

## 2018 IHI National Forum

# Better Quality Through Better Measurement Worksheets

Minicourse Q4  
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***IHI Faculty***

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## Measurement Self-Assessment

Source: R. Lloyd, Quality Health Care: A Guide to Developing and Using Indicators. 2<sup>nd</sup> edition, Jones & Bartlett Publishers, 2017.

Measurement Topic or Skill	Response Scale				
	1	2	3	4	5
Help people in my organization determine why they are measuring (improvement, judgment or research)					
Move teams from concepts to specific quantifiable measures					
Building clear and unambiguous operational definitions for our measures					
Develop data collection plans (including stratification and sampling strategies)					
Explain why plotting data over time (dynamic display) is preferable to using aggregated data and summary statistics (static display)					
Explain the differences between random and non-random variation					
Construct run charts (including locating the median)					
Explain the reasoning behind the run chart rules					
Interpret run charts by applying the run chart rules					
Explain the statistical theory behind Shewhart control charts (e.g., sigma limits, zones, special cause rules)					
Describe the basic 7 Shewhart charts and when to use each one					
Help teams select the most appropriate Shewhart chart for their measures					
Describe the rules for special cause variation on a Shewhart chart					
Help teams link measurement to their improvement efforts					

1. I'd definitely have to call in an outside expert to explain and apply this topic/method.
2. I'm not sure I could apply this appropriately to a project.
3. I am familiar with this topic but would have to study it further before applying it to a project.
4. I have knowledge about this topic, could apply it to a project but would not want to be asked to teach it to others.
5. I consider myself an expert in this area, could apply it easily to a project and could teach this topic/method to others.

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# Aim Statement Worksheet

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**Project Topic:** \_\_\_\_\_

**Aim statement**

(What's the problem? Why is it important? What are you going to do about it?)

**How good?** \_\_\_\_\_

**By when?** \_\_\_\_\_

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# Organizing Your Measures Worksheet®

Topic for Improvement:

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Concept	Potential Measure(s)	Outcome	Process	Balancing

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. 2nd Edition, Jones & Bartlett Learning, 2017.*

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# Operational Definition Worksheet

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Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. 2<sup>nd</sup> Edition, Jones & Bartlett Learning, 2017.*

**Measure Name:** \_\_\_\_\_  
 (Remember this should be specific and quantifiable, e.g., the time it takes to..., the number of..., the percent of... or the rate of...)

**Operational Definition**

Define the specific components of this measure. Specify the numerator and denominator if it is a percent or a rate. If it is an average, identify the calculation for deriving the average. Include any special equipment needed to capture the data. If it is a score (such as a patient satisfaction score) describe how the score is derived. When a measure reflects concepts such as accuracy, complete, timely, or an error, describe the criteria to be used to determine "accuracy."



# Data Collection Plan Worksheet

Project name & location: \_\_\_\_\_

Measure Name	Is Stratification appropriate? If Yes, list the levels of stratification	Will you use sampling? If Yes, describe the sampling method you will use	Frequency of data collection (e.g., hourly, daily weekly?)	Duration of data collection (i.e., how long do you plan to collect the data?)

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. 2<sup>nd</sup> edition, Jones and Bartlett, 2017*

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# Measurement Dashboard Worksheet<sup>©</sup>

Name of team: \_\_\_\_\_ Date: \_\_\_\_\_

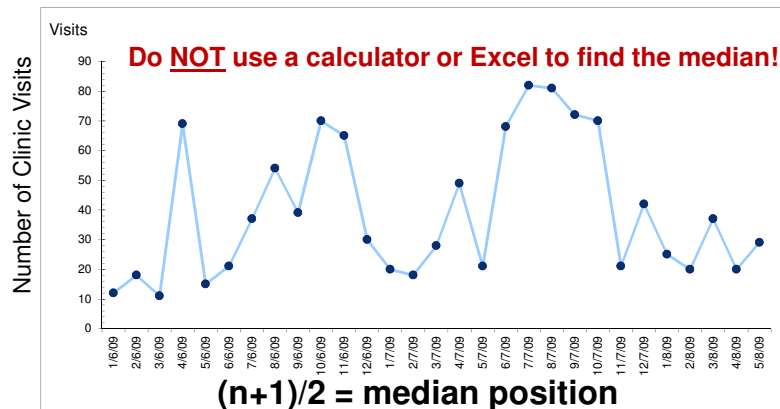
<b><u>Measure Name</u></b> (Be sure to indicate if it is a count, percent, rate, days between, etc.)	<b><u>Operational Definition</u></b> (Define the measure in very specific terms. Provide the numerator and the denominator if a percentage or rate. Be as clear and unambiguous as possible)	<b><u>Data Collection Plan</u></b> (How will the data be collected? Who will do it? Frequency? Duration? What is to be excluded?)

