

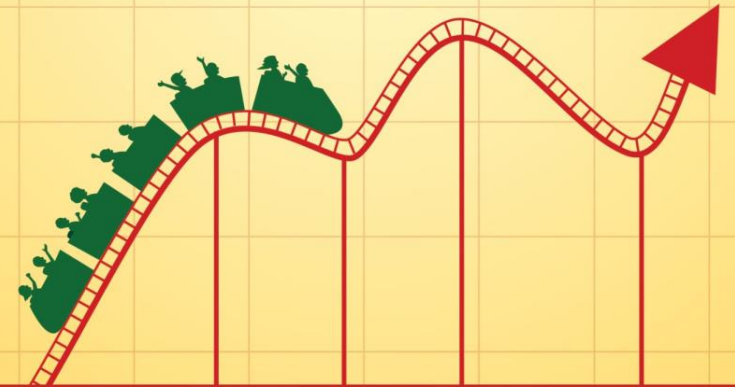
***Better Metrics Yields
Better Management:***
**Understanding Variation
and Managing
Performance Using
Deming Methods**

Mark Graban

"If you're navigating a tough business environment,
you need this book." - Daniel H. Pink

MEASURES — OF — SUCCESS

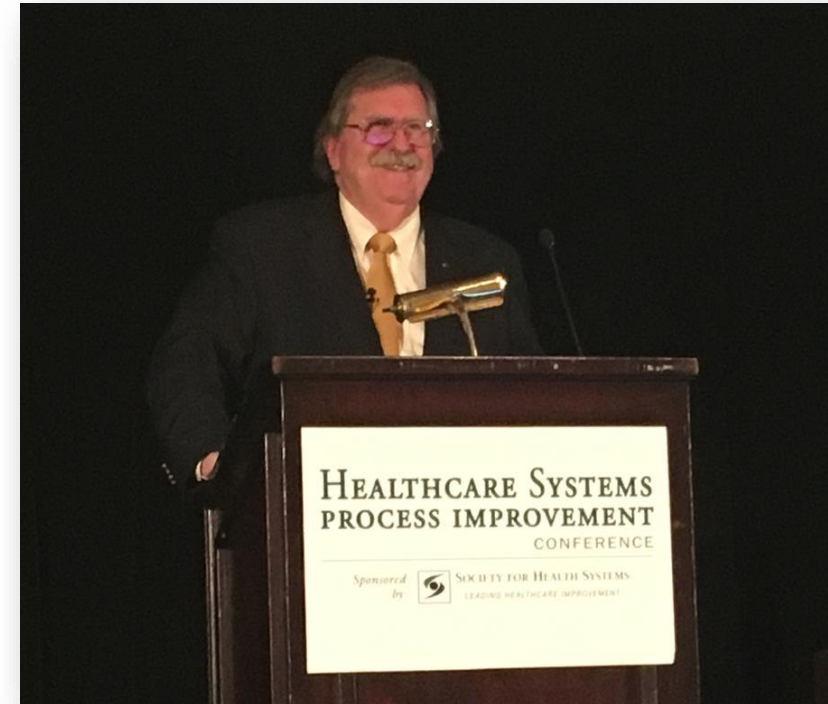
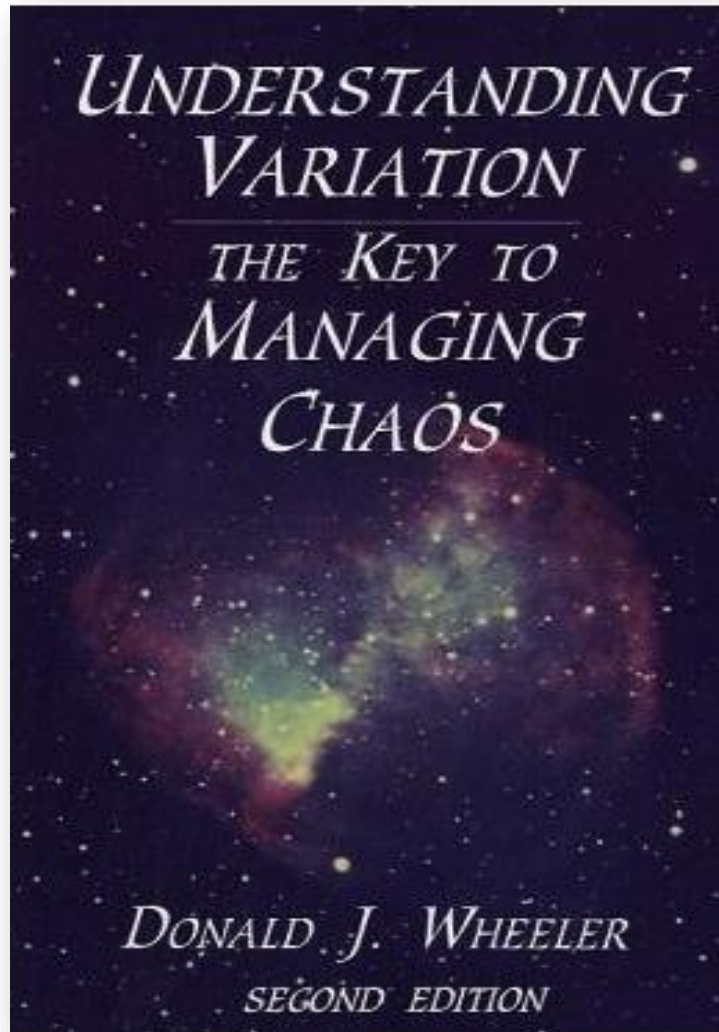
REACT LESS, LEAD BETTER, IMPROVE MORE



MARK GRABAN

FOREWARD BY DONALD J. WHEELER, PH.D.

My Most Favorite Book Ever



Donald J. Wheeler, Ph.D.

<http://www.spcpress.com/>

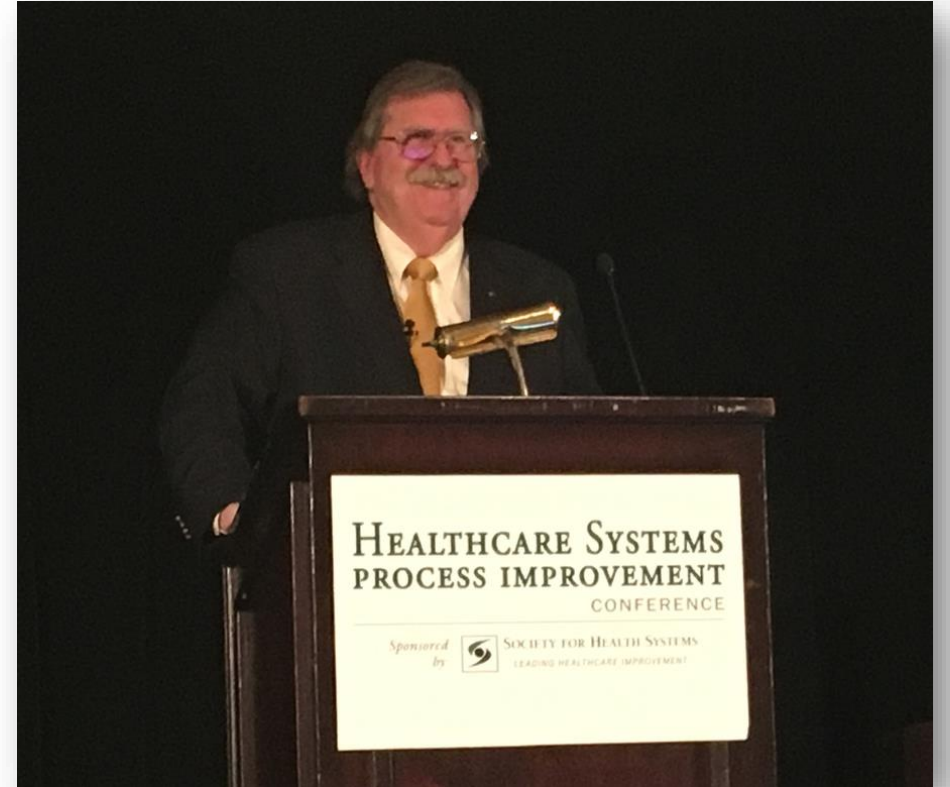
Amazon: <http://bit.ly/wheeler-book>

The Method We Are Here to Learn

- **"SPC Chart"**
 - **Statistical Process Control**
- **a.k.a. "Control Chart"**
- **a.k.a. "Process Behavior Chart"**
- **"XmR Chart"**
 - **The "Has the Process Changed Chart?"** (Wheeler)
 - **The "Is It Time to Fix It Chart?"** (Wheeler)

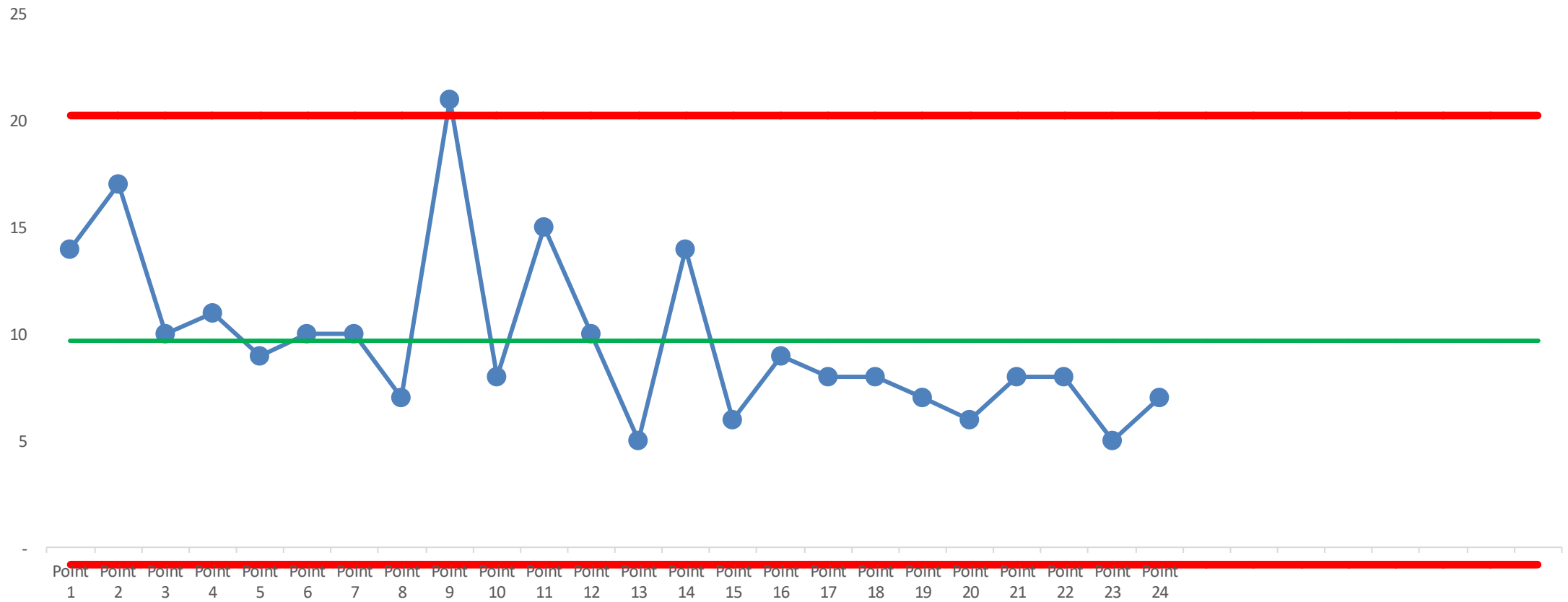
Wheeler Says

"SPC is a way of thinking, with some tools attached."



Red Bead Process Behavior Chart (Today)

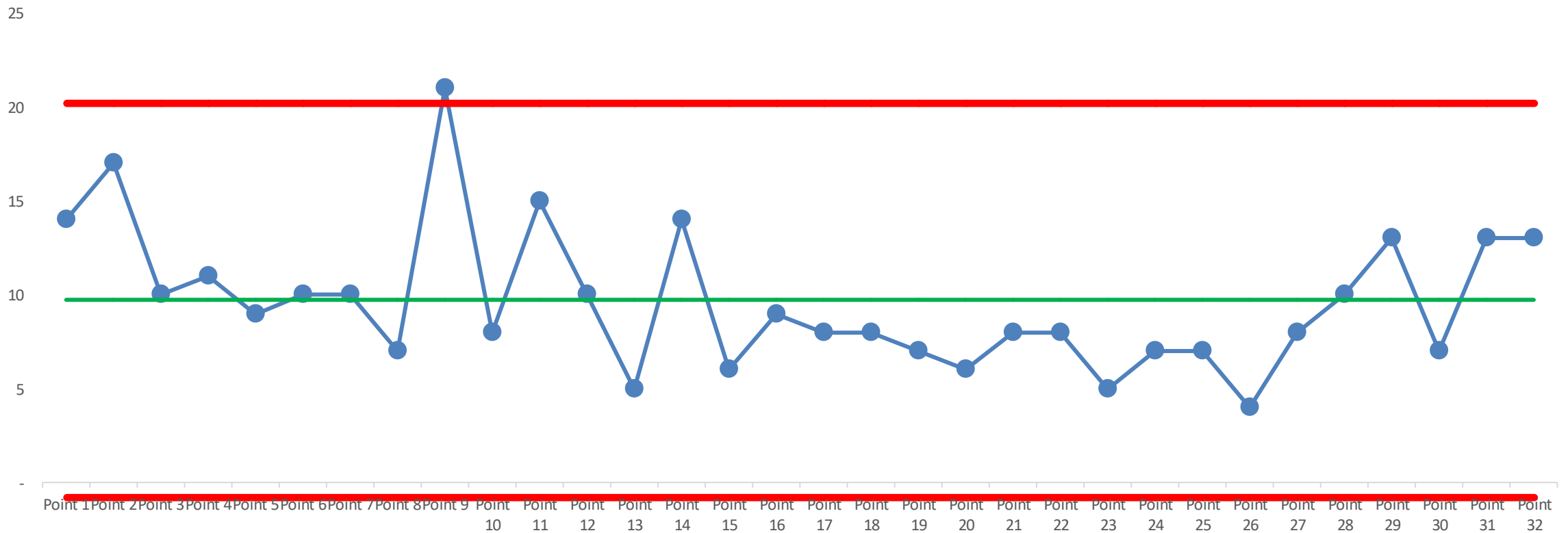
X Chart (Individuals Data)



(5)

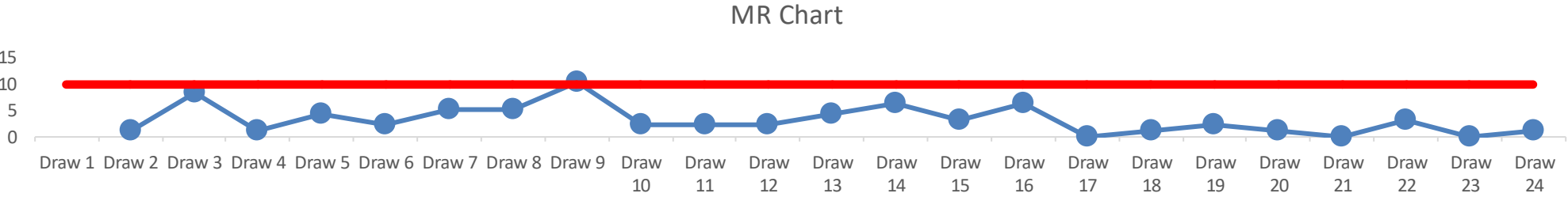
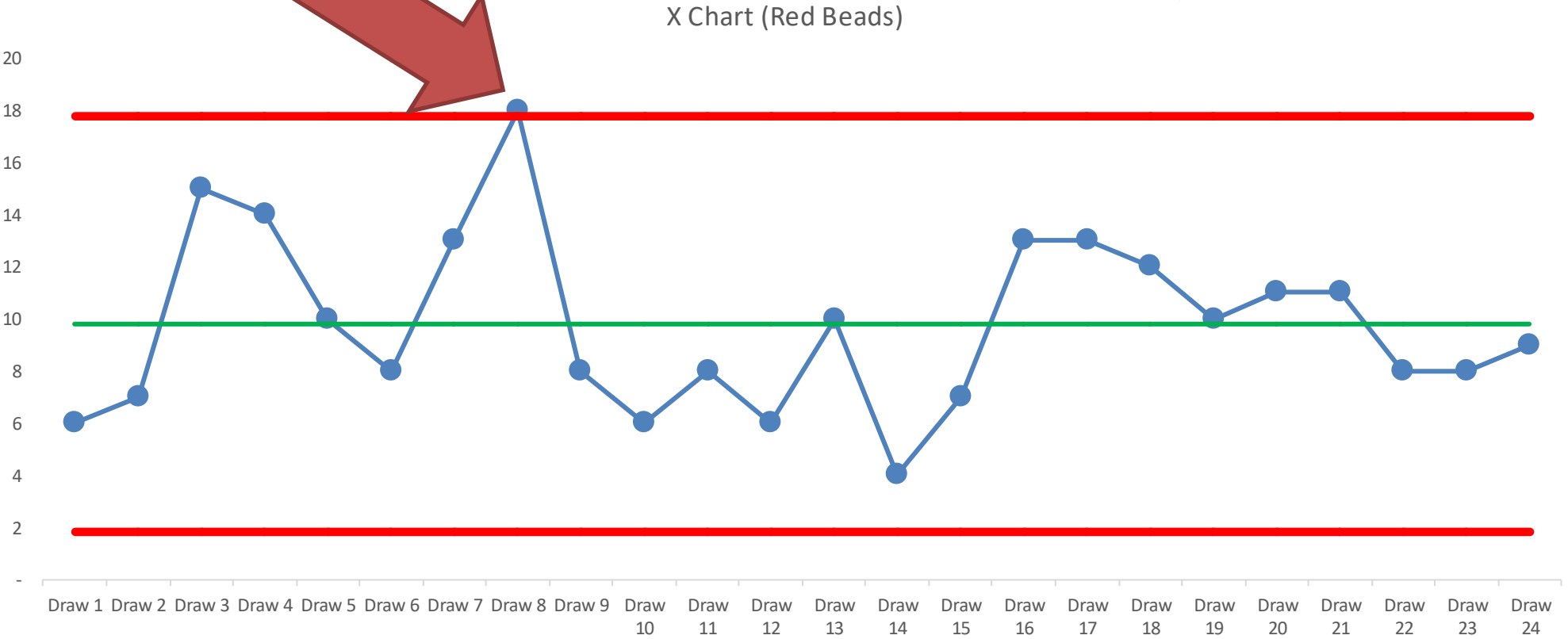
Red Bead Process Behavior Chart (More Data Points)

X Chart (Individuals Data)

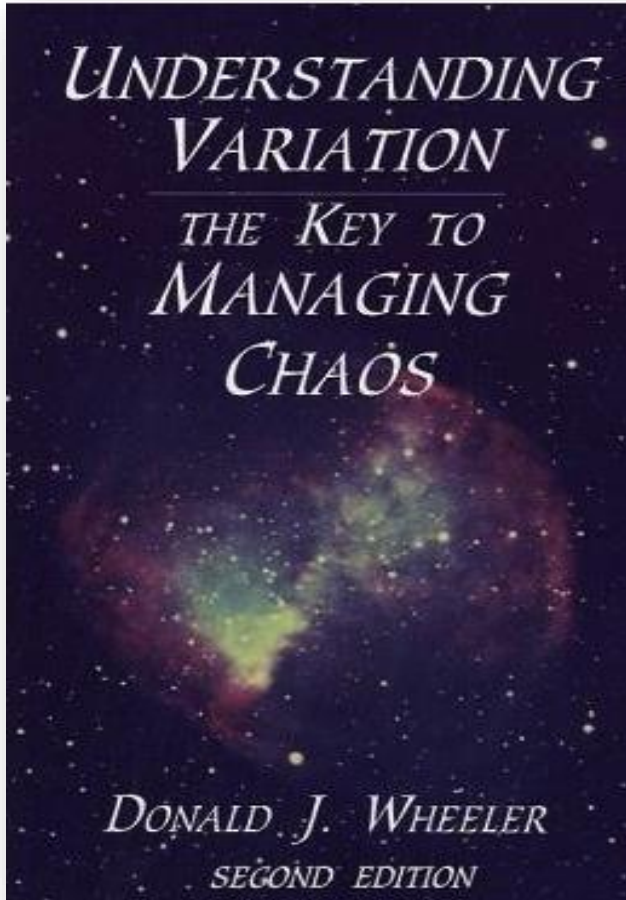


(5)

Red Bead Process Behavior Chart (Past Session)



Signal vs. Noise?

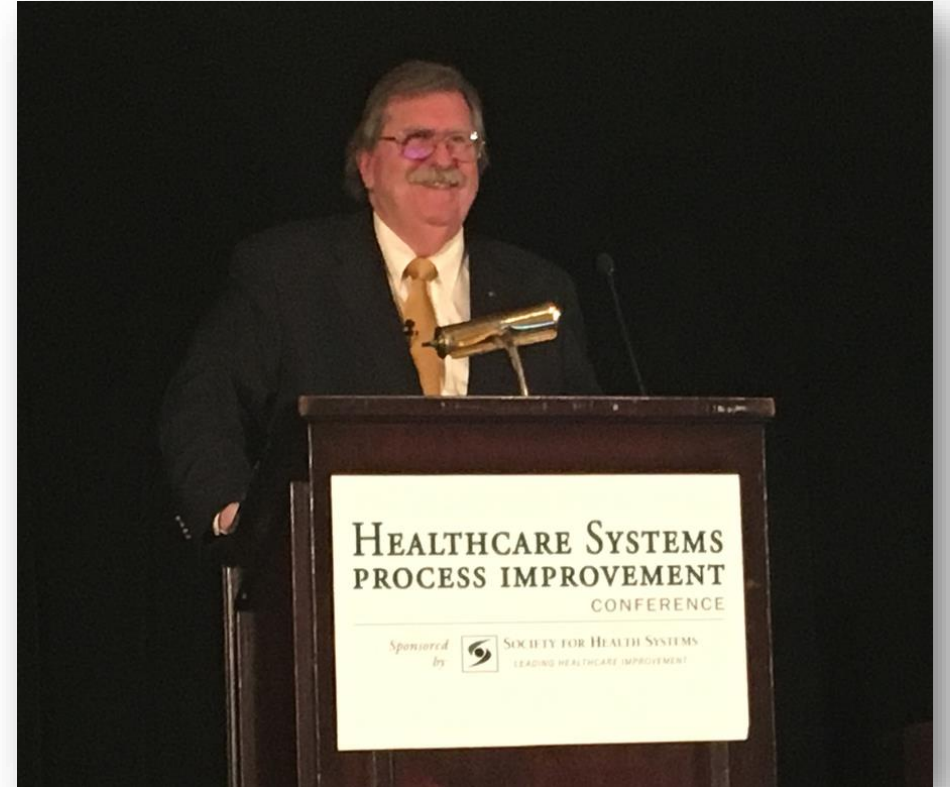


"While every data set contains noise,
some data sets may contain signals.
Therefore, before you can detect a signal
within any given data set,
you must first filter out the noise."



