

# Understanding Variation – Detecting Change

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and

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# Why do we measure?



**The answer to this question will guide our entire measurement journey**

# Measurement in, and of, improvement

- Are changes happening in the way health care is delivered?
- Are these associated with improvements for patients, carers & the public?
- Are these changes causally linked?
- How can we reproduce this improvement elsewhere?

# Measurement for improvement

A few simple and specific measures

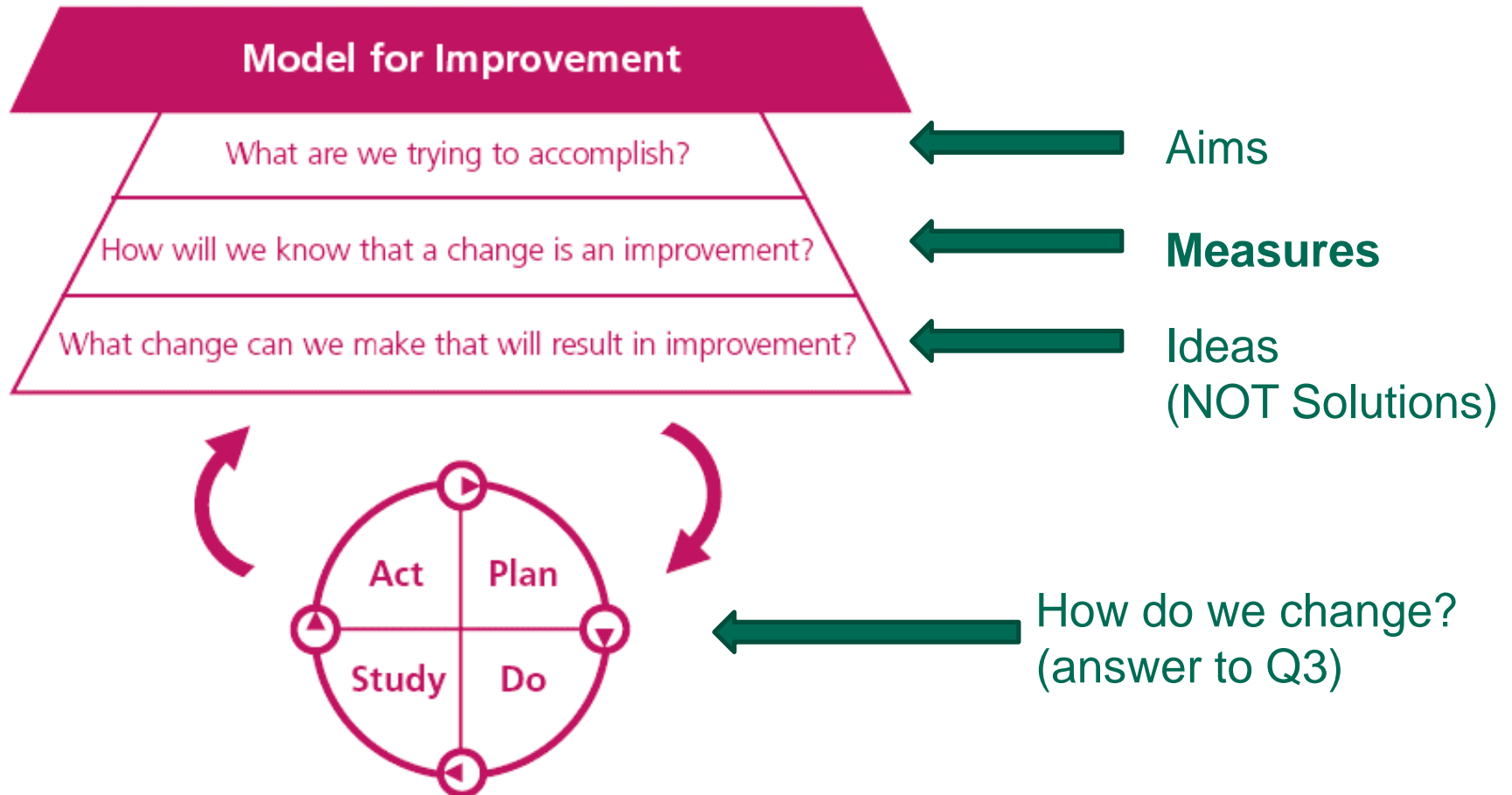
linked to your objectives and aims

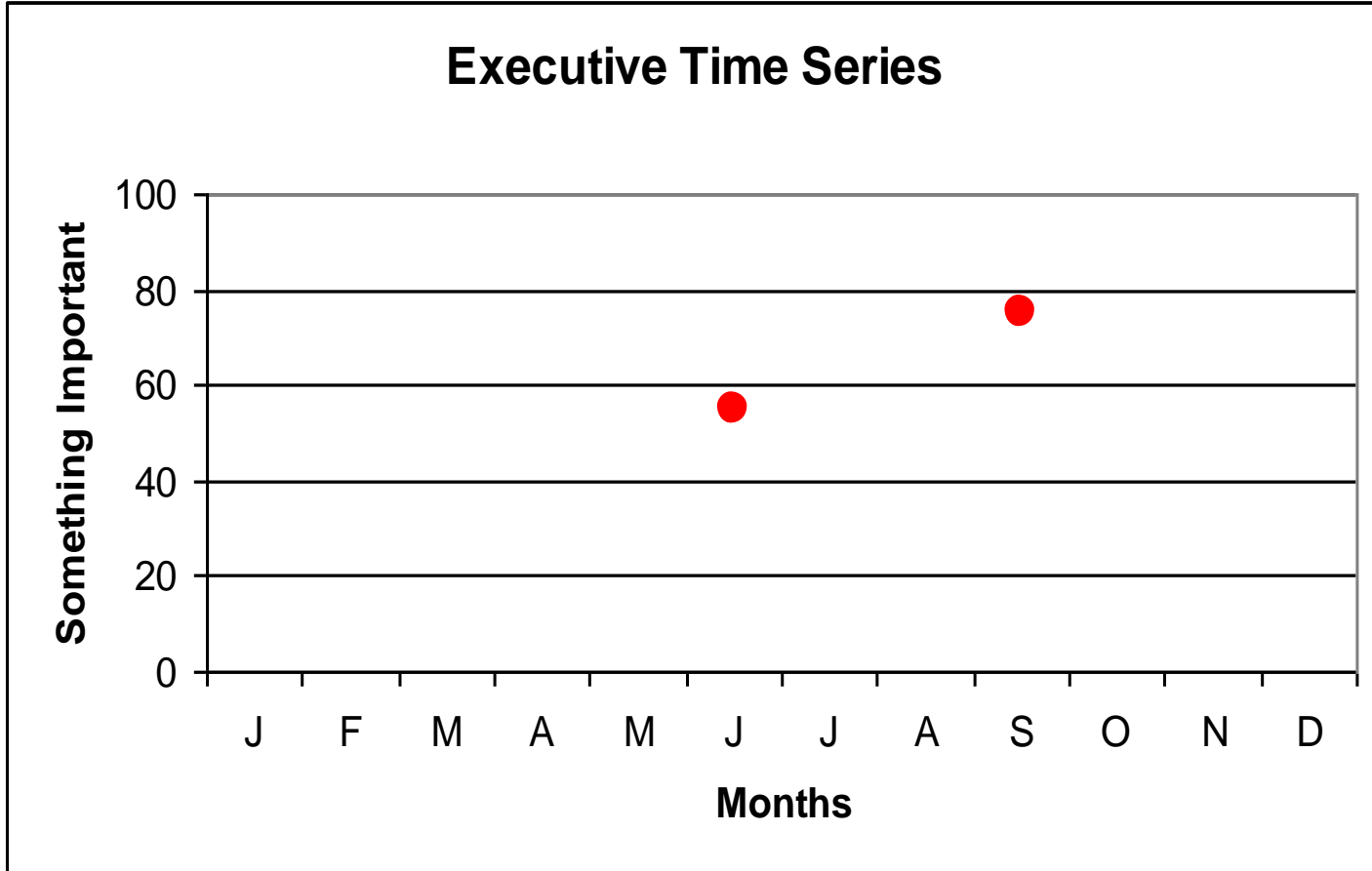
available in real time

to demonstrate whether changes are

making improvements

# Model for improvement





## A&E: sharp rise in number of patients turned away

NHS figures show there were 52 'diverts' in the first two weeks of 2016, up from 35 in the same period last year

Mark Tran  
Friday 22 January 2016 18.38 GMT

## NHS set to miss target on foreign patient costs

🕒 28 October 2016 | [UK Politics](#)

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The Department of Health has "refined" to £346m its target for 2017-18, says the National Audit Office. Some £289m was paid in 2015-16; £73m in 2012-13.

