BTS QUALITY IMPROVEMENT METHODOLOGY OVERVIEW

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This work forms part of the BTS Respiratory Quality Improvement activities. We work with our members, healthcare professionals from other specialties and patients and carers to improve standards of care for people with respiratory diseases, and to support those who provide that care.

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INTRODUCTION

Quality improvement is a systematic approach that uses specific techniques to improve quality. Improving quality is about making healthcare safe, effective, patient-centred, timely, efficient and equitable. It embraces practical, applied learning that can generate transferrable knowledge from local levels to a broader scope (1). We will provide an overview of some quality improvement methodologies and commonly used tools in addition to suggested resources to explore (2-6)..

This document is not intended as an exhaustive guide to QI, but instead will provide a brief introduction to help you start your projects. We suggest it is used along-side the additional QI documents and resources provided by the BTS which suggest specific areas of focus and provide examples from other projects in the UK (https://www.brit-thoracic.org.uk/quality-improvement/).

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PART 1 – PRINCIPLES OF QUALITY IMPROVEMENT

The underlying principles of quality improvement include:

- Understanding the problem, with emphasis on what the data tells you.

- Understanding the processes and systems within your organisation, especially the patient pathway and whether these can be simplified. Process mapping is commonly used to map the pathway or journey through part or all of a patient's journey and supporting processes. Process mapping is extremely useful as a tool to engage staff in understanding how the different steps fit together and which steps add value.

- Understanding the culture of the system the problem exists within, and the drivers and barriers to change within it.

- Analysing demand, capacity and flow of the service. For a process improvement to be made there needs to be a detailed understanding of the variation and relationship between demand, capacity and flow. For example, demand is often stable and flow can be predicted in terms of peaks and troughs. In this case, it may be variation in capacity available that causes the problem.

- Choosing the tools to bring about change including leadership and clinical engagement, skills development, and staff and patient participation. It is important not to underestimate the involvement of all relevant staff, including non-clinical staff, who are often the first point of contact for patients. Many clinicians will be keen to improve the quality of service they offer but may be unfamiliar with QI approaches. Patients and carers have a significant role to play and may define quality differently from clinicians and managers.

- Evaluating and measuring the impact of change. 'Measurement for improvement' asks how an intervention can be made to work in a given situation and what will constitute 'success.'

PART 2 – THE IMPROVEMENT JOURNEY

Figure 1: The Improvement Journey diagram.

