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PHASE

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PHASE Data For Improvement Webinar: Taking the Pulse of Improvement Efforts Using Run Charts and Funnel Charts

Jerry Lassa, MS Statistics

July 18, 2018

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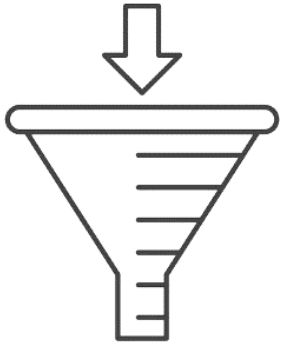


PHASE Data For Improvement Webinar

Taking the Pulse of Improvement Efforts Using Run Charts and Funnel Charts

JERRY LASSA, MS STATISTICS

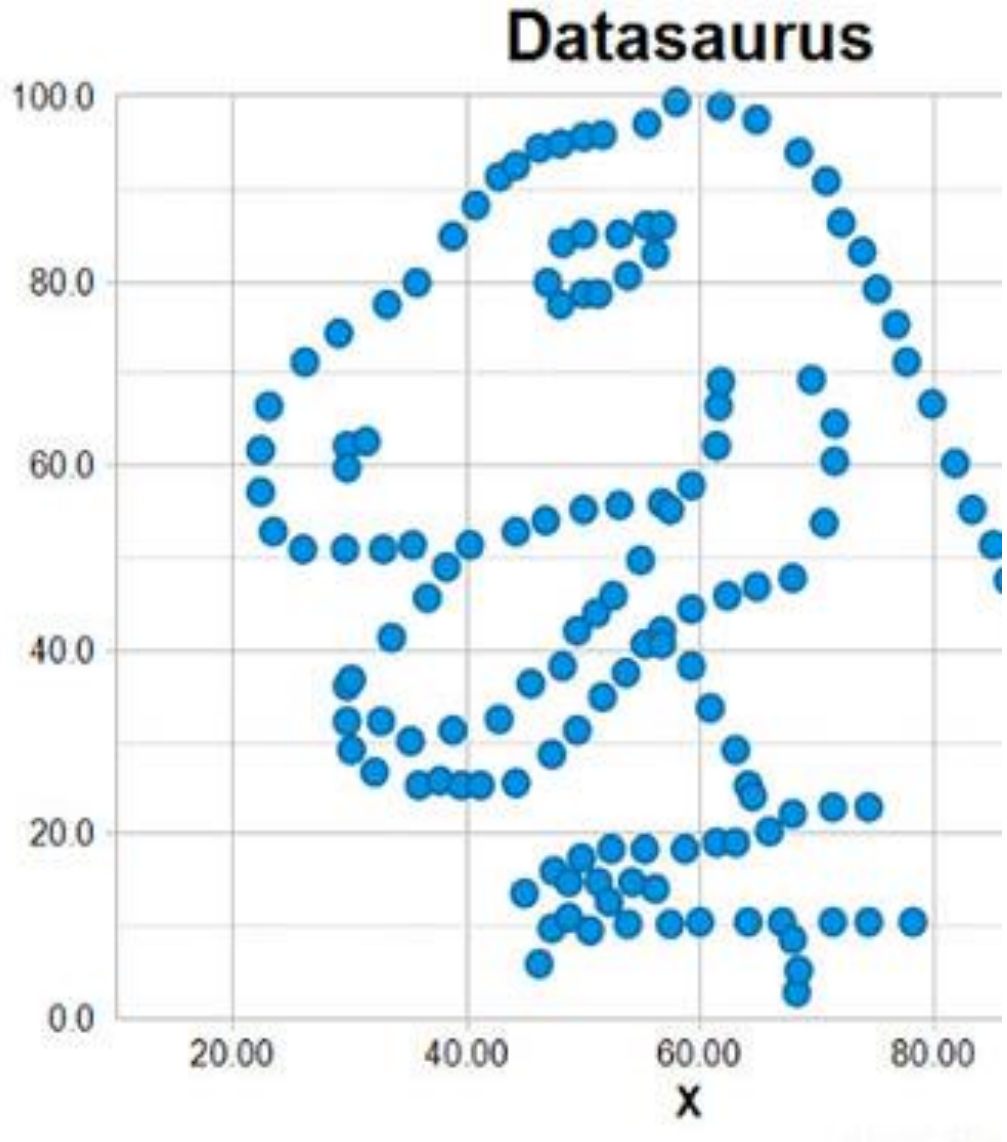
JULY 18, 2018

LEARNING OBJECTIVES

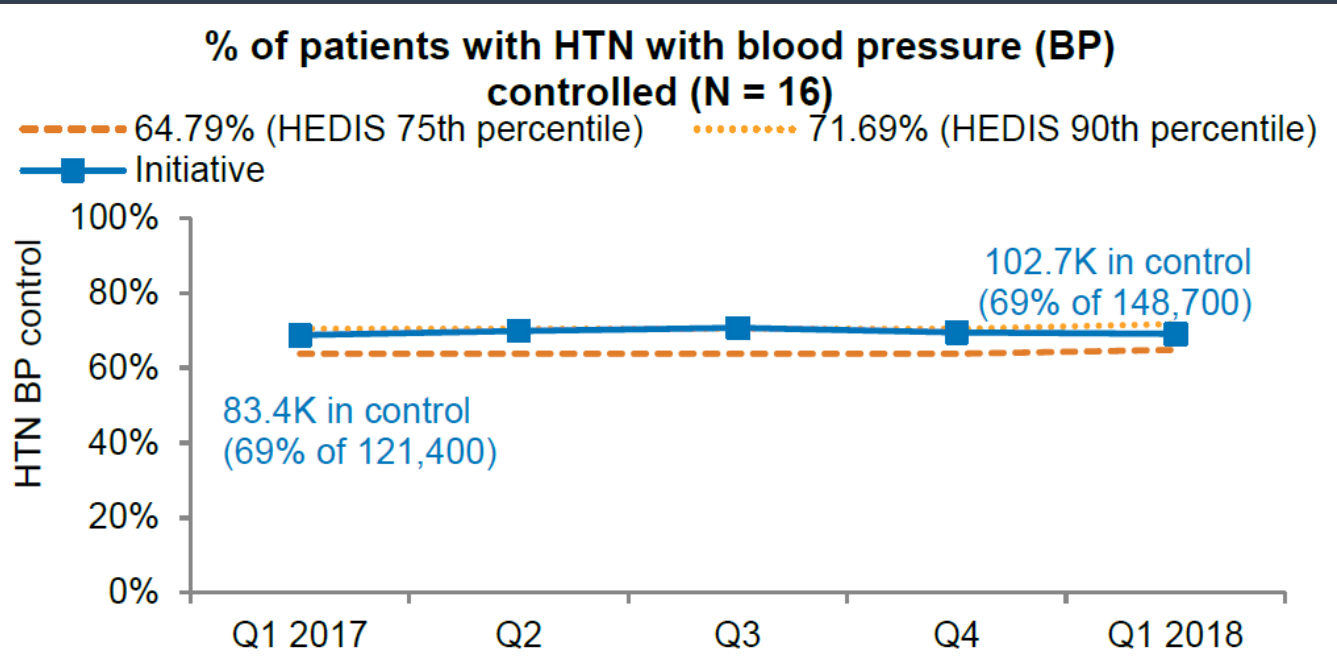
- Gain a deeper understanding of the data in your improvement efforts
- Learn how to use visual display and statistical analysis techniques that flag significant trends in data
  - Run Chart and Deming's Rules
  - Testing of Means
  - Funnel Charts

