Royal College of Emergency Medicine

RCEM QUALITY IMPROVEMENT GUIDE

A practical guide for clinicians undertaking quality improvement in Emergency Departments

Septmber 2022

Foreword

In the Emergency Department, continuously improving the quality of care we provide for our patients is a central part of what we do. The Royal College has been at the forefront of many efforts to introduce Quality Improvement (QI) initiatives to improve the care we try to deliver in the complex environment that an Emergency Department can represent. These efforts including establishing QI as a major part of the curriculum, being one of the first Royal Colleges to introduce a requirement for trainees to have an assessment of a QI project, and establishing a National QI project for Emergency Departments.

This booklet is designed to be an introduction into the approach of the Royal College to QI, together with an introduction to the basic science of QI. It is aimed at providing Fellows and Members with the knowledge and tools to help them in this rapidly evolving field. While the FRCEM exam will undoubtedly drive interest in this guide, it cannot be emphasised enough that quality improvement is a skill that all emergency physicians should understand, plan, perform, reflect and of course – go again!

I am grateful to the authors, including trainees, from multiple RCEM committees, for all their efforts and congratulate them for creating the tools that will help our members and more importantly improve quality of care for our patients.

Dr Katherine Henderson
President
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Royal College *of* Emergency Medicine

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Scope

This guide is designed to assist Fellows and Members who are undertaking Quality Improvement (QI) work in their Emergency Departments. It is intended to help bridge the gap between improvement science and implementation. This guide is complimentary to the many of the excellent guides that already exist, such as the Academy of Medical Royal College's report on Training for Quality Improvement and those produced by the Health Quality Improvement Partnership.

This guide is pragmatic, providing a useful 'how to' guide, but is also aims to introduce the reader to the common terminology, jargon, concepts, and processes within the QI field. It also introduces the narrative of QI: it's development, the role in healthcare, ethical considerations, and the relationship between QI and RCEM.

Key concepts

What is Quality?

The Institute of Medicine have defined quality as '*the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge*' and identified six dimensions (see table).

Institute of Medicine. *Crossing the quality chasm: a new health system for the 21st century*. Washington DC: National Academy Press, 1990, p244.

Quality in health-care The six dimensions* *note IHI have suggested Prevention, Access and Value as additional dimensions					
Safe Avoiding injuries to patients from the care that is intended to help them	**Efficient** Reduce waste	**Effective** Match care to science. Avoid overuse of ineffective care and underuse of effective care	**Patient-centered** Respect the individual and their choices	**Timely** Reduce waiting for both patients and those who give care	**Equitable** Close gaps in health status between different patient groups

What is Quality Improvement?

QI in healthcare has been defined as:

"*The combined and unceasing efforts of everyone to make the changes that will lead to better patient outcomes (health), better system performance (care) and better professional development (learning)"*

Batalden PB, Davidoff F. What is ''quality improvement'' and how can it transform healthcare? Qual Saf Health Care 2007; 16: 2–3

"*The conception of improvement finally reached as a result of the review was to define improvement as better patient experience and outcomes achieved thorough changing provider behaviour and organisation through using a systematic change method and strategies.*"

Øvretveit J (2009). Does improving quality save money? A review of evidence of which improvements to quality reduce costs to health service providers. London: the Health Foundation.

There has been increasing recognition that traditional audits and performance management tools are not always effective at improving the delivery of healthcare. Much effort is wasted on quality assurance exercises. QI methods have been adopted from industry and are effective in improving the safety, efficiency, and effectiveness of care.

All clinicians will be familiar with a traditional audit, which has a useful quality assurance role. **Table 1** shows some of the key differences between quality assurance and quality improvement.

Traditional audits have limited ability to influence clinicians to improve care and culture in a timely fashion. QI has been defined as "better patient experience and outcomes achieved through changing provider behaviour and organisation through using a systematic change method and strategies". (1)

QI methods differ by providing a quicker turn-around, so that the nuances of understanding a problem and effective intervention are not lost. There are multiple points where evaluation is performed. Multiple interventions can be attempted and evaluated. Ineffective interventions can be quickly and usefully discarded, while contributing to overall understanding of the problem. There is a much greater emphasis on the culture and engagement of a team and the psychology of changing behaviour. Feedback is quicker, or ideally almost immediate, and by implication, more effective. Many consultants and trainees will do much QI work informally.

Table 1: The differences between quality assurance and quality improvement

	Quality Assurance	Quality Improvement
Motivation	Measuring compliance with standards	Continuously improving processes to achieve high quality care
Means	Inspection	Prevention

Attitude	Required, defensive	Chosen, proactive
Focus	Outliers: "bad apples" Individuals	Processes Systems, Patient focused
Scope	Medical provider	Patient care
Responsibility	Few	All

Ethical Considerations

The differences between QI and research might seem obvious; with QI there is no experimentation, hence no fixed hypothesis, no blinding, no concurrent control (there might be a comparison to historical data), no attempt at reducing bias, the data collection is different ('just enough' data, serially collected), and no attempt to control confounding variables, and no randomisation. However, there are grey areas where QI and research could be viewed as overlapping; this is discussed in a few papers (See *Fiscella et al, BMC Medical Ethics (2015 16:63 for discussion of the ethics of QI*)**.** Hence, it is useful to register your QI project with the host institution (as is usual with audit), to ensure governance, regulatory and if needed ethical oversight.

First steps: Choosing a project, analysing the problem and choosing a method

Identifying a QIP

A quality improvement project can start in a number of ways. Commonly, the genesis is when a member of staff notices a 'defect'- something that does not go as planned, when there is an adverse event, or when the outcome is less than satisfactory. However, it can also start when a 'difference' is noted, either in process, culture, or outcomes. This 'difference' does not have to be negative; QI also occurs when 'good' is made 'better'.

It is important with QI to start with a 'problem' or issue, rather than a solution. As will be discussed throughout this guide, with QI there is rarely one intervention that will resolve the issue, and various interventions will need to be trialled to establish which ones (and/or combination) make a difference.

Common sources of 'issues' are audit data, patient feedback (complaints or compliments), incident reports, previous (and current) QIPs, observation.

Examples of inspiration for QIP include:

- **Protocoled management:** is the protocol correct, is there room for improvement?
- **Observation:** noticing events or variation may stimulate a QIP
- **Incidents:** when things have gone well, or poorly, consider why?
- **Differences:** especially when new to a department, noticing differences in practice can be a spur to considering QI potential
- **Clinical Governance/M&M meetings**
- **Evidence review:** Has practice changed recently?
- **Audit data**
- **Patient feedback:** complaints, compliments, discussions with patients

See FAQs for examples in each of these areas.

Once an 'issue' or clinical domain has been identified, the next step is the analysis of the issue to determine the reason the situation is as it is ("*Every system is perfectly designed to deliver the results it does*": Paul Batalden), and what if any interventions are possible.

Initial Analysis: Analysis of problem and developing interventions

Once an area for improvement has been identified, the next step is analysing the issue to identify causes of the current situation.

This may involve clarification of the current situation, for example using **small pilot surveys**, interviewing patients, and staff. A useful tool here is a **process map** (a visual representation of a process (such as patient flow through an emergency department) enabling identification of redundant/replicated processes). Alternative tools often used here include

- **Ishikawa diagram (also called Fishbone analysis)** which is a visual representation of causes and sub-causes and what actions could be considered to affect change;
- **Root Cause Analysis** (e.g. the '5 whys', looking at the ultimate cause of the situation);
- The **priority matrix** (mapping impact against difficulty);
- **Driver diagrams** (identifies goal, and primary and secondary drivers, and potential interventions);
- **Pareto diagram** (a chart which ranks interventions against frequency; visually represents the 80/20 rule, 80% of achievement comes from 20% of effort and enables establishing high value interventions)

These tools may be used together/combined and revisited during the QI project.

Creativity in analysis

Several tools exist for helping with developing creative interventions, often in the context of small group work. Some of the more common ones are *briefly* described below and include:

- De Bono's six thinking hats®, is a method of considering different perspectives
- SCAMPER/ 'Breaking the rules': considers the rules we work by and bow to re-think them: Substitute, Combine/mix/integrate, Alter, Modify/change shape or scale, Put to another use, Eliminate, Reverse
- TRIZ: also known as TIPS. Designed to assist with developing creative solutions in technology, often applied to managerial problems. A methodology and series of tools to foster innovation and resolve the contradictory factors that often exist
- Creating a list of ways to get the *worst possible outcome.* Often, about half of the list is already being done! Identifies processes to consider stopping
- 'Fresh eyes' (process for obtaining alternate perspectives), similar to 'Stop before you start' tool

Methods also exist for prioritising interventions once identified:

- Dot voting: a method of establishing priorities for the project
- Priority matrix: involves creating a 2x2 importance/urgency table
- MoSCoW (Must do, Should do, Can't Do, Won't Do), similar to 'Stop, start, continue' tool

After analysis…

Following analysis of the issue, you should have a clear understanding of:

- **the context and culture** (how the system works, why the problem exists), leading to
- **a suite of possible interventions** (with an appreciation of the 'high value' interventions)
- **metrics**, and how these relate to interventions

The next stage is to plan the project. For advice on this, see the sections on change management and quality improvement, and the FAQs. You will need to consider the **team** (who is in it, what everyone does) and, the **timeline** (including when interventions will occur), and **termination of the project** (what happens when your project ends, how will you disseminate learning, and embed changes).

Choosing a Quality improvement method

Introduction to QI methods

There are several methods and tools described in the QI literature. In general, some tools are useful in analysing the issue, and identifying interventions; these are described in earlier sections. Other methods are described here, and are useful in implementing a QIP.

These methods and tools have some common features, but different methods should be used to tackle different problems. Effective quality improvement entails using multiple methods, for example a root-cause analysis can be used to increase the understanding of a clinical audit that has revealed important deficiencies in care. This list is not exclusive, and a successful QIP may use other methodologies.

Choosing the correct method is important. You should consider your aim and the advantages and disadvantages of each method carefully, and can explain why you have chosen your method(s).

Using a QI methodology increases the likelihood of success of the project, by ensuring that no step is left out (cf checklists in clinical practice). Some QI methods are system based, and less suitable for small QI projects, such as TQM and Kaizen.

For example, with a small scale or 'test of concept' project, before wider implementation then probably the most commonly used method is MFI-PDSA; has a simplicity and familiarity; however, this less ideal for projects the events are less common (e.g. improving management of an uncommon condition or reducing uncommon adverse events). In this case, HFMEA might be a better choice of method.

Common features of quality improvement methods

- Defining the problem (responding to concern) – What care do you want for the patient (not solution based)
- Identification of standards or best practice (frequently by a literature review)
- Involve relevant stakeholders
- Define measurement
- Continuous evaluation
- Learning and intervention
- Reporting
- Dissemination
- Culture Change

Quality improvement methods

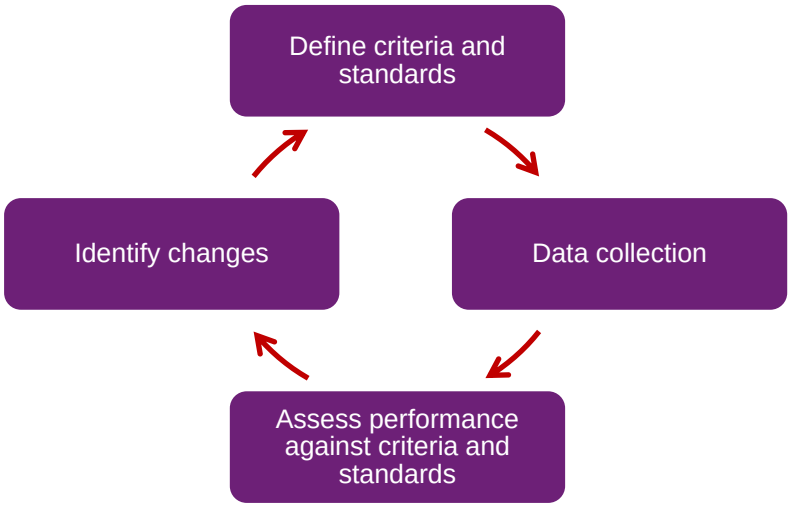
National and local clinical audit

Use to: Check clinical care meets defined care standards and monitor improvements to address shortfalls. Used extensively for quality assurance and regulatory approval.

How to: Use predetermined standards either retrospectively or prospectively. Data is collected, compared to standards and interventions are identified. The standards can be developed locally, or adopted from national bodies, such as Royal Colleges, or guideline writing organisations such as NICE. The audit is then repeated after intervention to see whether there have been improvements. The effectiveness can be enhanced by performing rapid cycle audits of standards that have been difficult to achieve.

Advantages: Audit is well understood, established, intuitive and usually supported by an administrative structure. It is an effective tool for benchmarking performance against other Emergency Departments. There is some evidence that hospitals taking part in audits provide better care than non-participating hospitals. Clinical audits can be a potential start point to identify the area for a QIP to improve.

Disadvantages: Audit can be cumbersome and slow. There is surprisingly little evidence that clinical audit is effective at driving improvement. National benchmarking can be slow and this hinders the implementation of interventions. There is little emphasis on the change management and a lot of data is normally required.



Example
RCEM has published, organised and collated data on care for patients with fractured neck of femur. There are set standards for time to analgesia, x-ray, pain scoring and so on. These are applied retrospectively to a consecutive sample of patients attending Emergency Departments across the United Kingdom. A report is produced which provides evidence of departmental performance against national standards and bench marking against other departments.

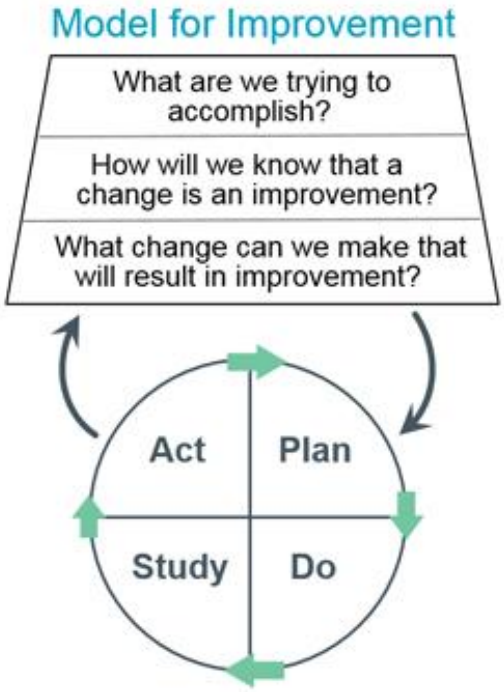
Model for improvement (MFI) and the plan, do, study, act cycle

Use to: Learn the right questions to ask – and set aims that are patient centered and achievable. Find out what is really the problem – not hearsay. Measure the problem then do multiple small interventions to improve a solution and to scale up the right one

How to: Three fundamental questions need to be asked of the team to define the problem and how to decide on some solutions

1. What are we trying to achieve, and for which patients?
2. How will we know that a change is an improvement?
3. What changes can we make that will result in an improvement?

Test changes with a series of iterative Plan, do, study act cycles before disseminating widely. These are done on a small scale first to check for unintended consequences.



Institute for Healthcare Improvement, 2009

Advantages: This is more responsive than traditional audit as it allows a series of interventions to be tested, adapted and evaluated quickly. They are effective at changing culture and improving care.

Disadvantages: Involving stakeholders can be time consuming and frustrating. They are less useful for regulators and quality assurance. Engaging all staff with the final process can be difficult.