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators. 2<sup>nd</sup> Edition*, Jones and Bartlett, 2017.

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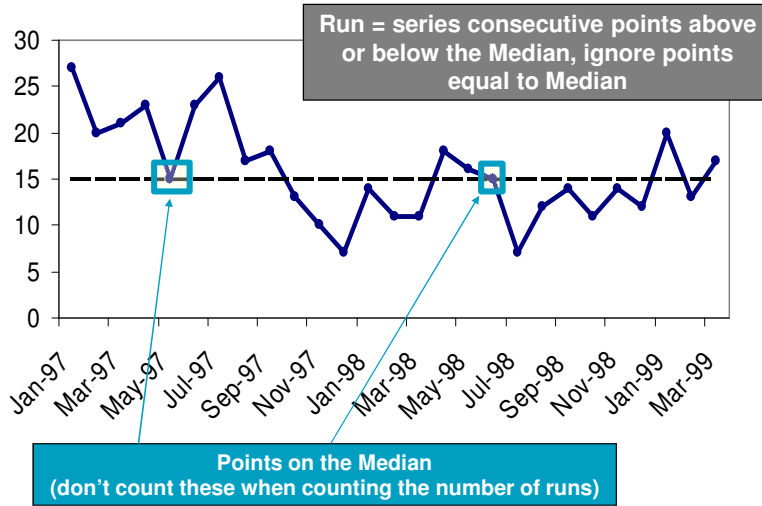
## After plotting the dots, calculate the median position and then the median value

1. Find the Median Position  $(n+1)/2$
2. Then slide a piece of paper down the page to reveal the dots in descending order.
3. At the point where you find the **Median Position** draw a horizontal line across the chart. This is the median line.
4. Determine where this line intersects the Y axis and find the **Median Value**.



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## How many runs on this chart?

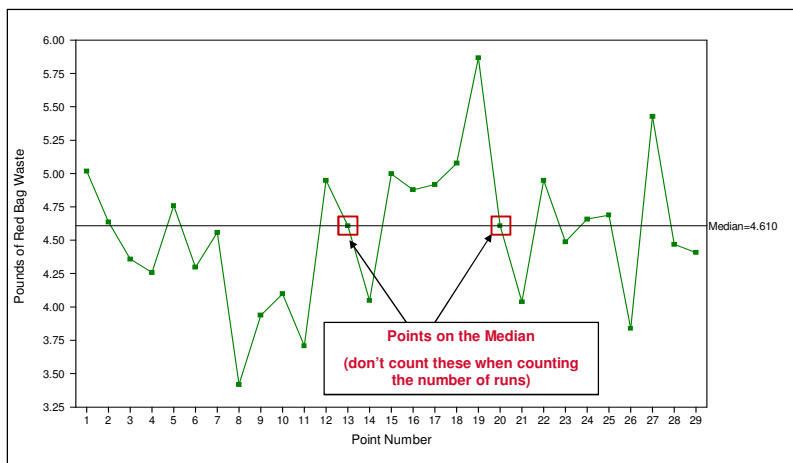


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### Run Chart: Medical Waste

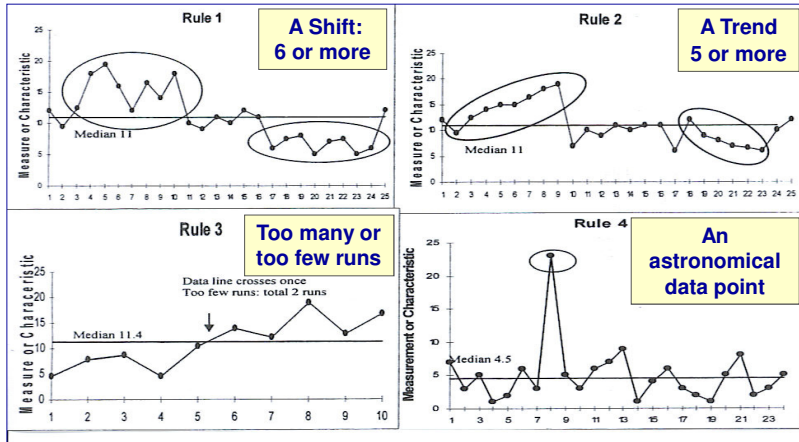
## Determine the number of runs on this chart



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# Non-Random Rules for Run Charts



Source: The Data Guide by L. Provost and S. Murray, Jossey-Bass Publishers, 2011.

