The Health Foundation
Inspiring Improvement

*Evidence scan:*

# Quality improvement training for healthcare professionals

August 2012

*Identify Innovate Demonstrate Encourage*

# Contents



Health Foundation evidence scans provide information to help those involved in improving the quality of healthcare understand what research is available on particular topics.

Evidence scans provide a rapid collation of empirical research about a topic relevant to the Health Foundation's work. Although all of the evidence is sourced and compiled systematically, they are not systematic reviews. They do not seek to summarise theoretical literature or to explore in any depth the concepts covered by the scan or those arising from it.

*This evidence scan was prepared by The Evidence Centre on behalf of the Health Foundation.*

# Key messages

There is an increasing focus on improving healthcare in order to ensure higher quality, greater access and better value for money. In recent years, training programmes have been developed to teach health professionals and students formal quality improvement methods.

This evidence scan explores the following questions:

- What types of training about formal quality improvement techniques are available for health professionals?
- What evidence is there about the most effective methods for training clinicians in quality improvement?

For the purposes of this scan, quality improvement training was defined as any activity that explicitly aimed to teach professionals about methods that could be used to analyse and improve quality. Courses about techniques, such as evidence-based medicine, statistics and leadership, were included if the stated aim was to improve quality. Courses about improving a specific condition or pathway were included if they incorporated material about improvement techniques that could also be widely applied to other topics.

Ten electronic databases were searched for research published between 1980 and November 2011 and 367 studies were summarised. Sixty higher educational institutions and other organisations in the UK and internationally were contacted for course curricula. Unless otherwise specified, the trends reported are evident throughout the Western world.

## Types of training

Training in quality improvement is available for medical, nursing and paraprofessional students in many parts of the world. Continuing professional development (CPD) courses are also available, including short workshops, on-the-job training and training related to specific projects.

The training approaches most commonly researched include:

- university courses about formal quality improvement approaches
- teaching quality improvement as one component of other modules or interspersed throughout a curriculum
- using practical projects to develop skills
- online modules, distance learning and printed resources
- professional development workshops
- simulations and role play
- collaboratives and on-the-job training.

## Training content

In much of the Western world, quality improvement modules for medical and nursing students tend to focus on techniques such as audit and plan, do, study, act (PDSA) cycles. Most courses run by academic institutions tend to be unidisciplinary and classroom based or undertaken during clinical placements. However, there is an increasing acknowledgement of the value of multidisciplinary training, especially in practical work-based projects. Many courses now contain a practical component. Simulation is also becoming popular as a training approach.

Continuing professional development training about quality improvement appears to be growing at a faster rate than university education. Ongoing education includes workshops, online courses, collaboratives and ad hoc training set up to support specific improvement projects. There is a growing trend for training which supports participants to put what they have learned into practice or to learn key skills 'on the job'.

There are some geographic variations in the content of formal courses and CPD programmes. In the US and to a lesser extent Canada, quality improvement is conceived largely as a 'total quality management' paradigm and training focuses on collating predominantly quantitative information. In the UK, a patient safety and change management approach is more common. To some extent the US approach is more standardised and rigid and the UK approach is more open and less consistently applied.

Courses in the US tend to focus on 'named' approaches such as PDSA cycles. Practical projects are increasingly common. In Canada and Australasia, training about quality improvement also emphasises putting theoretical concepts into practice using work-based projects. In the Netherlands and Scandinavia there has been more focus on mentorship and peer review, whereas in the UK training tends to concentrate on specific components of quality improvement, such as leadership and safety. In recent years, UK courses have started to recognise the importance of population health and risk assessment, but relatively few programmes emphasise the needs and perspectives of service users in any real depth.

In the US, training in quality improvement is mandatory for medical students. In contrast, in the UK, until recently there was less focus on training students in quality improvement and little integration of quality improvement concepts into pre-qualification courses. This is beginning to change, with more time now spent on concepts such as evidence-based medicine, audit and improving safety.

In England, arms length bodies, workforce deaneries and strategic health authorities run quality improvement courses for health professionals. Activity in this area has increased in recent years. There is no consistent content or definition of quality improvement, but there tends to be a common approach which involves using practical, rather than simply didactic, methods.

# Training effectiveness

## Impact of training

A great deal has been written about training professionals to improve quality in healthcare. In fact, more than 5,000 articles were identified about this topic. However, the majority merely describe training approaches and content, rather than examining the impacts of training or the most useful content and training methods.

There is some evidence that training students and health professionals in quality improvement may improve knowledge, skills and attitudes. Care processes may also be improved in some instances. However, the impact on patient health outcomes, resource use and the overall quality of care remains uncertain.

Most evaluations of training focus on perceived changes in knowledge rather than delving deeper into the longer-term outcomes for professionals and patients. Programmes which incorporate practical exercises and work-based activities are increasing in popularity, and evaluations of these approaches are more likely to find positive changes in care processes and patient outcomes.

There is not a body of evidence assessing whether training professionals is any more or less effective for improving the quality of healthcare than other initiatives.

## Effectiveness of different methods

Few studies have directly compared different training methods. This means that there is insufficient evidence to conclude whether classroom formats, practical projects, online modules or other methods are more or less effective. However, active learning strategies, where participants put quality improvement into practice, are thought to be more effective than didactic classroom styles alone.

It appears important to include quality improvement methods in both pre-qualification training and CPD. It is also important to upskill trainers so that they can teach quality improvement methods robustly.

In recent years, the concept of quality improvement has become more widely accepted in the UK and training is increasingly available, especially for qualified professionals. However, a great deal remains uncertain about training in quality improvement, including: the most appropriate content; how training can best be delivered to improve processes and patient outcomes; how to measure and ensure quality within training.

This is an essential area for further exploration. Training professionals may be important not only to ensure that they have the skills needed to improve the quality of healthcare, but also to enhance their motivation to do so.

# 1. Scope

For hundreds of years, clinicians have sought to make healthcare more effective and accessible. Recently, health professionals have begun to learn about formal methods to improve quality. This evidence scan summarises research about the types of training available and its impacts.

## 1.1 Purpose

> *'Not all changes are improvements but all improvement involves change. Changing the systems that deliver care has thus become the cornerstone of the movement that is now referred to as medical quality improvement.'*[1]

The focus on improving the quality of healthcare is not new. In 1517 the founding charter of the Royal College of Physicians emphasised the need for members to set and maintain standards of practice 'for their own honour and the public benefit'.[2] However, over the past 20 years improving the quality and safety of healthcare has taken on new importance in the UK.

Health services are now facing significant challenges. There are constant medical and technological advances to keep pace with, the population is growing in size, people are living longer but often in poor health and the demand for healthcare outstrips the staffing and financial resources available.[3,4]

The focus on patient-centred care, holistic practice and providing value for money means that there is a greater need to ensure that health professionals, allied teams and managers have the knowledge and skills to improve and develop healthcare services.

A wide range of techniques have been used to improve healthcare including improvement cycles, clinical audit, guidelines, evidence-based medicine, healthcare report cards, patient-held records, targets, national service frameworks, the Quality and Outcomes Framework, performance management approaches, continuous quality improvement, financial incentives, leadership, choice and competition. All of these initiatives require health professionals and managers to learn and apply new skills. The Health Foundation believes that training can be an effective lever for improving the quality of healthcare. Yet education and training initiatives are not always prioritised by policy makers or practitioners.[5,6]

> *'While healthcare organisations are initiating a number of strategies to improve care and respond to changing regulatory and policy requirements, many clinicians practicing in them have not received training on quality and safety as a part of their formal education.'*[7]

Research suggests that a lack of knowledge and skills among clinicians and managers is a significant barrier to improving quality in healthcare.[8–10] For example, an evaluation of improvement projects in England found that managers and practitioners often lacked basic skills and knowledge in how to assess evidence, plan improvements, manage projects and analyse data.[11]

Training health professionals in quality improvement has the potential to impact positively on attitudes, knowledge and behaviours.[12] In fact, some suggest that training professionals may be just as effective as financial incentives for improving the quality of healthcare.[13]

Yet little is known about the most effective ways to train health professionals in quality improvement.

This evidence scan explores the following questions:

- What types of training about formal quality improvement techniques are available for health professionals?
- What evidence is there about the most effective methods for training clinicians in quality improvement?

This section briefly describes the scope and methods of the scan. Section 2 outlines some of the content and teaching methods used in quality improvement training. Section 3 explores the effectiveness of various types of training.

## 1.2 Defining quality improvement

Quality improvement is not solely about 'making things better' by doing the same things and 'trying harder'. Instead, quality improvement requires a different approach to traditional 'fact-based' learning and needs a new set of knowledge and skills to put this approach into practice. For the purposes of this scan, training in quality improvement was defined as any activity that explicitly aimed to teach health professionals about methods or skills that could be used to improve quality.

Table 1 lists the domains of quality improvement that the Health Foundation is interested in. The scan focused on training to support health professionals to develop knowledge and skills in these key areas.

Quality improvement was not defined solely as 'continuous quality improvement', 'total quality management' or other named models, but rather as a way of approaching change in healthcare that focuses on self-reflection, assessing needs and gaps, and considering how to improve in a multifaceted manner. In this definition, training about quality improvement aims to create an ethos of continuous reflection and a commitment to ongoing improvement. It aims to provide practitioners and managers with the skills and knowledge needed to assess the performance of healthcare and individual and population needs, to understand the gaps between current activities and best practice and to have the tools and confidence to develop activities to reduce these gaps.

Thus, the scan did not focus only on narrowly defined quality improvement models such as 'plan, do, study, act' (PDSA) cycles, Six Sigma, LEAN and so on – although it included courses that defined quality improvement in this way too.

Courses about techniques such as evidence-based medicine, statistics and leadership were only included if the stated aim was to improve quality. Courses about improving a specific condition or pathway were included if they incorporated material about improvement techniques that could also be widely applied to other topics.

### Terminology

The focus was on accredited education and ongoing training through courses and workshops rather than resources such as books, mentoring, fellowships or other learning methods.

The term 'education' is often used to describe formal courses run by higher educational institutions whereas the term 'training' is broader and encompasses CPD and short courses run by a variety of providers. For simplicity, the scan uses the general term 'training' to apply to both formally accredited education and other CPD.

Unless otherwise specified, the trends reported are generalised to reflect what is happening throughout the Western world.

**Table 1: Potential components of quality improvement**[14]

| Components | Examples of topic areas |
|---|---|
| The wider context | How the health system is structured and how it works<br>Historical, social and political context within which health systems develop and operate<br>Health policy<br>Accountability<br>Professionalism |
| Human behaviour | Psychology of change<br>Learning styles<br>Leadership<br>Teamwork and collaboration<br>Management<br>Multidisciplinary working<br>Reflection and learning from mistakes |
| Needs and preferences of people who use health services | Seeing healthcare from the user's perspective<br>Identifying and targeting the needs and preferences of different subgroups of users<br>Acquiring tools to assess and respond to users |
| Healthcare as a process | Systems thinking<br>Complexity theory and interdependencies<br>Spread<br>Sustainability<br>Planning and predicting<br>Understanding risk and risk management |
| The nature of knowledge | Different forms of evidence<br>The philosophy of science<br>Variation<br>Measurement<br>Local versus generalisable knowledge<br>Small versus large scale change<br>Collecting, analysing and interpreting data<br>Reporting and displaying information<br>Process mapping |

## 1.3 Identifying evidence

The review summarises the findings of 367 articles.