Example using model for improvement and the PDSA cycle

A novel approach to improving coagulation sample ordering in an Emergency Department (5)

Emma Murphy, Sile MacGlone, Claire McGroarty

BMJ Qual Improv Report 2015;4: doi:10.1136/bmjquality.u204785.w2857

Abstract

Driven by Emergency Department targets, there is a need for rapid initial assessment and investigations of attendees to the department, and blood tests are often performed before full patient assessment. It has been shown that many investigations ordered in the Emergency Department are inappropriate. Coagulation samples are acknowledged as one the commonest blood samples requested on admission. We predicted that the majority of the routine coagulation samples performed in our ED department were unnecessary.

We aimed to determine if coagulation tests sent from our department were appropriate, develop guidance for appropriate testing and to increase the percentage of appropriate tests to 90%. Criterion based audit was used. All coagulation samples sent from the ED over a one week period were reviewed and the indications for testing compared to guidance developed by consensus with ED consultants.

On the first data collection, 66 of 369 (17%) samples were deemed appropriate. Feedback to clinical staff was given at educational meetings and appropriate indications discussed. In collaboration with both senior nursing and medical staff, coagulation screen request bottles were removed from the main clinical area and were only available in the resuscitation area.

Following these interventions, 69 of 97 (71%) samples were deemed appropriate and a further intervention is planned to reach our standard.

This improvement could lead to a £100,000 saving annually and a cross-site collaborative study is planned to spread these improvements.

Lean / Six sigma

Six sigma is a systematic approach to improving processes or products. Firstly understanding how users of a service would define 'defects' and then reduce factors identified as critical to quality, and reducing variation using statistical methods.

Use to: Analyse healthcare systems to eliminate waste and redirect resources towards a more efficient, improved and consistent quality of care. Lean and Six sigma are often effectively combined.

How to: Lean uses process mapping with associated stakeholders to identify inefficiencies in care, enabling actions for improvement. Aim to eliminate 'just in case' and duplicate activity, holding excess inventory, multiple assessments and unnecessary waits. Six sigma uses DMAIC and control charts are used to study adjusted processes over time. DMAIC is defined below. This can use statistical process control charts.

DMAIC definition

Define: state the problem, specify the patient group, identify goals and outline the target process.

Measure: decide the parameters to be quantified and the best way to measure them, collect the baseline data and measure after changes have been made.

Analyse: identify gaps between actual performance and goals, describe the causes of these gaps and decide how process inputs affect outputs and rank potential solutions.

Improve: decide on interventions, identify which are easiest and most effective to implement.

Control: share a detailed solution monitoring plan, observe implementation and perform regular updates.

Advantages: This can be effective at reducing waste and improving processes. Similar to MFI and PDSA.

Disadvantages: Involving stakeholders can be time consuming. This can require a lot of data, and data quality needs to be good, ideally automated, to produce reliable maps. This is less good for complex problems and is not often patient centered.

Example of using Lean / Six sigma

Reducing Door to- Balloon- Time for Acute ST Elevation Myocardial Infarction in Primary Percutaneous Intervention: Transformation using Robust Performance Improvement

Samir Aljabbari, Tristan Harold Mananghaya, Salama J. Raji, Abdulmajeed Al Zubaidi

BMJ Qual Improv Report 2015;**4**: doi:10.1136/bmjquality.u207849.w3309

Prompt reperfusion access is essential for patients who have Myocardial Infarction (MI) with ST-segment elevation as they are at a relatively high risk of death. This risk may be reduced by primary percutaneous coronary intervention (PCI), but only if it is performed in a timely manner. Guidelines recommend that the interval between arrival at the hospital and intracoronary balloon inflation (door-to-balloon (D2B) time) during primary PCI should be 90 minutes or less. The earlier therapy is initiated, the better the outcome.

Our aim was to decrease the door-to-balloon time for patients with ST segment elevation myocardial infarction (STEMI) who come through the Emergency Department (ED) in Sheikh Khalifa Medical City, a tertiary hospital in UAE, to meet the standard of less than 90 minutes.

A multidisciplinary team was formed including interventional cardiologists, catheterisation laboratory personnel, Emergency Department caregivers and quality staff.

The project utilised the Lean Six Sigma Methodology which provided a powerful approach to quality improvement. The process minimised waste and variation, and a decreased median door-to-balloon time from 75.9 minutes to 60.1 minutes was noted. The percentage of patients who underwent PCI within 90 minutes increased from 73% to 96%.

Conclusion: Implementing the Lean Six Sigma methodology resulted in having processes that are leaner, more efficient and minimally variable. While recent publication failed to provide evidence of better outcome, the lessons learned were extrapolated to other primary percutaneous coronary intervention centers in our system. This would have marked impact on patient safety, quality of care and patient experience.

Experience based co-design (EBCD)

Use to: Work in partnership with patients and families to improve services from their perspective. Using EBCD offers unique insights into what makes a good experience for service users, and enables improvements to be co-designed by patients, families and staff.

How to: Observations are made about the day to day running of the service. Patients, families and staff are invited to share stories about what they like and dislike about the service. Key "touch points" within the service are identified and assigned a positive or negative emotion. Short films are made and are a powerful tool by which to reflect back to the team what really matters to the service users. Staff, patients and families then work together to respond to the findings, and co-design improvements. A useful toolkit can be found here: www.kingsfund.org.uk/projects/ebcd.

Advantages: EBCD is a truly patient-centred approach. It offers a unique opportunity to generate new ideas from diverse perspectives that respond to what really matters to patients and their families. It also engages staff, giving them a voice in achieving change and improvement in the care they provide.

Disadvantages: EBCD takes significant time and resource to implement in its full form. However, adaptations can be made, such as "accelerated EBCD" whereby archived "trigger films" can be used to start conversations about your service by surfacing key themes. Though not locally produced for each service, studies have shown the impact is as powerful in facilitating co-designing of locally bespoke improvements. Some examples are available here: www.healthtalk.org/peoples-experiences/improving-health-care/trigger-films-service-improvement/topics.

Example of using experience co-based design

John Hunter Hospital Emergency Department, New South Wales, Australia
In 2007 the team at John Hunter Hospital ED in New South Wales, set out to improve the experience of patients, carers and staff using EBCD.(6)(7) Patient and staff stories were collected using film and audio recordings. Stories were analysed and key themes identified. Emotional touch points were mapped to demonstrate positive and negative experiences. Initially patient and family groups met together, separate to staff groups each prioritising improvements to be made. The groups then came together to decide on next steps and co design them together.

Key themes surfaced included:
- Keeping patients and their carers together
- Being kept informed when waiting
- How professionals cooperate and share information with each other
- Belief in professionals' ability
- Physical comfort
- Caring for the whole patient and their family
- Resources for families

Co-designed solutions included:

- Education and training for staff around optimal verbal and non-verbal communication with patients and families
- Introduction of pagers for carers to use if they need to leave the ED
- Revised roles for front of house team, including a lead role for communication with patients in the waiting room
- Improved communication with speciality admitting teams by forming a partnership group with the top 5 most frequently contacted specialities which has enabled fast track admissions to those teams
- Streamlining of GP referrals into ED by implementation of a referral proforma, referral pathway for urgent but non-emergency cases to outpatients, and GP hotline for diagnostics dilemmas
- Improved environment, food and drink facilities
- Introduction of volunteers
- Production of fact sheets for patients and families

Evaluation of the project in 2010 demonstrated sustainable change, and ongoing benefits of the co-design work. Blogs and support groups have continued and led to patients and family being actively involved in safety work, inspections and action plans for the betterment of the department.

Staff reported a new energy in how they communicate and engage with patients and families and in being truly patient-centered. There was recognition of the potential for solutions to be spread across other clinical teams and areas. Challenges included ensuring good communication about the work to embed solutions and on-going training for staff given high turnover. Strong senior clinical leadership and executive buy in was key to ensuring success.

Healthcare failure modes and effects analysis (HFMEA)

Use to: Systematically and proactively evaluate processes for quality improvement opportunities. This design emphasises proactive prevention. This is useful for identify potential patient safety risks before an adverse event happens.

How to: Staff collaborate to describe the steps in a process, identify potential failures (what could go wrong?) explain and understand failure and describe the consequence of a potential failure in a process.

Advantages: This is useful when a new pathway, technology or process is introduced.

Disadvantages: The proactive and preventative nature of this work means that you may not be sure if your intervention has worked.

Example of using healthcare failure modes and effects analysis

Identifying vulnerabilities in communication in the Emergency Department[8]
Emerg Med J 2009;26:653-657 doi:10.1136/emj.2008.065318
E Redfern, R Brown, C A Vincent

Background: Communication in the Emergency Department (ED) is a complex process where failure can lead to poor patient care, loss of information, delays and inefficiency.

Aim: To describe the investigation of the communication processes within the ED, identify points of vulnerability and guide improvement strategies.

Methods: The Failure Mode Effects Analysis (FMEA) technique was used to examine the process of communication between healthcare professionals involved in the care of individual patients during the time they spent in the ED.

Results: A minimum of 19 communication events occurred per patient; all of these events were found to have failure modes which could compromise patient safety.

Conclusion: The communication process is unduly complex and the potential for breakdowns in communication is significant. There are multiple opportunities for error which may impact on patient care. Use of the FMEA allows members of the multidisciplinary team to uncover the problems within the system and to design countermeasures to improve safety and efficiency

Quality Management systems

Some QI methods describe organisational approaches to quality management. Whilst these are not necessarily useful for small QIPs, healthcare organisations are increasingly adopting these organisational approaches, and QIPs will be within this organisational culture and structures. Hence a brief description of the common systems is given below.

Business Process Reengineering: this involves a fundamental re-thinking of the central processes of an organisation, with change driven from strong leadership. In the UK, the first public sector site to test this was Leicester Royal Infirmary https://www.shefiled.ac.uk/polopoly_fs/1.110877/file/Re-engineering_Leisceter_Royal_Infrimary.pdf.

Total Quality Management (TQM): This is an organisational approach to quality; however, no agreed definition of TQM exists. There is emphasis on 'total' (all departments, not just the production line, are involved), and 'management' (managers are responsible for ensuring cultural elements, processes and staffing/training are in place), together with a focus on the 'customer requirements' and continuous QI.

5S: This was developed in Japan in the manufacturing industry, and the 5S are translated in English as 'Sort, Straighten, Shine, Standardise and Sustain'. Initially it related to workplace organisation. It is useful concept to consider streamlining and improving processes and workplace environment.

Kaizen: with a Kaizen approach, all workers are responsible for quality, and when defects are identified work is ceased until the issue is fixed. There are 20 'keys' to a Kaizen approach, the first 3 being: using 5S methodology to clean and organise to reduce the workload, then ensuring goals aligned and system rationalised, then small group work to identify actions. Kaizen 'blitz' is aimed at reducing waste, a 'burst' to improve processes.

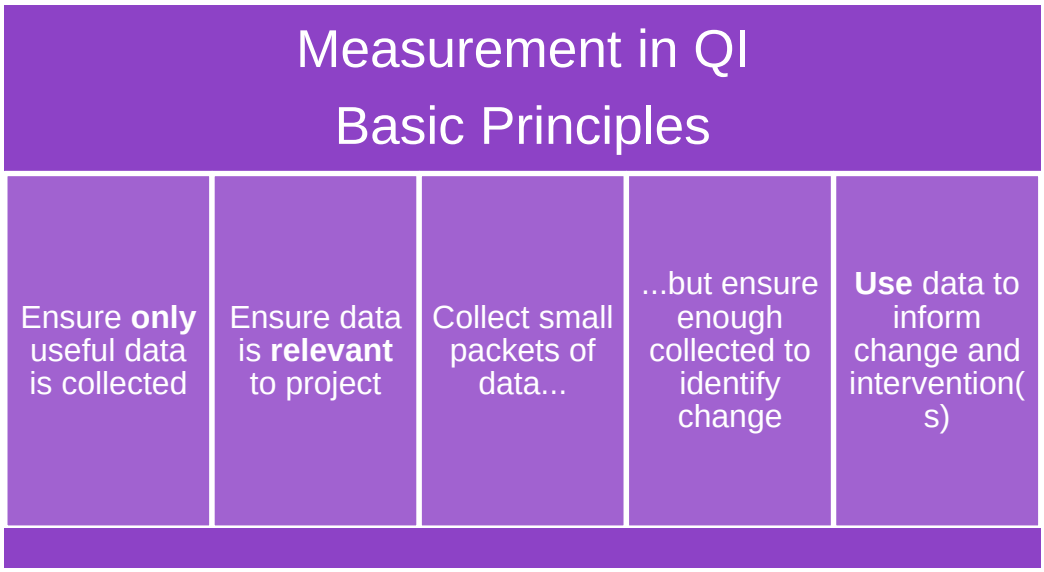
Theory of Constraints: This has long been used by NHS organisation to improve flow in outpatients, theatre and through hospitals to improve the 4 hours target. The concept is that movement through the whole system will only progress at the rate of the task with least capacity, and attempts to identify these tasks and re-engineer to avoid a 'bottleneck'.

Next steps: Choosing and using data

Measurement and QI

Measurement is of vital importance in QI. If you do not measure, you cannot know if you have made a difference (for better or for worse).

However, choosing **what to measure** is important, as if you do not select the correct measures you will be unable to demonstrate improvement (if any). Choosing the wrong metrics, like choosing the wrong QI methodology, may alter efficacy of the QI project (or at least the demonstration of efficacy). Ideally, data collection should be continuous, with multiple metrics.



Scope and scale of measurement

Scale of measurement
A common question is 'now much data is needed?' There is no single answer to this. The principles in the table above need to be considered. Unlike audit, collecting huge amount of data is not necessary, but sufficient to separate variation from effect is needed. The data must also be relevant to the intervention.

The volume of data that needs collecting can be informed by the 'Degree of belief' in an intervention or idea balanced against its risk:

	Low degree of belief	High degree of belief
Minor Consequences	Medium Scale	One test Cycle
Major Consequences	Small scale (1:1:1) *	Small to medium

*1:1:1 principle as the smallest unit of testing – 1 provider, 1 encounter, 1 patient – If on this scale an intervention is onerous or failing despite modification after initial adjustments it is unlikely to work at all.
Five times (5x) rule – Scale 1 → 5 → 25 →125: This can be used to increase the degree of belief as an intervention gains traction with each PDSA cycle.

Scope of measurement

This involves testing on different populations (e.g. adult or pediatric patients, resuscitation vs. ambulatory area, patients with a particular finding (such as severe pain) etc.) depending on its appropriateness. An intervention may only work in specific circumstances and needs to be re-evaluated if trailed in a new cohort or area.

Rationale for measurement

Data for improvement differs from data for research and for assurance in ways listed in the table below.