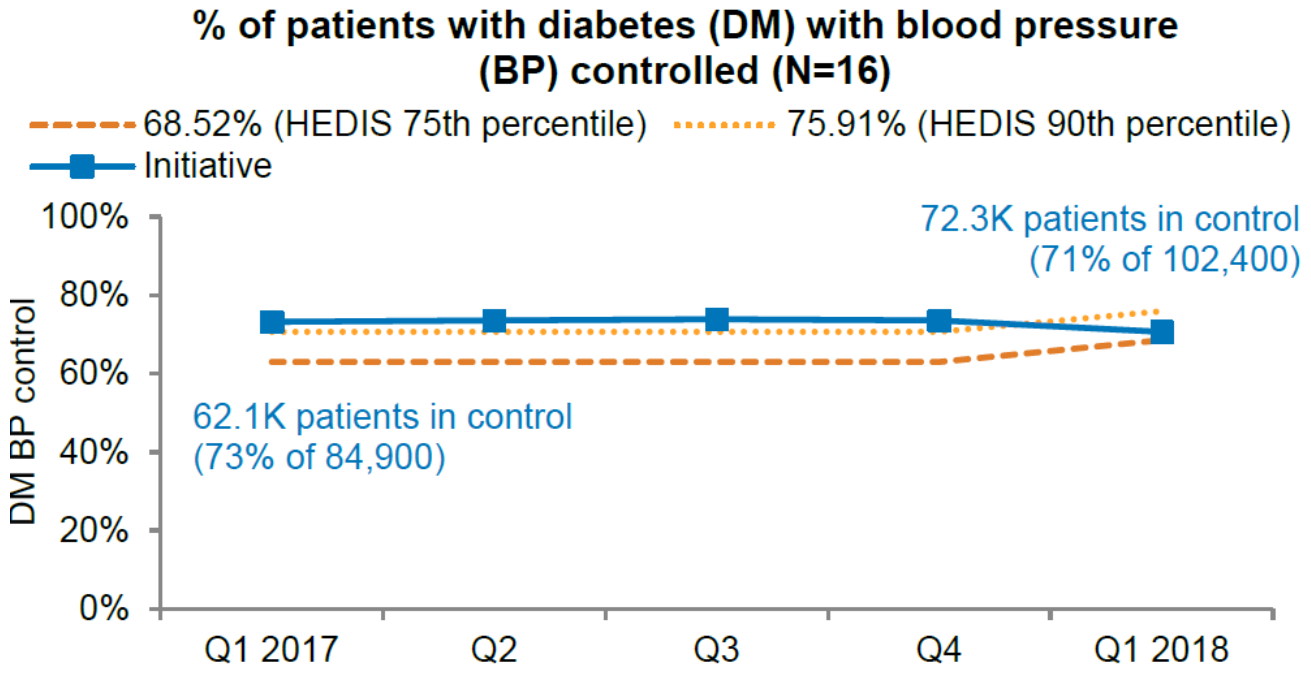
Most importantly…

Learn to embrace, not fear, your data.



YOUR PHASE MEASURE PROGRESS





POLL #1

My role with PHASE data (can select more than one):

- ❑ Capture (e.g., see patients, document in EHR)
- ❑ Compile, analyze (e.g., pull data, create reports)
- ❑ Use for improvement (e.g., clinical, operational)

POLL #2

We compile and review our PHASE measures at least:

- ❑ Weekly
- ❑ Monthly
- ❑ Quarterly

POLL #3

Our top challenge(s) in making use of data for improvement is (can select more than one):

- ❑ Availability of the right data (frequency, granularity)
- ❑ Data quality (accuracy, reliability)
- ❑ Fully understanding and communicating the data we have ("data literacy")
- ❑ Diligence and follow-through in acting on the data
- ❑ Other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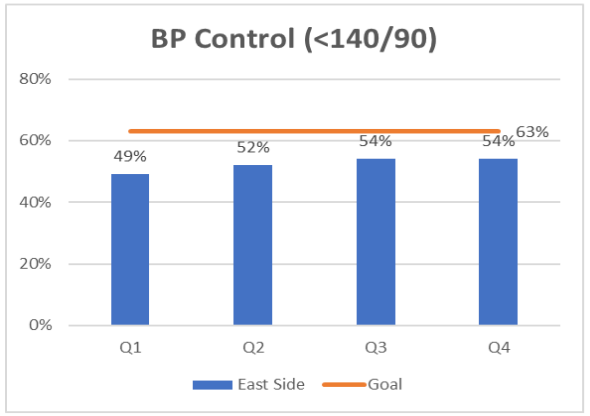
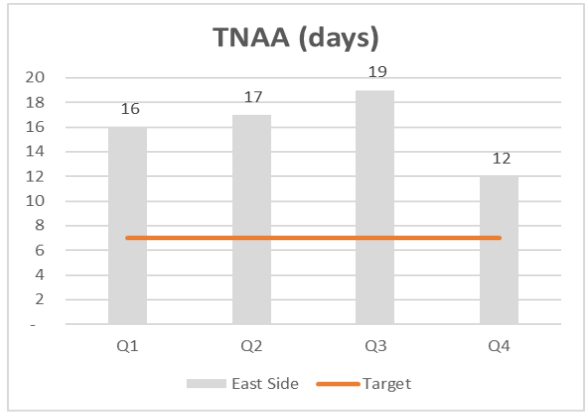
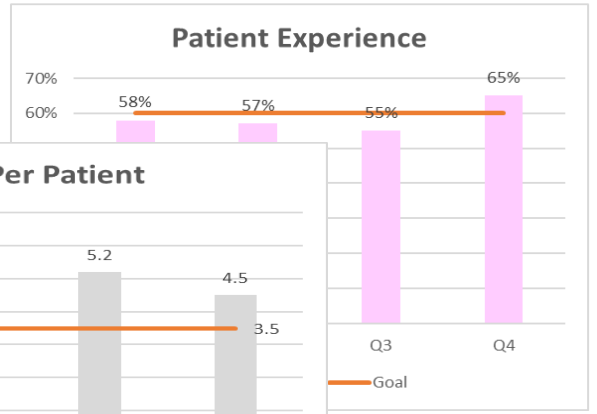
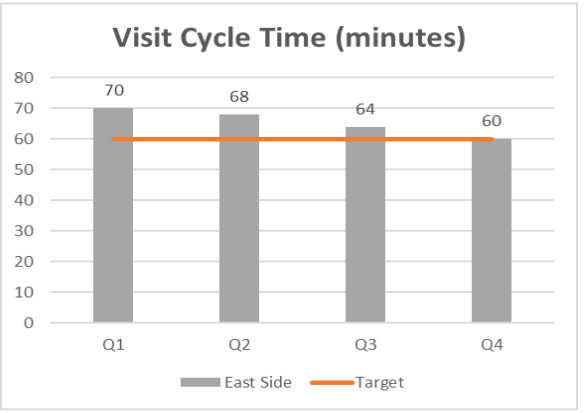
WILL THE DATA BE ACCURATE?
OKAY, LET'S PRETEND THAT MATTERS.

