Nebraska Hospital Association

The influential voice of Nebraska's hospitals

Nebraska QI Residency

Module E and F: Healthcare Data in Practice

July 13 - 14, 2023

Objectives

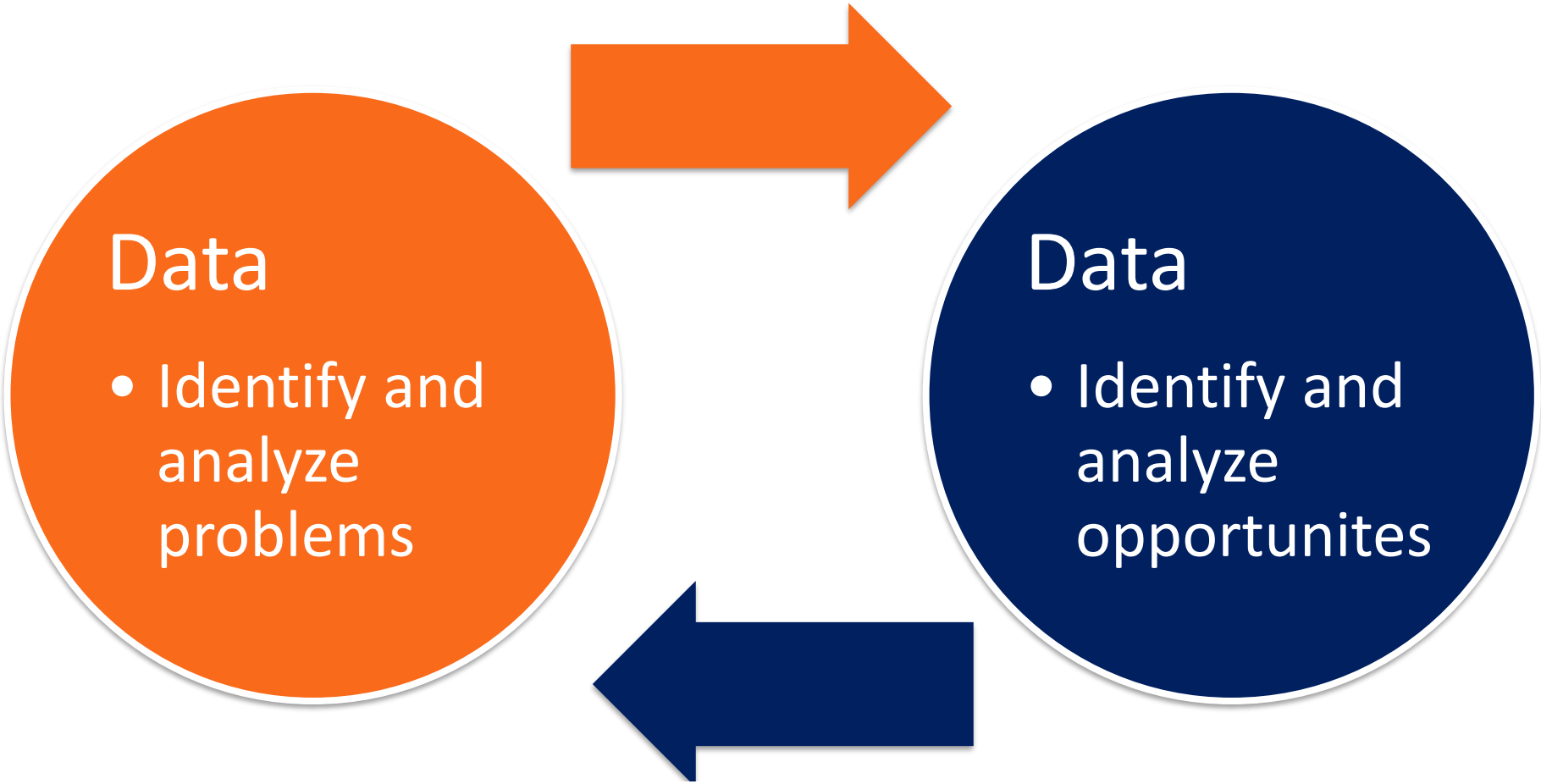
- Identify measures for quality improvement (e.g. structure, process, and outcome)
- Identify data sources for comparison (e.g., benchmarking)
- Summarize best practices for collecting and validating data
- Use Microsoft Excel to organize data for analysis and reporting
- Interpret data to support decision-making
- Use tools to display data or evaluate a process (e.g., Pareto chart, run chart, scattergram, control chart)
- Identify important components of Scorecards, Dashboards, and Board Reports
- Use data visualization tools and techniques to facilitate communication

Introductions

Why is Data Collection, Analysis, and Reporting So Important?

What is quality?

What is the role of data in quality improvement?



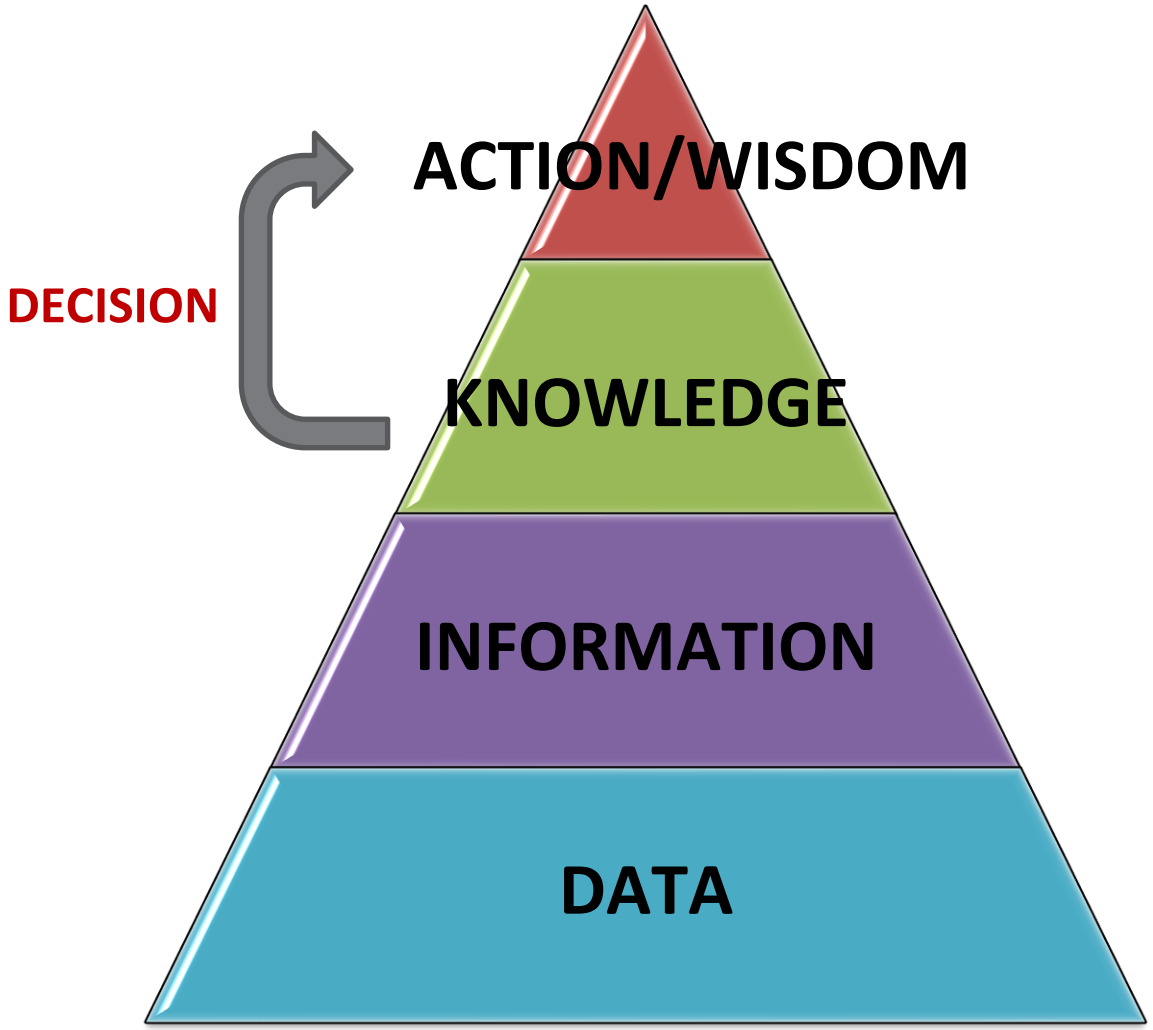
Victorian Government Department of Human Services, A guide to using data for health care quality improvement, 2008. Available at: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0006/273336/vqc-guide-to-using-data.pdf

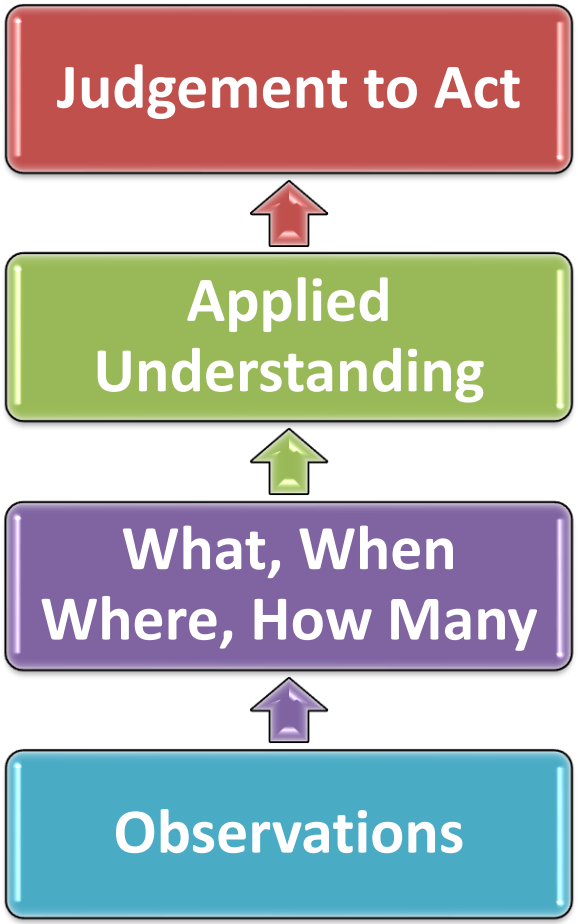
Learning from and solving problems with data

"The more effort you put into understanding and utilizing data, the more you will be rewarded in terms of solving the right problem in the right way."

