



Foillimneacht na Seirbhíse Sláinte
Health Service Executive

Quality Improvement Division

QI TALK TIME

Building an Irish Network of Quality Improvers

Run Charts

Speaker: Dr Michael Carton

19th Dec 2017

Connect

Improve

Innovate

Speaker

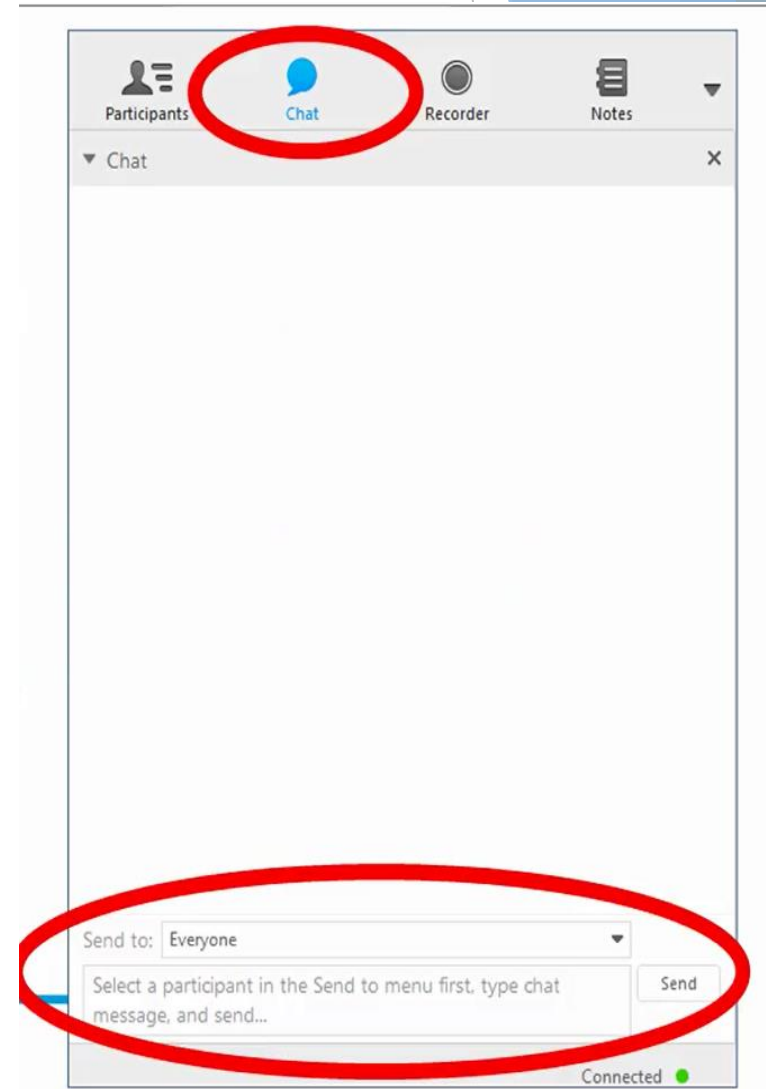
Speaker: Dr Michael Carton

- ▶ Michael's background is as a scientist, having received a Ph.D. in Microbiology from NUI Galway. Michael worked for a number of years in research and in public health/infectious disease surveillance at national and local level and received a masters in health informatics from Trinity College Dublin in 2007.
- ▶ Michael's current work focuses on supporting the use of healthcare data and information to drive and evaluate improvement. Michael is part of the Quality Improvement Division Measurement for Improvement team, whose mission is "Quality of Care is improved by the routine use of the right information, being measured in the right way to make better decisions".



Instructions

- ▶ Interactive
- ▶ Sound
- ▶ Chat box function
 - ▶ Comments/Ideas
 - ▶ Questions
- ▶ Q&A at the end
- ▶ **Twitter: @QITalktime**





Féilhméanacht na Seirbhíse Sláinte
Health Service Executive

Quality Improvement Division

Measurement for
Improvement Team
Quality Improvement Division



The Run Chart: a tool for Quality Improvement

Dr Michael Carton

QID Measurement for Improvement Team

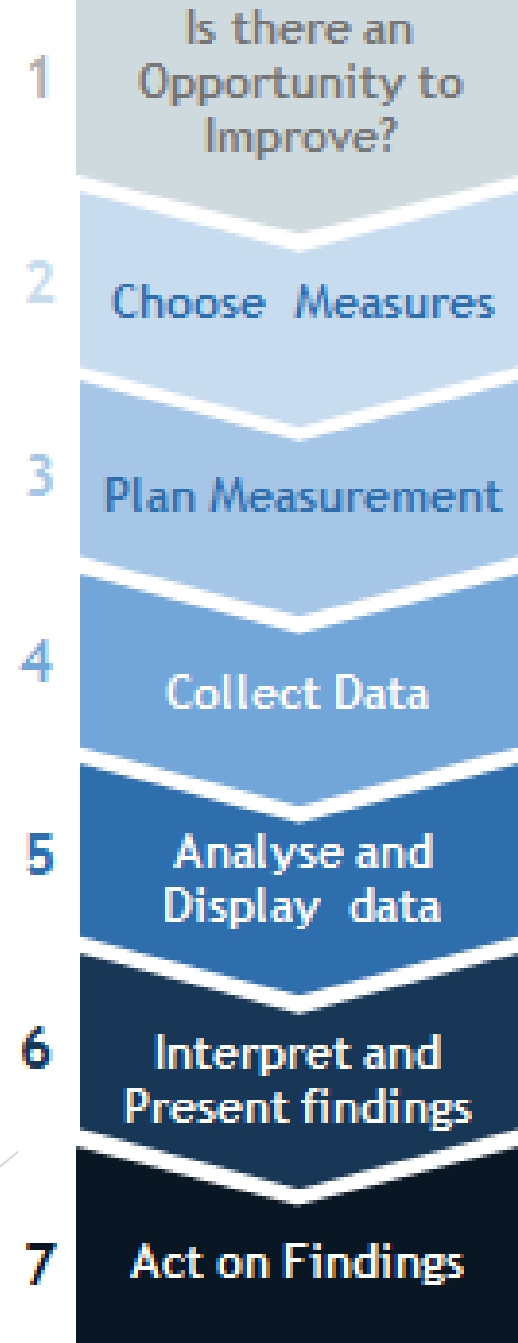
Tuesday 19th December, 2017



Previously, on QI Talktime...

The powers and pitfalls of Measurement for Improvement

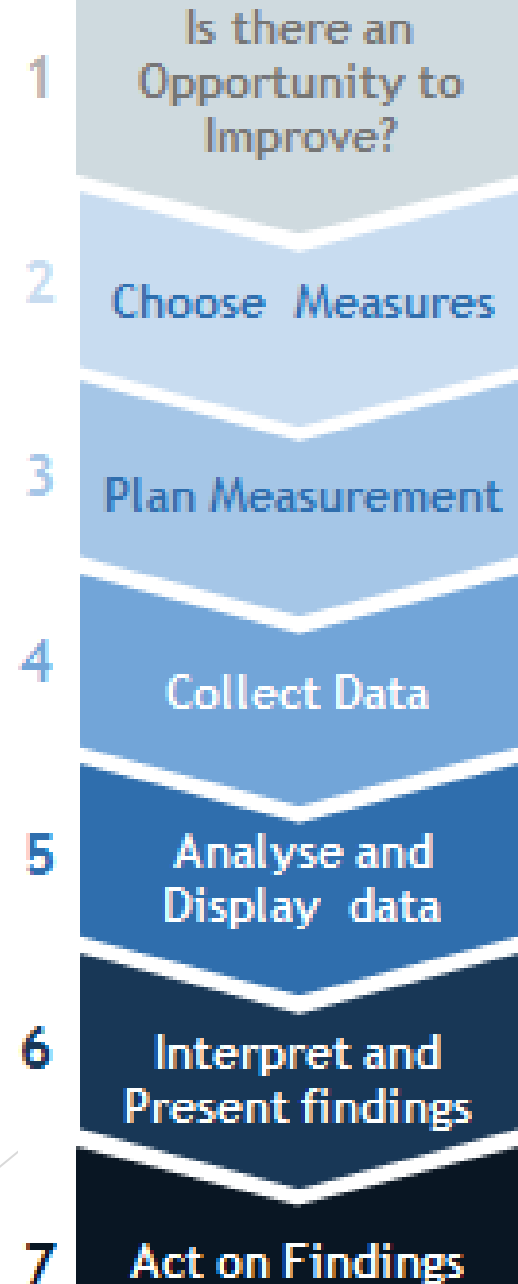
- ▶ What is Measurement for Improvement?
- ▶ The value of Measurement for Improvement
- ▶ The 7 steps towards Measurement for Improvement



Today, on QI Talktime...

