benchmark = 90 Days	**126.25**	**212.25**	**84.25**	**160**	**97.5**	**68.75**	**214.25**	**104.25**	**144.25**	**121.5**	**138.5**	**113.25**	**132.1**

To get a sense of overall performance, average by month and by year. This can be done through Excel formulas.

=AVERAGE(B2:B5)

B2 and B5 are cell ranges within excel

Control Limits

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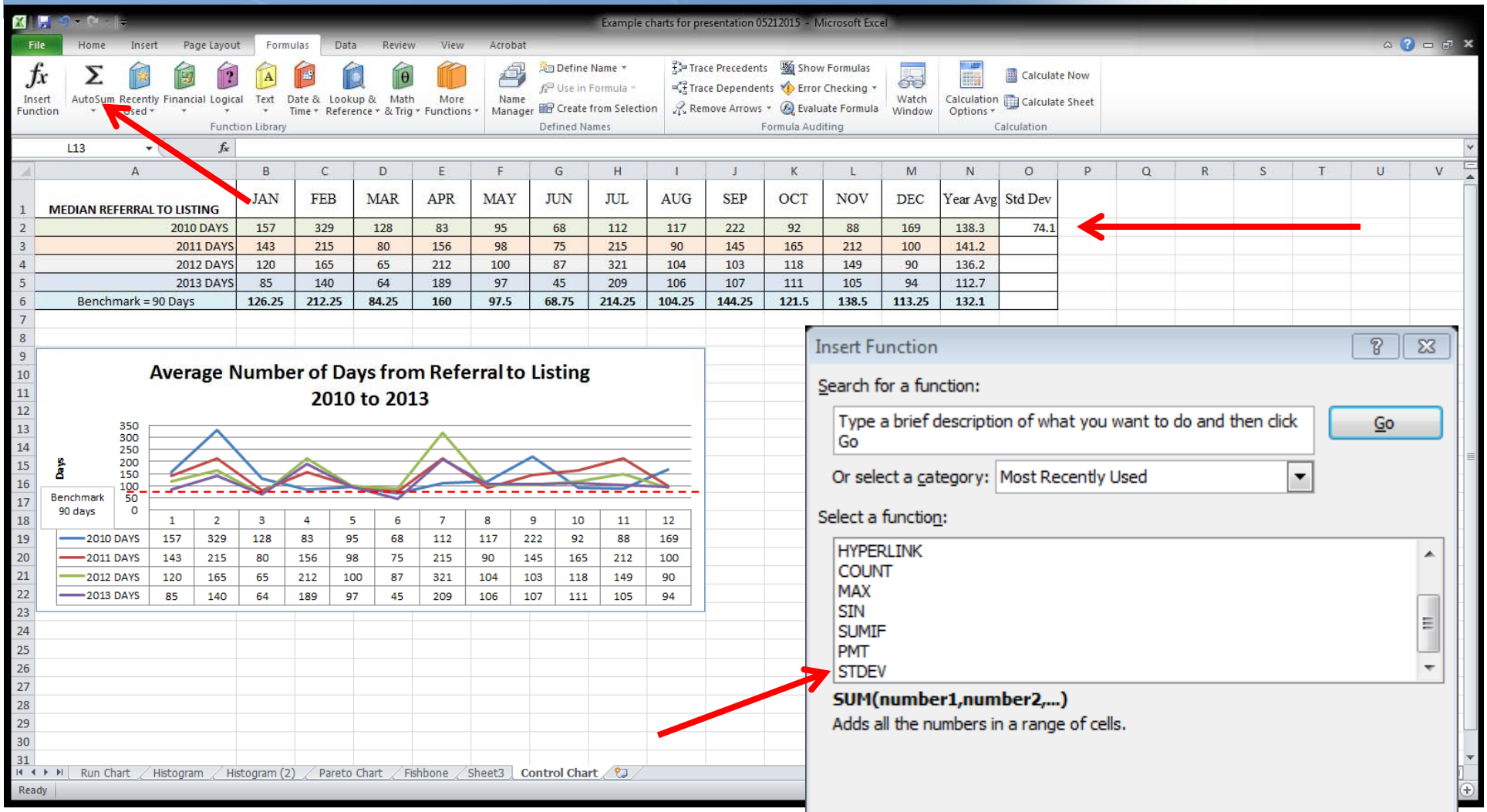


Establishing Upper and Lower Control Limits

Calculate Standard Deviation (STDEV) with Excel for all years and then calculate average STDEV.

MEDIAN REFERRAL TO LISTING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year Avg	Std Dev
2010 DAYS	157	329	128	83	95	68	112	117	222	92	88	169	138.3	**74.1**
2011 DAYS	143	215	80	156	98	75	215	90	145	165	212	100	141.2	**53.1**
2012 DAYS	120	165	65	212	100	87	321	104	103	118	149	90	136.2	**70.4**
2013 DAYS	85	140	64	189	97	45	209	106	107	111	105	94	112.7	**47.0**
Benchmark = 90 Days	**126.25**	**212.25**	**84.25**	**160**	**97.5**	**68.75**	**214.25**	**104.25**	**144.25**	**121.5**	**138.5**	**113.25**	**132.1**	**45.6**

Formula for Standard Deviation in Excel is

=STDEV(B5:M5)