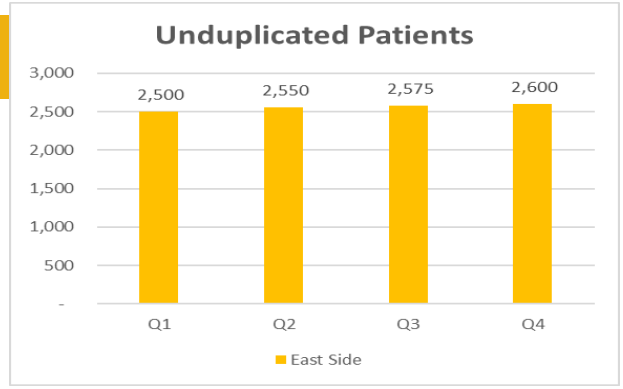
TREND CHARTS & DASHBOARDS ("DESCRIPTIVE ANALYSIS")

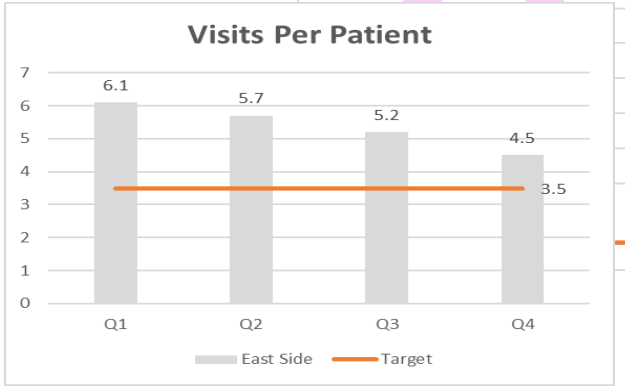


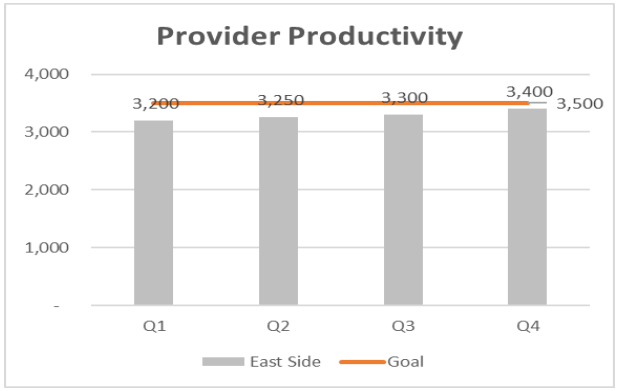


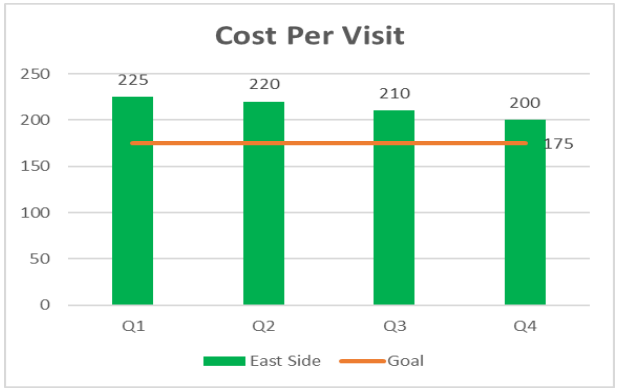












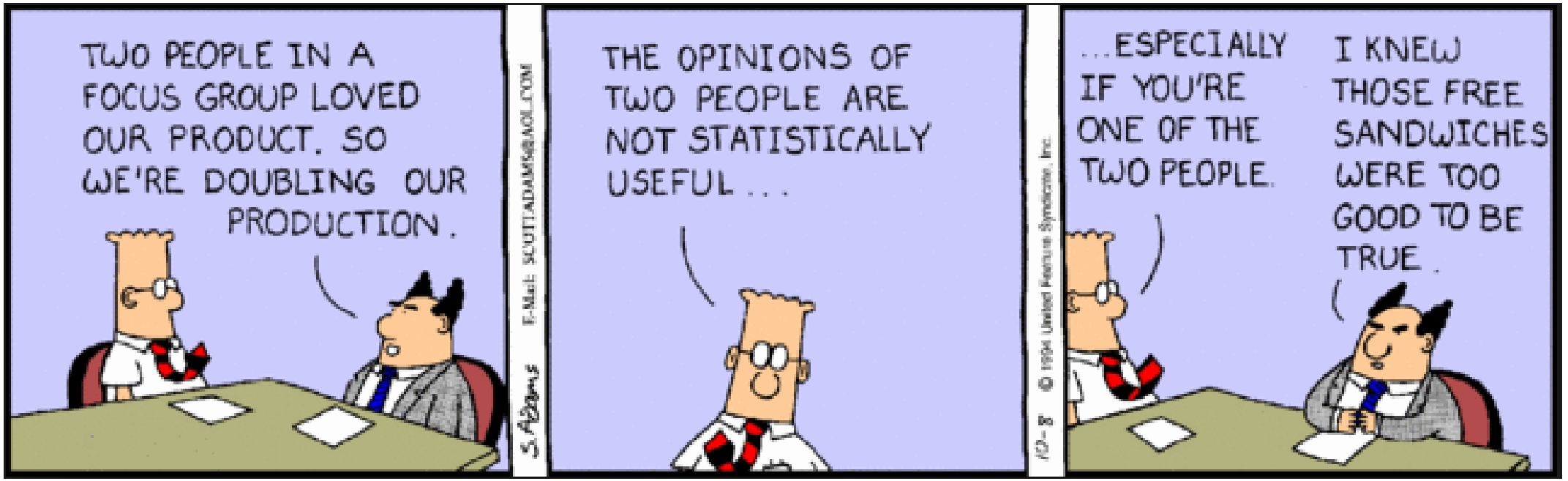
IMPORTANT TO HAVE REPORTS & DATA DISPLAYS THAT VISUALIZE WHAT'S HAPPENING WITH DATA "ON THE SURFACE"

ENSURE DATA QUALITY[1]

Are the numbers right? (Is there data integrity?)

- ✓ Verifiable – you get the same number when using different data sources
- ✓ Accurate/Reliable – numerator and denominator are correct; based on measure specs; get consistent results from same reporting tool
- ✓ Retrievable – desired data elements are documented in EHR in format that is possible to query (e.g., structured vs. un)
- ✓ Complete – all data elements, including repeat or re-analysis, are included

[1] This checklist was developed as part of Million Hearts® work funded by the Centers for Disease Control and Prevention (CDC) and is © 2016 TMIT Consulting and NACHC; non-commercial use with attribution is permitted.


TWO PEOPLE IN A FOCUS GROUP LOVED OUR PRODUCT. SO WE'RE DOUBLING OUR PRODUCTION.
THE OPINIONS OF TWO PEOPLE ARE NOT STATISTICALLY USEFUL...
...ESPECIALLY IF YOU'RE ONE OF THE TWO PEOPLE.
I KNEW THOSE FREE SANDWICHES WERE TOO GOOD TO BE TRUE.
S. Adams
E-Mail: SCOTTADAMS@AOL.COM
10-8
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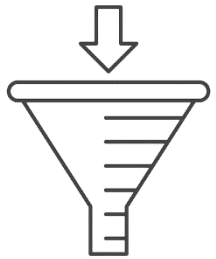
TECHNIQUES TO IDENTIFY IF VARIATION IS STATISTICALLY RELEVANT ("PREDICTIVE ANALYSIS")

For an "early warning" of statistically relevant changes, use a **run chart and Deming's Rules**

To statistically test for differences from period to period (e.g., month to month, quarter to quarter, year to year), use **trend analysis**



To statistically identify outliers (good and bad) for a single period of performance (e.g., one month, one quarter, one year), use a **funnel chart**

ARE YOUR PDSAS WORKING?

For an "early warning" of statistically relevant changes, use a **run chart and Deming's Rules**

When to use:

- When you lead teams through efforts using PDSA cycles and are testing and monitoring the impact of changes. For example, an effort focused on diabetic patient outreach and BP control. Has the effort resulted in meaningful change so far?

