Quality improvement

Quality improvement in health care is a structured analysis of a health-care system with a view to improving its performance. This review describes the history of quality improvement and its growing application in health care. It gives further information for doctors wanting to participate.

Improving the quality of health care is what health professionals want. Higher quality health care has multiple benefits including error reduction, improved patient safety, shorter patient stays and financial savings. According to the General Medical Council (2009), it is the responsibility of health-care professionals to strive for quality: 'You must work with colleagues and patients to maintain and improve the quality of your work and promote patient safety. In particular, you must:…(c) take part in regular and systematic audit and (d) take part in systems of quality assurance and quality improvement.'

Alongside a personal responsibility, quality in health care has been a high priority at an organizational level as outlined in Lord Darzi's (2008) *NHS Next Stage Review: High Quality Care for All*. A wide range of national initiatives and resources is geared towards improving the quality of health care including QIPP (Quality, Innovation, Productivity, Prevention), a national framework to guide the NHS in delivering higher quality care cost efficiently, and local quality observatories, which assist in developing and measuring local quality indicators to facilitate comparison and improvement of services across the country.

Clinical audit is a long and established method of improving quality of health care in the NHS. It involves assessment of current care against best practice, implementing an intervention to improve performance and a repeat assessment to see if best practice is being met. There are a large number of national audits in place that allow hospitals, departments and health-care professionals to gauge their performance across the board and improve where necessary.

It is understandable that junior doctors have long been involved in clinical audit as an attempt to improve the quality of health care. Although well established, clinical audit has a number of problems in practice. Junior doctors have doubts about the benefits of audit. A survey of foundation doctors in a south east England trust by Cai et al (2009) showed that doctors were equivocal towards the potential benefits of their audits and felt that there was not enough support to pursue audits in areas of specialist interests. Gnanalingham et al (2001) reviewed 213 audits carried out over a year in a teaching hospital in the UK, and found that 16% of those audits were 'non audits' such as literature reviews or research projects, illustrating poor understanding among doctors of the audit process. Furthermore, in less than a quarter of audits was the cycle completed by re-auditing, rendering practice improvement ineffective. There is a great need for a different approach to improve the quality of health care.

Quality improvement: a solution for change

An alternative solution is quality improvement. Quality improvement can be defined as a structured analysis of a system's performance with a view to improvement. While the purpose of audit falls within the realms and scope of quality improvement, the strategy and approach is different as illustrated in *Table 1*. It provides an attractive opportunity for doctors wanting to see change in their practice because of its flexibility and less onerous methodology compared to audit.

This review highlights the background of quality improvement, gives a guide to its constituents, and provides hospital doctors with information to get started.

Origins in industry

Three key figures are widely recognized for the development of quality improvement: Walter Shewhart, W. Edwards Deming and Joseph Juran. Although all three were instrumental in the use of quality improvement today, Walter Shewhart is recognized as one of the earliest pioneers.

Table 1. The difference in approach between audit and quality improvement projects

	Audit	Quality improvement project
Focus of project	Data collection to look at current practice	Making change
Data collection	Retrospective	Retrospective and prospective
Sampling size	Large	Variable, based on convenience and purpose
People involved	Usually a few health-care professionals	Multi-collaborative approach essential
No. of cycles in process	Usually one	More than one
Time between cycles	Months or years	Days, weeks, months or years
Origin of audit topic	National and hospital standards	National and hospital standards
		Issues in local practice
	Department and senior led	Trainee led

Dr Reuben Arasaratnam *is Resident Physician in the Department of Internal Medicine, University of North Carolina, Chapel Hill, NC 27514, United States (reuben.aras@doctors.org.uk)*

Shewhart was an American statistician with a doctorate in physics. In 1918, he started working with Western Electric Company, helping engineers developing telephone hardware, and later went on to work for Bell Telephone Research Laboratories. He devised two key notions regarding quality improvement (Best and Neuhauser, 2006).

The first idea was that to improve quality, it is necessary to reduce variation. Variation has two causes:

1. Common cause – which is the random variation in a system, easily predictable and usually of little consequence
2. Special cause – which is unusual, difficult to predict and has potential for disrupting a system.

