



QUALITY IMPROVEMENT
IN SURGERY –
BASIC PRINCIPLES



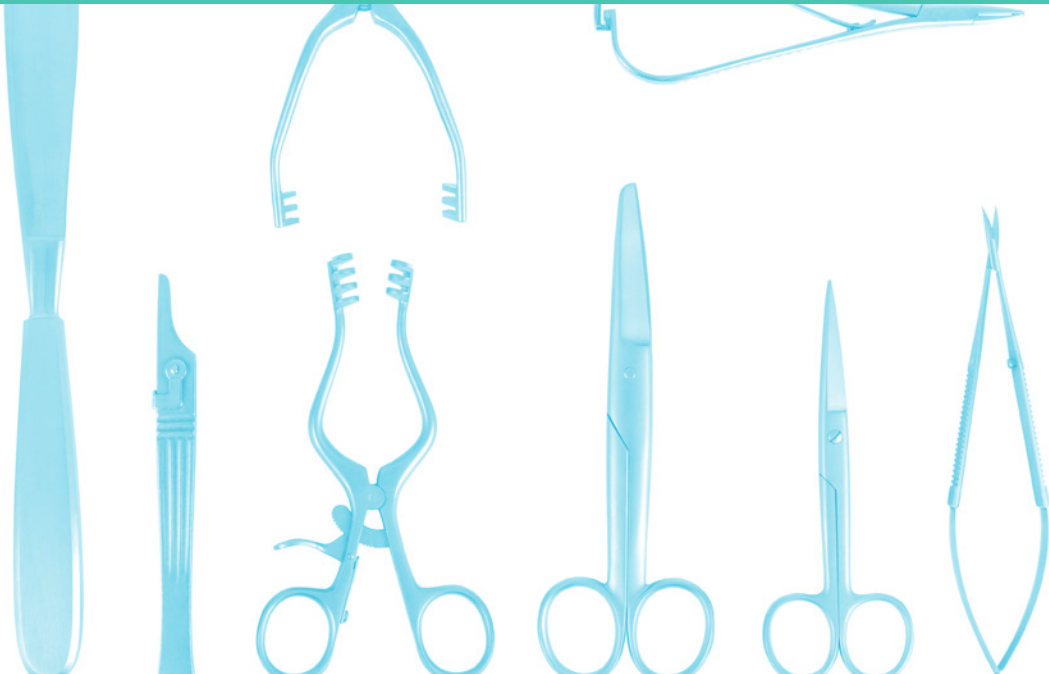
Royal College
of Surgeons
of England

ADVANCING SURGICAL CARE

QUALITY IMPROVEMENT IN SURGERY – BASIC PRINCIPLES

Quality Improvement Directorate

March 2021





Contents

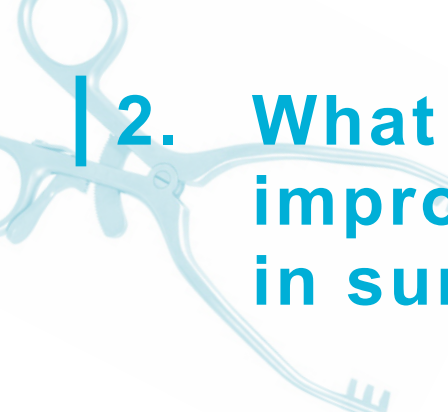
- 1. What this guide covers 3**
- 2. What is quality improvement in surgery? 4-7**
 - 2.a What is quality and quality improvement?
 - 2.b How does quality improvement relate to your clinical practice?
 - 2.c Quality improvement methods and approaches
- 3. Ten steps for quality improvement in practice 8-23**
 - 3.a Identify areas for improvement
 - 3.b Match improvement options to situation
 - 3.c Ideas to action
 - 3.d Embed and share
 - 3.e Case study from the Chole-Qulc cohort
- 4. Skills of an 'improver' 24-25**
- 5. References 26-27**

Jonathan Riddell Bamber was commissioned by the Royal College of Surgeons of England to prepare this guide. The College would like to thank him for drafting the document.



1. What this guide covers

This document provides a brief overview of the basic principles of quality improvement (QI) for those involved in delivering surgical care in the UK. It builds upon best evidence of what has worked or not in implementing QI within healthcare settings over the past few decades, linking with Good Surgical Practice¹ and the Royal College of Surgeons of England's web-based resources on QI.² It provides ideas on how surgeons can facilitate change through QI methodologies, common barriers that occur and how they can be overcome.



2. What is quality improvement in surgery?

WHAT IS QUALITY AND QUALITY IMPROVEMENT?

Improving quality in healthcare is central to all work of health professionals. It is ensuring that the healthcare you provide is safe, timely, effective, efficient, person-centred and equitable (Box 1).³

Box 1: Dimensions of quality

SAFE: avoiding harm to patients from care that is intended to help them

TIMELY: reducing waits and sometimes harmful delays

EFFECTIVE: providing services based on evidence and which produce a clear benefit

EFFICIENT: avoiding unnecessary waste

EQUITABLE: providing care that does not vary in quality because of a person's characteristics

PERSON-CENTRED: establishing a partnership between practitioners and patients to ensure that care respects patients' needs and preferences

Donabedian defined quality as 'the application of medical science and technology in a way that maximizes its benefits to health without correspondingly increasing its risks'. Keeping abreast of how the latest medical and technological advances are best applied in surgery is central to the process of continuous professional development and good surgical practice.¹

The complexity of surgical care has two important implications. First, that high quality can only be achieved through efforts to improve outcomes and reduce variation; and, second, achieving high quality care is a multidisciplinary process needing skills

and knowledge of how to achieve system-wide excellence.

QI is the systematic effort to reduce unwarranted variation and improve the quality of care provided. It empowers members of the surgical care team to deliver positive changes for patients. Paul Batalden and Frank Davidoff articulate it as the 'combined and unceasing efforts of everyone – healthcare professionals, patients and their families, researchers, payers, planners and educators – to make the changes that will lead to better patient outcomes (health), better system performance (care) and better professional development (learning)'.⁵

QI supports people to work in a structured way to identify an area for improvement, explore the options for addressing it, implement changes in a planned way and use these changes to improve care. This process often uses specific QI methods and approaches over a set period of time, and often follows recognised intervention types, such as care bundles or check-lists. However, QI is more than following set approaches within a project: it involves monitoring and reacting to needs within your surgical team and organisation and being flexible to match different methods to each situation. Improvement skills and ‘habits of an improver’ are important aspects of quality improvement.^{6,7,8} There is also increasing recognition of the importance of organisation-wide improvement approaches and that learning from QI projects is systematically shared and learnt from, with appropriate structures to share learning across organisations and professions.^{9,10}

HOW DOES QUALITY IMPROVEMENT RELATE TO YOUR CLINICAL PRACTICE?

The tenants of QI lie at the heart of the concept of professionalism and professional bodies, including the RCS – to demonstrate technical expertise and ethical commitments. Involvement in QI enables surgical teams to develop clinically relevant practical skills that link directly to the expectations of good surgical practice (Box 2), including skills in human factors, interdisciplinary team working and managing complexity.

Box 2: Excerpts from Good Surgical Practice¹

‘Engage in quality assurance processes and quality improvement activities, including participation in national and local audit, measuring validated outcome data, peer review, multidisciplinary meetings and morbidity and mortality meetings.’

‘Be committed to quality improvement in the interest of patient care as a core part of your clinical duties. You should contribute to clinical governance systems that strengthen day-to-day quality management and effective service delivery.’

‘Patient feedback: Promote a culture that treats patient experience and patient feedback as a driver of quality improvement and a fundamental measure of service quality.’

Involvement in QI is a necessary part of both the annual review of competence progression (ARCP) for trainees or revalidation requirements, and the NHS Well-led framework includes guidance on the role of QI in developmental reviews.¹¹ For those new to QI, involvement in a programme rather than an individual project can develop vital inter-disciplinary working experience.