Table 2: The differences between data for improvement, research and assurance

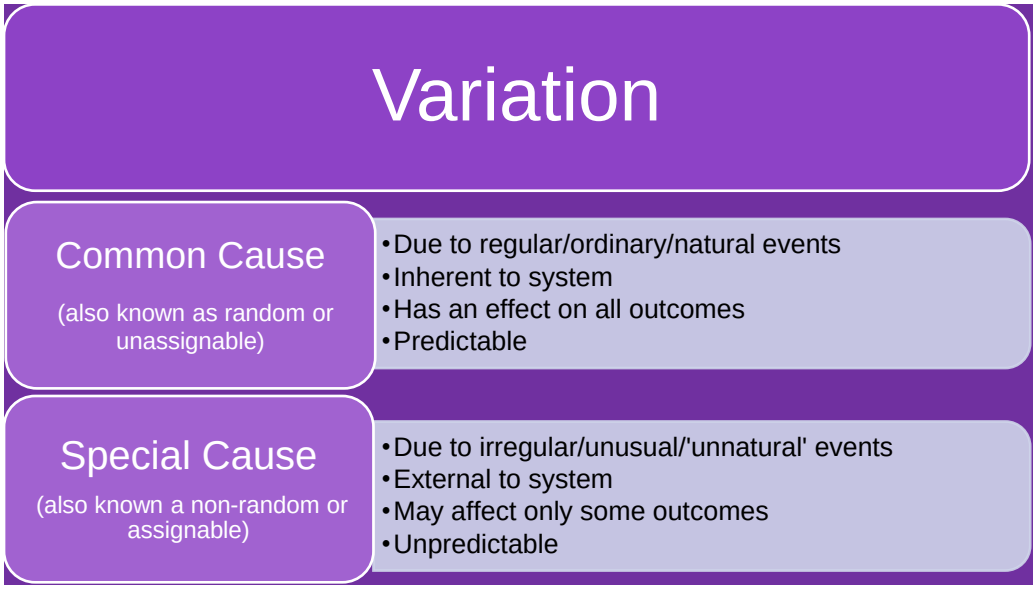
Data for improvement	Data for research	Data for assurance
Hypothesis changes	Hypothesis fixed	No hypothesis
Just enough data, small sequential sample/continuous data	Large amount of data 'just in case'	All relevant, available data
Accept bias (consistent)	Design to eliminate bias	Measure for bias, adjust for bias
Data for use by those involved only	Subjects data confidential	Data in public domain
Test seen	Test blinded	For performance evaluation, no test
Sequential tests	One (large) test	No test
Aim is improvement	Aim is new knowledge	Aim is evaluate/compare

For example, if you choose to look at procedural sedation and compliance with a checklist as part of your QI project, a large sample of patients (such as the 2015 RCEM national audit) is not required. You are not testing which sedation agent, adverse events list or procedural checklist to use. A small sample is sufficient, if non-compliance with checklist occurs in 10% of events, it is likely that this will be seen in a sample of 10. The checklist use (or non-use) will be fed back early, and possibly checklist changed to increase compliance (examples of hypothesis change and bias acceptance).

Interpretation of data

It is important to be careful when interpreting the metrics. All data has variability, if you measure one thing more than once it may well be different each time; a good example would be the number of patients attending your Emergency Department each day. This is known as 'common cause' or natural variation: this is stable (and 'probabilistically predictable') variation in the data caused by phenomena in the system (often unknown). For example, you can look at numbers of patients attending your department on a daily basis, and plot the average and range of the data over days of the week, seasons of the year etc., but you cannot say at the start of any particular day the exact number of patients that will attend. Generally, more patients come to the department on a Monday than Tuesday, however if you looked (by chance) at the numbers on a busy Tuesday and a quiet Monday there may be more attendances on the Tuesday. Hence, if you ascribe what is natural variation in data to an effect of your QI project, **you may be misled into thinking your intervention has had an effect (positive or negative).** This risk is higher if insufficient data collected (see section on control charts below).

Special cause variation is unpredictable, unexpected, often new or surprising data, due to external (to the process) factors. While natural variation affects all aspects of the process, special case variation may not. For example, the natural variation in attendances usually mirrors variability in waiting times within the system, as the same phenomenon affect both, but a large spike in attendances such as a major incident (a special case variation) may not affect all waiting times. It is important not to ascribe special cause variation as natural variation and vice versa.



Control charts

Given the importance of continuously collected data, and using this data to identify effects of interventions, how this data is presented and analyzed is important.

Tools are used to plot this data graphically to assist with this interpretation, most commonly on a 'control chart'. The control chart can be used to identify effects of changes to process (i.e. the QI project interventions) on the data, as well as to differentiate variation from effect of interventions.

The two most used common examples of these tools (charts) used in QI include run charts or Statistical Process Control (SPC) charts. A run chart is simply data plotted over time and assists with interpretation of changes to that data. SPC were developed by Shewhart and is a process to use statistical processes to monitor a process and then control it. SPC charts generally have the data plotted on them, together with a line to represent mean value (usually) of this data, and lines delineating 'unlikely' values called control limits (this is often three Standard Error of Mean above and below mean, but can be other statistical values such as Inter-Quartile Ranges). SPC charts allow interpretation as to the effects of process changes on the chosen metrics but also differentiation of variation types.

Note that the exact type of control chart depends on the type of data (variable/measurement: on a continuous scale, or attribute/count: discrete classified by categories). Attribute data is then further categorized into defectives (when opportunities for defective event to occur is known, e.g. deaths from operation and number of operations) or defects when number of opportunities or adverse events is not known (e.g. falls in hospital). Several tools exist to assist with the process of creating control charts.

Run charts and control charts		
	Run chart	SPC
Average	Usually median	Mean
Control limits?	Not mandatory	Yes
Derivation of control limits	Can be either statistical or defined by project team	Statistical
Minimum data points	10	20
Axis	X= time, Y= data	X= time, Y= data
Advantages	Simple	Identifies data not in expected range and type of variability
Disadvantages	Does not identify nature of variability, or degree of deviation from average	More complicated to produce
Uses	Determining effect of interventions Planning further interventions **Identifying data outside of reasonable norms**	Determining effect of interventions Planning further interventions **Identifying 'out of control' data** **Identification of variability**

		Predicting expected range of outcomes

Please note: run charts commonly identified as, and called, control charts, however technically not these are separate; see text. It is useful to consider control charts as extensions of run charts, when greater interrogation of data is needed, and if early rapid action is needed in response to data. However, control charts may 'over-complicate'.

Data (and SPC charts)

The choice of specific type of SPC chart depends on the data being collected. For **variable** data, the choice is usually an XmR chart (average and moving range); this is for data with single observations (e.g. length of stay, waiting times etc.). For variable data with sampling (e.g. patient satisfaction where sample taken) then X+S chart (average and standard deviation) is used (unless small numbers then average and range (X+R) is used).

With '**attribute**' data (also known as discrete or categorical data) then different chart are used. The type of chart depends on whether the data is 'defectives' or 'defects'. The former is when the number of (adverse) event is known, as well as all the chances for it to occur, whereas the latter is when the number of non-events is not known. Examples of 'defective' data is measured in percentage such as be number of mediation errors (and the chart is a percentage (p-chart or np-chart). Examples of 'defect' usually measured as rate, such as falls per patient day, and the chart are u-chart (for rates), or c-chart (for count/time period).

The data points may be individual or aggregated- this may also affect specific chart selection (as the comparison (of the average or difference) will change).

Interpretation of run and control charts

Definitions for what is a shift and what is a trend exist for control charts: when these are identified (this might be a result of the intervention), a re-calculation of the median is then required before further interventions or 'tests'.

Note also that if your run chart 'joined dots' do not cross the average at sufficient number of times, it is a sign that not enough data has been collected (see below: counting 'runs'). If you have 20 or more data points, an SPC chart is preferred.

Control charts and run charts have 'rules' that need to be applied to them for interpretation, and these rules are different for control and run charts. These rules must be understood for meaningful use, determining what constitutes trends, shifts, identification of variation etc.

Run Chart: example of table used to calculate if sufficient data points					
Number of data points	Lower limit for run count	Upper limit for run count	Number of data points	Lower limit for run count	Upper limit for run count
10	3	8	17	5	13
11	3	9	18	6	13
12	3	10	19	6	14

13	4	10	20	6	15
14	4	11	21	7	15
15	4	12	22	7	16
16	5	12	….		

For a given number of data points, the data line should cross the line plotting 'average' (median) a defined number of times, as above. The number of 'runs' is calculated by counting the crossing of the average and adding one. Insufficient data points hamper interpretation of effect of interventions.

Run Chart Rules:
A shift: 6 or more points above/below median: as unlikely this is due to chance, intervention likely to have been effective in producing change
A trend: 5 or more points consecutively increasing/decreasing
A run: indicates if sufficient data points exist; the data plot should cross median line often. A run is a series of points above or below the line. Run number is the number of times the median line is crossed, add one. For a given number of data points, there is an upper and lower acceptable number of runs, to identify if enough data points collected
An astronomical point is one that is clearly abnormal; usually special case variation

SPC Chart rules: 8 exist for identification of variation and include:
One point is >3 s.d. from mean: one out of control point
Six points increasing/decreasing: a trend exists
Nine points same side of average: prolonged bias exists
Other rules exist regarding identification of non-random data and out of control data

Measurement

The data collected for QI can be

- **Outcome measures** are 'the voice of the patient', that is, what actually happens to the patient. Patient satisfaction is an example, as are outcomes such as survival, morbidity and mortality.

- **Process measures** are 'the voice of the system', that is measures of processes with the system (e.g. waiting times, reviewing and endorsement of investigations).

- **Balancing measures** are those metrics which look at the system from different angles; these are important because changing one part of the process may affect other outcomes, potentially adversely, as in the example below.

Choosing the correct metrics is of vital importance. For example: you notice from complaint letter and incident investigation that there is a long time to recording and interpretation of ECGs in your department. After reviewing the process, you notice that the 'Rapid Assessment' process is very prolonged leading to a queue for this. You decide to alter the process of Rapid Assessment sequentially as part of a MFI/PDSA methodology. What metrics might you choose?

Process measures such as time to ECG, and time to doctor reviewing of ECG might be good examples (if you can collate this data continuously and easily). A process measure such as 'Time to PCI' may not have as much utility, as less common outcome, and processes less subject to influence. If you choose 'high level' outcomes such as an improvement in 'time in department' (a key performance indicator), there may not be an improvement. It is possible that some metrics e.g. 'time to assessment' may show an improvement, but this may depend on how you implement change. For example, if you choose to implement a system of re-triage for chest pain or of filtering these patients out then the change may be neutral for influence on this metric.

What about outcome measures? Similar issues apply; if you choose measurements such as outcomes for patients with Acute Coronary Syndromes you are unlikely to see much change. However, safety outcomes such as reducing missed or late diagnosis rates may be affected.

As for balancing measures, it could be that other 'Rapid Assessment functionality' such as time to analgesia or sepsis treatment could be adversely affected by this, and maybe balancing measures looking at these should be considered. Outcomes such as chest pain discharge rates or outpatient referrals may also conceivably be affected, and may need to be monitored.

Although this largely relates to quantitative data, qualitative data is also useful in QIPs; sometimes using Likert scales can 'convert' this to numerical data for plotting (rating scales for satisfaction for example). Use of qualitative data is particularly useful in the analysis phase of a QIP; e.g. outputs from focus groups, free text comments from patients, survey results etc.

From a practical perspective, it is useful to identify routinely collected data, and avoid aggregating data, and to use sampling, all of which will ease the burden of data collection.

In summary, measurement is a key element in the QI process. Metrics should be:

- carefully and prospectively selected
- continuously measured
- multiple metrics used (a mix of outcome, process and balancing measures)
- ideally plotted on a control chart
- carefully interpreted (both in terms of whether sufficient sampling, and correlating intervention and effect

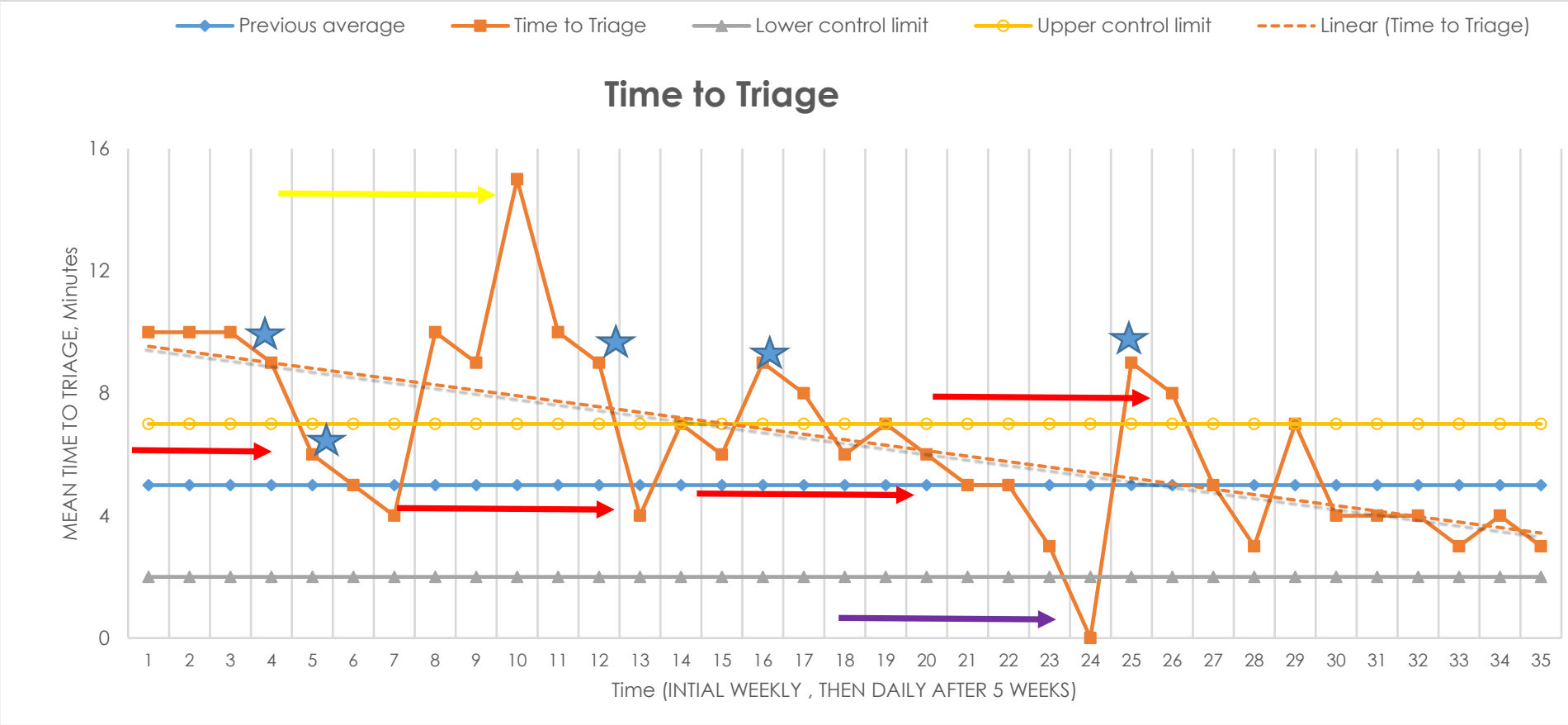
The data can then inform interventions: where enough data exists, and where an intervention effects change. If a positive effect is seen, the intervention should be adopted (or modified and expanded), or discarded if negative/no effect.

In quality improvement the main function of the data and metrics and the interpretation, is to determine whether interventions have had an effect or not (therefore to decide whether to **adopt, adapt or discard** these interventions).

Hence it is best to introduce interventions serially and collect enough data points (in terms of frequency, not necessarily volume), to establish effectiveness of interventions.

The interpretation of data needs to establish at whether enough sampling has occurred, as well as effect of interventions on the data.