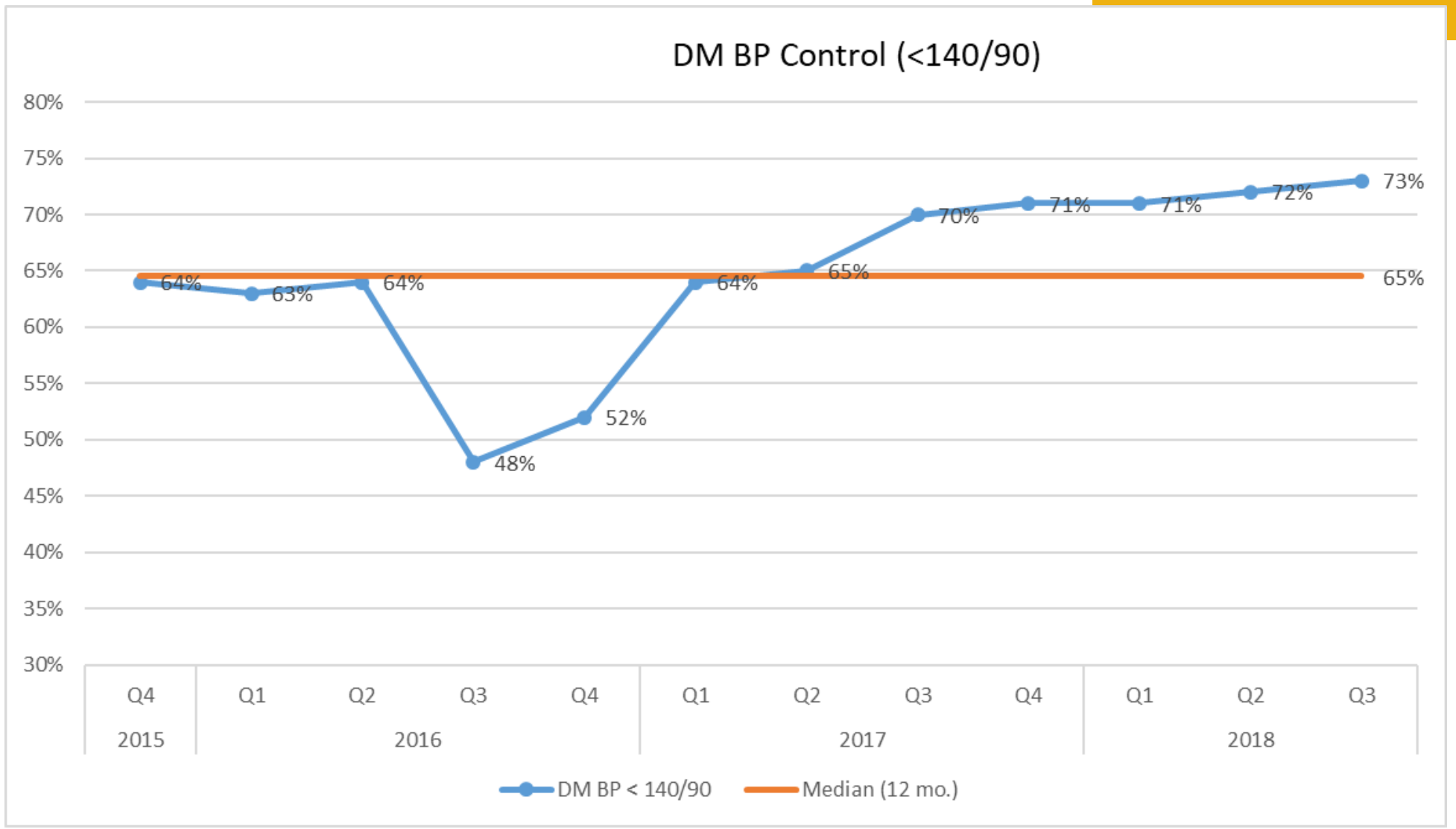
What the results will help you determine:

- Whether there is statistical evidence that improvement efforts may be leading to significant changes.

Potential Challenges:

- Sufficient data points for each period to ensure they are representative. Aim for 15-30 measurements.

RUN CHARTS

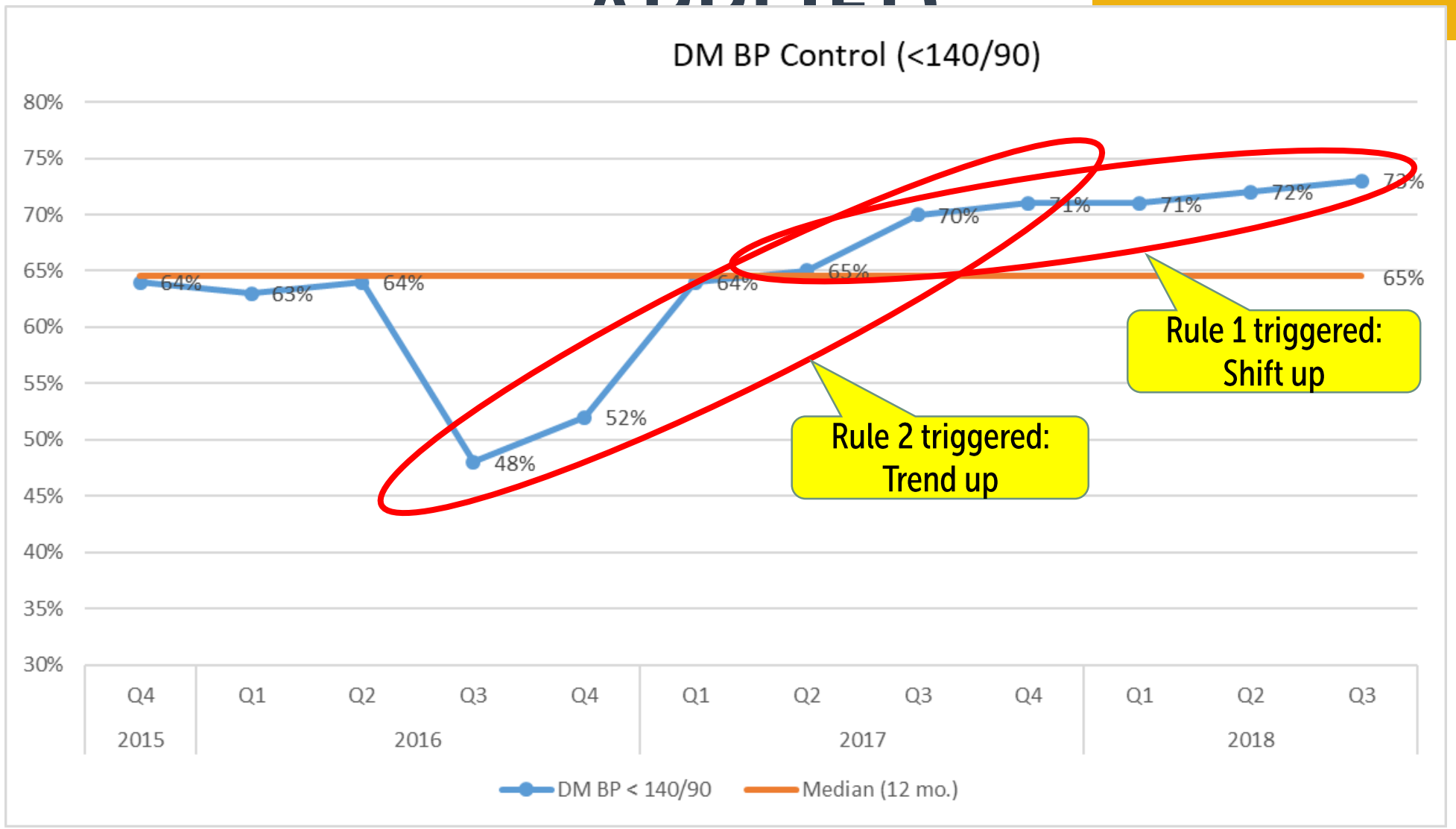

DM BP Control (<140/90)
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
64%
63%
64%
48%
52%
64%
65%
70%
71%
71%
72%
73%
65%
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
2015
2016
2017
2018
DM BP < 140/90
Median (12 mo.)

Deming's Rules for Run Charts

One or more broken rules is a signal of "special cause" variation.