QUALITY IMPROVEMENT METHODS AND APPROACHES

Overarching approaches

Although the terms ‘approaches’, ‘methods’ and ‘intervention types’ are often used interchangeably, it is helpful to understand that there are some overarching approaches to QI that use a range of techniques and methods. These approaches can broadly be seen to use similar or overlapping methodologies to achieve change. These include lean, continuous quality improvement, agile, sigma 6 and QI

collaboratives. Some health delivery organisations have taken on these improvement approaches across integrated care systems as their predominant model for improving quality. These approaches have considerable overlap in methods and techniques used, all covering the following four aspects in some way:

- identifying areas for improvement;
- matching improvement options to the situation;
- systematic and measurable tests of change;
- reflecting and learning from results to embed improvements in care provision.

Methods

The methods and frameworks outlined in Table 1 are the predominant and common tools used within these four stages. Many have been developed

within these overarching approaches. Some of these methods and tools that can be used effectively for multiple purposes. For example, clinical audit is often used to identify how local performance relates to quality standards; however, if combined with change cycles, it can be an active tool supporting change in practice rather than simply diagnosing local performance. Central to the usefulness of each method is being clear as to the purpose it is being used for.

Intervention types

The QI process involves testing and then embedding changes to processes, behaviours or structures. Increasingly, there have been consistent types of intervention that are used regularly in QI projects and programmes, including ‘bundles’ of evidence-based practices, check-lists, technical interventions or training programmes. They are not QI methods or approaches in themselves.

Table 1: Examples of QI approaches, tools or frameworks

PURPOSE	EXAMPLES OF APPROACHES, TOOLS OR FRAMEWORKS
IDENTIFY AND PRIORITISE AREAS FOR IMPROVEMENT	
Identification of overarching problem/ area for improvement <ul style="list-style-type: none"> • Unwarranted variation • Practice falling below unacceptable levels • Imbalance between benefit/risk 	National data <ul style="list-style-type: none"> • Performance benchmarking • Getting It Right First Time • National Clinical Audit Programme
	Local data <ul style="list-style-type: none"> • Measurement and monitoring • Clinical audit (also ideas to action)
Articulate and define the area for improvement (sense-making)	<i>Cynefin framework</i> Theory of change (also useful under ‘assess potential causes’)

MATCH IMPROVEMENT OPTIONS TO SITUATION		
Understand local context	Context check-lists Forcefield analysis SWOT (strengths, weaknesses, opportunities, threats) analysis	
Assess potential causes	Enhanced significant event analysis Logic modelling Theory of constraints	Failure modes effect analysis Root cause analysis Five whys Forcefield analysis Fishbone diagram
Assess current processes and systems	Process mapping Flow diagrams Value stream mapping Decision trees	Clinical pathways Five S (sort, set, shine, standardise, sustain) Spaghetti diagrams Patient shadowing
Develop improvement options	Driver diagrams Donabedian model of care Idea development exercises	Experience-based co-design Evidence of successful solutions (literature review etc.) Innovation cycles (30/60/90)
IDEAS TO ACTION		
Engagement and behaviour change	Communications tools, e.g. situation, background, assessment and recommendation Change–Ross change curve	Behaviour change models, e.g. Behaviour change wheel patient stories
Test and review	Model for improvement Plan–do–study–act	
EMBED AND SHARE		
Embedding into normal practice	Spread check-lists	
Share to support learning (scaling and replication)	Evaluation Standards for Quality Improvement Reporting Excellence	Diffusion of innovation model

3. Ten steps for quality improvement in practice

With approximately two decades of implementation of a range of healthcare improvement methods across the UK and globally, there is a growing evidence base of how to go about QI in surgery to achieve sustained and embedded improvements to care.

Although the precise approach necessarily changes every time, there are certain consistent factors that need to be addressed (Box 3). These factors include not only choosing the right methodology and approach but also spending time and energy on other aspects of improvement not typically thought of as QI, such as gaining consensus that the problem you are trying to fix is the right one for your context, building and maintaining momentum for improvement, and integrating innovations into normal practice.

Box 3: Ten steps to support successful improvement

IDENTIFY AREAS FOR IMPROVEMENT

STEP 1: Identify areas for improvement

STEP 2: Prioritise and articulate the improvement

MATCH IMPROVEMENT OPTIONS TO SITUATION

STEP 3: Understand context

STEP 4: Assessing current processes, behaviours and potential causes

STEP 5: Develop improvement options

IDEAS TO ACTION

STEP 6: Engagement and behaviour change

STEP 7: Measurement for improvement

STEP 8: Test and review

EMBED AND SHARE

STEP 9: Embedding into normal practice

For success, QI practitioners need to develop and use basic knowledge and skills for improvement to be successful. These can be articulated as technical improvement skills, *soft skills* – such as communication, organising and leadership skills, as well as the skills in managing local political and bureaucratic landscape – and *learning skills*.¹² These habits are best developed by doing QI in practice.

IDENTIFY AREAS FOR IMPROVEMENT

Step 1: Identify overarching areas for improvement

Prioritising which aspects of surgical care most need improving can be difficult, particularly with complex care provision and pressure to meet often competing targets and requirements. If asked whether your team or organisation is providing the highest possible quality of care for your patients, the challenge is less whether there are areas that could be improved but more which ones should be the focus. The first step in any improvement work is to agree on the most important area of improvement to focus on, balancing benefit and risk between allocating resources to improve and benefits to patients.

Measurement and monitoring

There is an increasing range of data sources and measurement processes that can highlight variation in practice or where outcomes fall below accepted good or best practice. At a national level, performance data such as episode data and the Getting it Right First Time (GIRFT) programme, and national clinical audits are highlighting poor quality and variation in care. Aligning your project with national drivers and priorities can smooth the improvement process, as

long as the programme is still owned and led locally, designed to best fit in with your local situation.¹³ Patient and staff surveys and other qualitative data can also highlight areas of poor quality. Local measurement and monitoring systems can provide more detailed data on performance, and clinical audits can provide a good retrospective picture of local practice (although they can also be used as improvement mechanisms is used in conjunction with measurable tests of change).

Step 2: Prioritise and articulate the QI goal

Once areas for improvement have been identified, a topic should be chosen that in your best estimate has the greatest chance to improve quality. If carrying out small QI projects, consider whether your area of focus aligns with broader organisational priorities. Articulating the problem will need some *making sense of the nature of the problem* and developing an *initial theory of change* (logic model or driver diagram), which will be covered further when matching situation with improvement options. Rephrasing as a QI goal (sometimes referred to as QI aim) instead of a problem is part of that process, enabling you to turn focus on solutions within your unique context.

A QI goal will answer the question ‘What are we trying to accomplish?’ and should be specific to exactly what is targeted for improvement, including scale:

- What patient outcomes would improve, and what is the patient population?
- What processes, systems or behaviours would improve?

The challenge in setting a QI goal is to make them ambitious enough to truly make a difference and enable transformative change, and realistic enough that you do

not set yourself up to fail.¹⁴ This overarching goal is not a target for judgement, and challenging goals can shift thinking to look for innovative solutions.¹⁵ At this stage ‘challenging enough’ is a good mantra.

Once you have assessed, context, current systems and causes you will be in a position to revise your QI goal to include information on how much, by when and how an improvement will be measured (as articulated within the model for improvement – *see Figure 4*).

Considerations

Identifying and understanding the most important areas of improvement within your team and organisation is a key first step, both in terms of demonstrative measurement and perceptions by colleagues. However, beware of excessive focus on identifying problems at the expense of developing and testing context specific solutions.

Identifying problems that align with local perceptions of high risk or poor quality will lead to continuing engagement and support from leadership and voluntary commitment and motivation from surgical colleagues. Conversely, not convincing your fellow professionals that there is a problem is a common barrier that can stifle QI efforts. Although producing evidence of the extent of a problem may convince some, also demonstrating that improvement is possible in your organisation through measurable tests of change leads to more effective attitudinal and behaviour change.

MATCH IMPROVEMENT OPTIONS TO SITUATION

Once there is an agreed area of improvement, the next stage is to explore the potential options for addressing it.