Using a process termed 'statistical process control', he devised a control chart and statistical variables that were able to distinguish between common cause variation and special cause variation. By using this process, the aim was to create a system that would aim to eliminate special cause variation, thereby improving quality.

The second important idea was the Shewhart cycle of plan, do, check (study) and act, often referred to today as PDSA cycles. This trial and error learning cycle emphasized small tests of change with multiple cycles to develop an intervention into success. Deming applied Shewhart's concepts successfully in assisting American manufacturing industries during World War II and then in helping Japanese engineers and scientists after World War II (Best and Neuhauser, 2005).

Applications in health care

Quality improvement has been used in many key industries such as aviation and commercial gas and oil (Hudson, 2003). In such industries, failure of a system can have catastrophic consequences for the environment and human life, and so the presence of safety checks and systems to reduce error are of paramount importance.

An important parallel is seen in health care. Following the Institute of Medicine's publication in 1999, *To err is human: building a safer health system*, there was recognition of the high human and financial cost of medical error (Kohn et al, 2009). Moreover, like industry, it was understood that systems rather than individuals were responsible for error. Not only did this thrust patient safety high up the agenda but quality improvement was seen as a key vehicle for success because of its systems approach to problems. There are a whole host of successful quality improvement initiatives that have been used in health care today including improvements in patient safety, management of chronic disease and preventative medicine. Quality improvement is a growing force in health care and its prominence is illustrated by the emergence of improvement organizations, international journals, conferences and specialist career opportunities in the last 20 years (*Figure 1*).

Theory behind quality improvement

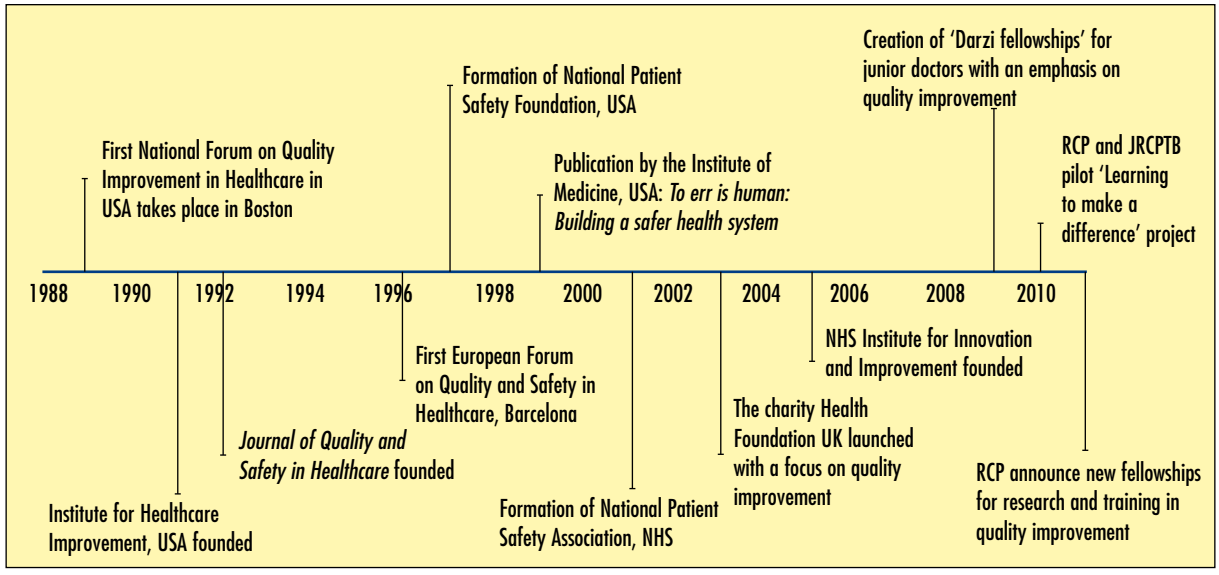
There are a number of different models that are used today in quality improvement. This review will refer to 'The model for improvement' by Langley et al (2009). It consists of three important questions to guide quality improvement followed by a methodology for action. It is depicted pictorially in *Figure 2*.