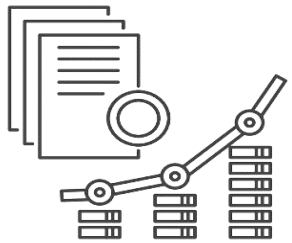
#	Rule	Meaning
1	Shift - 6 or more consecutive points either all above or all below the median	There is evidence that the underlying process (e.g., care process) has systematically changed, resulting in sustained improvement or decline.
2	Trend - 5 points all going up or all going down	There is evidence that the underlying process is steadily improving or worsening.
3	Runs - a series of points in a row on one side of the median. (Total runs = n + 1, where n equals # times the line between data points crosses the median.)	There is evidence that the underlying process is erratic and may not be producing normal, or common cause, variability.
4	Astronomical Point - unusually large or small points	There is evidence the underlying process is producing suspect or outlier(s) results.

RUN CHARTS WITH DEMING'S RULES APPLIED



RUN CHART IN EXCEL

DID YOUR MEASURE CHANGE SIGNIFICANTLY?



To statistically test for differences from period to period (e.g., month to month, quarter to quarter, year to year), use **trend analysis**

When to use:

- When presenting, for example, quarterly results on a measure to your leadership team and they want to know if they should take action on any of the trends occurring (up or down).

What the results will tell you determine:

- Whether there was a statistically significant change (improvement or decline) that warrants action (recognition or intervention).

Potential Challenges:

- Accuracy of numerator and denominator totals.

  Ensure data quality.

TREND ANALYSES

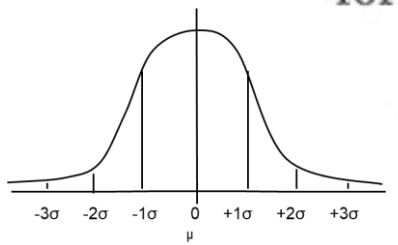
USE TO DETERMINE IF MEASURE CHANGES ARE STATISTICALLY SIGNIFICANT

Was your measure improvement or decline statistically significant?

You can use this approach:

Difference of Proportions Hypothesis Test:

H_0: $P_1 = P_2$
H_1: $P_1 \neq P_2$



$\alpha = 0.05$ testing level
(~2 standard deviation difference will be significant)

Sample Test Statistics for Tests of Hypotheses for difference of proportions

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\overline{p}\,\overline{q}}{n_1} + \frac{\overline{p}\,\overline{q}}{n_2}}}$$

where $\overline{p} = \frac{r_1 + r_2}{n_1 + n_2}$ and $\overline{q} = 1 - \overline{p}$

$$\hat{p}_1 = r_1/n_1; \hat{p}_2 = r_2/n_2$$

Or you can use this approach:

Sample size (each period)	Significant Difference
30	19%
40	17%
50	15%
60	14%
70	13%
90	12%
100	11%
200	8%
300	7%
500	6%
800	5%
1500	4%
1600	3%
3600	2%
15000	1%

"The UDS 70"

TREND ANALYSES

USE TO DETERMINE IF MEASURE CHANGES ARE STATISTICALLY SIGNIFICANT

Let's use the easier approach!

Sample size (each period)	Significant Difference
30	19%
40	17%
50	15%
60	14%
70	13%
90	12%
100	11%
200	8%
300	7%
500	6%
800	5%
1500	4%
1600	3%
3600	2%
15000	1%

Look up measure denominator in table to determine approximate difference required for significance

Since denominator for each period is ~5,000, a 1-2% change will be significant.

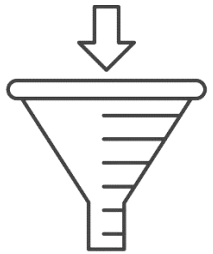
Example: BP Control has improved from 55% last year to 58% this year in Q1.

Was the improvement statistically significant?

	Last Year Q1	This Year Q1
Numerator	2,700	3,100
Denominator	4,900	5,300
DM BP < 140/90	**55%**	**58%**

>> Increase of 3% is statistically significant. Celebrate!

WHICH PROVIDERS NEED HELP?



To statistically identify outliers (good and bad) for a single period of performance (e.g., one month, one quarter, one year), use a **funnel chart**

When to use:

- Use for priority measures where provider variability is high. For example, you may be trying to improve incentive payments from a health plan and want to identify providers that are performing significantly better or worse than all providers in total.

What the results will tell you determine:

- The Funnel Chart compares results for a single measure across all providers on a single chart and displays a confidence interval (an upper and lower bound on the measure) for each provider. It identifies which providers are performing significantly better or worse than all other providers on that measure.

Potential Challenges:

- Transparency. All should agree to sharing. Otherwise results should be masked or coded.

FUNNEL CHARTS

USE TO STATISTICALLY IDENTIFY OUTLIERS (GOOD AND POOR) FOR A SINGLE PERIOD OF PERFORMANCE

What is the Margin of Error on results for individual providers?

You can use this approach:

95% Confidence Interval for a single population proportion:

z_c = 1.96 critical value
(~2 standard deviation Margin of Error)

Confidence Interval

for p ($np > 5$ and $n(1-p) > 5$)

$$\hat{p} - E < p < \hat{p} + E$$

where $E = z_c \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

$$\hat{p} = \frac{r}{n}$$

Margin of Error ("MOE" or just "E") is used to compute the +/- range (Confidence Interval) for the "true" measure value.
The more data points (patients) you have, the smaller MOE will be.

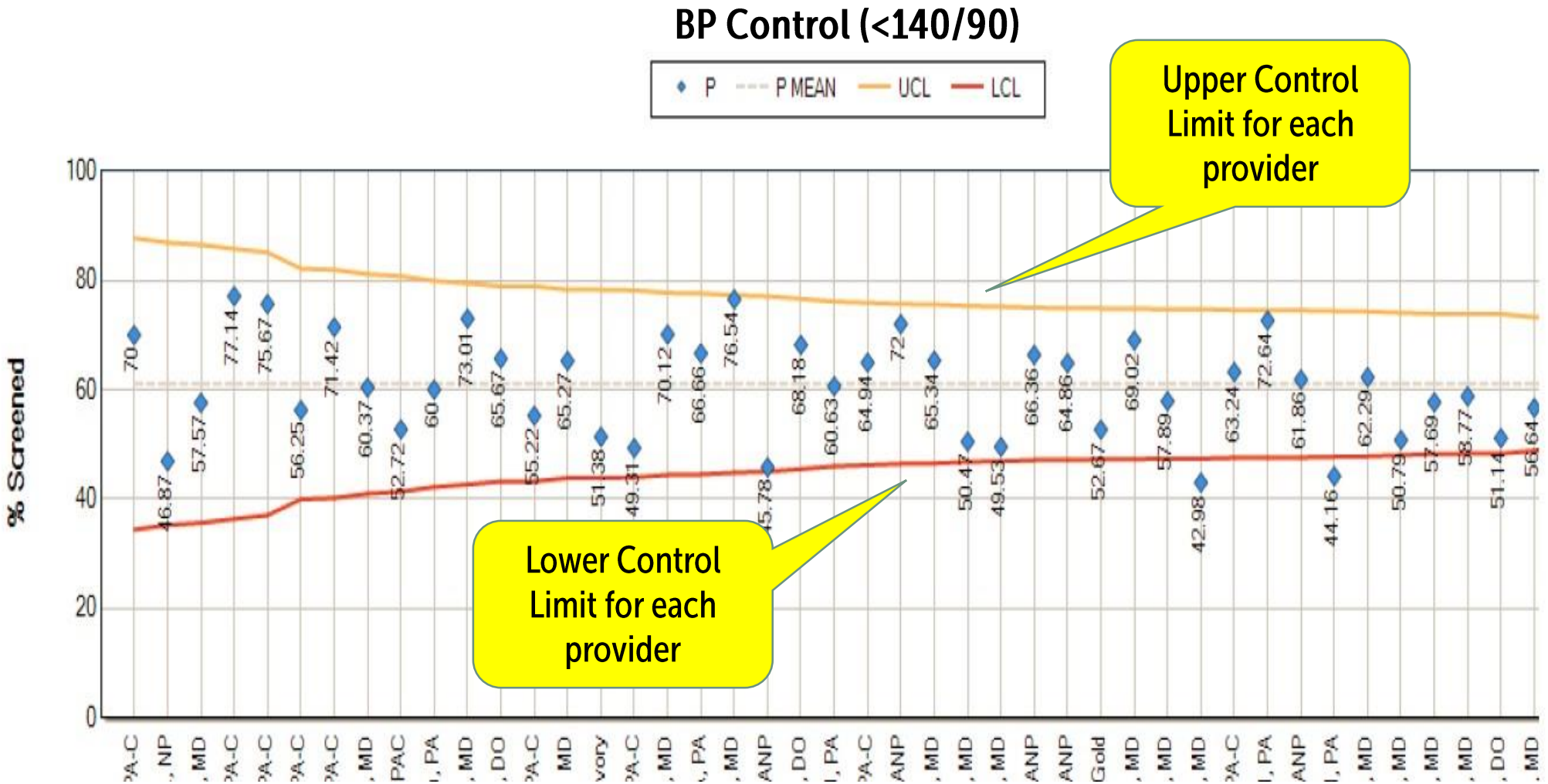
Or you can use this approach:

Pv	Num	Den	BP Control	MOE
R	55	90	61%	10%
J	85	130	65%	8%
Q	180	250	72%	6%

Enter in provider level numerators and denominators and let Excel compute the Margin of Error!

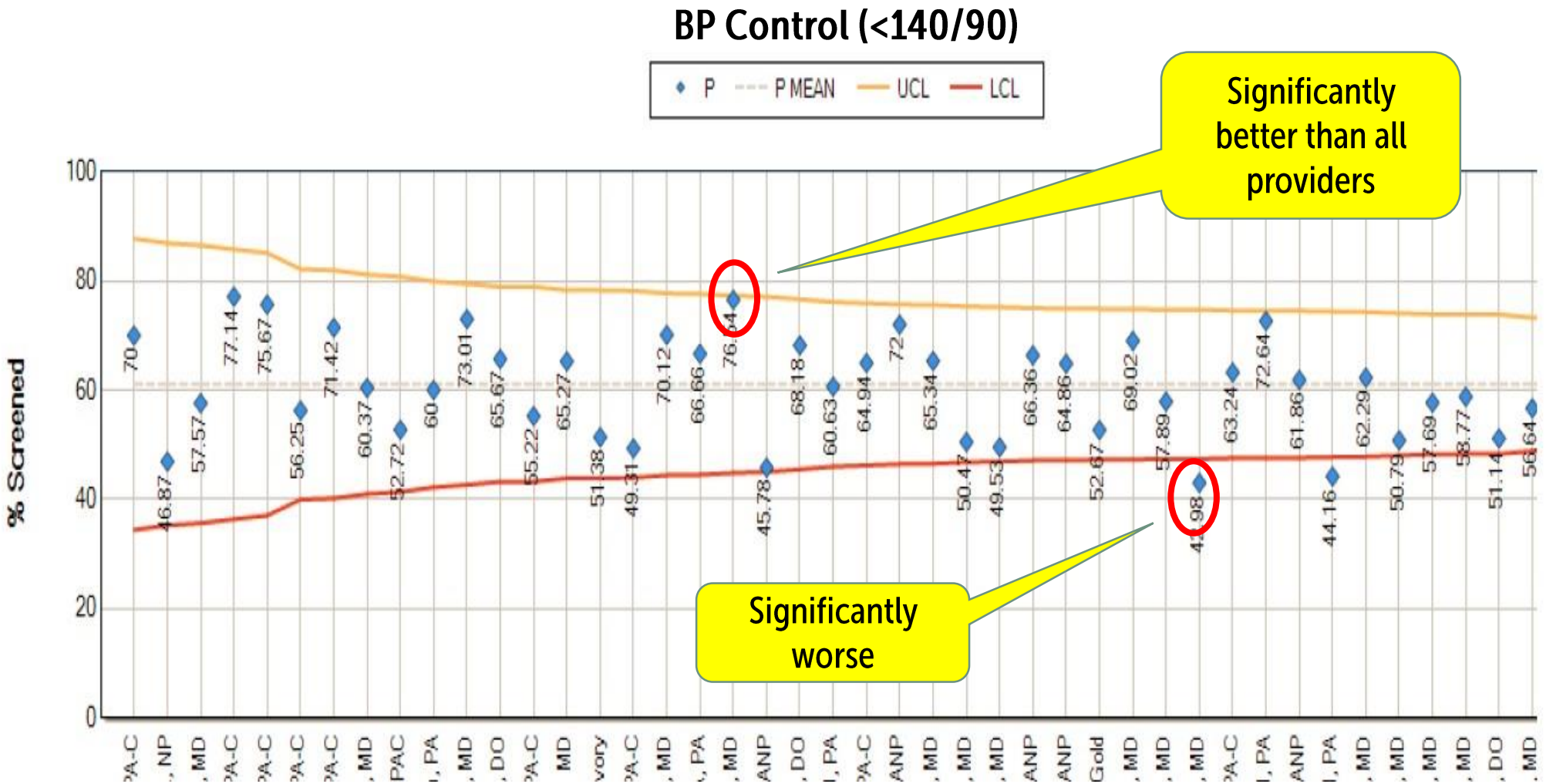
FUNNEL CHARTS

USE TO IDENTIFY STATISTICALLY SIGNIFICANT PRACTICE VARIATION



FUNNEL CHARTS

USE TO IDENTIFY STATISTICALLY SIGNIFICANT PRACTICE VARIATION