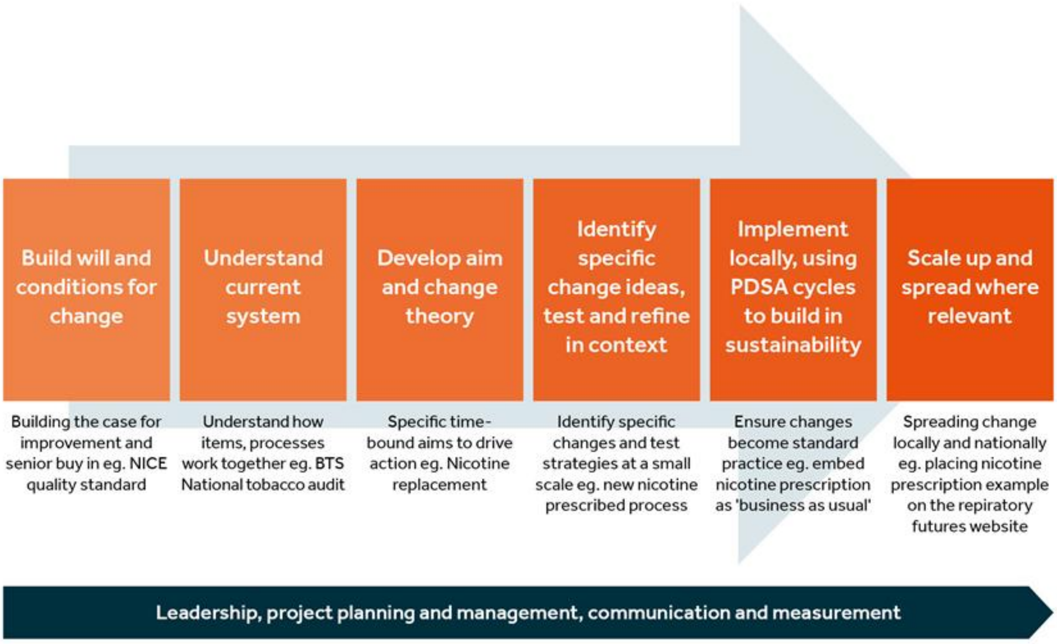


Figure 1: The Improvement Journey diagram is adapted from the original published by NHS Education for Scotland on the Quality Improvement Zone (2017)

Many models of healthcare improvement are available, but at the core of each is a systematic approach to any project. Figure 1 above illustrates a model from improvement published by NHS Scotland. We have used the Improvement Journey as a structure to introduce you to Quality Improvement tools and techniques that you may wish to use.

2.1 STEP 1: BUILD WILL AND CONDITIONS FOR CHANGE

Much QI literature will discuss the impact of Organisational Culture on the success of large-scale improvement projects. Indeed, both the Health Foundation and the King's Fund have produced reports on its impact (7,8). See Figure 1.

However, in starting a small scale projects this can be as simple as allowing Junior Doctors dedicated time for completing projects or holding local events to celebrate ward-based improvements to encourage participation and innovation amongst staff.

2.2 STEP 2: UNDERSTAND THE CURRENT SYSTEM

Understanding the current system is important for a number of reasons; to collect baseline data, to ensure the proposed project is focussing on an appropriate issue, to gain insight in to potential levers and barriers and to form a measures plan.

2.2.1 Variation as a focus in quality improvement

Two broad types of variation in healthcare include variation in the organisation of services or processes and variation in clinical practice. A certain amount of variation is considered normal and many quality improvement approaches assess whether the system, process or clinical practice is within control limits. They then use this as a key measurement tool, to help understand the level of variation in the system and to measure it over time. Unwarranted variation can lead to inefficiency, waste and harm or lost opportunities.

2.2.2 Clinical audit and data collection

National clinical audit is a vital way of identifying where variation exists and helps participants to identify where improvements may be needed at a local level. BTS offers a number of snap-shot national audits but does not offer continuous national data collection because it would be too burdensome for participants to enter data for all BTS audits, especially in light of other national audit obligations. However, all BTS audit tools are available for sites who wish to undertake a re-audit between national audit cycles. Continuous data collection is essential for supporting quality improvement interventions and details of other options for collecting local continuous data are set out below.

When collecting data at a local level projects should be mindful of sample size. The more data you can collect the more robust your results will be. When benchmarking e.g. against national audit data, to detect differences of 10% a sample of at least 100 is required; or to detect differences of 20% a sample of at least 25 is required. However, small local data collections can still be very useful in tracking local quality improvement interventions, particularly when there is a desire for rapid adoption of change (9).

There are a number of additional potential tools to help understand the context and need for change. These are listed with brief descriptions below, with links to more information where available.

2.2.3 Fishbone

A Fishbone or Ishikawa diagram is used to define cause and effect. See Figure 2. This is best used when approaching a QI project to solve a particular problem where you will need to establish the causative factors in your project design. The 'problem' forms the back-bone of the fish and then causative factors the main ribs. Further smaller contributing 'bones' are added to the ribs as the conversation develops.

Figure 2: Fishbone diagram example.