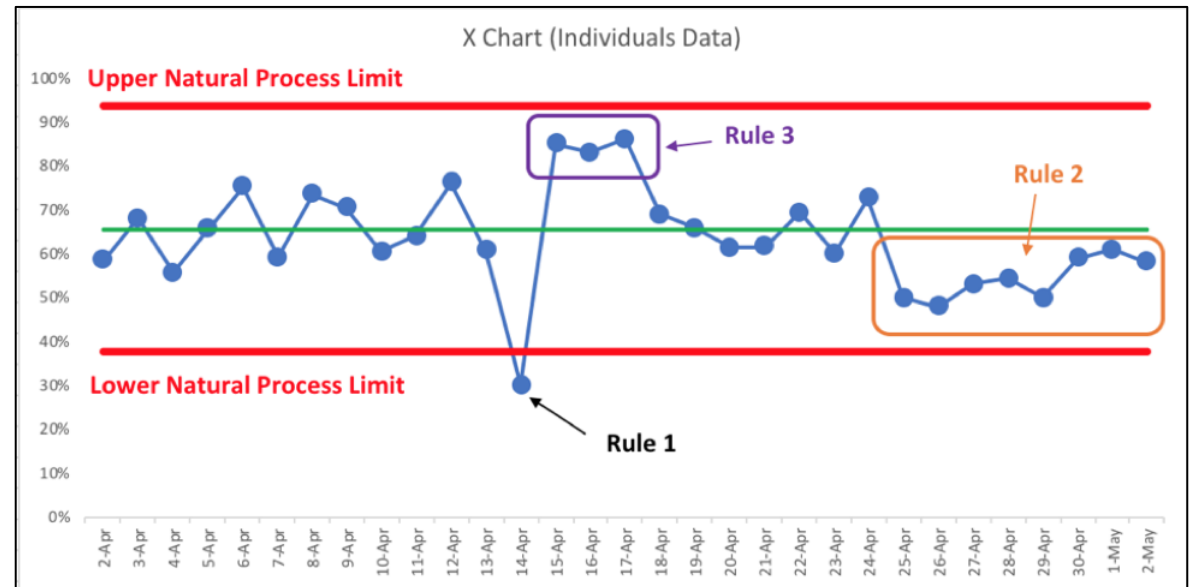
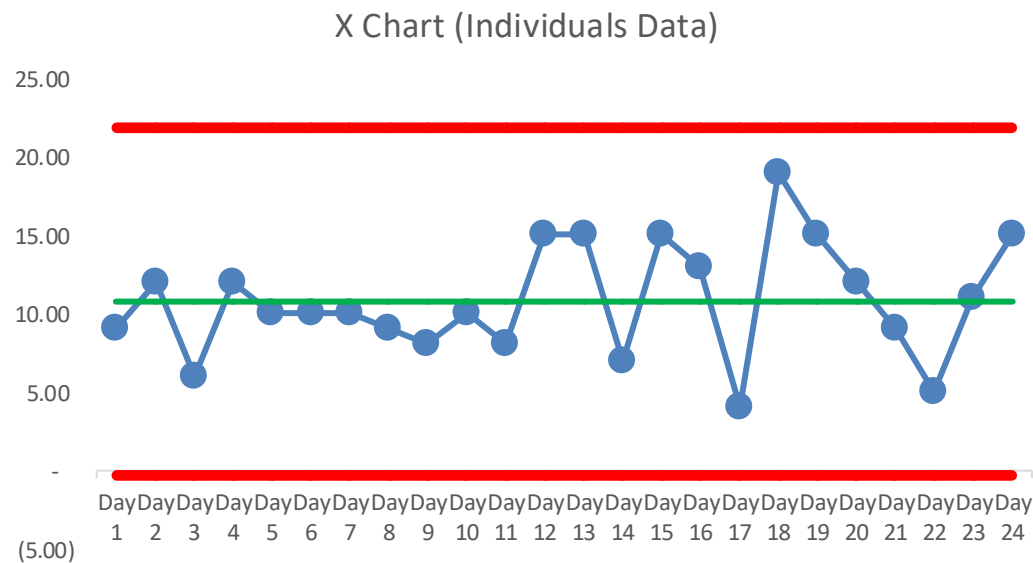
Wheeler Says

- Process behavior charts "will filter out virtually ALL noise in the system."



Which Type of Cause?

Common	Special
Routine	Exceptional
Noise	Signal



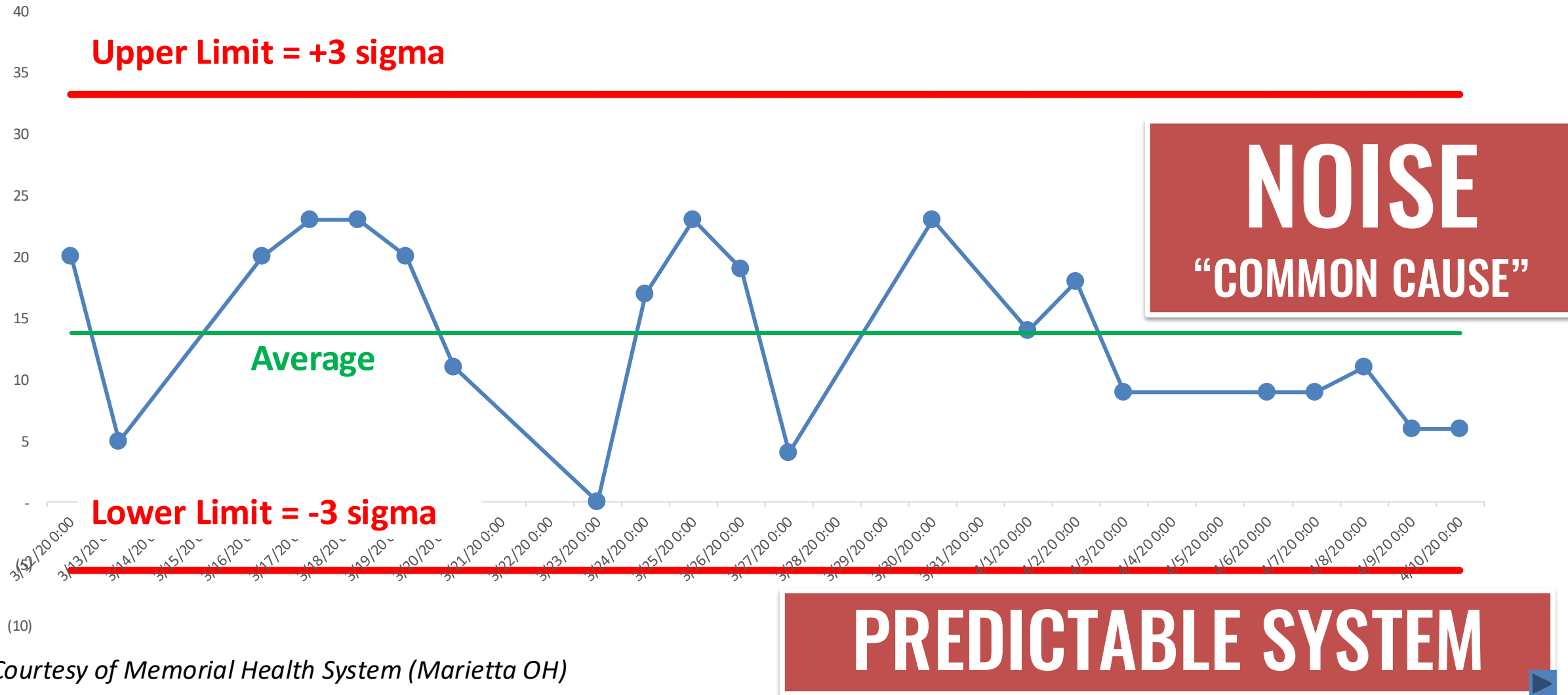
Two Kinds of Mistakes (Wheeler)

1. We get things wrong when the system does not change but we interpret the data as representing a change. This is the error of interpreting noise as a signal.
2. We also get things wrong when the system changes and we interpret the data as representing no change. This is the error of missing a signal.

Process Behavior Charts strike a balance

Process Behavior Chart

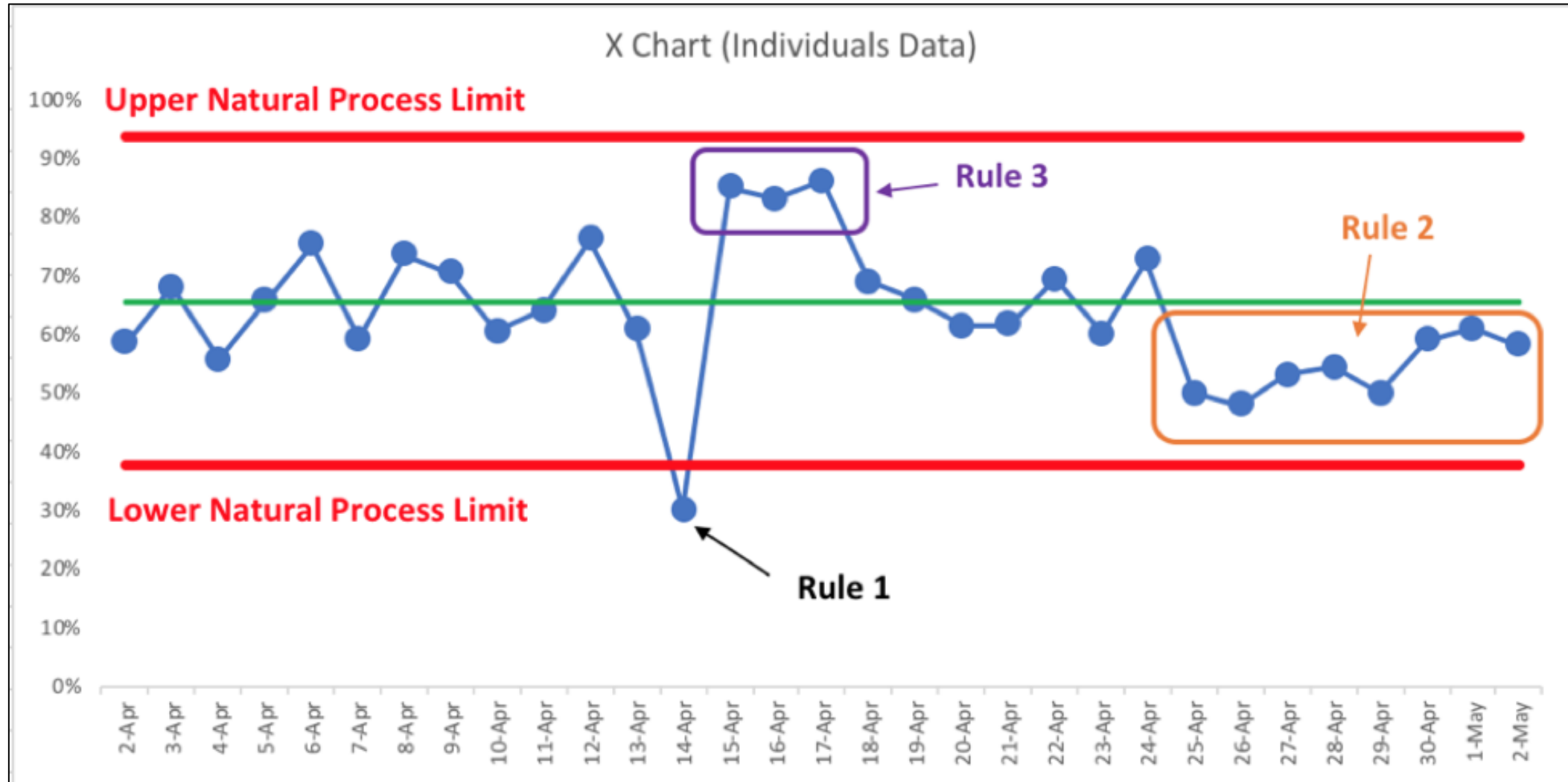
X Chart (Number of Employees Out Sick)

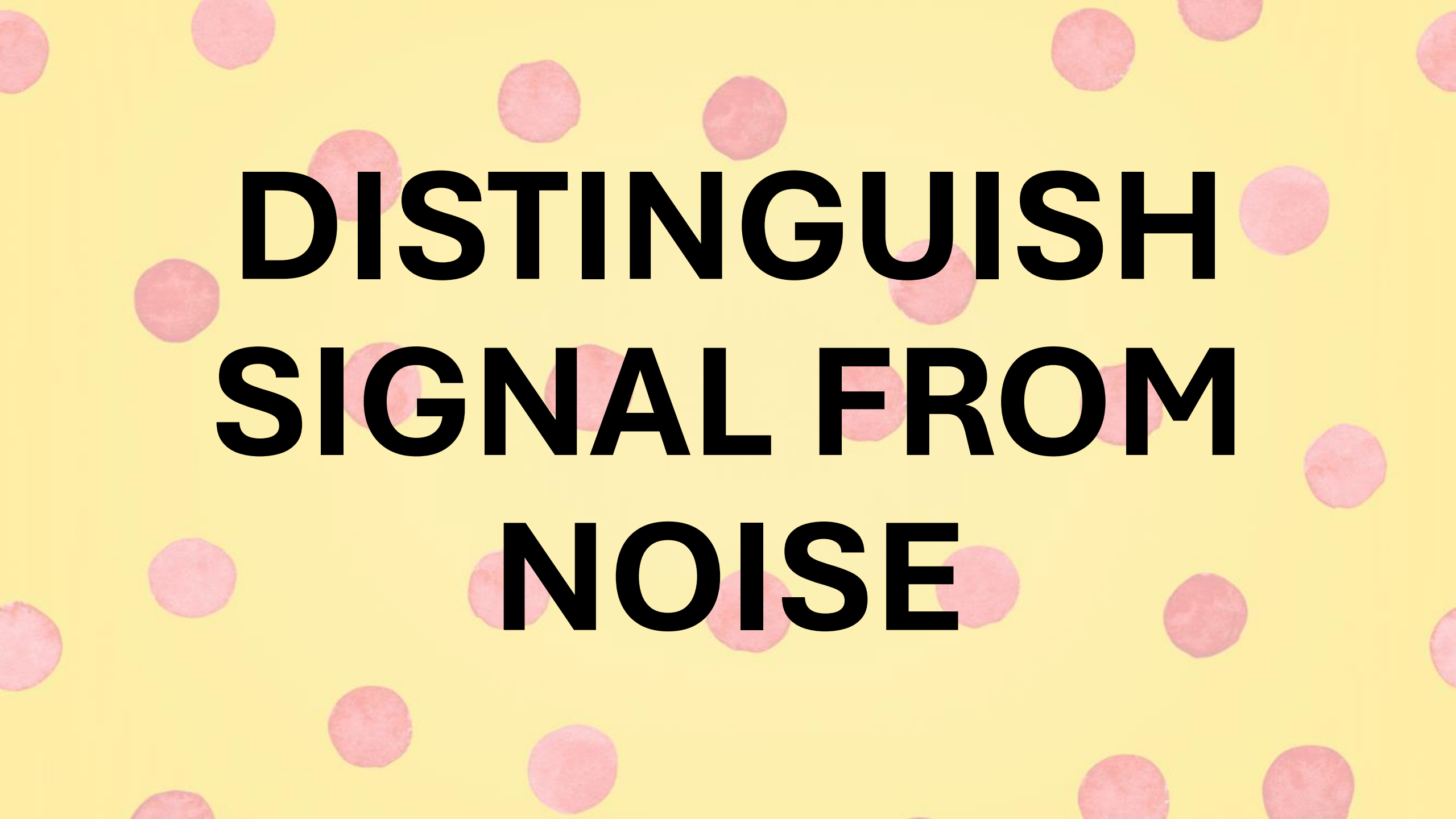


(10)

Chart Courtesy of Memorial Health System (Marietta OH)

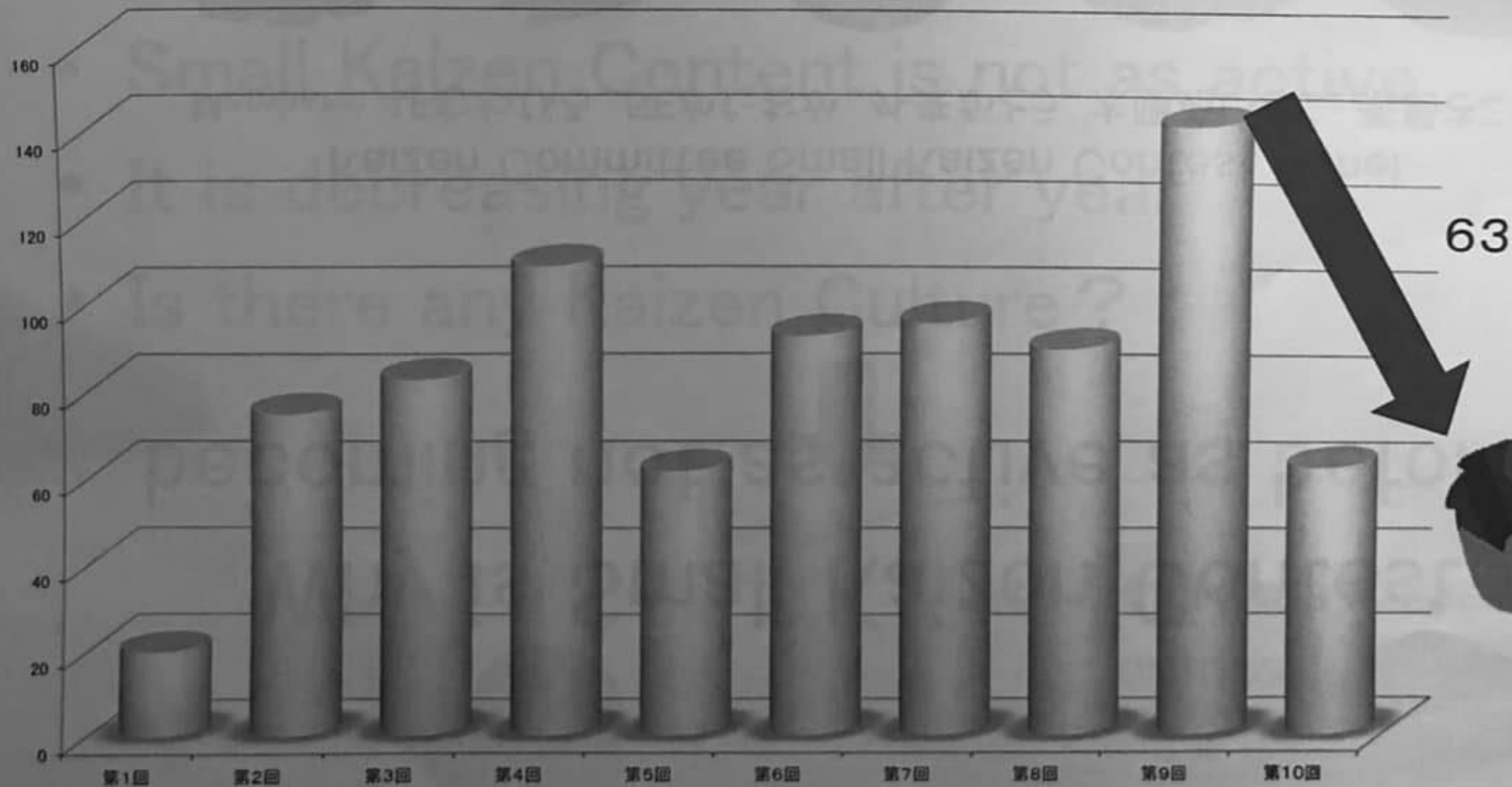
3 Rules for Finding a Signal



The background of the image is a solid light yellow color, decorated with numerous pink circular polka dots of varying sizes scattered across the entire surface. The text is centered in the middle of the image.