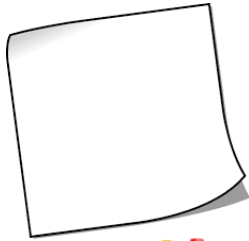
Step 5: Analyse and Display Data

- ▶ What is a Run Chart?
- ▶ When to use a Run Chart
- ▶ How do draw a Run Chart on paper
- ▶ How to interpret a Run Chart



Today we are going to make a run chart

YOU WILL NEED:



SHEET OF PAPER



MARKERS OR PENS



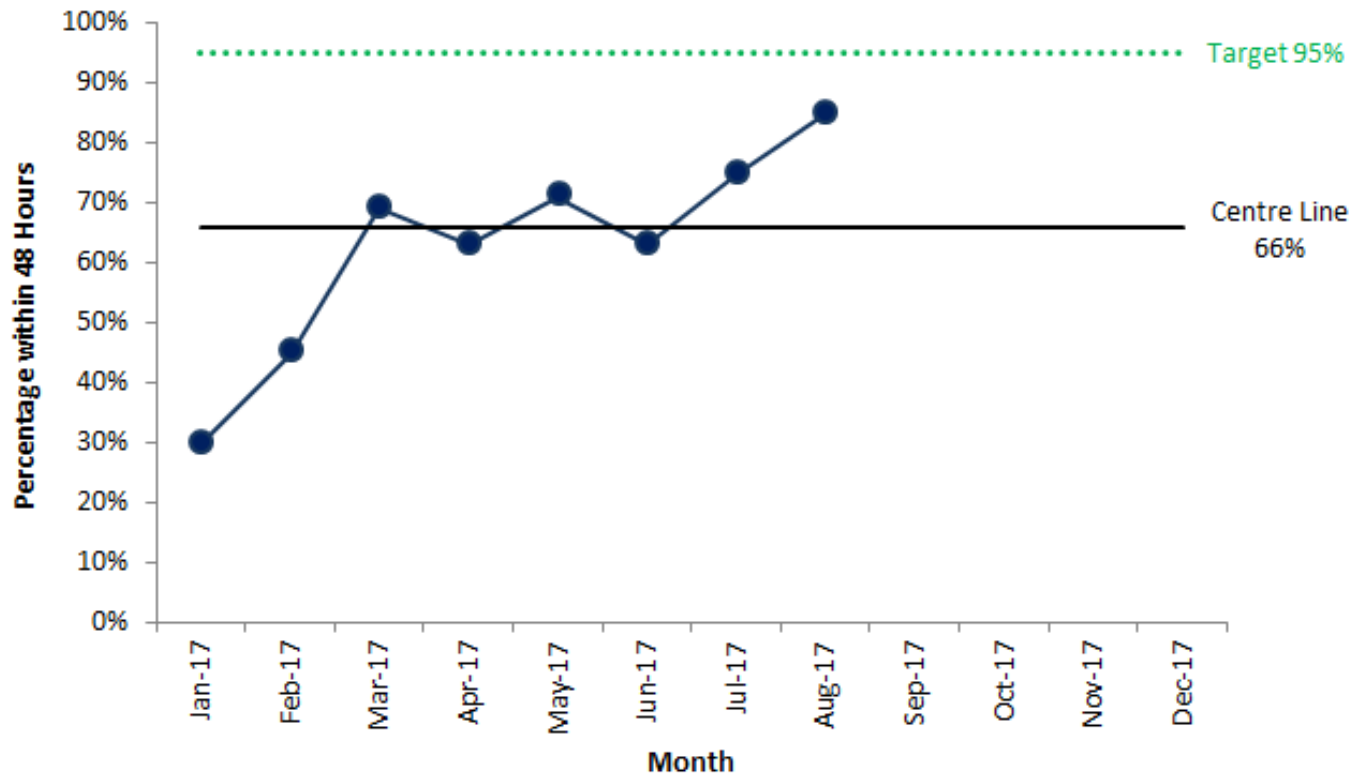
SOME DATA ✓



What is a Run Chart?

- ▶ A chart that displays data over time
e.g. Monthly or weekly data
Includes a Centre Line (C.L.)

Example 1: Percentage of patients with a hip fracture undergoing surgery within 48 hours, by month



What kind of Data is suitable for a Run Chart?

Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

TALLY	FREQUENCY
	8
	9
	17
	16
	9
	19
	11

Metascope
ICD Registry™ AMERICAN MEDICAL ASSOCIATION
NCDR® ICD Registry™ V2.1 Data Collection Form - Generator & Leads

A. DEMOGRAPHICS

Last Name¹ First Name¹ Middle Name¹
SSN² Patient ID³ Other ID⁴
Birth Date⁵ Sex⁶ Male Female Hispanic or Latino Ethnicity⁷ No Yes
Race⁸ White⁹ Black/African American¹⁰ Asian¹¹ American Indian/Alaskan Native¹² Native Hawaiian/Pacific Islander¹³

B. EPISODE OF CARE (continued)

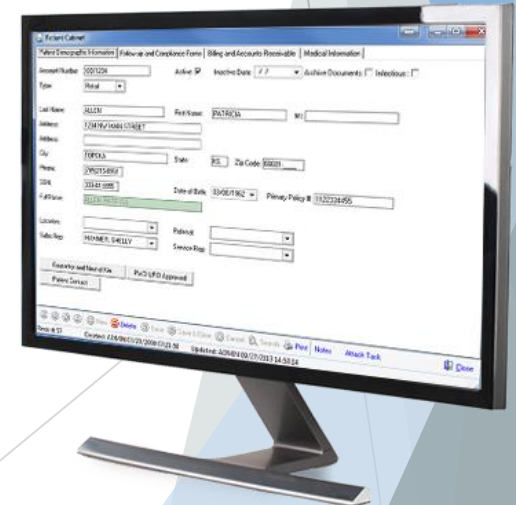
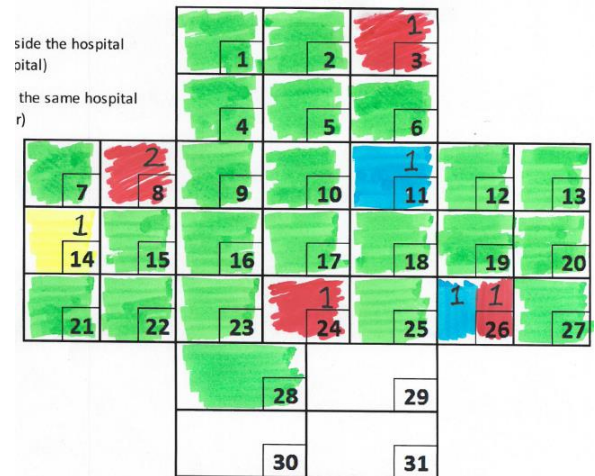
Admission Date¹⁴ Patient Zip Code¹⁵ Zip Code NA¹⁶
Reason for Admission¹⁷ Admitted for this procedure Cardiac - Heart Failure Cardiac - Other Non-Cardiac
Insurance Payer(s)¹⁸ Private Health Insurance¹⁹ Medicare²⁰ Medicaid²¹ Military Health Care²²
Work at time of event²³ State-Specific Plan (Non-Medicare)²⁴ Indian Health Service²⁵ Non-U.S. Insurance²⁶ None²⁷

C. HISTORY AND RISK FACTORS (complete only once for episodes of care unless noted or specified)

Heart Failure²⁸ No Yes
→ If Yes: Duration of Symptoms Since Initial Onset²⁹ < 3 months 3 to 6 months > 6 months
→ If Yes: Prior Heart Failure Hospitalization³⁰ No Yes
→ If Yes: Prior HF Hospital Transcatheter³¹ No Yes
NYHA Functional Classification³² Class I Class II Class III Class IV
Non-Ischemic Dilated Cardiomyopathy³³ No Yes → If Yes: Transcatheter³⁴ 0 to 3 months 3 to 6 months > 6 months
Prior Heart Transplant³⁵ No Yes Syncope³⁶ No Yes
On Heart Transplant Waiting List³⁷ No Yes Family History of Sudden Death³⁸ No Yes
Atrial Fibrillation/Flutter³⁹ No Yes
→ If Yes: AF/A-Flutter Classification⁴⁰ Paroxysmal Persistent (> 7 days) Persistent (> 1 year)
Secondary (reversible cause) Unknown
Ventricular Tachycardia⁴¹ No Yes
→ If Yes: Non-sustained Instability⁴² No Yes Unknown
→ If Yes: Sustained Instability⁴³ Non-sustained VT Sustained monomorphic VT Sustained polymorphic VT
→ If Yes: VT Type⁴⁴ Sustained monomorphic and polymorphic VT Unknown
Cardiac Arrest⁴⁵ No Yes → If Yes: Most Recent Arrest Date⁴⁶ _____
→ If Yes: VTach/Vfib Arrest⁴⁷ No Yes Unknown
→ If Yes: Bradycardia Arrest⁴⁸ No Yes Unknown
Syndromes w/ Risk of Sudden Death⁴⁹ No Yes
→ If Yes: Syndrome Type⁵⁰ Long QT syndrome Short QT syndrome Brugada syndrome
Catecholaminergic polymorphic VT Other