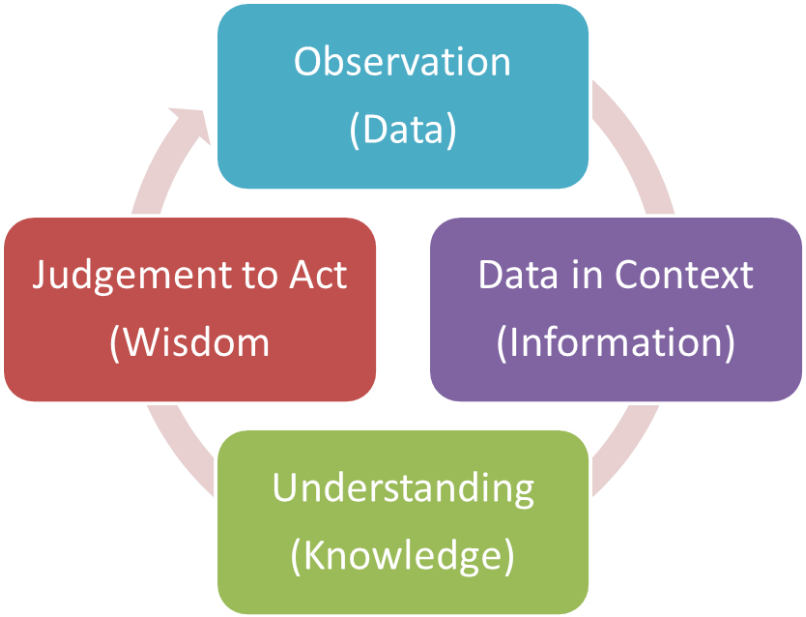
Victorian Government Department of Human Services, A guide to using data for health care quality improvement,2008. Available at: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0006/273336/vqc-guide-to-using-data.pdf

DIKW Hierarchy



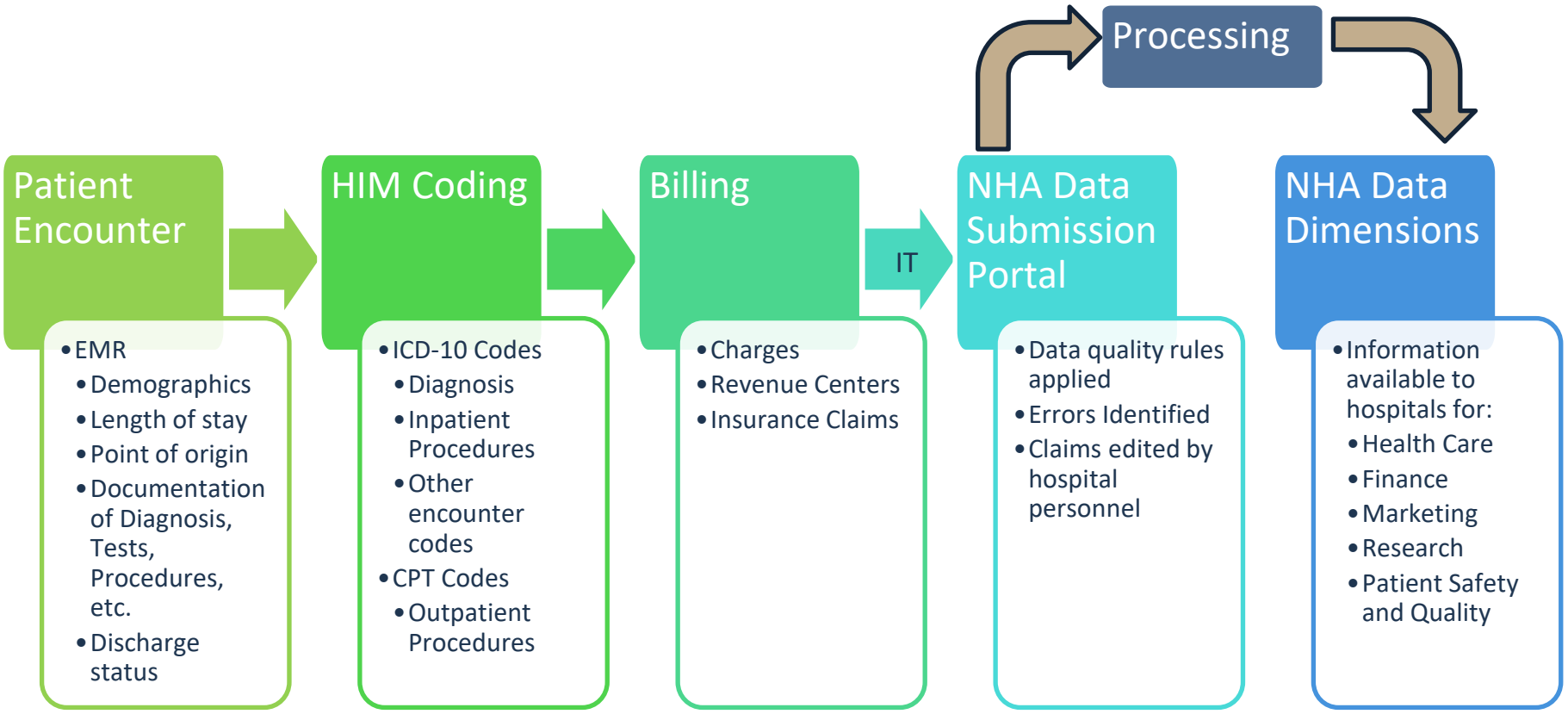


Data to Wisdom

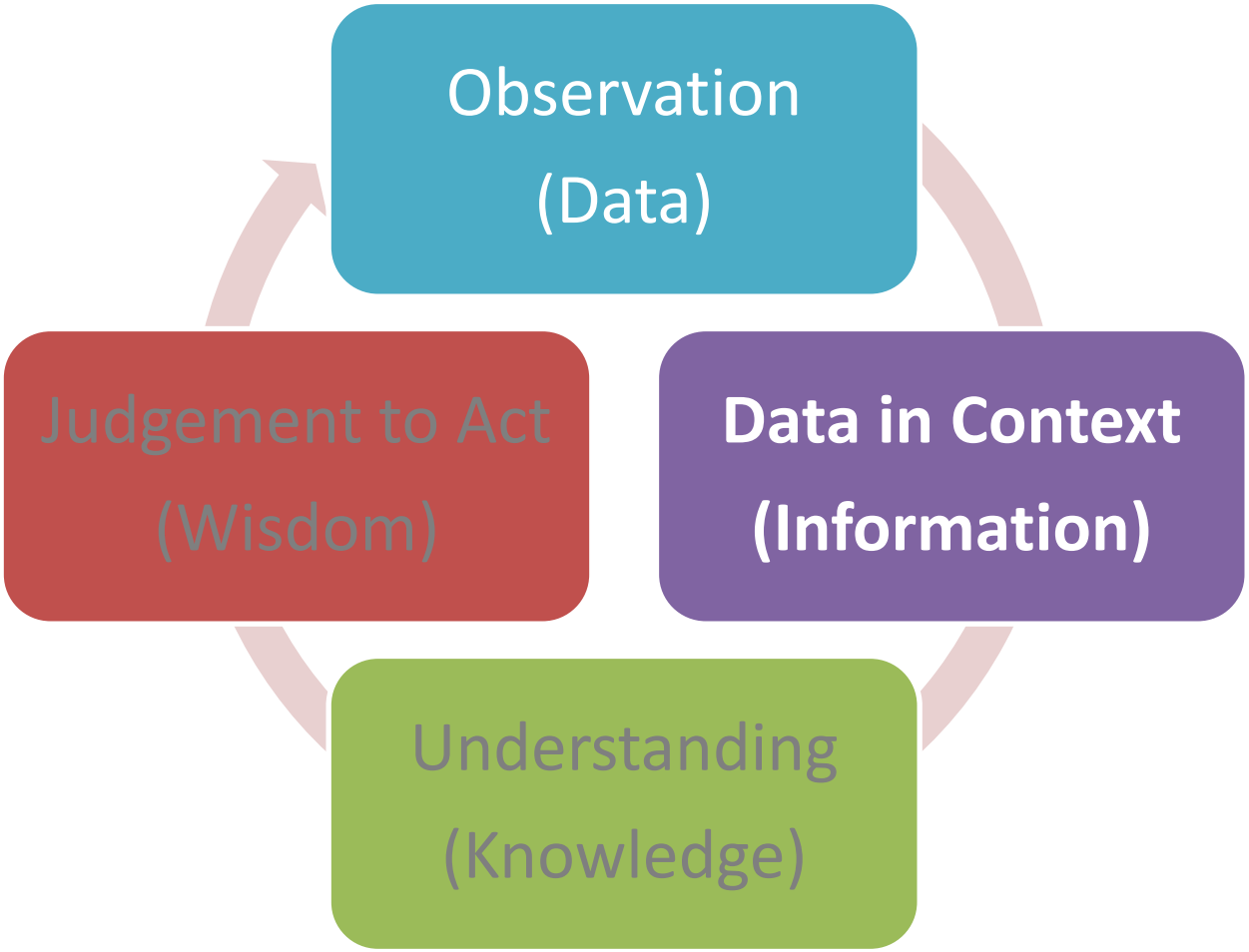


NHA

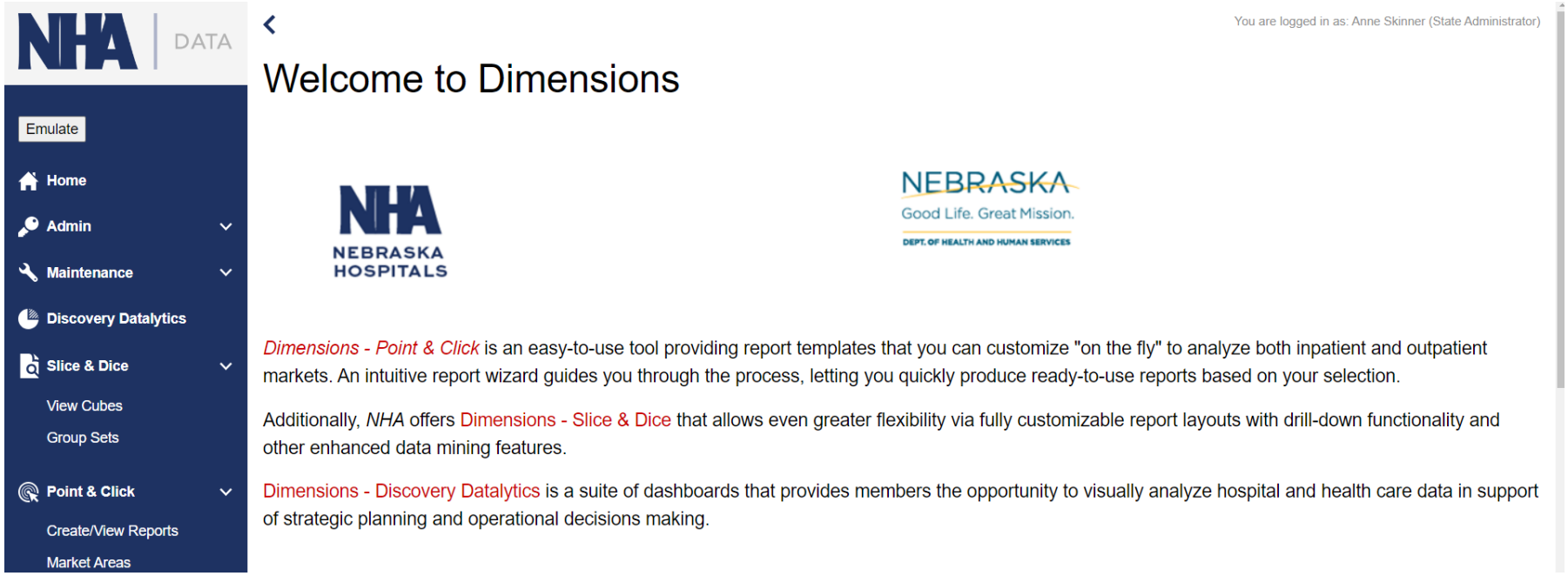
NHA Data


Processing
Patient Encounter
HIM Coding
Billing
IT
NHA Data Submission Portal
NHA Data Dimensions
•EMR
•Demographics
•Length of stay
•Point of origin
•Documentation of Diagnosis, Tests, Procedures, etc.
•Discharge status
•ICD-10 Codes
•Diagnosis
•Inpatient Procedures
•Other encounter codes
•CPT Codes
•Outpatient Procedures
•Charges
•Revenue Centers
•Insurance Claims
•Data quality rules applied
•Errors Identified
•Claims edited by hospital personnel
•Information available to hospitals for:
•Health Care
•Finance
•Marketing
•Research
•Patient Safety and Quality

Data Analysis



NHA Data Dimensions



Data and Information Sources

- Hospital Electronic Medical Records
- Hospital Administration/Billing System
- Laboratory Information System
- Event Reports
- Audits/Chart Reviews
- Surveys
- Quality Reports

Data and Information Sources

- Benchmark Data
  - IHI, CMS, AHRQ, DHHS, NCPS
  - Quality programs
  - Published research
  - *Inpatient Quality Indicators (IQI) Benchmark Data Tables, v2022 [Version_2022_Benchmark_Tables_PSI.pdf]
  - *Network of Patient Safety Databases Chartbook [npsd-chartbook-2022.pdf]

Data Collection

Develop a Plan

- What data will be collected?
  - Create Data Dictionary *[vqc-guide-to-using-data.pdf Table 4.1, Page 38]*
- How will data be collected?
- Who will collect data?
- When and where they will be collected?
- What are the boundaries?