Example of a run chart



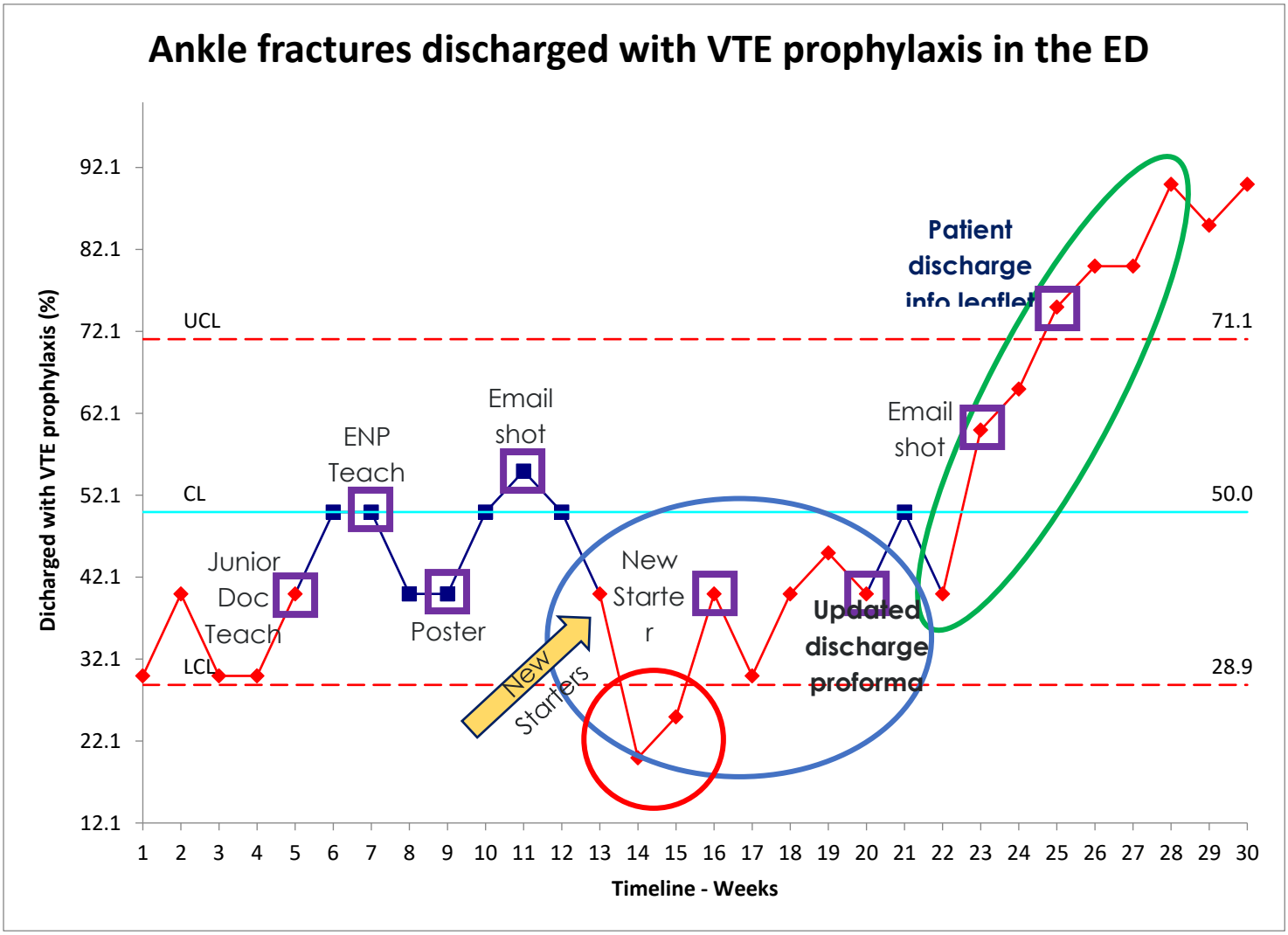
Insufficient sampling

A shift

Special case variation

Changes and interventions performed as part of PDSA cycle

Example of SPC chart



PDSA cycles – Frequent cycles are required. Emails and posters will not in themselves lead to lasting change but may help raise an issues profile to bring stakeholders on board for more ambitious system wide interventions requiring more buy-in.

Astronomical Points – Cannot be accounted for by common cause variation and lie outside the upper or lower control limits. New staff starting is an example of special cause variation which could account for the change in this example

A Shift – A sustained run of 6 points above or below the mean without crossing it demonstrating a sustained change.

A trend – 5 or more consecutive points all going up or down. In this example following a system change reinforced with other interventions to maintain momentum.

Relying solely on teaching/emails/posters to create change is vulnerable to attrition particularly as new members join the team or when those with the subject interest leave and it is no longer regularly provided.

Implementation of QIP: managing change, and dissemination

Quality Improvement and Change management

Change and QI: a brief history

Quality improvement is widely identified as beginning in Japan after WW2, a key 'founding father' is W Edwards Deming (building on the work of Walter Shewhart). Both were mathematicians and took a statistical approach (including regular sampling, and reducing variation). QI is credited with being an important element in the Japanese manufacturing industry 'economic miracle' of the 1950s onwards. These processes were then applied to health sector from the 1990s (see Cantiello et al), an impetus being publications from the 1960s revealing deficits in care at national level.

At a similar time, a social psychologist, Kurt Lewin, was developing Change Management (CM) theory. All QI involves a change and this change should be managed; however not all change is QI. The key differences are that with QI there is a dependence on metrics to identify progress and improvement and guide (and evaluate) the interventions, whereas change management is a method of organisational change and does not require metrics. QI is an iterative process, whereas change management is not necessarily so. This guide discusses aspects of change management and how this is relevant to QI.

Kurt Lewin identified the process as one of 'unfreezing' the processes (delegitimising resistance), changing (team building, education, support) and then 'refreezing' (HR management, policy change, rewards etc) to ensure sustained change. Further models of CM have been developed:

John Kotter's 8-Step Process for Leading Change:

- Create a Sense of Urgency
- Build a Guiding Coalition
- Form a Strategic Vision and Initiatives
- Enlist a Volunteer Army
- Enable Action by Removing Barriers
- Generate Short-Term Wins
- Sustain Acceleration
- Institute Change

The Change Management Model (Change Management Foundation):

- Determine Need for Change
- Prepare & Plan for Change
- Implement the Change
- Sustain the Change

PDSA cycle, created by Shewhart/Deming

Keys to success with change management (and QI)

The important discussions within change management relate to the relative importance of 'conditioning' individuals compared to changing the 'gestalt' or culture (cf 'Culture eats strategy for breakfast' is a widely misattributed quote that illustrates this issue, and the difficulties of QI and CM). Much has been written about CM, however the key elements for effective change are:

- Planning by employees in change process (to extent of affect should parallel level of involvement), ownership and strong leadership are important (hence 'remotely managing' a change is very difficult, especially in the early stages).
- Long planning time decreases effectiveness of change.
- Education of staff on change process important.
- Leadership is important (MBWA, 'management by walking about'), direct, and both formal and informal.
- Building in rewards or benefits early into process.
- Remembering the emotionality: when changing you are implying that 'the old ways were wrong' and conflict can be exposed. A process like bereavement for the old systems can occur, and maybe even hubris.
- Consider the small issues: the effect of 'one more process' on busy staff.
- Communication through multiple channels, before changing, and visible communication about process of change, endpoints, as well as the change itself.
- Beckhard/Harris change equation is an often quoted: ***DxVxS>R.*** The desire for change (D), multiplied by the vision of the future (V) and the difficulty of the first step (S), must be greater than the resistance to change. If D, V or S are 'zero' then then resistance will be higher, and no change will occur!

The relationship between QI and change management

QI obviously involves change, and Quality Improvement Projects (QIPs) will involve the management of change. There is a large literature about change management theory and practice, but not all of this is relevant to performing a QIP. Firstly, not all change is aimed at improving quality, as change can be aimed at cost improvement, efficiency, or be a reaction to change. Secondly, much change management theory evolved in a business setting; many health services have a lesser focus on profit motive, less clear lines of management, and involve complex, changing systems.

Change management applied to QIPs

CM applied to QIPs consists of four elements:

1. Defining vision and clear aims, you should be able to explain the problem that you are trying to sort out very simply to anyone in your department in under five minutes. Having a clear picture of what success looks like helps.

2. An analysis and option appraisal. Analysis may include an initial internal analysis and an external analysis (e.g. PESTLE or SWOT*) and analysis of potential barriers to change (stakeholder and Forcefield analysis*).

The 6S's of internal analysis and option appraisal

- Strategy
- Skills
- Shared Values (indefinable)
- Structure (allocation of staff)
- Style
- Systems (budgets, training, audit, communication

3. Planning of the change. This may involve, allocation of tasks and deadlines, monitoring, establishing rewards, anticipating contingencies, methods of liaison, consideration of implications for cost, time and effect outside the department.

4. Establishing effect of the change and next steps. There will inevitably be unexpected outcomes and it is important to review these promptly, learn from them and try alternative strategies.

*PESTLE: a form of external analysis: Political, Economic, Social, Technological, Legal, and Environmental factors that influence the project
SWOT: Strength, Weaknesses, Opportunities, and Threats
Stakeholder Analysis: establishing how stakeholders will affect change process, and how they should be 'managed'. Common methods are devising a power/interest grid, or establishing the 'mules, sheep and lions'.
Force-field Analysis: developed by Kurt Lewin, a method of establishing the drivers and resistors for change (and the magnitude), to assist with planning of change process

Changing staff behaviour

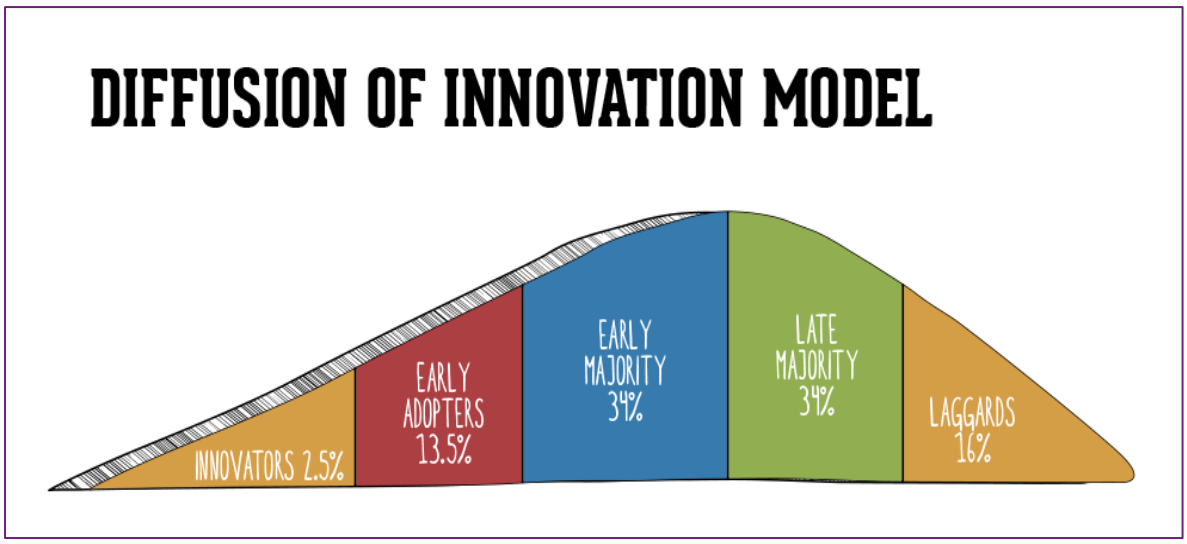
Over 70% of changes that are attempted in any organisation fail, usually due to the lack of engagement with the staff involved. Everyone involved in changing care for patients has to choose to change, and this becomes much easier when they are involved in the change that is taking place, rather than having something imposed. Quality improvement explicitly sets out to be collaborative.

Different people have different reactions to change - some enthusiastic, some find it threatening. This can depend on the person themselves, or their relationship with the person leading the change, on the change itself or the amount of change that has been happening within a department recently. Understanding and exploring some of these barriers is a key part of leading successful change.

Ownership of the problem
Most of the key theories of quality improvement emphasise the need to start with a problem and not a solution. This is essential not only to get a good solution to the problem, but also to allow the team to feel involved and that the solution has been thought through by those affected by the change. The team will be engaged by finding a solution that will make a difference and that they will feel is worthwhile. Developing and sharing both a vision and a journey towards that vision will engage people who can see the big picture and also people who need to see achievable steps.

Consider personal styles
Different people have different personal styles that affect how they respond to information and how they communicate thoughts and ideas. Some will need more data driven information, some rely more on feelings. Understanding this can lessen conflict. Also understanding different personality types can be an essential part of gathering and encouraging a team. Getting the right people on the team and then asking them to do things that play to their strengths is important. Understanding the difference between ‘asking’ and ‘telling’ is a useful approach in QI.

Diffusion of innovators is a concept that splits people into five categories of behaviour change (2). The theory suggests that improvement needs about 20% of people to change before the rest will follow. Each different group may need a different approach to enable them to change. Just influencing the innovators and early adopters will not usually be enough to lead to sustained change.



Tools for engaging staff during the QIP and change management

The importance of communicating with, and engaging staff in the change process has been highlighted, and will involve formal and informal methods, and a variety of communication methods. Some of the tools listed in the analysis section have staff involvement inherently built in. Having a communication plan is also a consideration. Common tools used to enhance engagement and communication exist. Commonly used ones include:

WIIFM (what's in it for me): a tool to consider the project from other groups or individuals' perspective, and establish how this might affect the project and your approach in engaging them

Managing Transitions tool (a three-stage tool which helps staff consider the 'endings' (what has changed), the 'neutral zone' (the transition) and 'beginnings' (how things will look and work after the change). This is closely allied to the 'resistance to change' tool which considers the emotional aspects of change; often a painful process!

Storytelling, a simple graphic tool to visually show the project, including the end points; useful for planning, inspiration and communication

Benefits logic map/ Benefits Realisation plan, these are also tools for planning, that can be utilised in communication.

Circle of influence and control: considering what areas you can control, what you can influence and what you have neither control nor influence over.

Tips for engaging staff

1. Educating staff about the process of change and the management of this, as well as the planned change itself increases the chance of success. The level of involvement of each staff group needs to be proportional to the effect the change will have on them. Staff need to understand why a change is necessary and you may need to create a sense of crisis. Educating a whole department is a daunting task, and it may be better to target the people who really need to know.

2. Build in some ‘quick wins’ for staff, so they can see the value of the QIP. Consider what difficulties staff might have and find ways to make this easier. The Beckhard and Harris change equation states that the desire to change, combined with the vision of the improvement and the difficulty of the first stages must be greater than the resistance to change.(3) Change management can be viewed as a process of modifying these variables.

3. Communication is a vital aspect in managing the human dimensions of change. Keeping the team and the department updated about the project will allow gradual spread of knowledge and for problems to be dealt with before a project is launched. It is important to be inclusive, positive and engaging when delivering messages about the project. Use all available methods to communicate within your department (e.g. newsletters, roadshows, e-mail, noticeboards and meetings). Visibility of the process is important. A clear message of what you are aiming for is vital. An email or poster in isolation is an ineffective way of communicating what you are trying to do.

4. Consideration of the emotional effects of change. It may reveal conflicts within the system, and has been likened to the emotional effect of bereavement. Staff are being asked to ‘do things differently’ which implies what they are currently doing is somehow ‘poorer’, and they may ‘mourn’ the ‘old ways’. Attention to some of the smaller details (e.g. where is your new proforma, is it easily available?) may help.

5. Leadership style is important. Direct and visible leadership is important; ‘Management by Walking About’ is considered to improve efficacy of change, and can help greatly with immediate feedback (bi-directionally), troubleshooting of issues that arise and increase the chance of QIP success.(4) Engaging respected, influential individuals can role model the interventions.

Case studies on change management

Recording of violent crime

The Emergency Department was expected to contribute monthly anonymous data about the location, date and weapon used in assault cases to the local community safety partnership, following RCEM Guidelines and the ISTV program, but the quality of the data was poor and not being used. The data were supposed to be collected by the receptionists, collated by an analyst and sent to the safety partnership. The emergency physician went to talk to the reception manager who was unaware that this was needed, or even how it could be important. The reception manager spoke to her team, but there was a lot of resistance from the receptionists, citing poor IT, excessive workload and little point in the task. The consultant organised for a senior police officer to meet with the receptionists and explain why this was important and how it could help stop violent assaults in the city centre. Each month, the data was reviewed for usability and this was shared with the receptionists. The quality of the data gradually improved and the emergency physician encouraged the receptionists by positive feedback and showing them the data. The police also encouraged by showing examples of how the information had been used. After 12 months, the emergency physician encouraged the police to present the receptionists a community safety award. The overall effect was that the number of assault patients dropped by 30%.