This will involve understanding how the improvement topic fits into national and local context, assessing current systems and processes are working and draw out potential causes, and developing options for improvement to test. Depending on the nature of the problem, different methods can be used to cover these three steps and they can be carrying out sequentially or in different orders. Table 1 lists some of the common QI methods and tools used to support these steps.

Step 3: Understand context

Context can be seen as the environment or situation in which improvement efforts will be taking place. Taking time at the start of the improvement process to understand relevant contextual factors will help in the process of deciding which methods and approaches to use, and who to can best support the improvement effort. An appreciation of context is often ignored in the pursuit of ‘one size fits all’ interventions, leading to mixed outcomes.¹⁶

Make an initial assessment of contextual factors that may affect successful improvement:

- What are the structures, resources, strategic priorities and attitudes to the specific area for improvement? (Receptive context)
- What is the prevailing culture towards improvement? (Culture) This covers aspects such as organisational learning, interdisciplinary teamwork, recognition and rewarding good practice.
- What is the leadership approach to improvement? (Leadership). This covers support for innovation and improvement, role clarity and willingness to ‘unblock’.

(Adapted from PARiHS model, as presented by Rycroft-Malone et al, 2004)

There are tools and frameworks that can help with this process, such as *context check-lists*, including the Promoting Action on Research Implementation in Health Services (PARIHS) model. If aspects of context are highlighted as hindering improvement, tools such as strengths, weaknesses, opportunities and threats (SWOT) or forcefield analysis can be useful to develop ideas for change that can be tested and improved.

Step 4: Assess current processes and systems and potential causes

With an overarching QI goal and understanding of context, the next step is to develop a clear picture of what is happening in practice, drawing out potential causes (and solutions) where possible. As Paul Batalden states, 'every system is perfectly designed to get the results it gets'.¹⁸ Investigating current practice can draw out understanding of critical points in a care pathway leading to poor practice or system factors – drivers – that need to be addressed to achieve your QI goal.

It can be useful to ask members of the team what they think about processes and what they consider might work for improvement. This can also help in the dissemination of messages afterwards, to ensure that all team members feel committed to making a change.

Choosing your method

There are bewildering numbers of different methods and techniques that could be followed, with only some of the available methods listed in Table 1. Deciding on the method to use should depend mainly on the scale and nature of the problem, although which method you choose is less important than going through the process of assessing the current system drawing out causes and ideas for improvement.

Working within the system, surgical teams will have tacit knowledge of failings in processes and systems, while patients, carers and families can be best placed to observe and notice critical points of failure, such as communication at handover. QI methods can bring structure to draw this knowledge out as well as uncover new knowledge.

What is the focus of the improvement area?

- If your improvement area relates to improving a pathway or relatively simple set of processes, then tools like process mapping, decision trees or clinical pathways may be useful. These tend to be problems where there is either clear best practice or good practice, and that it is possible to understand the system, although this will likely require expert knowledge.
- Improving or reducing complex defects in patient care, focusing on all aspects of quality. Start with a theory of change or logic model and then consider techniques that delve into the root causes of poor quality, such as significant event analysis or root cause analysis.
- Reducing cost/waste to improve efficiency. Lean techniques are particularly useful here (e.g. fishbone analysis).

Step 5: Develop improvement options

With a clear QI goal and a full picture of current system performance and context for the QI goal, it is now time to collate the ideas for change and potential solutions already surfaced, source evidence of successful solutions from elsewhere and develop new ideas from professionals and patients involved in the specific surgical care to be addressed.

Driver diagram

A good way to visualise your improvement options, particularly for complex change, is by creating a driver diagram. A driver diagram is a mapping tool for teasing out and outlining what actions and improvements will lead to achieving the overarching QI goal. The overarching QI goal is linked to primary drivers, which are the main factors that directly contribute to achieve this goal, articulated as statements. Primary drivers may be linked to secondary and then tertiary drivers (if they exist), which are specific improvement statements or sub-goals which will achieve the driver above (see [Figure 1 for an illustration](#)).

Discrete interventions or change ideas then link to the lowest-level drivers.

By developing a driver diagram, it becomes clearer what changes will have to take place to achieve your goal, where there are gaps in knowledge of how to achieve your goal and how to prioritise. Distinguishing between improvement goals/statements as structural, processes or care outcomes will be useful when setting up your measurement system (see [Donabedian model of care](#)). More guidance on primary drivers is available at NHS Improvement.¹⁹

New sources of improvement options

An essential part of the pulling together ideas of improvement is by reviewing the current evidence of solutions to your QI goal from other settings. This should start with a rapid sweep of the published evidence, but will ideally include

checking grey literature from statutory improvement bodies (such as Healthcare Improvement Scotland, the Agency for Healthcare Research and Quality and NHS Improvement), improvement charities (such as the Institute for Healthcare Improvement, the King's Fund and the Health Foundation), academic improvement bodies (Academic Health Science Networks, Collaboration for Leadership in Applied Health Research and Care, the Healthcare Improvement Studies Institute) and the RCS website. Using informal networks to enquire with professional colleagues if they have heard of good practice and talking with them for advice (or other examples of good practice) can often elicit excellent ideas for improvement.

Methods such as [experience-based co-design](#) or [30/60/90 day innovation cycles](#) provide an excellent structure for developing new ideas within a clear time-bound structure. [Idea development exercises](#) can quickly elicit ideas from a group of surgical colleagues, particularly if a bit of time is taken to 'translate' some of the innovation jargon such as 'ideation'.

When new ideas are developed, collate them into an 'ideas list' and feed them back into a revised driver diagram. A driver diagram or equivalent model for articulating QI goals and change mechanisms, such as logic models, is an essential part of the QI process. This information will be used to prioritise which improvement options to test, when and how, and will be the frame for developing your [measurement system](#).

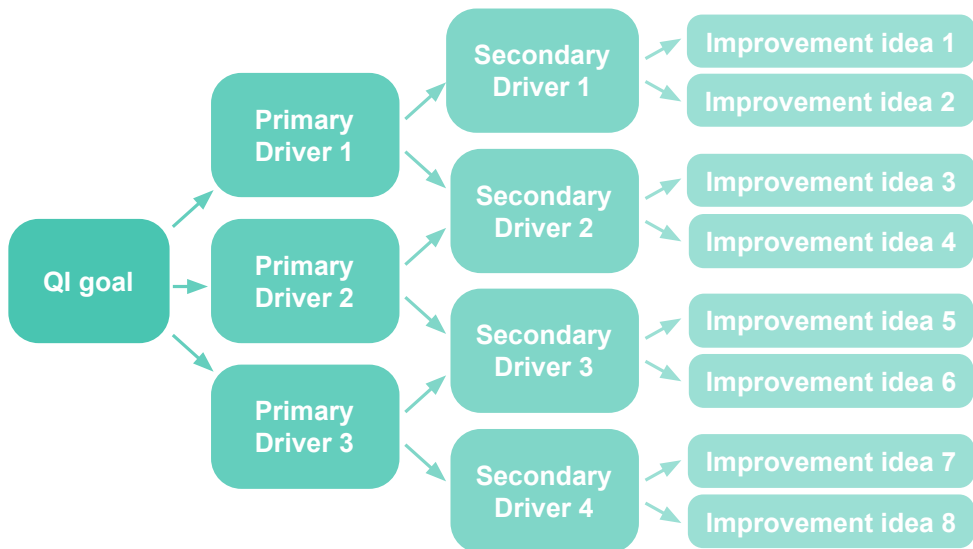


Figure 1: *Driver diagram*

Considerations when matching options to situation

Time spent understanding context, current system performance and reviewing evidence previously successful improvements have traditionally been neglected in QI. By spending time thinking through these steps, you can build upon the current evidence base and not reinvent the wheel. However, it is not necessary to spend too long focusing on these steps before developing clear plans for action and start testing improvements. If evidence of solutions cannot be found, a lack of evidence is not an excuse for inaction.

When pulling together examples of successful solutions from elsewhere, be mindful that improvement interventions are notoriously difficult to replicate in other contexts, partly as the documented interventions often focus on the technical rather than the social constructs that made the original intervention successful.