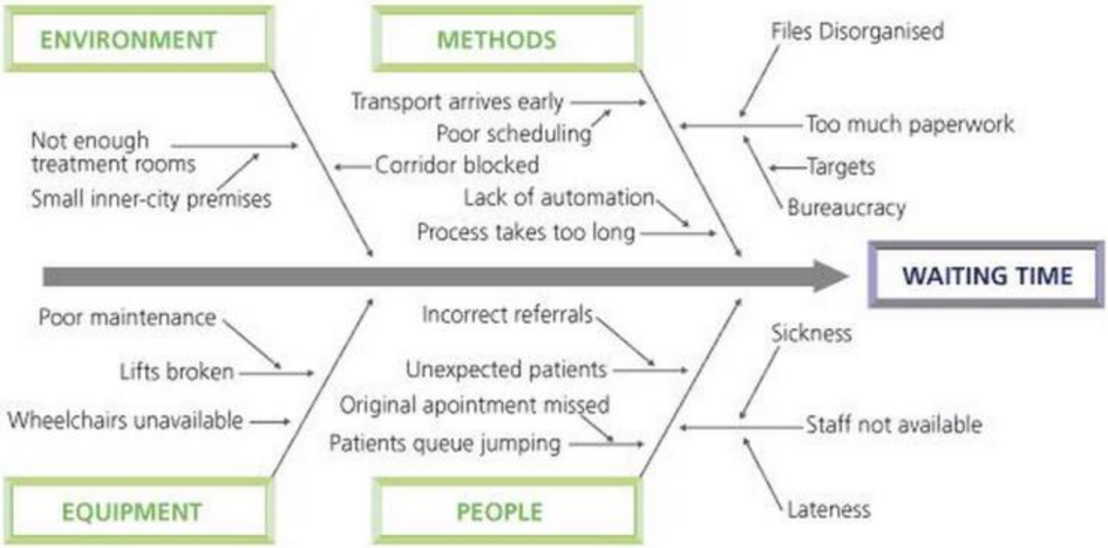


Figure 2 – TIN, now the East Midlands Improvement Network and Dave Young. © Copyright NHS Institute for Innovation and Improvement 2008

2.2.4 Process mapping

Process mapping is an essential tool when your QI project focusses on a system or complex multi-step process. Taking the example of a patient's journey through a cancer pathway, your team can gain insight by mapping out each step in the process and thus identifying where there are bottle necks or vulnerabilities. This is best done as a group exercise and with either a pen and whiteboard or post-its and a wall. By completing this exercise, you can identify targets for improvement, or better assess the impact of an improvement you may have in mind.

The 2010 paper by Trebble on process mapping the patient journey provides a good description (10).

2.2.5 Theory of Constraints

The theory of constraints came from a simple concept similar to the idea that a chain is only as strong as its weakest link. See Figure 3. It recognises that movement along a process, or chain of tasks, will only flow at the rate of the task that has the least capacity. The approach involves:

- Identifying the constraint (or bottleneck) in the process and getting the most out of that constraint

- Recognising the impact of mismatches between the variations in demand and variations in capacity at the process constraint

Figure 3: Theory of constraints cycle.

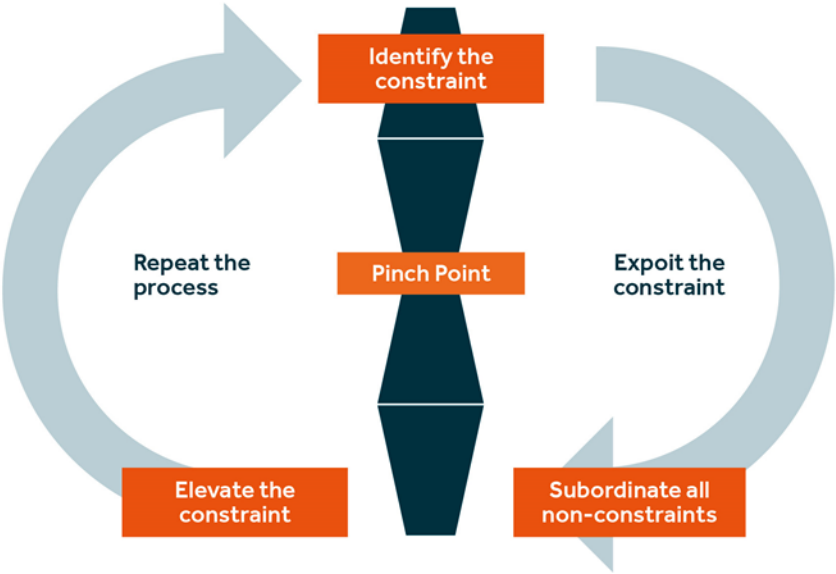


Figure 3: Theory of constraints cycle:

1. identify the system's constraint(s)

2. decide how to exploit the system's constraint(s)

3. subordinate everything else to the above decision(s)

4. elevate the system's constraint(s)

5. of in the previous steps a constraint has been broken, go back to step 1, but do not allow inertia to cause a system's constraint.

2.2.6 Appreciative inquiry

Appreciative inquiry is a paradigm shift from the ever-present tendency to record what is going wrong to finding out what is going well. This process, often conducted through interviews or semi-structured feedback tools, looks to discover what is working well in a system so as to bring these elements to the fore and ensure they are promoted in a system. This approach, developed by Cooperrider and Srivastva (11), shifts the focus to collective inquiry into what is desired in future; the idea being that this is more compelling and motivating than focussing on negatives which require incentives and coercion to effect change. The five principles of appreciative inquiry are:

- The constructionist principle – a group's belief determines what they do. The purpose of inquiry is to generate new ideas and possibilities for action.

- The principle of simultaneity - inquiry into human systems causes change and will impact the questions that are asked, which in turn impact the direction of change.

- The poetic principle - the words and topics chosen for inquiry have an impact, and effort should therefore be put into using those that enliven and inspire.

- The anticipatory principle – projections about the future are a powerful mobilizing agent. Collective focus on positive scenarios can shape anticipatory reality.

- The positive principle - sustainable change depends on social bonding. Positive sentiments like hope and excitement promote these connections and openness to new ideas, particularly between groups in conflict, which helps enable collective change.

A focus on what is going well in an organisation can be helpful in shifting the normal distribution upwards

2.2.7 Focus groups

A cornerstone of Quality Improvement practice is to keep the patient (or system user if your project is staff-focussed) at the core of all. Thus, in your efforts to understand the current system a focus group of system users can be invaluable. Their insights may demonstrate positive or negative aspects to a system that are not visible to you which can form your project development.

2.3 STEP 3: DEVELOP AIM AND CHANGE THEORY

Multiple models for improvement exist and are discussed in QI literature. Many trusts choose to adopt a particular school of thought and you should check which is adopted before setting out on your project. We list some common tools to help you develop and test your aims.

Before you set out, you may find the following resources helpful:

- Quality Improvement Made Simple, The Health Foundation (2)