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## Rule #3: Too few or too many runs

Use this table by first calculating the number of "useful observations" in your data set. This is done by subtracting the number of data points on the Median from the total number of data points. Then, find this number in the first column. The lower number of runs is found in the second column. The upper number of runs can be found in the third column. If the number of runs in your data falls below the lower limit or above the upper limit then this is a signal of a special cause.

# of Useful Observations	Lower Number of Runs	Upper Number of Runs
15	5	12
16	5	13
17	5	13
18	6	14
19	6	15
20	6	16
21	7	16
22	7	17
23	7	17
24	8	18
25	8	18
26	9	19
27 Total useful observations	10	19
28	10	20
29 Total data points	10	20
30	11	21

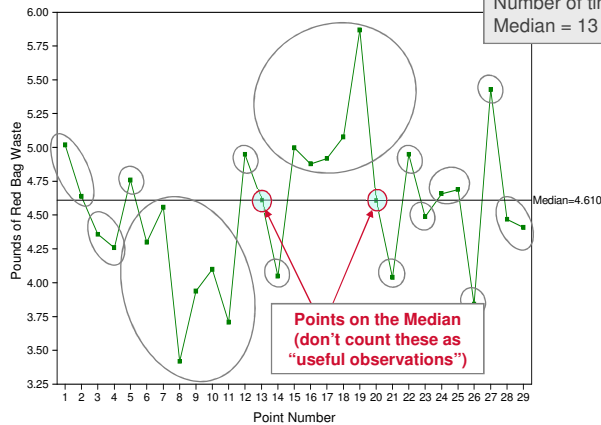
The key point here is that in any data set you can have too much or too little variation.

In either case, it does not produce a normal distribution.

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## Run Chart Interpretation: Medical Waste

Total data points = 29  
 Data points on the Median = 2  
 Number of "useful observations" = 27  
 (should have between 10 & 19 runs)  
 The number of runs = 14  
 Number of times the data line crosses the  
 Median = 13 + 1 = 14