IDEAS TO ACTION

Testing improvement ideas in the real world using a structured, measurable approach is the essence of QI. For smaller QI projects or areas of improvement where there is a clear, commonly agreed and urgent need for improvement, the time spent between starting and beginning testing will be short. Even for complex improvement programmes, it is important not to spend too much time focusing on measuring problems and planning theoretical solutions. Agree on who needs to be involved and in what way (Step 6: Engagement), set up your system of measurement ([Step 7: Measurement for improvement](#)) and start by testing small changes, build and adapt in response to your measured results ([Step 8: Test and review](#)).

Step 6: Engagement and behaviour change

An essential part of *leading QI* is ensuring that the right people own, participate and input into your improvement efforts, including leadership, 'influencers' and patients. Many of these people will have been involved in the earlier steps outlined above already, particular when *assessing local context*, but it is worth reviewing throughout your improvement project whether you have the right people involved and in the right way, and whether action is worth taking to improve engagement. Identify who should be engaged in the QI activity within the four categories below, being clear on project roles and expectations.

CORE TEAM:

The core team includes all the appropriate people needed to develop ideas for improvement, carry out tests of change, collect and monitor data, review and act upon the results. Involve representation from all professional groups involved in delivering care for the population focus. This team will need leadership (which could be distributed) and composition can change over time, including different people as different ideas are tested.

ENABLERS:

Identify all the people involved in delivering care for the area of improvement, particularly influential people who could either support and enable improvement or stifle the effectiveness of improvement. Developing a feeling of understanding the value and ownership of the improvement effort is important to help keep people as 'enablers' rather than 'blockers'.

LEADERSHIP:

Ensuring that you have leadership support is essential to ensure the improvement team has the space and resources to test changes and to be able to step in to 'unblock' challenges.

PATIENTS:

Involving the patients, carers and families affected by the specific surgical care that you are improving provides an essential perspective on the impact and effect of poor-quality care. Providing a platform for *patient voices and stories* will provides an insight on the reality of the care provided and an understanding of their experience. As well as ensuring that change ideas are appropriate for patients, it is a powerful mechanism for engagement from staff and leadership.

Mechanisms for improving engagement or behaviour

Awareness of the programme should begin when deciding on your area of improvement, but engagement is an active process that needs to be maintained. Be clear on who realistically needs to be engaged, using the categories above, and make it easy for them to find out about the QI activity. Provide a simple process for them to contribute time, ideas or resources. Many techniques are as simple as talking with patients and colleagues in formal and informal situations, using posters in prominent areas and digital communication channels. As mentioned above, looking for and developing *patient stories* will help to engage patients in the improvement process and helps with motivating colleagues to support improvement efforts.

As part of this assessment process and when assessing local context, poor communication, motivation, attitude or behaviour may be highlighted. Using change management models such as the Kübler-Ross change model, or behaviour change models such as the behaviour change wheel can be helpful in understanding the reasons behind unhelpful behaviour or lack of engagement, particularly by distinguishing between capability, opportunity and motivation and understanding potential ideas to improve behaviour.²⁰ Most people who block change are doing so as they believe their position is right; by understanding their perspective it can be easier to find a way for them to help constructively. Communications tools such as **SBAR** (situation, background, assessment and recommendation) can be useful to introduce tests of communication change. When using any of these tools, follow the *test and review* process outlined below.

Step 7: Measurement for improvement

Measurement system

Setting up systems for measuring improvement is an essential part of QI. If set up well, such systems can provide ground breaking insights into the reality of system performance and can be a powerful tool to galvanise support for embedding and spreading improvements in surgery. As setting up the system can be complicated and, together with data collection, time consuming, it is important to spend time before testing to ensure that the right data are being collected efficiently to support the QI goal.

It should be simple enough to meet your needs, measuring the right data rather than more data. Data collection should be resourced well, with protected time for team members to collecting and review data.

Developing measures

Review your driver diagram (or equivalent) to ensure that the statements within each QI goal are specific, understandable to anyone involved in the QI activity, and measurable. For example, an improvement programme looking at surgical equipment might have an initial QI goal of 'improve equipment problems in hospital X', which is then developed through consensus after comparison with the evidence base and current performance to: 'Ensure equipment problems occur in fewer than 5% of general surgical procedures at hospital X'.

The improvement team would need to work out how 'equipment problems' are defined, how they can be measured over time, and practically what process would need to be followed to collect these data, who will collect the data and how will it be reviewed. It may be helpful to use the *NHS Improvement measurement checklist* to be clear that the measure is fit for purpose. Each measure must be easily repeatable over time and reproducible.

- **Repeatable:** Can you, who created the definition, understand it and repeat it? Also known as test–retest error, used as an estimate of short-term variation.
- **Reproducible:** Can the definition you have created be reproduced by other people?

Your measures will probably be a combination of outcomes measures affecting patient care and process measures. Once you have developed measures against your QI goals/statements, review what could be unintentional consequences of the QI work and develop associated balancing measures.

Balancing measures

Balancing measures reflect what may be happening elsewhere in the system as a result of the change. A common refrain when outlining proposed change will be 'if you change this, it will affect that'. Measuring the 'that' might be a useful balancing measure.

This impact may be positive or negative. For example, you want to know what is happening to your postoperative readmission rate: if it has increased, you might want to question whether, on balance, you are right to continue with the changes or not.

Collecting and presenting data

After agreeing upon the core set of measures, a decision on how data are collected, by whom and how much is collected. There must be enough data, but not necessarily all data, for the particular process, outcome or balancing measure. If sampling, collect a sample of random data at regular intervals to try and be as representative as possible. Deming referred to this as a judgement rather than a convenience sample.²¹

Time series data

Tracking quantitative measures over time provides a range of advantages over pre–post measurement, particularly if you are collected small samples; it enables distinction between natural variation, reliability and change associated with your test of change (Figure 2).²² Presenting this information in a dynamic, point-by-point way enables changes in process and outcome to be visible quickly. By marking on the time series chart when a particular change occurs, it is clear to see whether any improvement coincides with tests of change implemented. Run charts and statistical process control charts are the statistical tools most commonly used within QI. *Run charts* provide a quick and simple mechanism that indicate whether there is there is variation in your measure and by following basic interpretation rules, understanding whether there is non-random variation. Depending on whether your area for improvement varies before testing begins, the baseline collection period for run charts can be very short.

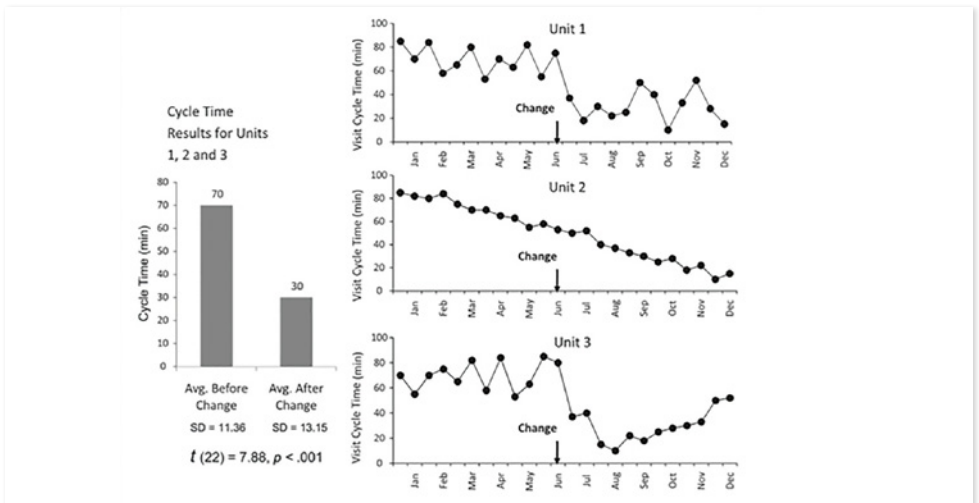


Figure 2: Time series change compared with pre–post

A *statistical process control (SPC) chart* is a more complex tool which enables us to see the variation in the data and to investigate outlying data points. Control bars are added at three standard deviations away from the mean to display 'acceptable variation'. With multiple changes, SPC

charts can clearly illustrate how different interventions match with changes in average outcome – recalculation of the overall mean – and increase on control or reduction in variation, tightening of the control limits (Figure 3).