To collate evidence for the scan, 10 bibliographic databases were searched: Medline, Embase, ERIC, Science Citation Index, Cochrane Database of Systematic Reviews, NHS Evidence, PsychLit, Web of Science, Google Scholar and the Health Management Information Consortium.

The focus was on readily available literature published between 1980 and November 2011. Articles from any country and in any language were eligible for inclusion. Articles about training in quality improvement outside healthcare were not included.

The search terms included combinations of the following words and other similes: education, training, curriculum, course, competencies, teaching, learning, quality improvement, improving quality, improvement science, science of improvement, quality, continuous quality improvement and PDSA. In addition, the quality improvement domains listed in Table 1 were used. Articles about training in planning, systems thinking, the philosophy of science, needs assessment, health policy, learning styles, leadership, risk management and self-reflection were identified in order to assess whether these courses also included other components of quality improvement training.

Furthermore, the scan identified examples of training by searching the websites and course outlines of organisations such as the General Medical Council and all royal colleges, the Association of American Medical Colleges, the Institute for Healthcare Improvement (IHI), the NHS Institute for Innovation and Improvement, the Improvement Foundation and academic institutions. Sixty organisations were contacted for information about their quality improvement curricula.

More than 5,000 pieces of descriptive and empirical evidence were analysed to draw out key themes about the types of training available and the most effective training methods. Of these, 367 of the most relevant and high-quality studies were summarised as examples alongside descriptive and narrative articles to provide context. The chosen articles were selected based on relevance to addressing the topics of interest, methodological quality, novelty of content and accessibility.

The scan does not purport to summarise all available studies about training in quality improvement, but rather seeks to provide a flavour of the available research and an overview of key trends and changes.

Unless geographic trends are specifically noted, the information reported reflects what is happening throughout the Western world in generalised terms.

# 2. Examples of training

This section describes some of the content covered in courses about quality improvement and the variety of training methods used.

## 2.1 Content covered

Quality improvement has been defined in a number of ways in training courses. This section outlines some of the broad content covered in training courses. The aim is not to draw conclusions about how quality improvement **should** be defined, but rather to illustrate the scope of such courses in general terms.

### PDSA cycles and total quality management

One of the most common approaches, especially in formal accredited education, defines quality improvement as a set of principles and methods originally developed in the commercial sector and known as total quality management, continuous quality improvement or PDSA cycles.[15] Other descriptors include the IHI Improvement Model, CANDO, Six Sigma and LEAN.[16,17]

Although these approaches have some differences, they are similar in that they suggest that unintended variation in processes can lead to undesirable outcomes and that continuous small scale tests of change can be used for improvement.[18]

A systematic review of 41 quality improvement and patient safety curricula for medical students and residents throughout the world found that the most common content included continuous quality improvement, root cause analysis and systems thinking.[19]

In the US, quality improvement training is now formally mandated for medical students and this is defined largely in terms of PDSA methods. This approach is supported by the Association of American Medical Colleges,[20] the Council on Graduate Medical Education,[21] the Pew Health Professions Commission[22] and the Institute of Medicine.[23,24] This conceptualisation of quality improvement has also been implemented widely throughout the world.[25]

Adaptations of these continuous improvement models have been used in the UK in both formal accredited training and in CPD.[26]

### Core competencies

Another approach is to see quality improvement as one of a set of core competencies that are essential for health professionals.[27–33]

For instance, in the US, two out of the six Accreditation Council for Graduate Medical Education core competencies, that all residents (registrars) must achieve, relate to quality improvement. The competencies are 'practice based learning and improvement' and 'systems based practice.'[34–36]

The Quality and Safety Education for Nurses (QSEN) initiative also identifies six competencies essential for nursing practice: patient centred care, teamwork and collaboration, evidence based practice, quality improvement, safety and informatics.[37–39]

Another example of this competency-based definition is the Institute for Healthcare Improvement's eight domains of quality improvement knowledge (see Box 1).

A number of educational institutions use similar types of competencies to guide teaching about quality improvement.[40–49]

These competency-based approaches are not mutually exclusive from definitions which focus on PDSA improvement cycles and the two are often used in tandem.

**Box 1: IHI's eight domains of quality improvement knowledge[50]**

**Customer/beneficiary knowledge:** Identifying people or groups using healthcare and assessing their needs and preferences.

**Healthcare as process/system:** Acknowledging the interdependence of service users, procedures, activities and technologies that come together to meet the needs of individuals and communities.

**Variation and measurement:** Using measurement to understand variation in performance in order to improve the design of healthcare.

**Leading and making change in healthcare:** Methods and skills for making change in complex organisations, including the strategic management of people and their work.

**Collaboration:** Knowledge and skills needed to work effectively in groups and understand the perspectives and responsibilities of others.

**Developing new, locally useful knowledge:** Recognising and being able to develop new knowledge, including through empirical testing.

**Social context and accountability:** Understanding the social context of healthcare, including financing.

**Professional subject matter:** Having relevant professional knowledge and an ability to apply and connect the other seven domains. This includes core competencies published by professional boards and accrediting organisations.

## Standards

It was only relatively recently that quality improvement techniques began to be implemented formally in healthcare and training has reflected this growing interest.[51] This has been accompanied by the standardisation and institutionalisation of quality improvement via standards and guidelines.

For instance, the International Standardisation Organisation (ISO) 9000 is a worldwide standard for the implementation of quality management systems. The ISO 9000 standards require organisations to develop, implement, improve and sustain quality improvement processes. While less common than continuous quality improvement cycles or competency-based approaches, some educators have used ISO 9000 standards to help develop educational strategies for quality improvement.[52] This is more common in Europe than in North America.[53]

Other standards have also been used as a basis for training. For instance, evidence-based guidelines have been considered an 'ideal' for quality improvement, with training put in place to work towards certain levels of care. Royal colleges have set standards that include quality improvement and audit.[54,55]

## Safety

A great deal has been written about methods to improve patient safety and courses have been developed explicitly with this in mind.[56] This scan did not focus explicitly upon safety initiatives, but a number of quality improvement curricula or efforts to improve quality in healthcare use safety as a primary focus.[57]

Some training postulates that most adverse events in healthcare are the result of the cumulative effects of human errors and failures in organisational and administrative processes so steps should be taken to reduce variation.[58] This is similar to the approach in formal quality improvement cycles.

## Other approaches

Outside the US, slightly broader models of quality improvement are taught.[59] However, there is no standard approach to, or definition of, quality improvement.

Whereas PDSA cycles often emphasise quality improvement at the level of service delivery, broader models define quality improvement at a range of intervention levels (see Table 2).

**Table 2: Levels of quality intervention**[60]

| Level | Example |
|---|---|
| Level 1: Micro-interventions to change individual behaviour | New education programme for nurses or financing initiatives |
| Level 2: Micro-system interventions | Shared record system to improve team communication |
| Level 3: Organisational interventions | Programme to train all departments in quality improvement methods |
| Level 4: Healthcare system interventions | Information system linking all health and social care groups |
| Level 5: Public health systems or community wide interventions | Identifying population needs through multi-agency meetings |

In this view, there are specific components of quality improvement initiatives that distinguish them from audit and feedback or other similar methods. First, quality improvement implies a review of practices at the organisational level and a collective effort to change, rather than focusing on the individual. Second, once the problem has been identified, quality improvement initiatives tailor a solution to the problem and focus on addressing root causes. Third, quality improvement often involves training as one of the solutions.[61]

A description of the underlying tenets of different quality improvement models and associated training is outside the scope of this scan. However it is important to note that most training approaches target individual practitioners or managers as the 'change agent,' seeking to improve knowledge, attitudes, skills and behaviours through educating individuals in change management or quality improvement methods. Some approaches target teams, but most do not take a wider systems approach to quality improvement training. Though the training itself may consider the importance of systems thinking and needs assessment, these strategies are rarely applied within training courses.

In the UK a number of courses focus on leadership and examining the social and historical context of health systems. Other approaches use complexity theory and similar paradigms.[62] Thus, in the UK a broader conceptualisation of quality improvement is perhaps more common than in the US.

## 2.2 Training students and registrars

This section provides examples of accredited education in quality improvement for health professionals in training.

### Classroom teaching

A systematic review of 26 studies found that relatively little emphasis is given to leadership, management and quality improvement in medical curricula,[63] but a number of studies have described the types of formal training available.

Accredited education most commonly uses classroom or lecture style teaching alongside printed education materials.[64,65] This is increasingly coupled with practical projects.[66,67]

Formal courses are available for medical students and to a lesser extent nurses, pharmacists and others. These tend to focus on PDSA-style approaches, be more common in US settings and be uniprofessional.[68,69] Some courses cover the broad concept of quality improvement, whereas others focus on particular components such as population health or evidence-based practice.[70–72] Numerous examples are available (see Box 2).

Most of the published articles about accredited education are descriptive. For example, one university in the US developed a two-year curriculum about systems thinking and human factors analysis, root cause analysis, process mapping and other quality improvement techniques. Learning was applied in practical tasks and projects. The curriculum shifted residents' thinking towards a systems-based approach, improved self-reported quality improvement skills and was associated with changes in practice following root cause analysis.[73]

**Box 2: Examples of formal education about quality improvement**

**Newcastle University** in England offers a Masters, Postgraduate Diploma and Postgraduate Certificate in health sciences. Modules include health statistics, fundamentals of research, project management, health economics, healthcare quality, applied epidemiology and others.