The B5 and M5 are cell ranges within Excel

Scenario: Upper and Lower Control Limits

- **Control Limits are established by the transplant program or organization determining how much variation is acceptable within a given process. Control Limits should be based on statistically significant calculations and not be based on subjective data or 'gut' feelings.**

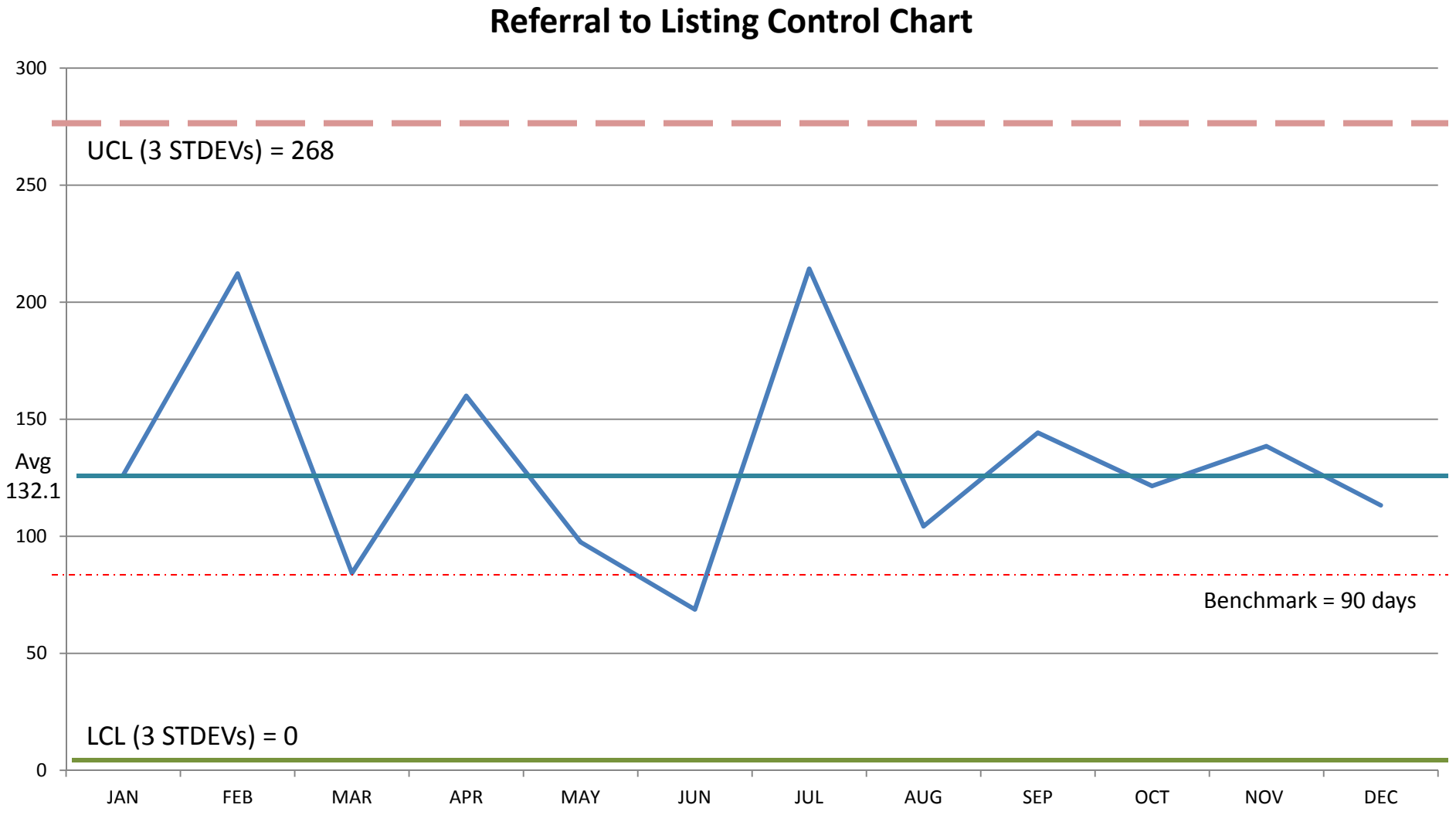
- **Six Sigma (*statistical operation*) is 6 STDEVs away from the Mean (*average*) and captures 99.99997% of all variation (*almost 100% of all variation or perfection*).**

- **Initially, some organizations may want to only look 3 STDEVs away from the mean to begin collecting data and bringing a process under control, then move to 6 STDEVs at a later point.**

- **Upper Control Limits define the highest level of variation desired within a process.**

- **Lower Control Limits can be Zero – depending on the process under change.**

Apply Control Limits to Run Chart



Control Chart Analysis

- Control charts require more data, but help drive action towards improvement by understanding the reasons causing variation in a process.
- Actions taken can be controlled and monitored on a control chart.
- The entire purpose of Control charts is to identify process variation (Special and Common Cause), take action towards improvement that results in a stable predictable process or a perfected process.

Closing

Closing Summary

- Many different tools can be used to collect, analyze and report data for QAPI. Select the right tools to fit your program's information needs and questions.
- Ensure that template blanks do not contain previously used data; are easily understood; and that staff are trained in how to properly use them.
- Verify that the tools selected do not misrepresent the data, data analysis or the message that needs to be conveyed.
- Raw numbers on a spreadsheet are just that: raw numbers. Use data tools to turn that data into useful information that can be used to evaluate the program's performance and to identify and act on opportunities for improvement.

QUESTIONS

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