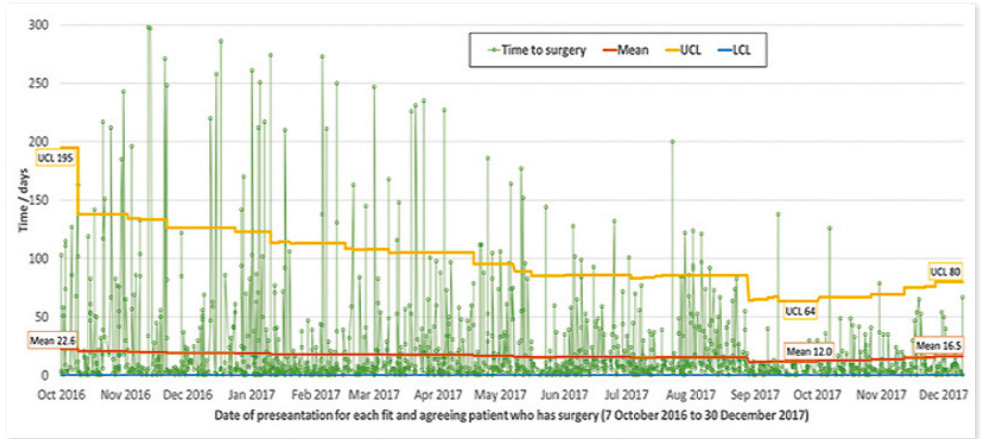


Figure 3: Example of an SPC chart

Qualitative data

Combining time series data with qualitative or descriptive data can be useful to get inside the 'black box' of what happened during testing and provides an explanation to complement hard outcome data.

Considerations when measuring for improvement

Reflect on the different audiences that will be looking at the data measured, particularly when analysing and displaying data for improvement. Be ready to explain how time series data relate to traditional pre-post data.

Setting up and collecting improvement data can sometimes seem a thankless task but once new processes become familiar, the evidence collected can be very powerful. Consider how to provide reward or recognition for those grafting on measurement and celebrate when successfully set up.

Remember that as an emergent process, new improvement ideas and challenges will arise over time, needing new measures, so remain flexible to changing what you measure over time. Finally, plan to continue measuring after a QI project has finished to ensure that improvements are sustained.

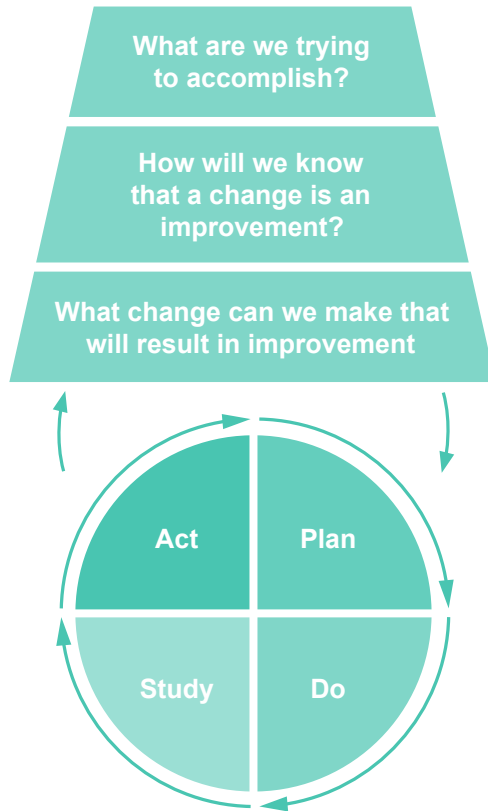


Figure 4: Model for improvement

Step 8: Test and review

When introducing any new change, it is important to agree within your improvement team exactly what change you are testing (DEFINED CHANGE), how you will measure if it leads to improvement (MEASURES) and how the change links to your QI goal (PURPOSE). These are articulated in the model for improvement developed by the Institute for Healthcare Improvement (Figure 4) as question statements.²³

PURPOSE: What are we trying to accomplish?

This is the improvement goal for this specific change. For simple interventions this may be the same as your overarching QI goal, but there are usually sub-goals or drivers linked to your driver diagram (or equivalent). Taking the surgical equipment example from *measurement for improvement*, rather than the overarching QI goal of reducing occurrence of equipment problems, focus might currently be on a driver such as 'improved communication across surgical team before surgery'.

DEFINED CHANGE: What change can we make that will result in improvement?

If there is only one change, this is as simple as agreeing which change to test to achieve your QI goal, documenting what it is in a change statement and including when and how it is tested. For more complex interventions, you should agree which idea or ideas to prioritise first from your *'ideas list' or driver diagram*. As you continue the QI project, new ideas will emerge or new challenges will surface that need improving (e.g. *improving engagement or behaviour*); remember to document what the change is, when and how it is tested.

Taking the surgical equipment example further, the change to test may be 'including verbal confirmation of equipment availability, checks for faults and confirmation of capability to use within the surgical briefing before every procedure in the month of June, following the newly designed surgical checklist'.

MEASURES: How do we know that a change is an improvement?

Each test of change must be measurable. Review the change statement to ensure that the change is specific and links to the relevant QI goal.

If the change is addressing the primary outcomes of the QI project, measurement

systems may already address this test; however, you may need to collect additional data, particularly if you are introducing a change in processes, systems or behaviour. Remember to start measuring before testing to gather a baseline, think of probable unintended consequences and consider whether you need any *balancing measures*. Your measure may be qualitative, such as pre-post questionnaires or interviews to assess how the new checklist has been used and perceived, and has affected communication between nurses and surgeons.

Small tests of change (plan-do-study-act)

Once you have agreed on a change that can be measured (plan), introduce the test for a set period of time (do), review the data – ideally time series data – (study) and then decide to continue testing, to expand the test to other areas, to stop testing or to adapt to carry out a different test (act). This was articulated by Deming as a plan-do-study-act (PDSA) cycle, sometimes referred to as the Deming circle or plan-do-check-act (Figure 5). These cycles work well when begun on a small scale with short tests, rapid assessment and multiple cycles that learn from prior tests; they are cost effective and it is easy to get going compared to 'big bang' larger testing

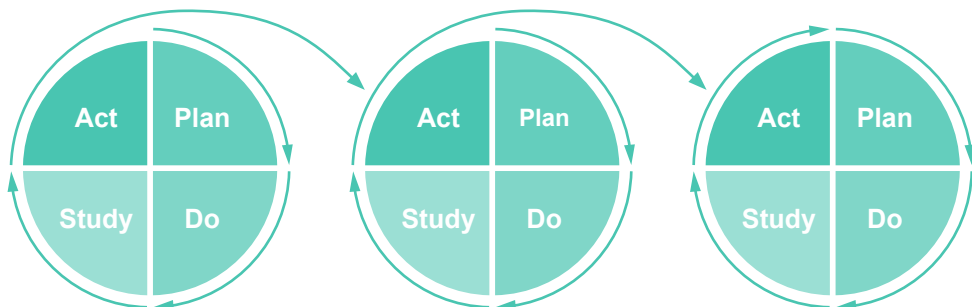


Figure 5: Iterations of the PDSA cycle

Considerations when testing

The speed and effectiveness of PDSA cycles makes them an ideal testing tool in many situations, but they do need to be planned well, with rapid not being synonymous with 'quick and dirty'. Recent research has highlighted the importance of investing in the support and resources needed to carry out rapid change cycles effectively.²² Ensure that you are building on experience and evidence from elsewhere in *developing improvement ideas* and not solely relying on data from PDSA cycles.

Starting small does not mean remaining small: once it is clear that changes are leading to improvement, work is necessary to test at larger scale and in different contexts, appreciating that success within a local context may not translate to larger situations and new change ideas will need to be developed (and new challenges considered) while scaling.