**DISTINGUISH
SIGNAL FROM
NOISE**

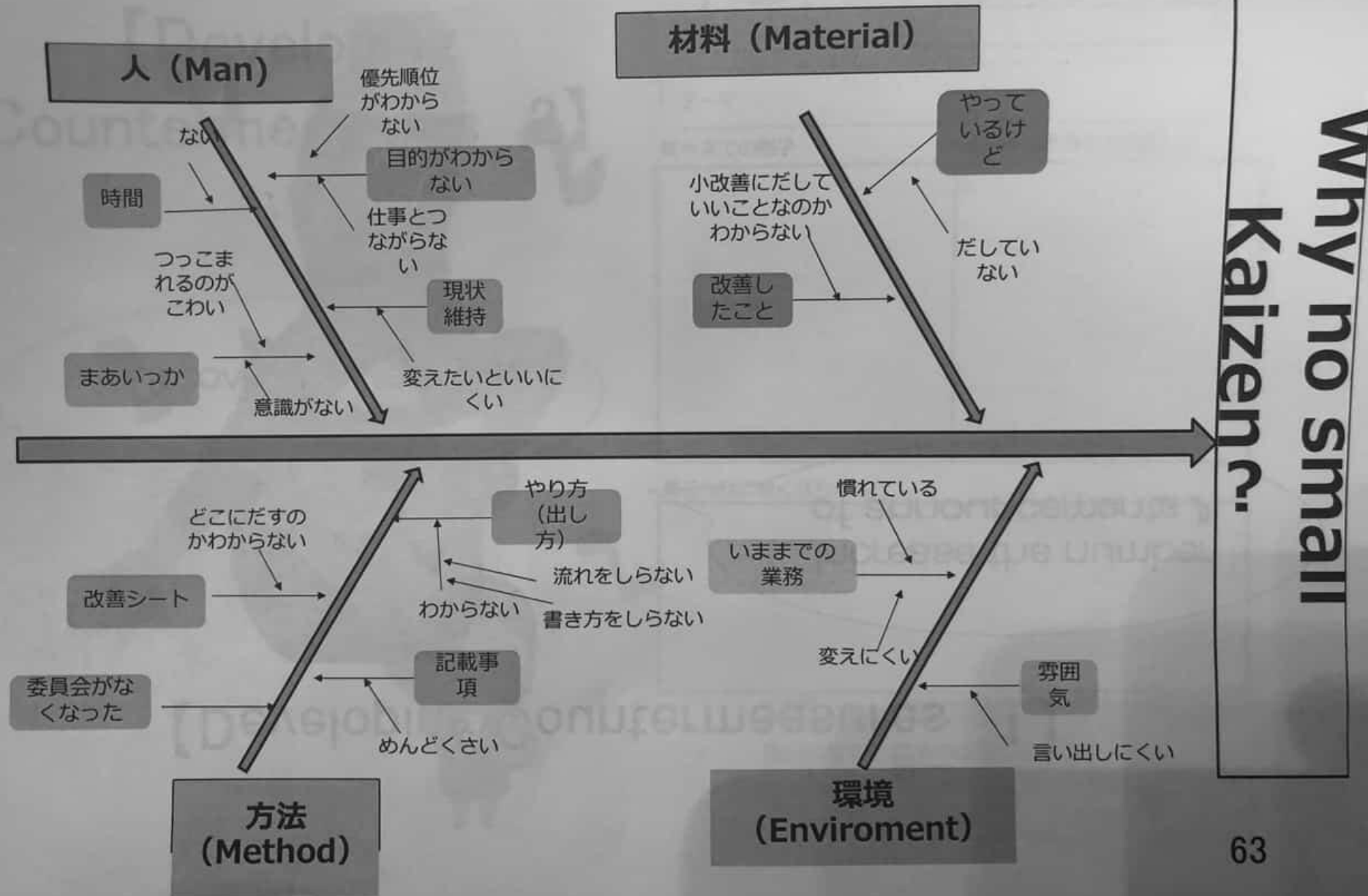
of Small Kaizen Activity Submitted



63

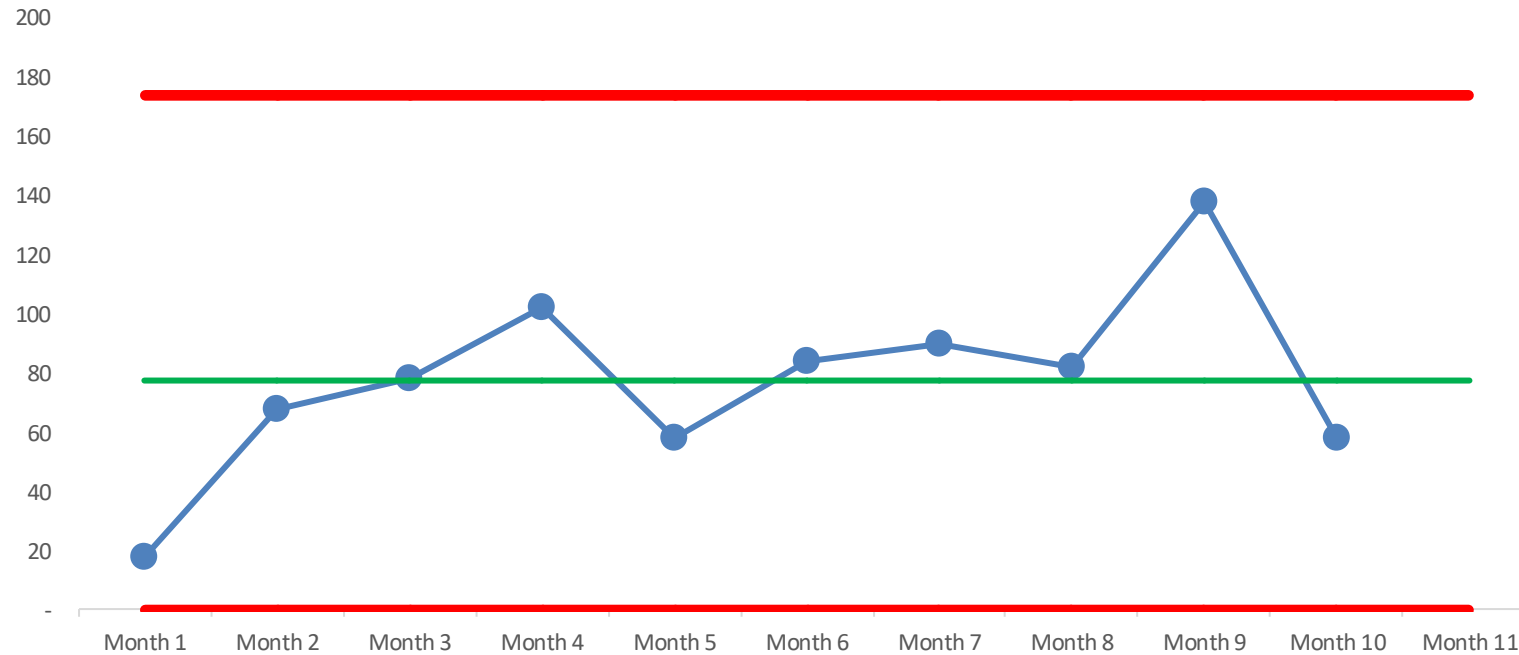


【 Cause and Effect diagram 】

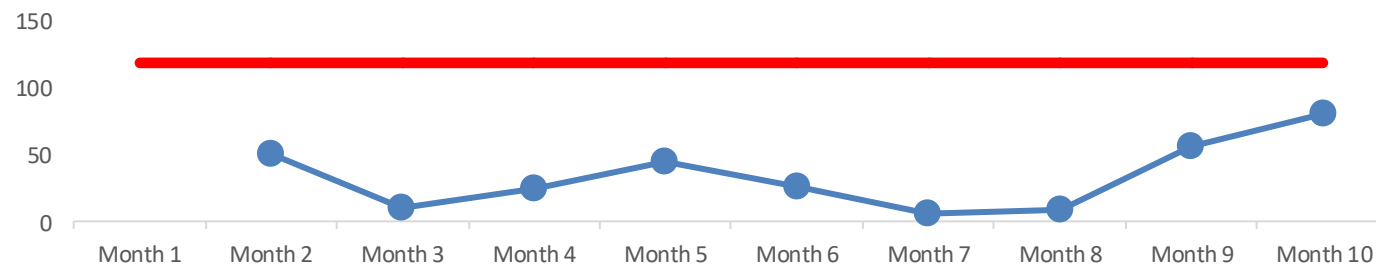


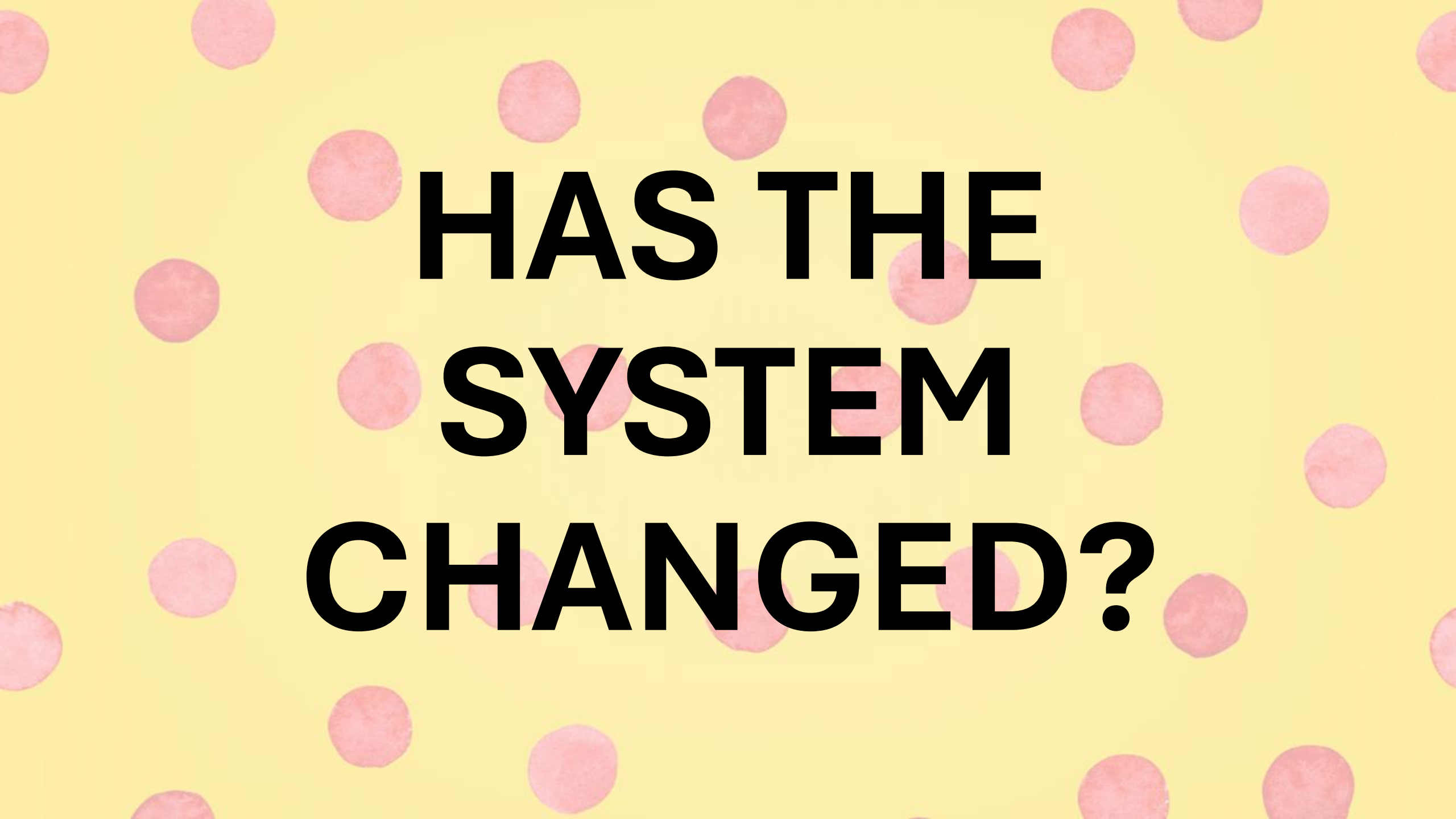
“Process Behavior Chart”

X Chart (Small Kaizens Submitted)



MR Chart

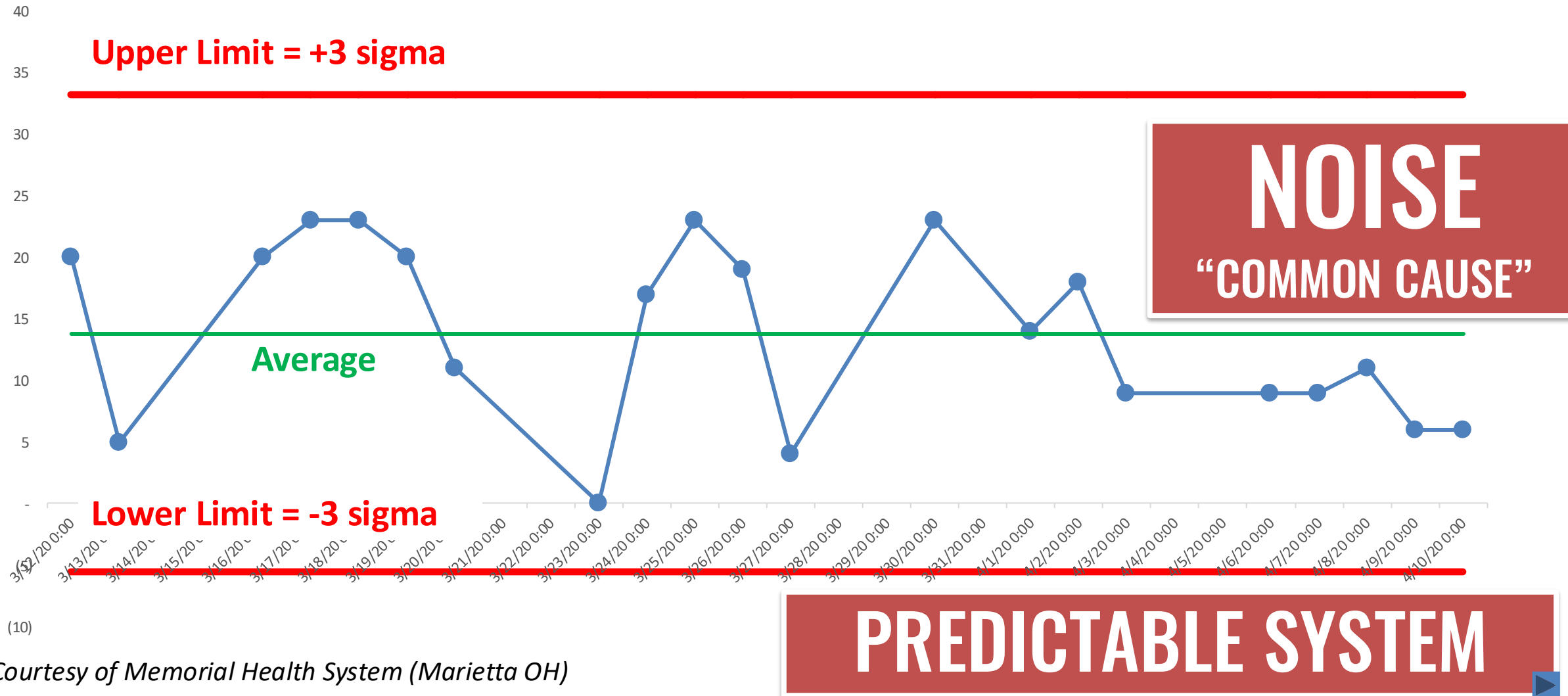


The background is a solid yellow color with numerous pink circles of varying sizes scattered across it. The circles have a slightly textured, watercolor-like appearance.

**HAS THE
SYSTEM
CHANGED?**

Process Behavior Chart

X Chart (Number of Employees Out Sick)

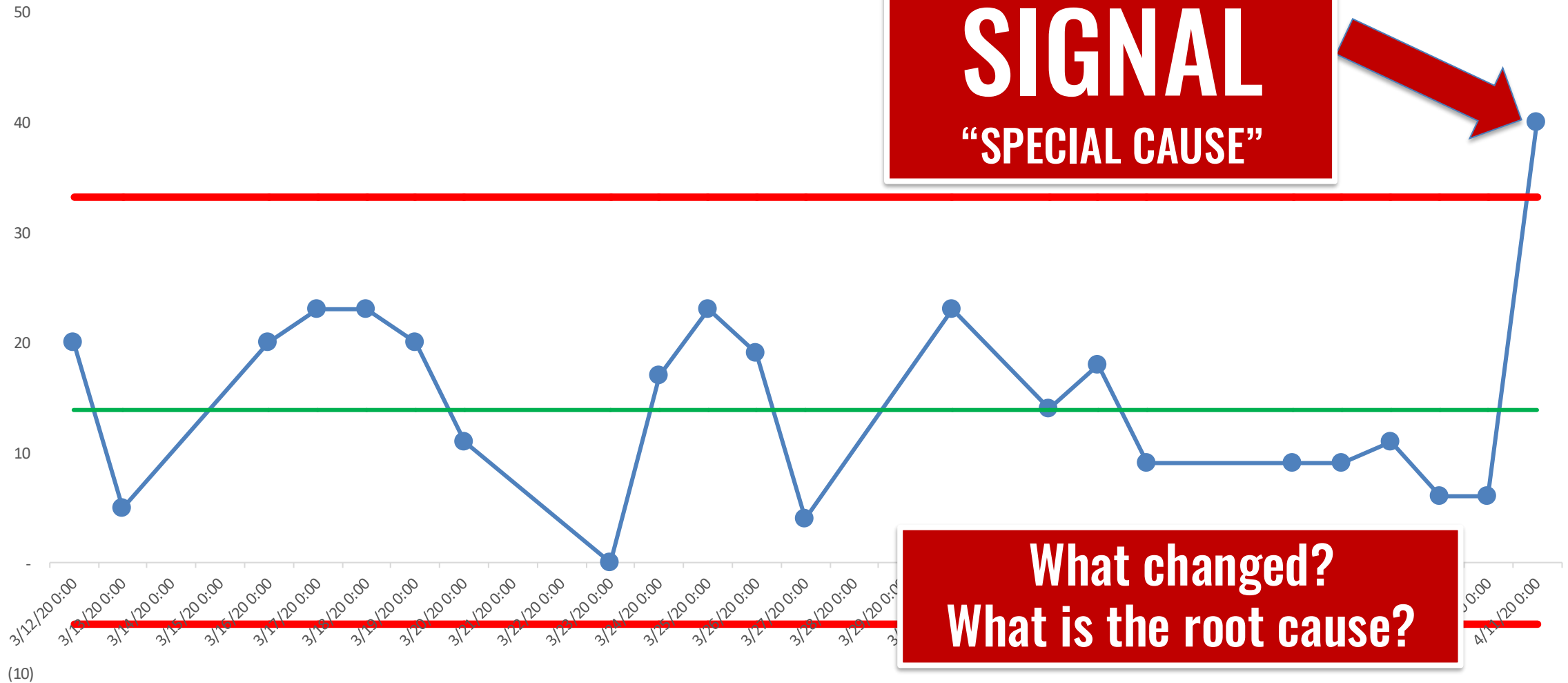


(10)

Chart Courtesy of Memorial Health System (Marietta OH)

Has the System Changed?

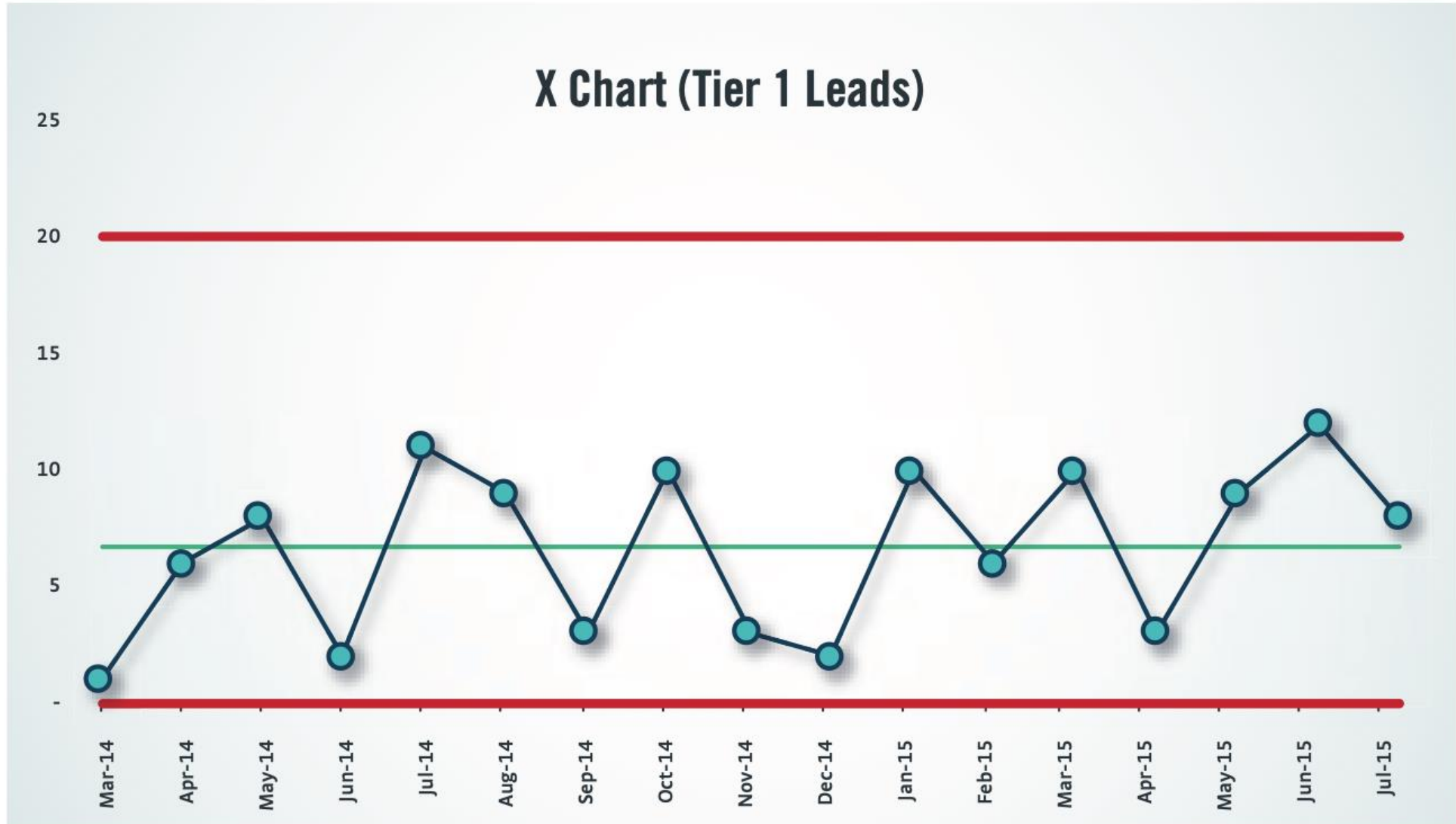
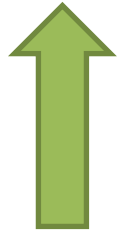
X Chart (Number of Employees Out Sick)



Note: The last data point is a **hypothetical** situation



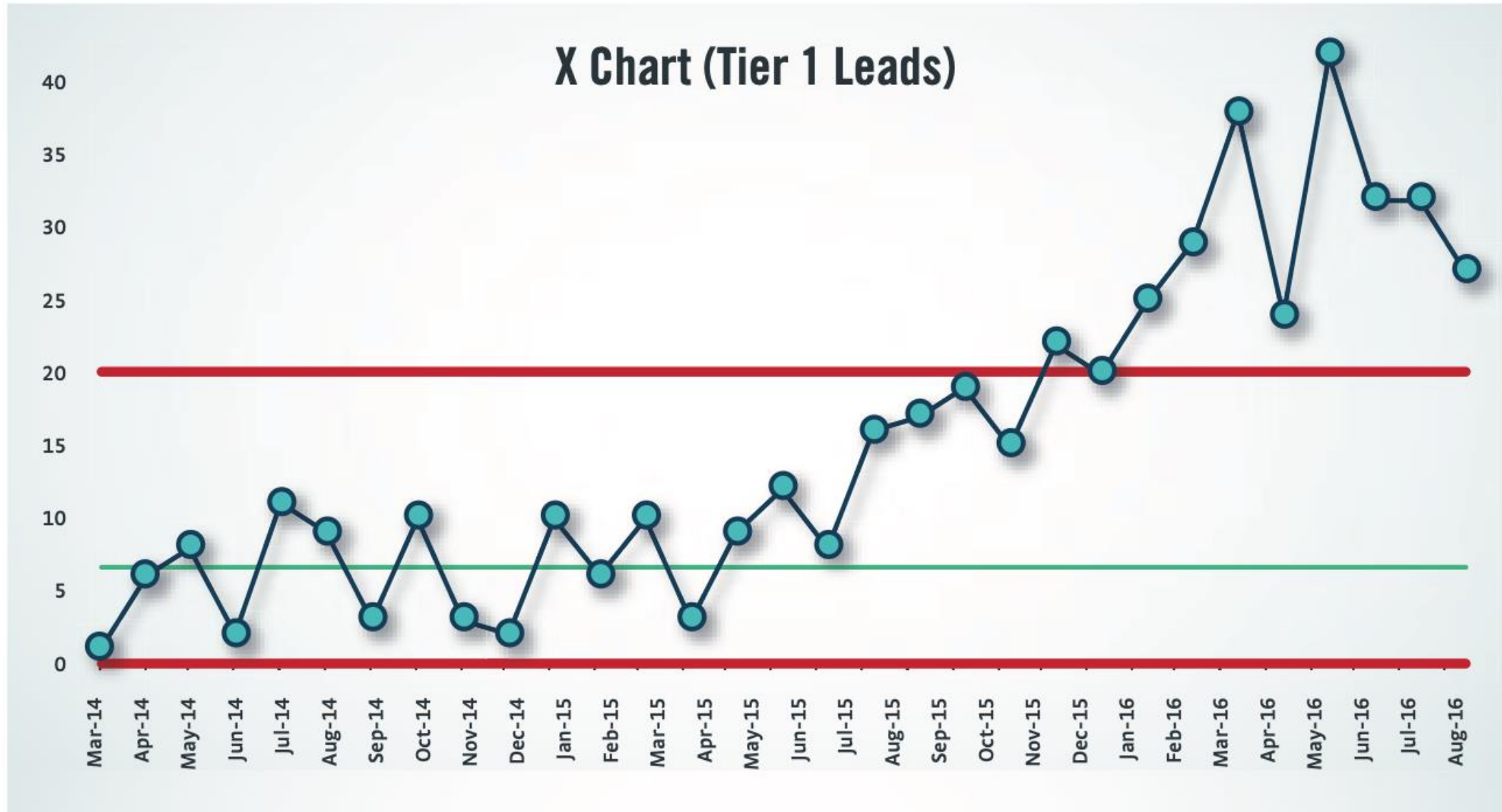
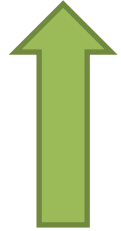
KaiNexus Metric = Noise



The background of the image is a solid light yellow color, decorated with numerous pink circles of varying sizes, resembling polka dots. The text is centered and reads:

**DID WE
IMPROVE THE
SYSTEM?**

System Change → Signal

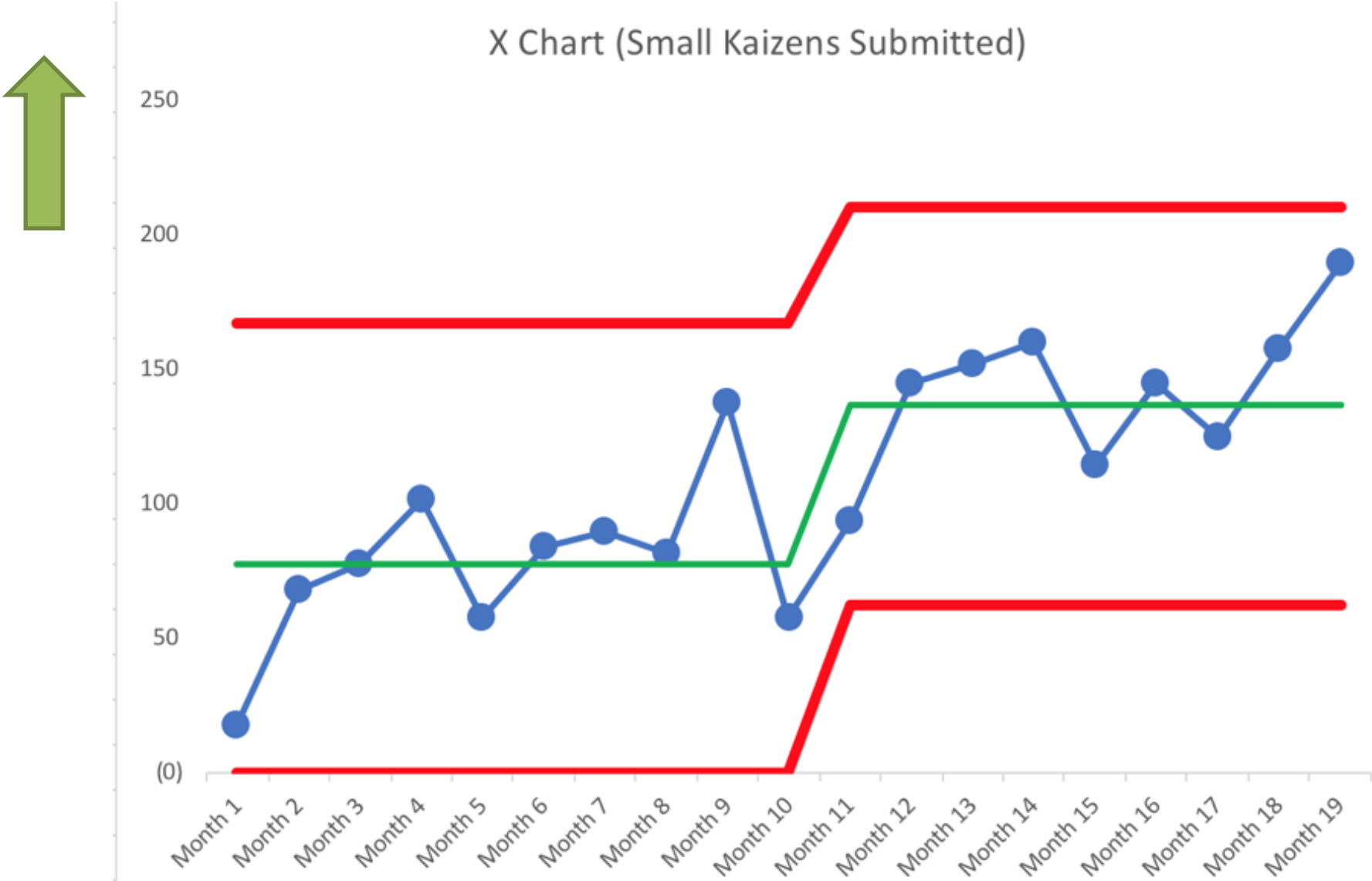




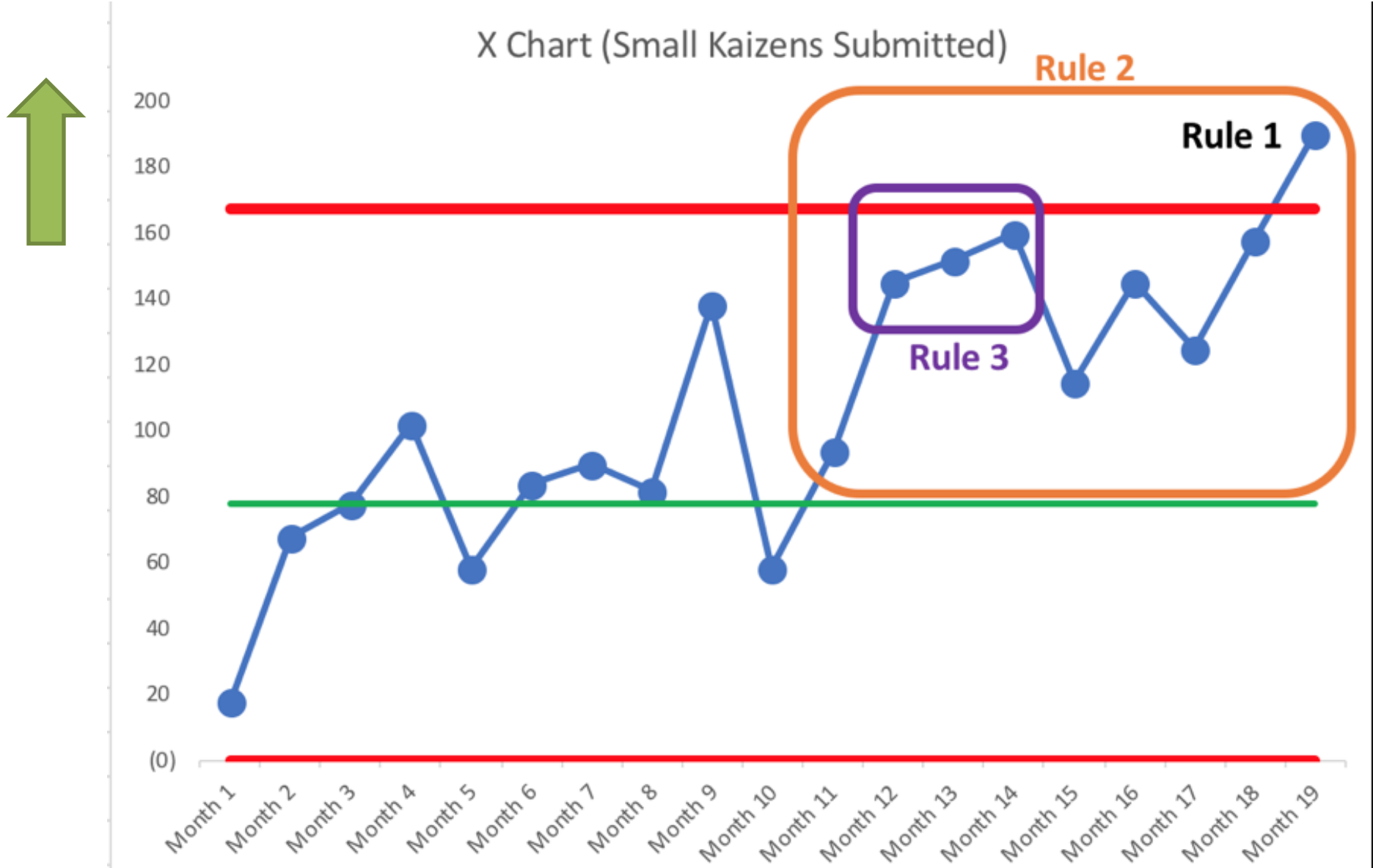
“Signal vs noise — understanding this distinction was one of the most profound changes to my business acumen... not only understanding variation in the system but also freeing up my time. It sharpens my focus on what's important while keeping an eye on a large set of metrics.”

Greg Jacobson, MD
CEO and co-founder, KaiNexus

Shifts That Show Significant, Sustained Improvement



Shifts That Show Significant, Sustained Improvement



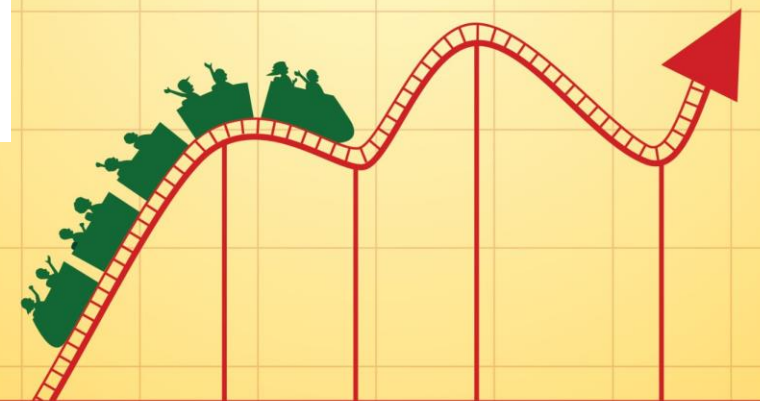


Create a PBC

"If you're navigating a tough business environment,
you need this book." - Daniel H. Pink

MEASURES — OF — SUCCESS

ACT LESS, LEAD BETTER, IMPROVE MORE



MARK GRABAN

FOREWARD BY DONALD J. WHEELER, PH.D.

Creating & Using Process Behavior Charts -- Retrospective

Template and Data --

<http://www.MarkGraban.com/PBCBlog>

A Few Options

- Download my template
 - Excel or Google Sheets
 - www.measuresofsuccessbook.com/extras/
- Web Tools
 - XmRit.com/t
 - pbc-analyzer-pro.vercel.app/
- Use your own time-series data OR
 - Use my blog data: <http://www.MarkGraban.com/PBCBlog>



Data Sets to Download

- <http://www.MarkGraban.com/PBCBlog>
- [MarkGraban.com/data1](http://www.MarkGraban.com/data1) through [data11](http://www.MarkGraban.com/data11)

< > Data Sets For Class Use	
Name	
	1 CLABSI Rates.xlsx
	2 Complaints Received.xlsx
	3 Employee Accident Data.xlsx
	4 HCAHPS.xlsx
	5 Productivity.xlsx
	6 Pyxis Stockouts.xlsx
	7 Returned POs and IVs.xlsx
	8 Rick Shannon Data.xlsx
	9 Severity Adjusted Inpatient Mortality Rate.xlsx
	10 Sprains Strains.xlsx
	11 Staff Turnover.xlsx

Step 1: Get Initial Data

- Generally, want about 20 data points to calculate “natural process behavior limits”
 - (can start with just 4, worst case)
 - *Note: Weekends are excluded here because that is a different "system"*

	A	B	C
1	Process Behavior Template		
2	Date	Page Loads	Average
3	1/2/12	999	1,576.20
4	1/3/12	1,654	1,576.20
5	1/4/12	1,773	1,576.20
6	1/5/12	1,523	1,576.20
7	1/6/12	1,275	1,576.20
8	1/9/12	2,225	1,576.20
9	1/10/12	1,916	1,576.20
10	1/11/12	1,798	1,576.20
11	1/12/12	1,622	1,576.20
12	1/13/12	1,385	1,576.20
13	1/16/12	1,604	1,576.20
14	1/17/12	1,551	1,576.20

Step 2: Calculate Average & the Moving Ranges

- Calculate average of the first 20 points

C2: =AVERAGE(B2:B21)

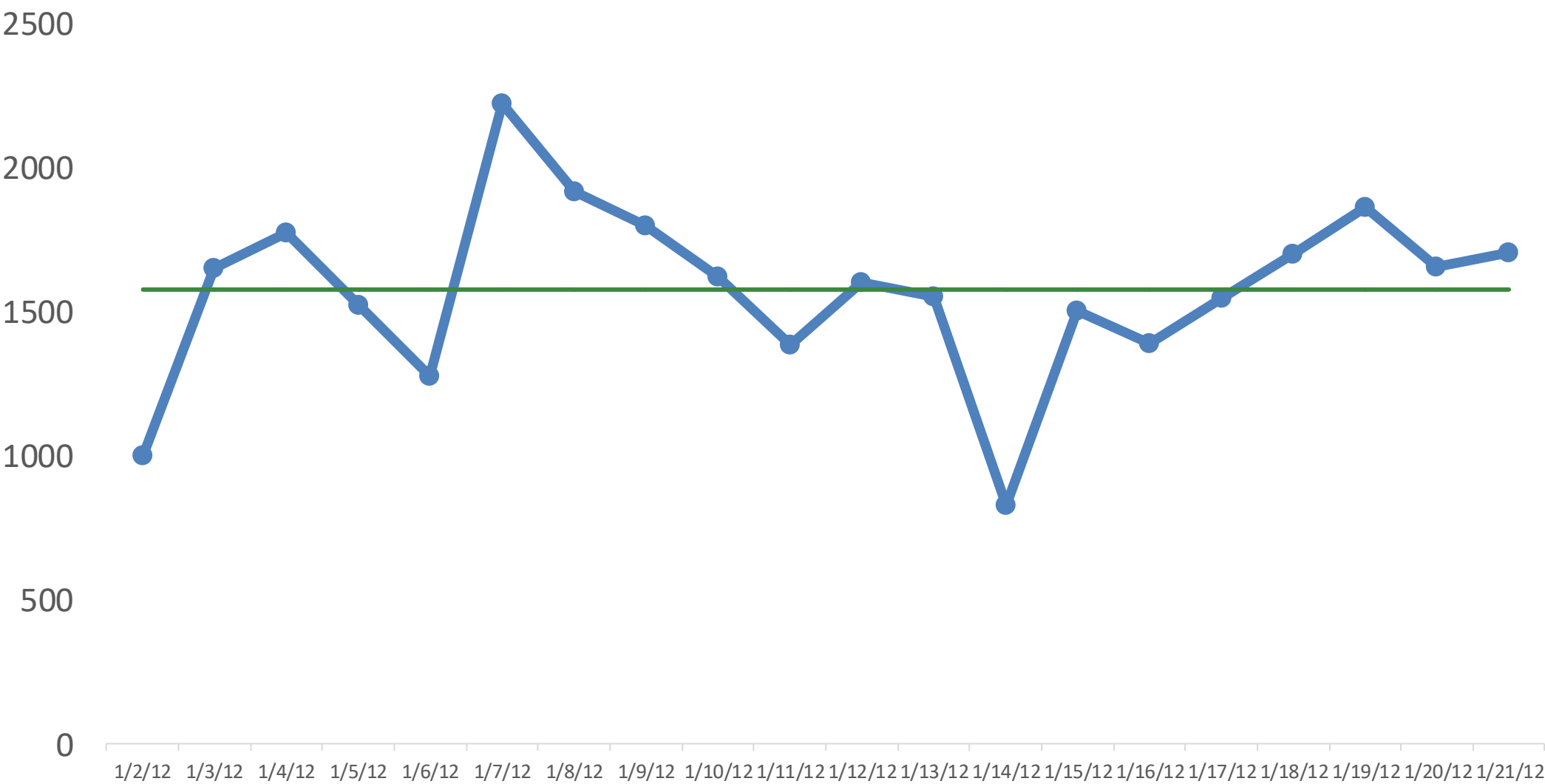
(if data is in column B)

- Calculate the moving range of the first 20 points

D3: =ABS(B3-B2)

	A	B	C	D
1	Process Behavior Template provid			
2	Date	Page Loads	Average	Moving Range (MR)
3	1/2/12	999	1,576.20	
4	1/3/12	1,654	1,576.20	655.00
5	1/4/12	1,773	1,576.20	119.00
6	1/5/12	1,523	1,576.20	250.00
7	1/6/12	1,275	1,576.20	248.00
8	1/9/12	2,225	1,576.20	950.00
9	1/10/12	1,916	1,576.20	309.00
10	1/11/12	1,798	1,576.20	118.00
11	1/12/12	1,622	1,576.20	176.00
12	1/13/12	1,385	1,576.20	237.00
13	1/16/12	1,604	1,576.20	219.00
14	1/17/12	1,551	1,576.20	53.00
15	1/18/12	828	1,576.20	723.00
16	1/19/12	1,502	1,576.20	674.00
17	1/20/12	1,201	1,576.20	111.00

Step 3: Draw Initial Chart (With Average Line)



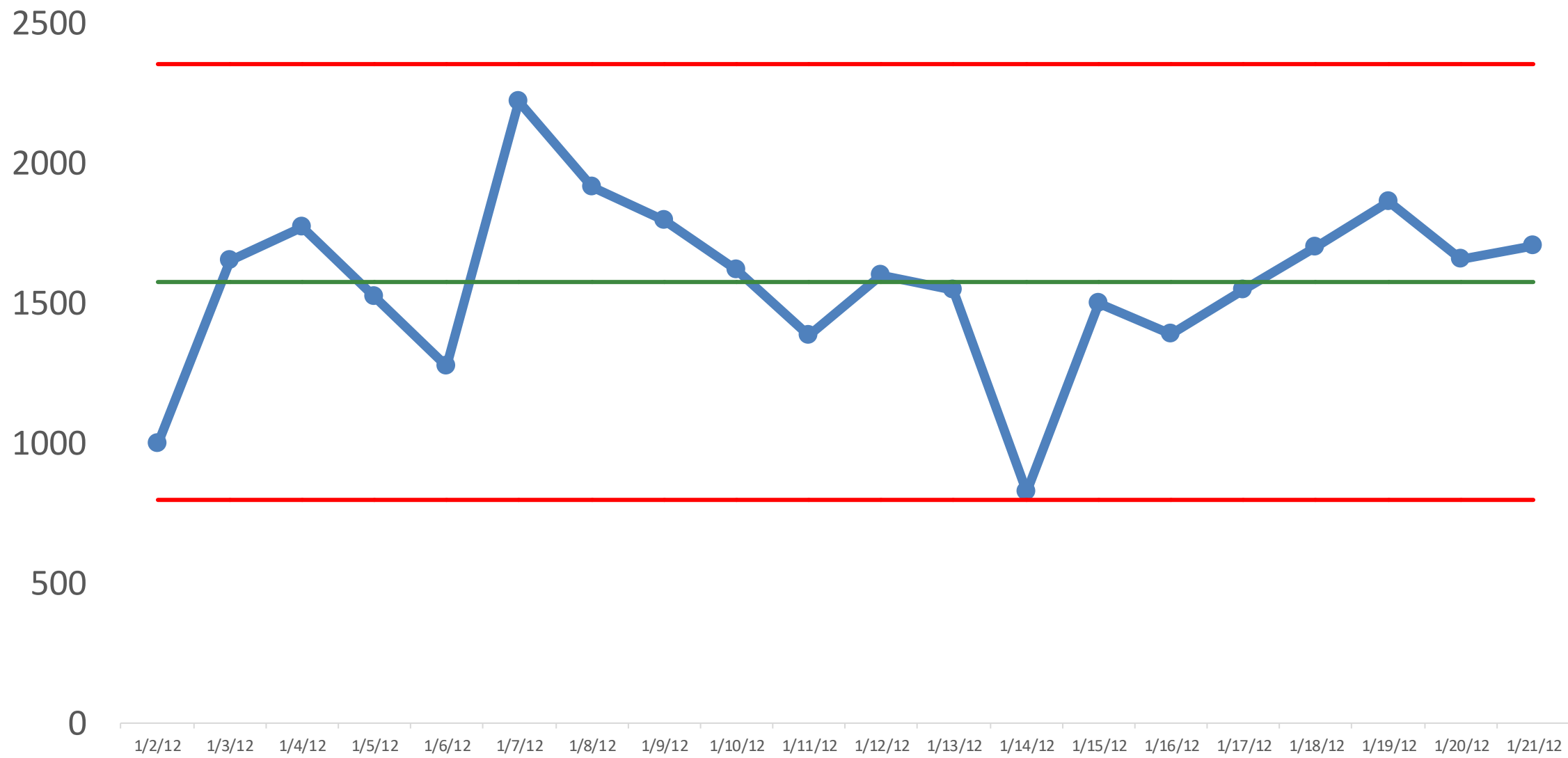
Step 4: Calculate Natural Process Limits

- Calculate “MR-bar”
 - Average of the 1st 19 MRs
 - E3: =Average(D4:D22)

	A	B	C	D	E	F	G
1	Process Behavior Template provided by Mark Granbois, author						
2	Date	Page Loads	Average	Moving Range (MR)	MR Bar	Lower Natural Process Limit	Upper Natural Process Limit
3	1/2/12	999	1,576.20		293.16	796.52	2,355.88
4	1/3/12	1,654	1,576.20	655.00	293.16	796.52	2,355.88
5	1/4/12	1,773	1,576.20	119.00	293.16	796.52	2,355.88
6	1/5/12	1,523	1,576.20	250.00	293.16	796.52	2,355.88
7	1/6/12	1,275	1,576.20	248.00	293.16	796.52	2,355.88
8	1/9/12	2,225	1,576.20	950.00	293.16	796.52	2,355.88
9	1/10/12	1,916	1,576.20	309.00	293.16	796.52	2,355.88
10	1/11/12	1,798	1,576.20	118.00	293.16	796.52	2,355.88
11	1/12/12	1,622	1,576.20	176.00	293.16	796.52	2,355.88

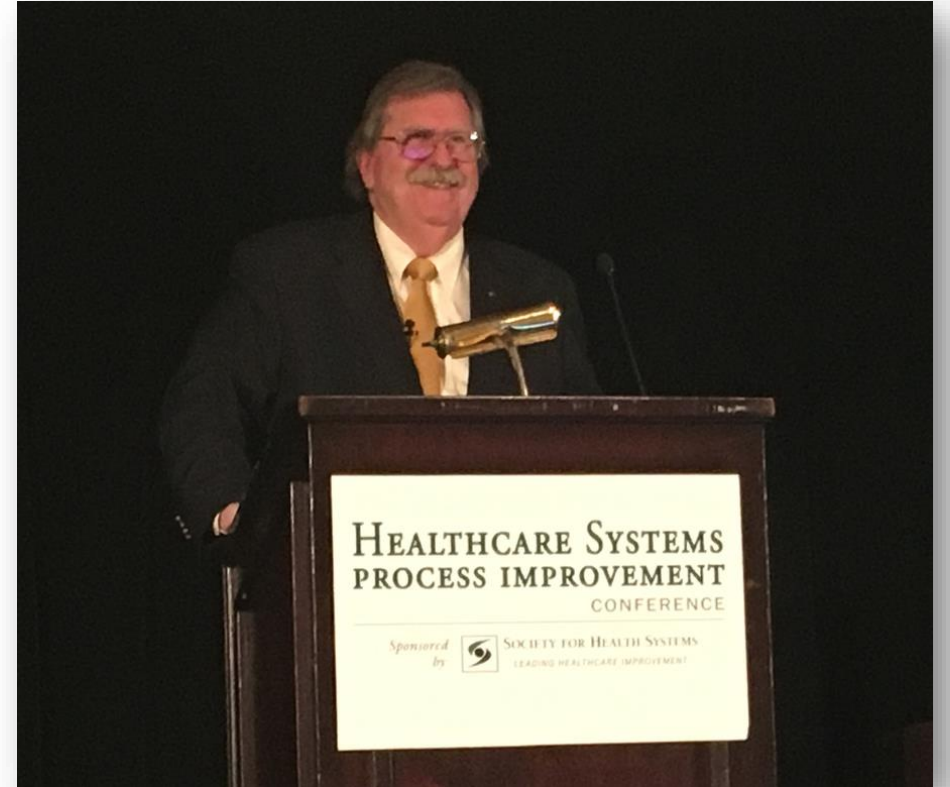
- Calculate the Limits
 - Lower = Average – 3*(MR bar)/1.128
 - F3: = C3-3*E3/1.128
 - Upper = Average + 3*(MR bar)/1.128
 - G3: = C3+3*E3/1.128

Step 5: Review Initial Chart With Limits



Key Points from Wheeler

- “Limits are computed from the data.
- You do NOT get to choose the limits.”



More Key Points

- The upper & lower limits are not arbitrary
- You don't choose the limits
- The limits are the “Voice of the Process”
- Goals or Targets might be different
 - “Voice of the customer” (??)