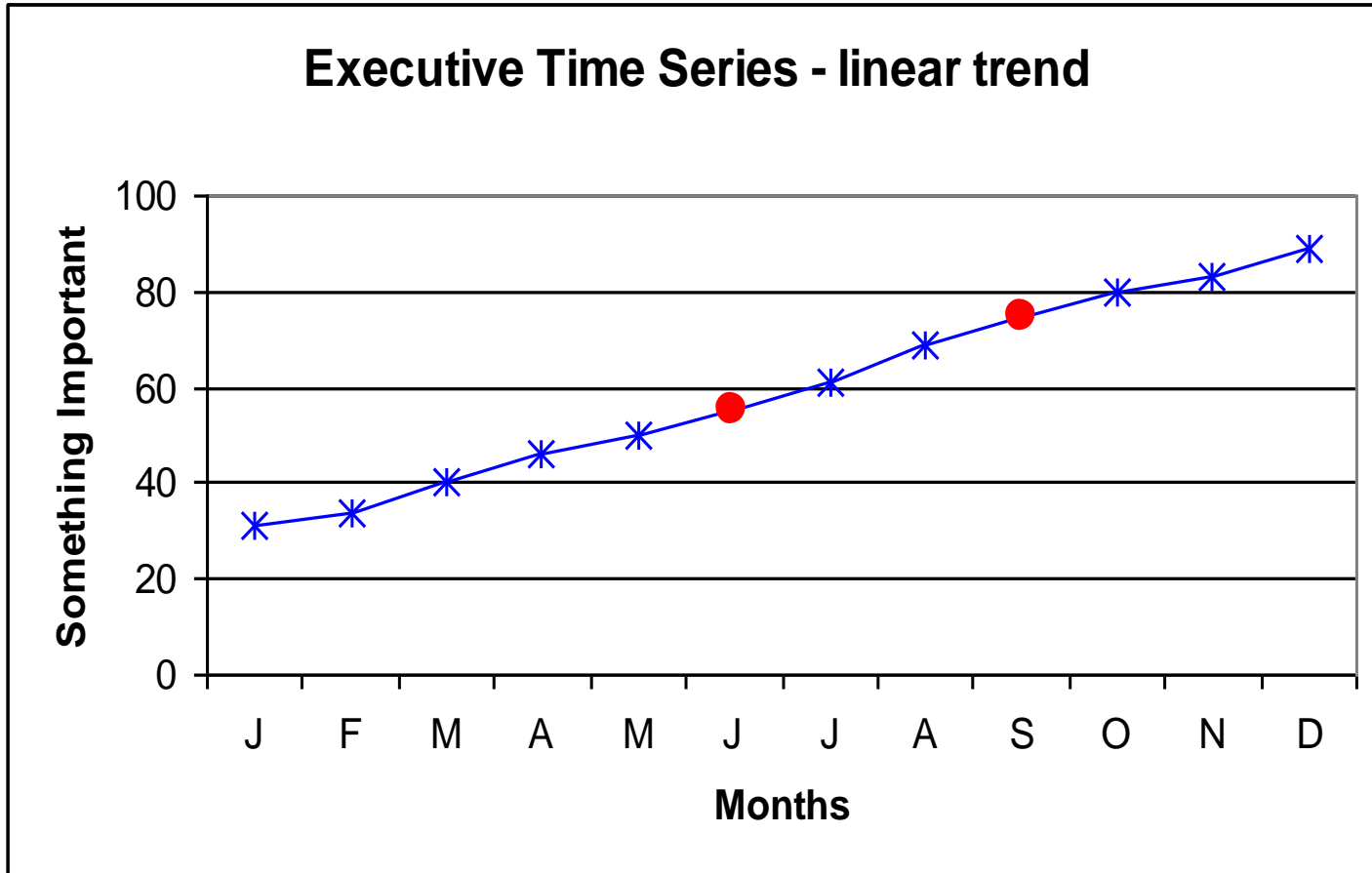
## Ambulance patients face long A&E delays

By Nick Trigg  
Health correspondent

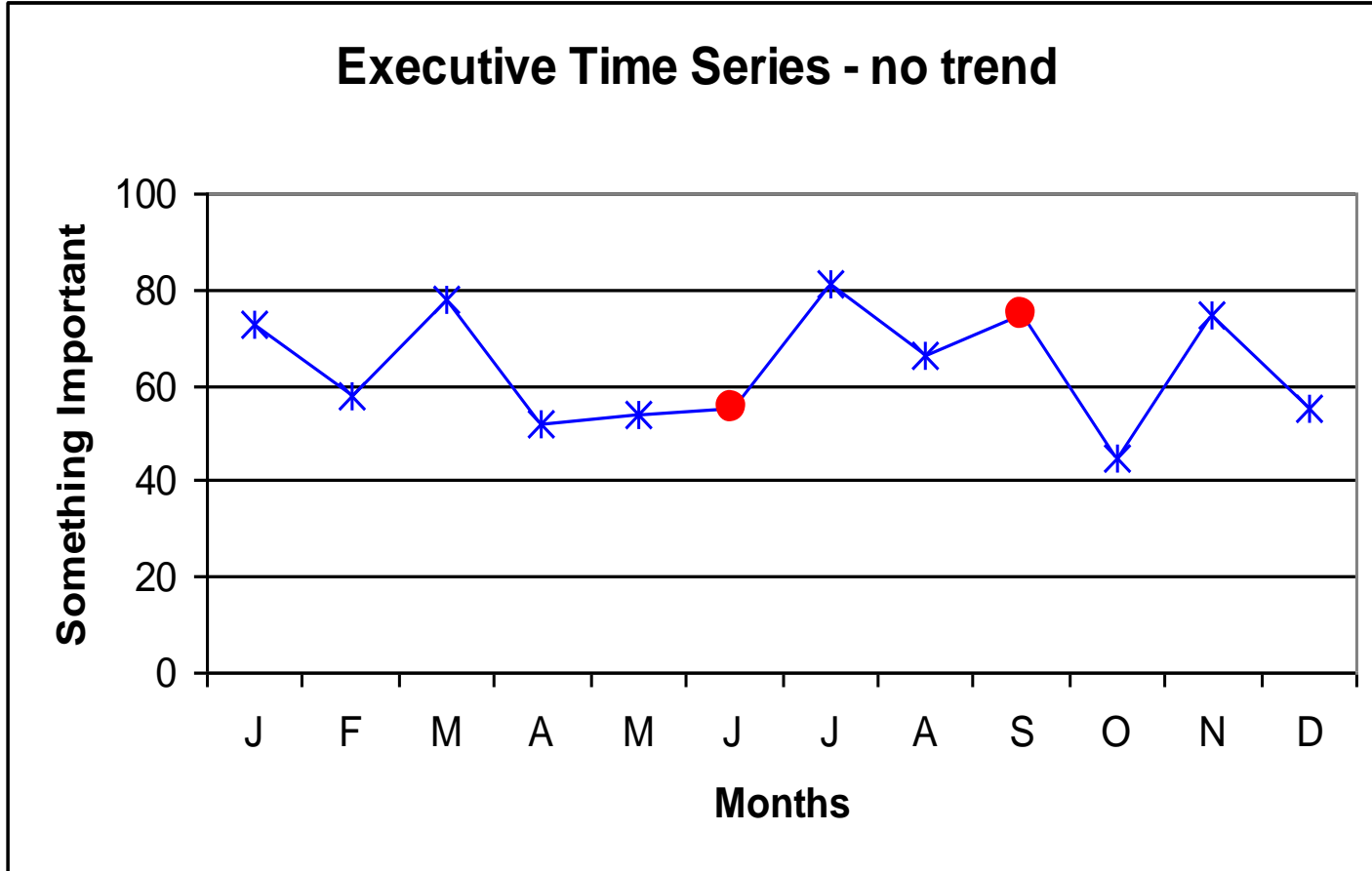
🕒 18 October 2016 | [Health](#)