Although there are fundamental aspects that should be followed with tests of change, small iterative PDSA cycles are not appropriate for all situations. The *Chole-QuIC case study* outlines a successful improvement where, although iterative cycles of change were encouraged, one site embedded successful improvement with little iteration after detailed engagement and behaviour work took place. The fundamental aspects cover the four stages of a change cycle and are consistent with the approach at the heart of applied research and improvement science:

PLAN: Build on the evidence and learning from the previous seven steps to clearly define the test of change linked to measures and a QI goal (within your driver diagram).

TEST: Introduce the test for a set period.

STUDY: Review the data and then decide to

ACT: i) Continue testing to gather more data

ii) Expand the test to other areas (spread)

iii) Stop testing (sufficient evidence that the idea is not leading to improvement).

ADAPT TO CARRY OUT A DIFFERENT TEST (REVISED TEST IDEA OR EMBEDDING IMPROVEMENT)

Embed and share

Step 9: Embedding into normal practice

If the project successfully develops evidence that tests of change have led to improvement at the scale intended when agreeing your area for improvement, it is important to review and assess how the change can move from a test to normal practice. This may be a natural process of continuing with the change, but it is worth considering what additional structures should take place or what communication is necessary to ensure that there is a smooth transition. Staff rotation (particularly with registrars) can disrupt a previously smooth process, and extra attention to communicating new ways of working should be considered.

People may have been willing to change practice or behaviour 'for the project' but less willing to carry as daily practice. Many successful QI projects suffer from results returning to rates close to those seen at baseline, partly because energy (and protected time) during the project are important factors contributing to improvement. Once the change appears to be embedded, ensure that you continue to collect measurement data for a while to ensure that results have continued.

This may be a smaller dataset or collected at a set period after the main QI project.

Diffusion or integration into broader practice

Successfully demonstrated improvements may naturally diffuse to other parts of your organisation, but more active widening implementation may be necessary to support colleagues taken up new improvements to care. This is an aspect

not traditionally focused upon, but there are increasing documents and frameworks to supported integration of successful improvements across your organisation. The Health Foundation's [organisational spread checklist](#) is a useful tool to support integration as is their learning report on organisation-wide improvement.²³

Step 10: Share to support learning (scaling and replication)

Increasing attention is being placed on scaling and spreading successful improvement and innovation by NHS, statutory and non-statutory bodies.^{24,25} Fundamental to this drive is the recognition that there are good examples of transformative improvement and innovation ideas that need to be shared and fostered, and that organisations and networks need to be orientated to provide the ecology for large-scale improvement.²⁶ Your organisation may have forums set up to support the sharing learning, such as 'Schwartz rounds'.

It is important to share your successes, failures and what you have learnt while carrying out QI. Documenting your improvement work and sharing learning through open access publications (such as BMJ Open Quality or BJS Open) and the [RCS Quality Improvement website](#). [SQUIRE guidelines](#) provide a simple structure for documenting learning from QI.

Some form of evaluation can play an important role in supporting improvement across the UK. Outcome evaluations deepen the evidence of improvement in comparison to national trends, and process evaluations can provide a deeper understanding of the mechanisms for change (i.e. provide explanation to support better replication or scaling).²⁸ Publication of improvement results can build support from leadership and funders to embed, spread and scale interventions.

CASE STUDY FROM THE CHOLE-QUIC COHORT

We undertook case studies of the most successful hospitals within the Chole-QuIC project. This case study is from a medium-sized teaching hospital (around 1,000 beds) with an upper gastrointestinal surgical team of eight consultants.

The area for improvement was identified through consultation with the RCS membership and led to the funding of a 13-site collaborative. Improving time to surgery for biliary patients was an accepted problem that a wide range of clinicians thought needed to be fixed. As such, it was an ideal problem to work on, as the additional time and effort required to improve care made sense to people (**Step 1**).

At this hospital the surgeon leading Chole-QuIC had spent time prior to joining the project gaining consensus from surgical and management colleagues about participation and building agreement that this was a priority area for improvement. This work upfront to make sure that the majority of key players were on-board appeared important (**Steps 1 and 6**).

The collaborative teams jointly agreed on the patient population and QI goal: by the end of the programme, to perform a cholecystectomy within eight days of presentation on all fit and consenting patients with gallstones, in line with national guidance (**Step 2**).

When Chole-QuIC subsequently proposed and tested the changes required to improve surgery times (including changes in patient flow and surgeons' lists) the consensus building work upfront increased the acceptability of these changes. Importantly, this engagement work involved both discussion in meetings and by email but also one-to-one conversations with colleagues so that they felt heard and included and were able to share their own ideas about how to solve the

problem (**Steps 1 and 6**). This led to an understanding of what had been tried previously to solve this problem historically (i.e. failed solutions), what the current barriers were and what would need to be done to address them (**Steps 3, 4 and 5**). An audit was also performed to understand current performance plus a case review of delayed cases (**Steps 3 and 4**), which, together with the various discussions with colleagues, facilitated a detailed understanding of the problems and possible solutions to these (**Step 5**). The best solution identified was considered quite radical, as it involved moving appropriate hot cases from the main hospital site to the trust's elective site a few miles away, with a concurrent ringfencing of elective capacity across each surgeons list at that site. Having spent time considering solutions and gaining consensus (**Step 6**), what was notable was that Chole-QulC did then not waste time before testing it out to see if it would work in reality (**Step 8**). As an aside, we found across all the most successful sites in Chole-QulC there was a clear pattern of site leads investing time on deliberating solutions with colleagues upfront but then not being afraid to just get on and try these out in practice (**Step 8**).

STEPS TO SUPPORT SUCCESSFUL QI

IDENTIFY AREAS FOR IMPROVEMENT

STEP 1: Areas for improvement

STEP 2: Prioritise and articulate the QI goal

MATCH SOLUTION OPTIONS TO SITUATION

STEP 3: Understand context

STEP 4: Assessing current processes, behaviours and potential causes

STEP 5: Develop improvement options

IDEAS TO ACTION

STEP 6: Engagement and behaviour change

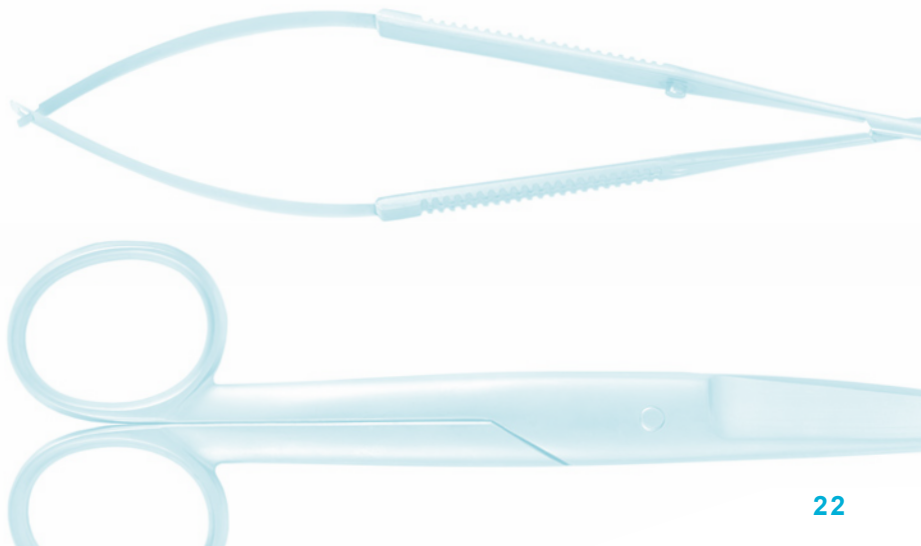
STEP 7: Measurement for improvement

STEP 8: Test and review

EMBED AND SHARE

STEP 9: Embedding into normal practice

STEP 10: Share to support learning



The new process required substantial engagement across all involved stakeholders (surgeons, service managers, nursing staff, booking clerks,) to ensure a co-ordinated effort to make the new process work (**Step 6**). Again, this took the form of face-to-face discussions rather than just emails. Once everyone had agreed and understood the process, it was tested at a time when the lead surgeon was available to manage and monitor everything to minimise the risk of glitches but also to learn from any that occurred (**Step 7**). By comparison with other successful sites, no major changes were made, although as the new process did work well, minor refinement occurred to streamline performances. For example, the booking clerks suggested ideas to refine the slot allocation process, which was a nice indication that they felt sufficiently engaged to contribute to the improvement process. Essentially, the new process was tested for several months; while the process started to be managed across the whole team, Chole-QulC reviewed every case verbally with colleagues to ensure new issues were not arising. By comparison, other successful Chole-QulC sites iterated through a range of changes (**Step 8**). Six months later, Chole-QulC felt comfortable enough that the processes were embedded to step back a little. A crucial moment came when the team had a two-week holiday and returned to discover that the process had been followed as planned in their absence with no problems (**Step 9**).

