HQIP
Healthcare Quality Improvement Partnership

A guide to quality improvement tools

December 2020

Contents

HQIP Healthcare Quality Improvement Partnership

Update 2020:
Ian Woolhouse, HQIP
Kim Rezel, HQIP

First published: June 2015

Author:
Sally Fereday

Researcher:
Nicola Malbon

Acknowledgements:
The National Quality Improvement Clinical Audit Network (NQICAN) and the HQIP Service User Network (SUN) for consultation on this document

ISBN NO 978-1-907561-05-4

Design: Pad Creative www.padcreative.co.uk

Introduction

Purpose

The purpose of this guidance is to signpost those working within, leading, commissioning and using healthcare services to a broad range of quality improvement tools. It should be especially useful to those putting together quality improvement programmes.

This guidance introduces a variety of quality improvement tools used in healthcare and presents case examples and associated tools available to assist with implementation.

Definition of 'quality'

Much of the current thinking that defines quality in the NHS was set out in 'High quality care for all: NHS next stage review',[1] led by Lord Darzi.

It set out the following three dimensions (figure 1) which must all be present to provide a high quality service:

- Clinical effectiveness: quality care is care which is delivered according to the best evidence as to what is clinically effective in improving an individual's health outcomes
- Patient safety: quality care is care which is delivered so as to avoid all avoidable harm and risks to the individual's safety
- Patient experience: quality care is care which looks to give the individual as positive an experience of receiving and recovering from the care as possible, including being treated according to what that individual wants or needs and with compassion, dignity and respect

Definition of healthcare quality improvement

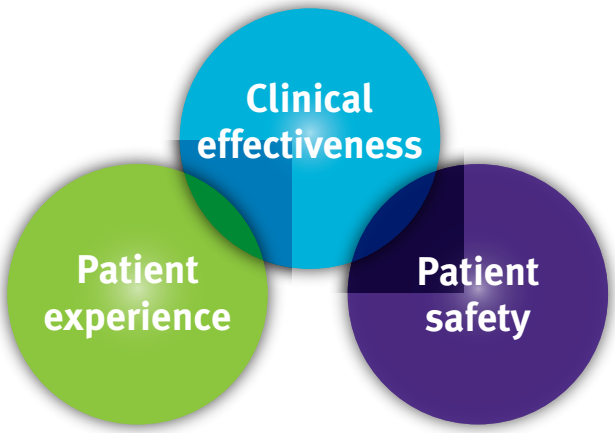
There is no single definition of quality improvement within healthcare. In general, the term 'quality improvement' refers to the systematic use of methods and tools to try to continuously improve quality of care and outcomes for patients.

Key components include:

- Understanding the complex healthcare environment
- Applying a systematic approach
- Designing, testing and implementing changes using real time
- Measurement for improvement

There is no clear evidence that one approach is superior to others. Rather, it is the process of having a systematic approach to quality improvement and applying this consistently that is important.

Figure 1. Definition of quality



1. Department of Health, 2008. High quality care for all: NHS next stage review

Involving people in quality improvement

Those experiencing healthcare systems first hand can provide insightful feedback on the quality of services and how they might be improved. They can also provide useful personal perspectives which should be captured.

People's input into service design is essential as only they have experience as service users. The involvement of people and communities in healthcare quality improvement can take many forms, for example:

- Representation at organisational quality committees
- Shadowing their journey to identify quality shortfalls
- Leading assessments of the health and care environment
- Completion of satisfaction surveys
- Involvement of people and communities to review the information materials that are provided to them
- Networking to share self-care strategies
- Analysis of complaints, concerns and claims
- People and community involvement in quality improvement focus groups

Further information (full reading list on page 29):

- HQIP, patient and public involvement in clinical audit[i]
- HQIP, a guide to develop a patient panel in clinical audit[ii]
- NHS Improvement, Patient experience framework, June 2018iii https://improvement.nhs.uk/documents/2885/Patient_experience_improvement_framework_full_publication.pdf
- NHS Institute for Innovation and Improvement: The experience based design (EBD) approach, July 2017 - https://improvement.nhs.uk/resources/the-experience-based-design-approach/ iv
- NHS England, Patient-led assessments of the care environment (PLACE)[v]

Figure 2. Capturing people and community experiences for insight and perspective

Quality improvement collaboratives

Quality improvement collaboratives involve groups of professionals coming together, either from within an organisation or across multiple organisations, to learn from and motivate each other to improve the quality of health services. Collaboratives often use a structured approach, such as setting targets and undertaking rapid cycles of change.