Asthma care

A recent audit had shown that the care of patients with acute asthma in the Emergency Department, though safe, was not meeting most national standards, particularly around measuring peak flow, prescription of steroids, documentation of follow up and written information. An emergency physician decided to try and improve matters and emailed the forty page audit report to all ED staff. He presented the audit results at the departmental audit meeting, attended by other consultants, senior nurses and representatives from the Trust audit team. He also presented the results to a respiratory audit meeting. He put a poster in the majors area showing the British Thoracic Society's guidelines. He completed an effectiveness trail and repeated the audit a year later. This showed no improvement in the audit performance.

In the first example, the emergency physician has been very targeted in his approach. He has involved both internal and external staff. He has had a clear aim, and engaged the reception staff well. He has spent time talking to the people who can make the change and got the benefits. In the second example, the emergency physician has not taken the time to understand what the problem is. At no point does he go and talk to the people who do the majority of asthma care in his department. Email and posters in isolation are frequently ineffective tools for change management.

Practical advice (See also FAQs)

Choosing a QI project

It can be a little daunting and confusing trying to decide what problem needs a quality improvement project. The following principles should guide the choice of a QIP. The problem should be important to both you and your patients. The project should aim, explicitly, to improve the quality of care for patients. Projects that aim to save money or meet performance targets are important, but not necessarily quality improvement, though a QIP might lead to savings. Your own interest is vital to sustain the project and enthuse others. You also need to ensure that this is not duplicating other QI work in your department, there should be a consultant in each department who maintains a log of all the quality improvement activity. Discussing the aim of your project with a few appropriate patients can be extremely useful. Talking to your patients can suggest what is and isn't useful and meaningful. It can be helpful looking through some recent complaint letters to see if there are any particular recurring themes. Effective projects start with very focused problems, it is tempting to be overly ambitious at the start of a project. Truly effective change starts incrementally with small, achievable goals.

Case study 1: The pain problem

Repeated RCEM audits had demonstrated that the department's care for patients with a fractured neck of femur was poor, compared to both the proposed national standards and benchmarked against other hospitals. The RCEM audit contained several standards, against which performance was poor. Talking to his patients and their relatives indicated a lot of frustration with delays to analgesia. Reviewing the complaint letters over the last six months showed that there were often absent pain scores and long delays to analgesia. The consultant looked at all the standards and discussed the problem with his colleagues. Informal shop floor discussions with the nursing staff indicated a desire to try and fix the problem of long waits for analgesia. He decided to focus on time to initial analgesia for severe and moderate pain for people with fractured neck of femur. He decided not to look at the time to x-ray or time in the department.

Case study 2: The blood test problem

The operations manager and pathology services manager contact the Clinical Director as they are concerned that too many blood tests are being done in the Emergency Department and the laboratory is overwhelmed. They show that many of the blood tests are not acted upon. Most of the blood tests are requested by phlebotomists at triage and this process aims to have results available to the clinician when they evaluate the patient. They ask the Clinical Director to 'sort out the expensive problem of inappropriate tests'. The Clinical Director delegates this project to a junior doctor who is in the Emergency Department for a year and asks him to report back 'when it's sorted.'

Both quality improvement projects are trying to tackle important problems, but the pain project is much more likely to succeed. The project is much more focused on a specific problem and a specific patient group. The blood test project is not focused, though this could be refined (such as reducing the number of clotting tests that are taken on patients with abdominal pain.)

The ‘top down’ and delegating approach of the Clinical Director, who is responding to a concern from outside the ED is unlikely to garner much sustained support. It also isn’t clear whether other ED staff, both medical and nursing staff, would support this project. The blood test problem isn’t really aiming to improve quality of care for patients, though it could be argued that reducing costs would allow money to be spent on improving care elsewhere. Quality improvement projects should not explicitly set out to save money, though this can be a side benefit.

Disseminating learning from your QIP

All too often something that has been shown to work well in one place is not adopted by another place that could benefit. Dissemination and diffusion of effective work relies on multiple methods. Publishing your work in an academic journal helps provide your work with some credibility, but can take a long time and has no guarantee of success. Presenting at a conference or scientific meeting can generate useful debate and networking, but you may not be presenting to the right people. You should aim to target your messages at the people who can use the information most easily. You should also aim to make the message as simple as possible, busy staff can only retain so much information.

The Health Foundation has described five 'golden rules' for communicating quality improvement findings:
www.health.org.uk/publication/using-communications-approaches-spread-improvement

1. Take the time to assess the current concerns of the people you need to influence. Look for any connections you can make between their priorities and yours. If you want to influence inpatient consultants, they may have a series of competing priorities to yours and you will need to acknowledge these.

2. Ensure that they hear your message from people they trust. This may mean asking a more senior person or a staff member outside your role to communicate on your behalf.

3. Gather the evidence, data and stories that support your case. Different people are influenced by different types of information. A professor may want to see graphs and reams of data, while a junior nurse may be more swayed by a patient story. A mix of a narrative and data is more effective than only data or a narrative alone.

4. Do not expect busy people to come to you. If your project involves the nursing staff doing something slightly different, go to the staff handovers and make your case.

5. Pay attention to the more vocal sceptics. Being challenged is infinitely better than being ignored! A person who challenges you is already engaged, you should avoid pretending to have all the answers.

Writing up a QI project

As part of dissemination of a QIP, you may need to write this up formally. Your organization may have a report format which is necessary to complete as part of the registration and indemnity process. This section is designed to give advice about how to write up a QIP project.

When submitting to a publication, the paper should be organized according to the SQUIRE Guidelines, will the items on the 'checklist' in these guidelines are useful when considering both design of project, but also writing up a QIP. However, when writing up a QIP for other purposes, the considerations will be different.

See Appendix 3 regarding how to present the QIP for satisfaction of RCEM curriculum.

When writing a report for an organization, it is important to consider the existential nature of the report; what is for, what is it trying to achieve, what is the readership? This enables you to consider how best to format and present the project for maximum effect.

General principles are:

- **There may be a prescribed format**; the report does need to be professional both in style and content.
- **It often helps to be chronological**; one issue with QIP reports is the narrative can become obscured, having a chronological approach can help.
- **It is more about 'change' than 'science'**; often the narrative is in first person (this can be difficult for doctors used to reading and writing scientific literature. This is particularly true regarding the reflections on the process!

Some 'top tips' are:

- **Make it authentic**: evidence the process and your involvement
- **Make it readable**: consider use of pictures, tables, diagrams, visual representations etc.
- **Ensure the narrative is clear**: an 'executive summary' is useful.
- **Ensure the 'quality' element is clear**: highlight how patient experience will improve as a result. Make this aim clear.
- **Make it easy to navigate**: index and cross-reference clearly. Have a clear structure, using mark-scheme domains, SQIURE guideline or 'background, local problem, methods, interventions, results and conclusions' format.
- **Contextualise**: what is the local setting, and element that make this unique, how did this influence the project?
- **Make the measurement section clear**: How did you measure the effects of your change? What happened as a result of the interventions? Initial steps of the intervention(s) and their evolution over time (e.g., time-line diagram, flow chart, or table), including modifications made to the intervention during the project. Describe details of the process measures and outcome. Any observed associations between outcomes and interventions? Unintended consequences such as unexpected benefits,

problems, failures, or costs associated with the interventions. Details and a judgement about missing data and this influences results

Other considerations in the write up (especially the reflection/discussion section for the QIAT) could include:

- Particular strengths of this project
- Challenges faced and how you overcame them
- What has been done to ensure the change is not temporary
- Impact of the project on people and systems
- Reasons for any differences between observed and anticipated outcomes, including the influence of context
- Costs and strategic trade-offs, including opportunity costs
- Identify limits to the generalisability of the work
- Describe factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis
- Outline efforts made to minimise and adjust for limitations
- Describe the: sustainability, potential for spread to other contexts, Implications for practice and for further study in the field, suggested next steps

Funding and Ethical considerations

Outline sources of funding that supported this work, if any, and whether the organisational QI or ethics committee were involved (see Ethical Considerations section above): your organisation should have a process for registering QIPs as it does audit.

Advice for trainees

Why should I do this (WIIFM)?

The QIP requires a combination of skills, all of which are important for life as a Consultant; including leadership, team working, and managerial skills etc. It is also useful to remember that as consultants (and as a part of appraisals) participation in quality improvement is expected.

How to I start, how long does it take? Setting and scale.

It is suggested that the scope of the QIP should be such that it takes 3-6 months to design and implement change, and another 3 months to assess and write up. In terms of scale, the work should ideally be in one Emergency Department, and require liaison with at least 2-3 stakeholder groups.

Given that many trainees rotate on an annual basis, it is acknowledged that timescales can be challenging. Starting early is important, ideally soon after rotation (which is also the best time for 'inspiration', see FAQs). If you have an area of interest, it may even be suitable to approach your supervisor or the department before arriving to explore areas for your QIP.

It is important to consider scale and feasibility, and to discuss with your trainer about these aspects. It is not possible to take on a large-scale institutional change project, but there are usually focussed areas within the spheres of control and influence of the Emergency Department that can produce real improvement.

There are no restrictions on the topic choice within the examination regulations but there are restrictions on setting; projects wholly outside of the Emergency Department are not suitable (e.g. Pre-hospital only, ITU only), but projects than span these areas may be suitable.

As mentioned in the mark scheme, projects that are primarily SIP and CIP rather than quality projects are best avoided, as are wholly educational or for staff wellbeing. Often service/cost improvement, education and staff wellbeing are part of QIP projects, rather than the whole focus. That said the main consideration (in terms of examination success) is can you satisfy the mark-scheme, so these projects may be suitable; discuss with your trainer (or the QI examinations lead). Often the detail and focus can clarify the suitability. **A good guide is to consider 'how will my patients in the ED know the difference?'**

For example: you want to develop a teaching programme about substance abuse and want to know if this is a suitable QIP. Teaching programmes are often 'solutions' to problems, or rather a quality intervention. Consider why you want to develop this- what is the problem that needs addressing? Is it that your department is not screening for this condition, or not advising as well as you would want, or managing the complications well? How do you know this? From this perspective, you can start to develop metrics and additional interventions?

How do I choose?

Please see the FAQs for discussion on how to choose a QI project.

Common question is whether the RCEM National QIP programme can be used for the FRCEM QIP examination. The answer is 'yes' but with caveats; remember that the examination submission is assessed through the QIAT (se appendix 3) and you need to consider this, specifically how to demonstrate the domains regarding analysis, change and interventions and what have you done in these areas. Probably the biggest are that will need thought is the metrics section- as the National QIP defines a small number of measurements for you, you will need to think about other measurements and if they are required (often balancing measures particular to your department).

What help is there?

There is a useful summary in the RCEM Publications 'The Quality Improvement Project Advice to Examination Candidates', available on the RCEM website at: https://www.rcem.ac.uk/docs/Exams/FRCEM%20QIP%20Advice%20for%20candidates%20updated%20July%202018%20FINAL.v2.pdf, and reproduced in the Appendix 4.

Please see also the section on 'Structures and support' and 'Advice to supervisors' above.

Some candidates are daunted by the RCEM advice: Trainees and Healthcare organisations Roles and responsibilities in quality improvement and audit. This guidance is aimed at organisations, especially regarding the National QIP programme, and designed to be supportive of trainees in managing QIPs. It does describe the issue that large organisation (and culture) change is difficult for trainees to achieve in the time and resources a trainee will have for the QIP for FRCEM. Whilst being involved in large scale change is valuable, the difficulties and time constraints mean that most trainees will need to choose a small scale, or more focussed QIP, for the FRCEM examination.

Frequently Asked Questions

Can you offer me a 'cookbook' for the QIP?
The essential ingredients are:

- Enthusiasm
- Preparation: read this guide, and review the resources listed
- To think of an area you are interested in improving

The main steps are:

- Discuss with QI lead; establish the problem
- Analyse the problem and the context
- Consider your aims
- Choose QI methodology
- Choose your metrics
- Choose your interventions
- Engage your team
- Manage the change
- Measure and iterate

Do I need to be original?
No. There is nothing new under the sun. All Emergency Departments wrestle with the same problems. QI is not about originality. It is about continuously trying to improve, and is heavily context dependant. Hence, the same problem may be tackled at difference sites and different times. With different sites, the context will be different, and so interventions and change process will be different. At different times, the personnel and interventions will change, as may the focus of the project; unless perfection was achieved, there I always scope for further QI!

Do I need to be successful?
No. Rather like research trials, where null findings sometimes offer insights, QIPs that do not succeed may offer insights. There are no marks on the mark scheme for successful improvement in quality. However, consideration as to why the project was unsuccessful will form an important part of the reflection on the project. It may be that reduction in variation is as success, and can be a good basis to build subsequent QIPs on.

How can I generate ideas for a QIP?
As a trainee, rotations offer a way of bringing a new perspective to a department ('the last thing a fish notices is the ocean': those working for a long time in a department have been immured to the departmental foibles!).
Think 'Data, Differences, Disasters'.

Examples include:

Protocoled management (A trainee noticed that at their new hospital, all patients with PVB had a PV examination as part of the protocol prior to referral to Gynaecology or Early

Pregnancy clinic. This process was established in this hospital because of a missed ectopic (a common response to an incident is to add a step to the process, creating additional layers in the 'Swiss Cheese' model; in engineering terms this has the effect of **reducing** reliability of the whole process). The trainee reviewed the process and care of patients with PVB, reducing length of stay, PV examinations and patient satisfaction (interventions in this case included new protocols including nurse fast track and increased EPU, PVB care packs, dedicated designed cubicles for intimate examinations)

Observation (A trainee noticed that when breaking bad news regarding bereavement, over the space of 3 nights the conversation had ended with a query about parking tickets in the hospital. The trainee wondered whether a car park ticket could be included in the bereavement pack. The trainee started with this solution, but then started to consider other issues regarding the care of bereaved relatives, and how this could be improved. The consideration of which measures to use for this was a major consideration in the progression of this project)

Incidents (During the introduction of FICB to a department, a trainee was involved in wrong site block. This led to a review of the FICB process, but also to the process of regional anaesthesia and pain management for procedures in general in the department)

Differences (A trainee starting a new post noticed a number of differences in management of fractures; all fractures were sent to next day fracture clinic, including torus fractures, and many injuries which could be followed up in alternative ways. The trainee was aware of the Glasgow Virtual clinic model, and previous projects and evidence regarding self-management of torus fractures and began to consider how to improve the care of ED patient, and reduce unnecessary follow up)

Clinical Governance/M&M meetings (A trainee attended a CG meeting, and on reviewing previous minutes noticed that a suggestion for diagnosis-specific Patient Information Leaflets (PILs) had been discussed and suggested on a few occasions. The trainee that investigated the patient satisfaction with information, and the quality (and quantity) of PILs given out. Several interventions including QR codes, new leaflets, increased availability of leaflets to patients and staff, automated printing were used)

Evidence review (A trainee was aware of the decreasing use of hard collars in C-spine immobilisation, and reviewed the evidence surrounding it. When trying to remove/reduce use in a department, realised this was a solution, but that the problem was not hard collar use per se, but prolonged, possibly unnecessary, and inappropriate immobilisation. A project started on reducing length of immobilisation (early CT, rapid turnaround for reports), increasing screening and early removal of immobilisation, and improving care (pressure area/hydration/communication etc) for those immobilised)

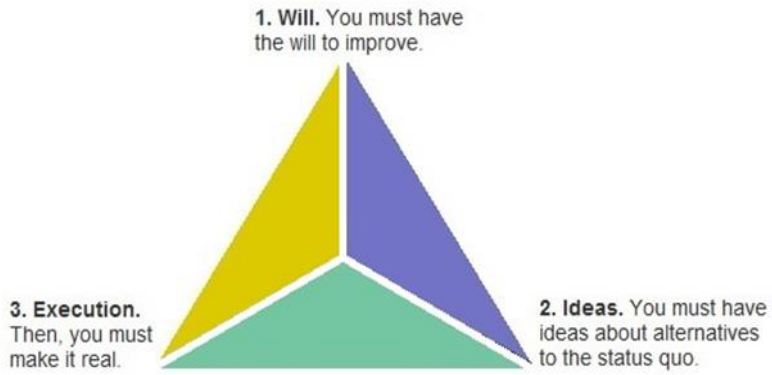
Audit data (On reviewing TARN data, a trainee investigated and established trauma team functioning as an area key to explaining this data, a QIP project on establishing trauma teams, education for its members and leaders, protocols and operating procedures for members, handover standardisation etc was commenced)

Lastly, remember a QIP can take something good and make it better, it does not always need to be a response to poor outcomes or performance!