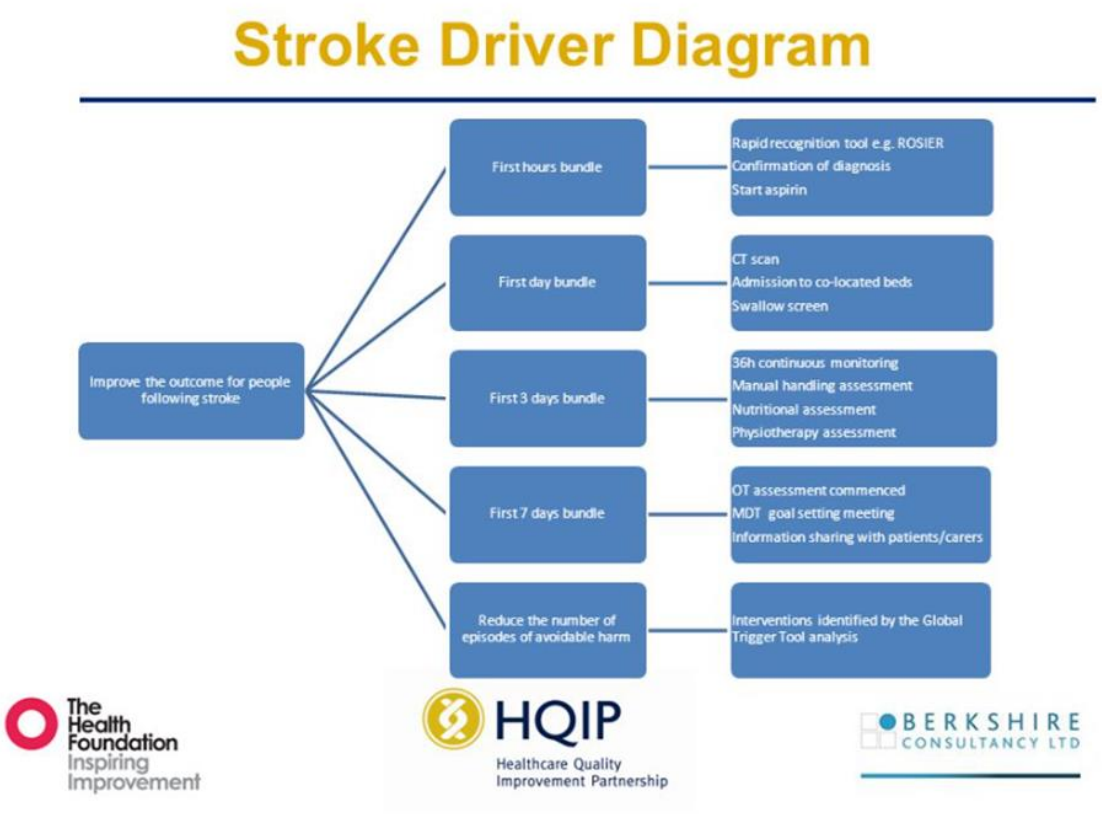
- A promise to learn – a commitment to act. Improving the safety of patients in England (12).

2.3.1 Driver diagram

A driver diagram is used to break down an overall improvement ideal in to its composite divers and theory of improvement. See Figure 4. This is of particular use when ideas are large scale (for example "improving the Asthma Outpatient clinic") and need to be tackled in smaller manageable approaches. You may be similar with producing a logic model for projects; this is a similar tool. This process can be further enhanced by use of any of the additional tools described below.

NHS IQ provide an on-line tool to generate your own driver diagram. This can be accessed here:
https://improvement.nhs.uk/resources/creating-driver-diagrams-for-improvement-projects/

Figure 4: Example of a driver diagram.



http://slideplayer.com/slide/2388783/9/images/14/Stroke+Driver+Diagram+Improve+the+outcome+for+people+following+stroke.jpg

2.3.2 SMART aims

Before starting out on your project, define an aim. We recommend using the SMART system. SMART stands for:

Specific	What exactly do you want to achieve? Avoid nebulous aims such as "to improve x service", but instead focus on what exactly you will do.
Measurable	How will know if you have improved?
Achievable	Have you been realistic in your goal?
Relevant	Is it the right objective? When you have undertaken your system examination exercises did this present as an issue?
Timely	By when?

An example of a SMART aim would be:

"Improve the number of patients offered nicotine replacement therapy during their inpatient stay by 10%, recorded on their drug chart, by the next audit cycle."

Setting an aim allows you to plan the project and also allows for communication to wider stakeholders.

2.3.3 Continual improvement – PDSA cycles

This is an approach to continuous improvement where changes are tested in small cycles that involve planning, doing, studying, acting (PDSA), before returning to planning, and so on. See Figure 5. Each cycle starts with hunches, theories and ideas and helps to form them into knowledge that can inform action and ultimately, produce positive outcomes.

The cycles use three key questions:

- 'What are we trying to accomplish?'
- 'How will we know that a change is an improvement?'
- 'What changes can we make that will result in improvement?'

Figure 5: The model for improvement.

Figure 5: taken from The Improvement Guide: A Practical Approach to Enhancing Organizational Performance, 2nd Edition, Gerald Langley, Ronald Moen, Kevin Nolan, Thomas Nolan, Clifford Norman, Lloyd Provost. Jossey-Bass Pub., San Francisco, 2009, p. 24

2.4 STEP 4: IDENTIFY SPECIFIC CHANGE IDEAS, TEST AND REFINE

Now you have made your project plan, check you have a robust measures plan. Referring to the PDSA methodology above, how will you know your change is an improvement.