The most common model for improvement collaboratives is the Breakthrough Series approach developed by the US Institute of Healthcare Improvement. A Breakthrough Series is a short term (6 to 15 months) learning system that brings together teams from hospitals or clinics to seek improvement in a focused topic area. The driving vision behind the Breakthrough Series is that sound science exists on the basis of which the costs and outcomes of current healthcare practices can be greatly improved.

Key elements of an improvement collaborative include:

- Topic selection
- Faculty recruitment
- Enrolment of participating organisations and teams
- Learning sessions
- Action periods
- The model for improvement
- Summative workshops
- Measurement and evaluation

The quality improvement tools employed within improvement collaboratives are described in more detail in the next section.

Further information (full reading list on page 29):

- IHI breakthrough collaborative series[i]
- NHS Improving Quality, Patient safety collaboratives[ii]

Figure 3: Collaboration for quality improvement

Directory of tools for quality improvement

This next section illustrates a number of tools for quality improvement. A combination of tools is required for successful completion of a quality improvement project. A common pitfall is to move straight to testing new ways of working without spending sufficient time understanding the cause of the problem.

Clinical audit

Use to: Check clinical care meets defined quality standards and monitor improvements to address shortfalls identified.

Most effective: For ensuring compliance with specific clinical standards and driving clinical care improvement.

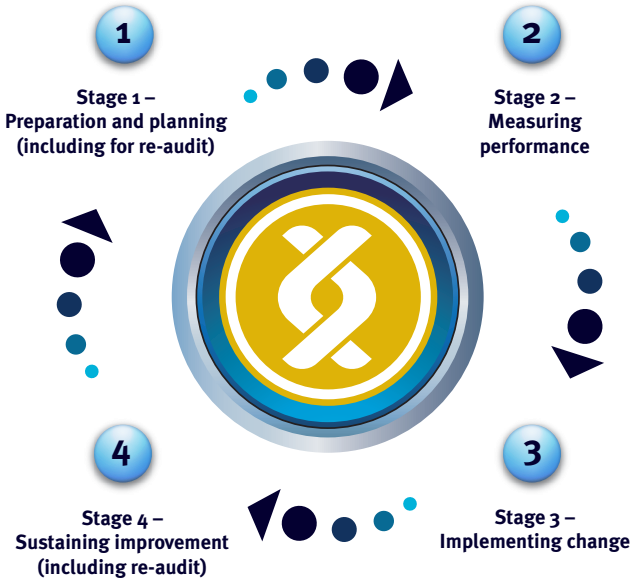
Prerequisites: Evidence based clinical standards drawn from best practice and an audit proforma comprised of measures derived from the standards. A clearly defined population of patients (or a sample from the population) whose care will be measured using the pro forma.

Overview: Clinical audit can be described as a quality improvement cycle that involves measurement of the effectiveness of healthcare against agreed and proven standards for high quality, and taking action to bring practice in line with these standards so as to improve the quality of care and health outcomes.[2]

How to use it: To check clinical care provided against specific desired standards, clinical audit typically involves the design of a clinical audit pro forma comprising those standards, and the subsequent review of a defined sample of healthcare data, such as health records, using this pro forma, collecting data over a specified timeframe. Data is analysed and where shortfalls against the standards are identified, action planning follows, to drive improvement, with repeated cycles of data collection and analysis at appropriate intervals to monitor change. Each full audit cycle is not complete until there is evidence that changes made have been effective (see Fig.4). Clinical audits can be carried out retrospectively, though are increasingly prospective, with clinicians completing proformas during or immediately after care delivery, or through automated electronic healthcare record ongoing real time data collection. Where clinical audits are designed and carried out by clinicians, desired standards are embedded and awareness is raised amongst those delivering care. Findings and required actions for quality improvement should be shared with the entire relevant workforce to foster learning.