**The University of Birmingham** in England runs a Masters programme in healthcare management. Modules include health services management, healthcare policy, organisational development, public and user involvement, partnership working, procurement and contracting, quality and service improvement, strategic commissioning and using quality and service improvement tools.[74]

**The University of Sheffield** in England offers postgraduate courses in public health. Modules include research methods, health needs assessment and economic evaluation, statistics, systematic reviews and critical appraisal techniques, evidence-based healthcare, economic analysis and health technology assessments. Some modules can be taken as standalone courses.[75]

**The University of Dundee** in Scotland offers a six-week course at undergraduate level focused on quality improvement and safety. Medical students reflect on improvement and safety skills as part of their annual portfolios.[76]

**Betanien College of Nursing** in Norway offers undergraduate courses in quality improvement. Nursing students follow a patient's experiences during their clinical placement and then take part in a two-day seminar about quality improvement methods. Students produce flow charts to identify areas of improvement and cause-and-effect diagrams.[77]

At **Dartmouth Medical School** in the US, quality improvement concepts have been interspersed throughout medical training. Quality improvement skills form a background for students' learning, rather than a separate course. In the first two years, students receive an orientation lecture about process analysis and variation in healthcare. Small group problem-based learning sessions cover topics such as clinical processes, medical error and systems improvement. During clinical placements in the third year, each student picks a clinical problem to study and gathers evidence about the problem. In the fourth year, students take part in workshops and are given a real quality improvement problem to study in groups.[78]

Training in quality improvement occurs in many departments at the **University of Michigan Medical School** in the US, ranging from informal discussions to more formal lectures or conferences. Quality improvement concepts are introduced to medical students formally during the second and third years. Students are also taught through role modelling by faculty and residents during clinical rotations.[79]

For medical students in the final two years of their residency, **McGill University** in Canada offers 20 hours of classroom instruction divided into four-hour blocks over a five-month period. Topics include leading and motivating change, risk management, quality improvement and balanced scorecards.[80]

Another US organisation used the metaphors 'the mirror' and 'the village' to implement quality improvement training which was divided into the core competencies of practice-based learning and improvement and systems-based practice. Practice-based learning was likened to residents' holding up a mirror to document, assess and improve their practice. Tools such as morning reports, self-audits and learning portfolios became the mirrors. Systems-based practice was introduced through multidisciplinary patient rounds, nursing evaluations and quality assessment exercises using the metaphor 'it takes a village to raise a child'.

Elsewhere in the US, engineers and doctors partnered to provide a three-week elective course about quality improvement in healthcare. The engineering staff taught medical students about stakeholder analysis, root cause analysis, process mapping, failure mode and effects analysis, resource management, negotiation and leadership.[81]

Examples for nurses and pharmacists are also available. For instance, a nursing course in the US used a 'spiral' approach to teach seven activities of increasing complexity that built on previously acquired skills. Working in teams, nursing students learned how to develop an improvement question, search for literature, synthesise current knowledge, identify the significance of the issue using models, examine existing data and compare those data to national benchmarks, investigate a healthcare issue using quality improvement methods, and draft a proposal for a continuous quality improvement initiative.[82]

Also in the US, a five-module programme was designed to educate pharmacists and pharmacy students about quality improvement.[83]

An example of multidisciplinary learning comes from New Zealand where one university provided quality improvement modules during undergraduate education for medicine, nursing and pharmacy students. The content included patient safety, equity, access, effectiveness, cultural sensitivity, efficacy and patient centredness.[84] One two-day module focused on patient safety and was a requirement for all third year students. The module examined weaknesses and root causes in healthcare systems that may lead to errors. Students learned how to make and interpret flow charts and cause-and-effect diagrams, develop causal statements and measure the impact of change.[85] The second module focused on healthcare for ethnic minorities. Small groups worked on case scenarios and presented their findings and recommendations to panels comprising heads of participating schools, cultural advisors and health professionals.[86] An unusual component of this approach was combining students from medicine, nursing and pharmacy to encourage teamwork. The courses were also taught and assessed by a multiprofessional team. Evaluations found that the courses were well received but the impact on behaviour and practice has not been assessed.

Descriptive studies about tools and workbooks used within formal courses are available, such as worksheets to support root cause analysis or team assessment and competency tools.[87–90]

Novel methods have been used to assess learning too. For example, in the US, students used skits, filmed performances, plays and documentaries to demonstrate competency in key skills.[91] Simulated patients and actors have been used in courses to assess improvement skills.[92,93] Portfolios have also been used to good effect.[94,95]

In addition to published research about classroom teaching, we reviewed 60 publicly available course curricula from the UK and abroad to gain a more in-depth understanding of the type of content included. We identified courses in Australia, Africa, Belgium, Canada, China, France, Germany, Japan, the Netherlands, New Zealand, Norway, Sweden, the Americas and the UK and Ireland, among others. This analysis found that most information available about accredited courses relates to medical students at pre-registration or junior doctor level. There are fewer examples of nursing curricula about quality improvement, although the literature suggests that quality improvement principles, such as reflective practice and critical appraisal, may be more likely to be interwoven throughout a nurse's educational career rather than taught in a specific course.[96]

There were few examples of formal courses about quality improvement methods for social workers or allied health professionals in the UK.

Selected multidisciplinary training and courses for managers are available at postgraduate level and as part of CPD.

Most of the courses identified described continuous quality improvement cycles and data collection, measurement and audit. Some courses included structured planning approaches and others focused on leadership. There was far less focus on needs assessment and understanding the views and context of service users.

Many of the courses were uniprofessional, although some offered opportunities for multiprofessional learning.

Most required some practical component, such as taking part in a work-based improvement project.

## Distance learning

Distance learning, such as online modules, dvds, videos and other non-face-to-face education methods, have been tested to supplement or substitute for classroom methods.[97–100]

For instance, a US study examined the impact of offering an online Masters in Public Health, including content related to quality assessment and improvement. A survey of 49 students one year after completing the course found that most thought it was useful and said that they had applied the techniques in their work.[101] The limitation with follow-up surveys of this nature is that they provide little understanding of what value the online method added to the learner's role or how they used what they learned to improve health services.

In Australia, a university used distance learning for postgraduate courses in quality improvement, including graduate certificates, graduate diplomas and Masters degrees. Students used online and postal methods to receive study materials. The courses were popular among quality coordinators and healthcare managers.

In Ireland, videoconferences were used to deliver a course for radiology residents in practice-based learning and evidence-based practice. The course included 16 weekly hour-long sessions for 21 second year residents at eight radiology centres. At each site a staff radiologist who had completed an intensive one-day course acted as a coordinator. Participants were satisfied with the course content and thought that videoconferencing worked well as an interactive teaching method. In total, 71% of residents reported that they would have been unable to participate in the course without videoconferencing.[102]

## Practical projects

Experiential learning involves experiencing, observing, conceptualising and retrying activities.[103,104] This differs from theory-based learning because it is case based rather than concept based and requires hands-on practice and reflection.[105]

There is an increasing focus on experiential learning in accredited quality improvement education.[106] This often takes the form of practical improvement projects or opportunities for students to apply their learning in day-to-day clinical practice.[107–109] For instance, some training programmes place students into multiprofessional improvement teams[110–112] or hospital quality improvement committees,[113] assign students to make improvements in community settings or rural areas,[114–117] or ask students to undertake improvement projects with or without formal training.[118–121]

Research suggests that the most promising form of experiential learning for quality improvement combines classroom learning with practical projects.[122–124] Many educational programmes for medical students, junior doctors and nurses in the US involve implementing quality improvement projects.[125–127] In fact, from 2002, the Accreditation Council for Graduate Medical Education introduced a new requirement that residents must demonstrate competency in 'practice based learning and improvement,' which requires hands-on improvement experience.[128]

For example, one study of 44 US registrars found that two sessions of instruction coupled with implementation of a quality improvement project over a month-long period helped to improve registrars' knowledge and skills. Pre and post tests were used to measure registrars' knowledge and confidence before and after implementing a project.[129] However, the researchers found that

one month was not long enough for the students to fully develop and implement their projects. A much longer period would be needed if educators wanted to assess the impacts on systems or service users.

Similarly, a US study found that a six-week course, whereby a university partnered with local health services to combine classroom teaching with practical projects, improved pre-registration medical students' knowledge and confidence, but there was a need for more detailed teaching of quality improvement principles and role modelling of quality improvement behaviours by faculty.[130]

Elsewhere in the US, a curriculum was developed for first and second year medical students that included classroom teaching about systems theory and quality improvement. Students conducted a project at clinical sites to develop a patient care improvement plan. The plan was presented to a panel of experts for assessment but the implementation of any recommended changes was left to the clinical providers.[131]

In another study, second year medical students undertaking a family medicine clerkship in the US learned about quality improvement principles during six short sessions and then undertook chart review to make improvement recommendations. The students were positive about the experience but wanted more time to discuss and implement changes.[132]

Practical training projects occur in primary care as well as in hospital. In the US, seven primary care practices incorporated quality improvement into training for junior doctors as part of day-to-day practical work. An evaluation found that practices that did this most successfully were likely to be larger, have previous experience with quality improvement projects, have staff with extensive experience in quality improvement and have an office manager or medical director who advocated the process.[133]

Another example involved 77 second year medical students working in groups of two to four who conducted continuous quality improvement projects about diabetes at 24 primary care practices. Students collected baseline data, implemented an intervention based on the results, and reassessed quality indicators six months later. The programme was associated with improved skills and knowledge for students and enhanced clinical outcomes for people with diabetes.[134]

Others in the US developed an asthma project for third and fourth year medical students in primary care clerkships. Each student wrote a case report about a person with asthma who they were caring for, with a particular focus on the cost of care, A&E visits, hospitalisations and the quality of care compared with clinical guidelines. Students were taught quality improvement methods to help them to analyse the care process and outcomes so that they could make improvement recommendations. Service improvements were made in many cases and students felt that the course enhanced their skills and confidence.[135]

Most US quality improvement training projects with medical students and registrars have similar characteristics. They tend to take place during ambulatory care assignments or electives and combine didactic instruction with participation in quality improvement activities.[136] Most are integrated into a short rotation, although some hold weekly or biweekly meetings for a year.[137–143] For example, one organisation implemented structured PDSA teaching modules and practical projects for surgical residents over a year-long period. Residents' self-reported knowledge and skills improved and residents were eager to apply their learning to make service improvements.[144]

Most published information about education of this type focuses on doctors, but there have been similar successes with nurses. For instance, a year-long US course encouraged nursing students in their senior year to work in small groups with community nurse mentors to assess the healthcare needs of a population, identify potential changes and develop an intervention. Students then implemented and evaluated their interventions and presented their outcomes and suggestions for improvement. The programme improved nurses' confidence and skills in quality improvement and had tangible impacts on the communities with which they worked. Good relationships with community providers were a key success factor.[145]

In Norway, second year nursing students followed a patient during a day's work, recording processes of care from the patient's perspective.[146] They collected data about waiting times, patient characteristics, people in contact with the patient and care offered. They then identified aspects of practice that could be improved. Students attended a two-day course about quality improvement methods and produced flow charts, cause-and-effect diagrams and quality goals based on their observations. Nursing students said that they had improved skills compared to before the course and felt that this type of training should be included throughout the nursing curricula.[147]

Another nursing curriculum integrated didactic instruction and quality improvement activities into an existing four-year programme.[148]

In the US a dedicated education unit was set up at one hospital to teach nurses about quality and safety competencies through a 10-week experiential learning programme. This practical approach improved competencies.[149]

An example of multidisciplinary learning also comes from the US. The IHI partnered with a federal agency to develop a training programme to support quality improvement in community services. The training was available to pre-registration and specialist medical students, nurses and public health students. Teams of faculty and students met every fortnight. Students were taught continuous quality improvement through classroom learning, coaching by faculty members in team meetings and hands-on project experience. This learning style was associated with self-reported improvements in competency and enhanced community services.[150]

A number of resources such as workbooks and toolkits have been developed to help get the most out of practical projects.[151] One US medical school combined the Institute of Medicine's aims for improvement and the Accreditation Council for Graduate Medical Education's core competencies into a tool called the 'healthcare matrix'.[152] The core competencies helped junior doctors identify why care was not safe, timely, effective, efficient, equitable or patient centred. Residents used the matrix to analyse the care of an individual patient and the care of groups of patients, such as those with heart disease. The healthcare matrix was formatted to help identify what was learned and what needed to be improved. Residents were then taught quality improvement approaches to help address the issues raised.[153]

A key learning point from these studies is that ensuring that participants have practical experience in improving quality is becoming common in formal education courses[154,155] – but practice-based learning alone is not enough. Training programmes appear more successful when classroom teaching and practical implementation are combined and when students have a long enough period of time to learn both theory and application.