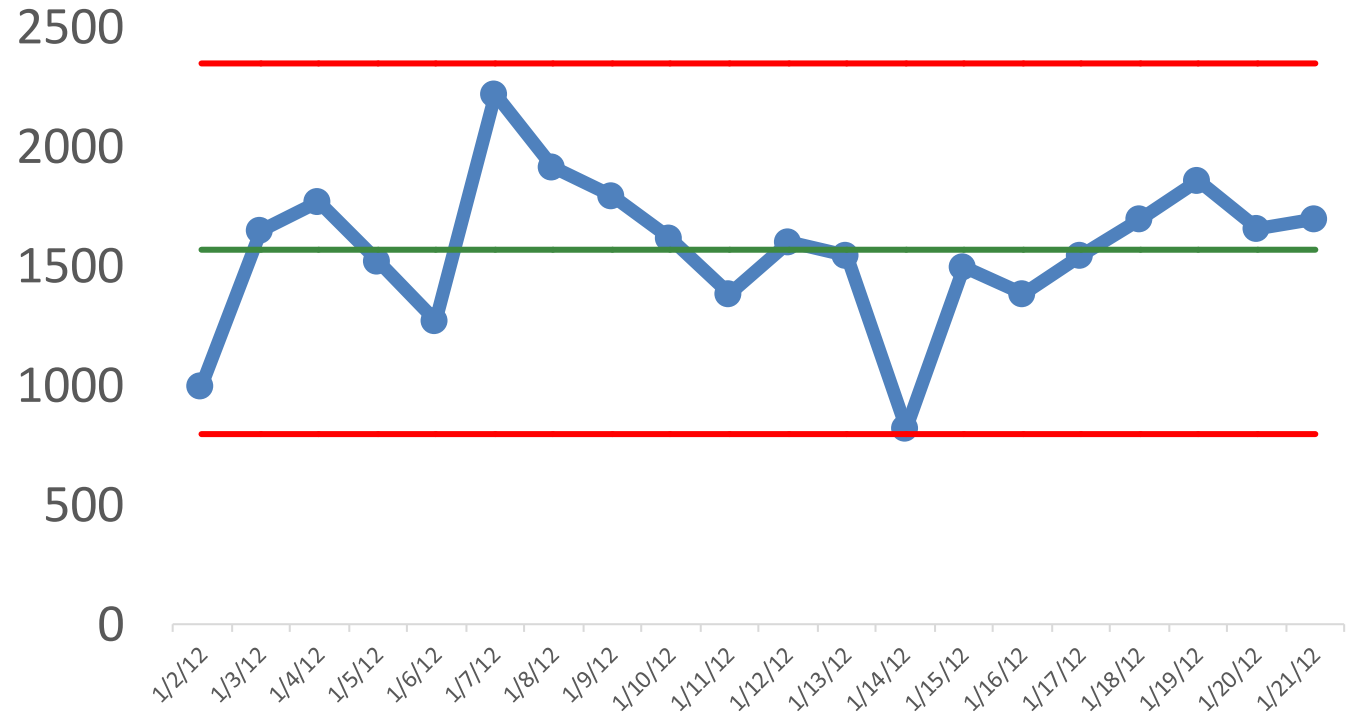
Another Key Point

- Do not continually recalculate the limits each time there is a new data
 - Exception – if you started your chart with just a few data points... recalculate limits (or add them) when you have 20 data points

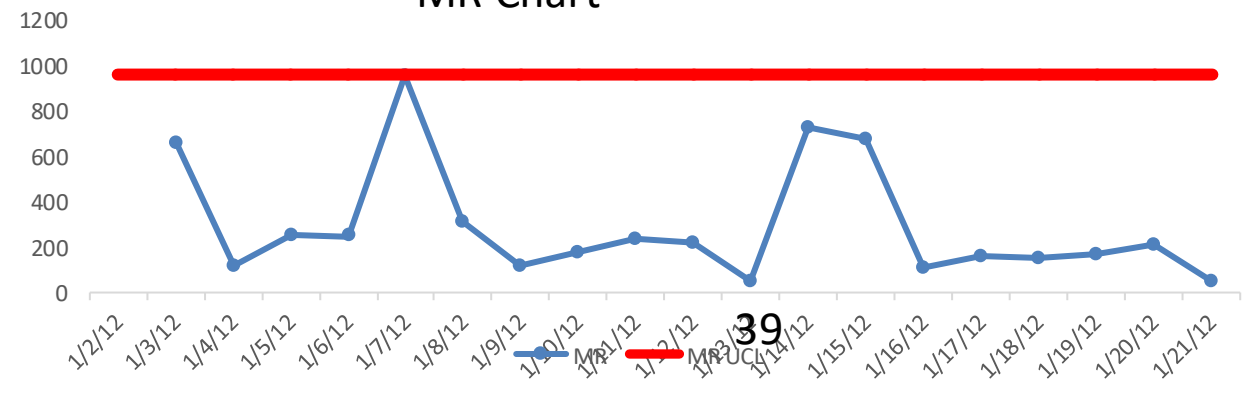
Step 6: Draw MR Chart & Evaluate

- Calculate MR Chart Upper Range Limit
 - $URL = MR\text{-}bar * 3.27$
 - $H3: =E3*3.27$

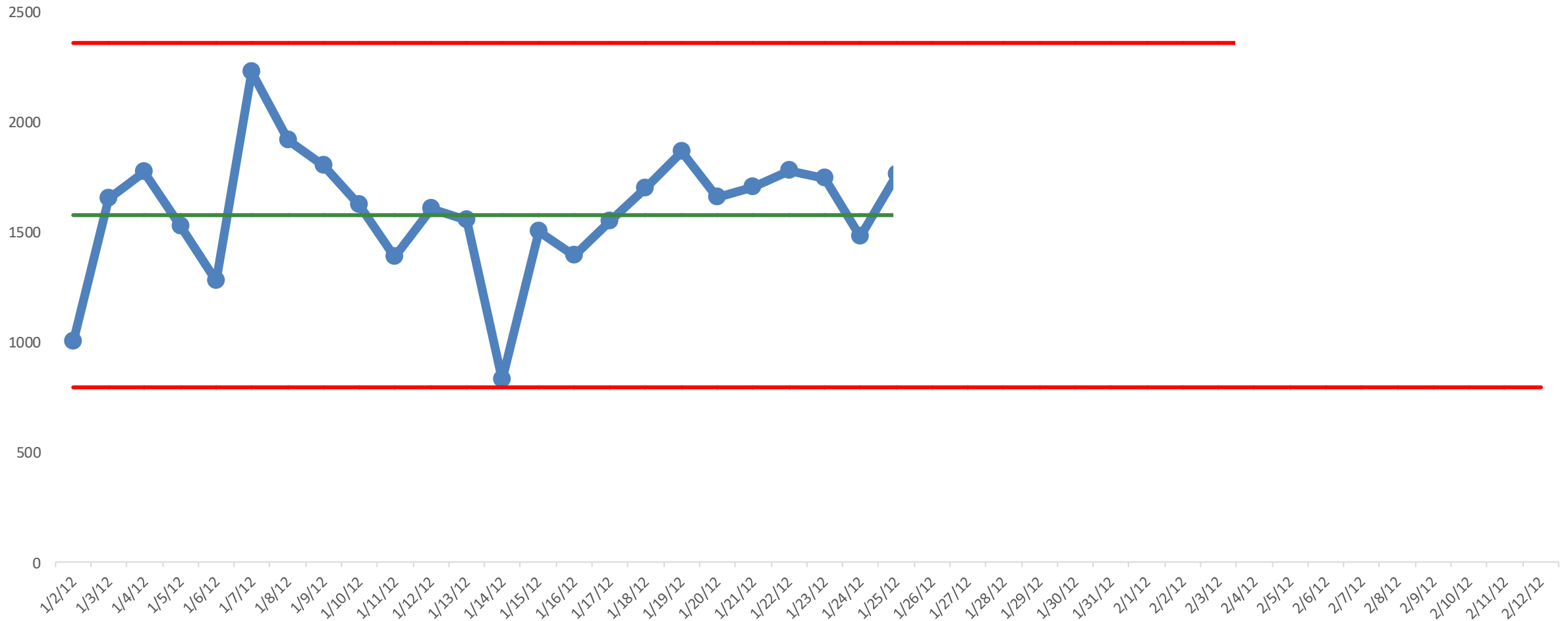
X Chart for Individuals



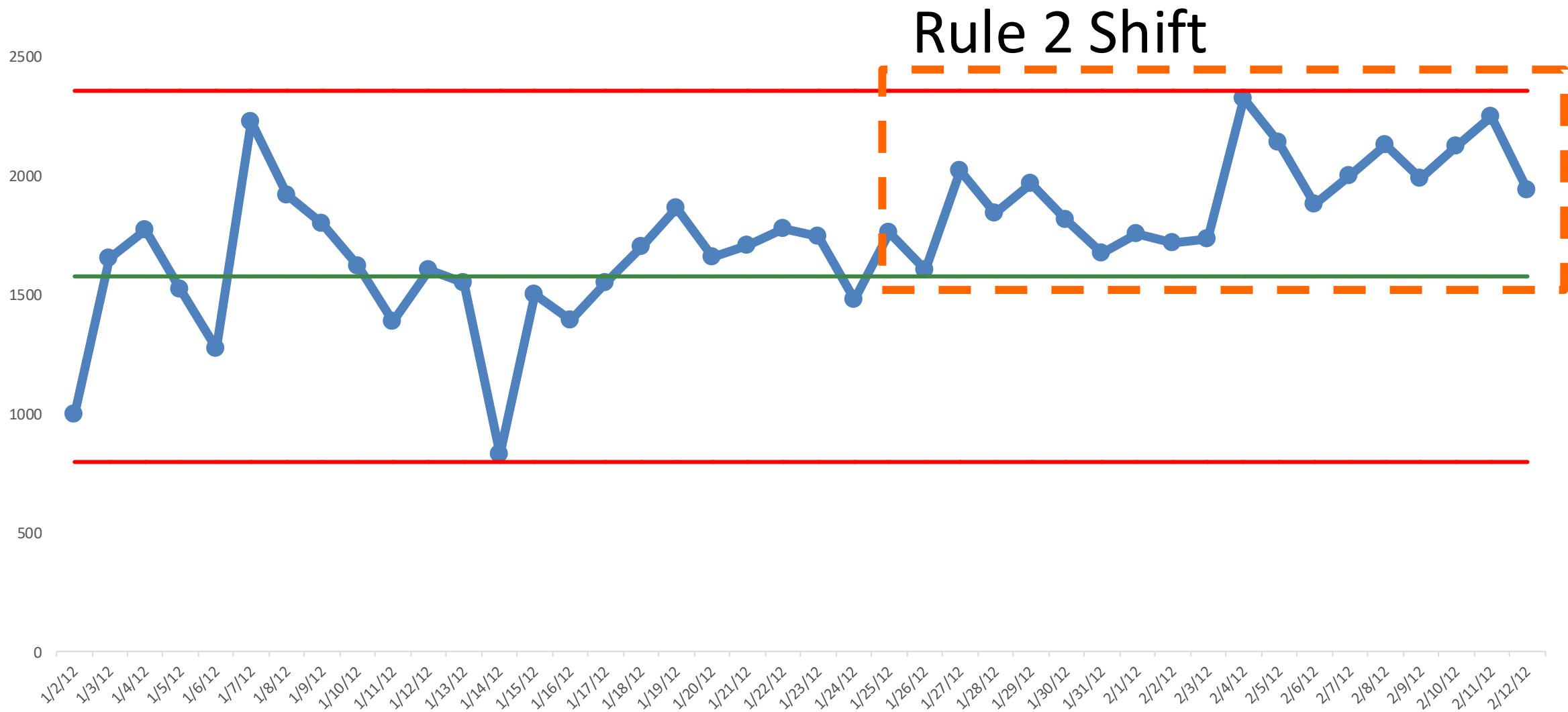
MR Chart



Step 7: Evaluate Over Time



Step 7: Evaluate Over Time



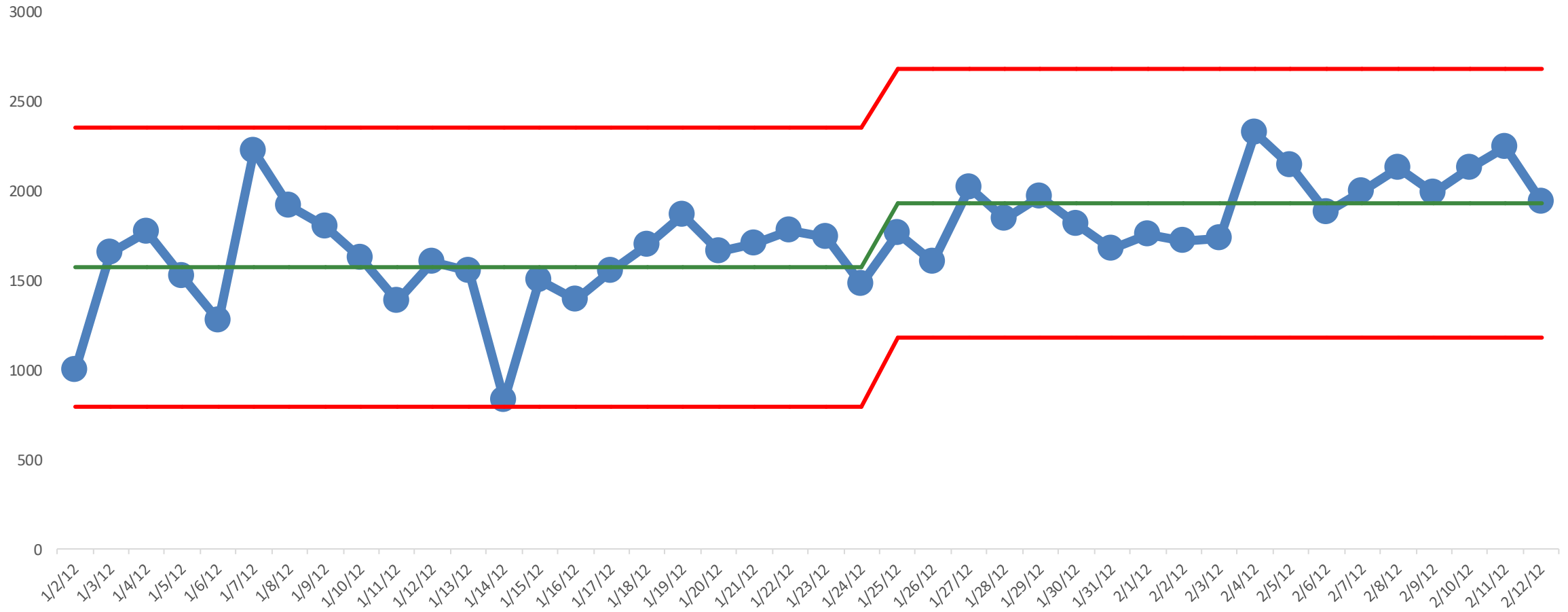
When Should You Shift Limits?

- Can you answer YES to all questions:
 1. Do the data display a distinctly different kind of behavior than in the past?
 2. Do you know the reason for this change in behavior?
 3. Is the new process behavior desirable?
 4. Is it intended and expected that the new behavior will continue?

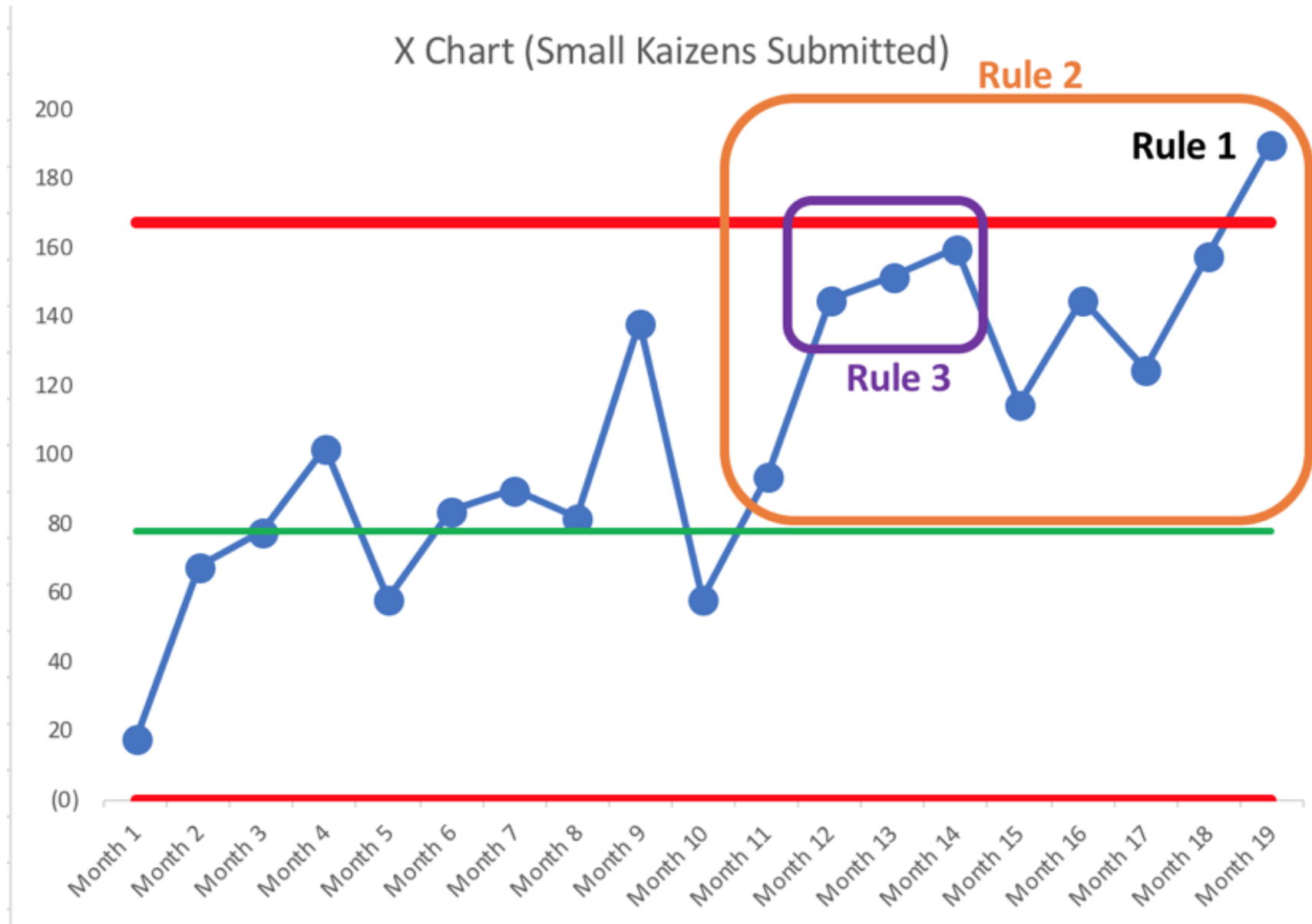
When Should You Shift Limits?

1. Do the data display a distinctly different kind of behavior than in the past?
 - NO? Don't shift limits
2. Do you know the reason for this change in behavior?
 - NO? "You should be looking for the assignable cause instead of tinkering with the limits"
3. Is the new process behavior desirable?
 - NO? "Why aren't you working to remove the detrimental assignable cause instead of tinkering with the limits?"
4. Is it intended and expected that the new behavior will continue?
 - NO? Same advice again

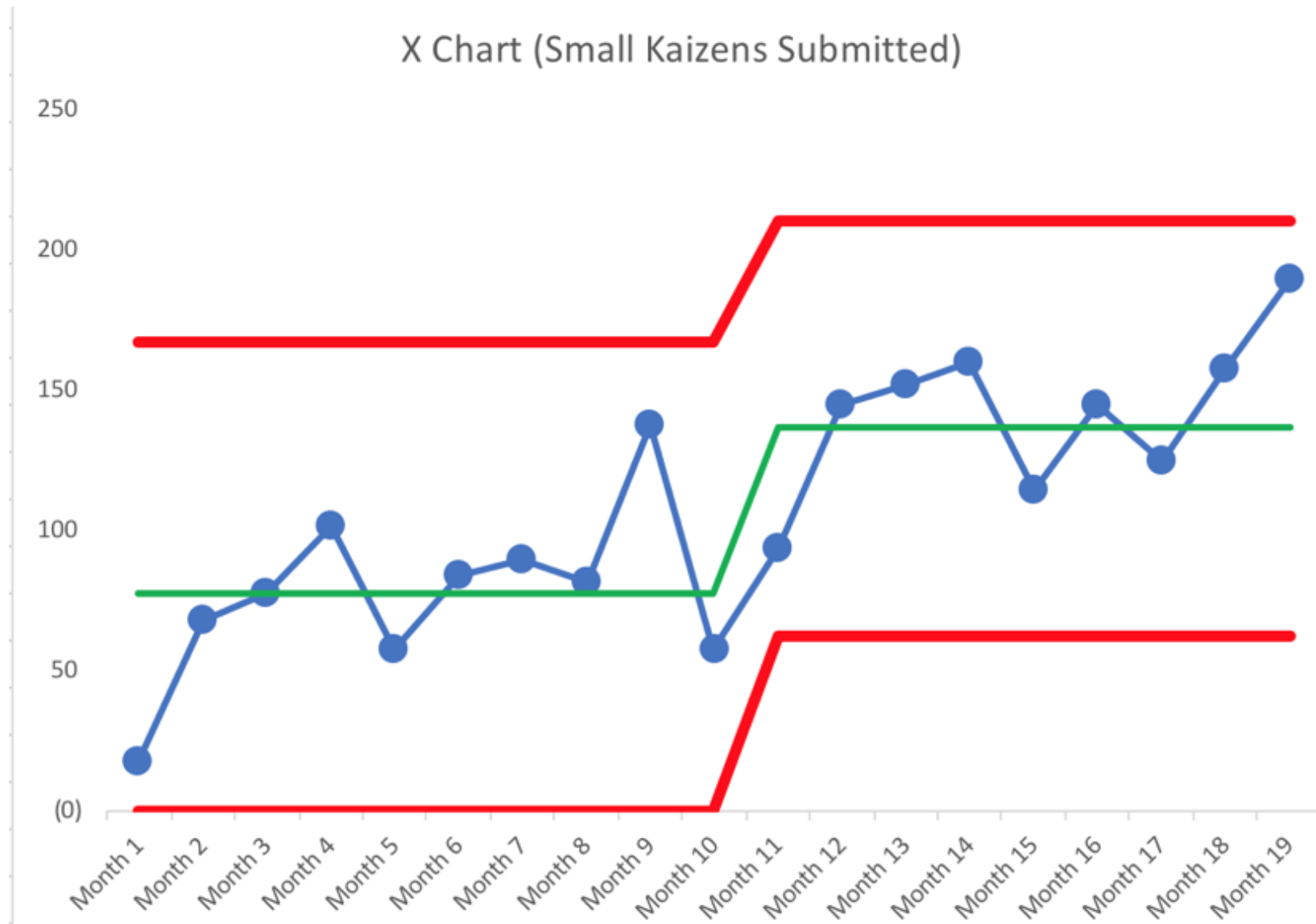
Step 8: Shift the Limits (If Applicable)



Shifts That Show Significant, Sustained Improvement



Shifts That Show Significant, Sustained Improvement

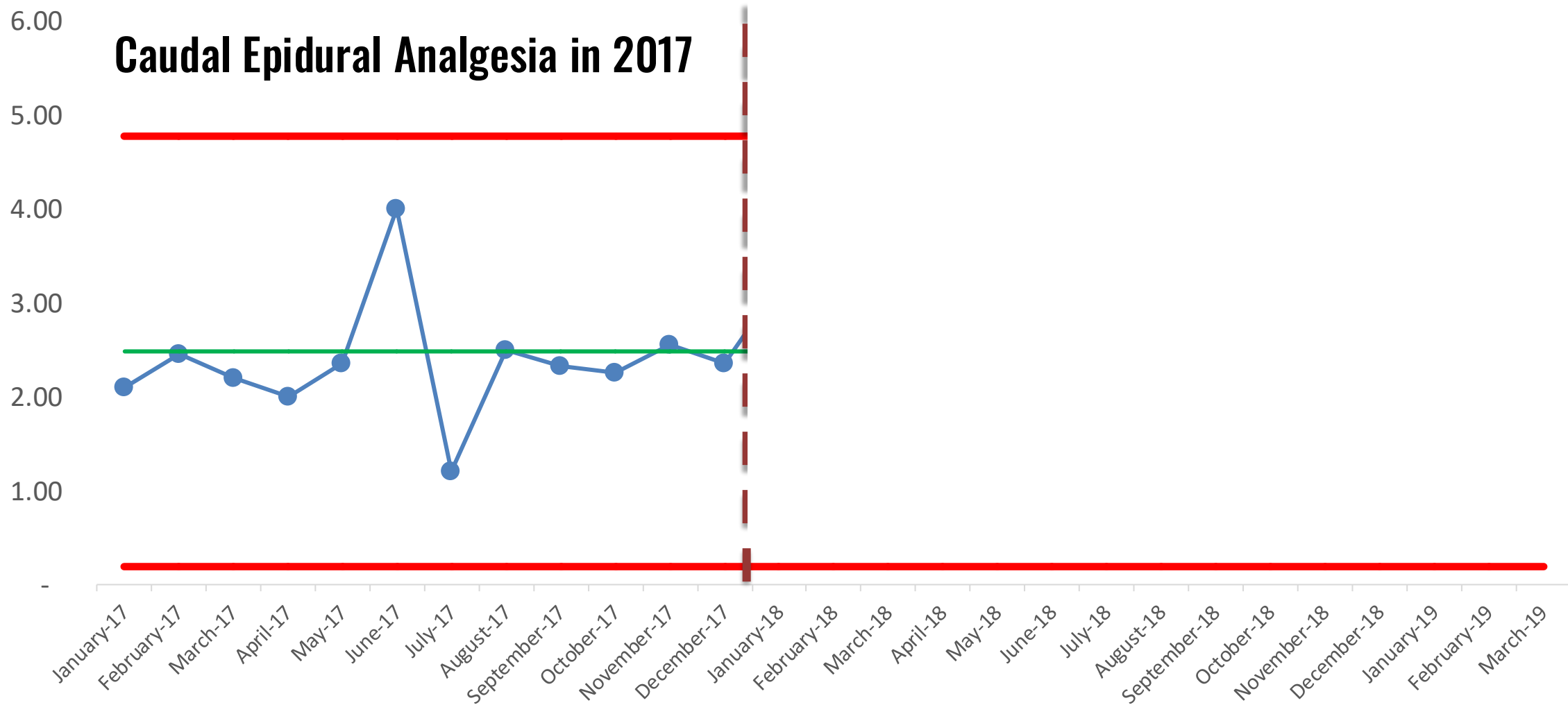


The background of the slide is a solid yellow color, decorated with numerous pink, watercolor-style polka dots of varying sizes scattered across the entire surface.