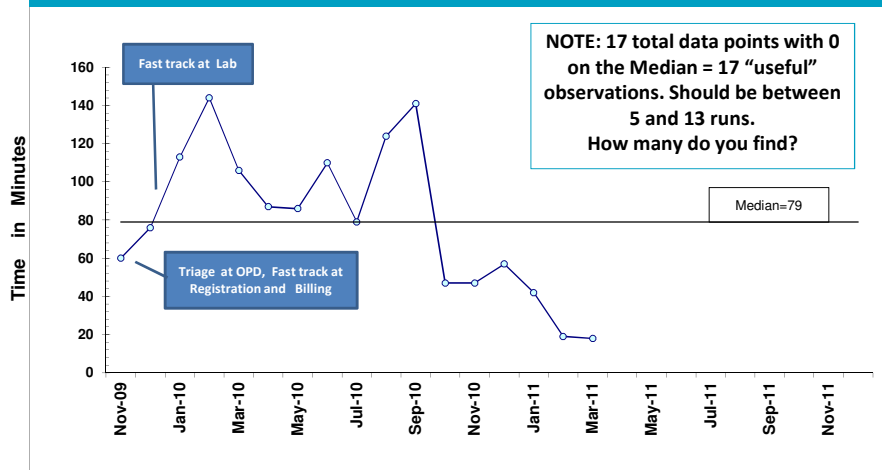


**Are there any non-random patterns present in this chart?**

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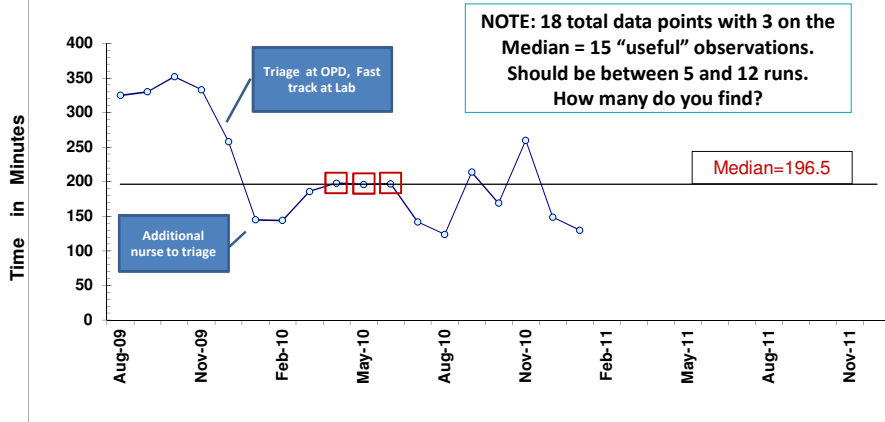
## Determine the number of runs on this chart and then apply the 4 Run Chart Rules

### Time of Registration of Critically Ill U5 to Initiation of Treatment in the Ward



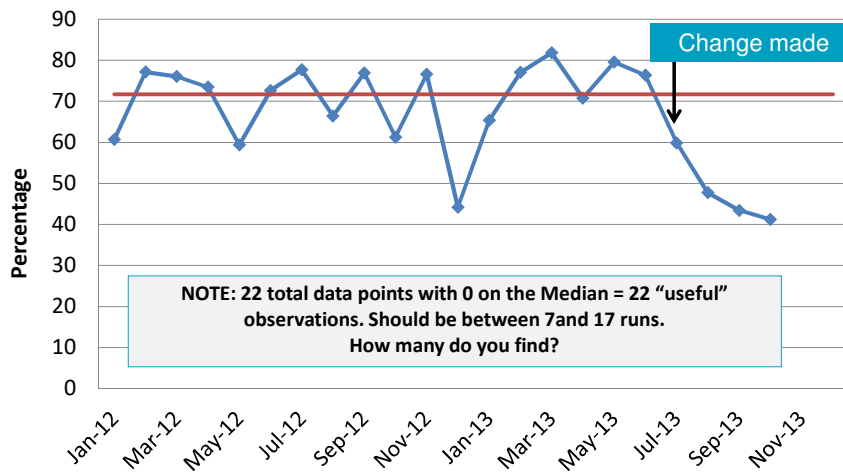
**Determine the number of runs on this chart and then apply the 4 Run Chart Rules**