Lean Six Sigma Training.NET

Sampling plan template

SAMPLING PLAN							
What data to collect ?	Source of data	Type of data	What question are we trying to answer ?	Sample size	Sampling frequency	Measurement Method	How will the data be displayed?

Lean and six sigma training course aid

The sampling plan is used during the measurement phase of the DMAIC lean six sigma project. The purpose of the sampling plan is to define what data to collect and how it will be collected and measured. The sample size and sampling frequency depend on things such as process variation and the precision of test required. The sampling plan describes how the data will be displayed [e.g. histograms, time series charts, box plots etc]

Data Types

- Continuous (degree of conformance)
  - Height, weight, volume, length, speed, temperature, time, et al
- Discrete (count data & can be classified)
  - Phone calls, steps, counties, population, snow flakes, etc.
- Categorical (conforms or not – is or isn't)
  - Yes/No, high/low, hot/not hot, blue/not blue, zip code, Wednesday, Christmas, Room 12, light/dark, Page No., Male/Female, etc.

NHA

Data Types

Data Scales

- Nominal (qualitative description; hot, large, west, etc.)
- Ordinal (nominal, but ranked to represent degree; best, worst)
- Interval (meaningfully arranged in order; 20, 30, 40 degrees F)
- Ratio (most meaningful, with a true zero; can use statistical analysis)
  - Falls per 1,000 patient days

Population vs Sample Data

Considerations for Using Population Data

- Measuring a population has greater advantages than sampling a population
- If the population is fairly large the cost in time and money may be prohibitive

Population vs Sample Data

Considerations for Sampling a Population

- Sample a population where possible
- Less degree of confidence in the results
  - Unless a significant number of samples is taken
- Use an appropriate sampling plan
- There are online sample calculators
  - Must know the number of items in the population
  - Must have an idea of the confidence interval needed

NHA

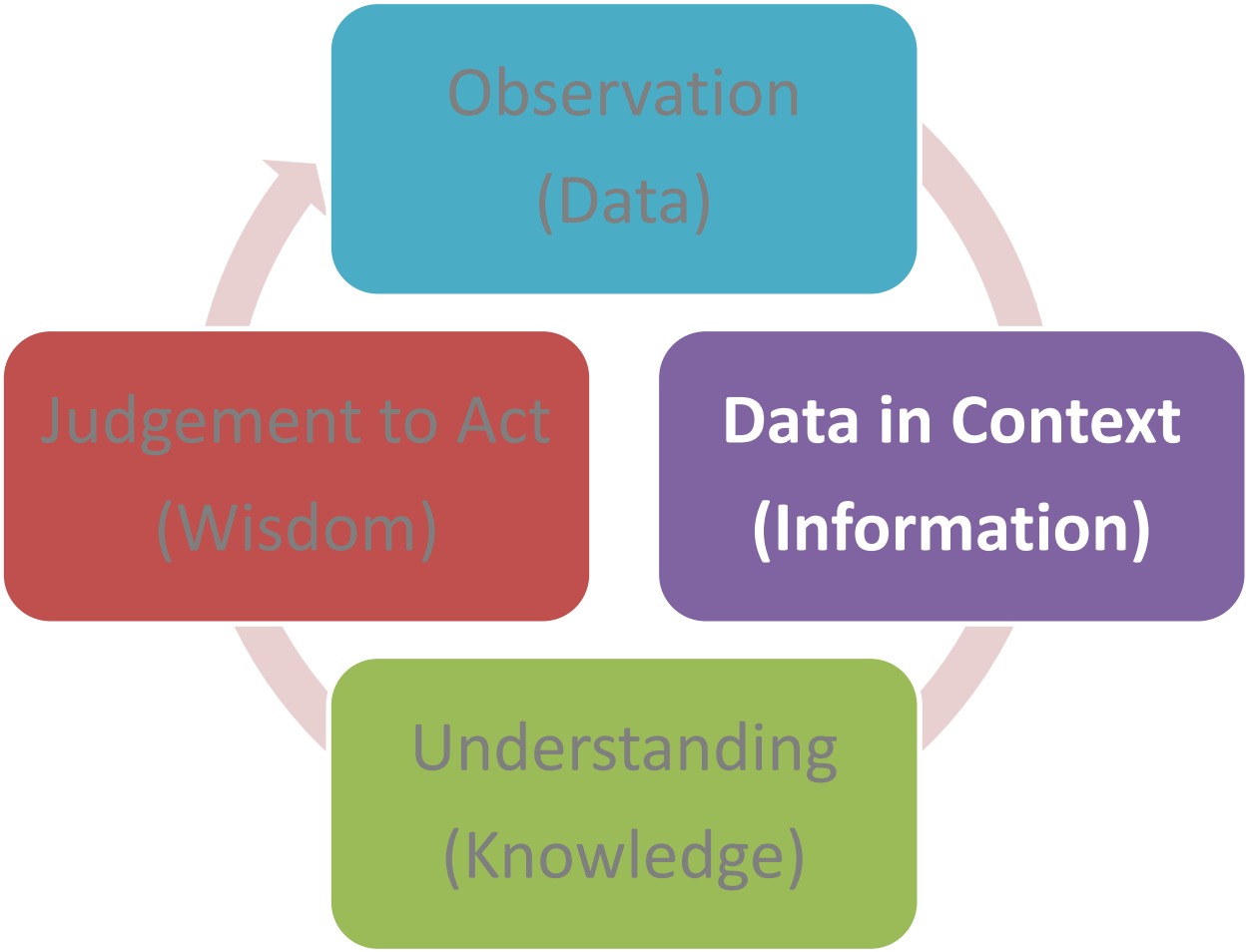
Population vs Sample Data

Sampling a Population

- The Central Limit Theorem
- Convenience Sampling
- Judgement Sampling (stratified data, expert opinion)
- Probability Sampling (statistical)
  - Preferable in most situations
  - Requires random samples

NHA

Data Analysis



Data Analysis

Descriptive Statistics

- Mean
- Median
- Mode
- Standard Deviation

Data Analysis

- T-tests of data
- Correlation of two sets of data
- Confidence intervals

Victorian Government Department of Human Services, A guide to using data for health care quality improvement, 2008. Available at: https://aci.health.nsw.gov.au/__data/assets/pdf_file/0006/273336/vqc-guide-to-using-data.pdf

Data Analysis

Subgrouping Data

- Average of each shift
- An average over each producer

Population vs Sample Data

- An average of each parallel process
- Once per hour, twice per hour, etc.

Data Analysis

Types of Errors Discovered During Surgical Set-up

Error Type	Frequency	Percent	Cumulative %
Wrong Supplier	67	46.5	46.5
Excess Count	24	16.7	63.2
Too Few Count	17	11.8	75.0
Wrong Size	10	6.9	81.9
Wrong Sterile Instrument Set	10	6.9	88.9
Missing Item	8	5.6	94.4
Damaged Item	6	4.2	98.6
Other	2	1.4	100.0
TOTAL	144		

Data Analysis

- Summarizing data using Excel
  - Hands on exercises using data from NHA Data Dimensions