2. Burgess, R. (ed), 2011. *New Principles of Best Practice in Clinical Audit*. 2nd ed. Radcliffe Publishing Limited

Figure 4: The clinical audit cycle



Implementation

The clinical audit was prospective and GPs evaluated their own management of diabetes in 20 consecutive consenting patients with T2D, using proformas comprised of standards for the development of care plans and clinical measurement targets. GPs evaluated their management of T2D patients at two time points, six months apart. Following the initial audit, GPs received feedback around the use of annual cycle of care plans and a decision support tool, to address the shortfalls identified.

Impact on quality

On re-audit, GP performance had improved across all measures, with the greatest gains being in the use of care plans (increased by 12%) and meeting clinical measurement targets. The clinical audit provided annual cycle of care plans, decision support tools and also diabetes patient registers, which improved the quality of care for patients with T2D.

Case example:

Healthcare quality issue

Type 2 diabetes (T2D) was responsible for 5.8% of the total disease burden in Australia in 2010, and despite advances in clinical management, many patients were found to have suboptimal glycaemic control.[3] Within general practitioner (GP) practices, development of care plans and meeting clinical measurement targets were known to be inadequate.

Method selection

In order to identify and manage the shortfalls in clinical care against expected standards in GP practices and to drive improvement in glycaemic control, a Type 2 care clinical audit programme was developed.

3. Barlow, J. and Krassas, G. (2013). *Improving management of type 2 diabetes - findings of the Type 2 care clinical audit.* Australian Family Physician

Statistical process control

Use to: Measure and control process quality against predefined parameters.

Most effective: When a process requires monitoring and control to maximise its full potential for optimum quality of care.

Prerequisites: A process requiring monitoring and control, and stakeholders.

Overview:

Statistical process control (SPC) is a method of quality improvement using statistics to monitor and control a process, ensuring that it operates at its full potential. At full potential, required quality is maintained and waste is minimised. SPC can be applied to any process within which outputs can be measured. SPC involves:

- Control charts
- A focus on continuous improvement
- The design of experiments

SPC highlights the degree of variation from required outputs and enables the measurement of the impact of any experimental process change made for improvement.

How to use it:

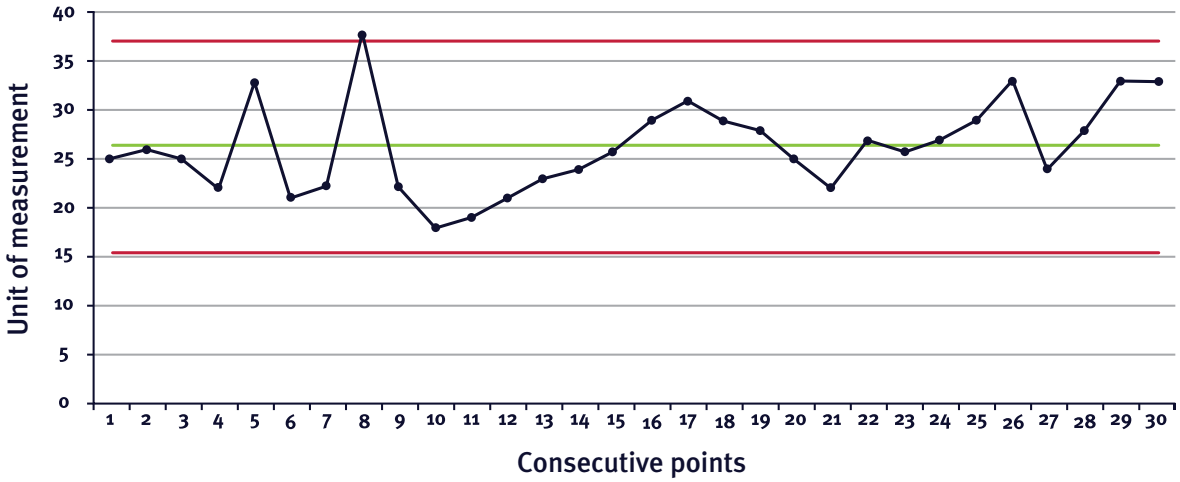
An upper control limit and a lower control limit are set using standard deviations from historical mean or baseline measurements and outputs are charted for variation in quality (see fig.5).