**Time of Registration of Critically Ill U5 to Initiation of Treatment in the Ward**

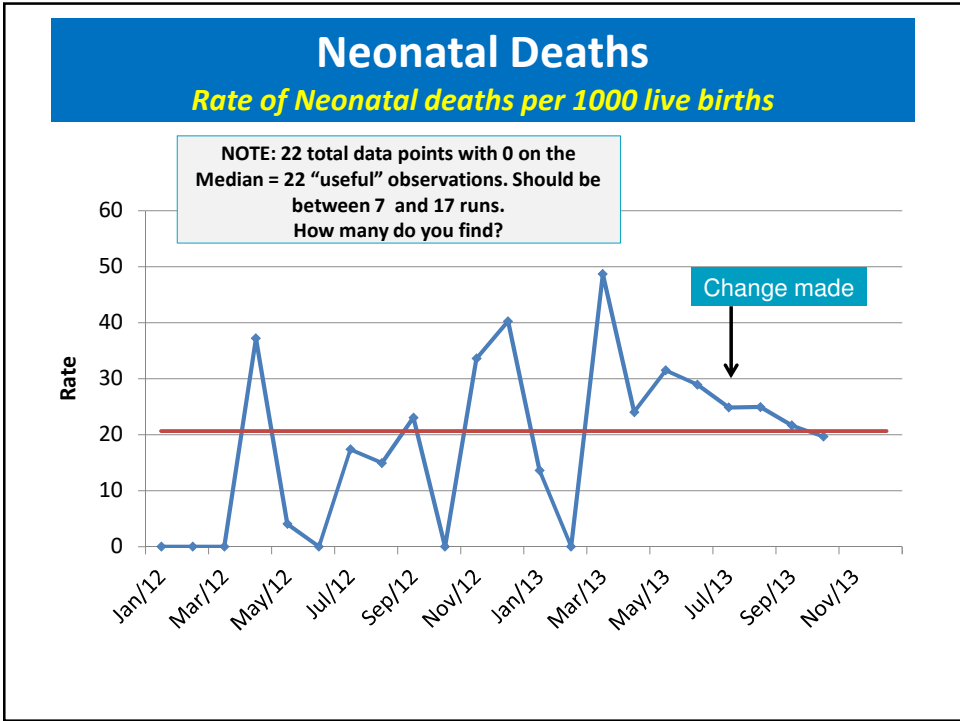


**Early ANC Registration:**

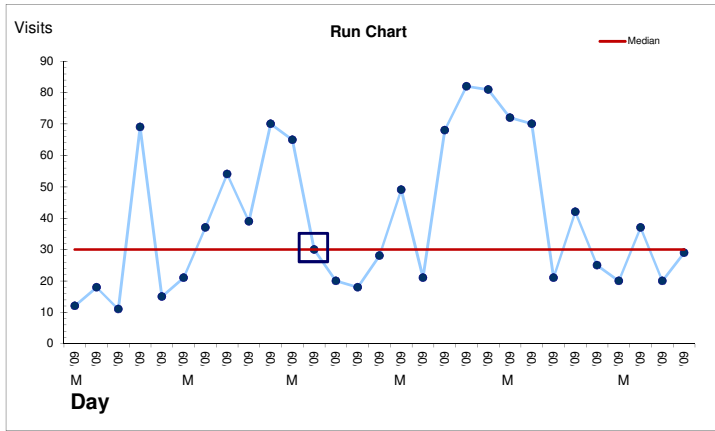
**% of ANC Registrants in 1<sup>st</sup> Trim at Registration**







1. **The Median Position is 15 and the Median Value is 30.**
2. It is useful to mark the data points that fall on the Median so you do not count them when determining the number of runs.
3. All the data points not on the Median are the “useful” data points for analysis using the run chart rules.
4. 29 total data points with 1 on the Median for 28 useful observations
5. **Now count the number of runs and apply the rules!**

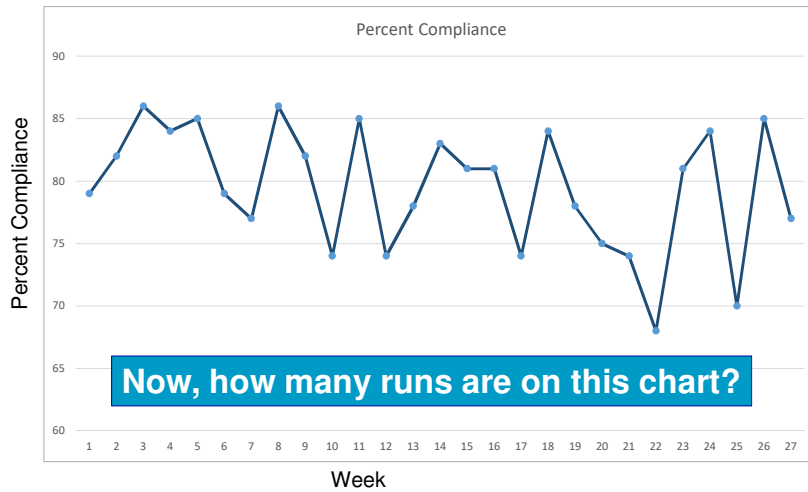


**Now, let's return to the Clinic Visits Run Chart**

# Let's find the Median

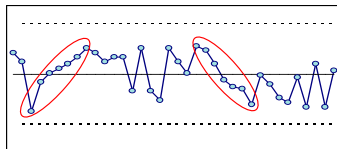
Median Position:  $(27+1) = 28/2 = 14^{\text{th}}$  data point

Median Value = ?