Visualizing Data

Visualizing Data

- For Analysis
  - Run chart
  - Pareto chart
  - Scatter Plot

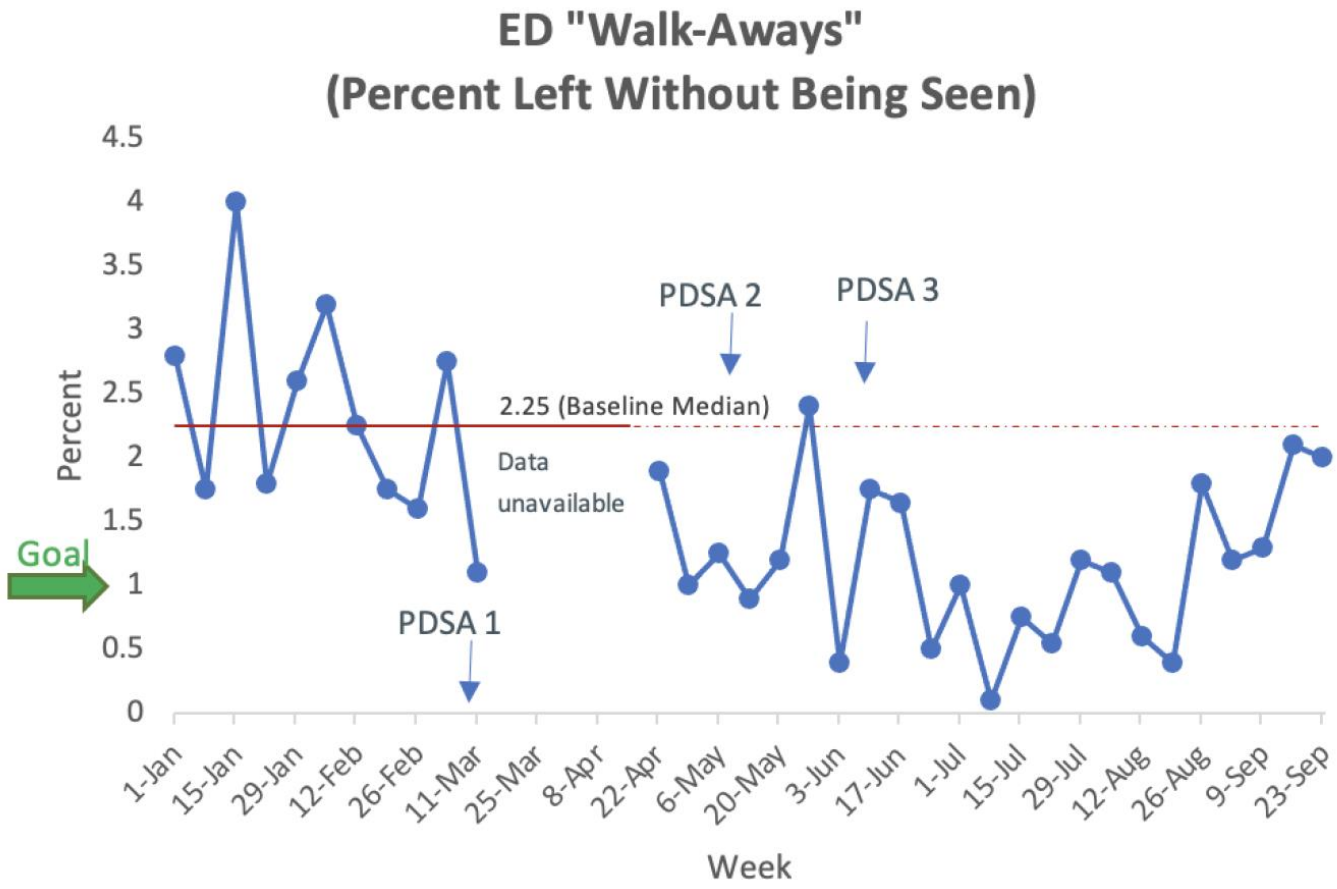
Visualizing Data

- Run Chart
  - Change in data over time
  - Impact of changes on measures

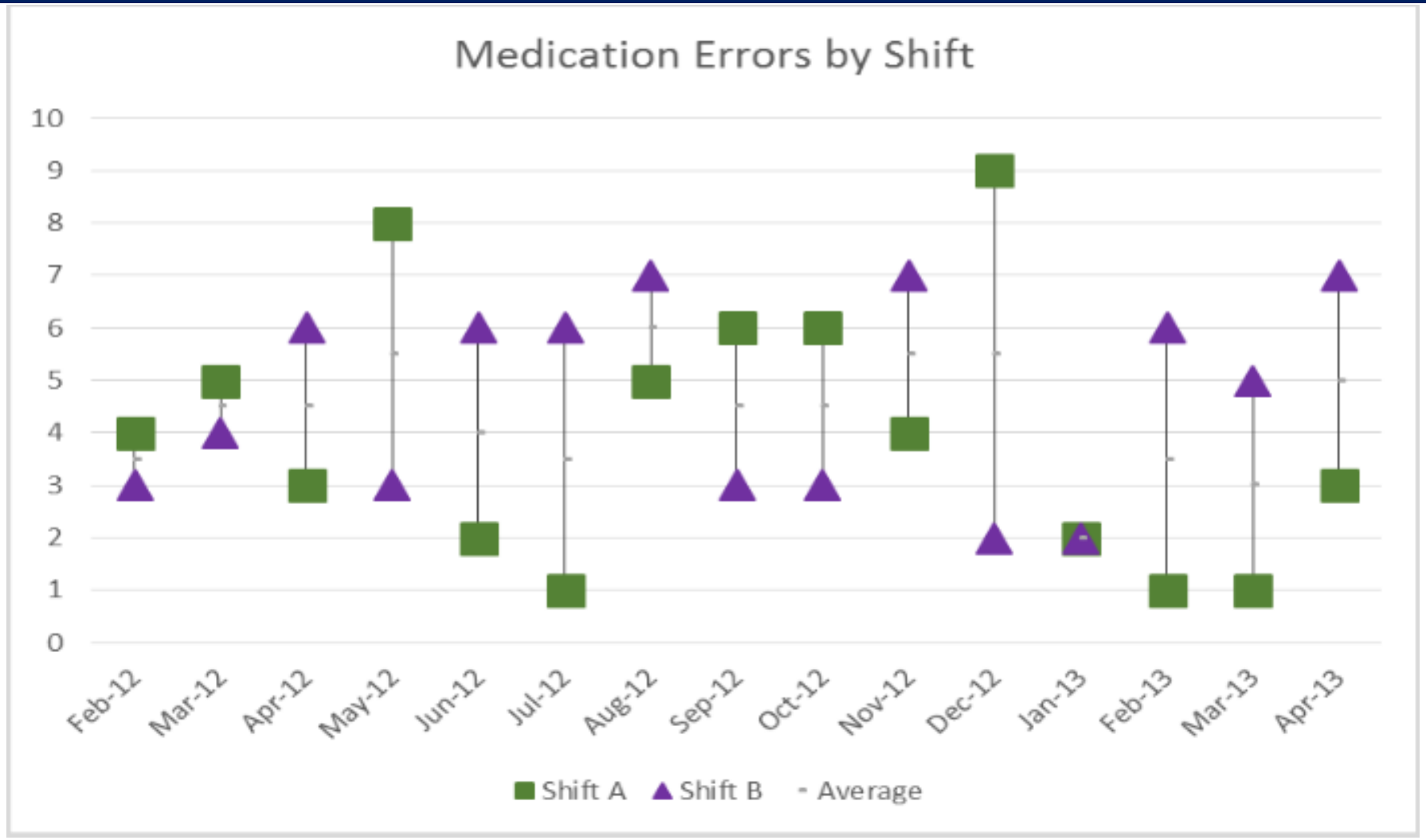
QI Essentials Toolkit: Run Chart

http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

Visualizing Data



Visualizing Data



Visualizing Data

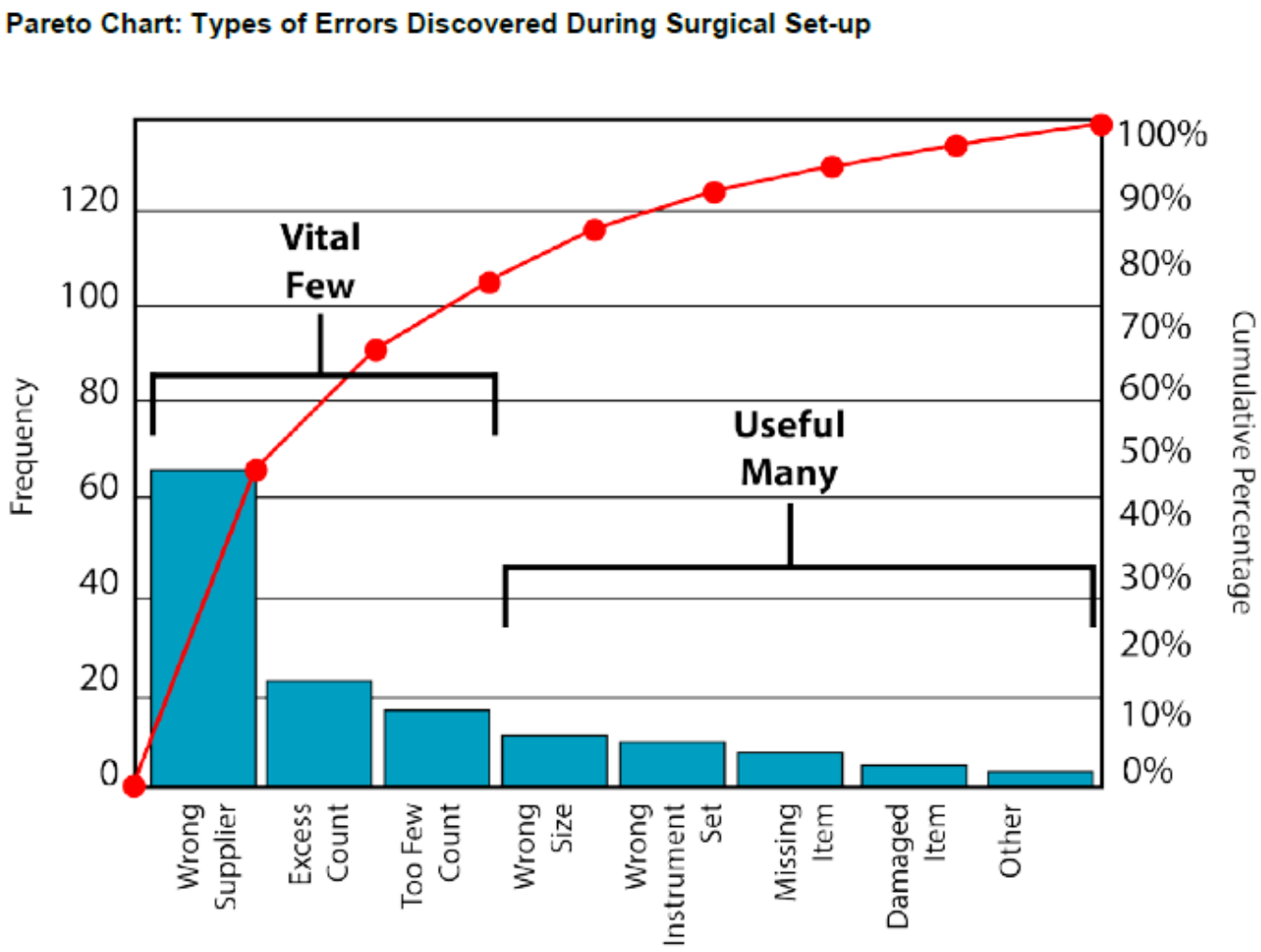
- Pareto Chart
  - Pareto Principle or 80/20 rule
    - Typically 80% of the effect comes from 20% of causes
  - Visualize areas of improvement with greatest impact

QI Essentials Toolkit: Pareto Chart

http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

NHA

Visualizing Data

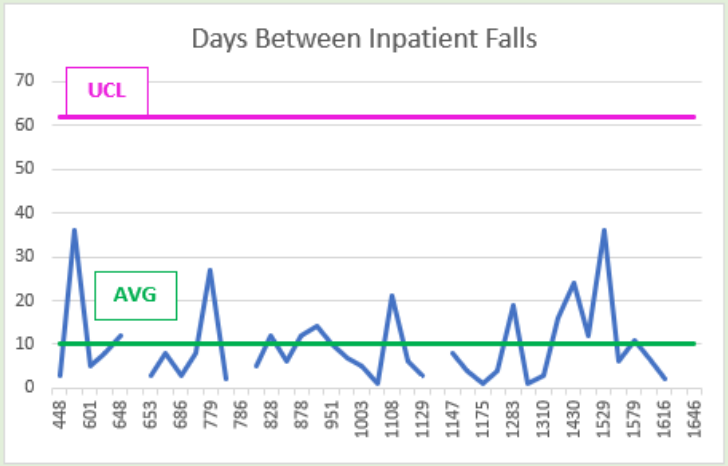


Visualizing Data

Data Variation

- Common Cause
- Special Cause

Visualizing Data



HOW TO USE THIS CHART

The DAYS BETWEEN INPATIENT FALLS is represented by the blue line.
Higher numbers are better. Higher trending is desired.

The pink line represents the upper control limit (UCL); all data points should be below that limit under normal process conditions and if no process improvements have been initiated.
Values that exceed the UCL should be investigated because it represents some change in condition(s) that produced a better result and should be replicated; especially if a process improvement was initiated and is being tested.

When process improvements are initiated that change the UCL significantly (< 5%) delete chart history prior to the process improvement - OR - recalculate the g-BAR UCL to display the change on the chart - OR - save this (and subsequent) sheet in a different tab for historical reference.