How do I turn ideas into QIPs?

First, make sure you start with a problem, not a solution. If you have a solution, work back to the problem, and re-start your analysis. Turing an idea into a QIP is all in the analysis. A short discussion with your departmental or regional QIP lead may well be beneficial here. Clarification of the problem will help with identification of interventions and metrics. Using the analysis tools discussed in this guide to help with selection of interventions.

Think about whether you have the desire to overcome the obstacles…..



Essential elements for systems improvement

Think clearly about your aims: have an 'aim statement': State Aim Clearly, include numerical goals, set stretch Goals, avoid aim drift, be prepared to refocus the aim.

Aim drift is 'relaxing' the aim, often as a result of lack of success (e.g. starting with aim of 75% improvement in outcome measure, then reducing this to 50%). Aim refocusing is a refining of the aim (e.g. starting with aim of reduction of pain scores in all patients in severe pain, then re-focussing t0 paediatric patients).

Below is a table which offers a 'pick list' of interventions as inspiration:

Eliminate Waste
1. Eliminate things that are not used
2. Eliminate multiple entry
3. Reduce or eliminate overkill
4. Reduce controls on the system
5. Recycle or reuse
6. Use substitution
7. Reduce classifications
8. Remove intermediaries
9. Match the amount to the need
10. Use Sampling
11. Change targets or set points

Improve Work Flow
12. Synchronize
13. Schedule into multiple processes
14. Minimize handoffs
15. Move steps in the process close together
16. Find and remove bottlenecks
17. Us automation
18. Smooth workflow
19. Do tasks in parallel
20. Consider people as in the same system
21. Use multiple processing units
22. Adjust to peak demand

Optimize Inventory
23 Match inventory to predicted demand
24 Use pull systems
25 Reduce choice of features
26 Reduce multiple brands of the same item

Change the Work Environment
27. Give people access to information
28. Use Proper Measurements
29. Take Care of basics
30. Reduce de-motivating aspects of pay system
31. Conduct training
32. Implement cross-training
33. Invest more resources in improvement
34. Focus on core process and purpose
35. Share risks
36. Emphasize natural and logical consequences
37. Develop alliances/cooperative relationships

Enhance the Producer/customer relationship
38. Listen to customers
39. Coach customer to use product/service
40. Focus on the outcome to a customer
41. Use a coordinator
42. Reach agreement on expectations
43. Outsource for "Free"
44. Optimize level of inspection
45. Work with suppliers

Manage Time
46. Reduce setup or startup time
47. Set up timing to use discounts
48. Optimize maintenance
49. Extend specialist's time
50. Reduce wait time

Manage Variation
51. Standardization (Create a Formal Process)
52. Stop tampering
53. Develop operation definitions
54. Improve predictions
55. Develop contingency plans
56. Sort product into grades
57. Desensitize
58. Exploit variation

Design Systems to avoid mistakes
59. Use reminders
60. Use differentiation
61. Use constraints
62. Use affordances

Focus on the product or service
63. Mass customize
64. Offer product/service anytime
65. Offer product/service anyplace
66. Emphasize intangibles
67. Influence or take advantage of fashion trends
68. Reduce the number of components
69. Disguise defects or problems
70. Differentiate product using quality dimensions
71. Change the order of process steps
72. Manage uncertainty, not tasks

Change Concepts and Related Ideas

Source: *The Improvement Guide*, Langley, Nolan, Nolan, Norman and Provost, Jossey-Bass,2009, p.357.

Why can't I get my project to work?

Firstly, is this a problem of selection (i.e. the wrong project). Is it too big, or unfeasible given the time and resources available?

Secondly, is there are issue with the analysis; did you start with a solution, not a problem. Are the interventions correct? Are the measurements the correct ones? E.g. a run of adverse events (such as acrylate adhesive spillage to eyes) may lead to a QIP on reduction to these; as this is a rare event, however a metric that only looks at adverse outcomes may not pick up any in the study period. Hence other data should be collected: balancing measures could be number of patients needed specialist input for closure (as this may increase), outcome measure such as patient satisfaction with wound closure technique and result, and process measure could be compliance with correct closure and eye protection processes.

Thirdly, is there a problem with the management of the change; are there barriers (stakeholder, PESTLE and force field analysis might be useful)?

Fourthly, is there an issue with engagement of the team. Are you a 'lone wolf' with this project. How will you engage the team and the stakeholders?

Fifthly, Are you ‘present’ enough. This allows rapid feedback and change to the system (also, change requires strong and consistent leadership ‘MBWA’).

What are the common mistakes?
Most commonly made mistakes are:

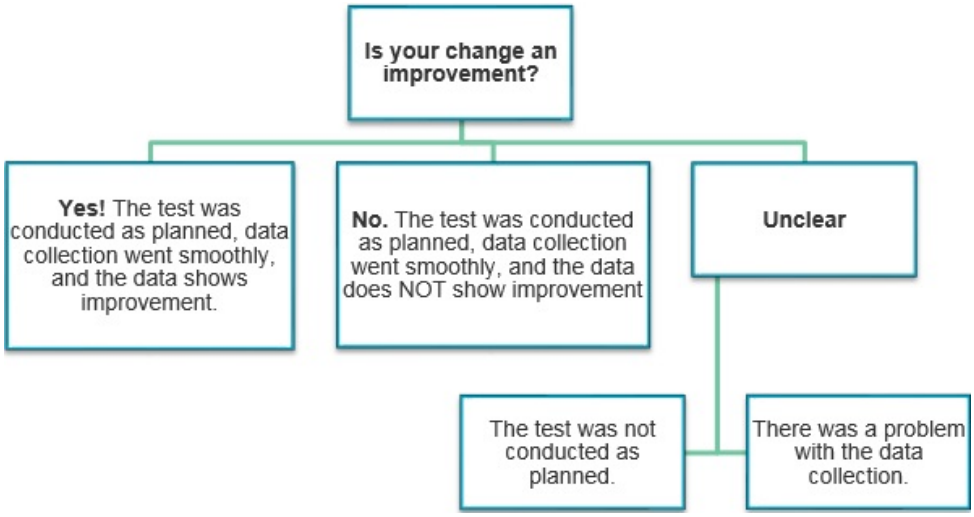
Unclear analysis of the problem.

Solutioneering: starting with a solution, not thinking about the problem. A consequence is usually having too few (often one) interventions.

Allowing perfection to be the enemy of change: waiting for all stakeholders to agree and sign off the ‘perfect’ protocol or SOP before testing and using. Sometimes ‘asking for forgiveness not permission’ is appropriate. Consider 1:1:1; start with one patient, one clinician and one intervention, and if successful increase one of these numbers to two! When designing a process measure early and do not be afraid to ‘adapt, adopt or discard’ based on this data.

Delay: QI is about action, and using data to inform action. Not collecting data, and not acting on what the data tells you will delay the project.

Unclear narrative: the problem, interventions and measurements should be clearly linked.



Why is it so difficult to start?
The environment with healthcare, particularly emergency care has several challenges that manufacturing does not. The environment is ‘VUCA’: volatile, uncertain, complex and ambiguous, leading to ‘wicked problems’
(“*Some problems are so complex that you have to be **highly** intelligent and well informed just to be undecided about them*” Laurence J Peter).

The system is ‘non-linear’: Output is disproportionate to input; Output for the same input value may not be constant over time, or be reproducible; Events occur both sequentially and simultaneously; each component of the system influences the other i.e. shows interdependence.
(R Tuffin; Implications of complexity theory for clinical practice and healthcare organization, *BJA Education*, Volume 16, Issue 10, 1 October 2016, Pages 349–352, https://doi.org/10.1093/bjaed/mkw013)

The processes and the project involves and affects people: both patient and staff; so unlike manufacturing there are issues such as reliability of systems with people at the centre, and the emotional aspects of change.

There is much discussion in CM about ‘conditioning vs Gestalt’; do you ‘train’ staff or change the system. (“*Culture eats strategy for breakfast*” attr. Giga information group).

My supervisor has told me I cannot do an education based QIP. Are they correct?
There are no restrictions on what topic the QIP is based on, although limitations on setting exist. The primary consideration is whether patients in the ED will (or may) have better care as a result of the QIP. Hence projects in Pre-hospital medicine, or **exclusively** in non-ED settings are not suitable.

It is true that staff that are well trained, and well supported (especially in terms of well-being), have better patient outcomes. Hence, education based QIPs are permissible; however please see the caveats described below.

Possibly the most difficult area is the measurement: how will you demonstrate an improvement in outcome measures? How will patients ‘feel’ the benefit and how will you demonstrate this? A second area where a QIP on one of these elements often struggle is with the iterative nature, and planning of interventions: implementing and then improving education could be viewed as a single intervention.

There are also pragmatic aspects to these projects: firstly, there are significant systems and ‘machinery’ around both medical education and staff well-being. Interactions with these systems, and implementing change in these areas can be slow process, and better suited to those who are not regularly rotating. Secondly, these are areas where intervention and improvement are often complicated, and costly.

Lastly, there is also the issue that projects in these areas tend to be inherently ‘solution-centered’, rather than problem centered at the outset. What is the issue that you are trying to resolve; what is the ‘problem’ at the centre? The problem is not, from a quality perspective, that education is poor, or staff dissatisfied or unsupported- these are a consequence of management within a department; the ‘problem’ is patient care is affected by these.

So, whilst most QIPs project have an element of educational interventions within them, often as an intervention, projects whose sole ‘existential’ reason is to improve education are best avoided (see text box for examples).

Examples:
You decide to establish a sepsis teaching programme for the staff in rapid assessment area, as the department is performing poorly against sepsis targets. While this is a good project; what in the analysis lead you to this solution; the problem is not necessarily a lack of training. What about other strategies; cognitive forcing strategies, IT solutions to identification, resource issues, improving application of sepsis triage tools, departmental 'cultural' aspects? An educational programme may help with the latter two but are not the only interventions in these areas.

You feel that the teaching programme is poor and should be 're-vamped'. This is a solution, what is the problem? How can you identify outcomes that will be improved? If there are specific areas where education has been demonstrated to be lacking (e.g. adverse outcomes from procedures) what are the other root causes needing intervention (equipment, checklists etc)? The lack of a procedure (e.g. no provision of paediatric sedation) is not necessarily a problem (see example in the mark scheme), and introduction may be considered a Service Improvement Project or 'solutioneering'. In this case metrics could be identified that demonstrate improvement in quality; however there will be other interventions apart from education only, and the project then starts to become 'more QIP than SIP'.

My supervisor has asked me to undertake a project that aims to save money (e.g. by reducing cost of medical devices, improving billing, or reducing locum costs). Can this be a QI project?

Whilst a 'Service Improvement Project' or Cost Improvement Project' (SIP/CIP) can have some similar/overlapping interventions the primary aim of a QIP is to improve patient 'care': experience or safety. Similarly, to educational QIPs above, SIPs/and CIPs may affect patient care it may be too remote from patients; elements of CIP or SIP often form one intervention in a QIP but not the only one. Hence, it is important to consider both how the project will improve patient care/experience/outcomes or safety. Often, these projects start with a solution, and have a limited single intervention. However, CIP/SIP project can provide a springboard for a QIP as well as being part of a QIP (E.g: Trainee reviews evidence for stiff cervical collars and decides to remove them from department to save costs. On analysis of problem, identifies that rather than discomfort of collars per se, patients report that the issue is with prolonged lie in department, and discomfort and boredom associated with this. Reduction of length of lie, provision of explanations and good nursing care become focus of QIP.)

My supervisor has asked me to introduce a new drug (or sort out the recruitment crisis) as my QIP. How should I start?

Firstly, be careful when to with starting with as solution, work back to the problem. New drugs, like new procedures are a single intervention, as discussed previously, will struggle on their own to satisfy the mark-scheme. The same is true about recruitment and rotas. These are Service Improvement projects- and are good elements for the management portfolio, and related curriculum items. The mark-scheme examples discuss this further. So, whilst these

may be elements within your QIP, they should not be the only intervention- go back to the problem. Hence, if for example, the new drug is an analgesic delivered by inhalation or intranasally, the problem is not absence of this drug, but the management of pain- how are you going to change this? A new drug does not, per se, usually solve the delay to analgesic effect, there are issues around time, triage and identification, resource, departmental culture and recording of metrics. Similarly starting with a perceived solution or new process, may open up into a QIP: e.g. introducing Fascia Iliac Block (FIB) considering it a useful analgesia for fracture NOF. This project identifies rapid pain relief as the issue, and initial data and analysis reveal that delays in triage, preforming XR, interpreting XR all prolong time to pain relief and therefore FIB; QIP then changes to a project that reduces these delays.

Often working through an analysis and producing a one-page 'Aim statement' will help clarify things.

An Example of an Aim Statement

Problem:
Half of the patients admitted to EAU miss doses of routine medication while in hospital under ED care.
Aim:
Reduce the number of missed drug doses for inpatients under ED care by 25% within 6 months.
Measure(s):

1. Proportion of patients with completed drug charts (process)
2. Number of missed drug doses (outcome)
3. Breach rate of admitted patients (balancing)

QI Methodology:
Model for Improvement (MFI)
Team/ Stakeholders:
Junior Docs, Matron, Pharmacy technician, Informatics Support

Any other hints/help?
Hint for choosing: **think about your area of influence and control**, keep project small and focussed, ensure it is an area you are interested in: this will help with engaging others and maintain your passion for the project.

Hints for running: **keep a diary** (both of events, including those all-important 'corridor conversations', and of your thoughts/reflections).

Hints for writing up: Be creative, use pictures, photos, mindmaps. Include dairy, diagrams, and data. Ensure 'readability' and clear narrative.

General advice: discussions at the outset, clarifying the project and analysis (especially avoiding 'solutioneering') with an experienced QI lead are important in ensuring 'on the right track'. Half an hour spent on this can avoid much wasted effort!

Lastly:
Don’t expect busy people to come to you
Don’t expect everyone to infer the brilliance of your plans
Don’t expect everyone to see the planned future
Don’t expect everyone to agree with the planned future!
Consider leadership style
Recognise and acknowledge different rationales
Acknowledge difficulties
Communicate plans
Highlight transition and change
Focus on patient care
Meet regularly

Resources

- RCEM Quality Improvement Webpage
- RCEM Safety Toolkit
- HQIP Guide to Quality Improvement
- Health Foundation guide to communicating results
- AoMRC Quality Improvement Training for Better Outcomes
- Practical advice on how to perform a QIP:
    - NHS Improving Quality – A simple guide to quality improvement
    - Health Foundation - Quality improvement made simple
    - Institute for Healthcare Improvement (IHI) website, 'Resources' section

- 'How to lead a Quality Improvement Project' – Fiona Tasker. Available at: https://www.bmj.com/content/346/bmj.f113
- SQUIRE guidelines http://www.squire-statement.org/
- Royal College of Physicians. Learning to make a difference, 2012. www.rcplondon.ac.uk/projects/ltmd-trainees
- NICE QIP examples and toolkits available at: https://www.evidence.nhs.uk/qipp
- BMJ Open Quality resource http://qir.bmj.com/

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Revised and expanded in September 2019 by Simon Smith, Adrian Boyle, Matt Edwards, Dale Kirkwood, and Sally-Ann Wilson

Revised June 2020 following changes to mark scheme (due to COVID pandemic).