For example, first and second year medical students at one US university took part in a course that combined didactic learning and small group work to improve an aspect of care at a community practice.[156] The educators identified four factors that contribute to successful quality improvement training:

- teaching about improvement concepts and tools
- the availability of baseline data
- cohesive team characteristics and a sense of ownership in the process
- access to the information and resources needed to carry out an improvement, such as literature, databases and funds.

Other studies support these factors as being important for successful practical learning.[157]

## Ongoing training

A number of studies have examined CPD or training in quality improvement of already qualified health professionals. These are courses that managers or health professionals might take after their main accredited education is completed. Some courses span the bounds of both accredited education and CPD. For instance, postgraduate university modules may be taken alone as CPD, but may also be part of a Masters degree or diploma programme. This section concentrates on shorter, informal courses and training offered by organisations other than higher educational institutions.

Continuing professional development for quality improvement can be divided into three main areas: structured group training sessions, more informal group training and practical initiatives, and individualised training. Many studies combine some of these approaches.

Box 3 provides some examples.

**Box 3: Examples of continuing professional development**

In the UK the **Open University School of Health and Social Welfare** offers a number of courses that focus on components of quality improvement. Key concepts from the courses include defining SMART goals, research methods and how to implement standards.[163]

The **NHS Institute for Innovation and Improvement** offers the Organising for Quality and Value: Delivering Improvement programme, spanning five days over a three-to-four month-period. Topics include leading improvement, project management, sustainability, engaging, involving and understanding others' perspectives, process mapping, the role of creativity in improvement, measurement for improvement and demand and capacity management. Participants are required to undertake a service improvement project.[164]

**Brighton Healthcare** in England developed a one-day course around the quality improvement cycle. Sessions include why quality matters, organising for quality, identifying and prioritising quality problems, defining and analysing quality problems, quality measurement and data presentation and solutions to quality problems. Practical tools are introduced in group exercises.

In England the **Institute of Healthcare Management** offers modules through accredited NHS trusts and other centres. The training includes online resources, classroom teaching and practical assignments. Each programme typically lasts six weeks.[165]

In the US, the **Institute for Healthcare Improvement** offers a range of online modules and 'webinars' followed by assignments. Topics include the improvement model, reducing waiting times for appointments and improving office efficiency in primary care, improving systems for high hazard medications, applying reliability science to health, SBAR and other tools for improving communication between caregivers, building skills in data collection, using run and control charts to understand variation and engaging hospital boards in quality and safety.[166]

The US **Veterans Health Administration** offers a one-day session covering quality improvement and development of a practical project.

The **Robert Wood Johnson Foundation** in the US offers courses designed to increase learners' competence in quality, safety and systems improvement. Four modules are taught which include the structure of healthcare and how it affects care delivered, who pays for care and why it matters, improving the care of individuals, populations and practices and improving the practice and health system. Participants put together a quality improvement plan and selected improvement initiatives are implemented in groups.

The **Columbus and Franklin County Health Departments** in the US ran a two-year CPD course for improving performance at the local level. The programme consisted of four modules for its entire workforce. The modules included public health in transition, visionary leadership and employee empowerment, systems thinking and partnerships.

## Seminars and workshops

Health professionals suggest that CPD is essential for ensuring that they maintain and learn new skills and competencies.[158]

> *'Clinical professionals themselves report a lack of expertise and skills as crucial and emphasise continuing medical education (CME), professional development, self instructional learning, learning from problems, and learning together with colleagues as methods for improving performance.'*[159]

A common method for training qualified professionals in quality improvement involves classroom or workshop style teaching, either at participants' places of work or at other venues. Numerous examples have been studied.[160,161]

A number of organisations run such sessions. For example, the Practice-based Commissioning Academy in England was targeted towards general practitioners (GPs) and primary care trust (PCT) managers interested in increasing their commissioning and analysis skills. The Academy was run jointly by the NHS Alliance and private industry and offered 11 half-day modules that professionals could combine or participate in as standalone training. Modules covered needs assessment, analysing data, leading and managing change, business planning, improving patient experience, financial modelling and ethics.[162]

Another example of offsite classroom type approaches is a course set up to train hospital nurses about quality improvement methods for safety in Canada. A trial found that nurses who underwent seminar-based training had improved self-reported skills.[167]

As well as inviting health professionals to offsite training, there are examples of visiting practices or hospitals to provide onsite training and mentorship or developing in-house training. There are sometimes difficulties providing 'in service' training due to attendance problems, perceived relevance and deciding on an appropriate level of education, however in-house training is usually popular.[168] For instance, in England a partnership between a hospital trust and a university ran a series of seven three-hour sessions focused on developing critical appraisal skills. Each session included a seminar discussion and group work to allow staff an opportunity 'to have a go' at critical appraisal using simple clinical scenarios. Participants included nurses, doctors, occupational therapists, dieticians, physiotherapists, technicians and managers. The timing and length of sessions were carefully considered to allow the maximum number of people to attend. Short, regularly repeated sessions were used and the location of modules was varied across the trust to give staff more opportunity to attend. The team found that these in-house sessions were well received and attended, but suggested that it would be more appropriate to design seminars that helped teams make a real change in their clinical environment.

This hospital also found some barriers to participation.

> *'Whilst staff express an interest in attending courses, if they are provided free of charge and not certificated, enthusiasm can wane and people fail to attend at the last minute, particularly when there are competing pressures… There is no quick fix for this and those providing education have to decide whether to use a carrot or stick approach; the carrot being, say education points, or a stick where some imposition is placed for those booking a place but not attending.'*[169]

Seminars to improve quality improvement skills and knowledge have been implemented across a wide range of disciplines including medicine, mental health, nursing, social work and allied professions.[170–173]

Training has been set up for managers and policy developers too. In total, 107 senior managers from 20 Serbian general hospitals took part in an improvement course. Organisational skills, motivating and guiding others, supervising the work of others, group discussion and situation analysis skills all improved. The least improved skills were applying creative techniques, working well with peers, professional self-development, written communication and operational planning.[174]

In the US, all health department and public health staff in one county were invited to attend four half-day small group workshops over a two-year period. The sessions covered improvement methods, leadership and systems thinking. In total, 600 people took part. Participants said that the training helped to reduce hierarchical barriers, support bottom-up decision making and involve more non-management staff in planning and policy advisory committee roles.[175]

Some suggest that it is important to train various levels and types of staff simultaneously in quality improvement approaches. One group of five US hospitals and a multispecialty health practice trained leaders and frontline staff. One two-day course known as 'leadership for healthcare improvement' was offered to senior managers and a four-month programme entitled 'practical methods for healthcare improvement' was offered to frontline staff and middle managers. More than 600 staff completed the programme over a two-year period. There were improvements in knowledge and confidence about quality improvement principles. Participants also initiated quality improvement projects, many of which were sustained up to one year after the training.[176]

Sometimes workshops or courses are run alongside other training approaches, especially when the aim is to improve a specific care process or pathway. For instance, in Australia, one hospital tested a ward-based training programme for quality improvement in nursing documentation. The programme consisted of two one-hour writing workshops followed by one-to-one coaching of nurses.[177]

There are many hundreds of articles describing seminars or courses that aim to provide a quick overview of quality improvement methods as part of CPD or as a component of a specific quality improvement initiative. What most of these articles have in common is that they outline the potential merits of courses and participant satisfaction or knowledge, but there is little focus on whether the training resulted in a real change in behaviours among professionals. There are also studies of particular methodologies, such as teaching crew resource management approaches to upskill professionals in team work, communication and critical thinking skills,[178–180] but most of these studies are not comparative so it is not possible to say whether one type of content or training approach is more effective than another.

## Simulation

Simulation techniques such as role play, using case studies, mock equipment, standardised patients and 'high fidelity' simulations which involve a full practice of the situation or environment have been used to support healthcare improvements, particularly regarding safety and teamwork.[181,182] In the US, simulation has been used extensively within formal nursing curricula and ongoing professional development about quality improvement.[183]

Role play has been used to good effect in a number of training initiatives. For instance, a hospital in England used actors to help nurses develop critical thinking and safety awareness skills. A study day was developed to help change the culture in the hospital, to allow nurses to challenge one another with a view to improving safety. The training was experiential and aimed to allow participants to explore their thoughts and feelings about potential barriers as well as providing tools and a safe environment in which to practise new skills. Actors performed scenarios to help nurses identify and learn from issues, and nurses then role played alongside actors. Nurses learned new skills and felt more confident in the need for, and methods to achieve, basic hygiene and safety components of quality improvement.[184] Other studies have also found that drama can be useful in developing new skills.[185,186]

## One-to-one training

One-to-one training can take the form of coaching, academic detailing and informal teaching sessions. Due to costs, this approach is not common for training about quality improvement, but has been found to be motivating in some instances.

In the US, outreach workers visited GPs and primary care staff to teach them about quality improvement. It was difficult to schedule time with primary care staff but outreach visits were associated with increased adoption of quality improvement tools.[187]

One-to-one training may also be implemented as a component of a broader learning strategy. For example, in England a programme was developed to improve patient care and develop leadership skills in 19 GPs in an area of social deprivation and underperformance on national quality indicators. New and experienced GPs took part in biweekly action learning sets, individual coaching, and placements with national and local health organisations. One-to-one learning was integral for building confidence and motivation. Each GP completed a project to improve the quality of patient care. The programme was associated with increases in leadership competencies and confidence and changes in services, care processes and culture.[188]

## Distance learning

Online and distance learning and web conferences are becoming more popular for CPD.[189–194]

For instance, PCTs in England partnered with a university to implement a variety of accredited work-based learning programmes for nurses. Distance learning, mentorship, reflection and a portfolio were used. Nurses thought that the training helped them to improve the quality of care.[195]

In total, 195 public health workers and managers from 38 local health departments in one US state took part in a distance learning programme about quality improvement. Sixty-five of the participants completed eight quality improvement projects, supported by experts, over a 10-month period. Participants were highly satisfied with the training sessions and projects and had increased understanding of the relevance of quality improvement and enhanced knowledge and confidence in applying these techniques. Six out of the eight practical projects were associated with moderate to large improvements in quality or efficiency.[196]

Elsewhere in the US, an online continuing education programme for oncology nurses used a mentoring format. Twenty-five expert nurses from specialist cancer centres partnered with 50 oncology nurses over a seven-month period. Learning methods included webcasts and printed resources. Several nurses implemented practice changes as a result of the programme.[197]

Researchers in China found that videos and online learning were popular among nurses, especially those in rural areas. 96% percent of nurses surveyed said that they had changed their clinical practice as a result of this type of CPD.[198] But most studies suggest that online learning or distance training should be coupled with interaction of some sort, such as coaching, blended learning or practical projects.