You may find this guide useful:

Measurement for improvement toolkit. Australian Commission on safety and quality in healthcare (13).

Start your project and plan your first 'study' section of your PDSA cycle. The stop point of this should be defined before you set out.

2.4.1 Statistical Process Control (SPC) charts

Real time data collection allows Quality Improvement to be a process of iterative change. Two suggested tools for this are SPC charts or Run Charting. The SPC approach examines the difference between natural variation (known as 'random/common cause variation') and variation that can be controlled ('assignable/special cause variation'). See Figure 6. The approach uses control charts that display boundaries for acceptable variation in a process. Data are collected over time to show whether a process is within control limits in order to detect poor or deteriorating performance and target where improvements are needed. SPC charts are best used when your QI intervention looks to change complex outcomes – for example COPD admissions – where several factors including your intervention may play a part in a change in outcomes. SPC charts require larger data sets with a minimum of 10 data sets required to calculate control limits.

Figure 6: Statistical Process Control Chart.

Figure 6: SPC chart – The further a data point is from the centreline the more chance that there is an identifiable cause for the variation and the opportunity to intervene. These assignable variations therefore facilitate targeted interventions.

This process relies on several steps to produce a robust analysis. Data are collected over time to show whether a process is within control limits in order to detect poor or deteriorating performance and target where improvements are needed. The data itself needs to be normally distributed with measurements independent of each other. The mean value can then be calculated and the standard deviation of this. The upper and lower control limit is then usually set at 3 standard deviations above and below the mean. (Three-sigma limits (3-sigma limits) is a statistical calculation that refers to data within three standard deviations from a mean). The data can then be plotted and the process assessed to determine whether it is out of control. Indications for this include:

- Any point falls beyond the above or below the control limits.
- 8 consecutive points fall on one side of the centreline.
- 2 of 3 consecutive points fall within a zone 3 sigma away from the mean.
- 4 of 5 consecutive points fall within a zone 2 to 3 sigma away from the mean.
- 15 consecutive points are within 1 sigma away from the mean.
- 8 consecutive points not within 1 sigma of the mean.

Information on interpreting SPC charts can be found on the NH Scotland website (14). Further information on statistical methods that can be used to evaluate variation and identify outliers is available from the Healthcare Quality Improvement Partnership (15).

2.4.2 Run charts

Run charting is a simple tool to look for changes in a process over time and can easily highlight if a project is leading to the desired outcome. See Figure 7. Data should be plotted contemporaneously and used in your PDSA reviews for best effect. Though accuracy of run charting improves with larger data sets, it can still be useful with fewer than 10 points and so should be the tool of choice on smaller projects.

Data is plotted against time and then interpreted using 4 simple rules (16):