Visualizing Data

Correlation - Understanding Relationships

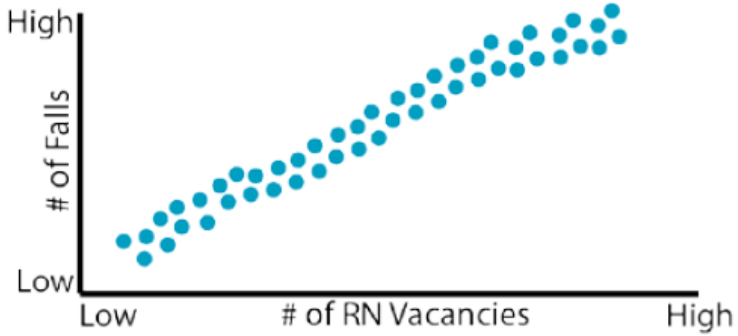
- Scatter Plot
  - Find relationships between two variables; possible cause-and-effect

QI Essentials Toolkit: Scatter Diagram

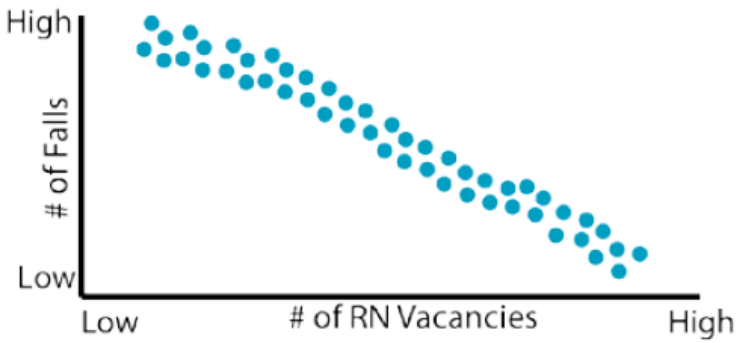
http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