In 2005, the NHS Clinical Governance Support Team's Primary Care Team launched a set of e-modules targeting practice managers to support clinical governance. The modules were based on, and mapped to, the General Medical Services contract and public policy initiatives. The programme targeted people who had little formal training in practice management, but it was also applicable to pharmacy and dental practice managers and PCT managers. There were nine e-modules with core competencies and interactive self-assessment, supported by a series of action learning sets run by a network of local facilitators. Participants also undertook a service improvement project and vocational training schemes. Quality improvement was one component of the programme. This is a good example of blended learning, whereby online modules were coupled with projects and facilitated support.

## Practical projects

As with accredited education, putting quality improvement concepts into practice is becoming increasingly common in CPD. An Australian study of training to build evidence-based practice into mental health services found that without practice and follow-up shortly after classroom sessions, training lost its usefulness.[199]

One hospital adapted an industrial quality improvement process for use within the NHS by providing training seminars alongside practical implementation of the methodology. The training was largely targeted at managerial staff. Staff said that putting the methods into practice on a day-to-day basis had improved their learning and most thought there had been some improvements in systems.[200]

Other examples of practical CPD are abundant. In Sweden, 240 nurses participated in a four-day training course about quality improvement methods. One group received training alone and another took part in a project to develop national guidelines as part of their training. Participating in the practical project enhanced nurses' ability to implement quality improvement methods but was no more likely to ensure that nurses maintained quality improvement activities over a longer period.[201]

Other common examples of practical training include collaboratives and courses set up as part of particular work-based improvement initiatives.

## Collaboratives

Collaboratives combine structured education, practical projects and sharing information between providers. For example, in the IHI Breakthrough collaboratives, organisations pay a fee to send teams to a series of seminars designed to aid in making major, rapid changes in the quality of care. Teams from each organisation include a group leader (usually a doctor) and a day-to-day manager (usually a nurse). Teams are taught how to study, test, and implement systematic improvements in care processes. In between collaborative meetings, the teams recruit others from their sites to participate in quality improvement interventions.[202]

Collaboratives have been applied to improve the quality of care and teach quality improvement methods across a wide range of care areas and disciplines, including cardiovascular disease, neonatal care, asthma, primary care, end-of-life care, rehabilitation, chronic obstructive pulmonary disease (COPD), diabetes and many more.[203,204] Many studies have examined the potential benefits of this model.[205–215]

For instance, in the US, groups worked together for 12 months, sharing information on their successes and challenges by telephone and email between meetings. An evaluation found that, compared to a control group, the collaborative learning approach resulted in enhanced knowledge and implementation of quality improvement methods and better clinical outcomes and quality of care for service users.[216,217]

The Improving Prevention Through Organisation, Vision and Empowerment (IMPROVE) and Improving Diabetes Care Through Empowerment, Active Collaboration and Leadership (IDEAL) collaboratives taught quality improvement concepts to US primary care teams using didactic instruction and interactive discussions during seven half-day workshops run over a two-year period.[218] In between sessions, participants undertook quality improvement initiatives supported by telephone calls and site visits from faculty.[219]

Eighteen hospitals in the US collected data about breast cancer care and compared outcomes between institutions. Aggregate and blinded data were shared with project directors and institutions at collaborative meetings and trends were analysed over time. Site project directors disseminated the data to their institutions and developed action plans for professional and patient education. This approach helped to improve care processes.[220]

A systematic review of seven regional quality improvement collaborations in surgical practice found that collaboratives were often set up in response to external demands for performance data. Collaboratives were associated with changes in care processes and improvements in clinical outcomes such as reduced mortality rates and fewer surgical site infections. Success factors included establishing trust among health professionals and institutions, the availability of accurate and complete data, clinical leadership, institutional commitment and infrastructure support.[221]

Adaptations of this type of collaborative approach have been tested. Most adapted approaches support learners with audit and feedback at an initial seminar followed by teleconferences or site visits to facilitate collaboration during quality improvement projects.[222–226]

In the US, online learning collaboratives have been tested. One initiative included an online educational toolkit, quality improvement coaching calls led by faculty, and individual feedback reports to motivate doctors to change. The initiative was associated with increased quality of care processes.[227]

Another related concept is managed clinical networks, which involve collaboration across organisations. An evaluation of a diabetes managed clinical network in Scotland over a seven-year period found that the initiative involved progressively implementing multiple quality improvement strategies directed at individuals and clinical teams, such as guideline development and dissemination, education, clinical audit, encouragement of multidisciplinary team working and task redesign. There were some changes in simple processes, but more time was needed for improvement in more complex processes and pathways. It was important to gain widespread clinical engagement by appealing to shared professional values and using clinical leaders and champions.[228]

## Ad hoc training during projects

By far the most commonly researched example of quality improvement training involves sessions run as part of a quality improvement initiative.[229–232] For example, a GP practice setting up a new telephone helpline might run a training session for staff covering principles of quality improvement or nurses may be trained in research principles or ethics as part of a programme to achieve clinical standards.[233]

There are many hundreds of articles describing initiatives of this nature spanning the globe, including Asia, Arab nations, Africa, Australasia and Oceania, the Americas and Europe.[234–237]

A smaller number of articles describe how quality improvement concepts have been taught at the beginning of improvement projects to support staff with implementation, particularly regarding audit and feedback.[238–242] In a number of cases the trainers were faculty from medical schools.

The scan did not focus on these studies in any detail because the training provided was not usually about methods for general quality improvement, but rather was specific to the particular project being implemented. This type of training was a component of the quality improvement intervention itself and did not necessarily aim to teach participants skills that they may be able to apply outside of that particular initiative. There were usually very few details provided about the scope of the training or the learning outcomes but such 'on the job' training could comprise short hour or half-day sessions or span a few days. While this type of training may help managers and practitioners learn transferable skills, its purpose was not usually to teach about quality improvement methods.

An issue with the evaluation of all initiatives of this type is that it is difficult to link work-based learning to specific outcomes. Researchers cannot usually make causal attributions suggesting that any changes in quality of care are a direct result of learning initiatives.[243]

## Train the trainer approaches

Train the trainer approaches have been used in some areas, especially to upskill professionals about improvements in patient safety. Train the trainer approaches involve teaching managers and professionals who then 'roll out' the material by offering training sessions to those in their own organisations or fields.[244–246] For example, the Patient Safety Education Project used practice improvement toolkits, online learning and safety trainers to support improvement in patient safety in the US and Australia. The teaching style was based on a 'stages of change' model, matching people's readiness and willingness to change with attitudinal and behavioural interventions.[247] These methods have also been used to upskill medical school faculty in how to teach quality improvement concepts.[248]

Another example is public health training in Nicaragua. The Centers for Disease Control and Prevention partnered with local government and non-governmental agencies to develop a 'train the trainers' programme for public health managers and government employees. This consisted of two workshops, a practical project and a concluding presentation. The first workshop was five days long and covered team building, behavioural styles and total quality management. Following the workshop, trainees disseminate their learning to peers by leading a local team through a learning project over a two-to-three-month period. This is followed by a seminar on presentation skills and a final presentation. Trainers have been taught to roll out the programme widely.[249]

Sometimes train the trainer approaches are implemented to supplement to quality improvement training. For example, one trust in England partnered with the King's Fund to develop in-house training to support quality improvement and audit. The training involved a one-day session plus a follow-up session some months later.[250] The project developed a facilitator's guide (providing instructions about running each session, group work materials and overheads) to enable staff to train as facilitators after attending the course and then run the sessions themselves. The developers suggested that it was beneficial to have staff from different professional backgrounds involved in the training to bring their unique expertise and experiences to course participants.

Other examples involve developing 'learning helpers' or quality improvement facilitators onsite.[251,252] The theory is that having informal learning support readily accessible will improve practice of, and therefore skills in, quality improvement. In Sweden, learning helpers in hospital have helped increase reflective practice, facilitate experiential learning and support quality improvement projects.[253]

## Feedback for improvement

Feedback has been used as a training technique in a variety of forms, including audit, videotaping and structured review sessions with teams.

For instance, 102 professionals in mental health teams took part in training to support team development and quality improvement. The teams spanned 12 US inpatient units and included the disciplines of psychiatry, psychology, nursing, social work and occupational therapy. The training programme included structured feedback, seminars, consultation and videotaping of sessions. The aim was to review treatment planning sessions as a tool for examining team functioning and care processes. Feedback and videotaping worked well to help raise awareness of quality improvement and team function among multidisciplinary teams. Here the focus was not so much on learning quality improvement techniques, but rather on using these techniques to make a difference to day-to-day working practices.

In England, the Royal College of General Practitioners developed a programme in partnership with other professional bodies such as the Institute of Healthcare Management and the Royal College of Nursing. The programme aimed to support quality improvement through practice team development, education and service planning. Teams set their own development targets, self-assessed, and took part in multidisciplinary peer review.[254]

Formal audit and feedback has been used as a training method for quality improvement. For example, in Australia, a learning project was set up to improve discharge management of people with acute coronary syndromes. Forty-five hospitals across the country participated in a quality improvement cycle of audit, feedback, intervention and reaudit. In total, 3,034 staff took part in educational meetings and received reminders and feedback about audit results. The training was associated with improved adherence to evidence-based guidelines about prescriptions, advice and referrals.[255]

The theory behind using audit and feedback is that clinicians who learn that their performance or behaviour is below par compared to colleagues will be prompted to improve and will learn quality improvement techniques more effectively.

> *'Audit and feedback can be effective in improving professional practice. The effects are generally small to moderate (median 5% risk difference), greater when baseline adherence to recommended practice is low and when feedback is delivered more intensively.'*[256]

A challenge with this approach is that often audit and feedback is undertaken without providing any formal upskilling in quality improvement techniques. Rating clinicians on a scale or providing graphs showing how they compare with others may raise awareness of the potential for quality improvement but does not train clinicians in how to address any gaps.