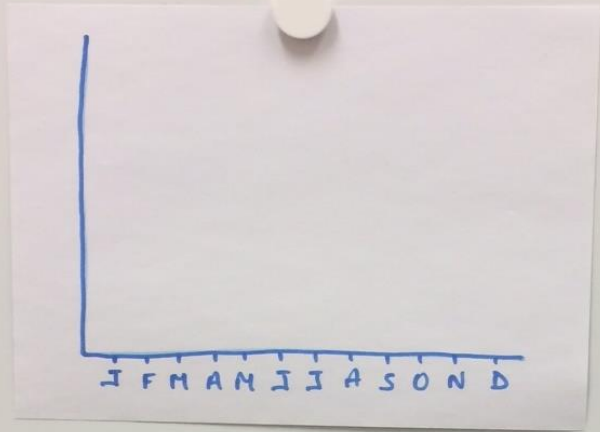
Previous ICD⁵¹ No Yes
→ If Yes: Type⁵² Single chamber Dual chamber CRT-D
→ If Yes: Previous ICD Implant Site⁵³ Chest Abdomen
→ If Yes: Previous ICD Date⁵⁴ _____
→ If Yes: Previous ICD Reason⁵⁵ Primary prevention Secondary prevention
→ If Secondary Prevention: Reason for Initial Implant (check all that apply)
Cardiac Arrhythmia-Biology Unknown⁵⁶ Spontaneous Sustained VT⁵⁷ Syncope with High Risk Characteristics⁵⁸
Syncope with Inducible VT⁵⁹ Ventricular Fibrillation⁶⁰ Not Documented⁶¹

Source: Pacing Clin Electrophysiol © 2012 Blackwell Publishing




Month	Pressure Ulcers
January	36
February	44
March	26
April	49
May	43
June	51
July	48
August	39
September	29
October	22
November	28
December	

1 STEP 1: DRAW AXES



X-AXIS: Showing Data over Time

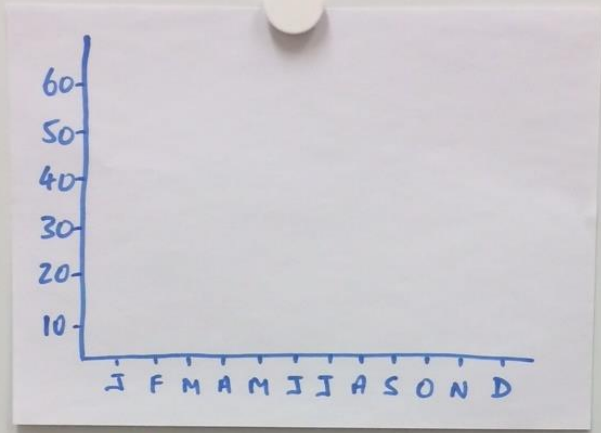
The FRAMEWORK for IMPROVING Quality in our Health Service



Month	Pressure Ulcers
January	36
February	44
March	26
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December	


1 STEP 1: DRAW AXES

Y-Axis →
Choose a suitable scale



X-Axis: Showing Data over Time

The FRAMEWORK for
IMPROVING Quality
in our Health Service



Month	Pressure Ulcers
January	36
February	44
March	26
April	49
May	43
June	51
July	48
August	39
September	29
October	22
November	28
December	

2 STEP 2: PLOT DATA

Y-Axis:

Choose a suitable scale

DATA:

Make the data stand out

X-Axis: Showing Data over Time

The FRAMEWORK for IMPROVING Quality in our Health Service

Month	Pressure Ulcers
January	36
February	44
March	26
April	49
May	43
June	51
July	48
August	39
September	29
October	22
November	28
December	

3 STEP 3: DRAW A Centre Line

Centre Line:
= the Median

Calculating the Median

► The **Median** is the data point where half the data points are above the median and half are below

- Take your Data:

36	44	26	49	43	51	48	39	29	22	28
----	----	----	----	----	----	----	----	----	----	----

- Put your Data in order from lowest to highest:

22	26	28	29	36	39	43	44	48	49	51
----	----	----	----	----	----	----	----	----	----	----

- The middle data point is the **Median**

Month	Pressure Ulcers
January	36
February	44
March	26
April	49
May	43
June	51
July	48
August	39
September	29
October	22
November	28
December	

3 STEP 3: DRAW A Centre Line

Y-Axis: →
Choose a suitable Scale

DATA:
Make the data stand out

Centre Line:
= the Median

X-Axis: → Showing Data over Time

The FRAMEWORK for IMPROVING Quality in our Health Service

Tweet your Run Charts

 @QImeasurement

QI TALK TIME

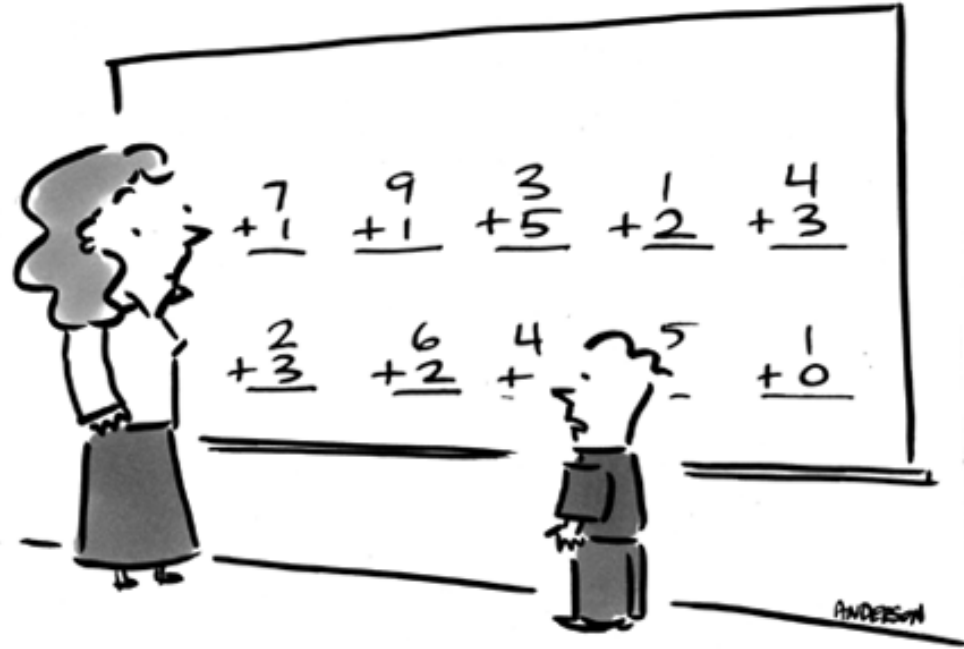


Building an Irish Network of Quality improvers

Using a Computer to Make Run Charts

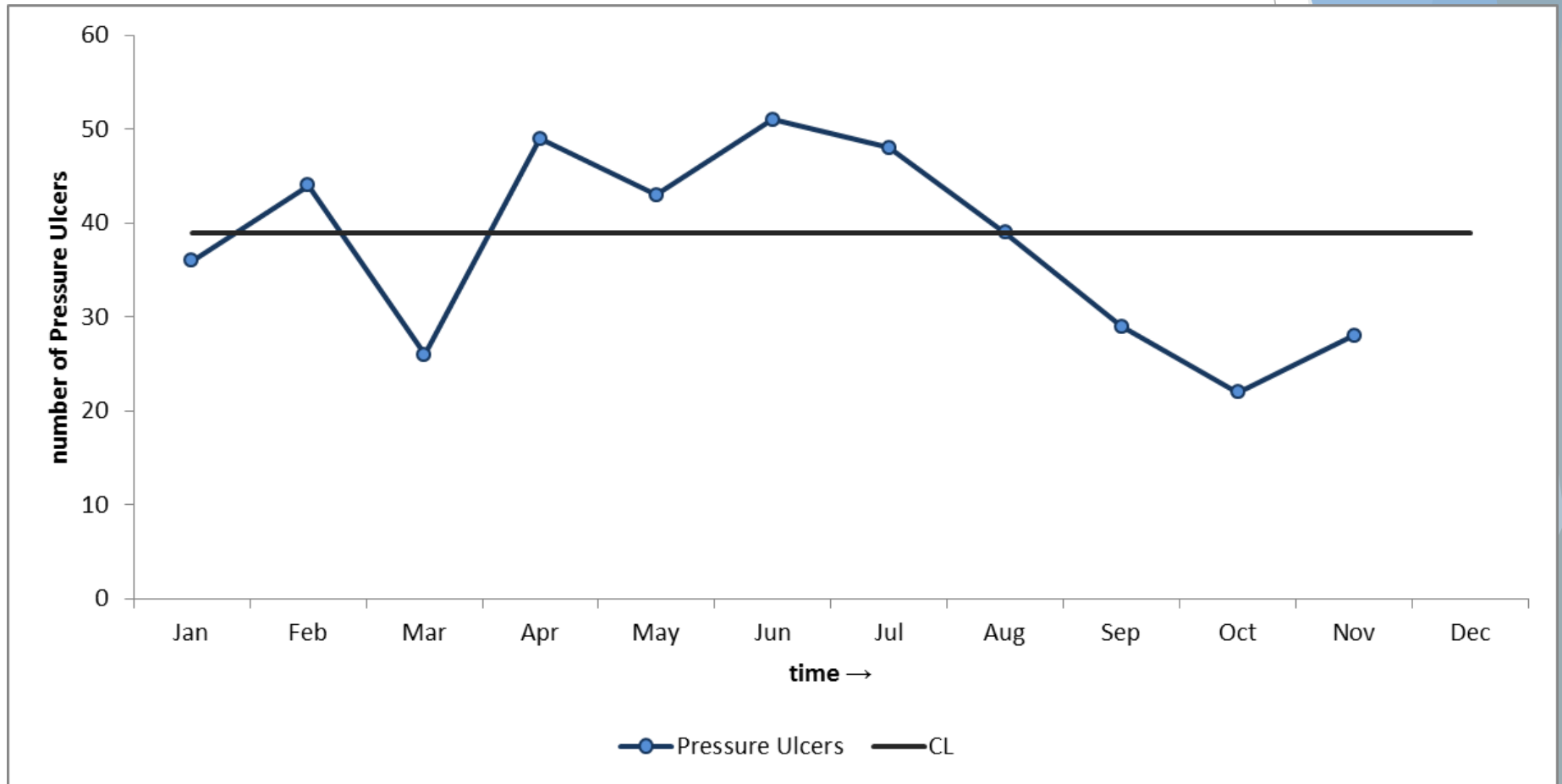
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"All I'm saying is we plug these into Excel, let it do its thing, and then we can all play until lunch!"