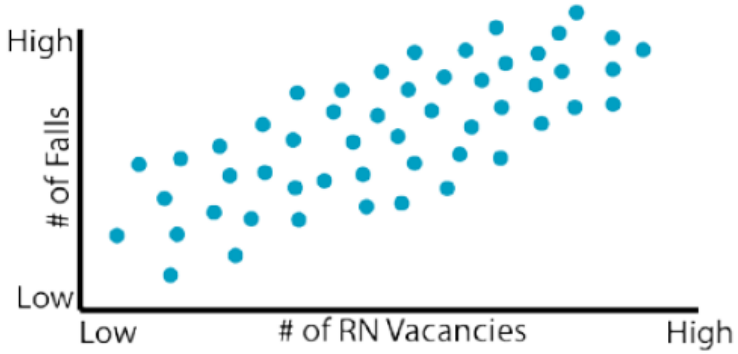
Visualizing Data

Strong Positive Relationship

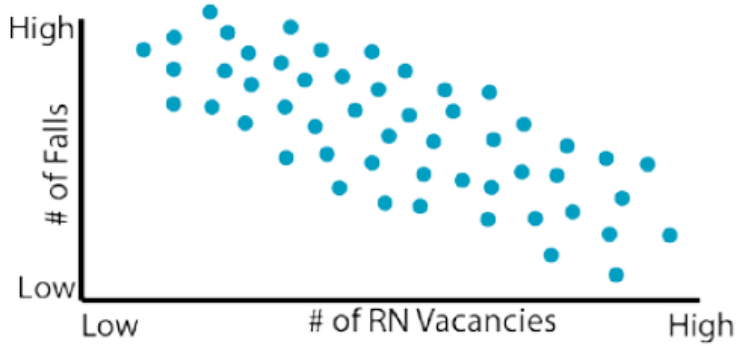


Strong Negative Relationship



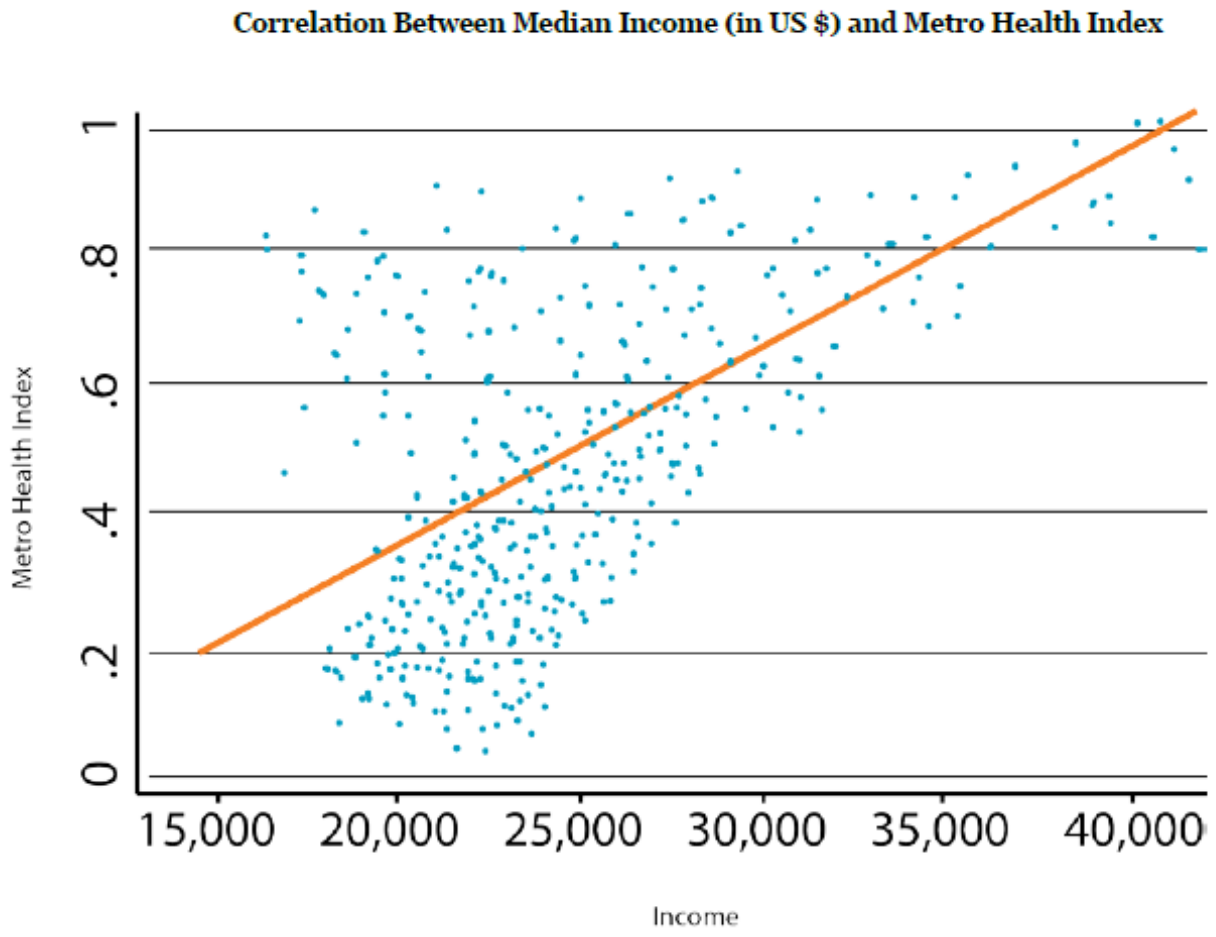


Weak Positive Relationship

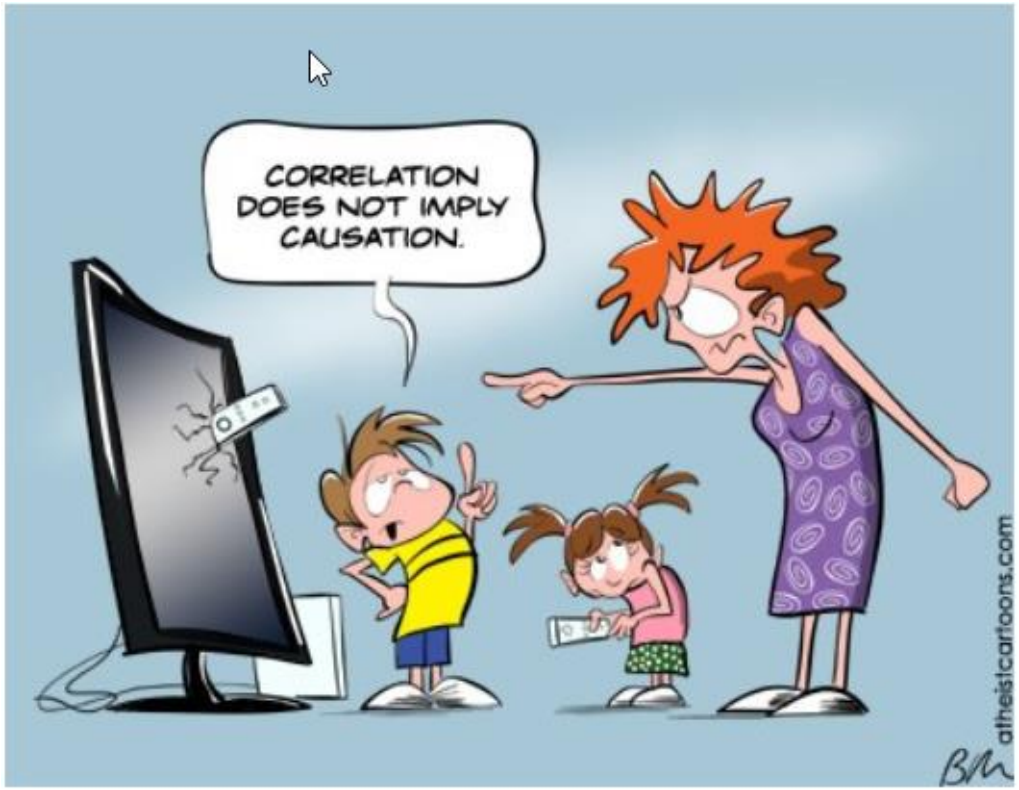


Weak Negative Relationship

Visualizing Data

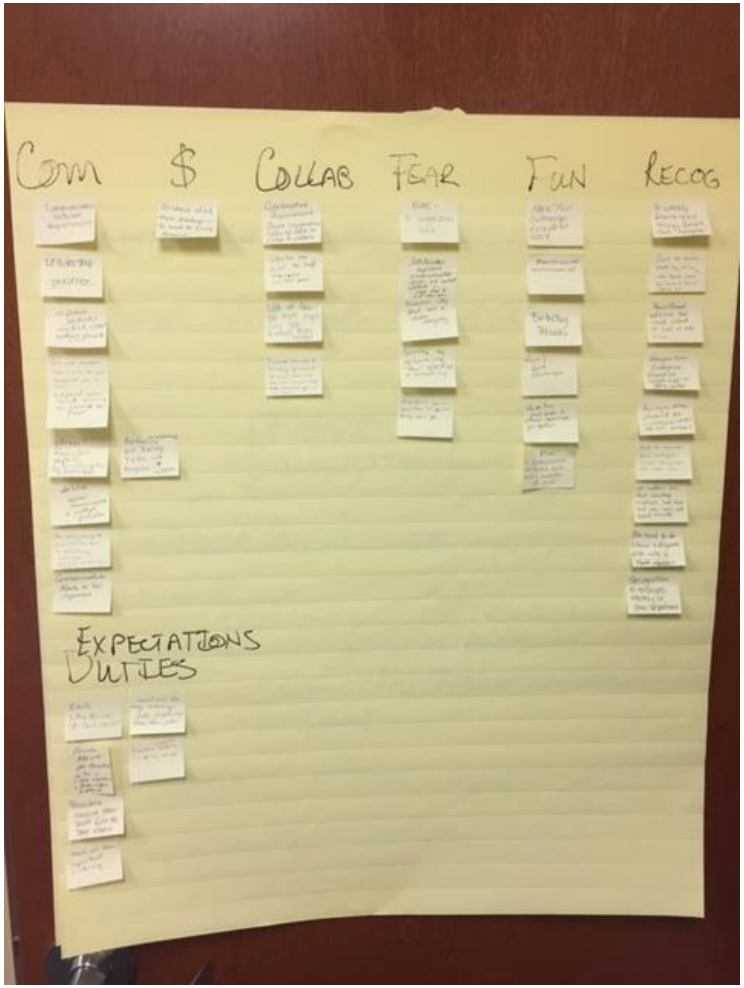


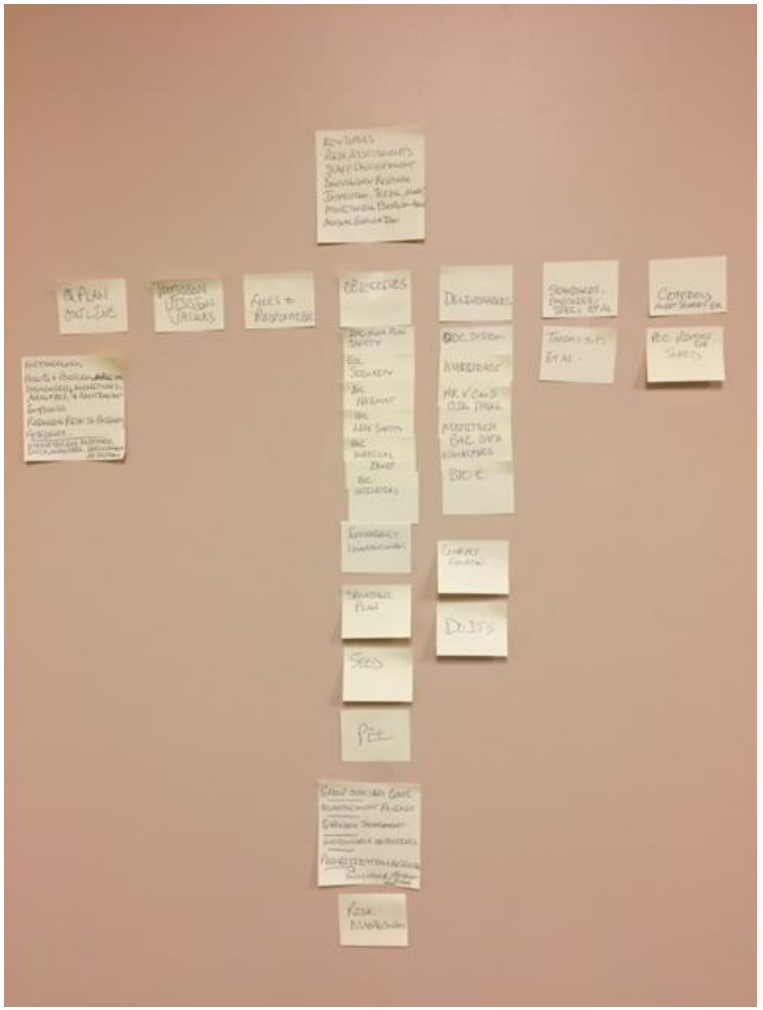
PSA



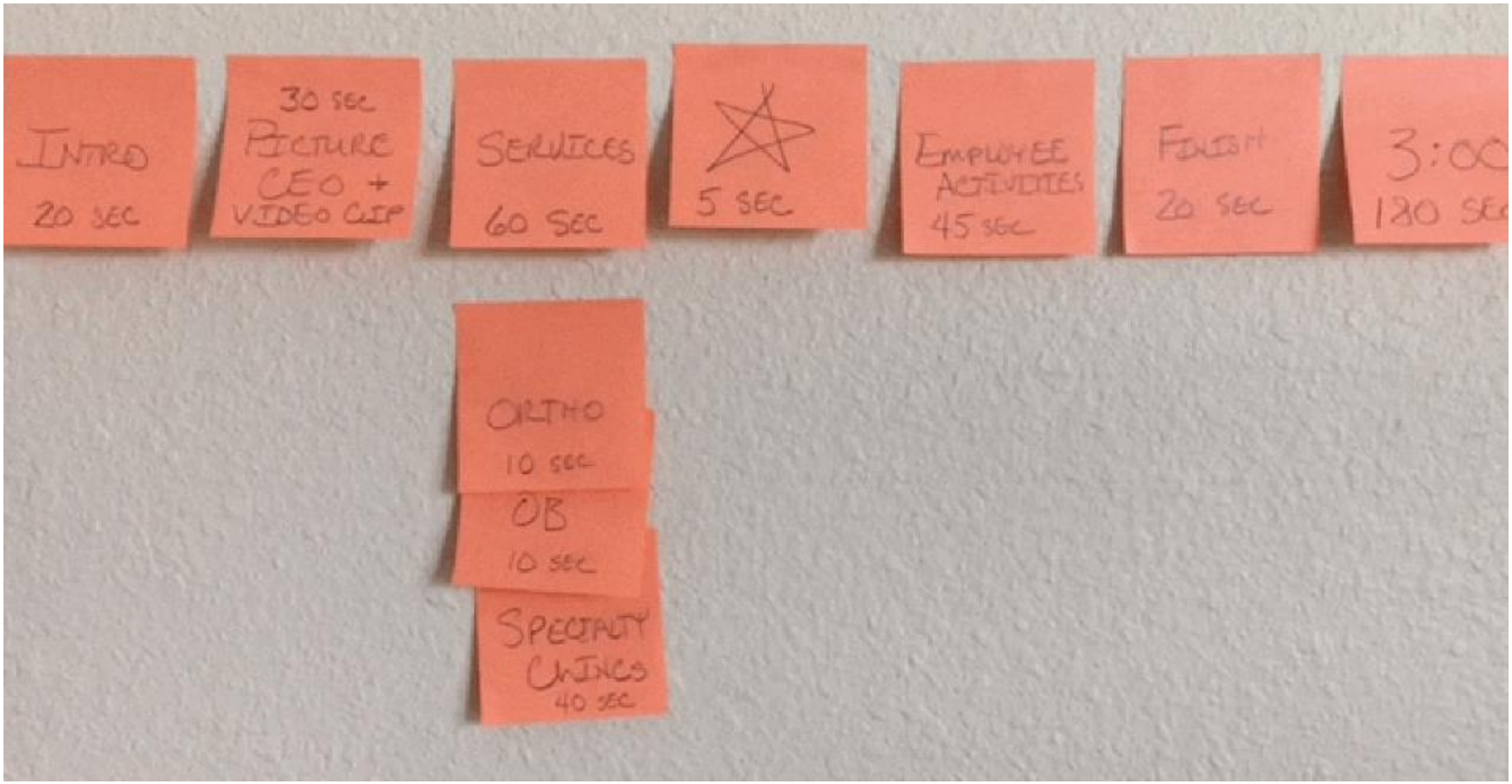
https://towardsdatascience.com/why-correlation-does-not-imply-causation-5b99790df07e