Another approach to using feedback involves peer review 'quality circles'. These have been researched most commonly in Europe.[257]

In the Netherlands, continuous quality improvement is being prioritised by many professional organisations and educational institutions. In line with this priority, teams of midwives tried a quality circle approach which focused on continuous, systematic and critical reflection on their own and others' performance. This method was found to improve knowledge but it did not necessarily help midwives learn new skills.[258]

In Austria, 445 GPs took part in quality circles to improve prescribing. These peer review groups helped to improve prescribing of generic medications, thus reducing costs. Quality circles also helped GPs exchange ideas about the problems they encountered.[259]

Similarly, in Switzerland quality circles were used to help pharmacists review and provide feedback about GPs' prescribing. Over a nine-year period, there was a 42% decrease in drug costs in the group taking part in quality circles compared to a control group. This equated to cost savings of US$225,000 per GP per year.[260]

## 2.3 Recertification

Bridging the gap between CPD and accredited education is recertification. Such revalidation includes methods to ensure that clinicians remain competent and fit to practice. This can be used to promote continuing improvement in the quality of care.[261]

The World Health Organization (WHO) has outlined the mandatory and voluntary revalidation strategies of many countries.[262] Only a small number such as the US, New Zealand and Australia made learning about quality improvement methods an explicit focus for reaccreditation.

For example, the American Board of Internal Medicine now requires completion of a 'practical improvement module' for recertification. This involves taking part in a quality improvement programme, collecting data and assessing outcomes.[263] Every internal medicine specialist must be recertified every 10 years. Other specialists undergo a similar review cycle every six to 10 years.

One study found that the self-assessment and quality improvement training required for recertification in the US can lead to meaningful behavioural change in doctors. A 'practice improvement module' used as part of the recertification programme for general internists and endocrinologists consisted of a self-directed medical record audit, practice system survey and patient survey. Coaching and self-assessment helped doctors learn about, and implement, quality improvement techniques during recertification.[264]

In Belgium, GPs and specialists are legally required to comply with certain standards. For GPs, this includes continued development of skills to enhance performance and practical demonstration of quality improvement.[265]

In New Zealand, doctors are expected to spend at least 50 hours per annum on recertification activities including external audit, peer reviewing cases, analysis of outcomes and reflective practice. Learning about and participating in quality improvement initiatives is required to obtain an annual practicing certificate.[266]

In the UK, participation in CPD is a condition of employment in the NHS and for continued membership of the royal colleges. The Department of Health has outlined how doctors will be required to renew a licence to practise every five years, but as yet quality improvement training is not a requirement.[267]

In England, practice level or organisational accreditation has been tested, which includes broadly defined quality improvement domains. The Primary Medical Care Provider Accreditation (PMCPA) scheme included 112 separate criteria across six domains: health inequalities and health promotion; provider management; premises, records, equipment and medicines management; provider teams; learning organisation; and patient involvement. An evaluation with 36 practices found that most could pass the core criteria, regardless of practice size or location.[268]

## 2.4 Summary

Many descriptive and narrative articles outline training in quality improvement for qualified health professionals and health professionals in training.

The training approaches most commonly researched include:

- university courses about formal quality improvement approaches
- teaching quality improvement as one component of other modules or interspersed throughout a curriculum
- using practical projects to develop skills
- online modules, distance learning and printed resources
- professional development workshops
- simulations and role play
- collaboratives and on-the-job training.

The next section examines the impacts of these types of training and whether one approach is more effective than others.

# 3. Most effective approaches

This section explores evidence about the impacts of training in quality improvement and the relative effectiveness of different training approaches.

## 3.1 Impacts of training

The previous section described some of the impacts of individual training approaches. This section draws this information together to look at the impacts of training more generally on outcomes for learners, patients and the wider healthcare system.

It is generally accepted that education and training can have an impact on the attitudes, knowledge, skills and potentially the behaviours of those who take part.[269] Thus, it is often assumed that training professionals in quality improvement is beneficial. However, published evidence about the effectiveness of quality improvement training is not clear cut.[270,271] In fact, some studies suggest that continuing medical education may have very little impact on compliance with guidelines or improved care.[272]

For example, a randomised trial with 47 rural and small community hospitals in the US compared quality improvement education to a control group. The educational programme consisted of two two-day didactic sessions about continuous quality improvement techniques, followed by the design, implementation and reporting of a local quality improvement project, with monthly coaching conference calls and annual follow-up meetings. There were no significant differences in processes or clinical outcomes between hospitals that took part and those that did not.[273]

Other trials comparing professionals who took part in quality improvement training and those who did not have also found no differences in skills and outcomes.[274]

A synthesis of 36 systematic reviews about training methods found that most techniques have limited effects. Even where ongoing training does have an effect on attitudes or behaviour, the magnitude tends to be small. This synthesis was about training for healthcare professionals generally, and was not specific to training about quality improvement, but it emphasises that there are not necessarily 'quick wins' from CPD.[275]

Several other studies and reviews about the effectiveness of quality improvement training suggest that the impacts may be mixed and variable.[276–279] For instance, a systematic review of 26 studies found that education had variable effects on students' attitudes to clinical practice guidelines, quality improvement techniques and multidisciplinary teamwork.[280]

Another systematic review of postgraduate training programmes identified 39 studies with a comparative design. Of the 39 studies, 31 described team-based projects and 37 combined didactic instruction with experiential learning. The review found that most quality improvement curricula were associated with improved knowledge and confidence in the use of quality improvement techniques, but evaluation tools were not always of high quality. There was much less certainty about the impact of quality improvement training on clinical or patient outcomes. Randomised trials were more likely to have mixed or null effects.[281] The implication is that we cannot automatically assume that training has positive effects on quality.

But not all research is negative, and more and more studies are emerging that suggest that training in quality improvement can be beneficial. A systematic review of quality improvement curricula for medical students and residents found that most formal education of this nature was associated with improved knowledge. One-third of curricula were associated with local changes in care delivery and 17% improved specific processes of care.

Factors that affected the success of curricula included having sufficient numbers of teachers familiar with quality improvement concepts, addressing competing educational demands and ensuring buy-in and enthusiasm from learners.[282]

Other individual studies from around the world reinforce these conclusions, suggesting that many types of training improve professionals' knowledge and skills and may have some impact on care processes.[283–290]

A small number of studies suggest that training is associated with improvements in clinical outcomes and direct benefits for service users or care systems, though examination of these types of impacts is rare.[291,292]

An example comes from an evaluation of a programme sponsored by the US Agency for Healthcare Research and Quality to train 'Patient Safety Improvement Corps'. Health professionals and managers were taught methods for improving quality and safety, with the aim of helping to build a national infrastructure supporting effective patient safety practices. One year after training, about half of state agency representatives reported that they had initiated or modified legislation to strengthen safe practices and modified adverse event oversight procedures. About three quarters of hospital staff said that training contributed to modifying adverse event oversight procedures and enhancing patient safety culture.[293]

The impact of training professionals on patient outcomes is uncertain. One randomised trial in the US included 20 GP practices in 14 states. All practices received copies of practice guidelines and quarterly performance reports. In addition, one group participated in meetings and received quarterly site visits to help them adopt quality improvement approaches. The practices receiving onsite training did not have significant improvements in patient outcomes compared to the group receiving guidelines and performance reports alone.[294]

Table 3 illustrates the mix of findings about the effectiveness of training in quality improvement.

**Table 3: Effectiveness of training**[295–297]

| Technique | Effects |
|---|---|
| Printed educational materials, posted information and media[298] | Limited effects on knowledge |
| CME courses, lectures and conferences[299] | Limited effects on knowledge |
| Reminders, prompts and computers[300–302] | Mixed effects on behaviours |
| Audit and feedback on performance[303,304] | Mixed effects on knowledge and behaviours |
| Opinion leaders[305,306] | Mixed effects on knowledge |
| Guidelines | Mixed effects on behaviours |
| Education outreach visits/ academic detailing[307] | Often effective for prescribing |
| Interactive seminars and small groups[308] | More effective for behaviours |
| Including practical components[309–312] | More effective for changing behaviours and may influence care processes |
| Courses plus other initiatives[313–317] | Usually effective for changing behaviours and some effects on patient outcomes |

There may be a number of reasons for the varying findings about the impact of quality improvement training. Firstly, outcomes do not tend to be measured systematically and widely varying measures may be used.[318] The definition of quality improvement and what is encompassed in this term also varies widely.

Another issue with reviews of the effectiveness of quality improvement curricula is that they tend to combine many disparate types of training. This means that it is not possible to assess whether one type of training is more effective than others.

Alternatively, the focus is on a narrowly defined type of training, such as classroom-based methods, but the reviewers generalise to all types of quality improvement training.

Most reviews tend to describe educational interventions that improve clinicians' knowledge of, or adherence to, guidelines rather than providing them with the skills needed to improve the quality of care.[319–321] This means that it may be unrealistic to expect changes in clinical outcomes or system issues.

Furthermore, in the US training in quality improvement is a component of most professional training curricula. As a result, most of the studies available about the effectiveness of quality improvement training are drawn from the US.[322,323] The findings are not always generalisable to other countries and this may influence some of the variations observed.

The extent to which training is more or less effective than other ways to improve quality is uncertain. A systematic review found that the most effective strategies for improving quality and safety in healthcare included audit and feedback, clinical decision support systems, specialty outreach programmes, disease management programmes, continuing professional education with small group case discussions and clinician reminders. Pay for performance schemes and organisational process redesign were modestly effective. This suggests that training may be one way to improve quality, but it is not possible to say whether it is more effective than other mechanisms. Furthermore, the training covered in this review was not solely about quality improvement.[324]

Others suggest that training professionals may be just as effective as financial incentives for improving the quality of healthcare.[325] But there is a very limited evidence base comparing quality improvement training with financial or other initiatives to improve healthcare.

## 3.2 Effective training methods

Most research published about quality improvement training in healthcare comes from North America. It is often descriptive or observational, with few rigorous evaluations of impact.[326] A review of 27 articles about educational strategies for quality improvement found that 75% were descriptive and that only 7% included an experimental design.[327] The quality of available research impacts on the conclusions that can be drawn about the benefits of different training methods. However, some broad statements can be made about content, training methods and other key success factors.

### Content

Research suggests that to be most effective, training should examine the needs of learners, target content appropriately and illustrate how the content applies to the participants' work environment (see Box 4). However, the most beneficial content regarding quality improvement has not been researched in any depth. Studies have not compared whether it is more effective to teach professionals about PDSA cycles or improvement science philosophies, for example.

In the UK there is an increasing focus on combining overviews of the philosophies behind quality improvement with training about specific tools. However, there is no research about whether this is more useful than the more structured focus on PDSA cycles often taken in the US.