▶ Here's one I made earlier...



Why use a Run Chart?

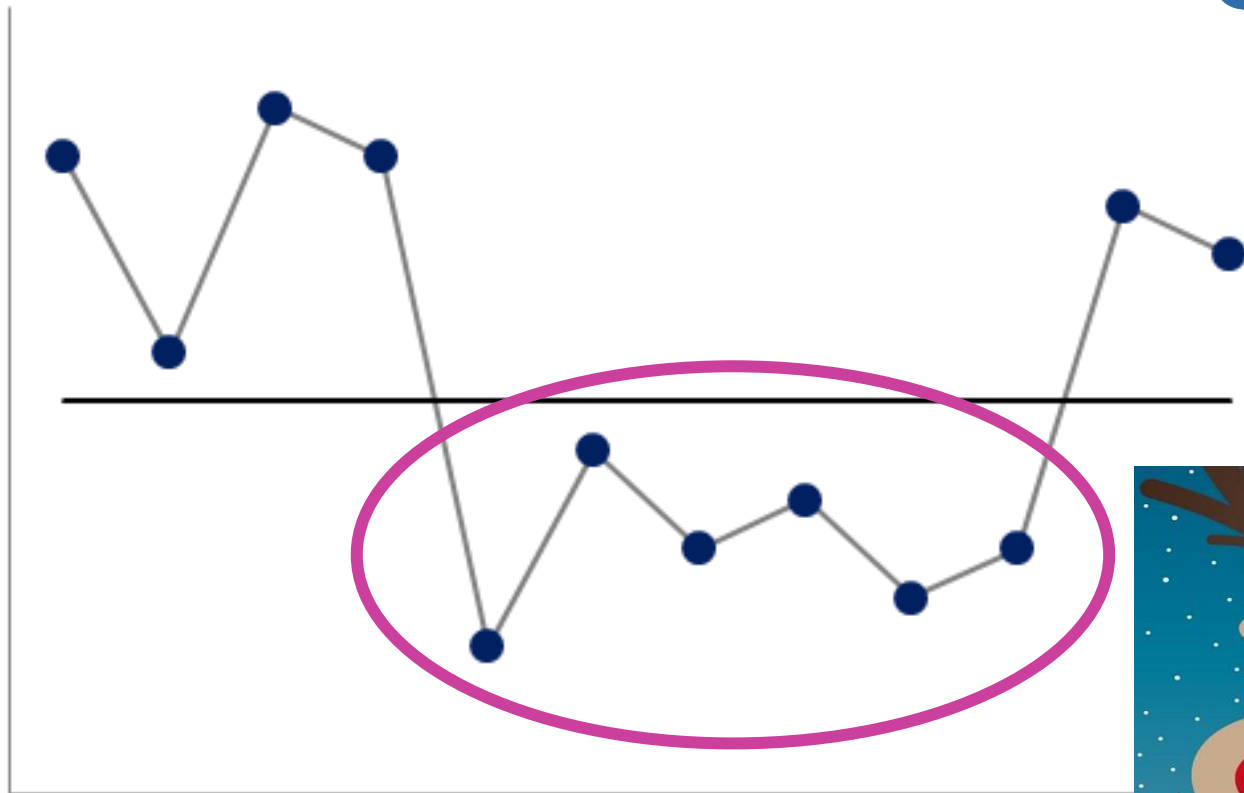
- ▶ The purpose of using a Run Chart is to help answer the question: has a change resulted in improvement?
 - ▶ Change happens over time
 - ▶ The importance of the Subject Matter Expert
- ▶ Easy To Construct
- ▶ Can be done from the start of a project
 - ▶ No Baseline Required
- ▶ Run charts are suitable for many types of data
- ▶ Easy to Interpret
- ▶ No detailed knowledge of statistics required

How to Interpret a Run Chart

- ▶ Using a run chart to understand the variation that lives in your data
- ▶ Four Rules for detecting non-random signals in your Run Chart

Rule 1 :the Shift

A run of 6 or more consecutive points above or below the centre line (a shift)



6

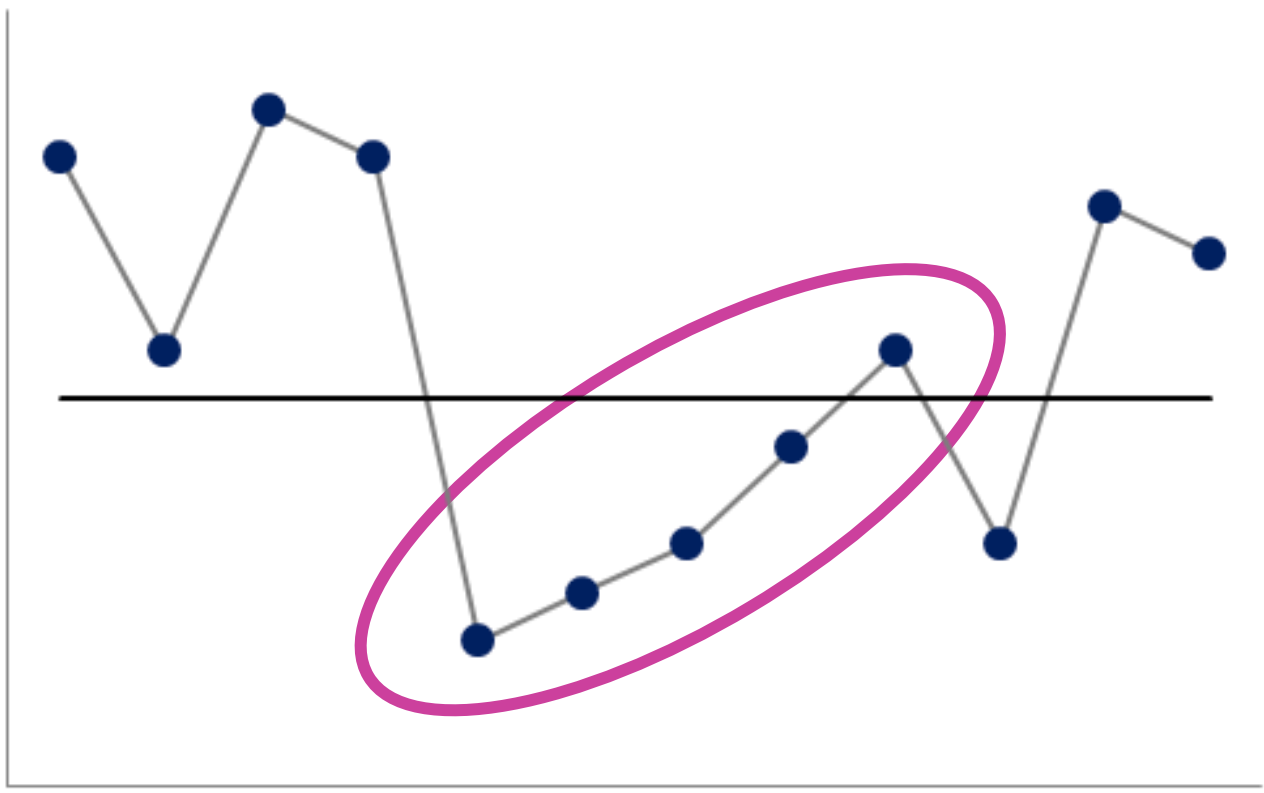


is also the no. of Sleeps to Santa!