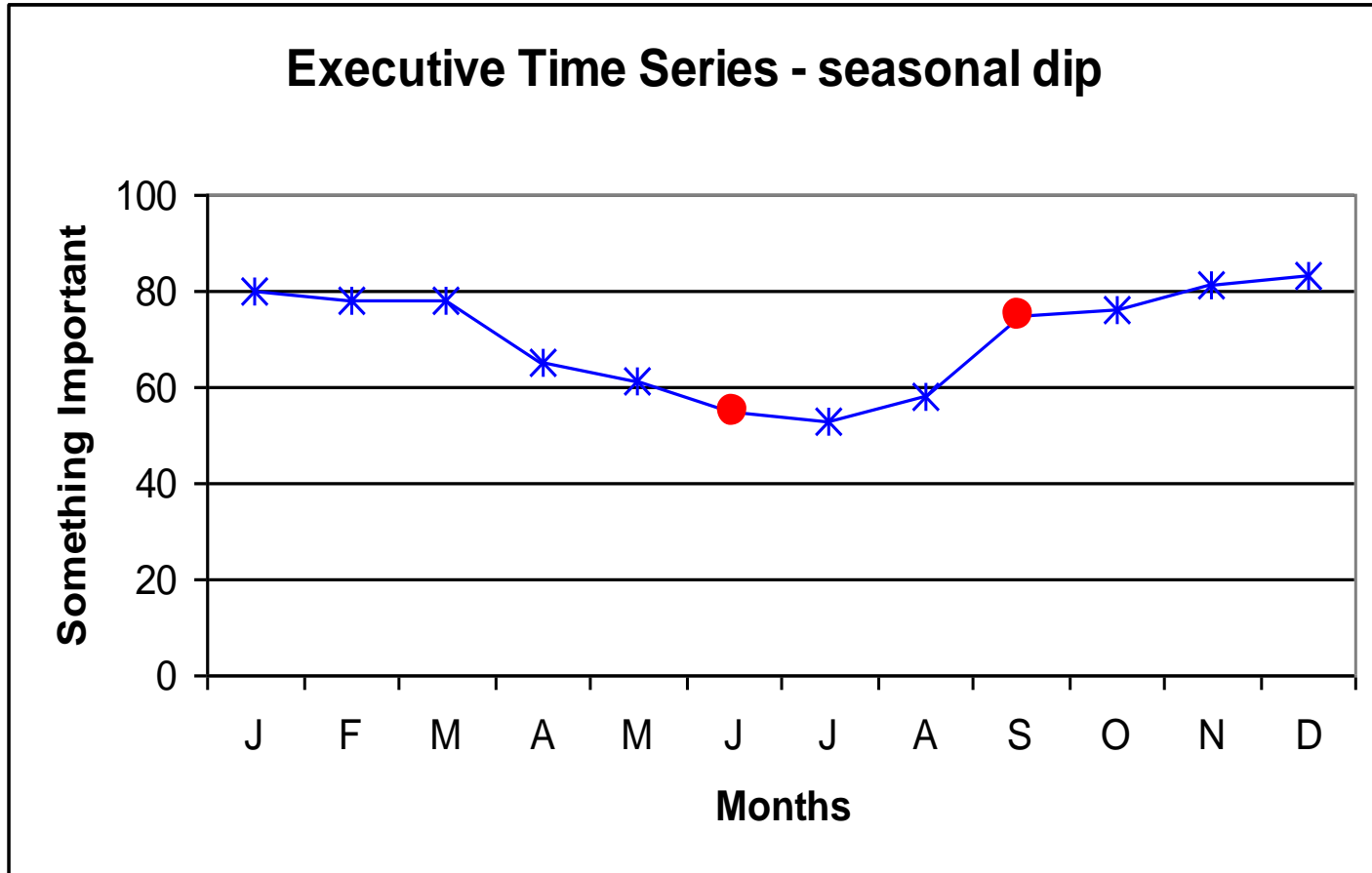
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There were 76,000 waits over an hour in 2015-16, up from 28,000 in 2013-14.









# Understanding variation

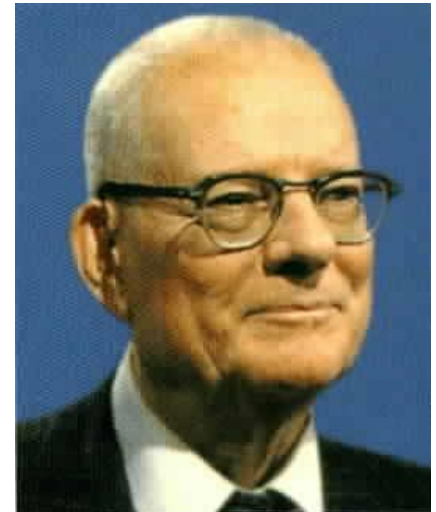
- Everything we can measure will vary
  - Even things we think of as very stable
- **Exercise:**
  - What might impact on percentage of patients discharged from medical ward before 12:00?

# Statistical Process Control

- SPC distinguishes two types of variation
  - **Common Cause**: inherent to the system (process or product), affecting at some point all outcomes
  - **Special Cause**: arising because of specific reason (e.g. an intervention, or change in patient population), not part of usual system
- Crucial when making decisions in an improvement initiative

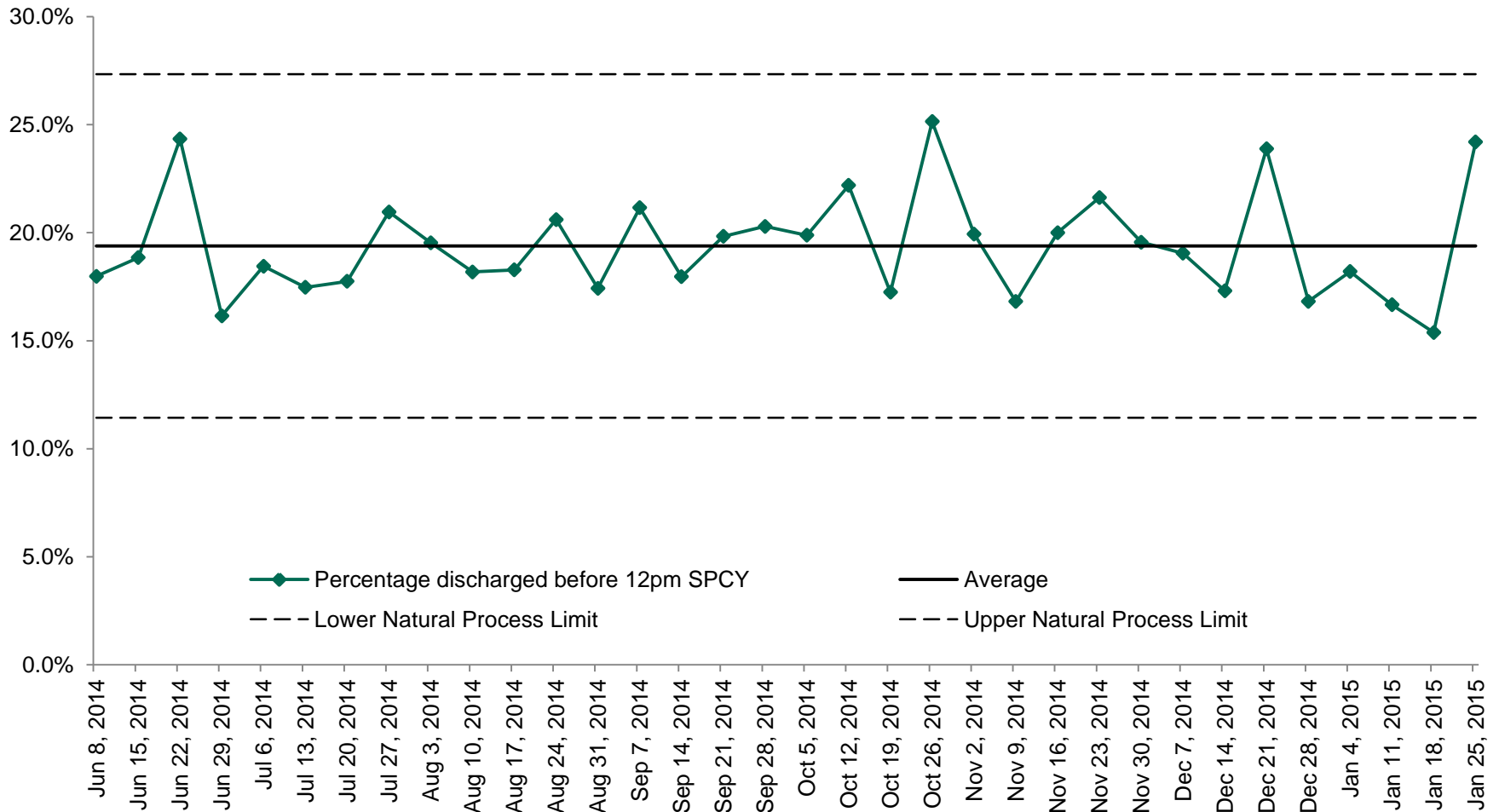
# SPC: Origins

- Dr. Walter Shewhart: physicist & engineer, Western Electric and Bell Laboratories, 1920s. Quality in manufacturing.
- Dr. W. Edwards Deming extended Shewhart's work, developing and explaining applications (U.S., then Japan after WWII, worldwide in the 80s and 90s).
- Increasingly seen in healthcare – but applied with varying degrees of rigour and success.