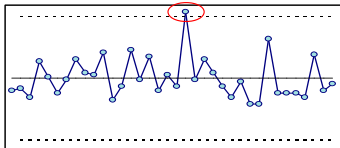


## Rules for Detecting Special Causes on A Shewhart Chart

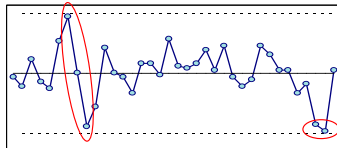
Six consecutive points increasing (trend up) or decreasing (trend down)



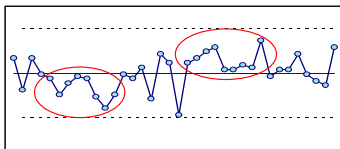
A single point outside the control limits



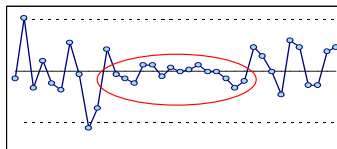
Two out of three consecutive points near a control limit (outer one-third)



Eight or more consecutive points above or below the centerline



Fifteen consecutive points close to the centerline (inner one-third)

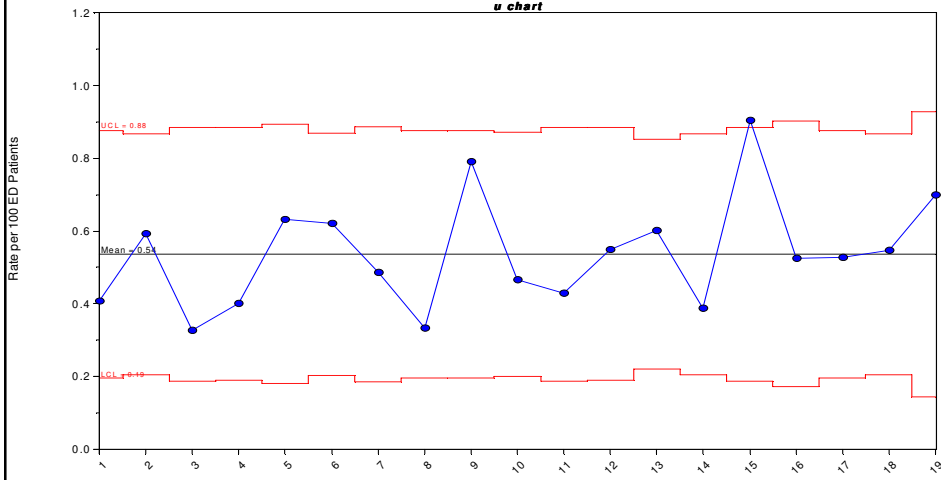


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## Is there a Special Cause on this chart?

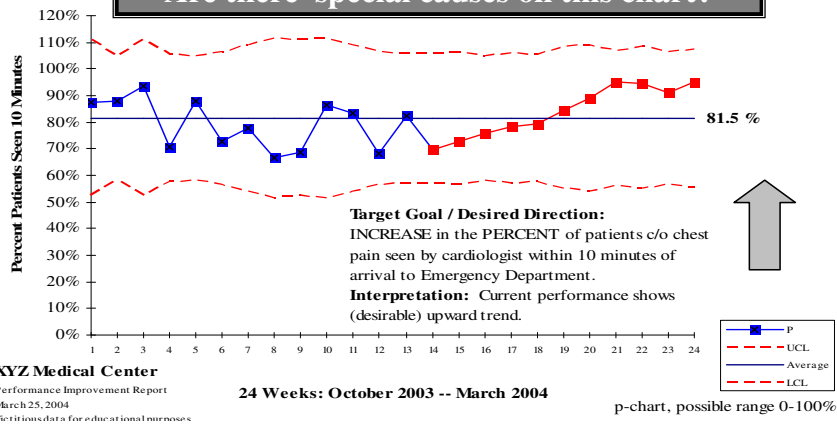
		Unplanned Returns to Ed w/in 72 Hours																		
Month		M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
ED/100	Returns	41.78	43.89	39.86	40.03	38.01	43.43	39.21	41.90	41.78	43.00	39.66	40.03	48.21	43.89	39.86	36.21	41.78	43.89	31.45
Returns		17	26	13	16	24	27	19	14	33	20	17	22	29	17	36	19	22	24	22



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## PERCENT PATIENTS C/O CHEST PAIN SEEN BY CARDIOLOGIST WITHIN 10 MINUTES OF ARRIVAL TO ED EXAMPLE CHART

Are there special causes on this chart?