Re-written in March 2022 to reflect changes to RCEM curriculum and assessment, by Anu Mitra and Simon Smith

References

1. Ovretveit J. Leading improvement. J Health Organ Manag. 2005;19(6):413–30.

2. Rogers EM. Diffusion of innovations [Internet]. Macmillian Publishing Co. 1995. 3rd Edition. Available from: http://hollis.harvard.edu/?itemid=%7Clibrary/m/aleph%7C006256656

3. Beckhard R. A model for the executive management of transformational change. In: The Pfeiffer book of successful leadership development tools The most enduring effective and valuable training activities for developing leaders. 1992. p. 83–96.

4. Todnem R. Organisational change management: A critical review. J Chang Manag. 2005;5(4):369–80.

5. Murphy E, MacGlone S, McGroarty C. A novel approach to improving coagulation sample ordering in an emergency department. BMJ Qual Improv Reports [Internet]. 2015;4(1). Available from: http://qir.bmj.com/content/4/1/u204785.w2857.abstract

6. Piper D, Ledema R, Gray J, Verma R, Holmes L, Manning N. Utilizing experience-based co-design to improve the experience of patients accessing emergency departments in New South Wales public hospitals: an evaluation study. Heal Serv Manag Res [Internet]. 2012;25(4):162–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23554443

7. Iedema R, Merrick E, Piper D, Britton K, Gray J, Verma R, et al. Codesigning as a Discursive Practice in Emergency Health Services: The Architecture of Deliberation. J Appl Behav Sci. 2010;46(1):73–91.

8. Redfern E, Brown R, Vincent CA. Identifying vulnerabilities in communication in the emergency department. Emerg Med J [Internet]. 2009;26(9):653–7. Available from: http://emj.bmj.com/content/26/9/653.short

9. GMC. Good Medical Practice: Duties of a doctor [Internet]. Good Medical Practice. 2013. Available from: http://www.gmc-uk.org/guidance/good_medical_practice/duties_of_a_doctor.asp

Appendix 1: Definitions

Quality	Safe, Effective, Patient Centred, Equitable, Efficient and Timely (IOM) Safety; clinical outcomes; and patient experience. NHS

Quality Improvement	Better patient experience and outcomes achieved through changing provider behaviour and organisation through using a systematic change method and strategies (Ovreveit)
Patient Safety	Prevention of errors and adverse effects to patients associated with health care (WHO)
National and Local Clinical Audit	A quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change
Rapid Cycle Audit	An adjunct to audit whereby very quick audits are performed on a few cases and standards to try and effect 'real time' change
Plan, Do, Study, Act	A quality improvement method, often combined with the Model for Improvement (see examples)
Model for Improvement	A quality improvement method, with PDSA cycles as an integral part (see examples)
Healthcare Failure Modes and Effects Analysis	A quality improvement method that proactively identifies deficiencies in care (see examples)
Lean	A quality improvement method useful for identifying inefficiencies in care, often combined with Six Sigma (see examples)
Six Sigma	A quality improvement method useful for identifying inefficiencies in care, often combined with Lean (see examples)
Run Chart	An analytical tool allowing the visual display of the data collected over time against a threshold
Statistical Process Control Chart	A graph used to study how a process changes over time. Data are plotted in time order. A control chart always has a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit.
Change Management	Any approach to transitioning individuals, teams, and organisations using methods intended to re-direct the use of resources, business process, budget allocations, or other modes of operation that significantly reshape a company or organisation
Root Cause Analysis	An analytical tool that provides a structured approach to investigating adverse incidents
Fishbone	A graphical approach to support a Root Cause Analysis

Process Mapping	A visual representation of a patient journey or process happening within a department. The map shows how things are and what happens currently, rather than what should happen
Driver Diagram	A type of logic chart to help define factors that would lead to your aim or goal
Forcefield Analysis	A useful decision-making tool. Helps analyse the forces for and against your change and how to deal with these
Measures **- Outcome** **- Process** **- Balancing**	Outcome measure – patient related e.g. harm/death/experience Process measure – how the system is operating e.g. time/number of cannulas Balancing – how other things in the system may be affected by your change
Gantt Chart	A chart that shows tasks on the vertical axis against time on the horizontal axis. This allows an intuitive understanding of the progress of the component parts of a project. These are usually used for project management.
Pareto Chart	A graph that displays both a bar chart and a line. The left sided vertical axis is labelled frequency, the right sided vertical axis is cumulative percentage and the horizontal axis has the group names of the response variables. This allows an intuitive display of the relative importance of the differences between groups of data.

Appendix 2: Skills, knowledge, values and behaviours in quality improvement

The Academy of Medical Royal Colleges has suggested the attributes required to conduct effective quality improvement work for trainee doctors. We have further proposed consultant and associate specialist abilities below. Each department should have a QI lead and this is a separate, but overlapping role to the audit lead. Trainees should be encouraged to perform a QIP as an alternative to an audit.

	Knowledge	**Skills**	**Values and behaviours**
Undergraduate	Can compare and contrast quality assurance and quality improvement, and describe the relationship of audit and quality improvement to clinical governance. Understands the principles of, and differences between, quality improvement, audit and research. Can describe PDSA cycles, human factors and reporting error.	Has actively contributed to a quality improvement activity (this does not necessarily need to be in a clinical setting)	Has actively contributed to a quality improvement activity (this does not necessarily need to be in a clinical setting)
Foundation	Can compare and contrast quality assurance and quality improvement, and describe the relationship of audit and quality improvement to clinical governance. Understands the principles of, and differences between, quality improvement, audit and research. Can describe PDSA cycles, human factors and reporting error.	Has taken part in systems of quality assurance and quality improvement, in the clinical environment, and actively contributes to a clinical improvement project	Recognises the need for a continuous improvement in the quality of care and for audit to promote standard setting and quality assurance

	Knowledge	Skills	Values and behaviours
Core / Basic Training	Describe tools available for planning quality improvement interventions Explains process mapping, stakeholder analysis, goal and aim setting, implementing change and sustaining improvement Understands and describes statistical methods of assessing variation	Designs and implements, completes and evaluates a simple quality improvement project using improvement methodology as part of a multi-disciplinary team Supports improvement projects to address issues of quality of care undertaken by other trainees and within the multidisciplinary team Demonstrates how critical reflection on the planning, implementation, measurement and response to data in a QIP have influenced planning for future projects	Demonstrates the values and actively supports quality improvement in the clinical environment
Higher Training and Middle Grade Doctors	Compares and contrasts improvement tools and methodologies Compares and contrasts the principles of measurement for improvement, judgement, and research. Describes types of measures, and methods of assessing variation	Proactively identifies opportunities for QI and leads multidisciplinary quality improvement project teams with minimal supervision Supervises a QIP involving junior trainees and other members of the multidisciplinary team using improvement methodology Leads and facilitates team-based reflective evaluation of a project	Demonstrates advocacy for clinical quality improvement

	Knowledge	Skills	Values and behaviours
Consultant and Associate Specialists	Compares and contrasts improvement tools and methodologies Compares and contrasts the principles of measurement for improvement, judgement, and research Describes types of measures, and methods of assessing variation Understands principles of change management	Proactively identifies opportunities for QI and leads multidisciplinary quality improvement project teams with minimal supervision Supervises a QIP involving junior trainees and other members of the multidisciplinary team using improvement methodology Leads and facilitates team-based reflective evaluation of a project Organises and prioritises a departmental QIP	Encourages and supports trainees and other clinicians who want to start clinical quality improvement Engages staff outside the Emergency Department in quality improvement

Appendix 3: Assessment guidance

In August 2021, a new GMC approved Emergency Medicine curriculum for trainees was approved and commenced. Details of how QI skills will be assessed under the new curriculum (From August 2021), as well as the changes to the FRCEM examination, can be found at: https://rcemcurriculum.co.uk/
Quality improvement activity is consistent with various elements of the 'Duties of a Doctor' (9), and it is hoped that implementation of the new assessment structure including QIP will further embed QI activity in Emergency Departments.
This section provides a practical guide for trainees (and trainers) to assessment processes under the new curriculum.

Introduction and background

Specialty Learning Outcome 11, Participate in and promote activity to improve the quality and safety of patient care, is one of the 12 SLOs in the RCEM curriculum, and covers quality improvement and patient safety. This now means, in line with a key GMC requirement for curricula in all specialties, that QI is embedded throughout the curriculum and should be assessed at every stage of training, not just one step in the FRCEM examination. More information on SLO 11 can be found here. The motivations for this change were:

- The GMC mandated that QI be present in all curricula, reflecting the fact that quality and safety comprise much of Domain 2 in Good Medical Practice. This means that QI must be assessed in each stage of training. QI cannot, therefore, be isolated to HST as a single assessment.
- There is evidence of the educational advantage of 'interleaving' and 'spacing' content. Such approaches are supported by 'spiralling' QI through training. Experience with candidates in the FRCEM QIP showed a reluctance to engage in further QI work once that hurdle had been cleared
- A breadth of experience can be recorded and reflected upon. This will support the trainee in considering their own strengths and weaknesses in relation to QI activity they have experienced in a number of settings.

Acceptance criteria for QIPs

The emphasis has shifted towards learning QI methodology generally and gaining a breadth of experience as one progresses through training. There is no longer a narrow set of acceptance criteria, which means that any QI project subject area may be suitable, including education, environmental sustainability, wellbeing, cost-saving, pre-hospital, overseas setting. This should significantly open up the range of QIP topics available for the trainee to take on.

Spiralling Involvement in QI

In recognition that a CT1 will have a different level of involvement in a QI project than an ST6, there are 3 different assessments which are commensurate with their stage of training (ACCS / Intermediate / Higher). The expectations of trainee at each stage can be summarised as follows:

- ACCS: records participation in QI activity. The trainee must demonstrate a basic understanding of key QI principles, reflection, and appreciation of the team-based nature of QI work
- Intermediate: records a project and requires additional of data analysis and an evaluation of change.
- Higher Training: records a project that the trainee has led on, with completion of the project by the end of training. The assessment at this level will be reviewed regionally by a panel including QI expertise to ensure there is consistency and expert insight. Review of the submission will be accompanied by review of supporting material, that may include copies of reports, data, feedback from presentation.
- QI assessment should encourage trainees to pursue interests, include QI from a variety of settings, and introduce the concept of a personal development journey with reflection. The assessment should then be signed-off by the trainee's educational supervisor. ***There will be a final sign-off by the regional QI panel for ST5-ST6 submissions only*** (until August 2022, further details below).

How will QI be assessed in training?

The QIAT

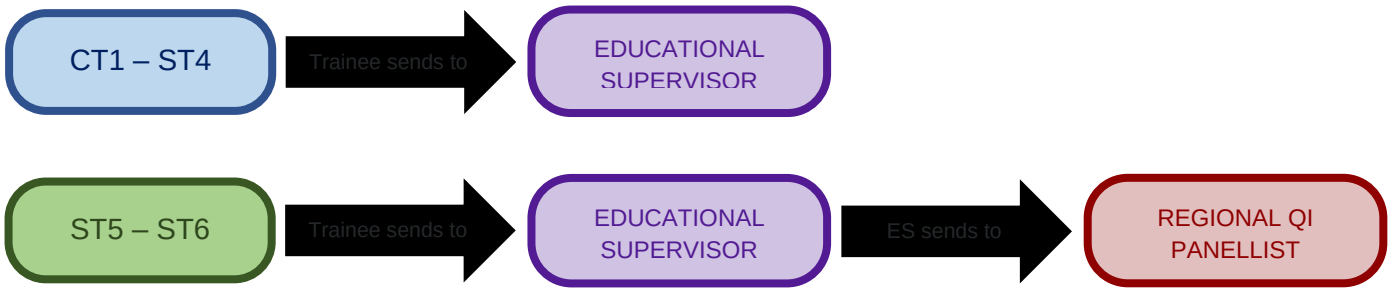
QIAT stands for Quality Improvement Assessment Tool. It is the reporting tool, available on Kaizen, which should be used to record QI activity in the past year. It is designed for reporting primarily on one QI project.

The QIAT is available electronically on Kaizen, and this is the format in which it should be submitted for marking. There are Word versions available as templates and exemplars, but these are for illustration only.

QIATs can be generated in Kaizen by entering QIAT in the search window. For CT1-ST3-4, generate the QIAT for August 2022 onwards (which doesn't require a regional panel sign-off). For ST5-ST6, generate the QIAT for August 2021 – August 2022 (which contains the final section for regional panel sign-off).

The QI Assessment Process

The assessment process should follow one or two steps, as illustrated below:



- Educational Supervisor: The ES should sign-off on the project after sitting down and reviewing the trainee's activity on the QIP. There should be comments about what the trainee did well,
- what they could have done better, and recommendations for further learning.

- Regional Panel (ST5-ST6 only): The Regional Panellist will review the QIAT and the uploaded evidence before awarding a mark (until August 2022).

The Regional QI Panel is chaired by the Regional QI Lead, and consists of consultants from all across the region. They are experienced in supervising QIPs, are departmental QI leads and/or have marked FRCEM QIPs. The QIAT may be graded excellent, satisfactory, or unsatisfactory. ***If unsatisfactory, this will result in an Outcome 5 at ARCP. If it is the final ARCP, an Outcome 3 will result.***

I have already passed the FRCEM QIP. What should I do?

If you have passed the FRCEM QIP, the QIAT is not a requirement for an Outcome 1 at ARCP. However, in the interests of lifelong learning in QI, it's good practice to continue QI activity during your training and record it in a QIAT for submission at ARCP. The FRCEM QIP gives you exemption from mandatory IATs until 2028.

I have only been in this post for 6 months. Is that enough time for a satisfactory QIAT?