Three important questions

1. What are we trying to accomplish?

The purpose behind the first question is to develop a clear aim. What are we trying to change? How much change do we expect and by when do we expect this change to have happened? An example of such an aim statement is this: 'We want to halve the rate of central line infections in the intensive care unit by April 2012'.

Figure 1. Significant events in the progress of quality improvement in the UK and abroad over the last 20 years. JRCPTB = Joint Royal Colleges of Physicians Training Board; RCP = Royal College of Physicians.



2. How will we know that a change is an improvement?

Consider what measurements are necessary to show an improvement. Two important measures are:

a. Outcome measures – these are measurements that relate directly to your aim. For example, if we wanted to reduce the rate of urinary catheter-associated infections, our outcome measure would be:
$$\frac{\text{Number of urinary catheter-related infections}}{\text{Number of urinary catheter patient days}}$$
b. Process measures – these are proxy measurements and help to see whether important steps that lead to the outcome are occurring. If our quality improvement project was to improve hand-washing among hospital staff, a useful process measure would be the amount of hand sanitiser used over a month.

3. What changes can we make that will result in improvement?

Coming up with an idea for change can be challenging. It may be a checklist, a pro-forma or the use of technology. Consider brainstorming ideas with a group of different health-care professionals and looking at past attempts, best practice and current contextual setting.

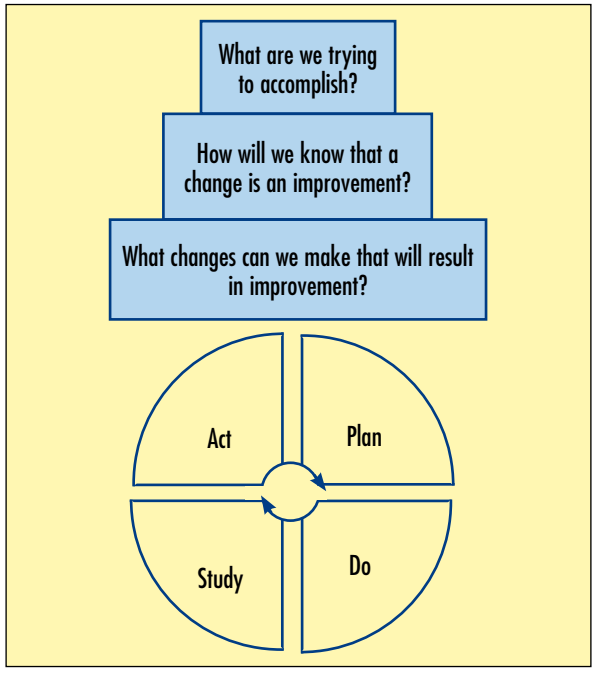
The PDSA cycle

After thinking through these questions, the PDSA cycle can be used to test your ideas out. The PDSA cycle stands for plan, do, study and act.

Plan

State your aim and make your predictions. Try and be as specific as possible. Establish the baseline situation. Outline the details of how you will collect data. Remember only to collect necessary data to illustrate your point.

Figure 2. The improvement model. From Langley et al (2009).



Do

Carry out your data collection. Note problems and key observations during this time period as this will be important when you want to refine your intervention.

Study

Consider what you learnt from data collection. How did this compare with what you thought would happen?

Act

Think about what changes need to be made to your plan and prepare for the next cycle.

It is important to keep initial tests small and repeat cycles so that you can learn from errors and refine your change. Although the PDSA cycle is simple, it keeps the project on track, informs team members of progress and creates a format for documenting your project. Furthermore, each PDSA cycle gathers evidence quickly for your proposed change. Note that, compared to audit, the aim is to go through multiple cycles and refine changes until they are suitable for larger scale implementation.