Measurement was the single biggest challenge in this otherwise very successful project (**Step 7**). On the one hand, Chole-QulC was reviewing each case (verbally with surgical colleague, nursing staff etc.) and so the process was being monitored for safety and effectiveness. On the other hand, a robust system for collecting process data on the time to surgery for the biliary patients was not established and so this duty fell to one individual.

This not only created substantial additional work for that person but also meant that data collection was often retrospective in nature, limiting its role in feedback and sharing of performance data (**Step 10**). This was not a major problem in this particular case in terms of successful change, but it did present challenges when Chole-QulC wanted data to demonstrate that improvement had occurred. This highlights the challenge of even simple data collection and the need to establish systems to make data collection an easy and shared responsibility, wherever possible (**Steps 7 and 10**).

STEPS TO SUPPORT SUCCESSFUL QI

IDENTIFY AREAS FOR IMPROVEMENT

STEP 1: Areas for improvement

STEP 2: Prioritise and articulate the QI goal

MATCH SOLUTION OPTIONS TO SITUATION

STEP 3: Understand context

STEP 4: Assessing current processes, behaviours and potential causes

STEP 5: Develop improvement options

IDEAS TO ACTION

STEP 6: Engagement and behaviour change

STEP 7: Measurement for improvement

STEP 8: Test and review

EMBED AND SHARE

STEP 9: Embedding into normal practice

STEP 10: Share to support learning

4. Skills of an improver

QI is a practical process, where knowledge and skills are best learnt through doing. There is a limit to what can be learnt in theory, with expertise developed through habit.⁸ By following the processes described in section 3, surgical teams can build expertise in QI while simultaneously improving patient care. Technical skills for carrying out QI will take time to develop, particularly the set up and interpretation of *run and SPC charts*. Training courses run by local trusts or health boards or national bodies such as the RCS can provide a useful introduction to concepts, but it is only through carrying out QI in practice that these skills can thrive. Part of the emphasis for learning skills falls on the individual, through building practitioner skills or following frameworks such as *Habits of an Improver* or the *skills for improvement pyramid*.⁸ Support from NHS providers and senior leaders, ideally following the lines outlined as the *Kings Fund's lessons for NHS boards and leaders*, is essential.²⁷ However, the driving force for QI in surgery will usually come from surgeon leadership.

LEADERSHIP FOR QUALITY IMPROVEMENT

Without an engaged surgical leader with sufficient protected time to be meaningfully and actively involved, many QI endeavours will falter. Leading a QI programme needs concerted work to engage and 'manage' all four groups outlined under the *engagement section (Step 6)* above: your team, colleagues, senior leaders and patients.

Leading a QI project requires a slightly different skillset from the leadership that surgeons give every day in clinical practice

and, often, they are surprised at how difficult leading such a project can be at the outset. There is no magic formula, but following the lessons from this guide will help. Three interrelated factors stand out. First, increase communication with the team, 'enabler' colleagues (who have the risk of being 'blockers') and senior leadership. These people are the arbiters of whether your change occurs and becomes routine or not. Keep colleagues up to date, feed data back regularly and ask for their help if progress is slower than hoped.

Second, share the load with your team – embrace distributed leadership and shared ownership. Other members of the surgical team, particularly trainees, nurses and managers, tend to thrive off active participation in larger QI projects, with opportunities to change their practice or do things a little differently as a result of the improvement project. People will likely surprise you and will drive the QI work further and more successfully than more hierarchical models.

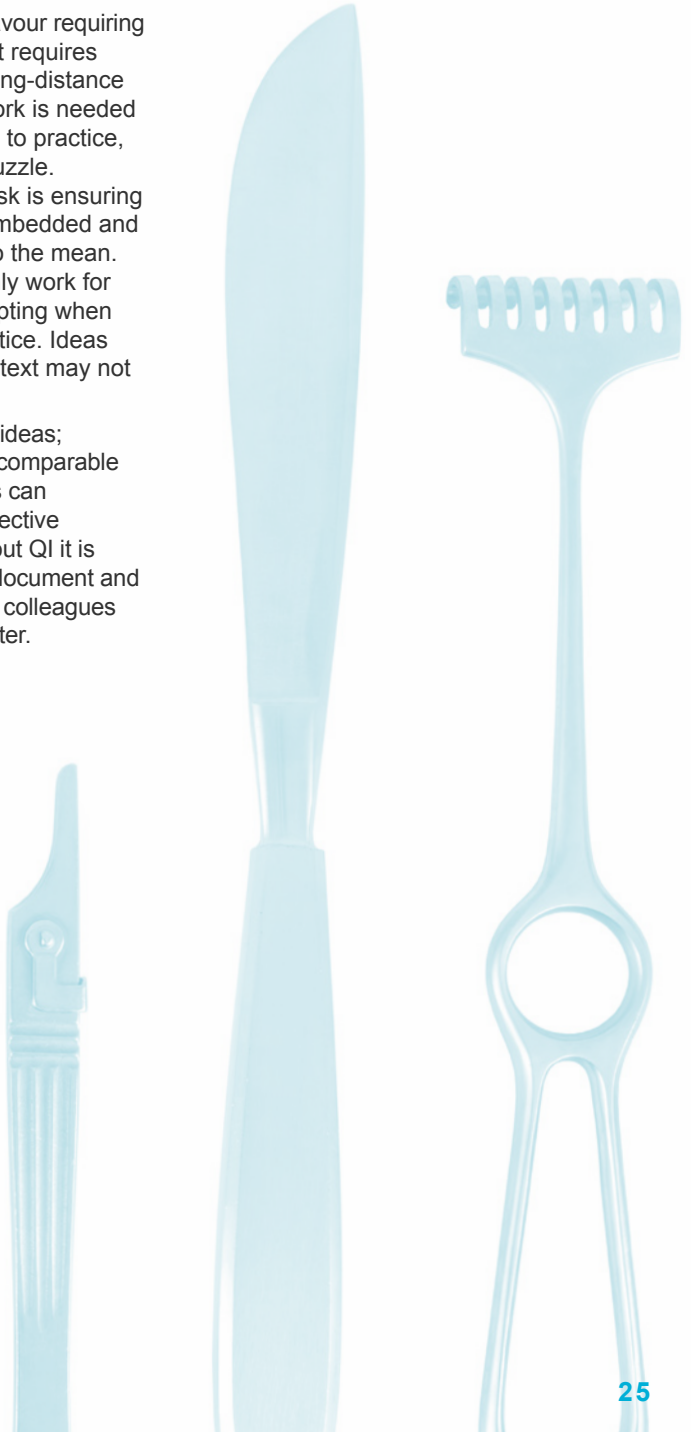
Third, even though many QI projects aim to address a technical aspect of care, it is people who are doing this technical work and therefore improvement is fundamentally a social process. Paying attention to these social aspects is likely to be as important as anything else when it comes to successful quality improvement. Chip and Dan Heath propose a clear way to lead QI in their book *The Switch: How to lead change when change is hard*.²⁸

CONCLUSION

Successful QI is a team endeavour requiring both urgency and patience – it requires the skills of a sprinter and a long-distance runner. Although dedicated work is needed to demonstrate improvements to practice, this is only one piece of the puzzle.

Perhaps the more complex task is ensuring that improvements become embedded and spread, avoiding regression to the mean. Some successful ideas will only work for short periods or will need adapting when introducing into standard practice. Ideas that are successful in one context may not work in other contexts.