Visualizing Data





Visualizing Data

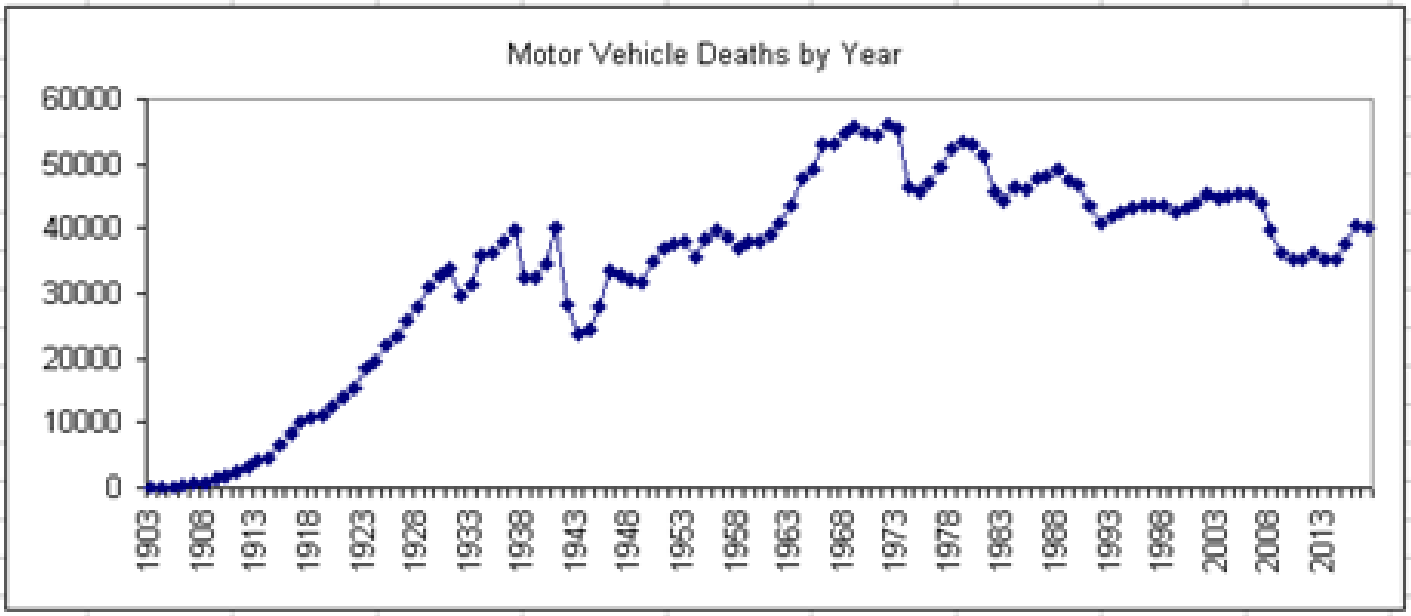


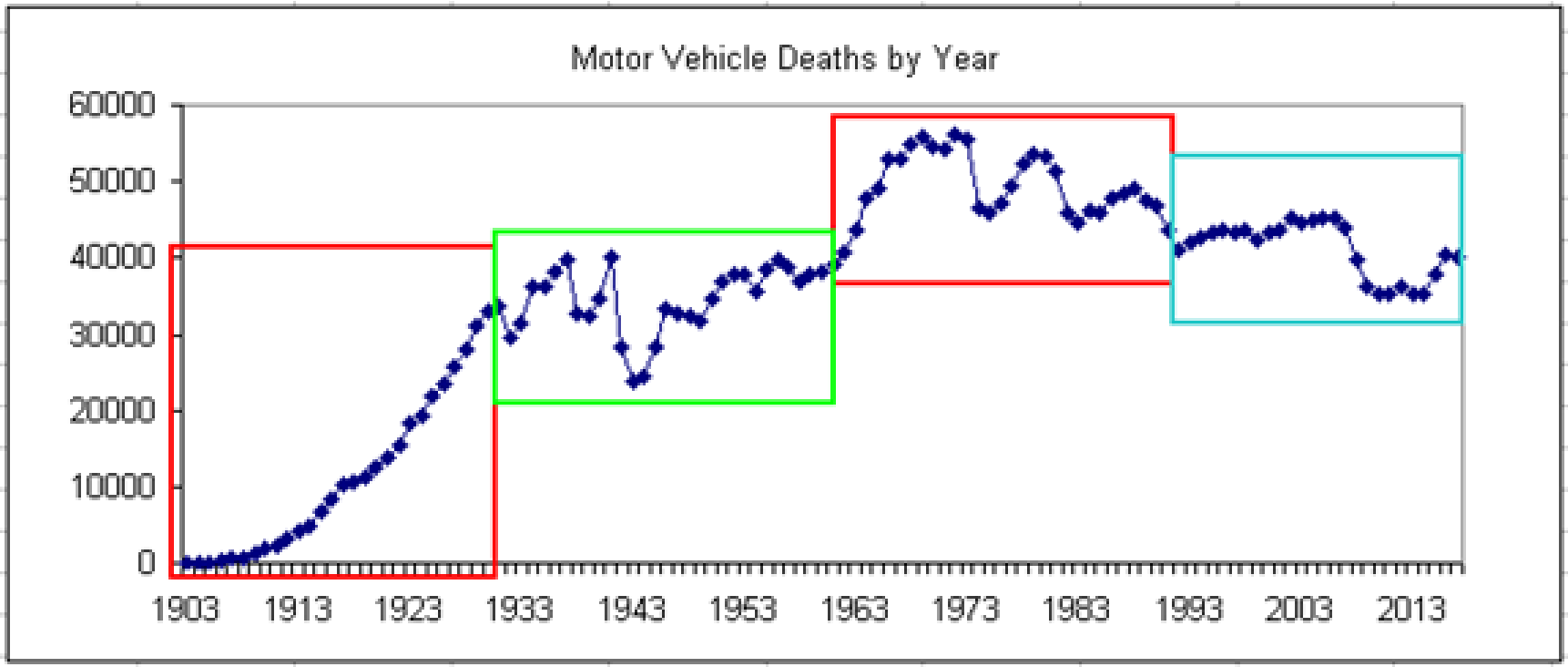
Case Study: Putting it all together

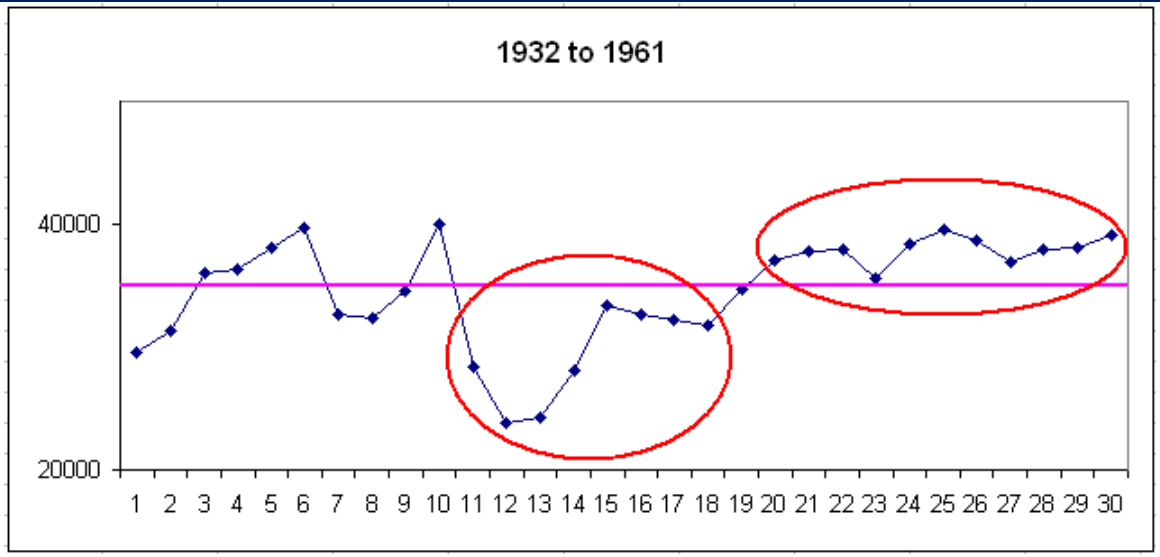
New York Times February 15 2017
U.S. Traffic Deaths Rise for a Second Straight Year
Headline:
Last year, traffic deaths increased 6 percent, to 40,200, according to estimates released on Wednesday by the National Safety Council. The two-year increase — 14 percent — is the largest in more than a half a century.
The latest batch of bad news arrived Wednesday in traffic fatality estimates released by the National Safety Council, a nonprofit organization that works closely with federal auto-safety regulators. According to its estimates, 40,200 people died in accidents involving motor vehicles in 2016, a 6 percent rise from the year before.

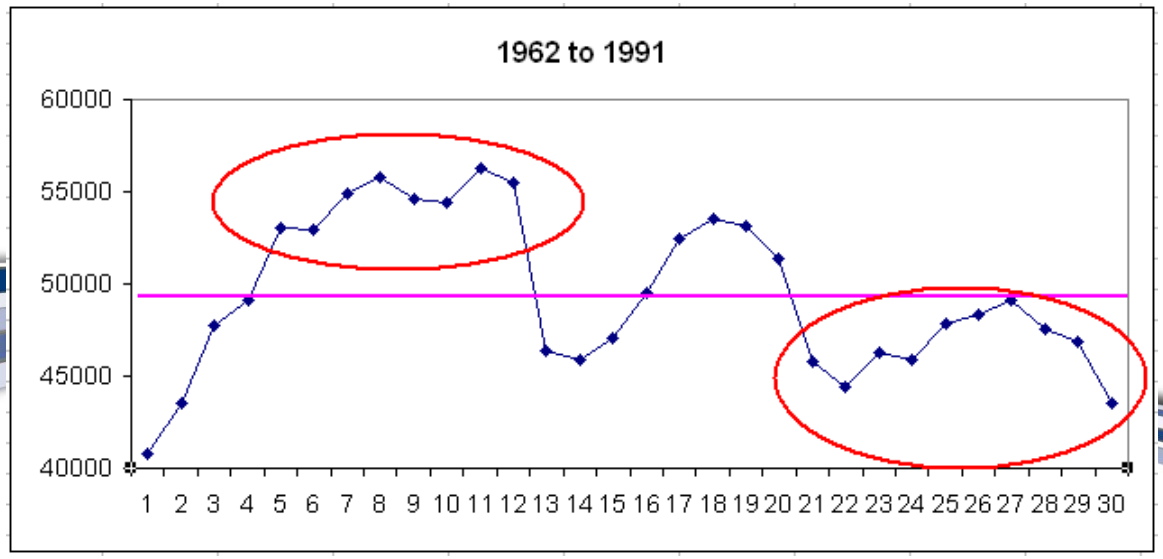
Chicago Tribune December 14, 2018
DETROIT (AP) — Traffic deaths on U.S. roads fell slightly in 2017 after two straight years of big increases, but a leading safety organization that compiled the numbers says it's no cause for celebration.
The National Safety Council on February 15 estimated that 40,100 people were killed in traffic crashes last year, down just under 1 percent from the 2016 total of 40,327. The group said it's too early to tell whether the small decline means a downward trend after a two-year spike in deaths that was blamed largely on people driving more miles as the economy improved as well as an increase in distracted driving.

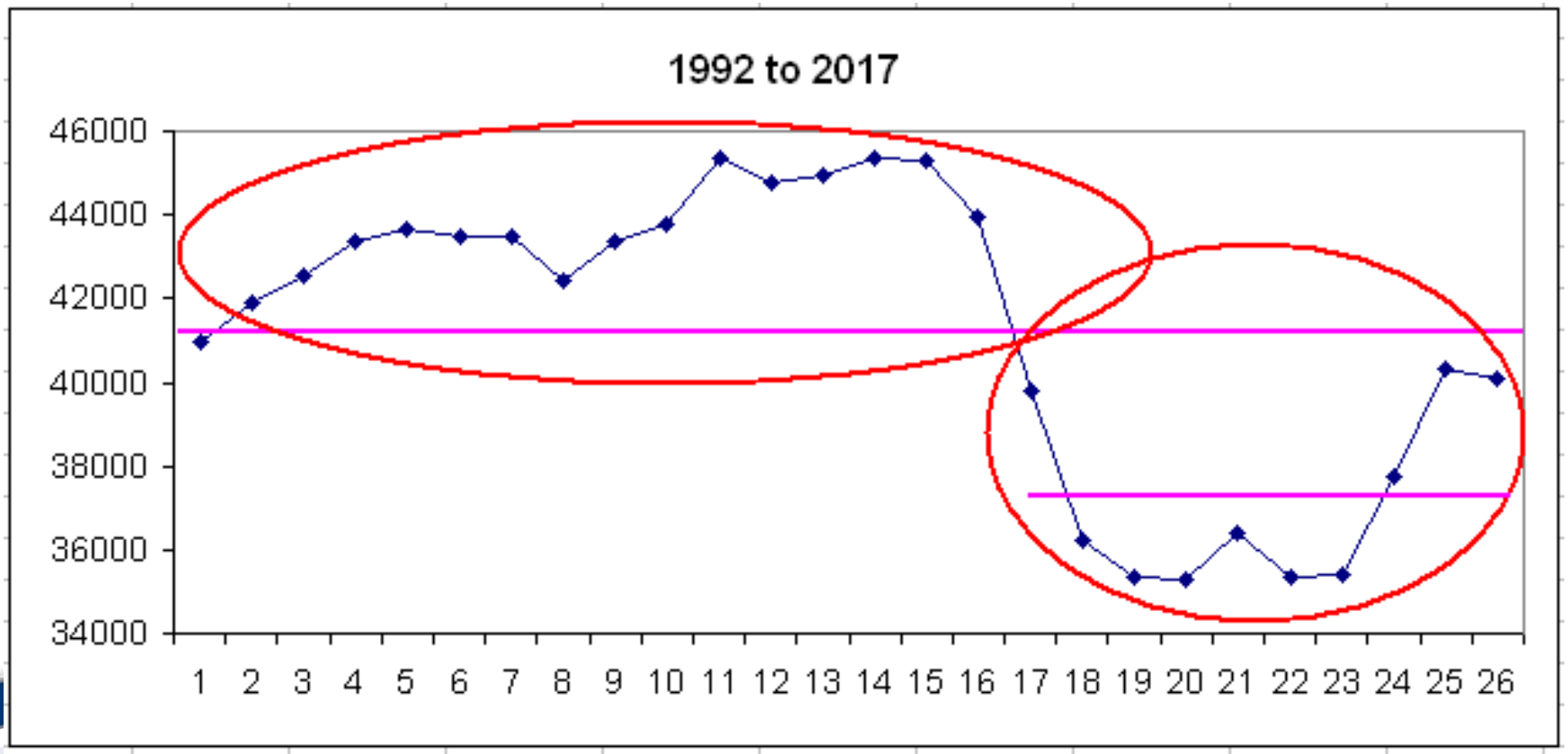
1998	43501
1999	42401
2000	43354
2001	43788
2002	45380
2003	44757
2004	44933
2005	45343
2006	45316
2007	43945
2008	39790
2009	36216
2010	35332
2011	35303
2012	36415
2013	35369
2014	35398
2015	37757
2016	40327
2017	40100