# Control charts characterise variation

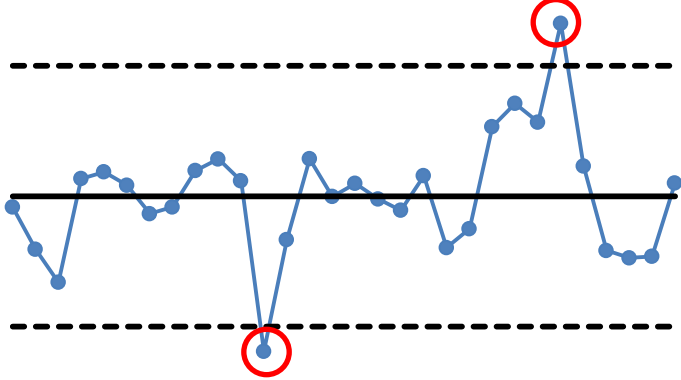
## Percent Patients Discharged Before 12:00



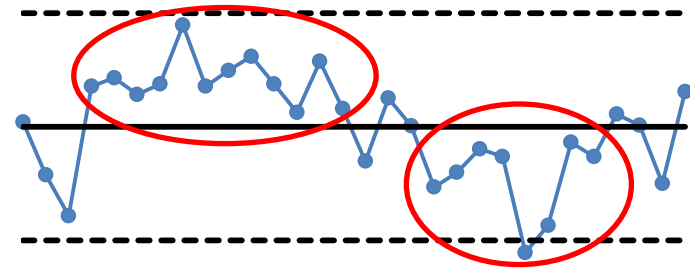
# NIHR CLAHRC

Northwest London

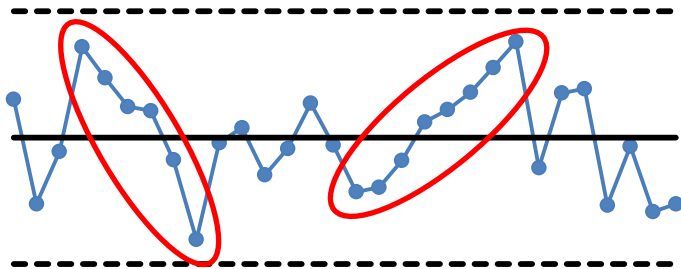
1. A single point outside the control limits



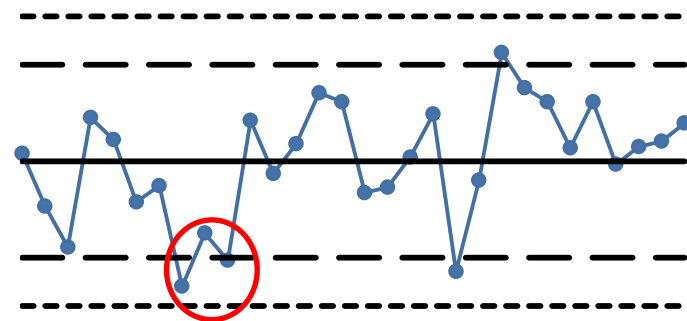
2. A run of Eight or more points in a row all above or all below the centre line



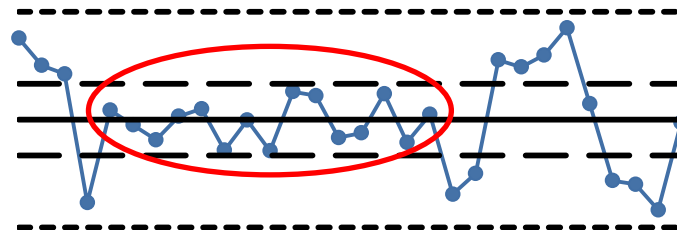
3. Trend - Six or more consecutive points all increasing or decreasing



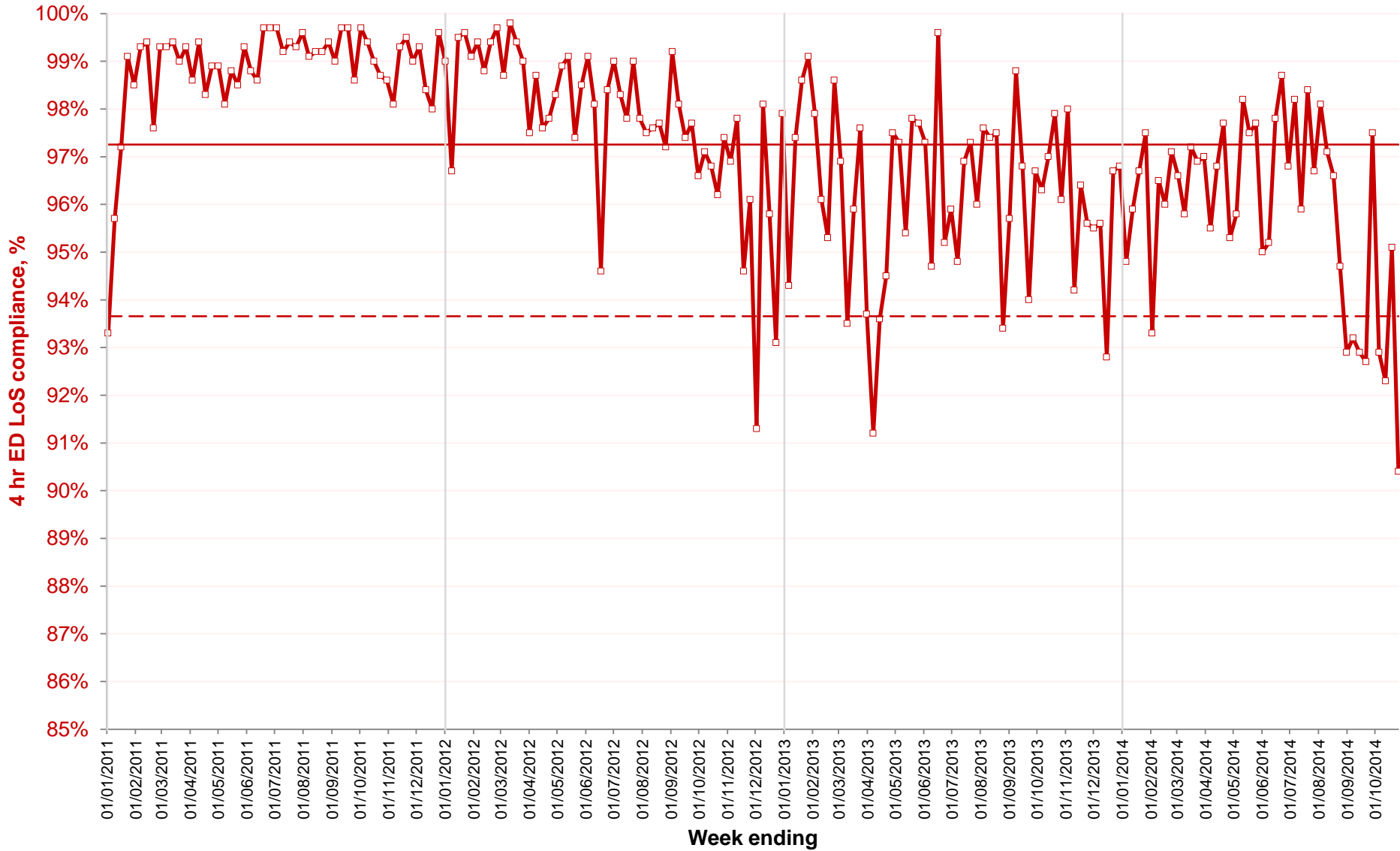
4. Two of three consecutive points near a control limit (in the outer third)



5. Fifteen consecutive points close to centre line (inner third)



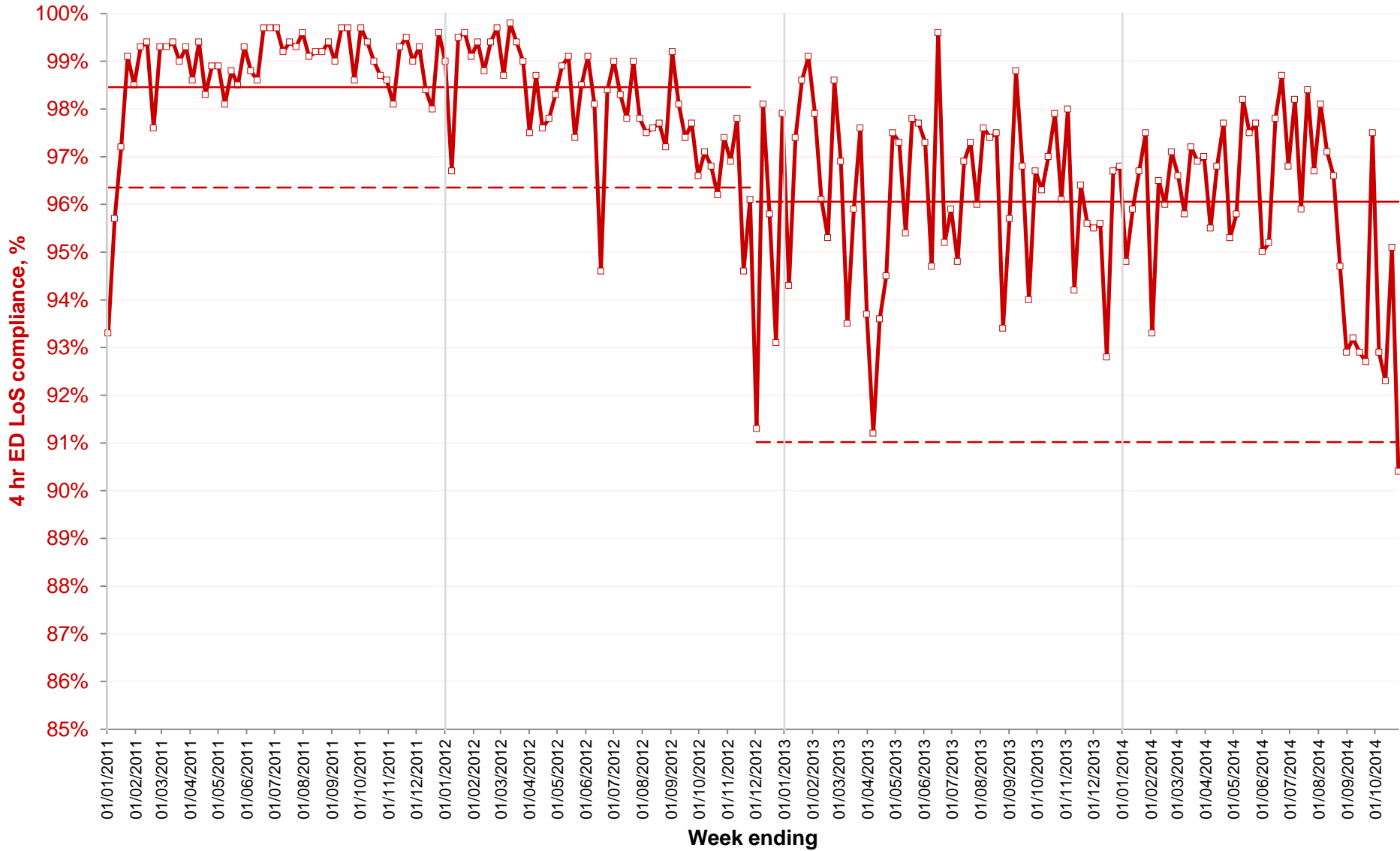
# Hospital A: % patients in department less than 4hrs