Rule 2: the Trend

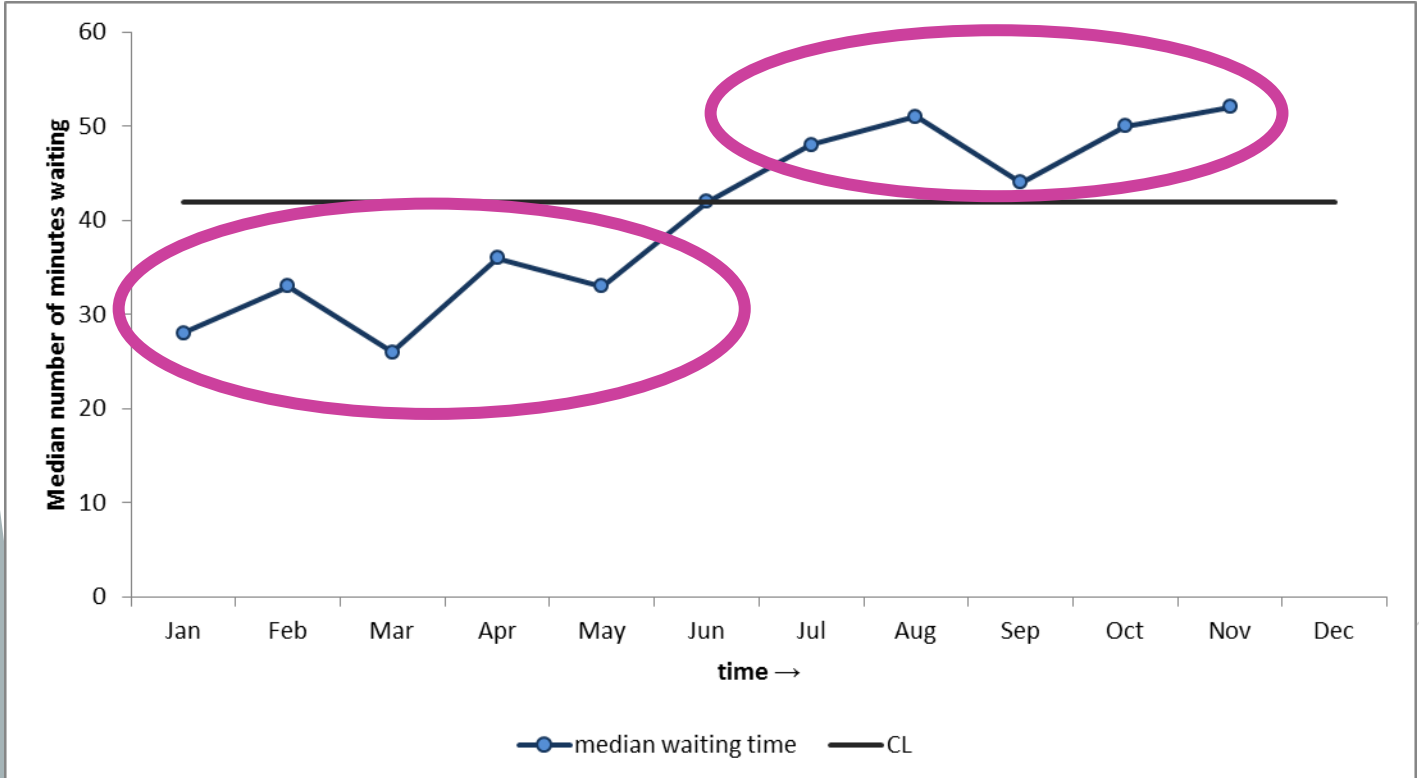
A trend of five or more consecutive points all going up or down



Rule 3: too many or too few runs

Use the Reference table to check if there are too few or too many runs

A Run Chart with 11 data points should have at least 3 runs (and no more than 10 runs)




Guidance Note

- ▶ The full Table is available in the Guidance Note: ‘Run Chart Rules’


ORIGINAL RESEARCH

The run chart: a simple analytical tool for learning from variation in healthcare processes

Rocco J Perla,¹ Lloyd P Provost,² Sandy K Murray³

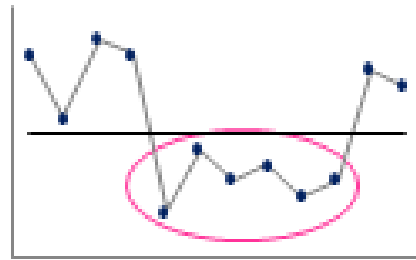


Measurement for Improvement
Guidance Note

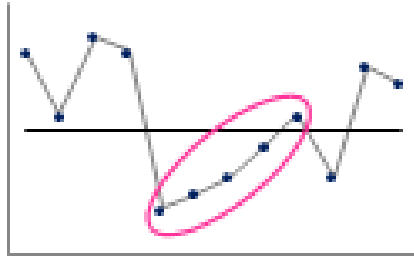


Rules for detecting non-random signals in run charts

1. A run of 5 or more consecutive points above or below the centre line (a shift)



2. A trend of five or more consecutive points all going up or down



3. Too few or too many runs
A run is a series of points in a row on one side of the centre line (median). Too few or too many runs is a signal of a non-random pattern.

To determine the number of runs count the number of times the line connecting the data points crosses the centre line and add one.

Consult Table 1 to determine whether the number of runs is within the expected range, or whether there are too few or too many (indicating a non-random pattern).

4. An astronomical data point (an obviously different value that everyone would agree is highly unusual)

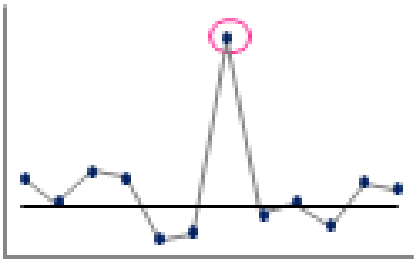


Table 1: Upper & lower limits for number of runs

N	Lower Limit	Upper Limit	N	Lower Limit	Upper Limit	N	Lower Limit	Upper Limit	N	Lower Limit	Upper Limit
24	4	4	26	7	17	28	10	16	30	13	22
25	5	10	27	8	18	29	11	17	31	14	23
26	6	11	28	9	19	30	12	18	32	15	24
27	7	12	29	10	20	31	13	19	33	16	25
28	8	13	30	11	21	32	14	20	34	17	26
29	9	14	31	12	22	33	15	21	35	18	27
30	10	15	32	13	23	34	16	22	36	19	28
31	11	16	33	14	24	35	17	23	37	20	29
32	12	17	34	15	25	36	18	24	38	21	30

N = Total number of data points on the run chart that do not fall on the center line

Lower Limit = Lower limit for the number of runs (less than this number of runs is too few)

Upper Limit = Upper limit for the number of runs (more than this number of runs is too many)

Source: Provost L, Murray S. The Healthcare Data Builder: Learning From Data For Improvement. San Francisco: Jossey-Bass, Publications 2002

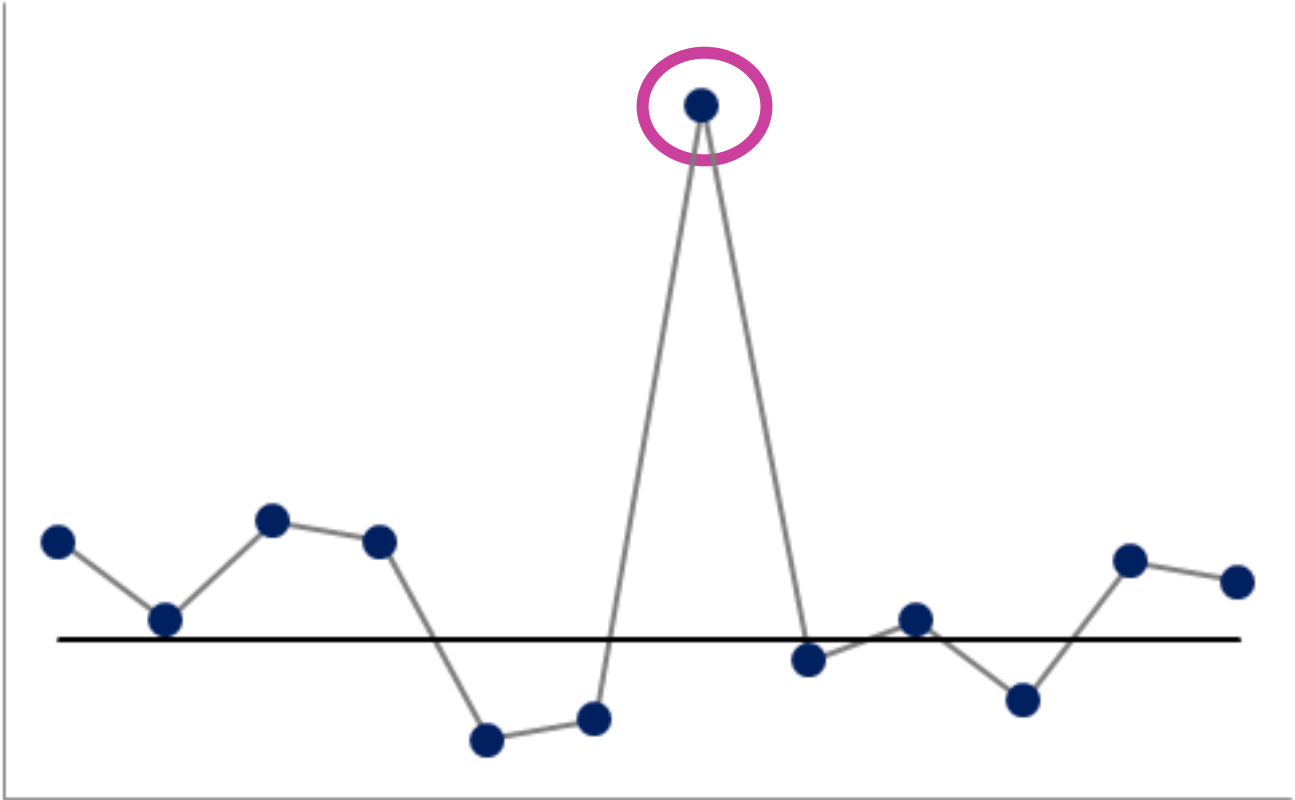
Your feedback will help us improve this content