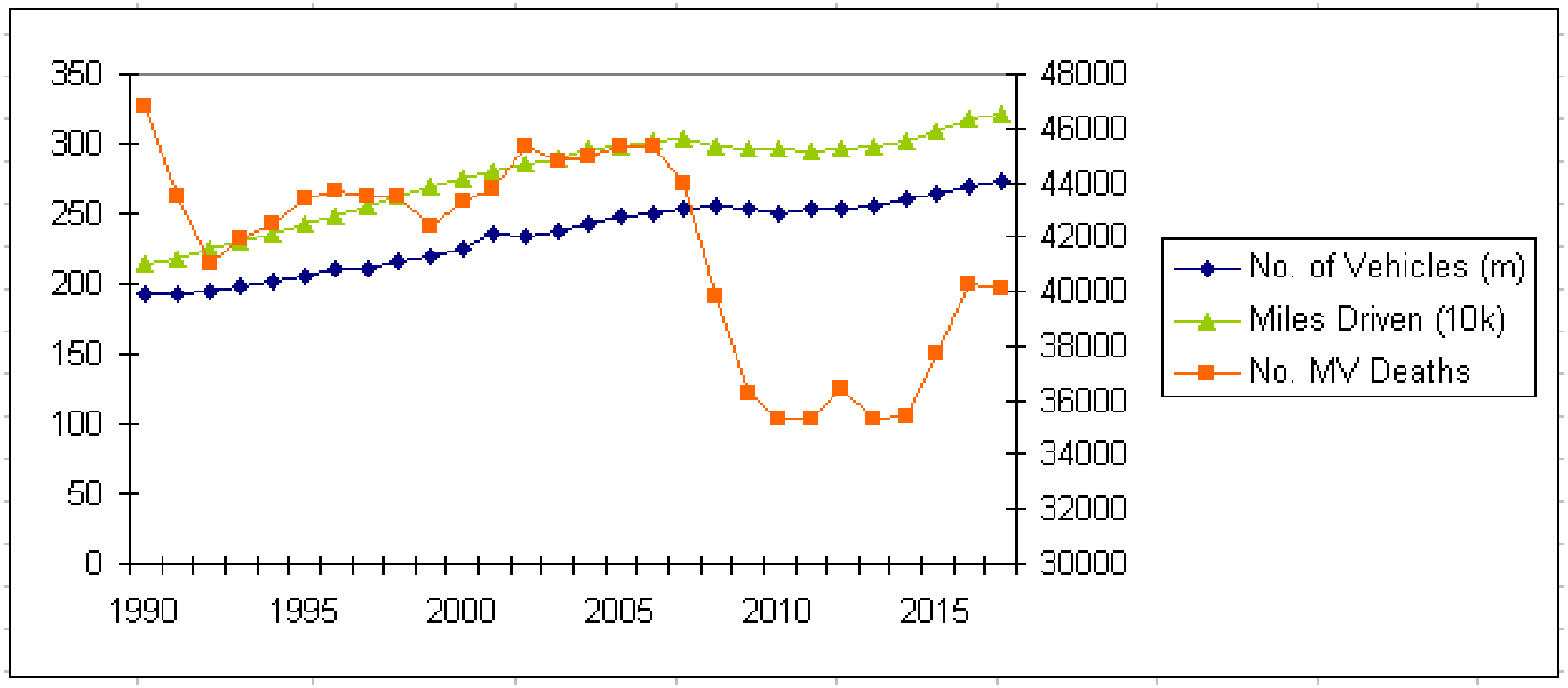



Motor Vehicle Deaths by Year
60000
50000
40000
30000
20000
10000
0
1903
1913
1923
1933
1943
1953
1963
1973
1983
1993
2003
2013


1932 to 1961
40000
20000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30


1962 to 1991
60000
55000
50000
45000
40000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30


1992 to 2017
46000
44000
42000
40000
38000
36000
34000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26


350
300
250
200
150
100
50
0
48000
46000
44000
42000
40000
38000
36000
34000
32000
30000
1990
1995
2000
2005
2010
2015
No. of Vehicles (m)
Miles Driven (10k)
No. MV Deaths

Data Visualization

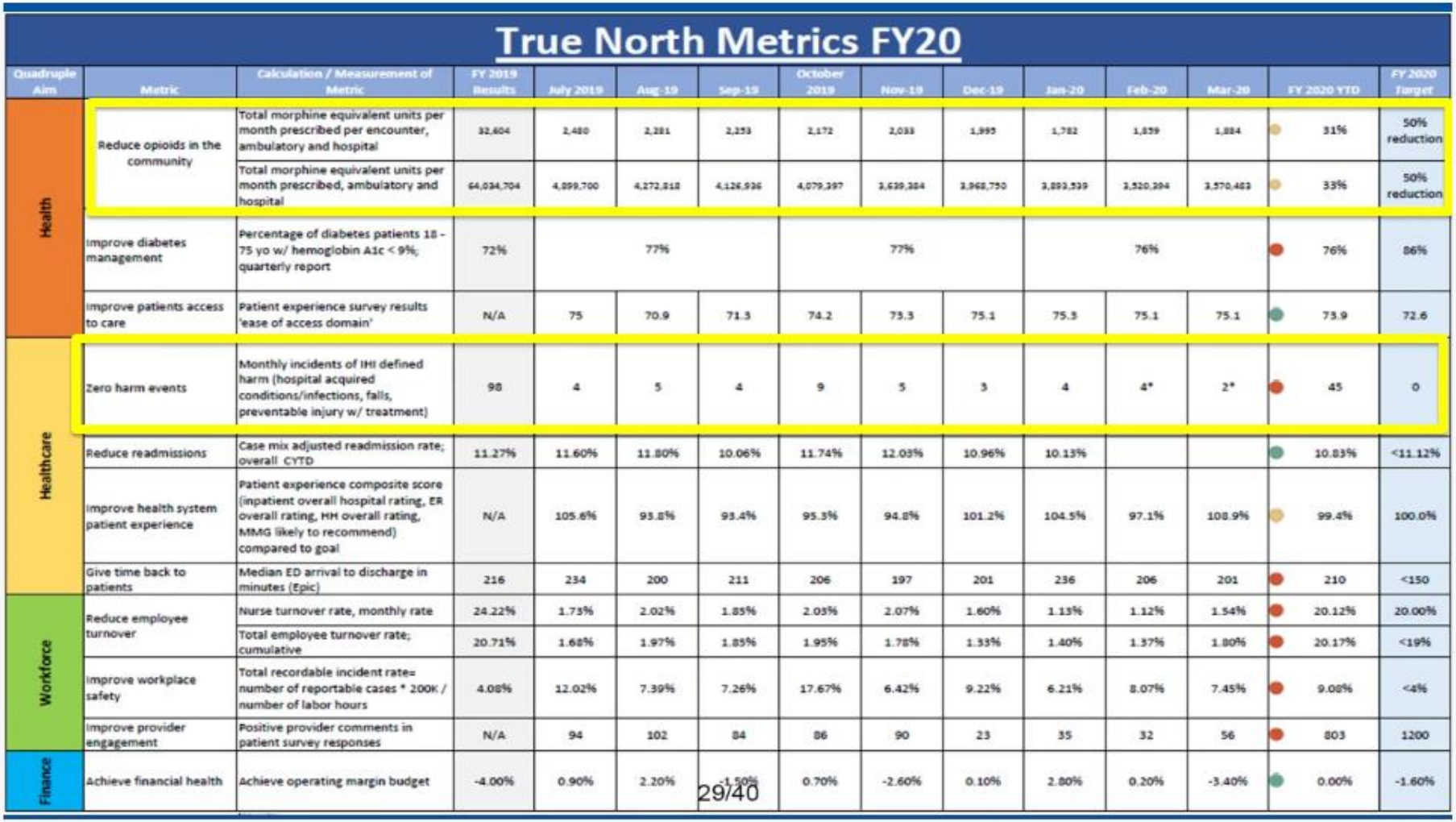
- Creating charts in Excel
  - Fall_Dashboard_Data_2021.xlsx
  - Generic_Dashboard_Data_2021.xlsx
  - Medication_Dashboard_Data_2021.xlsx
  - Pressure_Ulcer_Dashboard_Data_2021.xlsx

Using Visualization for Communication

- Reports/Dashboards
  - IHI Visual Management Board http://www.ihi.org/resources/Pages/Tools/Visual-Management-Board.aspx
  - Chart Chooser https://www.juiceanalytics.com/chartchooser
- Infographics
  - Examples https://www.ahrq.gov/data/infographics/index.html
  - Tool: Piktochart https://piktochart.com/formats/
  - Tool: Canva https://www.canva.com/

NHA

Evaluating Scorecards, Dashboards, and Board Reports



True North Metrics FY20

Quadruple Aim	Metric	Calculation / Measurement of Metric	FY 2019 Results	July 2019	Aug-19	Sep-19	October 2019	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	FY 2020 YTD	FY 2020 Target
Health	Reduce opioids in the community	Total morphine equivalent units per month prescribed per encounter, ambulatory and hospital	32,604	2,480	2,281	2,253	2,172	2,033	1,995	1,782	1,859	1,884	31%	50% reduction
		Total morphine equivalent units per month prescribed, ambulatory and hospital	64,034,704	4,099,700	4,272,818	4,126,936	4,079,397	3,639,384	3,968,750	3,893,539	3,520,294	3,570,463	33%	50% reduction
	Improve diabetes management	Percentage of diabetes patients 18 - 75 yo w/ hemoglobin A1c < 9%; quarterly report	72%		77%			77%			76%		76%	86%
	Improve patients access to care	Patient experience survey results 'ease of access domain'	N/A	75	70.9	71.3	74.2	73.3	75.1	75.3	75.1	75.1	73.9	72.6
Healthcare	Zero harm events	Monthly incidents of IHI defined harm (hospital acquired conditions/infections, falls, preventable injury w/ treatment)	98	4	5	4	9	5	3	4	4*	2*	45	0
	Reduce readmissions	Case mix adjusted readmission rate; overall CYTD	11.27%	11.60%	11.80%	10.06%	11.74%	12.03%	10.96%	10.13%			10.83%	<11.12%
	Improve health system patient experience	Patient experience composite score (inpatient overall hospital rating, ER overall rating, HH overall rating, MMG likely to recommend) compared to goal	N/A	105.6%	93.8%	93.4%	95.3%	94.8%	101.2%	104.5%	97.1%	108.9%	99.4%	100.0%
	Give time back to patients	Median ED arrival to discharge in minutes (Epic)	216	234	200	211	206	197	201	236	206	201	210	<150
Workforce	Reduce employee turnover	Nurse turnover rate, monthly rate	24.22%	1.73%	2.02%	1.85%	2.03%	2.07%	1.60%	1.13%	1.12%	1.54%	20.12%	20.00%
		Total employee turnover rate; cumulative	20.71%	1.68%	1.97%	1.85%	1.95%	1.78%	1.33%	1.40%	1.37%	1.80%	20.17%	<19%
	Improve workplace safety	Total recordable incident rate= number of reportable cases * 200K / number of labor hours	4.08%	12.02%	7.39%	7.26%	17.67%	6.42%	9.22%	6.21%	8.07%	7.45%	9.08%	<4%
	Improve provider engagement	Positive provider comments in patient survey responses	N/A	94	102	84	86	90	23	35	32	56	803	1200
Finance	Achieve financial health	Achieve operating margin budget	-4.00%	0.90%	2.20%	-1.50%	0.70%	-2.60%	0.10%	2.80%	0.20%	-3.40%	0.00%	-1.60%

29/40

Evaluating Scorecards, Dashboards, and Board Reports

- Joywave Hospital Acute Operational Dashboard.xlsx
- Provider Quality Scorecard.xlsx
- REO Board Report with dashboard and scorecard.pdf
- SCH Organizational Quality Initiatives.xlsx

Tomorrow……

More fun putting together scorecards, dashboards, and board reports!