—○— 4 hr ED LoS compliance      — Average 4 hr compliance for period  
- - - 4 hr compliance Natural process limit      - - - 4 hr compliance Natural process limit



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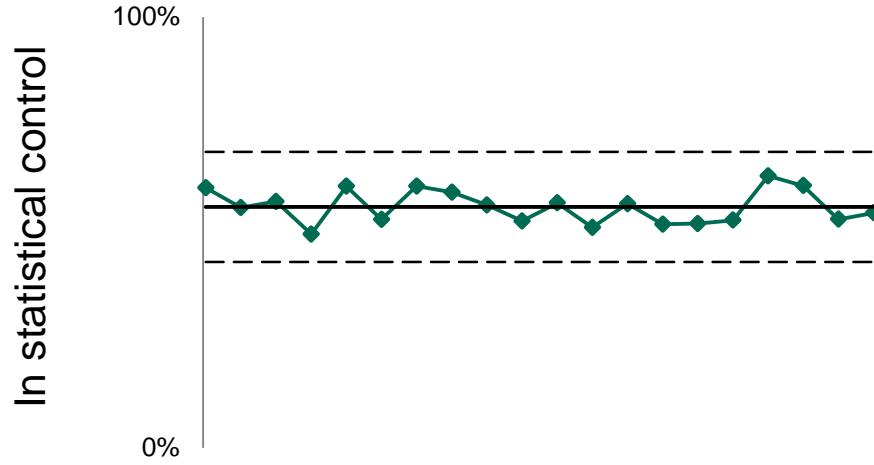
# Diagnosing your process 1

- A process can be **in or out of statistical control**
- “In statistical control” = no rules triggered
  - **many** causes of variation – chance - **none dominant** over the others
  - most data fall **within process limits**
  - this is **routine variation** or “common cause” variation
  - **The process will continue to deliver same results (predictable variation)**
- In statistical control:
  - **only way** to improve is to **change** the process

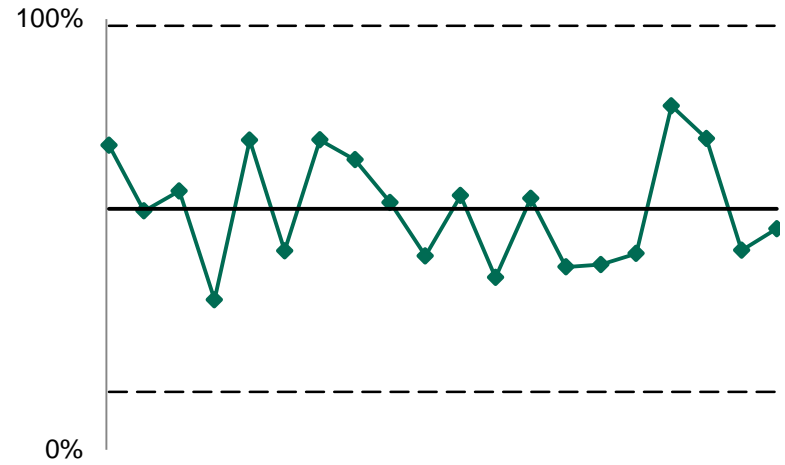
## Diagnosing your process 2

- “Out of statistical control” = rules triggered
  - Still contains routine variation
  - also has **exceptional variation**; e.g. **outside limits**
  - causes that **dominate** (assignable/special)
  - but process is in flux (for better or for worse)
  - **variation is not predictable**
- Out of statistical control
  - Improve by **removing assignable causes** of variation (or changing the process).

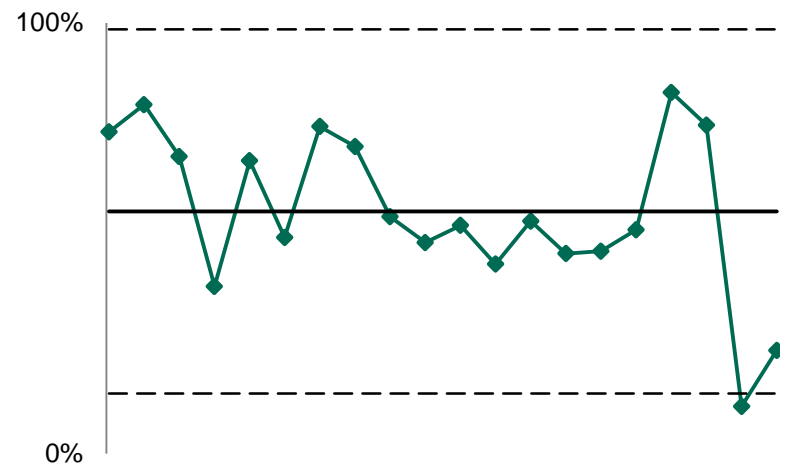
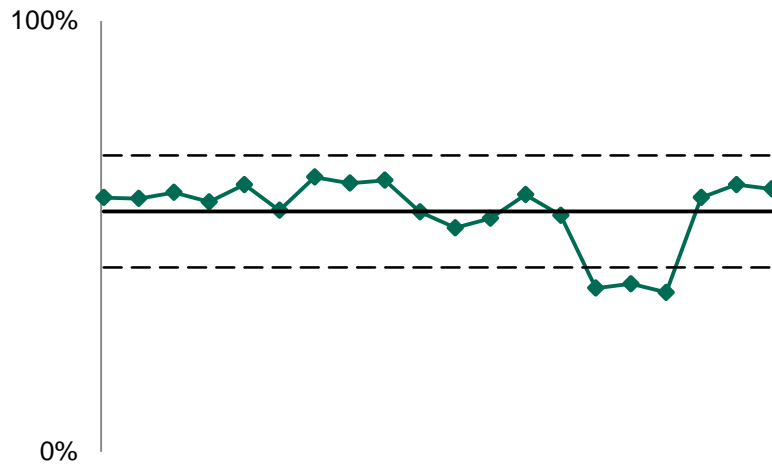
### Narrow control limits