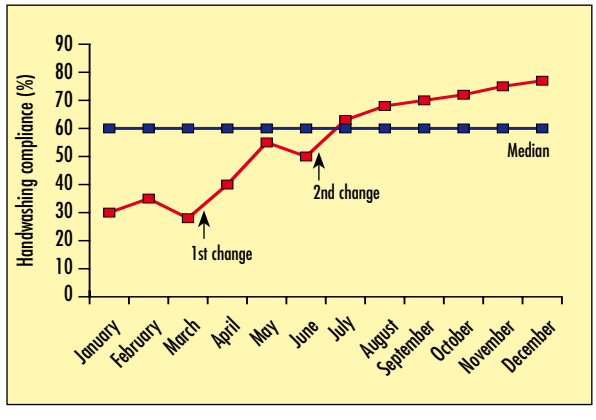
Displaying your data

There are a variety of methods used to display your data, but one of the most popular methods is the run chart (Perla et al, 2011). The run chart displays data chronologically, with the horizontal axis as a time scale and the vertical axis as the outcome measure. The median is often plotted as a reference point to see whether improvement has taken place. Further annotations can document changes made during the process to illustrate the time course of improvement. An example of a run chart is shown in *Figure 3*.

Practical aspects of quality improvement

Although the theory of quality improvement may appear simple, the practical nature of carrying out improvement

Figure 3. An example of a run chart showing handwashing compliance in a hospital ward.



projects is more challenging. Some of the common problems encountered are discussed below.

Ideas for change

Ideas for change are likely to originate from your experience of practice within your department or hospital. It is a good idea to involve other health professionals and see whether your hospital or department is aiming to improve a particular area. Some themes and examples are suggested in *Table 2*. Understandably, with the nature of quality improvement projects, they are likely to overlap in their themes.

Using a variety of methods

Doctors are often familiar with quantitative analysis as a result of their undergraduate medical sciences training. Given the experimental learning approach of quality improvement, the use of qualitative methods can yield valuable data in projects (Pope et al, 2002). For example, in exploring why staff are not adhering to a central line checklist, you may find that there were difficulties in obtaining a portable ultrasound machine or problems with availability of sterile drapes. Performing individual interviews or conducting a focus group with health-care professionals is more likely to yield this kind of information which quantitative analysis cannot. This will help to inform your next refinement and test of change.

Support and training

A quality improvement project should not be a solitary effort. Collaborative work and using a multi-professional team is very important. Identify 'quality improvement leads' in your hospital if they are present. If not, approach senior medical and nursing staff who may be able to help with the project. Registering your project with the clinical governance unit and seeking advice about ethical approval may also be necessary before proceeding.

Table 2. Examples of ideas for quality improvement projects

Theme for change	Example
Patient safety	Reducing number of inpatient falls
	Reducing the rate of central line-associated infections
	Reducing the rate of catheter-associated urinary tract infections
Adherence to standard	Measurement of peak expiratory flow rate for asthmatics presenting to the emergency department
	Venous thromboembolism risk assessment and prevention
	Meticillin-resistant *Staphylococcus aureus* screening for medical inpatients
Patient pathways and processes	Improving the number of weekend discharges on an orthopaedic ward
	Reducing waiting time to be seen in a medical assessment unit
	Reducing the delay of warfarin dosing on a medical wards
Health-care professionals	Improving the quality of clinical handovers by doctors between shifts
	Improving response time of speciality referrals
	Reducing medication errors, by improving allergy status documentation

Having an idea that is simple, small scale and has clear targets is more likely to be successful. It is important to align yourself with goals that your hospital has as this will gain you support. Mills and Weeks (2004) studied quality improvement teams in the Veterans Health Administration in the USA and found that alignment with an organization's key strategic goals was a key indicator for success. Current goals within your hospital may include topics such as venous thromboembolism risk assessment and prevention of inpatient falls.

Following a successful quality improvement project, larger scale implementation requires broad-based support from within the hospital. Clinical governance meetings can be a great platform to disseminate findings and propose further implementation strategies. Projects that can demonstrate financial savings and efficiency are likely to gain buy-in and adoption from hospital management leads. Successful implementation depends upon cultural change. Berenholtz et al (2004) reported a project aimed at eliminating catheter-related bloodstream infections which involved significant cultural change. Not only did this project facilitate change by making the process of line insertion easier by creation of a catheter insertion cart, checklist and regular education, but nurses were empowered to stop line insertion if the checklist was violated.

Resources to help doctors get started with quality improvement projects are listed in *Table 3*. In 2010, the Royal College of Physicians and the Joint Royal Colleges of Physicians Training Board piloted a quality improvement initiative entitled: 'Learning to Make a Difference'. It was primarily aimed at core medical trainees. The pilot allowed the trainee to develop his/her own quality improvement project and identify a suitable local mentor. Support and training was provided via regular electronic newsletters. Selected participants also had the opportunity to present their work at a final competition in London.