**Box 4: Features of effective training**[328]

**Needs assessment**
Include data showing a gap between current and best practice

Include data showing how practices or teams have improved

Identify evidence-based sources for programme content

**Content**
Describe key learning from implementing known best practice

Discuss data before and after successful implementation

Include as an objective 'by the end of course, participants will be able to summarise evidence on…'

Allow time for questions about the pros and cons of evidence

**Application**
Describe how evidence relates to participants' work environment

Ask participants how they will apply the evidence to their work environment

## Training approaches

Just as the most successful content remains uncertain, so too do the most effective training methods. A consensus from 53 countries in Europe suggested that:

> *'Education strategies vary in format and effectiveness. Passive strategies – didactic educational meetings, dissemination of printed or audiovisual educational material – often have no or modest effects. Active strategies – interactive workshops, outreach visits, charismatic opinion leaders – are more often effective. The source of information, format of presentation, frequency and timing of delivery and content affect impact. There is no magic bullet.'*[329]

It is not possible to draw conclusions about which training methods are most useful because there is a lack of rigorous comparative research and little focus on sustainable outcomes for service users and resource use. However, it is possible to suggest components of successful training which may be worth further exploration.

Reviews and studies have concluded that there is not one 'magic blueprint' for teaching quality improvement, either in formal educational environments or as part of CPD.[330] But researchers tend to agree that in order to be effective, quality improvement training should be part of the curricula for students, as well as being available as part of ongoing professional development training.[331]

A review of 26 systematic reviews and meta-analyses of general continuing medical education (not solely quality improvement), found that interactive techniques such as audit and feedback, academic detailing and outreach and reminders were the most effective at simultaneously improving care and patient outcomes. Clinical practice guidelines and opinion leaders were less effective. Didactic presentations, such as lecture style teaching and distributing printed information, had little or no effect on professionals' behaviour.[332] A significant body of individual studies reinforce these conclusions. But the question is whether these observations also apply to training in quality improvement methods.

A more specific review of 27 studies about quality improvement training concluded that there was insufficient evidence to suggest which training methods are most effective, but that courses that include a practical focus can be beneficial.

> *'Factors that may contribute to successful improvement experiences for students include using health data to set project priorities, having a clear definition of a target community, selecting projects that can be completed in short periods of time that coincide with the structure of an academic year, and emphasising interdisciplinary teamwork. However, there are no data to demonstrate the effectiveness of specific teaching methods or learning outcomes.'*[333]

A number of other studies have concluded that training with a strong practical component, such as work-based learning, improvement projects or collaboratives, is often associated with changes in care processes and sometimes patient outcomes.[334–336] In fact, most studies which have found benefits for patients or healthcare resource use relate to training as part of broader quality collaboratives or work-based improvement initiatives.[337–339]

Including practical examples and projects as part of the training process is important not only due to the benefits for learners, but also because the projects undertaken can have a real benefit for health systems, organisations and service users.[340]

> *'Adult learners are best educated by involving them in real work that interests them. In those circumstances, a teaching organisation can leverage the power and enthusiasm of learners to create change. Learners are a valuable untapped resource for quality, safety and systems improvement in teaching hospitals. They are not constrained by the usual ways of doing things, and can raise system concerns in a way that others cannot, or will not… In turn, when the learners feel that they are doing "real work"' and facilitating important improvements in quality, safety, and system performance, they are stimulated to learn more.'*[341]

However ongoing training opportunities may be needed to maintain effectiveness. It is also important to train new staff given the high turnover of healthcare quality improvement personnel.[342]

## Other training components

Some educational strategies suggest that practical implementation is so important that all learning should be based around problem solving rather than divided by discipline.[343–345] For example, a medical school in Canada changed from a traditional disciplinary-based curriculum to a problem-based learning curriculum. This included training in quality improvement methods at each stage in students' learning. A before and after study comparing students who learned through traditional versus problem-based learning found that problem-based learning styles were associated with improved quality improvement learning and implementation.[346]

Others suggest that such significant changes to curricula are not required, but that experiential learning, didactic activities that support active learning, structured reflective practice that examines the role of teams, and faculty development in, and role modelling of, quality improvement are all essential components of successful quality improvement training.[347–352]

The importance of ongoing support and coaching from mentors or faculty has also been highlighted.[353–355]

The importance of multidisciplinary learning remains uncertain. There is growing consensus that multiprofessional collaboration is an essential component for improving quality and safety, but the importance of including a range of disciplines in training about quality improvement methods is an area of debate. Some argue that in order for teams to work collaboratively in practice, they must be taught teamwork skills as part of quality improvement education.

*'Collaboration and teamwork do not just happen. Health professionals cannot be expected to work together collaboratively if they are not even exposed to one another during the formative educational training years.'*[356]

Some have suggested that to be most effective, interdisciplinary training should begin early, before learners become isolated in disciplinary domains and ensconced in traditional disciplinary hierarchies and boundaries.[357]

In the US, higher educational institutions partnered with the Robert Wood Johnson Foundation to develop a self-directed, four module web-based and action learning curriculum designed to increase graduate level learners' competence in quality, safety and systems improvement. Participants completed online modules and then set up quality improvement programmes in their teaching hospital. Students were drawn from internal medicine, emergency medicine, anaesthesia, family medicine, gynaecology, nursing, physical therapy, management and administration, surgery, rehabilitation and psychiatry. Twelve hospitals took part in an initial evaluation, which found that learners' knowledge of, and self-assessed competence in, quality improvement increased as did their attitude towards, and participation in, multidisciplinary work. This illustrates that relatively low intensity web-based programmes can have an impact on practitioners' attitudes and behaviour when coupled with a requirement to apply learning in practical projects.[358]

Some suggest that doctors and medical students may have a less positive attitude to multiprofessional education compared to nursing and pharmacy teams.[359] To address this, the Robert Wood Johnson Foundation programme was first piloted with medical learners and was accredited using the US Accreditation Council for Graduate Medical Education requirements. Only then was the programme rolled out as an interprofessional model.

Another key success factor in quality improvement training may be the capacity of trainers to provide high-quality education.[360] It has been suggested that strong clinical faculty role models are critical in learning about quality improvement and collaboration. Studies suggest that many professionals and educators feel uncertain about their knowledge of quality improvement competencies, let alone their ability to teach them to others.[361–363] There is a gap in the training and development opportunities available for faculty themselves.[364]

In the US, a number of organisations have set up 'train the trainer' initiatives to prepare educators to teach practice-based learning and improvement.[365,366]

## 3.3 Summary

To summarise:

- It is important not to assume without question that training in quality improvement is the best or only method for helping professionals improve the quality of healthcare. There is mixed evidence about the effect of training on outcomes.
- Training in quality improvement may increase the knowledge and confidence of health professionals, but didactic sessions alone are unlikely to improve care processes or patient outcomes.
- Learning methods that encourage active participation may be more effective than classroom-based learning alone.
- Online courses and other distance learning approaches may be useful and popular, especially when 'blended learning' approaches are used which also incorporate face-to-face tuition.
- Mentorship, supervision and audit and feedback cycles may be useful as components of training, but used alone are unlikely to produce sustained changes in quality improvement skills or behaviour.
- There is no evidence about whether it is more effective to train students versus qualified health professionals in quality improvement. Training both students and professionals is likely to have a place.

# 4. Important messages

## 4.1 Key trends

More than 5,000 articles have been published about training health professionals and students in quality improvement approaches over the past 30 years. Most are descriptive overviews or small observational studies, predominantly from North America. There is relatively little empirical research about the impact of training in quality improvement or the effectiveness of various training techniques. However, it is possible to draw some conclusions from the current knowledge base.

### Conceptualising quality improvement

Within education for students and CPD for qualified professionals, quality improvement is generally defined as PDSA cycles, total quality management, or as a set of interrelated competencies.

However, there are some geographic variations. In the US, and Canada to a lesser extent, quality improvement is conceived largely as a PDSA cycle paradigm and training focuses on collating and interpreting quantitative information. There may be a quantitative bias, whereby quality improvement is largely associated with audit and small tests of change.

In the UK, a leadership and change management-orientated approach is more common. However, in CPD the focus is sometimes on making one-off improvements rather than training professionals and students how to think critically about improvement, take a whole systems approach and continuously improve healthcare processes and services.[367]

### Training students in quality improvement

Some universities in the UK provide modules or courses about quality improvement for students before they qualify as health professionals, but there appears to be less explicit focus on quality improvement in the UK compared to the US, Canada, Australia and Europe where medical and nursing students often have these concepts interwoven throughout their studies.[368–371] This is slowly beginning to change in the UK, and courses or modules are now available focusing on critical appraisal, measurement for improvement and quality assurance.

Compared to the US, where quality improvement training is mandatory for doctors and routinely incorporated into the curriculum for nurses, the UK has a more implicit focus on quality improvement within formal education. The outcomes of quality improvement may be talked about, such as patient-centred care or safety, but formal techniques for thinking about and implementing improvement are less pervasive.

For instance, a study in England found that although patient safety has been recognised as a key priority nationally, this is implicit in the formal pre-registration nursing curriculum. It is included in teaching, but at a basic level and with limited quality improvement content. Students reported gaining most knowledge and experience about safety improvement from clinical practice. The organisational culture of both education and practice was characterised as being defensive and closed and as having an individual versus a systems approach.[372]

In the UK, formal education for students does not appear to draw on the full menu of techniques for quality improvement. Courses tend to be either narrowly focused on methods such as audit or

critical appraisal or to be very time and resource intensive, such as postgraduate degrees or modules. There are few 'middle ground' courses providing participants with both theoretical and practical grounding but not taking excessive time or commitment in formal education. However, this gap may be increasingly being filled by CPD.

Most training of students in the UK and internationally is unidisciplinary, although in some cases multidisciplinary practical projects have been tested with success.

## Continuing professional development

Over the past few years there have been significant developments in CPD about quality improvement in the UK. Arms length bodies such as the NHS Institute for Innovation and Improvement offer a number of quality improvement courses, as do workforce deaneries, leadership academies, strategic health authorities and private organisations. These tend to cover the basic philosophies underlying continuous quality improvement as well as practical techniques such as measurement and analysis.

In addition, training is commonly run as part of specific improvement initiatives. For example, professionals taking part in a safety improvement programme may participate in workshops related to quality improvement as one component of the programme. There is also an increasing focus on offering short courses with practical components and developing communities of practice or learning collaboratives to share learning in a less formal manner.

However, there does not appear to be one consistent conceptualisation of quality improvement or a standard foundation of content. Each course varies in approach and content.

## Impact of training in quality improvement

Research suggests that training in quality improvement can improve health professionals' skills and knowledge and may be associated with short-term improvements in care processes.

However, few studies have examined the impact of training on health outcomes, safety or resource use. It is important not to assume that training will automatically improve outcomes.

## Types of training

The need to provide patient-centred care, and provide value for money, means that health professionals require more than clinical skills alone. They also need to know how to assess, enhance and disseminate good practice.[373,374]

Surveys of medical, nursing and pharmacy students have identified gaps in formal training about quality improvement, leadership and safety.[375,376] Students often say that they do not feel well-prepared and that they would like additional training about quality improvement.[377–381] For example, a survey of 436 nurses in the US found that almost four out of 10 new nurses thought that they were 'poorly' or 'very poorly' prepared for or had 'never heard of' quality improvement. New nurses wanted more information about evidence-based practice, assessing gaps in practice, and research skills such as data collection and analysis.[382]

Research is available about a number of different training techniques, including classroom format, online modules, simulations and practical quality improvement projects. Few studies have compared one type of training with another so it is not possible to say that one type is most effective. There is evidence that blended approaches that combine classroom or online learning with opportunities to apply that learning in practice may be effective. Active learning strategies are thought to be more effective than didactic classroom styles alone but comparative research is rare.