Not all improvements are new ideas; reviewing what has worked in comparable contexts and learning from this can save time and lead to more effective improvement. When carrying out QI it is incumbent on practitioners to document and share what has been learnt so colleagues can find common solutions faster.



5. References

1. Royal College of Surgeons of England. *Good Surgical Practice: A guide to good practice*. London: RCS; 2020. <https://www.rcseng.ac.uk/standards-and-research/gsp> (cited February 2021).
2. Royal College of Surgeons of England. Quality Improvement in Surgery. <https://www.rcseng.ac.uk/standards-and-research/support-for-surgeons-and-services/quality-improvement-in-surgery> (cited February 2021).
3. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: The National Academies Press; 2001.
4. Donabedian A. The definition of quality and approaches to its assessment. Ann Arbor, MI: Michigan Health Administration Press; 1980.
5. Batalden PB, Davidoff F. What is 'quality improvement' and how can it transform healthcare? *Qual Saf Health Care* 2007; **16**: 2–3.
6. General Medical Council; Academy of Medical Royal Colleges. *Generic Professional Capabilities Framework: Guidance on implementation*. Manchester: GMC; 2017. <https://www.gmc-uk.org/education/standards-guidance-and-curricula/guidance/generic-professional-capabilities-guidance-on-implementation> (cited February 2021).
7. NHS improvement. Developing people improving care. December 2016 (updated February 2019). <https://improvement.nhs.uk/resources/developing-people-improving-care> (cited February 2021).
8. Lucas B, Nacer H. *The Habits of an Improver: Thinking about learning for improvement in health care*. London: Health Foundation; 2015.
9. Jones B, Horton T, Warburton W. *The Improvement Journey: Why organisation-wide improvement in health care matters, and how to get started*. London: Health Foundation; 2019.
10. Dixon-Woods M, Martin GP. Does quality improvement improve quality? *Future Hosp J* 2016; **3**: 191–194.
11. NHS England. Well-led framework. <https://www.england.nhs.uk/well-led-framework> (cited February 2021).
12. Gabbay J, le May A, Connell C, Klein JH. *Skilled for Improvement? Learning communities and the skills needed to improve care: an evaluative service development*. London: Health Foundation; 2014.
13. Dixon-Woods M, Leslie M, Tarrant C, Bion J. Explaining Matching Michigan: an ethnographic study of a patient safety program. *Implement Sci* 2013; **8**: 70.
14. Sitkin SB, Miller CC, See KE. The Stretch Goal Paradox. *Harvard Bus Rev Magazine* 2017; Jan–Feb. <https://hbr.org/2017/01/the-stretch-goal-paradox> (cited February 2021).
15. Institute for Healthcare Improvement. Science of Improvement: tips for setting aims. <http://www.ihl.org/resources/Pages/HowtoImprove/ScienceofImprovementTipsforSettingAims.aspx> (cited February 2021).
16. Bate P, Robert G, Fulop N et al. *Perspectives on Context: A selection of essays considering the role of context in successful quality improvement*. London: Health Foundation; 2014.
17. Rycroft-Malone J, Harvey G, Seers K et al. An exploration of the factors that influence the implementation of evidence into practice. *J Clin Nurs* 2004; **13**: 913–924.

18. Institute for Health Improvement. Like Magic? ('Every system is perfectly designed...'). <http://www.ihl.org/communities/blogs/origin-of-every-system-is-perfectly-designed-quote> (cited February 2021).
19. ACT Academy. Driver diagrams. Online library of Quality, Service Improvement and Redesign tools. London: NHS Improvement. <https://improvement.nhs.uk/documents/2109/driver-diagrams.pdf> (cited February 2021).
20. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011; **6**: 42.
21. Peria RJ, Provost LP. Judgment sampling: a health care improvement perspective. *Qual Man Health Care* 2012; **21**: 169–175.
22. Reed JE, Card AJ. *BMJ Qual Saf* 2016;**25**: 147–152.
23. The Improvement Journey: Why organisation-wide improvement in health care matters, and how to get started. <http://reader.health.org.uk/the-improvement-journey/> [accessed 5 July 2019]
24. Against the odds: Successfully scaling innovation in the NHS. Innovation Unit, 2018 <https://www.innovationunit.org/wp-content/uploads/Against-the-Odds-Innovation-Unit-Health-Foundation.pdf> [accessed 5 July 2019]
25. Scaling-up innovations. What works Scotland, 2015. <https://whatworksscotland.ac.uk/publications/scaling-up-innovations/> [accessed 5 July 2019]
26. Organizing for Quality Inside the 'Black Box' of Health Care Improvement in Europe and the United States. 2008. https://www.rand.org/content/dam/rand/pubs/research_briefs/2008/RAND_RB9329.pdf [accessed 5 July 2019]
27. Making the Case for Quality Improvement (QI): Lessons for NHS Boards and Leaders. Kings Fund, 2017. <https://www.kingsfund.org.uk/publications/making-case-quality-improvement> [accessed 5 July 2019]
28. Heath C, Heath D. *Switch: How to change things when change is hard*. Waterville, Me. Thorndike Press, 2011.






Royal College
of Surgeons
of England

ADVANCING SURGICAL CARE

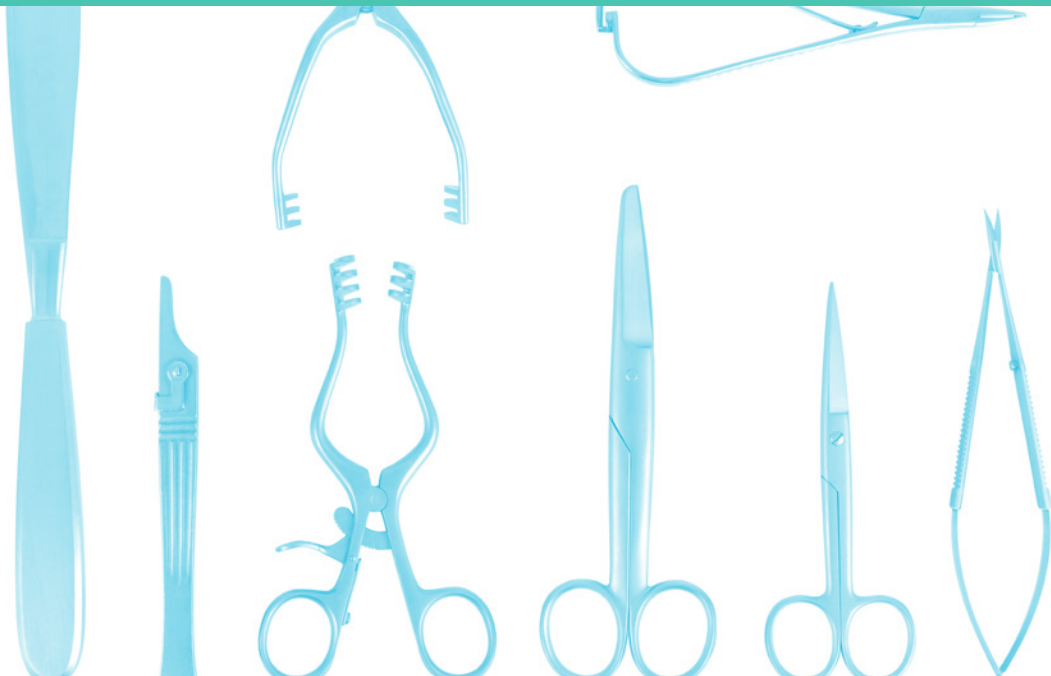
The Royal College of Surgeons

The RCS produces a wide range of standards and guidance to support the surgical profession within the areas of team working and leadership, legal and ethical concerns, personal development and service improvement. To find out more about our work visit www.rcseng.ac.uk/standardsandguidance.

The Royal College of Surgeons
35-43 Lincoln's Inn Fields
London WC2A 3PE

 The Royal College of Surgeons
 The Royal College of Surgeons of England
 @RCSnews

The Royal College of Surgeons of England Registered Charity number 212808



www.rcseng.ac.uk/standardsandguidance