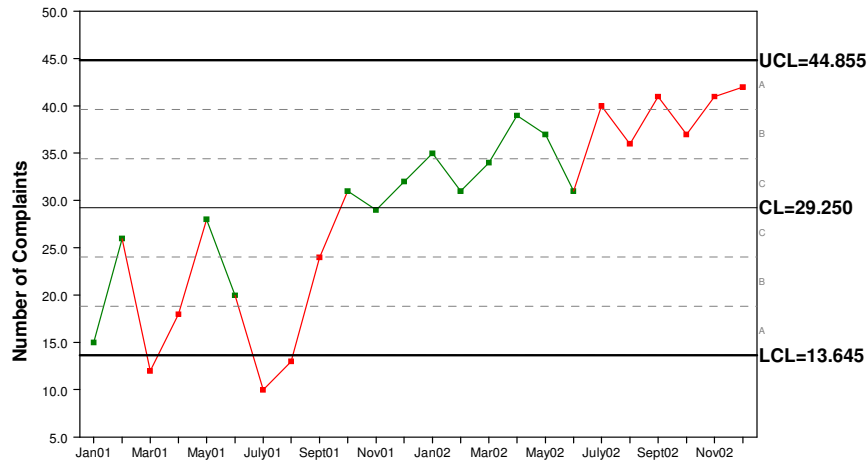
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## Number of Patient Complaints by Month

(XmR chart)

Are there any special causes present? If so, what are they?



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Month

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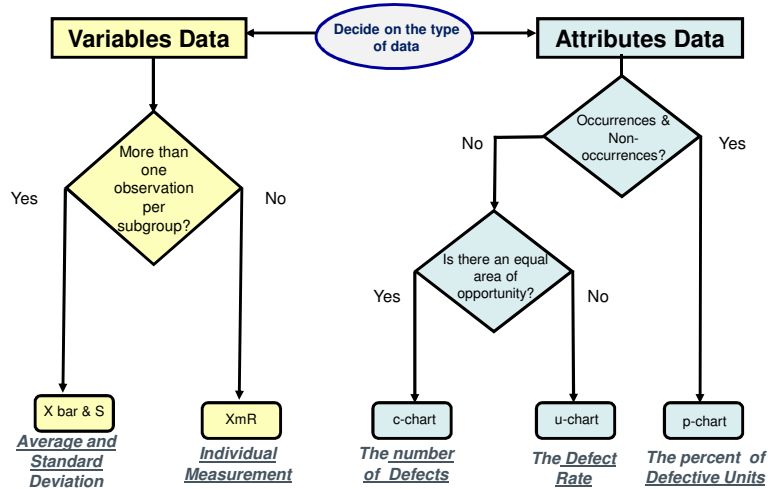
## You Make the Call! Is it an XmR (I) or X bar & S?

Measure	Subgroup	XmR (I chart)	X bar & S chart
1. Time to clean an inpatient room (in minutes)			
2. Patient satisfaction scores for a sample of 15 outpatients collected every 2 weeks			
3. Avg. turnaround time for all STAT labs done each day and stratified by shift			
4. Cost for each normal delivery			
5. A diabetic patient's 3x a day blood sugar readings			
6. Average length of stay for a random sample of 20 ICU patients pulled each month			
7. The distance (in feet) that a sample of 10 knee replacement patients can walk in 15 seconds			



# The Control Chart Decision Tree

Source: R. Lloyd. *Quality Health Care: A Guide to Developing and Using Indicators*. 2<sup>nd</sup> edition, Jones and Bartlett, 2017.



## You Make the Call! Is it a p, c or u-chart?

Measure	Subgroup	p-chart	c-chart	u-chart
1. The number of central line insertions each week during which all elements of the bundle were followed divided by the total number of central line insertions that week				
2. The number of catheter-associated urinary tract infections is placed over the total number of urinary catheter days each month				
3. The total number of patient falls each month (with or without injury to the patient and whether or not assisted by a staff member) is divided by the total patient days for the month				
4. An analyst pulls a sample of 50 orthopedic surgery charts each week and counts all discrepancies from standard documentation practice.				
5. Each medication order is checked against five potential types of errors. You also have the total number of orders placed each week				
6. Each day the number of home healthcare visits that are more than 15 minutes late on arrival are recorded and compared with the total number of visits scheduled for that day.				
7. The number of outpatients not showing up for an appointment is recorded each week. The total volume of outpatient appointments is also recorded.				



## Selecting the most appropriate chart for your measures

Measure Name	Outcome (O) Process (P) Balancing (B)	Subgroup ?	Type of Data?	Chart of Choice?
			V or A	
			V or A	
			V or A	
			V or A	
			V or A	