QI@MIT@hsa.ie

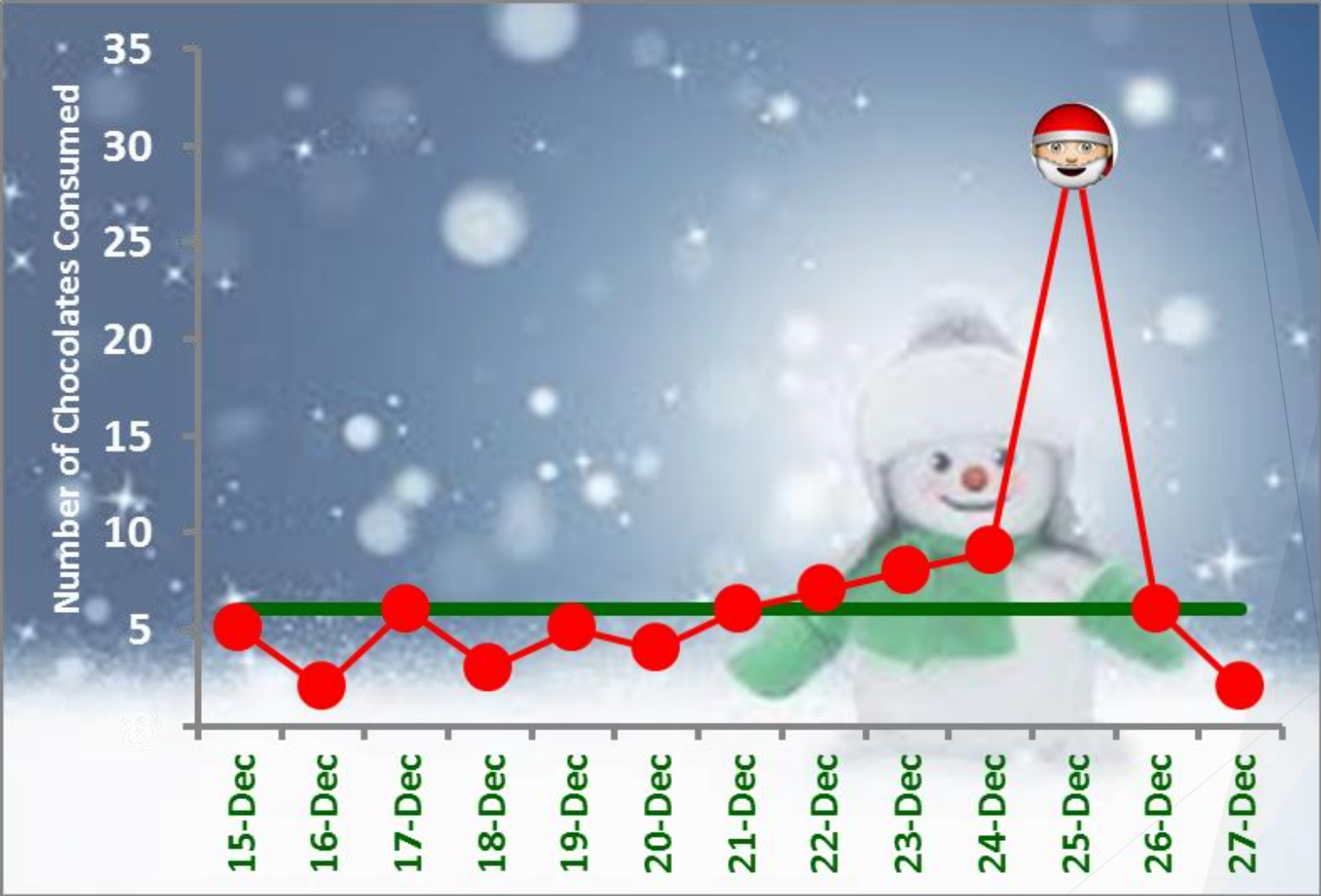
Version 1
23/11/2017

Rule 4: the astronomical data point

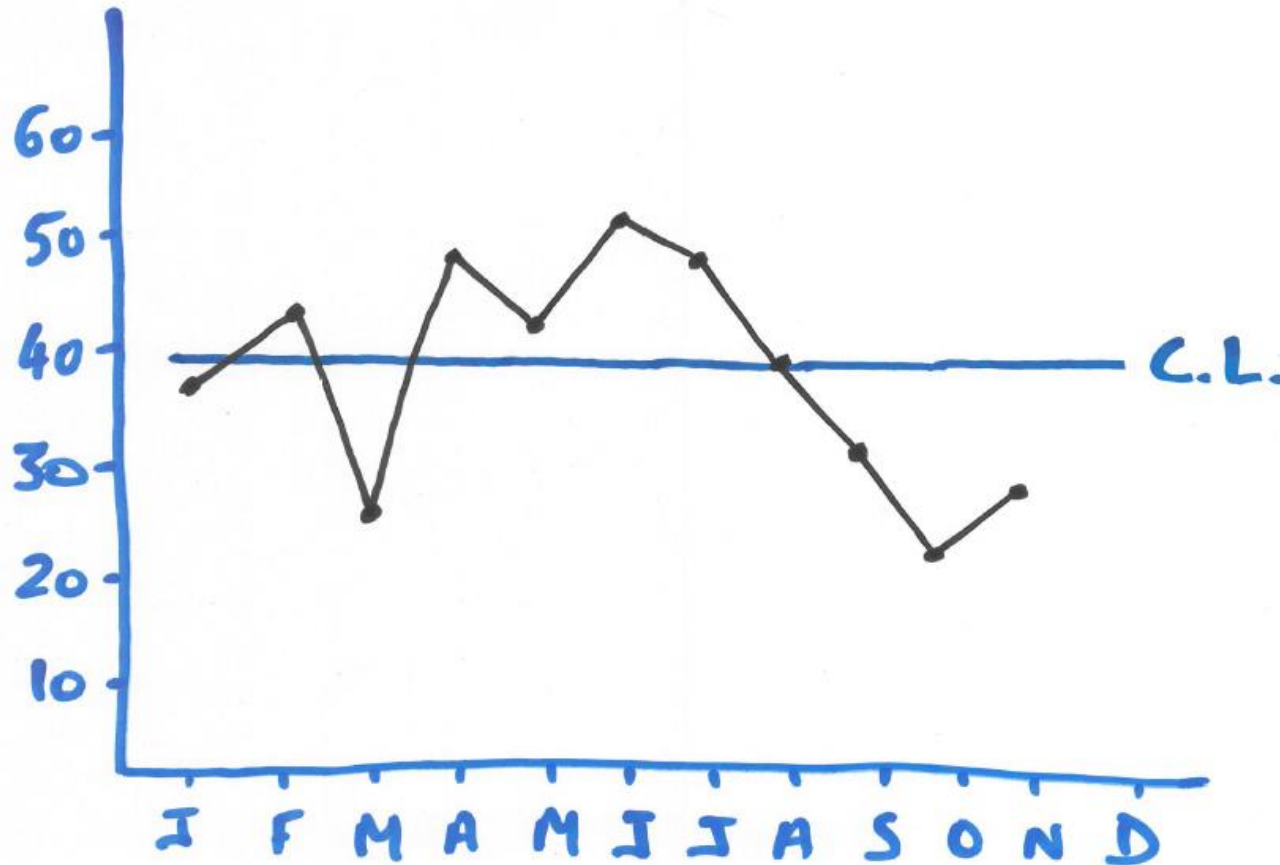
An astronomical data point (an obviously different value that everyone would agree is highly unusual)



Example of the astronomical data point:

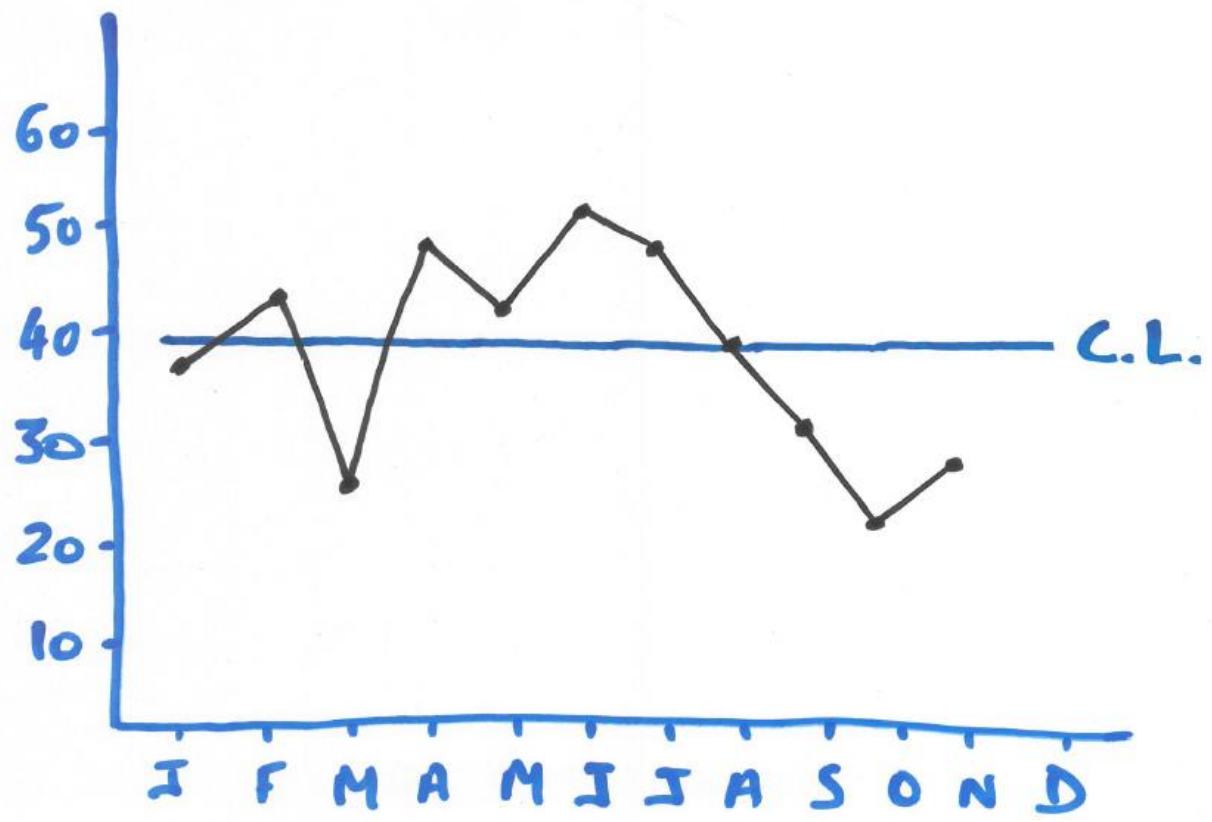


Back to the Run Chart we drew today...