**PROCESS BEHAVIOR
CHARTS HELP US
EVALUATE
IMPROVEMENT WORK**

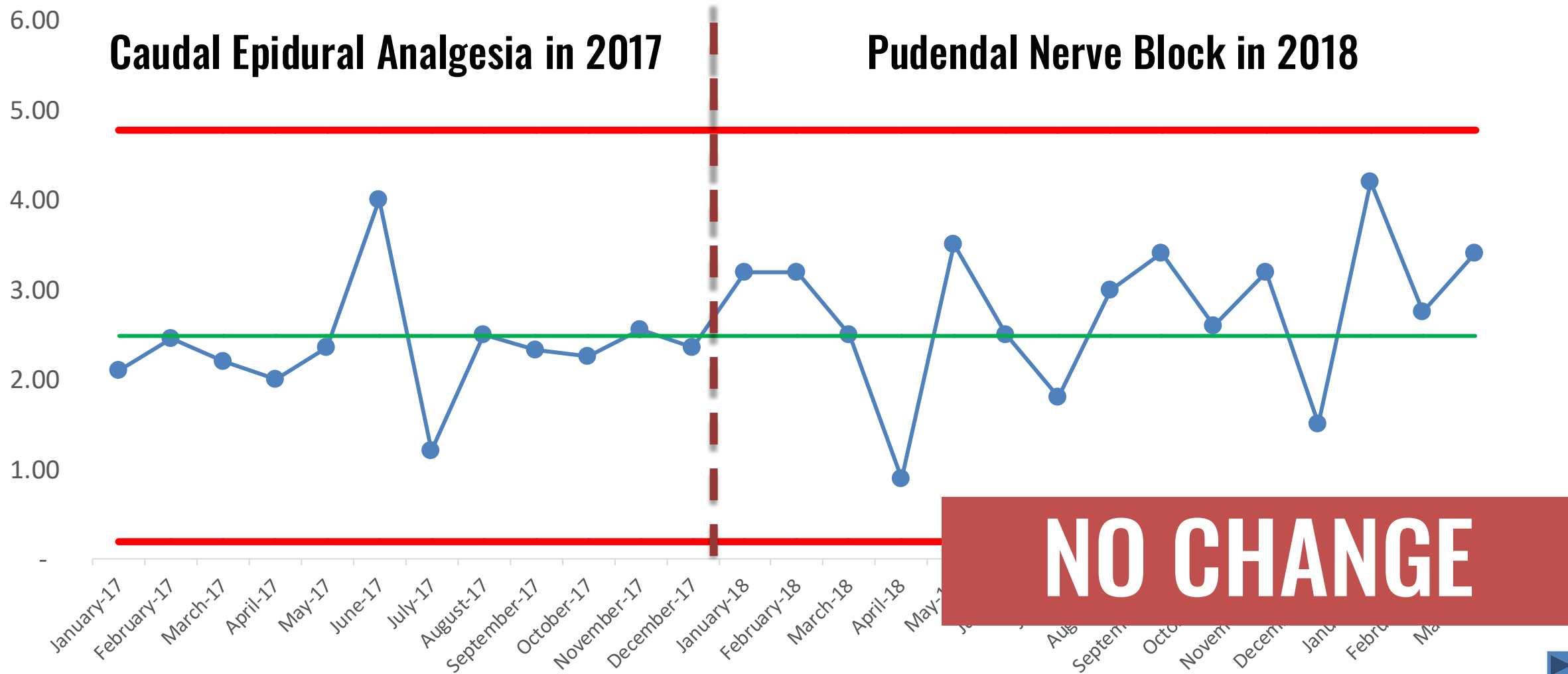
We Made Improvements (?) to the System

X Chart -- Pain Score (0-10)

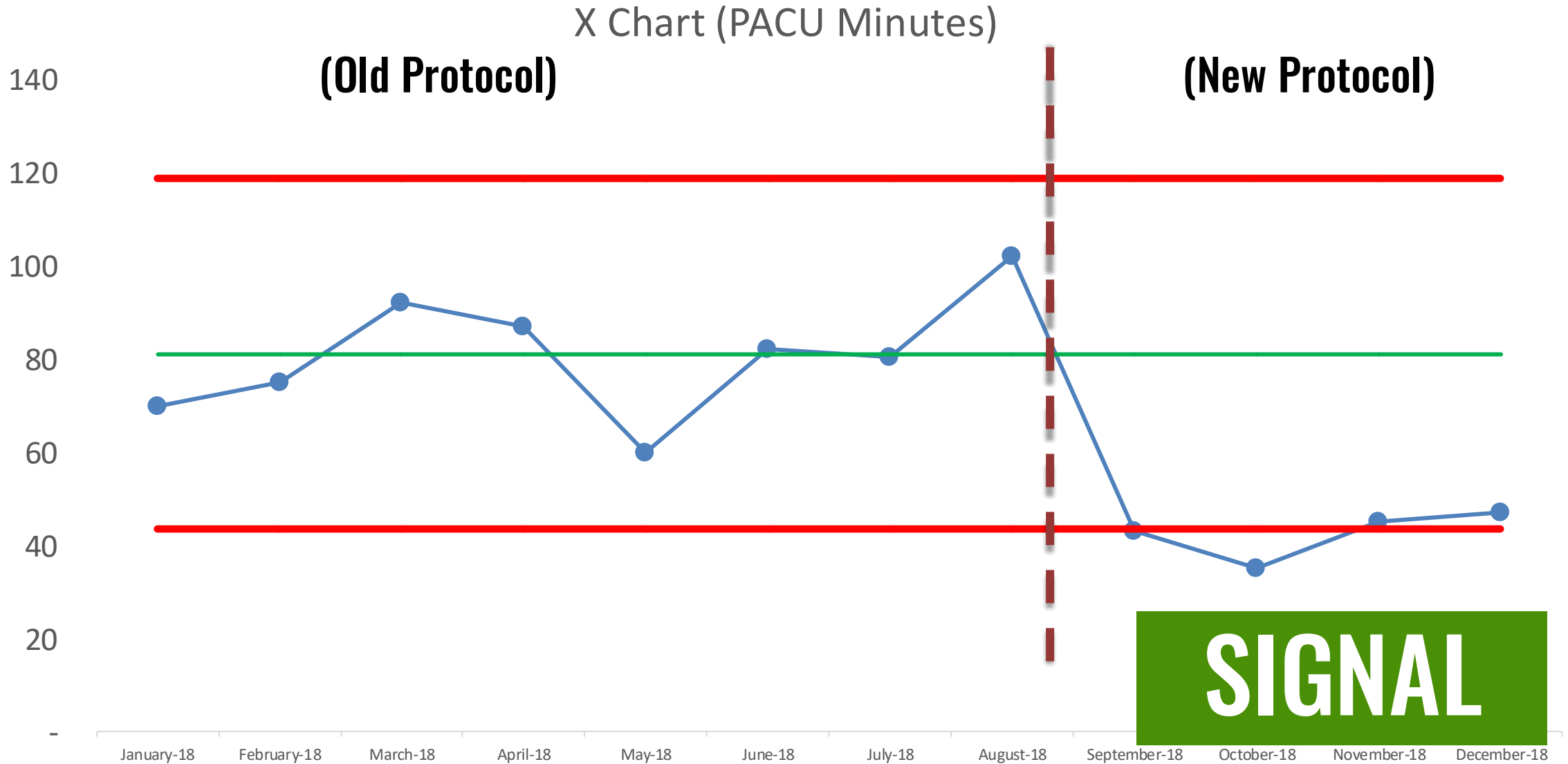


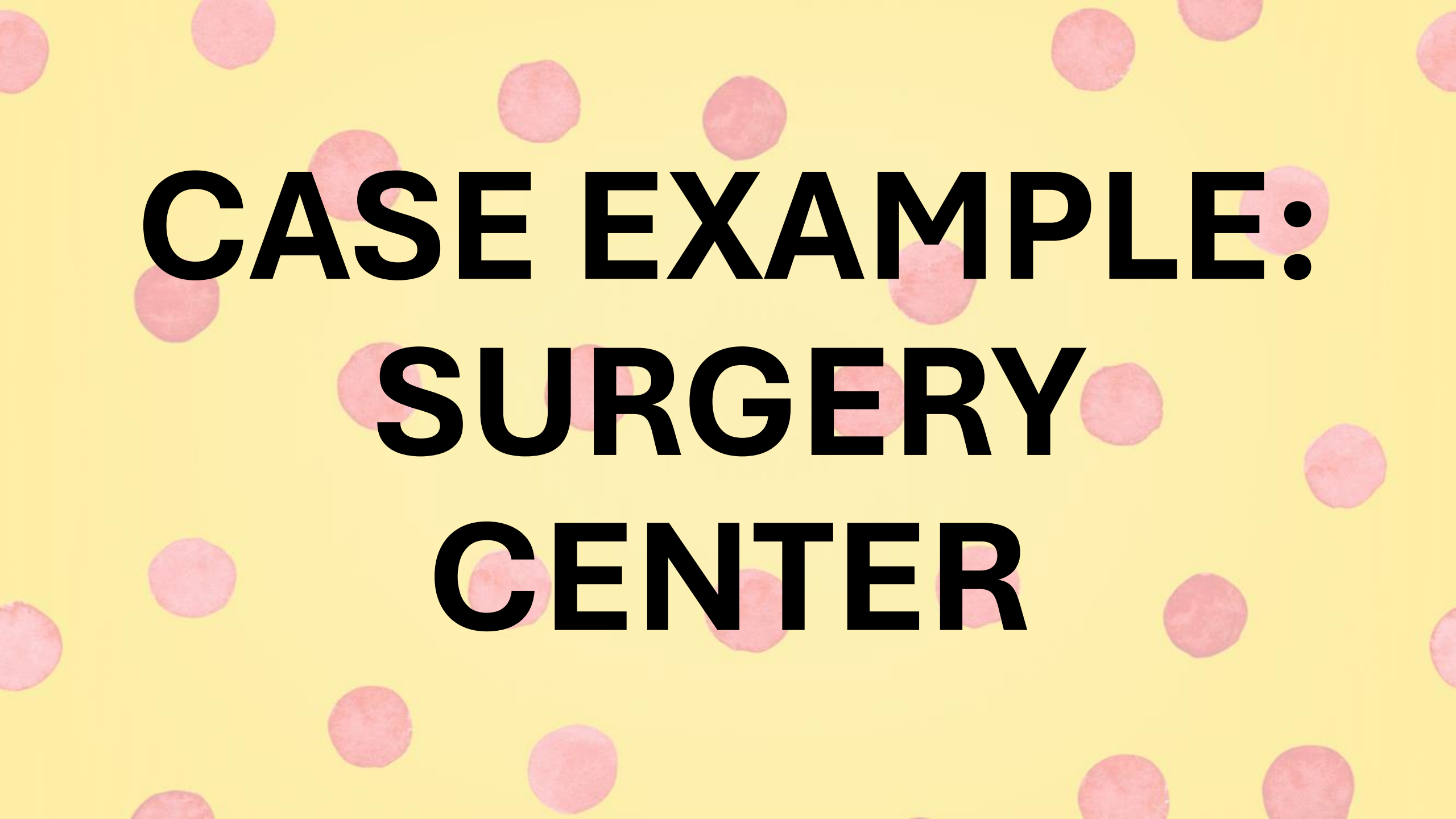
We Made Improvements (?) to the System

X Chart -- Pain Score (0-10)



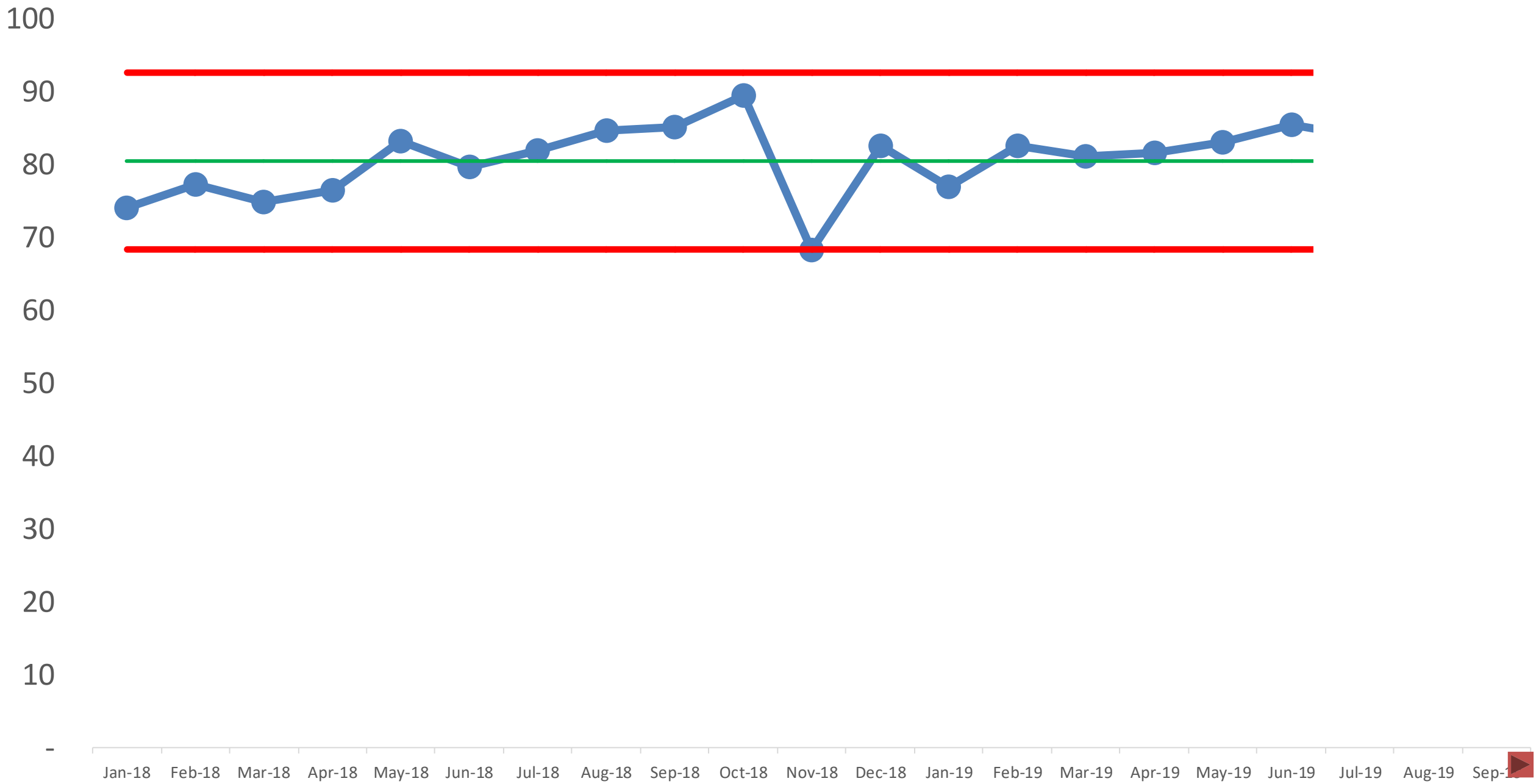
We Made Improvements (?) to the System



The background of the slide is a solid yellow color, decorated with numerous pink, watercolor-style polka dots of varying sizes scattered across the entire surface.

CASE EXAMPLE: SURGERY CENTER

Rate this Facility – Raw Score (by collected date)



FAMILY

5:30

5:30

6:00

6:30

SERICAL
PATIENT

FIRST CASE PT
ARRIVES
6 AM?
FALLS ON THE
OFFICE

POSSIBLE
WAITING
ROOM

PATIENT
REGISTERED
(GOING
DOWN)

POSSIBLE
BACK TO
3RD
WAITING
OR HALLWAY

SENT
TO
5TH
(IF < 6:30)

FAMILY
WAITS
ON 3
(15 MIN)

SENT
TO
4TH
(7:00)

REGISTRATION

REGISTRAR
ARRIVE
(ONE)

REGISTER-

SEES

CHECK TO
SEE IF

LIASON
4TH
WAITING

PRE-OP
NURSE

NURSE
ARRIVES
(ONE)

PRE-OP
ARRIVE
4:10s

PCT

CRNA

Patient

Reception

Liason
4th Flr
Waiting

Pre-Op
Nurse

PCT

CRNA

Anesthesiologist

Pre-Op

Infused
Nurse
Sung
Joon

Resident
Fellow

Attending

6:30

7:00

7:30

Dr. Brown
(10 min)

Dr. Brown
(10 min)
Dr. Brown
(10 min)
Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

Dr. Brown
(10 min)

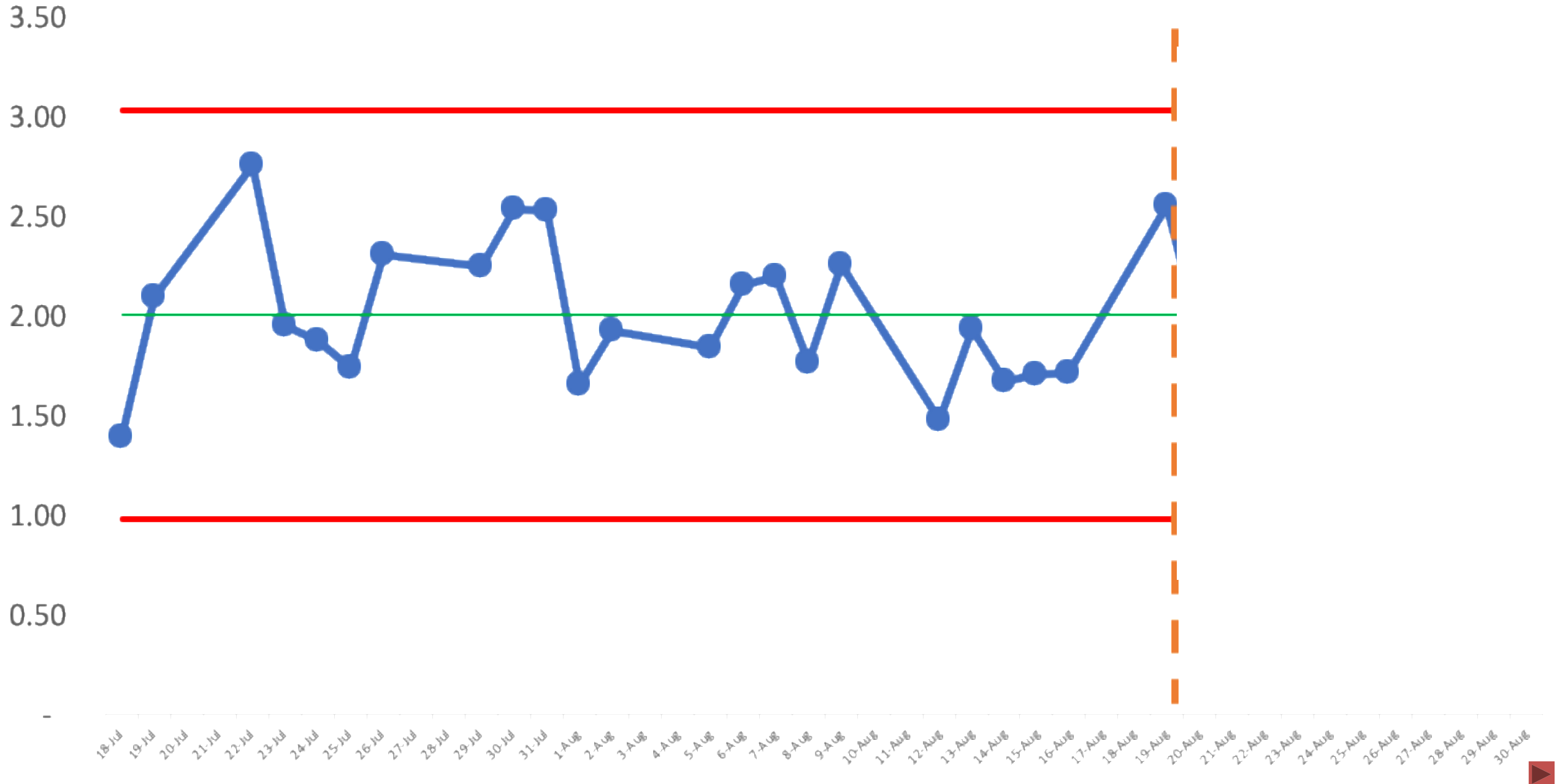
Dr. Brown
(10 min)

Dr. Brown
(10 min)