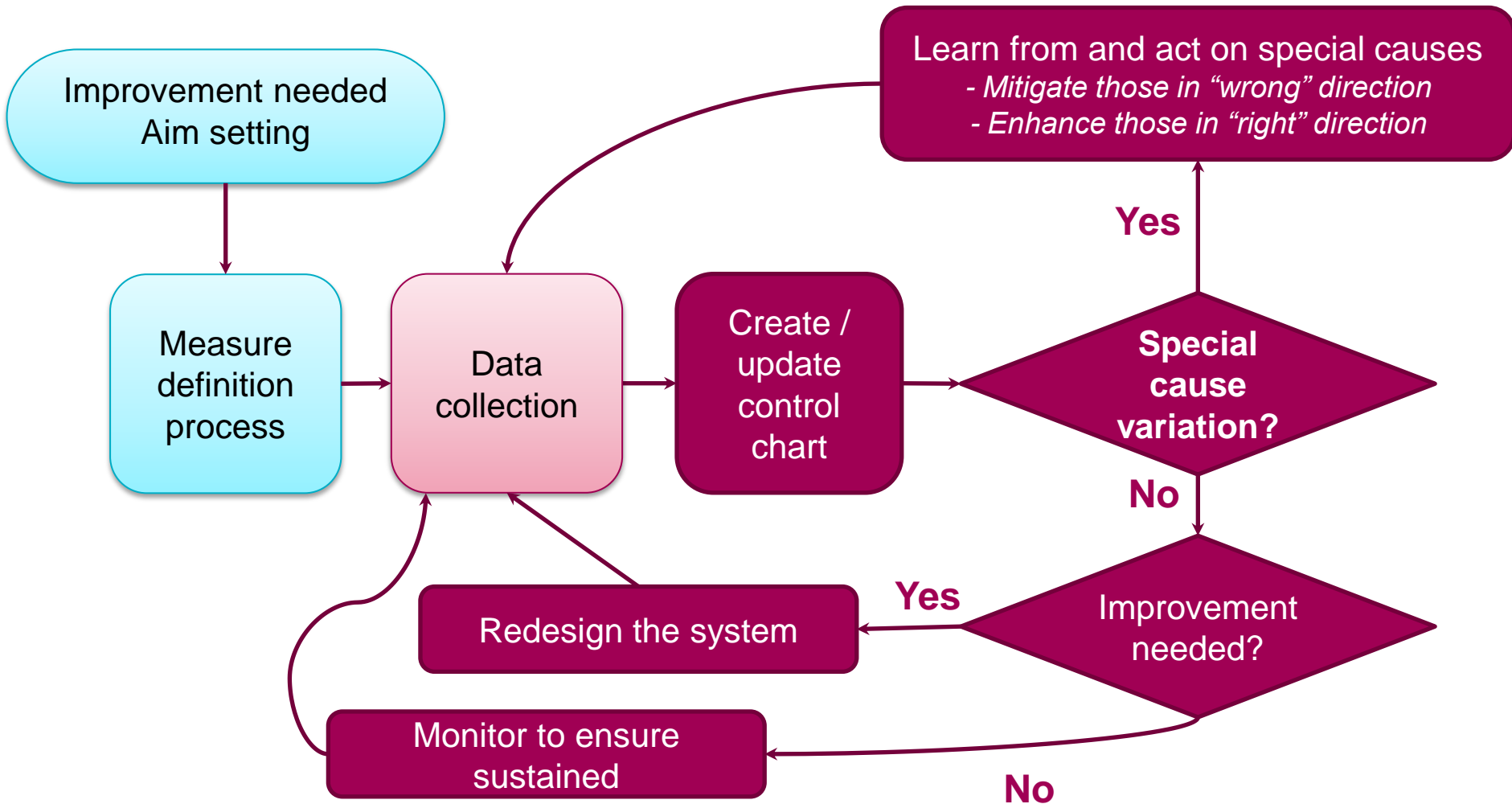
### Wide control limits



### Out of statistical control



# Making better decisions with data



# Redesign the system

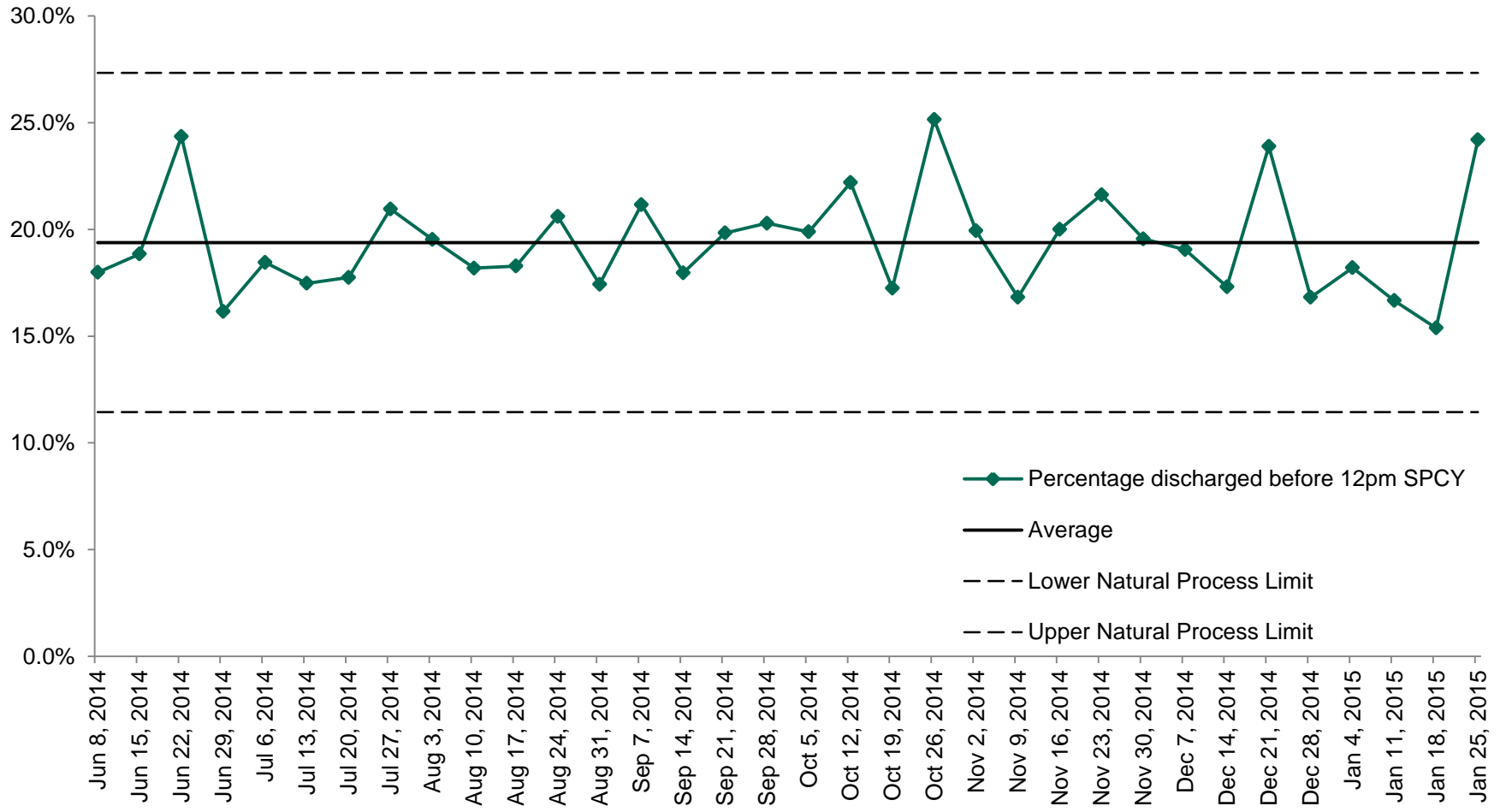
- If you have no special cause variation the only way to improve is to redesign the system
  - This mornings simulation, the management activities were in vain as the system not the workers was at fault
- Note, if there is special cause variation, actions to deal with this should lead to improvement

# Exercise – Making Better Decisions

Look at the charts in front of you, and decide which actions are likely to result in useful information for improvement, from the following options:

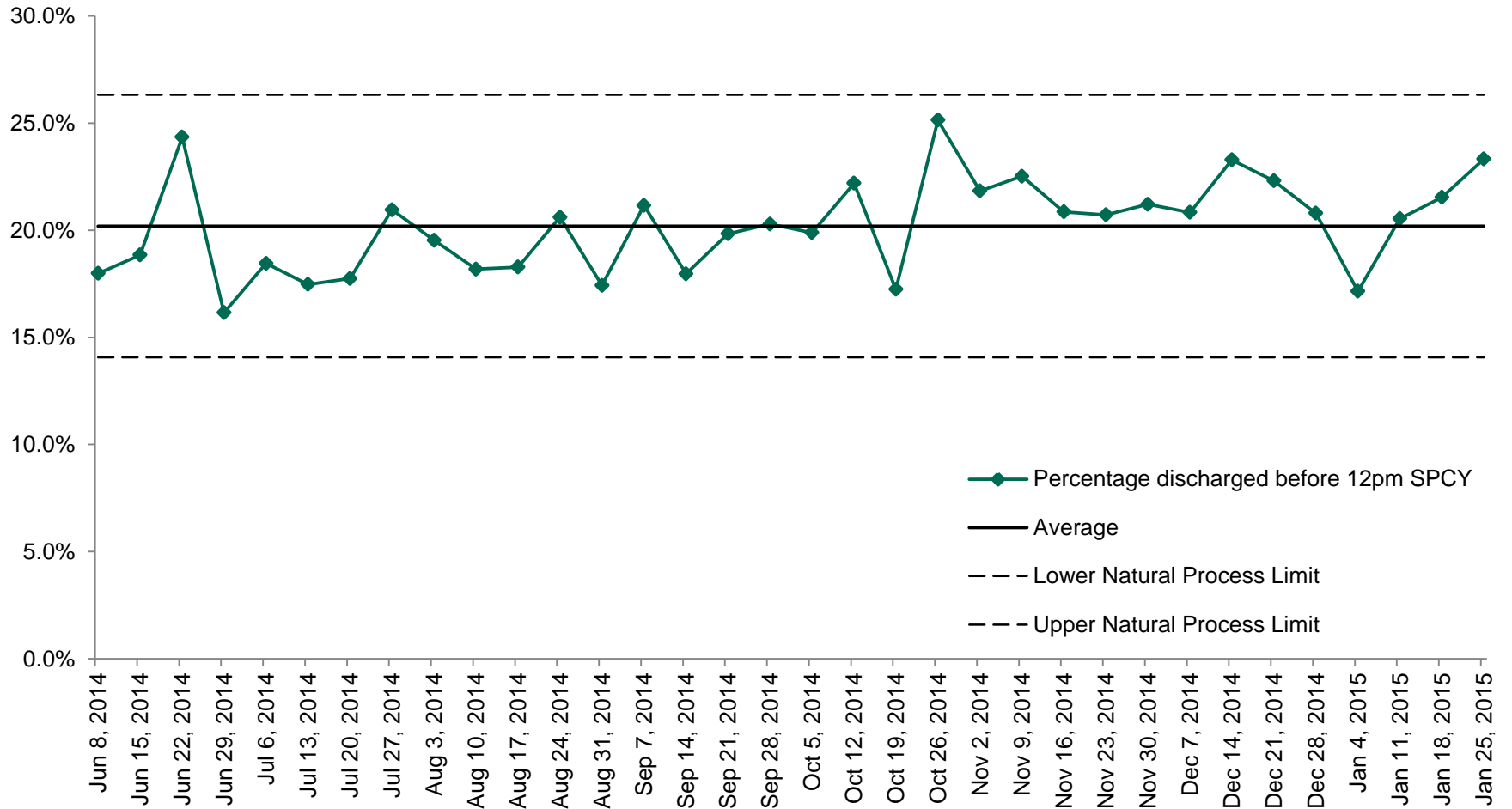
- a) Investigate the week(s) \_\_\_\_\_ to understand in what was happening then that was different
- b) Audit discharges from the period \_\_\_\_\_ to look for systemic patterns
- c) Celebrate success, and begin thinking about how to make further improvements
- d) Monitor the process with a view to detecting any return to previous performance levels
- e) Recalculate process limits to better encapsulate the new process\*