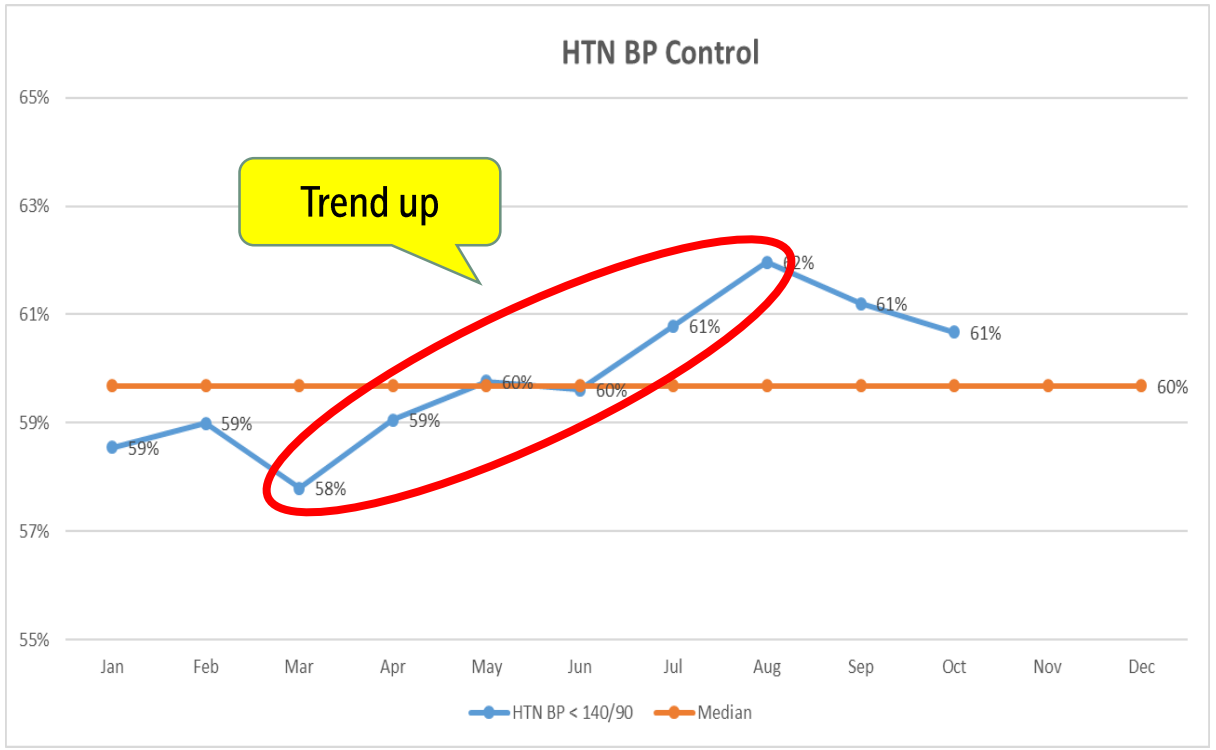


FUNNEL CHART IN EXCEL

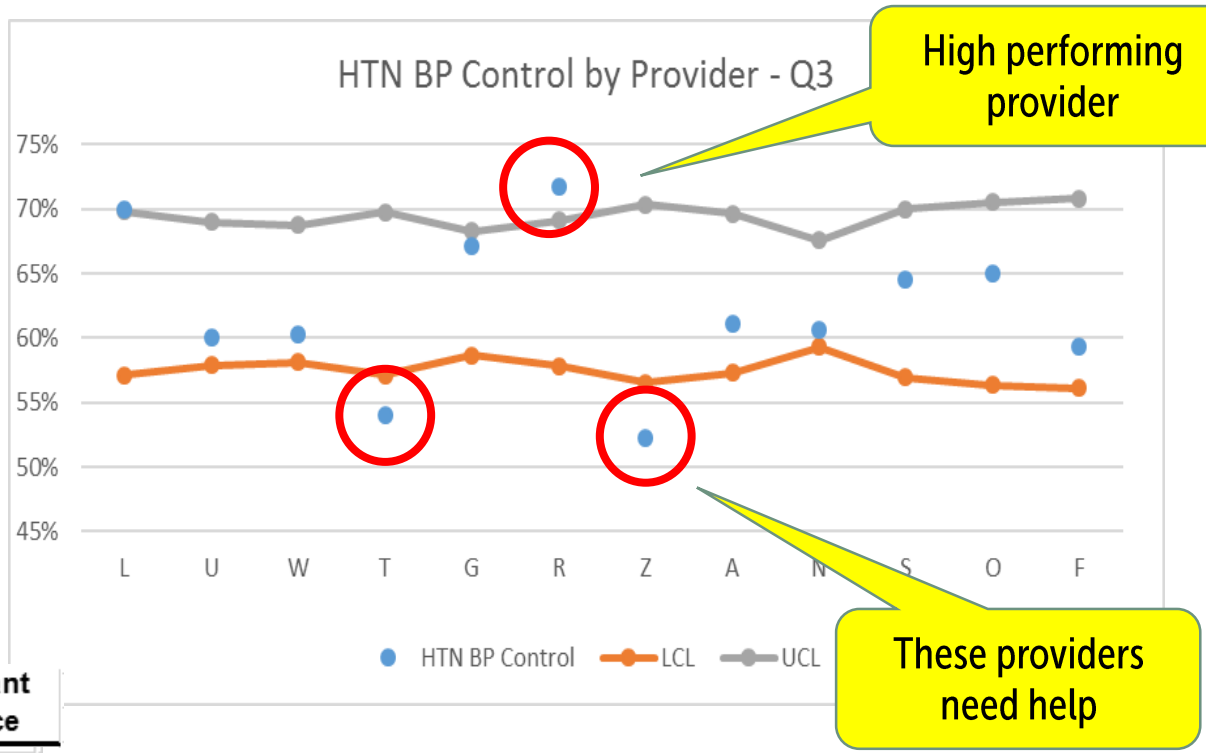
PRESENTING & DISCUSSING RESULTS

FAMILY HEALTH CENTER EXAMPLE

1) Run Chart



3) Funnel Chart by Provider



2) Trend Analysis

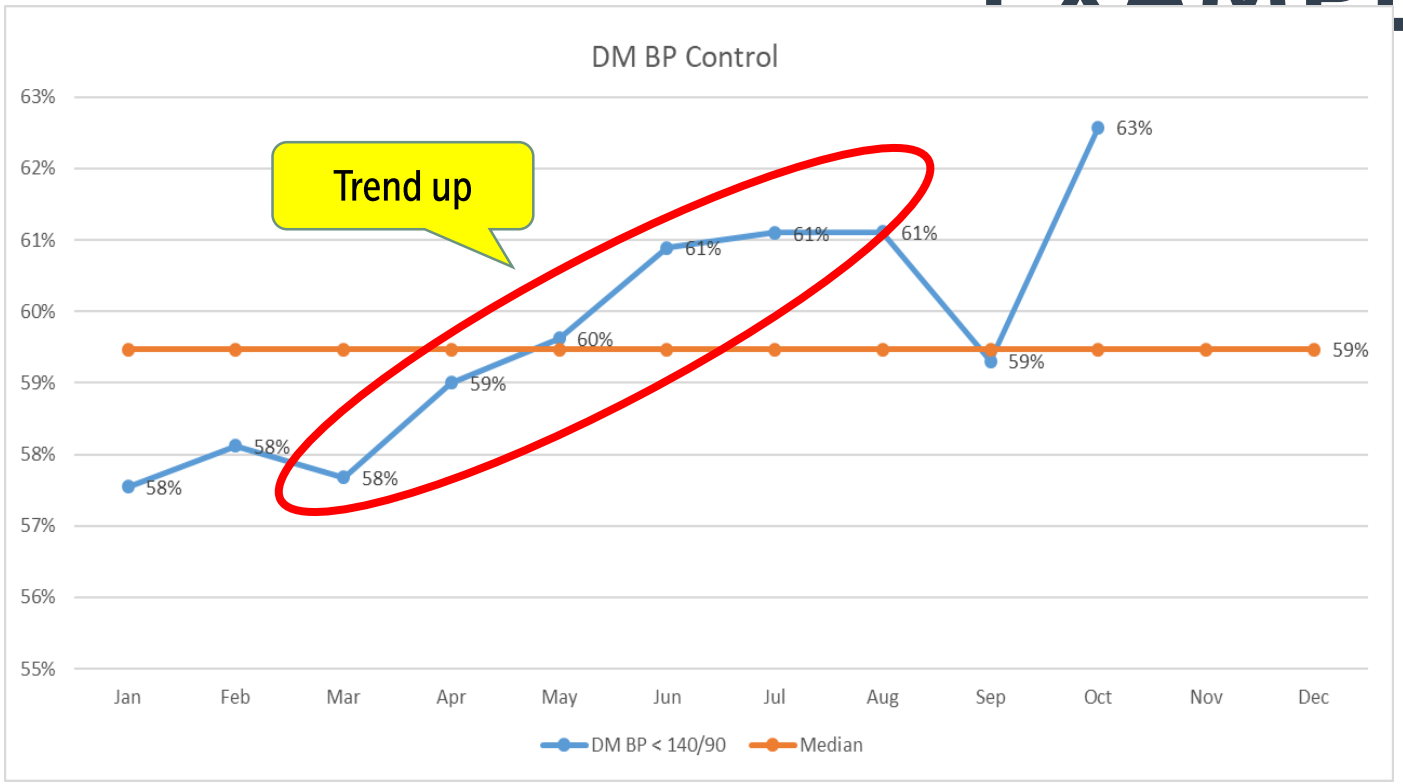
			January	October	Change
	Numerator		647	1,827	
	Denominator		1,105	3,011	
HTN BP Control			59%	61%	2.1%