Data may be unavailable and require special arrangements for collection for charting. For statistical rigour, the number and frequency of measurements are important: the more measurements that are charted, the more robust the overview of variation in outputs.

Analysis of variation enables the identification of shortfalls against the baseline and highlights opportunities for quality improvement. Such shortfalls require targeted investigation, process adjustment, and continued monitoring to check whether or not the changes made have reduced variation, or indeed, caused further variation, which may appear at another point within the process.

SPC is used throughout the life cycle of a process quality improvement project, at initial project identification, setting a baseline, checking progress, checking whether the project made a difference, whether changes are sustainable and in evaluating the worth of the project.

Figure 5: Statistical process control chart[4]



Case example:

Healthcare quality issue

Variation in improvement among practices participating in the Saskatchewan chronic disease management collaborative (CDMC), which set out to improve the quality of care through clinical processes for patients living with diabetes and coronary artery disease.[5]

Method selection

Statistical process control was applied to monitor the variation in improvement among practices participating in the CDMC and to explore the variation to identify remedial actions required.

Implementation

Study participants were primary care practices from across the province, involving more than 25% of Saskatchewan family physicians, all 13 regional health authorities and more than 15,000 patients with diabetes and coronary artery disease. SPC charts were used to record variation in CDMC process compliance between practices over time. The SPC charts set out to query whether all practices improved against the CDMC measures and if not, whether there were groups of practices that appeared to have different levels or rates of improvement and then to explore why.

Impact on quality

Once the variation in process compliance was charted it informed a further qualitative study to better understand why any differences occurred, exploring additional data on factors such as context (culture, team efficiency, leadership) and facilitation (collaborative facilitator roles and skills), to shed more light upon why differences between practices (and groups of practices) occurred and enable remedial action plans.

Further information (full reading list on page 29):

- NHS improvement making data count[i]

4. NHS Institute for Innovation and Improvement, 2008. *Statistical process control*
5. Timmerman, T. and Verrall, T. et al, 2010. *Taking a closer look: using statistical process control to identify patterns of improvement in a quality-improvement collaborative*. Quality and Safety in Health Care

Performance benchmarking

Use to: Drive quality improvement by raising awareness of local and national performance targets, and finding and sharing best practice.

Most effective: When local and national performance targets are established and given organisational importance as drivers for quality improvement.

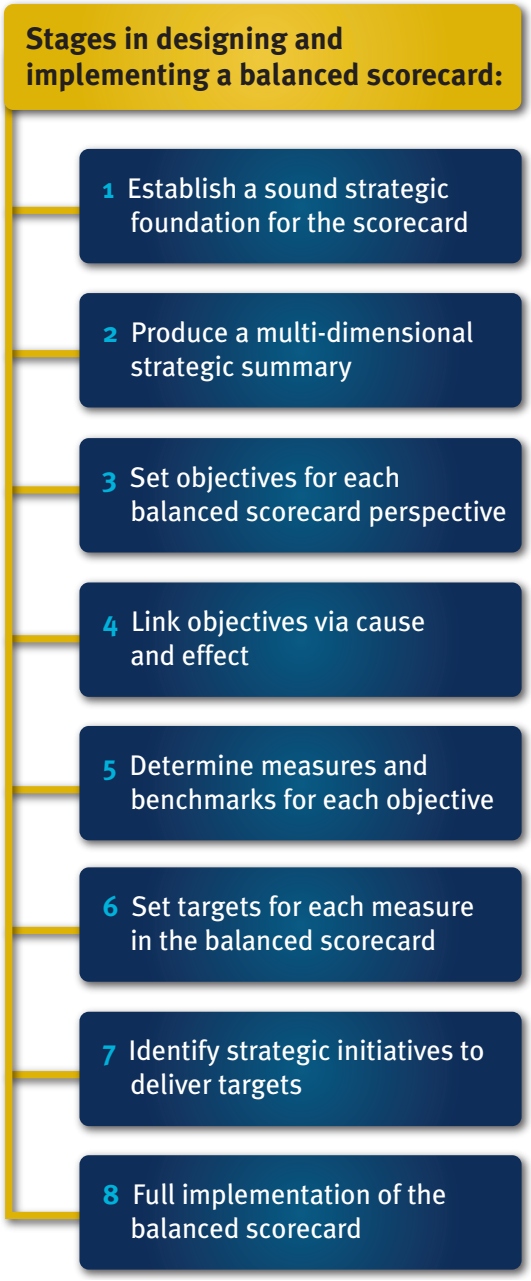
Prerequisites: Local and national performance targets, and data collection routines for monitoring and sharing systems and processes.