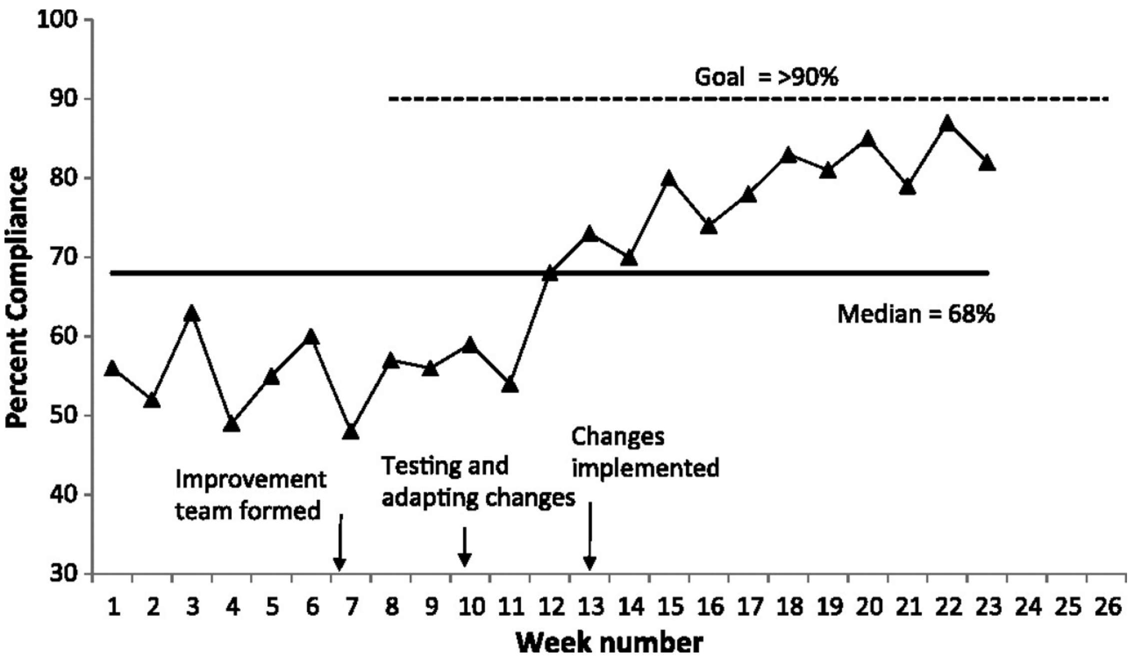
- **A Shift** – this is six or more consecutive points above the or below the median (values that fall on the median can be skipped). This suggests that a change is attributable to something and is not random – for example, if an event has two equally likely possible outcomes (50:50), the chance of these occurring six times in a row is less than 3 in 1000.

- **A Trend** - five or more consecutive points all going up or all going down. If the value of two or more successive points is the same, ignore the subsequent points of the same value, these do not make or break a trend.

- **Runs** – a series of points on one side of the median. A statistically significant change is indicated by too few or too many runs– this will depend on the number of data points plotted. A table is used in conjunction with this rule to identify the upper and lower limits for the number of runs to be significant: http://www.qihub.scot.nhs.uk/media/529936/run%20chart%20rules.pdf

- **Astronomical Point** - detects unusually large or small numbers, which are obviously different from all or most of the other values, and anyone studying the chart would agree that is unusual. Every data set will have a highest and lowest data point, but these are not automatically astronomical.

Figure 7: Example run chart (14).



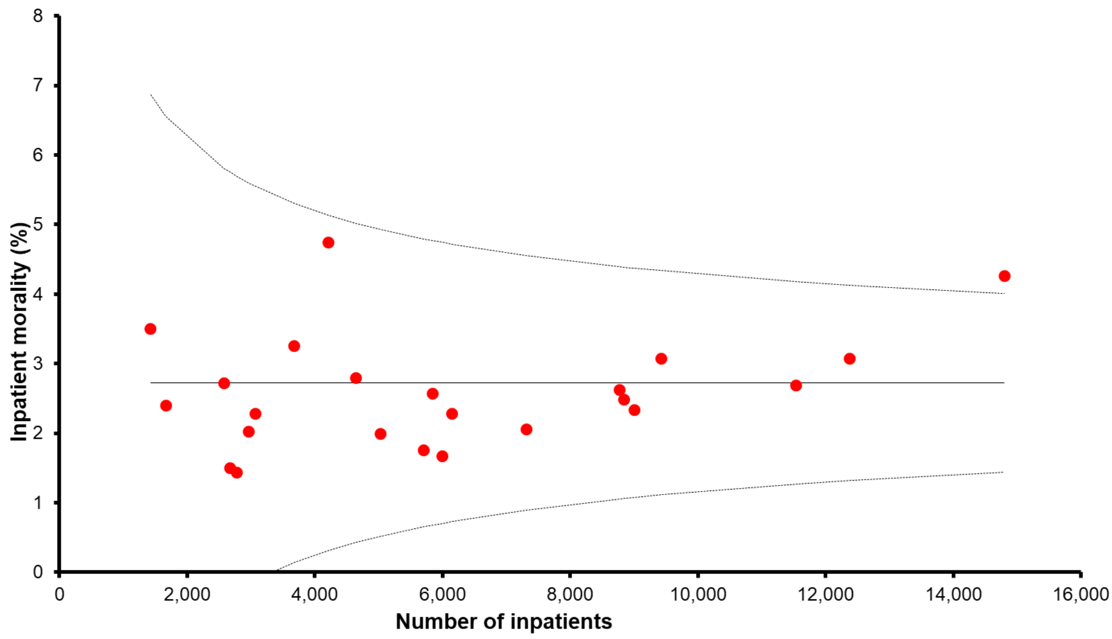
We recommend watching the Institute for Health Improvement's Run Chart training videos found here:

http://www.ihi.org/education/IHIOpenSchool/resources/Pages/AudioandVideo/Whiteboard7.aspx)

2.4.3 Funnel plots

These scatter charts are useful for providing a snapshot picture of variation across different entities e.g. for mortality rates across different hospital sites or wards. See Figure 8. In this example each site is represented by a different dot on the chart, the y axis is the mortality rate and the x axis is the sample size. Charts will normally plot the mean rate and one or more control limits, for example three standard deviations. These control limits take account of the spread of the results and show whether a particular result is statistically significant. The chance of a result being outside these lines is very small [0.2% for 3SD] and suggests a systematic difference, rather than a random result.

Figure 8: Example of a funnel plot.



BTS national audits will produce funnel plots for key measures such as mortality. Where any sites are found to be outliers they will be contacted to establish whether this is due to a data error or whether there appears to be an issue, in which case they will be asked to undertake a local investigation. Hospitals that are positive outliers may also be contacted and asked to share information on how they have achieved their results.

Funnel plots are a useful way of presenting variation at a national level or across a large number of entities at a particular point in time. At a local level funnel plots may be of less application, but could be used to show variation across a number of wards or specialties.

A guide to creating your own funnel plot is available here: http://www.kurtosis.co.uk/technique/funnel/

2.5 STEP 5: IMPLEMENT LOCALLY, BUILD IN SUSTAINABILITY

Many challenges have consistently been identified in QI programmes including (17):

A. Convincing people that there is a problem

B. Convincing people that the solution chosen is the right one

C. Getting the data collection and monitoring systems right

D. Excess ambitions

E. Organisational context, culture and capacities

F. Lack of staff engagement

G. Leadership

H. Securing sustainability.

For further information on this topic and how to increase quality improvement capacity is available from The Health Foundation (18).

Stakeholders

When you have examined the system in which you plan to improve you need to ensure you have the agreement and "buy-in" of those involved in the process. It is not always clear who, or how to approach. There are a number of tools for this, but the commonest is a Stakeholder Analysis.

It is helpful to think through how all players stand with regards to:

- their engagement in the process
- how key they are to success
- how important they are to the running of your project.

Useful guidance on stakeholder analysis is available from NHS Improvement:

https://improvement.nhs.uk/documents/2169/stakeholder-analysis.pdf

2.6 STEP 6: SCALE UP AND SPREAD

In the UK about a third of QI projects do not spread beyond their initial site of implementation. This is often the limit of the scope of the initial project (for example improving a specific process for a particular ward) and is thus valid. However, this statistic suggests that many projects do not achieve the spread they initially aim for.

Planning for the scale-up and spread phase of your project should be part of your initial planning, though will need to go through iterations as you progress through your PDSA cycles. Consider barriers you have encountered through your initial implementation and how these may apply as your project grows.

We suggest reading the report: The spread and sustainability of quality improvement in healthcare from the Scottish NHS QI hub (19).

This document has been developed by the British Thoracic Society and is designed to be read in conjunction with the range of topic specific respiratory QI tools available here: https://www.brit-thoracic.org.uk/quality-improvement/

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