For those with further interest, there are a number of competitive fellowship schemes that incorporate quality improvement including the Clinical Leadership Fellows Scheme funded by the National Leadership Council and quality improvement fellowships offered by the Health Foundation, a charity based in the UK.

The NHS Institute for Innovation and Improvement and the Institute for Healthcare Improvement provide online resources in quality improvement. The Institute for Healthcare Improvement Open School also offers online training modules with certification in quality improvement, resources for starting projects, and a discussion forum which has a global participant base.

Limitations of quality improvement

There are perceived limitations of quality improvement. Many have trouble with the flexible and less rigorous nature of data collection. Whereas carrying out an audit may require an analysis of 100 patient notes, quality improvement projects can start with a significantly smaller sample size. In quality improvement, there is no need for a control

arm to an intervention, no blinding of participants and its results may be limited to a specific context. For many, this is perceived as unscientific. However, Neuhauser and Diaz (2007) argue that well-conducted quality improvement projects are built on theory, can be appropriately generalized and adopted in practice elsewhere.

Changing systems to improve quality can be difficult because of existing beliefs and attitudes. Shekelle (2002) cites three important reasons why doctors may not support quality improvement projects:

1. Physicians may not agree on the measure by which quality is being judged
2. Quality improvement projects can be used as evidence to blame doctors for poor performance, especially if there is a pervasive blame culture
3. Participation in quality improvement projects is an extra burden on top of a high clinical workload.

Shifts in these attitudes and beliefs are required if quality improvement is to become more successful.

Conclusions

Quality improvement in health care is a structured analysis of the performance of a health-care system with a view to improving its performance. It offers an alternative to clinical audit, with a focus on change, flexibility of methods, trainee-led ideas and the ability to carry out many cycles of change. Although quality improvement had its origins in commercial industries, it has grown widely in health care and has many current applications. In the future, quality improvement will come alongside clinical audit as an important skill for junior doctors and is likely to develop into a speciality of its own right. BJHM

Conflict of interest: none.

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Table 3. Resources for getting involved in quality improvement projects

Resource	Information
Institute for Healthcare Improvement	Independent, not-for-profit organization based in the USA with a goal to improve health care throughout the world Online training modules from the Institute for Healthcare Improvement Open School and resources for quality improvement are available (www.ihi.org)
NHS Institute for Innovation and Improvement	A special authority under the NHS with a focus on improving health care. It has online resources for quality improvement (www.institute.nhs.uk)
Learning to make a difference project	New initiative by Royal College of Physicians and Joint Royal Colleges of Physicians Training Board to engage junior doctors in quality improvement projects (www.rcplondon.ac.uk/resources/clinical-resources/learning-to-make-a-difference)
Beyond Audit	A London Deanery initiative to involve junior doctors in quality improvement projects (www.leadership.londondeanery.ac.uk/home/beyond-audit)
Health Foundation	A charity in the UK, promoting quality in health care and offering annual quality improvement fellowships (www.health.org.uk)
Kings Fund	A UK charity aiming to improve the health system of England, with a focus on quality improvement (www.kingsfund.org.uk)
Clinical Leadership Fellowship Scheme	Competitive scheme sponsored by the National Leadership Council. A significant part of the scheme is related to quality improvement (www.nlcfellowships.nhs.uk)
QIPP (Quality, Innovation, Productivity, Prevention)	An NHS programme aimed at improving the quality of health care in a cost-efficient manner (www.improvement.nhs.uk/qipp)

KEY POINTS

- Quality improvement in health care is a structured analysis of a health-care system with a view to improving its performance.
- Doctors should be involved in quality improvement as this is a General Medical Council responsibility and an appropriate reaction to problems encountered in clinical practice.
- It originally had its use in industry but has a growing application in health care and particularly in the realm of patient safety.
- Key components of a project are identifying a project goal, making appropriate measurements of change and devising an idea for change. Following this, small tests are carried out through the use of plan, do, study, act cycles until sufficient evidence is gained for wider implementation.
- There are number of online training resources and UK schemes for doctors to get involved in quality improvement projects.