Overview: Performance indicators are used as part of a benchmarking process to raise awareness of required standards and act as drivers for quality improvement. Healthcare organisations and their departments strive to meet standards imposed, and those performing well demonstrate models of best practice which can be shared, becoming the benchmark against which performance is compared.

How to use it: Performance may be monitored through provision of data, or evidence of compliance with standards, to an external agency publishing league tables, which can also drive quality improvement as organisations aim for lead positions. Performance indicators should be carefully devised and are most powerful if they are active, for example, focused upon quality improvement initiatives met through evidence of positive outcomes achieved. The communication of organisational performance against national benchmarks for context raises awareness of shortfalls and stimulates further subsequent quality improvement.

Key performance indicators (KPIs) and benchmarking are also used within healthcare organisations to compare activity across different departments or units, unearthing and sharing best practice locally to drive quality improvement. Formal, routine and regular systems of data collection and review help define quality improvement targets, provide a clear picture of progress towards goals and indicate trends, including emerging quality issues requiring resolution. Balanced scorecards are useful to translate organisational vision and strategy into tangible objective measures to help create KPIs, enabling measurement of progress towards defined targets, such as length of stay parameters, and mortality and readmission rates and may ultimately take any shape or form (see fig.6).

Figure 6: Producing a balanced scorecard



Case example:

Healthcare quality issue

The German Cystic Fibrosis (CF) Quality assurance project required goals for the management of CF patients, to drive care quality improvement.[6]

Method selection

Benchmarking was chosen to highlight healthcare programs with the most favourable outcomes within registry data, and to identify and spread effective strategies for delivery of care.

Implementation

Clinical goals were developed for participating programmes through benchmarks derived from registry data.
Quality indicators were selected: airway cultures free of pseudomonas aeruginosa, nutritional measures, lung function measures and lack of serious complications. During two annual conferences, the highest-ranking programmes for these quality indicators presented their treatment strategies, and the ensuing discussions led to the identification of clinical practices that other programmes would aspire to adopt.

Impact on quality

Benchmarking improved the quality of CF care and whilst certain goals were accomplished through focus on data analysis, benchmarking programmes supplemented these data analyses with exploratory interactions and discussions to better understand successful approaches to care and encourage their spread throughout the care network. Benchmarking facilitated the discovery and sharing of effective approaches to improve the quality of CF care, and provided insights into the relative effectiveness of different therapeutic methods.

Further information (full reading list on page 29):

- NHS Improvement Balanced score card[i]

6. Schechter, M.S., 2012. *Benchmarking to improve the quality of cystic fibrosis care*. Current Opinion in Pulmonary Medicine

Process mapping

Use to: Map the journey of people who use the services ('patient') to identify quality improvement opportunities.

Most effective: When the 'patient' journey is complex with associated inefficiencies.

Prerequisites: A 'patient' journey and stakeholders.