Sample size (each period)	Significant Difference
1500	4%
1600	3%
3600	2%

Close to a significant improvement from Jan to Oct

HELPING HANDS HEALTH CENTER EXAMPLE

1) Run Chart



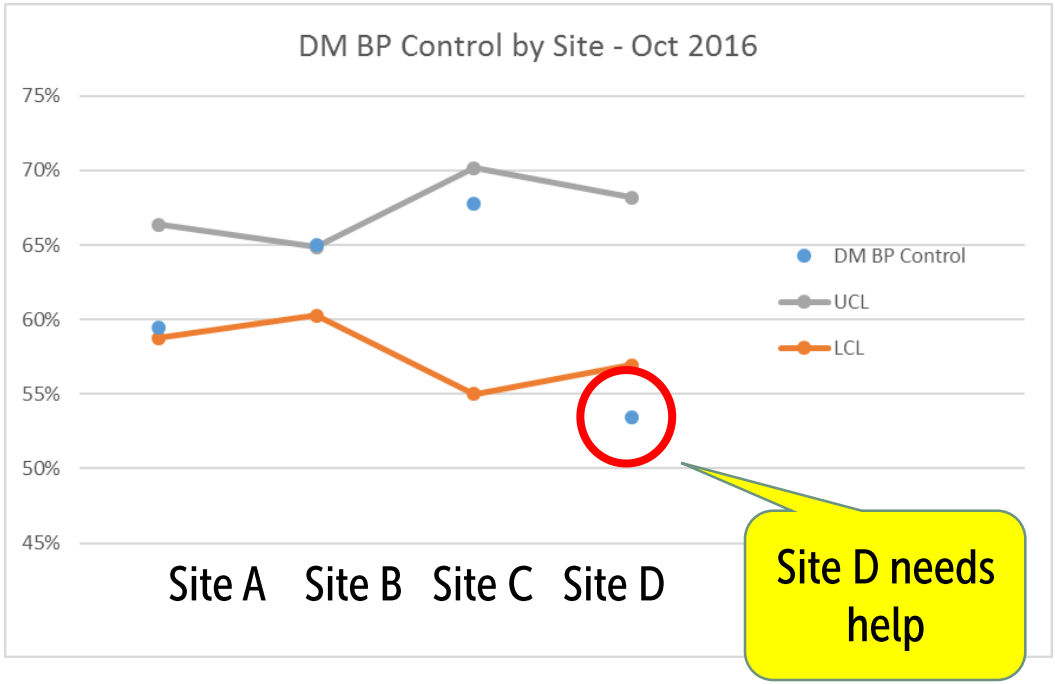
2) Trend Analysis

		Jan	Oct	Change
	Numerator	1,022	1,717	
	Denominator	1,776	2,744	
DM BP Control		58%	63%	5.0%

Sample size (each period)	Significant Difference
1600	3%
3600	2%

Significant improvement from Jan to Oct

3) Funnel Chart



Understanding the Source of Significant Changes in the Data (if any)

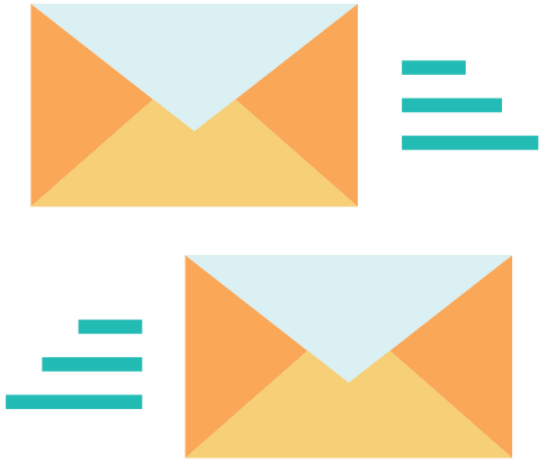
Be sure you have a good understanding of the underlying source of change so you can aim improvement efforts accordingly:

- Was there a change in measurement?
- Change in HIT?
- Change in reporting?
- Change in staffing?
- Change in practice?

In Conclusion

- Have trend charts and dashboard in place to monitor measures "descriptively."
- Use advanced analysis techniques such as run charts with Deming's Rules, trend analysis, and run charts to monitor measures "predictively" and gain deeper insights.
- Use these techniques to create a shared language about interpreting results and whether action should be taken.
- No surprise discussions with results! Be sure to meet with data stakeholders prior to meetings to share approach and findings. Encourage data owners to present findings.

CONTACT INFO



Jerry Lassa

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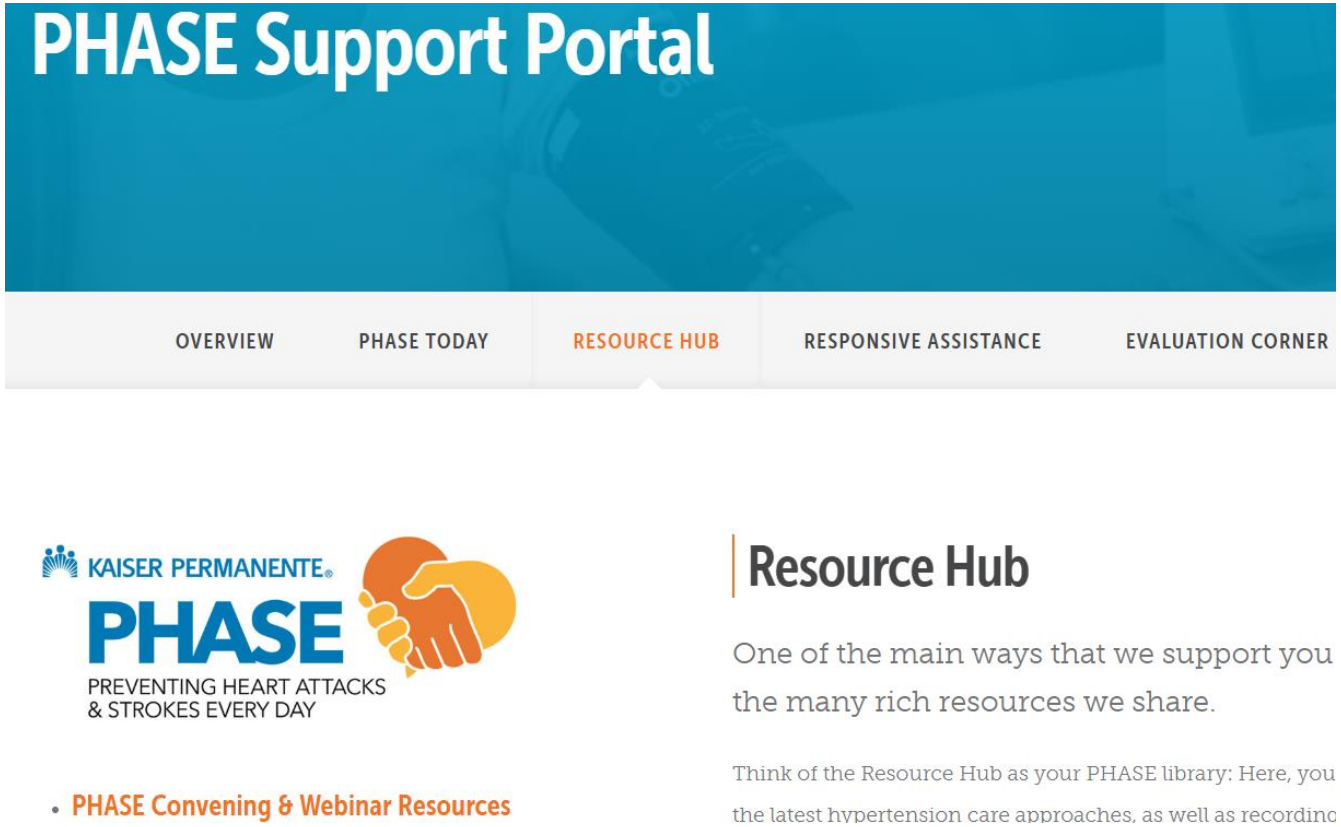

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