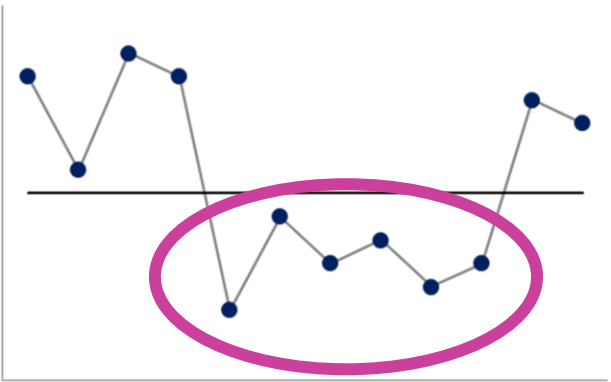


► Task: apply the rules to this chart

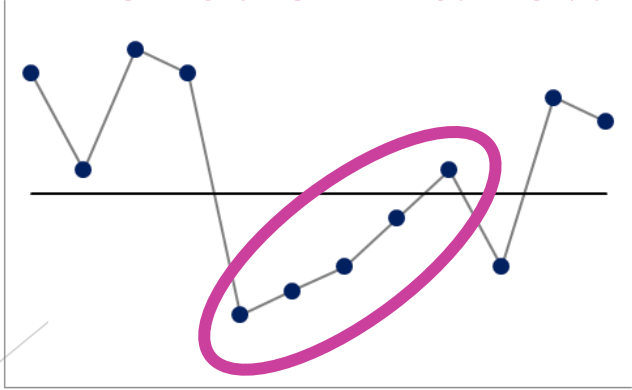
Task: apply the rules to this chart



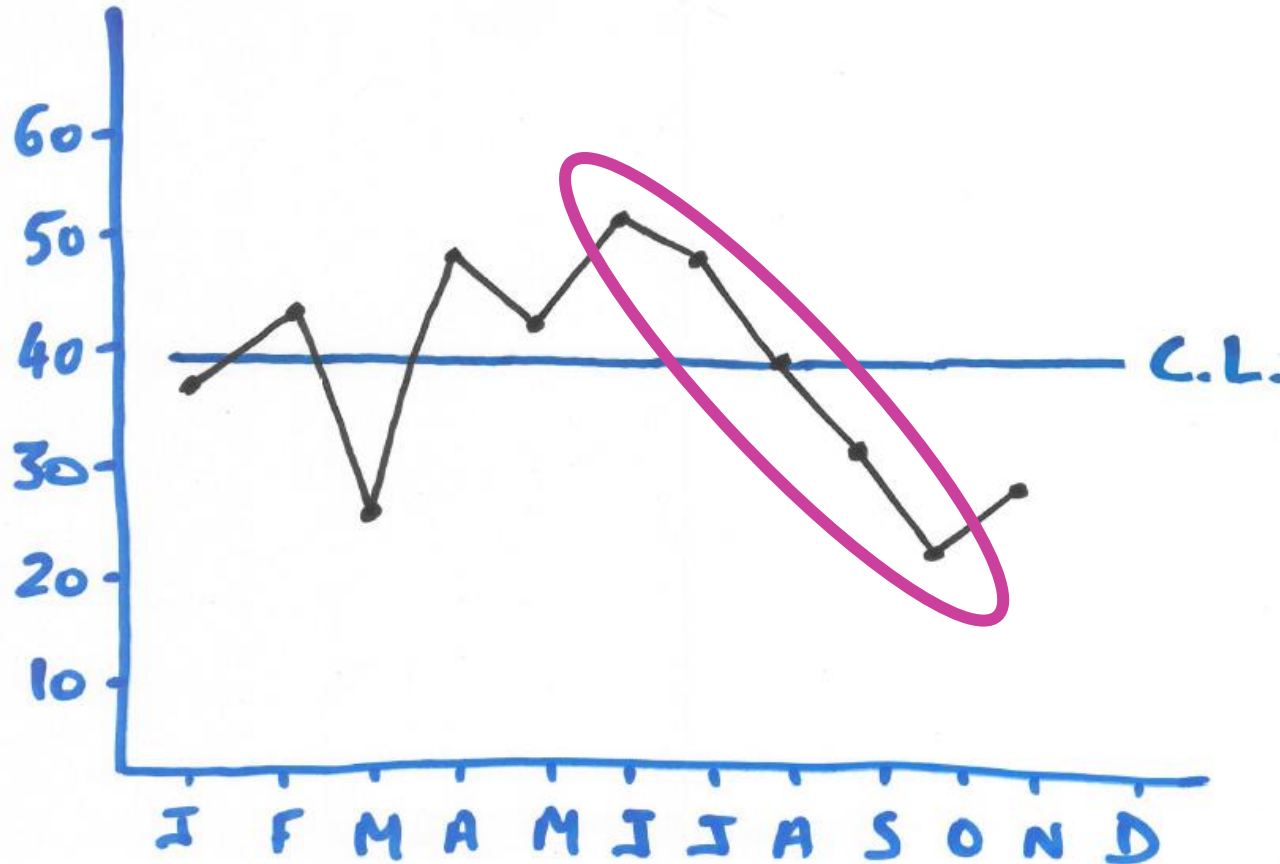
Shift: 6 in a row



Trend: 5 in a row

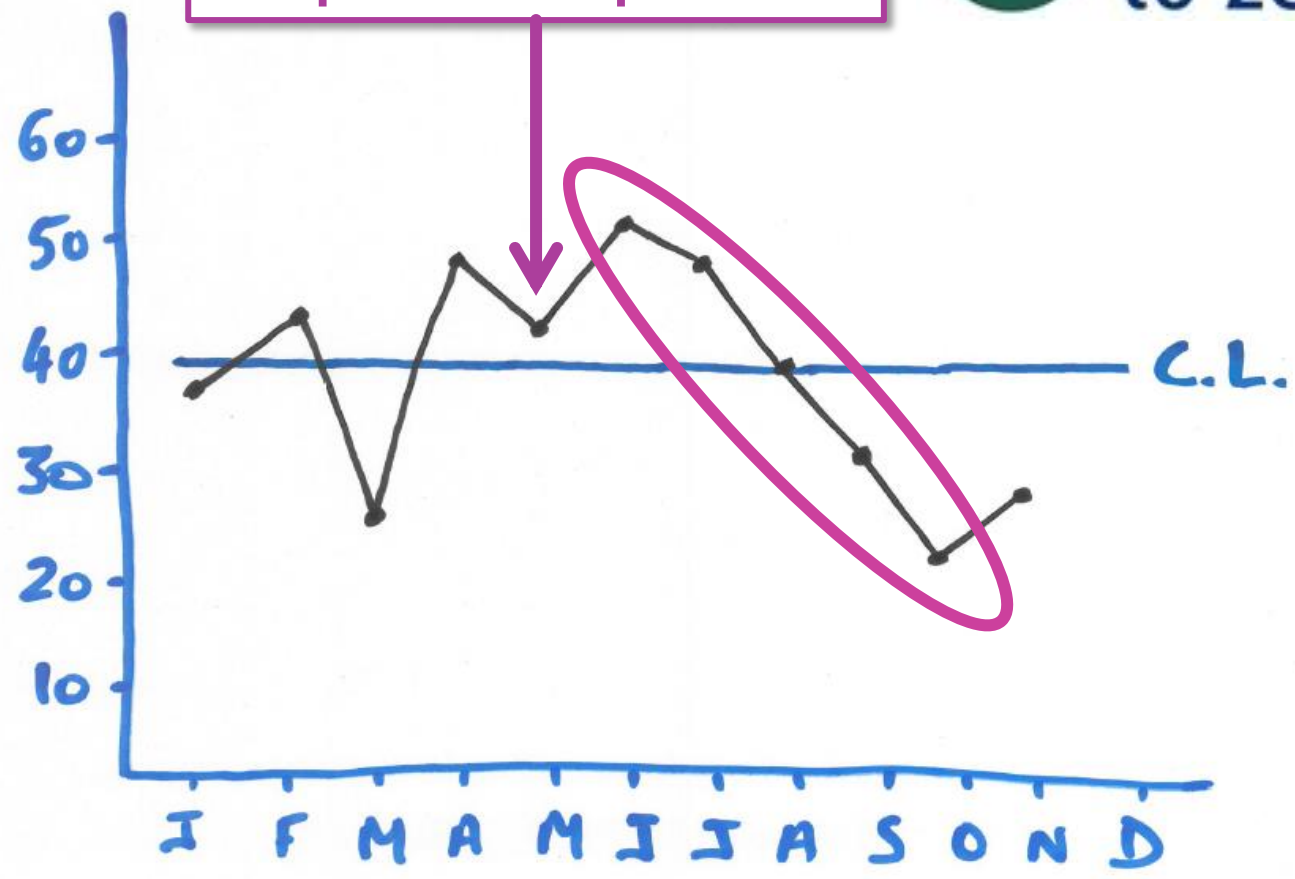


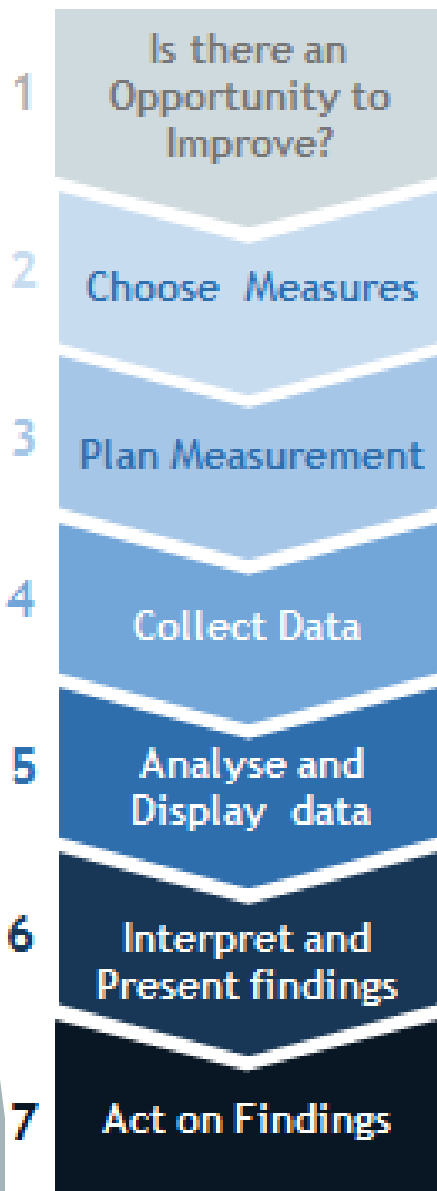
Trend: five or more consecutive points all going up or down



Annotating your Run Chart

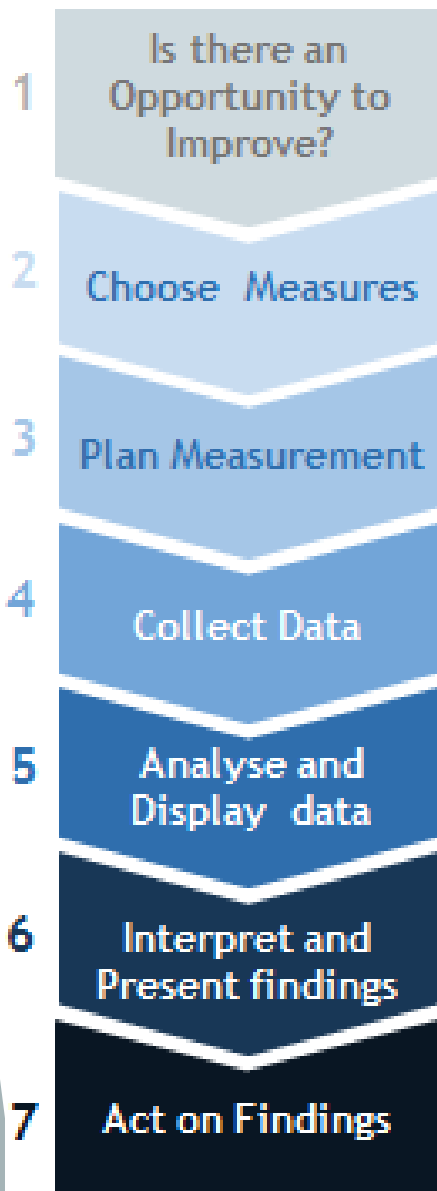
Beginning of PUTZ Collaborative in Hospital Group





Analyse and Display Data

- ▶ There are lots of ways to analyse and present data- it is important to remember to consider carefully which method of display you choose
- ▶ Use the right tool for the right job, and use it in the right way...



Interpret and Present Findings

- ▶ It is not enough to have good data, analysed and displayed appropriately!
- ▶ It has to get to the right audience
- ▶ They have to be ready to receive it

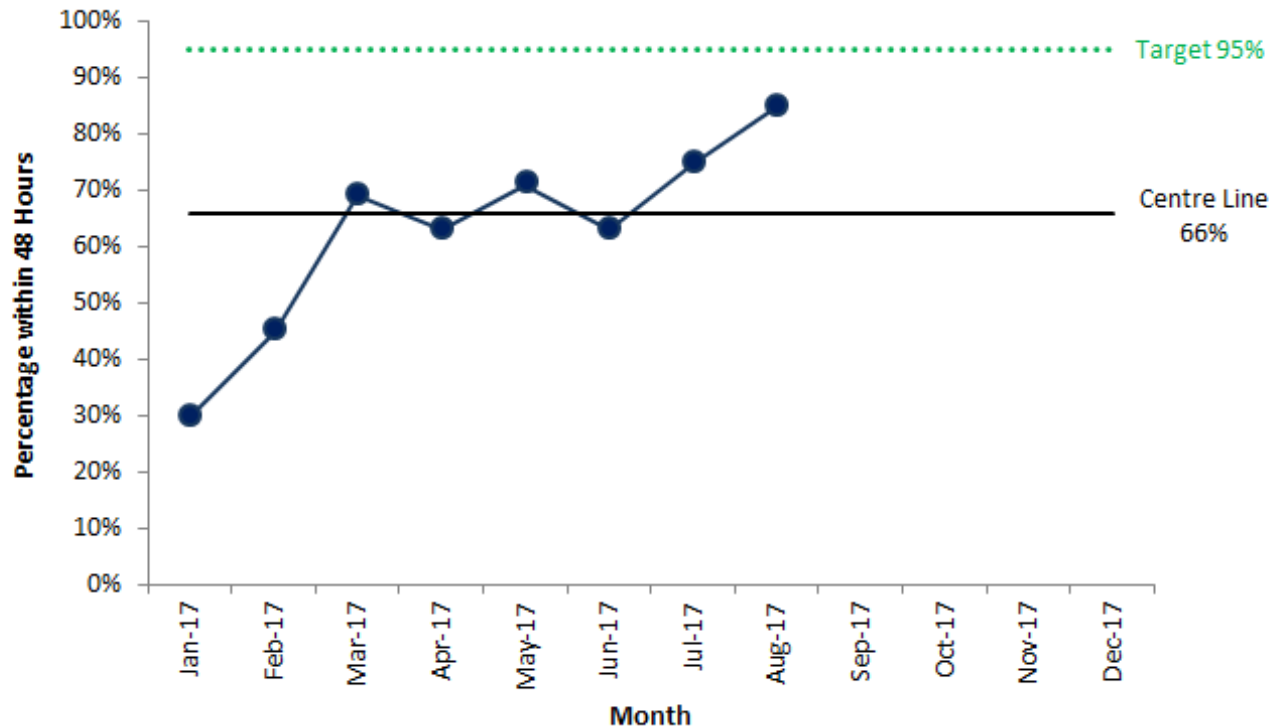
“Information is a source of learning. But unless it is organised, processed, and available to the right people in a format for decision making, it is a burden, not a benefit”



William Pollard
(1828-1893)