No studies have assessed whether formal education for students before they become health professionals is any more or less effective than CPD or on-the-job learning for enhancing skills in quality improvement. It may be important to provide training for students as well as opportunities for CPD rather than relying on one or the other alone. Key to this is ensuring that trainers and faculty have a consistent concept of quality improvement and are skilled at teaching about this topic.[383]

## Components of successful training

Educating health professionals about how to improve quality and safety may be key to the future of healthcare.[384] However, training opportunities are currently somewhat limited and fragmented.[385,386] This is more the case in the UK than in the US but even in the latter, where training in quality improvement is mandated for some professionals, there are opportunities for development. A systematic review of 18 published quality improvement curricula for medical students and residents in the US found that curricula varied widely in the quality of reporting, teaching strategies, evaluation instruments and funding obtained. Many curricula did not adequately address the topic of quality improvement or educational objectives.[387]

There may be scope to enhance the undergraduate and specialist curriculum in order to: emphasise team working, communication skills, evidence-based practice and risk management strategies;[388–390] develop a systematic approach to entrance requirements to medical school, the curriculum, training environments and student assessment;[391] offer ongoing opportunities to develop quality improvement skills; ensure that leaders are committed to quality improvement.[392]

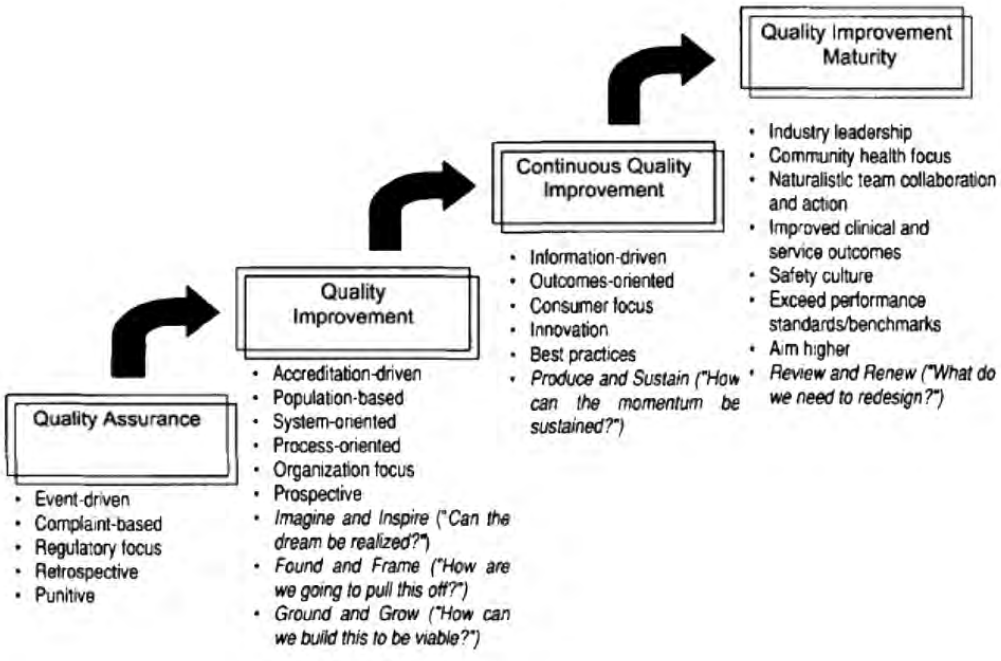
Research suggests that there are a number of key elements needed for successful and sustainable quality improvement education, including role models and champions, strong partnerships between academia and practice environments, a variety of educational modalities and a supportive learning environment.[393]

## 4.2 Geographic trends

It is difficult and potentially inappropriate to generalise about the nature of training in different countries based solely on this rapid scan. However, some broad trends are evident.

There appears to be greater focus on quality improvement training in North America compared to the UK. US training typically emphasises systematised methods and teaching managers and practitioners how to apply particular techniques, including how to collect and analyse data. Quality improvement is generally taught as a very structured and quantitative method. In contrast, the UK tends to emphasise leadership and theory much more. In the Netherlands and Scandinavia, there is more evidence of peer review and structured feedback as a training method, whereas Canada and Australasia are more likely to describe practical examples and work-based learning. Studies have not investigated whether any one of these approaches is more beneficial than others.

**Figure 1: Models of quality improvement**



It has been suggested that there is a 'quality improvement lifecycle.' Individuals, organisations or health systems move through the lifecycle as quality improvement conceptualisations become more advanced. In this view, basic quality assurance approaches are contrasted with continuous quality improvement cycles and 'quality improvement maturity' (see Figure 1).

While it may be inappropriate to see the lifecycle as a hierarchy, this model may be useful for describing some of the variations in approaches to quality improvement training between countries. [394,395]

While the US and Canada tend to focus on training for 'quality improvement' or 'continuous quality improvement', regions such as Australasia and Scandinavia may place more emphasis on 'quality improvement maturity'. This is not to suggest that any approach is more effective than others and it is acknowledged that such statements are generalisations.

It is difficult to categorise UK approaches within this typology because there is not necessarily a strong focus on quality improvement training. The training that does exist tends to be fragmented. There are examples of training in the UK that fit within each of these four conceptualisations, but the majority may be within the 'quality improvement' category rather than 'continuous quality improvement' or 'quality improvement maturity'.

There may also be differences in the training prevalent in different disciplines. Based on published studies, quality improvement training for nurses appears to be more reflexive and practical, whereas training for doctors and managers is sometimes more process orientated.

Based on the number of articles published, it appears that there has been a substantial increase in the awareness and 'popularity' of quality improvement training in recent years. It is difficult to judge whether the developing interest in quality improvement is cyclical or marks a linear increase. There seems to be a trend towards increasing interest over the past decade, but this is largely influenced by the US where improvement training is now seen as mandatory for medical students – and thus more has recently been published about the topic.

In the UK, the number of courses in quality improvement is growing, particularly in terms of CPD. However, as yet there does not appear to be a wide appreciation of the full menu of techniques for quality improvement.

## 4.3 Gaps in knowledge

Despite the quantity of published material available, there are gaps in information about quality improvement training. This scan identified the following questions as gaps in knowledge.

### Does training make a difference?

There is an assumption that training in quality improvement makes a difference. While there is evidence that training can influence participants' knowledge and confidence, most studies have not explored whether training directly results in positive outcomes for service users, care quality or resource use.

The literature acknowledges that courses alone are not enough to facilitate skills in quality improvement. Thus formal educational curricula alone are not likely to generate improved quality of care downstream.

> *'While most newly qualified physicians are well prepared in the science base of medicine and in the skills that enable them to look after individual patients, few have the skills necessary to improve care and patient safety continuously… medical school education can increase the number of graduates prepared to reflect on and improve professional practice. Doing so requires a systematic approach involving entrance requirements, the curriculum, the organisational culture of training environments, student assessment, and programme evaluation.'*[396]

## Who would benefit most from training?

Most published research focuses on doctors and, to a lesser extent, nurses. However, taking a holistic approach to quality improvement may necessitate considering the value of training allied health professionals, support workers such as healthcare assistants, faculty and healthcare managers. There appears to be a significant gap in the market for training that supports management teams to put quality improvement principles into practice.

Where managers are taught quality improvement techniques, these tend to focus on monitoring and measurement rather than how to lead and manage change, incorporate the needs of service users and consider the impact on staff.

To be effective, it is likely that quality improvement training should begin at pre-registration level, have options for specialist training and be available for regular updates during the careers of managers and clinicians.

## Are short courses, websites and one-to-one mentoring more or less effective than building quality improvement skills into formal pre-registration education?

There has been little comparative research into the most effective training methods and learning styles. Rather than considering the level of education as an either/or question, it may be worthwhile to think about supporting a menu of education to ensure that training is available to a wide range of professionals at different times in their careers.

While much quality improvement education is uniprofessional, in order to mirror the ethos of quality improvement such training may be more effective if run on a multiprofessional basis, emphasising reflective practice and providing opportunities for action research or on-the-job learning. It seems unlikely that focusing on classroom-based learning alone will support managers and practitioners to improve and apply their skills.

## How important is it to put quality improvement concepts into practice as part of the learning style versus classroom-based or online learning?

There is evidence that training that includes a practical focus, such as implementing quality improvement projects or work-based learning, may be more likely to result in tangible change compared to classroom-based or online learning. However, the balance of theoretical and practical learning remains uncertain. The most effective methods for introducing practical experience into quality improvement training are also unknown.

## How frequently should training be reinforced to ensure continued use?

In the US, doctors undergo training in quality improvement as part of their formal preliminary education. But little follow-up work has been done to assess whether the skills and knowledge learned pre-registration or as registrars lasts into longer-term practice.

Studies with nurses, though rarer, suggest that quality improvement teaching needs to be reinforced and practised regularly in order for learning to be sustained.

There may not be a shortage of quality improvement training, but rather a shortage of training that is simple and practical enough for managers and clinicians to apply in daily practice. A study in Finland surveyed a large sample of doctors about the availability of quality improvement training in 1998 and again five years later in 2003. The authors found that in both years, doctors thought that there was plenty of opportunity to obtain continuing medical education, in-house training, feedback from colleagues and guidelines for quality improvement education.[397] No similar study has been conducted in the UK so it is uncertain whether practitioners feel that there is adequate training available and whether the training is accessible and meets people's needs.

To conclude, researchers and practitioners are increasingly recognising gaps in training about quality improvement, both in terms of what is known about this topic and in terms of the quality and effectiveness of how the concepts and methods are taught.[398,399] There is a move towards seeing quality improvement as a dynamic concept underpinning service planning and provision, but as yet this has not permeated most training courses.[400] There is scope for major development in this area.

> *'To the extent that quality and safety are addressed at all, they are taught using pedagogies with a narrow focus on content transmission, didactic sessions that are spatially and temporally distant from clinical work, and quality and safety projects segregated from the provision of actual patient care… Transformation will require new pedagogies in which a) quality improvement is an integral part of all clinical encounters, b) health professions students and their clinical teachers become co-learners working together to improve patient outcomes and systems of care, c) improvement work is envisioned as the interdependent collaboration of a set of professionals with different backgrounds and perspectives skilfully optimising their work processes for the benefit of patients, and d) assessment in health professions education focuses on not just individual performance but also how the care team's patients fared and how the systems of care were improved.'*[401]

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The Health Foundation
90 Long Acre
London WC2E 9RA
T 020 7257 8000
F 020 7257 8001
E info@health.org.uk

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