## Percent Patients Discharged Before 12pm – Site 1

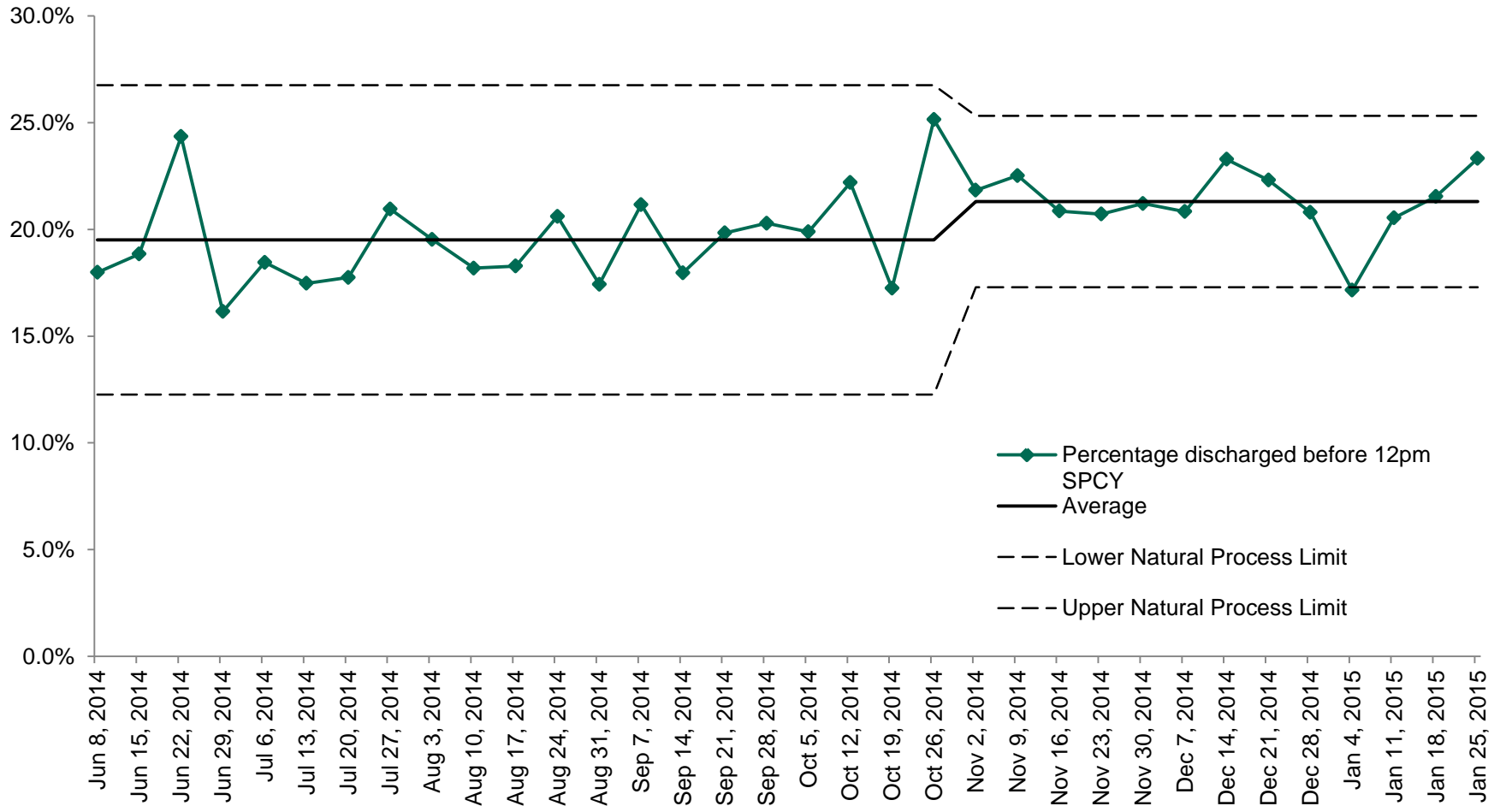




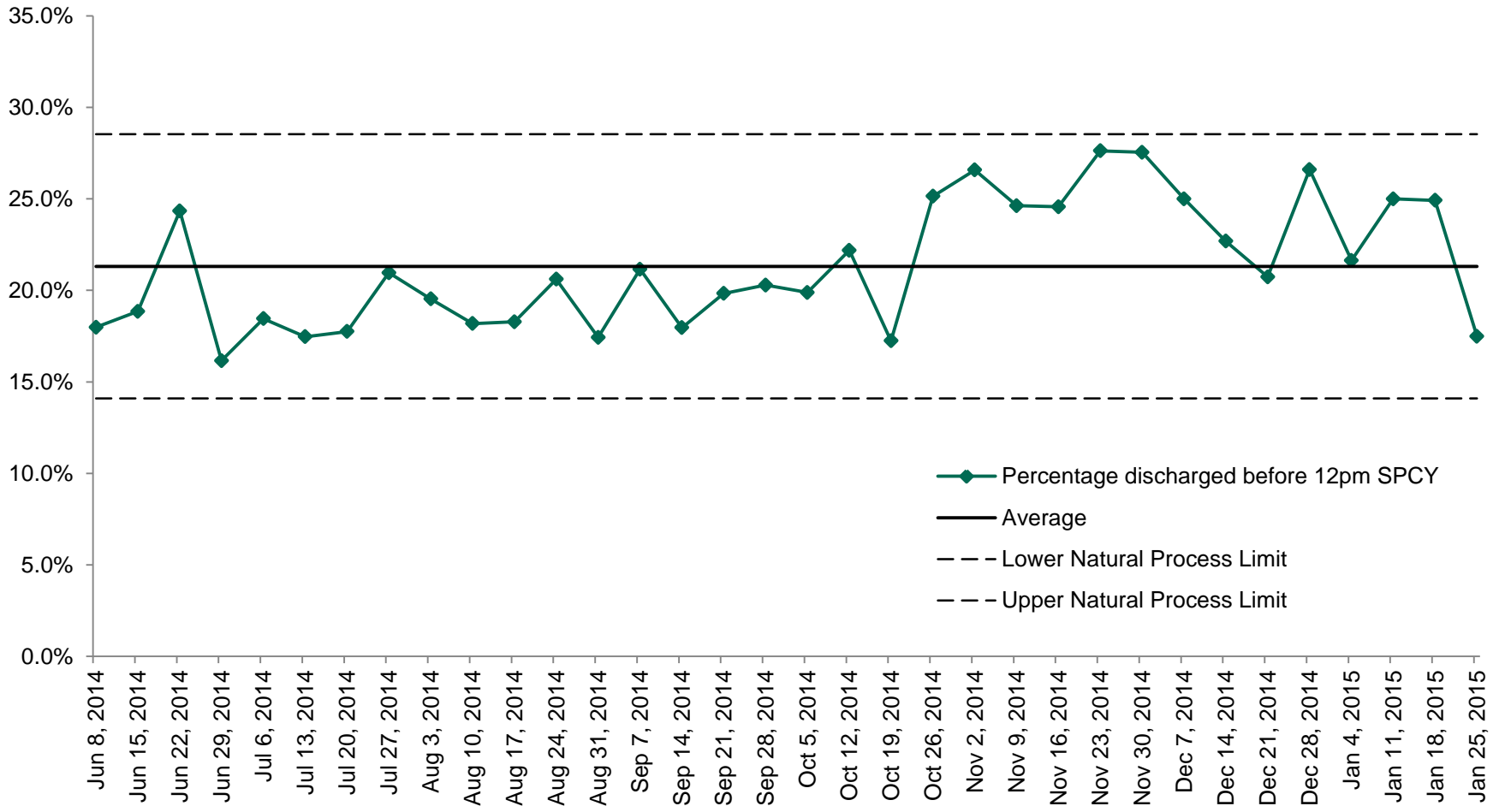
## Percent Patients Discharged Before 12pm – Site 2