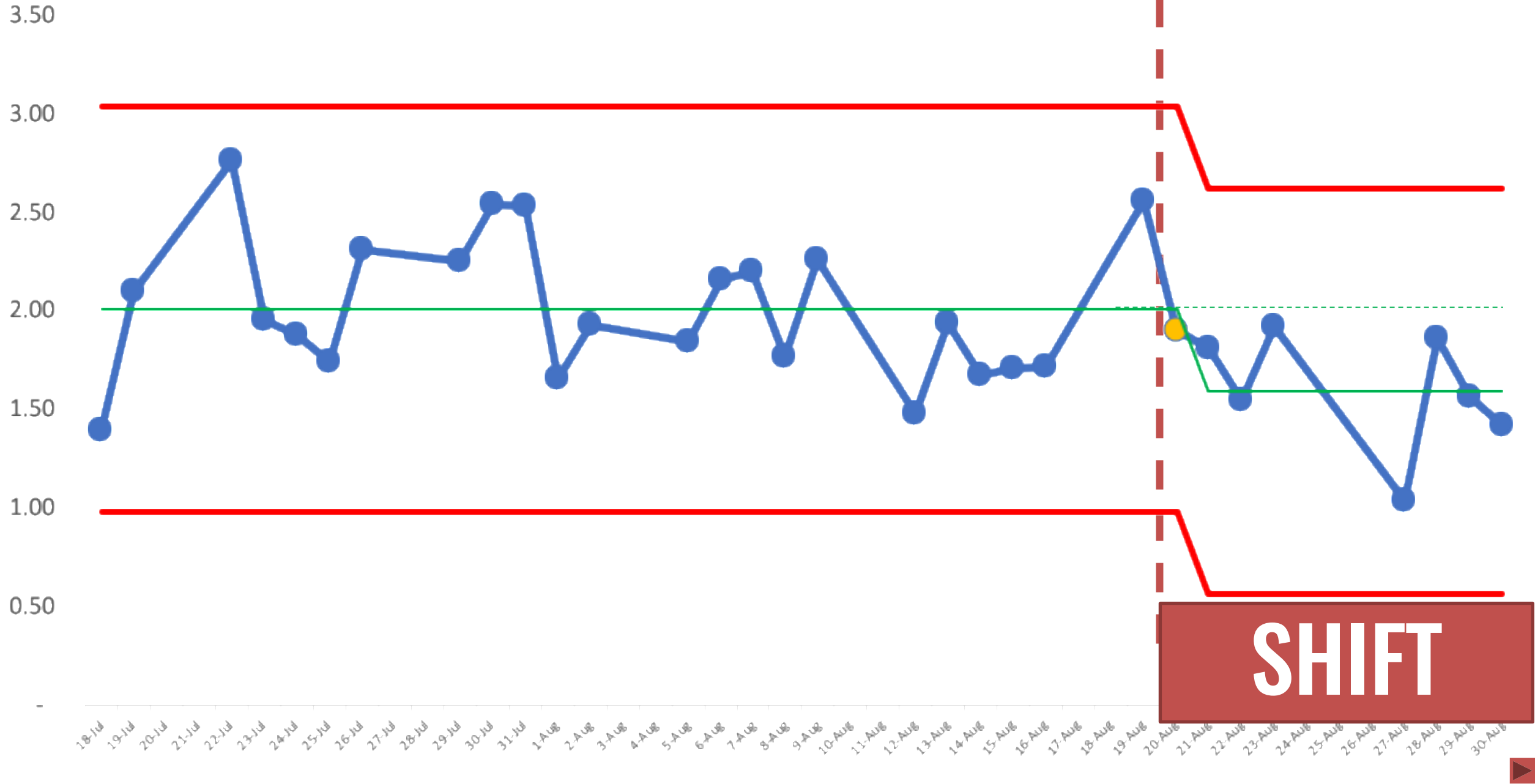
Dr. Brown
(10 min)

Dr. Brown
(10 min)

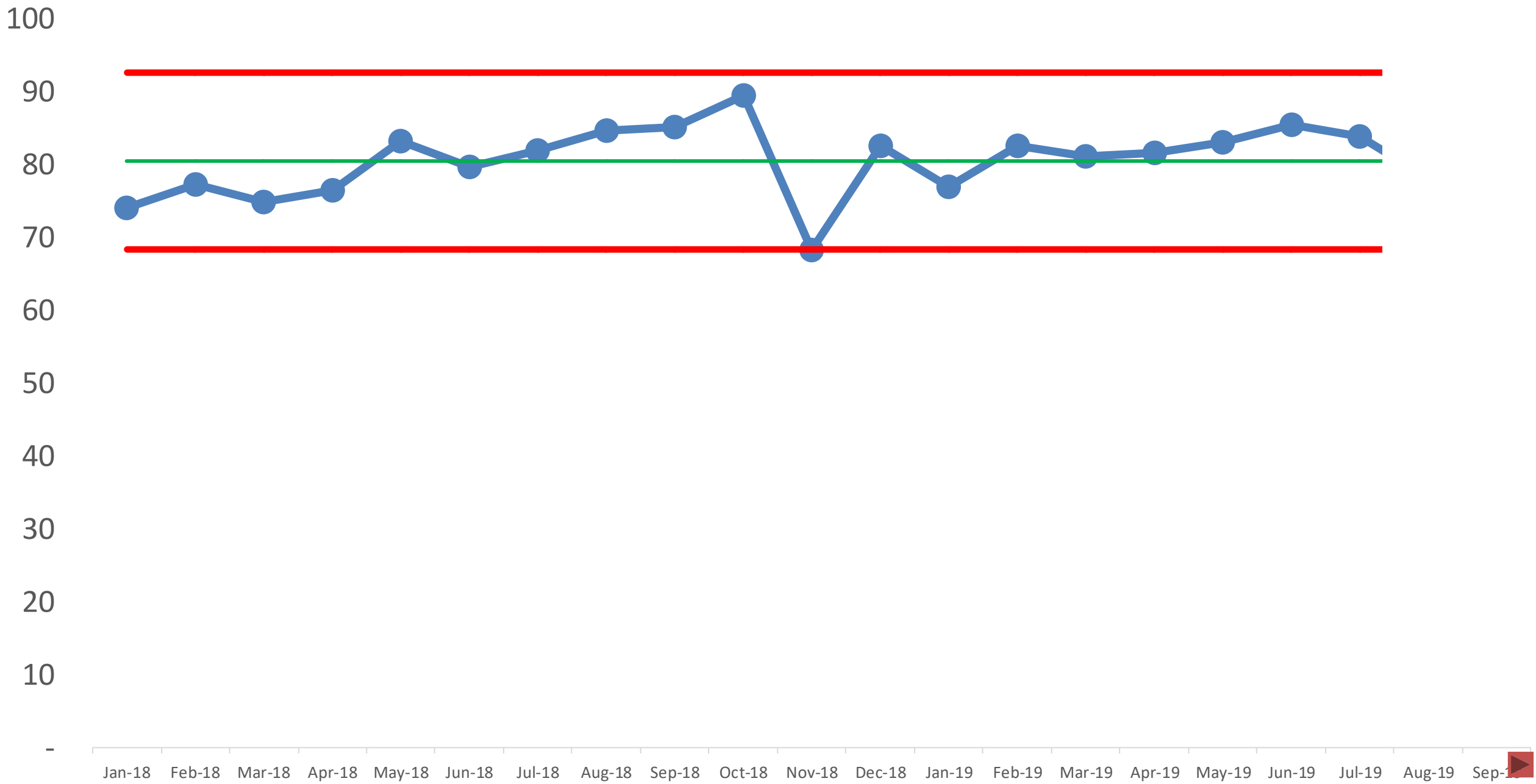
Daily Average of Patient Arrival to In Room - Surgery



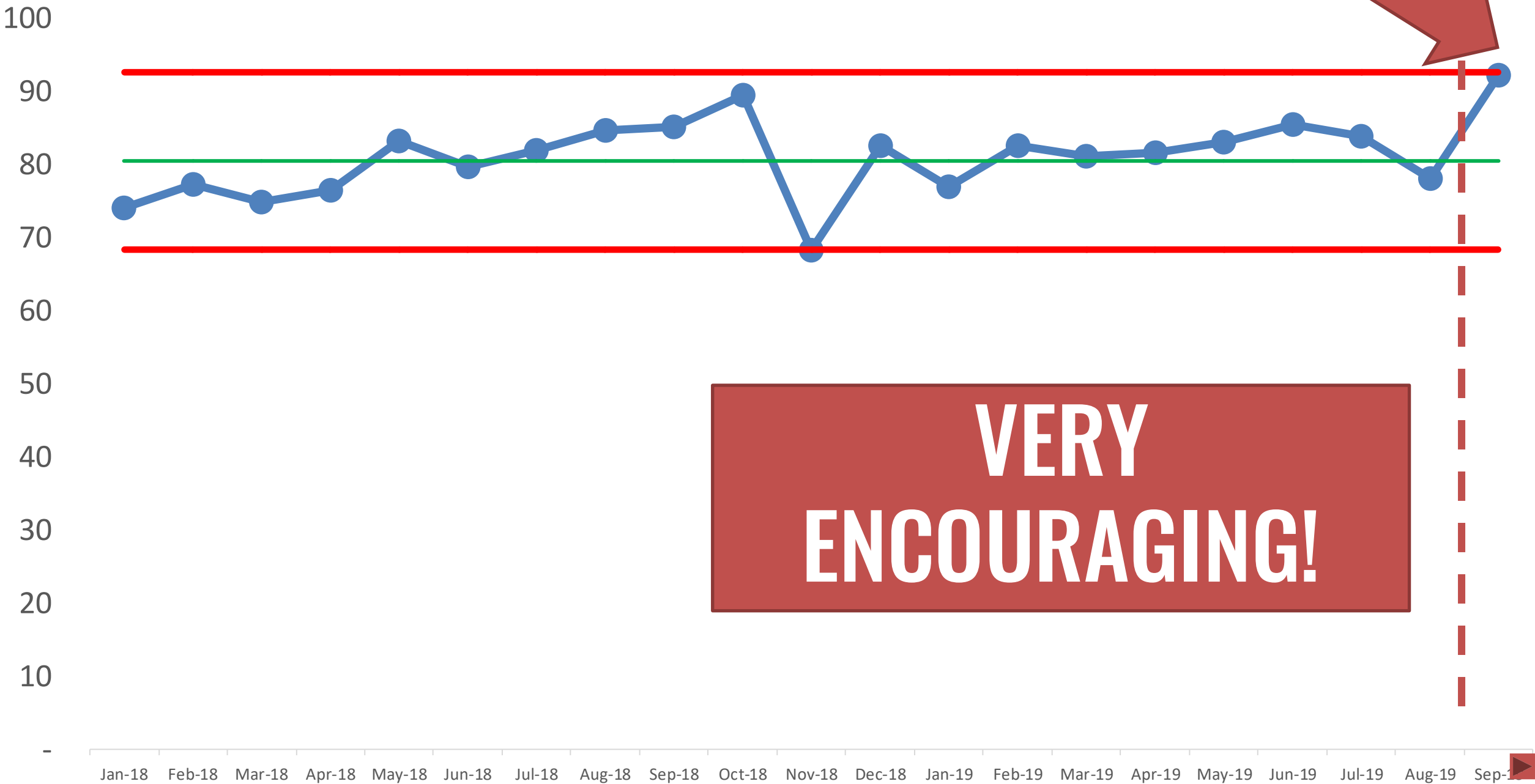
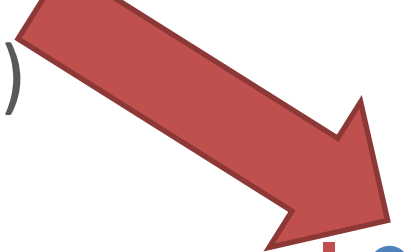
Daily Average of Patient Arrival to In Room - Surgery



Rate this Facility – Raw Score (by collected date)

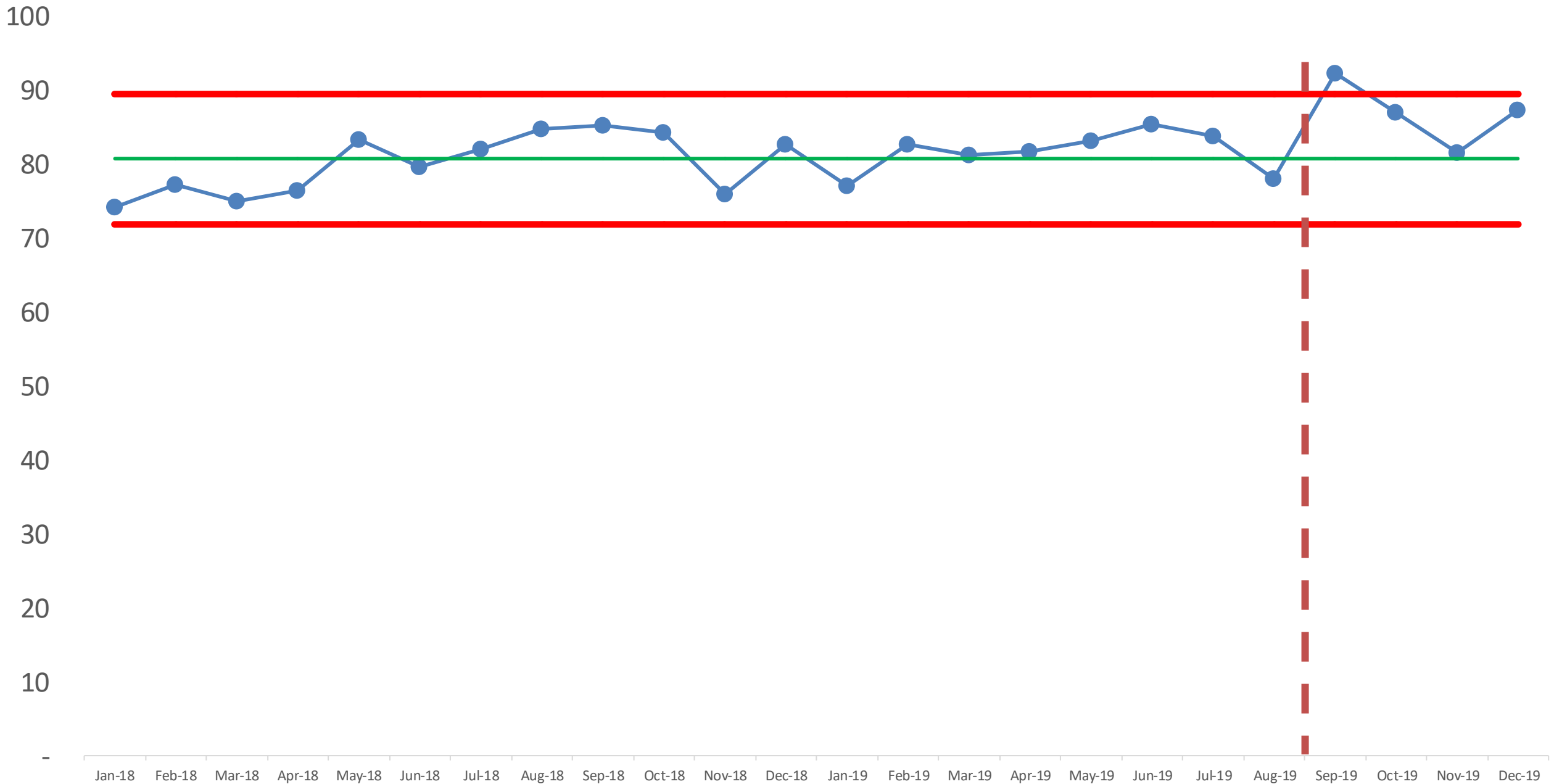


Rate this Facility – Raw Score (by collected date)



**VERY
ENCOURAGING!**

Rate this Facility – Raw Score (by collected date)



The background of the slide is a solid yellow color, decorated with numerous pink, hand-painted style polka dots of varying sizes scattered across the entire surface.

**PROCESS BEHAVIOR
CHARTS HELP US
EVALUATE ONGOING
OPERATIONS**

“Bowling Charts”

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Trend	Target
Hospital 1	4	36	46	39	43	41	59	52	66	72	74	75	↑	90
Hospital 2	80	63	58	60	57	60	64	67	68	58	78	69	↓	90
Hospital 3	85	92	93	79	76	76	78	76	78	77	73	76	↑	70
Hospital 4	75	67	69	72	74	67	65	63	70	72	67	71	↑	70

1. Are we achieving our target or goal?
2. Are we improving?
3. How do we improve?



“Bowling Charts”

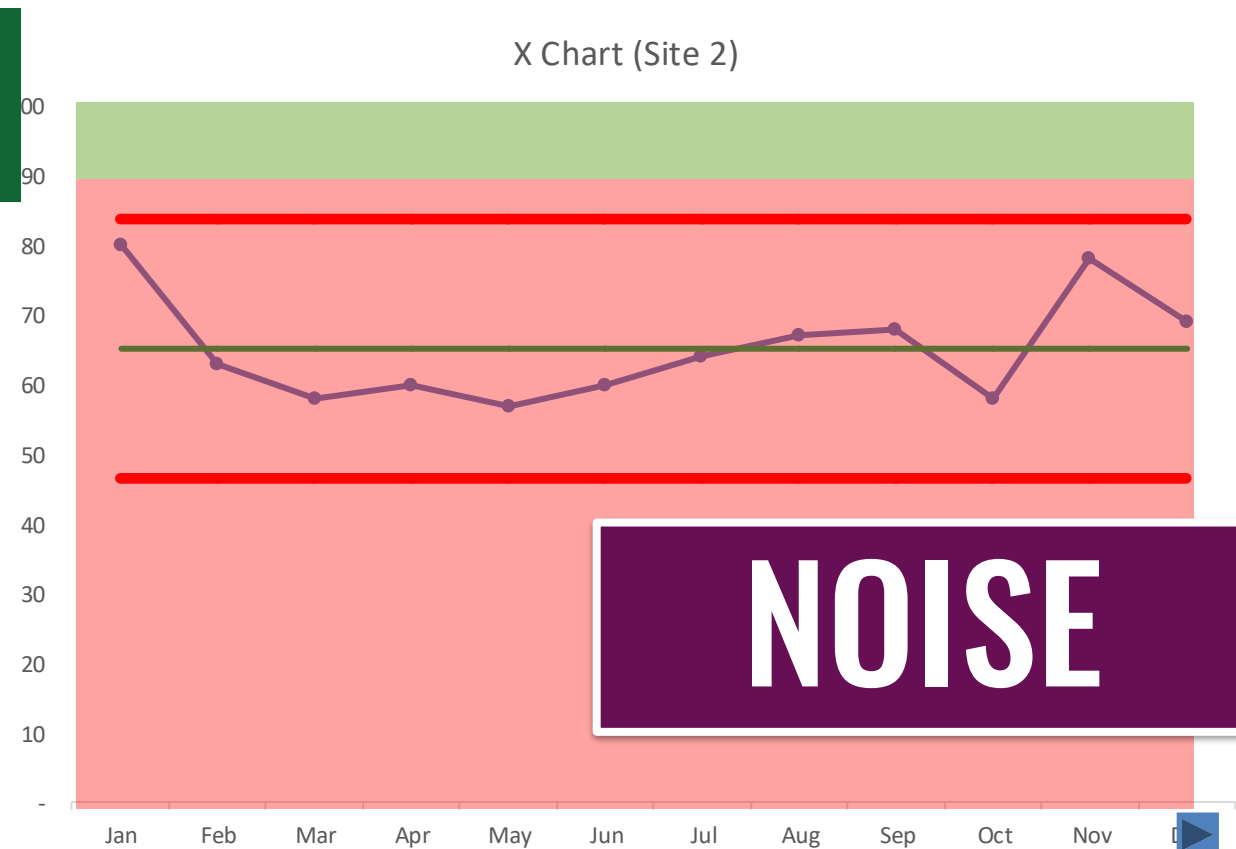
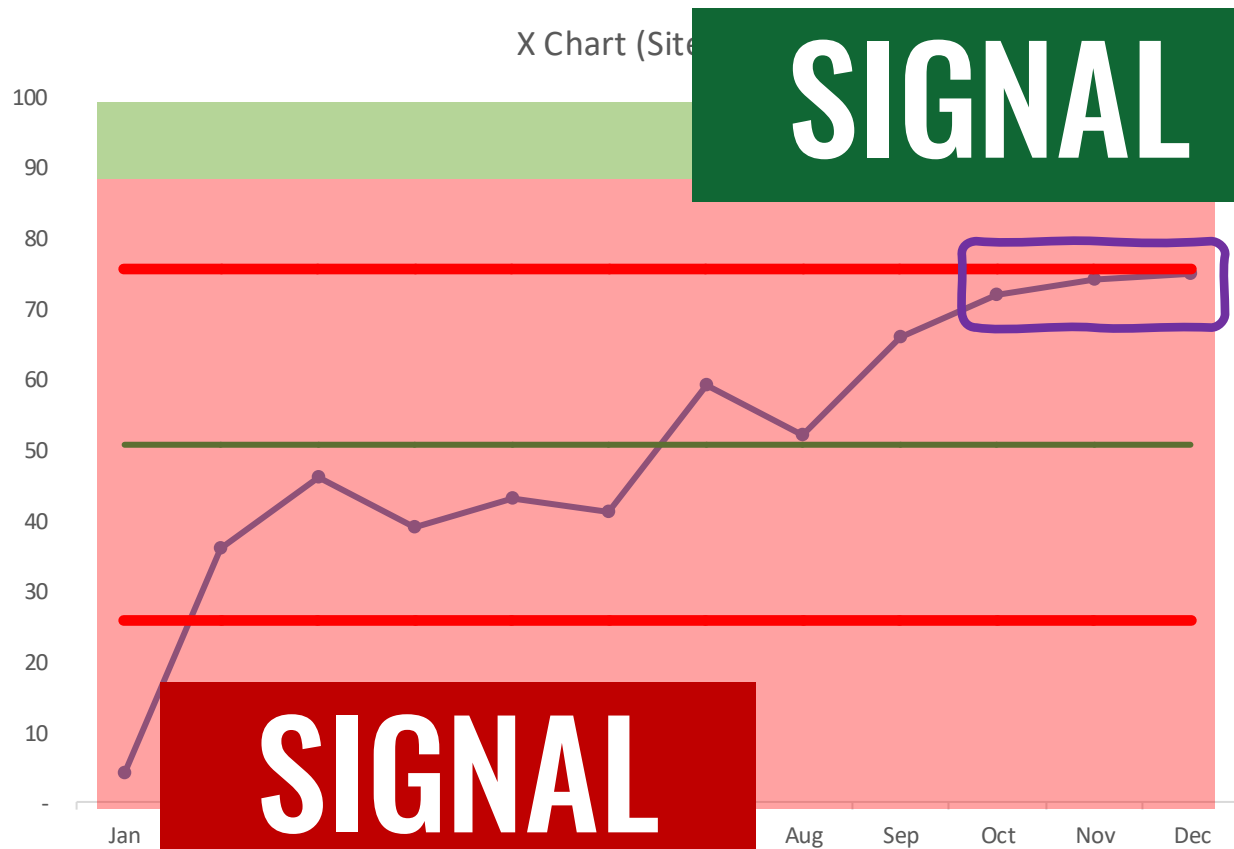
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Trend	Target
Hospital 1	4	36	46	39	43	41	59	52	66	72	74	75	↑	90
Hospital 2	80	63	58	60	57	60	64	67	68	58	78	69	↓	90
Hospital 3	85	92	93	79	76	76	78	76	78	77	73	76	↑	70
Hospital 4	75	67	69	72	74	67	65	63	70	72	67	71	↑	70

1. Which of these numbers (if any) suggests that the system has changed significantly?
2. Which of these merit reaction, investigation, or explanation?
3. How do we prioritize?