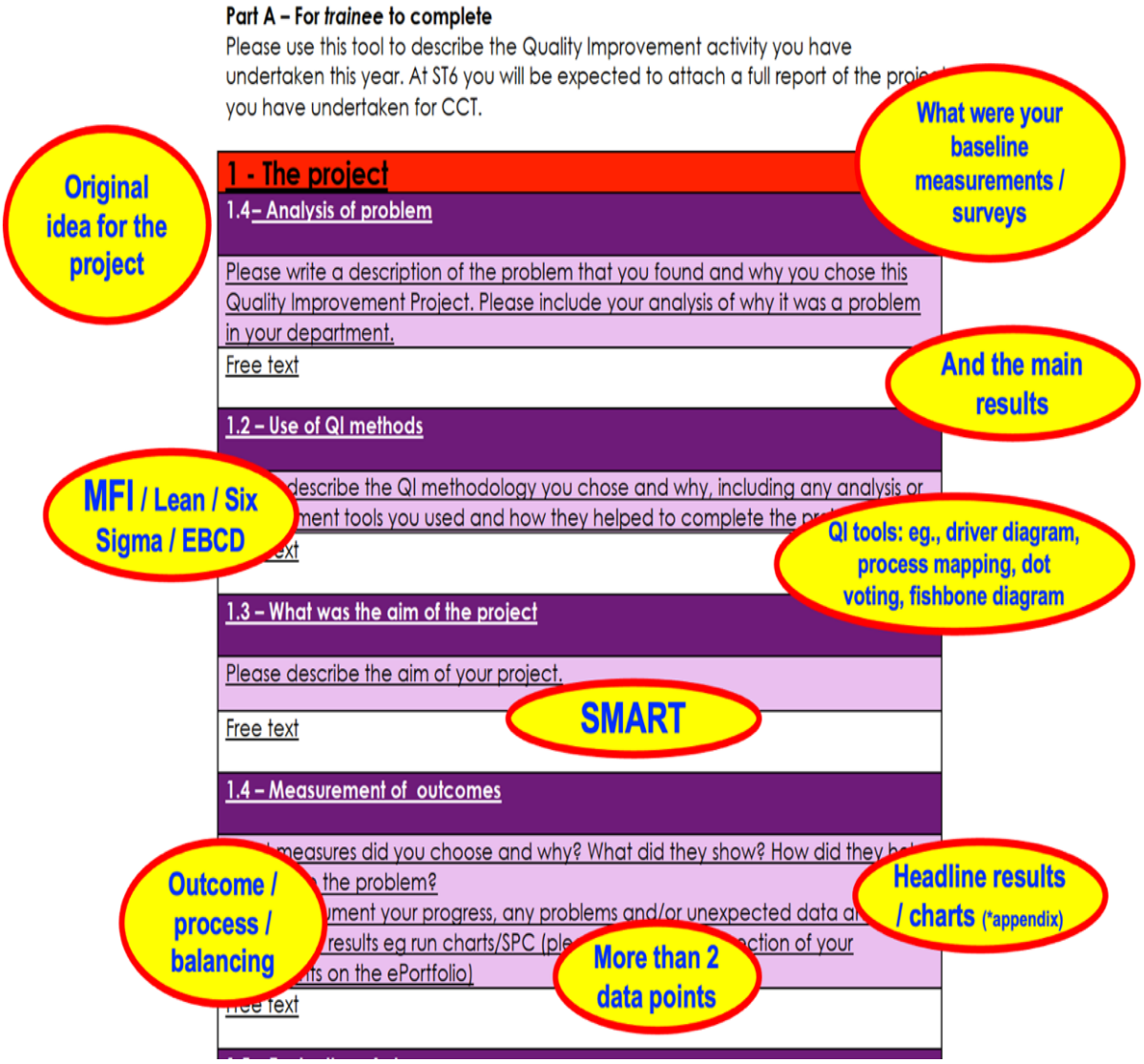
Your QIAT should record the period of time covered by the ARCP. If the ARCP period covers two posts, there should be a single QIAT. Occasionally, principally for ACCS trainees or HST trainees with offset start dates or short postings, or additional ARCPs, a second QIAT may be required. You can't be expected to have completed a QI project from start to finish in six months, but you will be expected to engage in QI in some form.

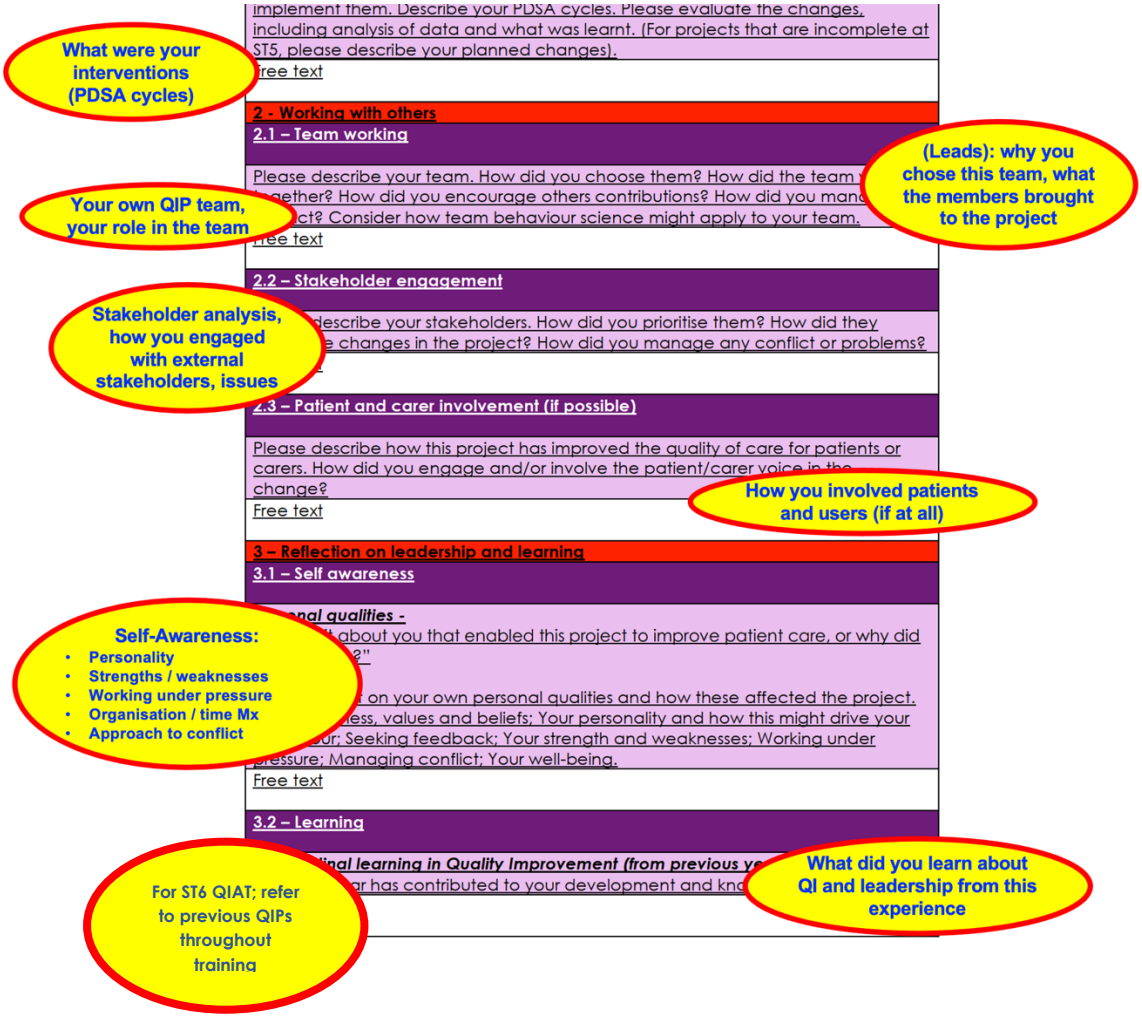
What if I am on a CESR pathway?

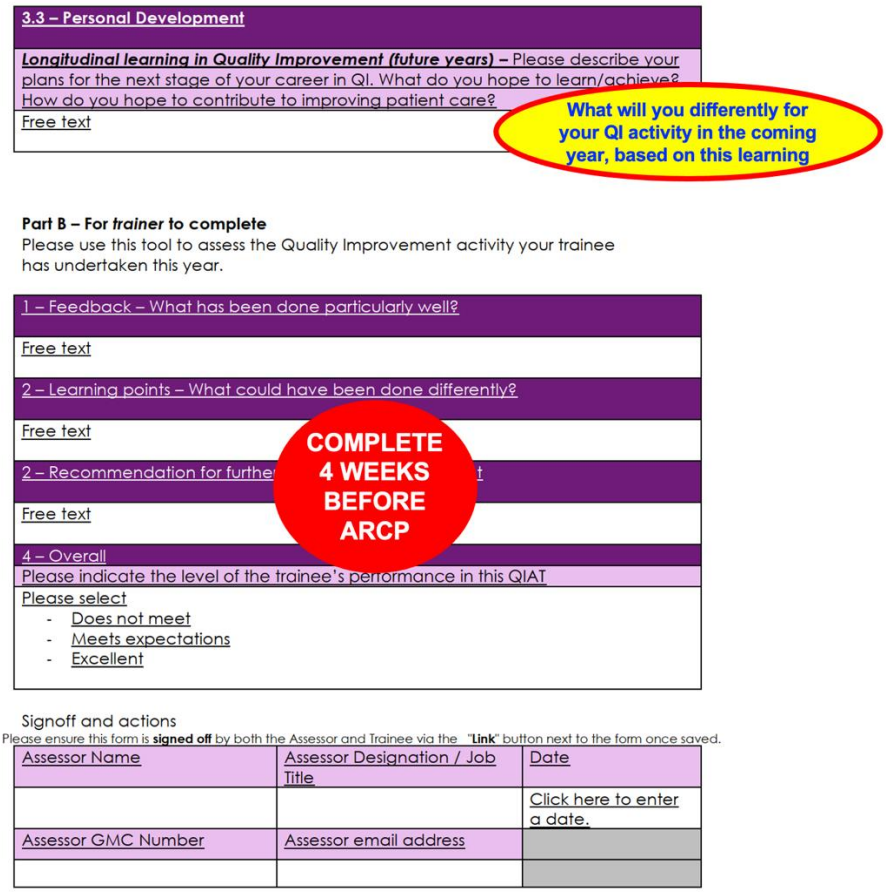
CESR trainees had a period of 'grace' to submit an FRCEM QIP which ended in February 2022, but can submit against the 2016 curriculum until August 2022. Otherwise, they must now follow the RCEM 2021 curriculum, they should ideally produce a QIAT once a year. The QIAT should be the post-August 2022 form which requires only the educational supervisor's sign-off. Most CESR trainees will have their own annual review – be it a form of ARCP or annual appraisal – and it is suggested that the QIAT be reviewed at this meeting. Signed-off QIATs should be included in the final CESR portfolio for submission to the GMC. Please see the Specialty Specific Guidance for more detail, or ask the CESR committee chair or local leads for advice.

How do I complete a QIAT?

The QIAT requires 3 broad areas of content: a report of the project itself, an account of working with others, and reflection and learning from the journey conducting the project. Below is a run-down of each section, with annotations on what should be included therein:




What were your interventions (PDSA cycles)
implement them. Describe your PDSA cycles. Please evaluate the changes, including analysis of data and what was learnt. (For projects that are incomplete at ST5, please describe your planned changes).
Free text
2 - Working with others
2.1 – Team working
(Leads): why you chose this team, what the members brought to the project
Your own QIP team, your role in the team
Please describe your team. How did you choose them? How did the team
gether? How did you encourage others contributions? How did you mana
ct? Consider how team behaviour science might apply to your team.
Free text
2.2 – Stakeholder engagement
Stakeholder analysis, how you engaged with external stakeholders, issues
describe your stakeholders. How did you prioritise them? How did they
changes in the project? How did you manage any conflict or problems?
2.3 – Patient and carer involvement (if possible)
Please describe how this project has improved the quality of care for patients or carers. How did you engage and/or involve the patient/carer voice in the change?
How you involved patients and users (if at all)
Free text
3 – Reflection on leadership and learning
3.1 – Self awareness
Self-Awareness:
Personality
Strengths / weaknesses
Working under pressure
Organisation / time Mx
Approach to conflict
nal qualities -
about you that enabled this project to improve patient care, or why did
?"
on your own personal qualities and how these affected the project.
ess, values and beliefs; Your personality and how this might drive your
ur; Seeking feedback; Your strength and weaknesses; Working under
ssure; Managing conflict; Your well-being.
Free text
3.2 – Learning
For ST6 QIAT; refer to previous QIPs throughout training
inal learning in Quality Improvement (from previous y
What did you learn about QI and leadership from this experience
r has contributed to your development and kn



There is also an annotated run-through of an exemplar QIAT, in the appendix. With a reasonable amount of detail, a good QIAT should cover the equivalent of 7-8 pages of A4.

What accompanying evidence should I include?

There should be some evidence which won't fit in the QIAT. This should be uploaded into the trainee's document library. For the assessors' convenience, all uploads should be stored in a dedicated folder for the QIP. It is also recommended that you link every piece of evidence to the QIAT itself. Suggestions for evidence might include (neither a mandatory nor an exhaustive list)

- Driver diagram
- Stakeholder analysis
- Process map
- Fishbone diagram
- Run charts of data (or other graphical representation)
- Tabulated data
- Guidelines / pathways / SOPs
- Posters and other comms
- Teaching / QIP presentation slides

Regional Structures and Support

Regional School QI Structure

It is expected that all Emergency Medicine Schools (or equivalents) will have a regional QI lead, who sits on the School board. This training lead will have the function of advising trainees (and trainers) on aspects of QI and the RCEM assessment system. It is expected that the training lead will have some training in QI, either by one to the national bodies (see RCEM website for details), or ideally by attending an RCEM study day (there are generic QI study days and bespoke trainers QI study days). These will report to and be advised by, the Head of School, and then ultimately to the RCEM Training Standards Committee (TSC).

It is also anticipated that each Emergency Department (ED) will have a QI lead, liaising closely with departmental governance, audit and safety leads (and within the hospital's Quality structure). Their function should be to plan strategically the departmental QI programme, advocate for and lead QI initiatives within the ED, and provide education for ED staff in QI methodology. These QI leads will be similarly trained to the School QI lead. The RCEM Quality in Emergency Care Committee (QEC) will be a key source of advice and guidance for QI lead, especially through the Quality and Standards, and Safer Care sub-committees. There are resources available on the RCEM website. In the context of QI assessment, it is anticipated that the department QI lead will be involved in overview of higher trainees' QI activity and the completion of their QIATs in advance of ARCP.

Regional QI Education & Support

There is an expectation that each EM School will provide QI education, training and support for trainees. What shape this will take will the determined by the Regional QI Lead, based on the configuration and learning needs particular to that region. Support may include dedicated pan-regional QI training days, embedding QI into the main regional training day programme, locally-produced e-learning, 1-to-1 support from regional QI faculty for trainees, or referring to educational resources already available. Ideally, there should also be provision for trainers to learn how to supervise their trainees as they undertake their QI projects, perhaps embedded in the regional EM Faculty Development programme.

Advice for QI Panels: Assessing a QIP

Currently under development

Advice for trainers: Supervising a trainee performing QI project

This section is to help a consultant supervise a trainee who is conducting a QIP project. You do not need to be the trainees' Educational Supervisor (ES) to supervise their QI project, and neither is the ES necessarily obliged to be the QIP supervisor, although often the ES does supervise the QIP. The important aspect of supervising the trainee through a QIP is that you have the QI knowledge and skills, and can advise and direct the trainee.

'Top tips' include:

- It is generally accepted that trainees do better if they choose their own subject areas as this helps maintain interest.
- Regular review of a trainee's project is important.
- The QIP should be the trainee's own, however it is appreciated that there may be a requirement for trainers to assist with identification of the topic, and to give some

guidance during the project. However, the project should not be a simple management task that the Emergency Department requires action on.

- Look at the RCEM curriculum website, and the advice above on assessment.
- Engage with the trainee early, as soon as possible. Trainees may come to you with ideas before they start their post with you; this is to be encouraged to ensure they 'hit the ground running', given the tight timescales.
- It is important to be involved early to help with issues such as contextual analysis, analysis of problem (e.g. to avoid 'solutioneering'), ensure the project is appropriate in terms of scale and feasibility ('think about 'low hanging fruit', and consider area of influence and control), and ensure that it is suitable with respect to setting, and most importantly the trainees grade and 'journey' within QI
- You will also be able to help guide the trainee using your 'contacts' and 'local knowledge', and smooth when barriers and resistance is encountered- this is acceptable and suitable. If the trainee identifies barrier and has insight into the issue this is good evidence of awareness and excellent 'fuel' for reflection.

With supervision, a balance between encouragement and directing in terms of achieving timelines can be challenging; best managed by ensuring the trainee is enthused and interested in the project.


Royal College of
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