Today, on QI Talktime...

► What is a Run Chart?



► When to use a Run Chart

How to Draw a Run Chart on paper

1. Draw Axes

2. Plot your data

3. Draw a centreline
(Median)

How to Interpret a Run Chart



S = Shift (6 Points)

A = Astronomical Data Point

N = Number of runs

T = Trend (5 Points)

A = Apply all 4 rules

Special Thanks To:

The QID Measurement for Improvement Team

- ▶ Dr Jennifer Martin
- ▶ Gráinne Cosgrove
- ▶ Emma Hogan
- ▶ Dr Gemma Moore
- ▶ Joseph Reeves

- ▶ Join our network by emailing QID-MIT@hse.ie
- ▶ Follow us on Twitter: [@QIMeasurement](https://twitter.com/QIMeasurement)



- ▶ Check out our webpage:

<https://www.hse.ie/eng/about/Who/QID/MeasurementQuality/measurementimprovement/>

Helpful links

Framework for Improving quality

www.qualityimprovement.ie



Improvement Knowledge
and Skills Guide



<http://www.hse.ie/eng/about/Who/QID/aboutQID/>

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Happy Christmas from all @QITalktime
We will be in touch in the new year with a schedule of webex talks

Thank you from all the team @QITalktime
Roisin.breen@hse.ie
Noemi.palacios@hse.ie



QI TALK TIME
Building an Irish Network of Quality Improvers