Bowling Charts vs. Process Behavior Charts

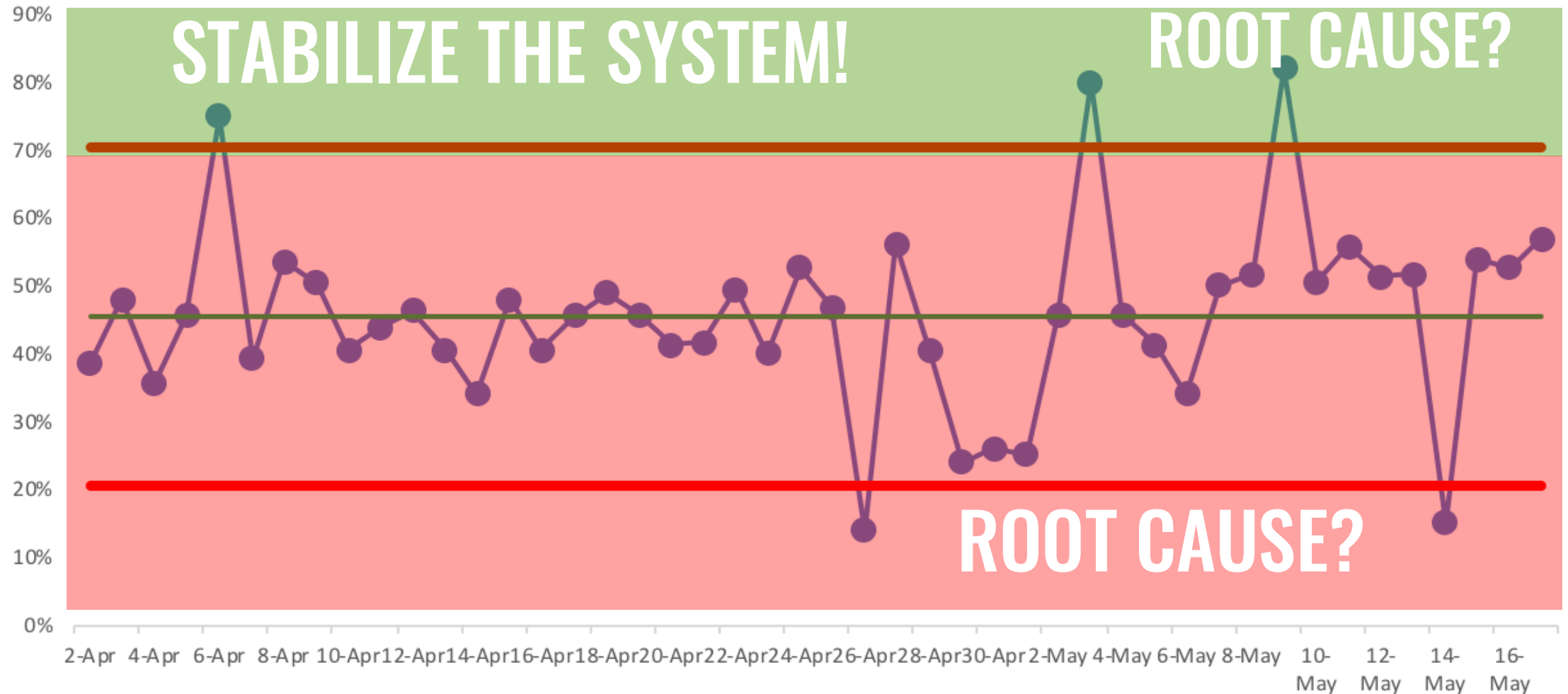
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Trend	Target
Site 1	4	36	46	39	43	41	59	52	66	72	74	75	↑	90
Site 2	80	63	58	60	57	60	64	67	68	58	78	69	↓	90
Site 3	85	92	93	79	76	76	78	76	78	77	73	76	↑	70
Site 4	75	67	69	72	74	67	65	63	70	72	67	71	↑	70



**Is our Metric
Predictable
and/or
Capable?**

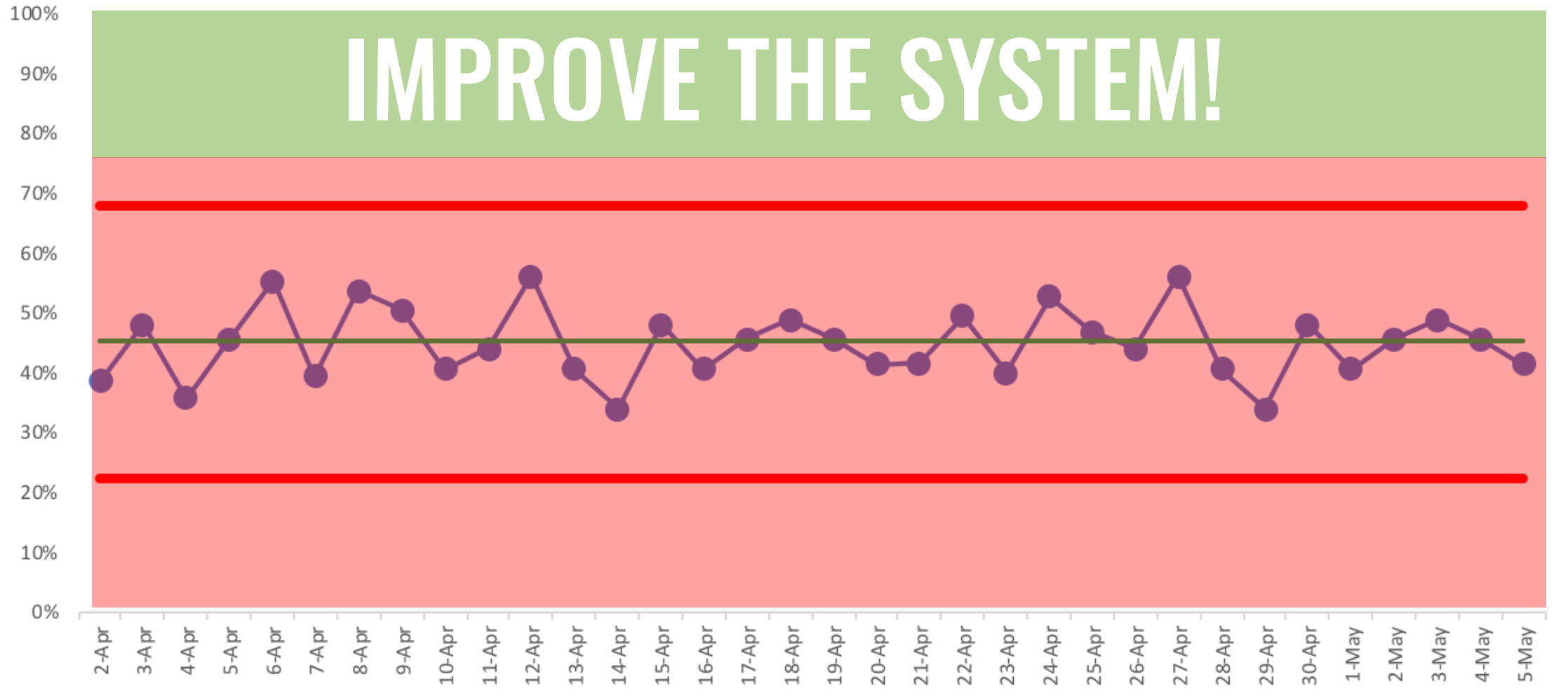
Unpredictable & Not Meeting Target

X Chart (Individuals Data)

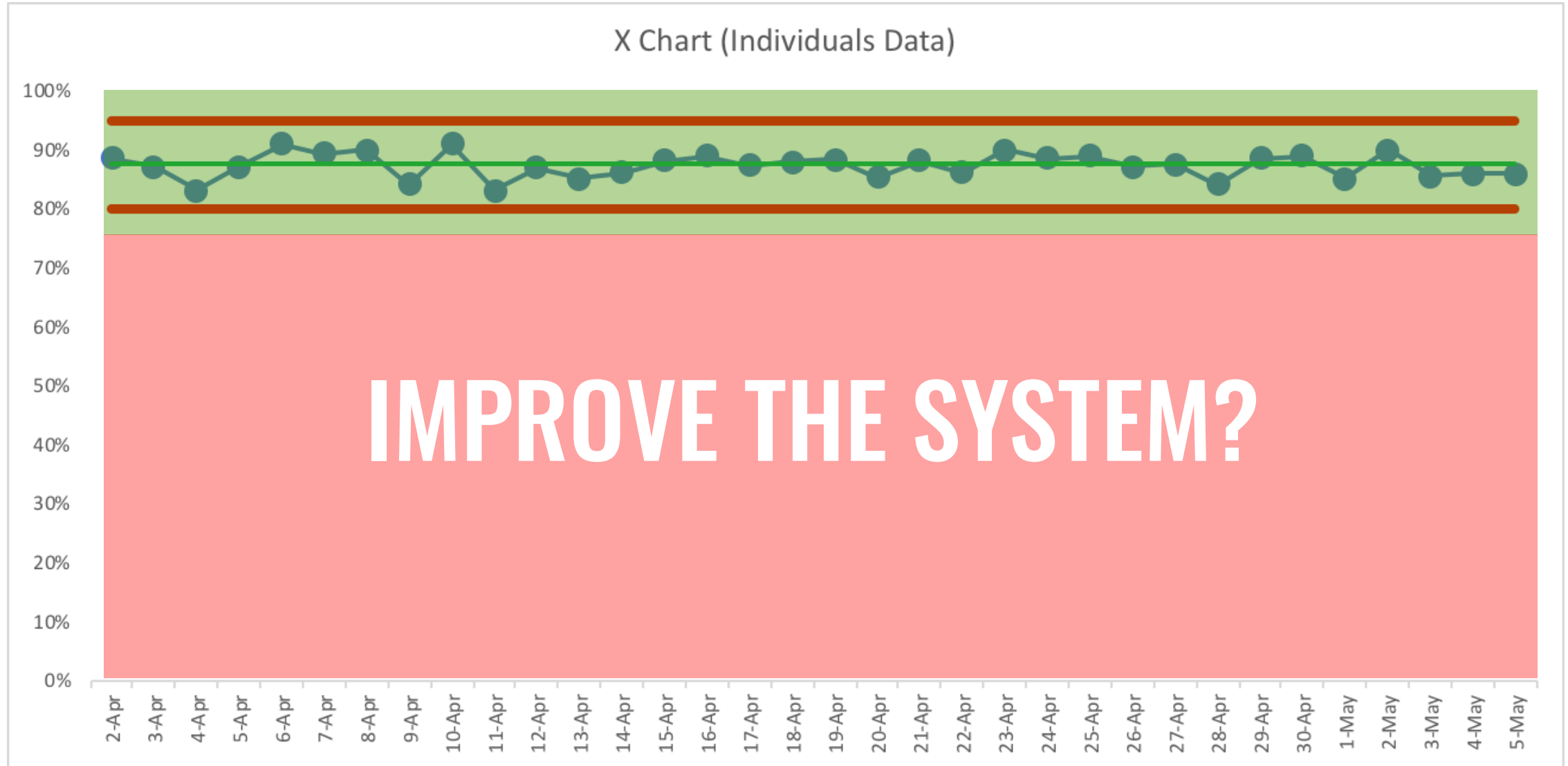


Predictable & Not Meeting Target

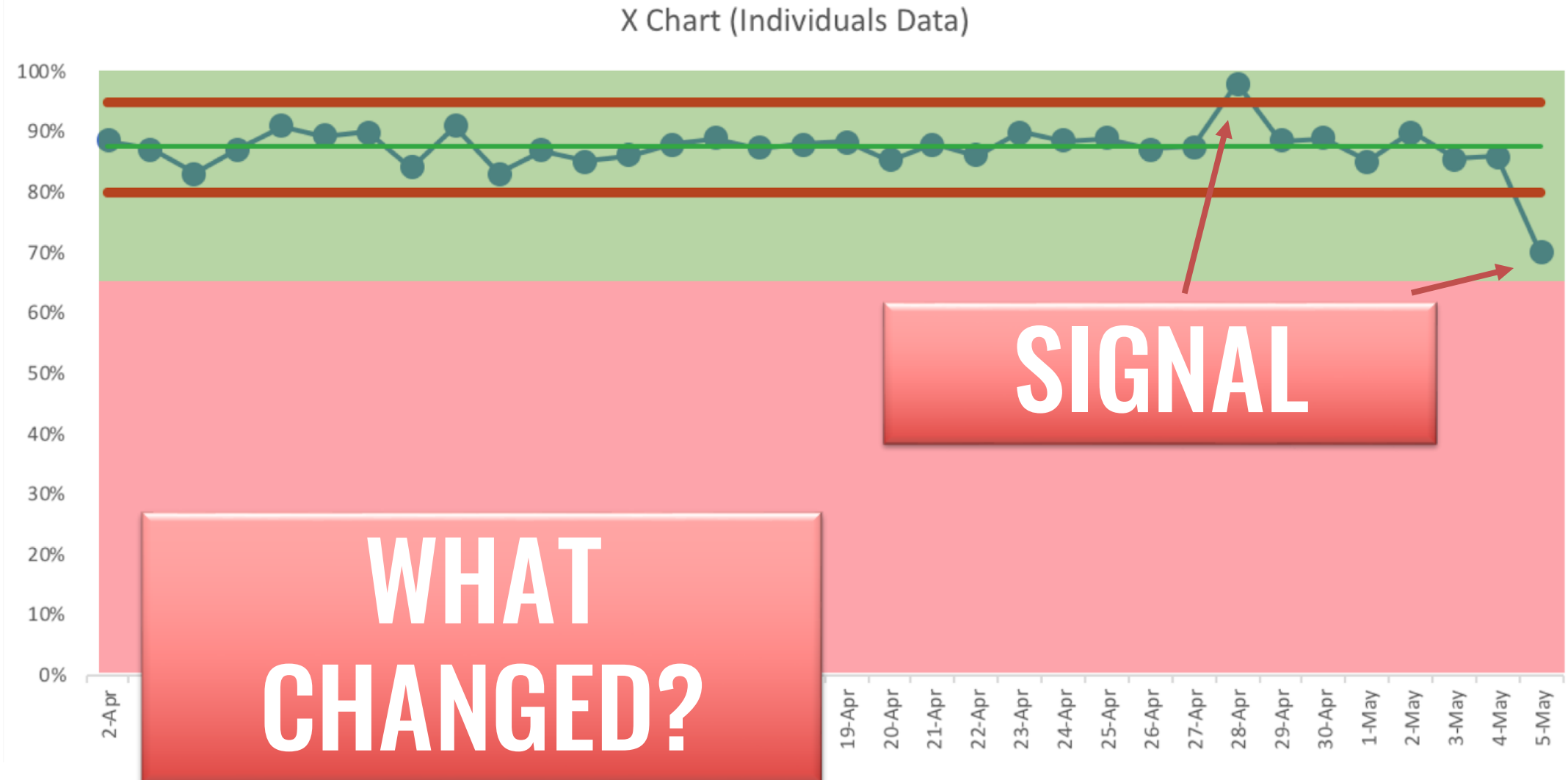
X Chart (Individuals Data)



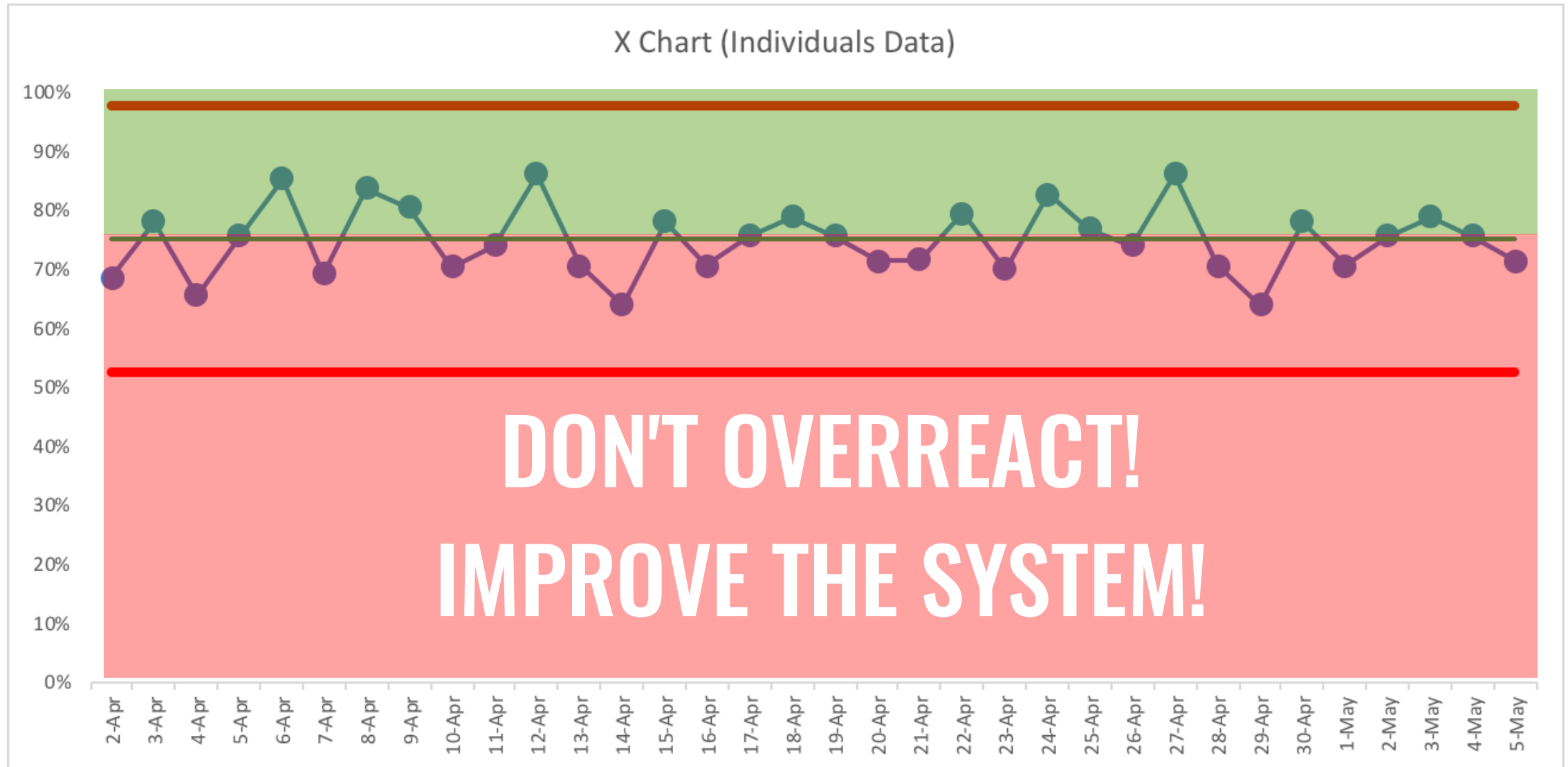
Predictable and Always Meets Target

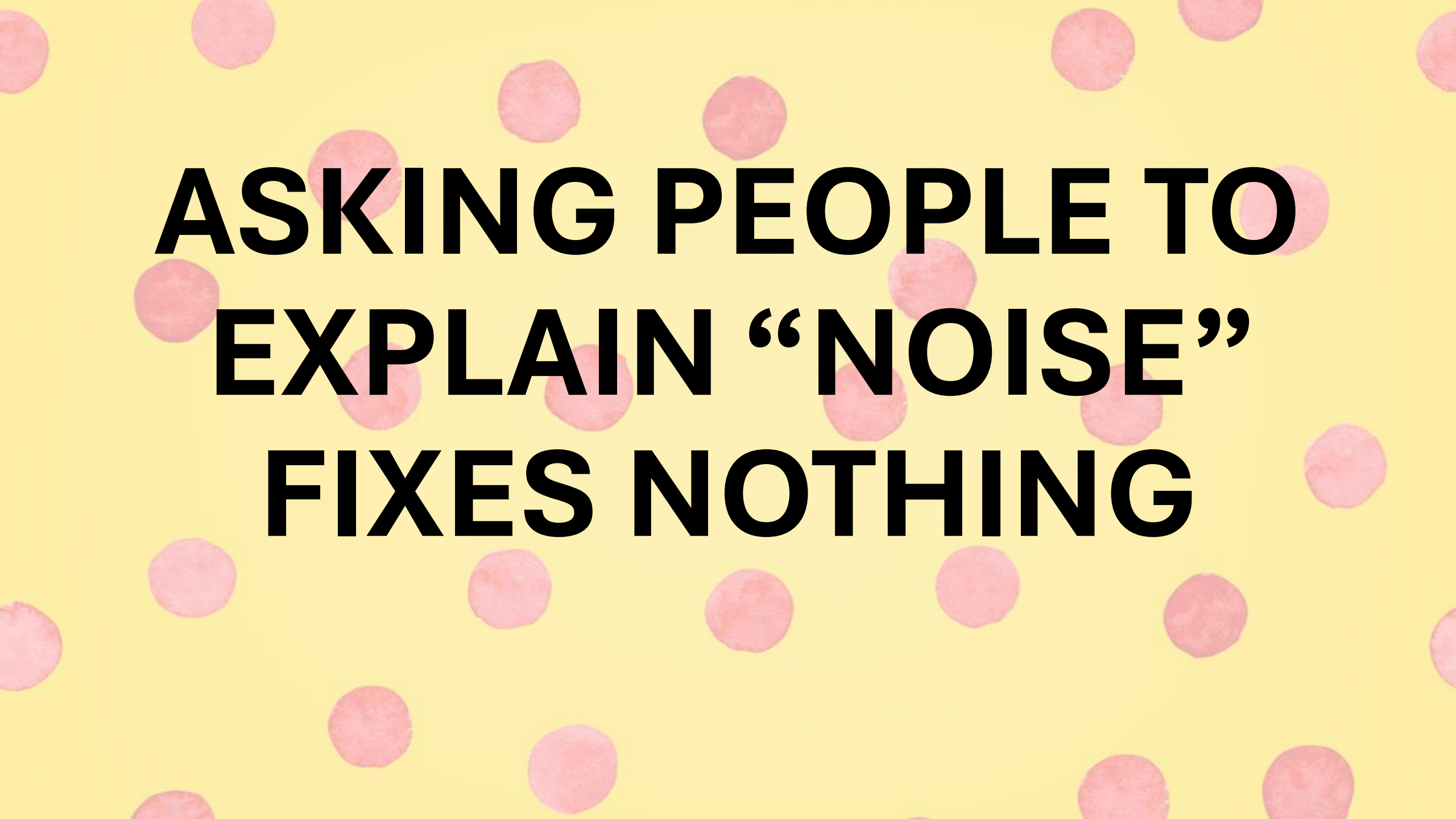


Looking for Signals in a Metric That Meets Target



Predictable and Sometimes Meets Target



The background of the image is a solid light yellow color, decorated with numerous pink circles of varying sizes, resembling polka dots. The text is centered and reads:

**ASKING PEOPLE TO
EXPLAIN “NOISE”
FIXES NOTHING**

The background of the image is a solid light yellow color, decorated with numerous pink circles of varying sizes, resembling polka dots. The text is centered and consists of three lines, each in a bold, black, sans-serif font.

REACT LESS
LEAD BETTER
IMPROVE MORE

Q&A and Contact Info:

mark@markgraban.com

www.MeasuresOfSuccessBook.com

www.MistakesBook.com

www.MarkGraban.com

"... a readable, informative book to guide any leader who wants to help an organization achieve true and lasting success."
Eric Ries, Author of "The Lean Startup" and "The Startup Way"

MEASURES — OF — SUCCESS

REACT LESS, LEAD BETTER, IMPROVE MORE



MARK GRABAN

FOREWORD BY DONALD J. WHEELER, PH.D.