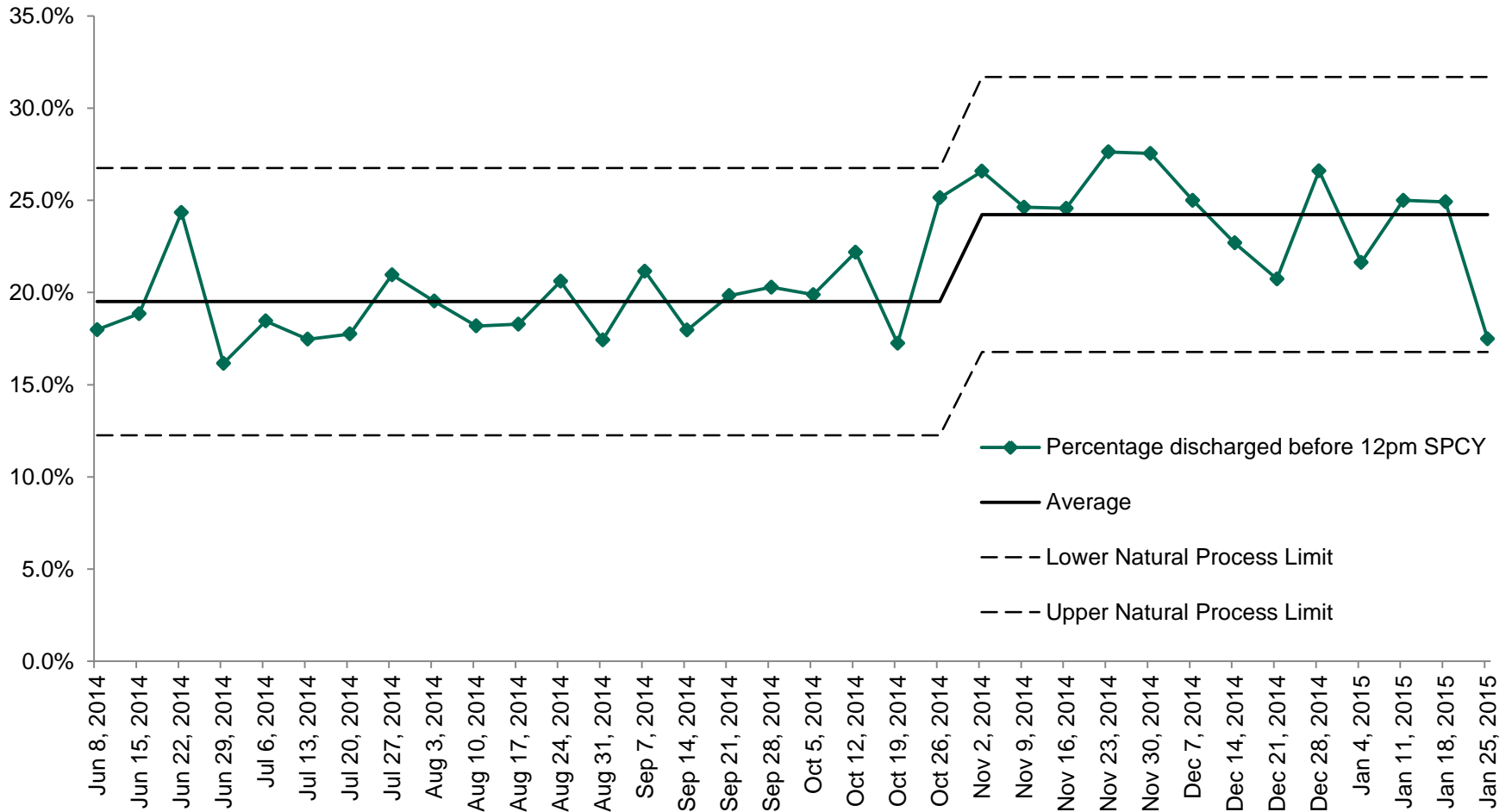
## Percent Patients Discharged Before 12pm – Site 2



## Percent Patients Discharged Before 12pm – Site 3



## Percent Patients Discharged Before 12pm – Site 3



# Web Improvement Support for Healthcare

Welcome to CLAHRC NWL WISH You last logged in on: Thursday, 23 October 2014 12:02:40

**Project Access**

Please select a project you'd like to work in from the list below and press the open project button:

- + CLAHRC 2014
- + CLAHRC 2009-2013
- + Administration

**News feed / alerts**

Time	Sender	Recipient	Message
20/12/12 14:22	katie.randall	CAP_CW	<input type="button" value="show message"/> <input type="button" value="hide message"/> Welcome to the new CLAHRC WISH system <input type="button" value="Promote to Comment"/> <input type="button" value="Delete"/>
24/09/12 14:05	tom.projadmintest	Example-Project-COPD	

**Post a message to your projects**

Messages can be sent to all users in a team or teams. Users in selected teams will see the message on the welcome screen next time they log in.

Select project(s):

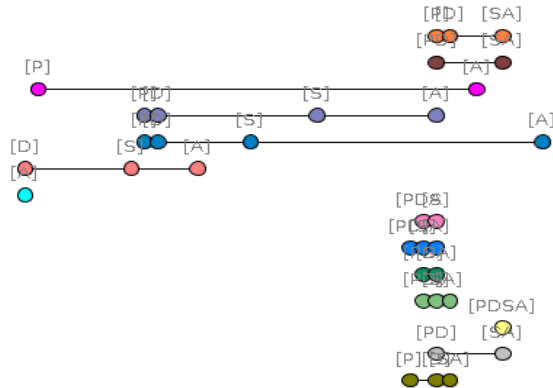
- Ambulatory Care WMUH
- Pulmonary Rehab.
- Adult Congenital Heart Disease
- Ambulatory Care THH
- Ambulatory Care CW
- COPD Care Bundle THH

Enter text:

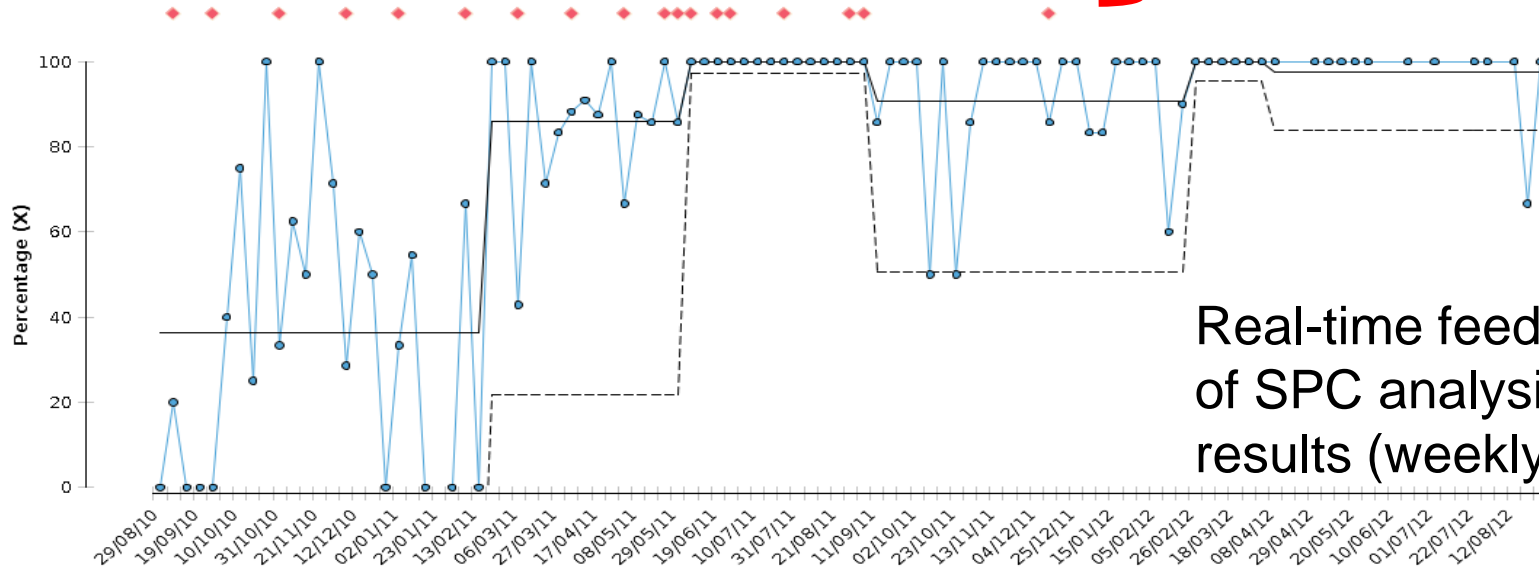
<http://bit.ly/WISHpaper>

Curcin *et al.* 2014 J Biomed Inf

# Web Improvement Support for Healthcare



Qualitative data:  
PDSA cycles,  
and "comments"



Real-time feedback  
of SPC analysis  
results (weekly)

# Summary

- SPC distinguishes two types of variation
  - Common Cause & Special Cause
- If you have no special cause variation the only way to improve is to redesign the system
- WISH system automates the analytics for you