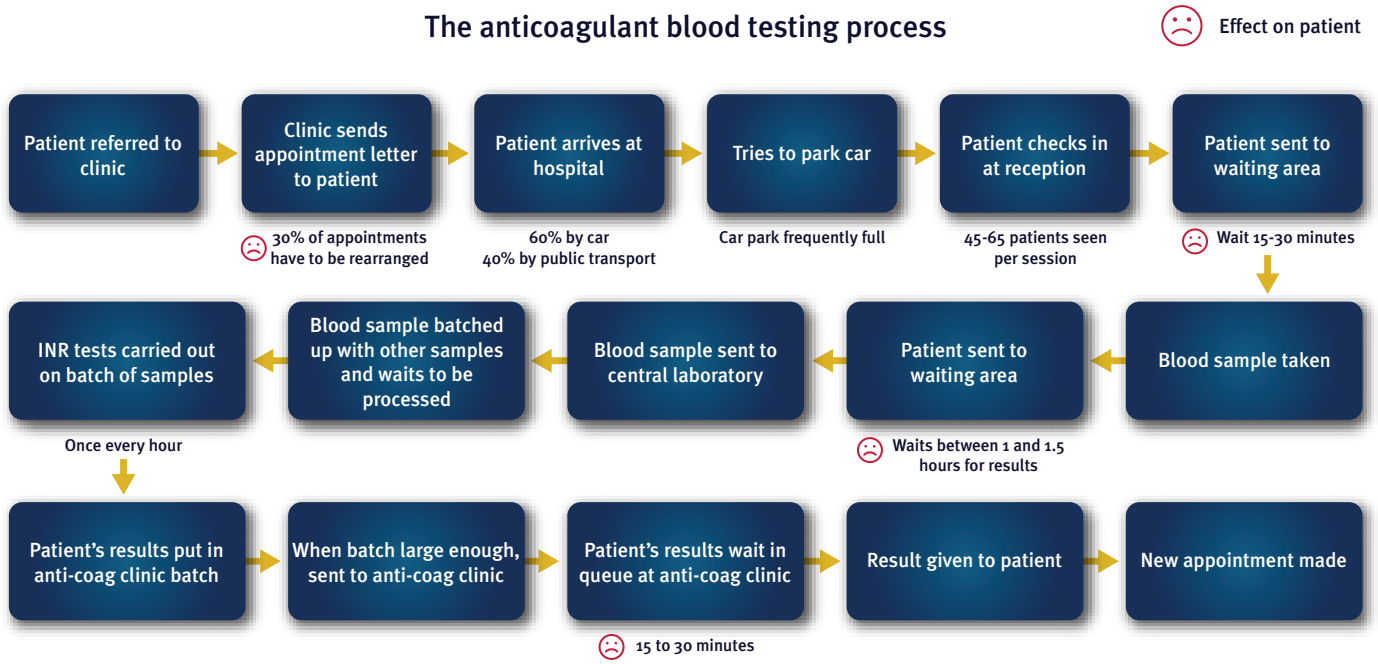
Overview: Reviewing and mapping the whole 'patient' journey or diagnostic pathway with all parties involved enables the identification of inefficiencies and opportunities for improvement. It illustrates unnecessary steps, duplication, discrepancies, and variation and stimulates ideas for quality improvement to help create failsafe systems (see fig.7).

How to use it: Starting with a high level process map, the scope of the process and significant issues are set out, step by step, to create a more detailed map. The exercise offers all those taking part a broader insight into the process under review and sets out exactly what happens in practice, as opposed to what those involved think happens.

By placing the 'patient' and their needs central to the journey and involving representatives from people and communities in the exercise, barriers to safe, effective care are identified and process changes can be discussed, agreed and designed out of the system.

Process mapping promotes staff ownership of each stage of the process and enables all stakeholders to input to avoid the ripple effect, whereby a change to one stage of a process adversely affects another stage. Mapping should cross team and department boundaries, revealing the whole process from start to finish, ensuring quality improvements which flow across teams and departments.

Figure 7: Process mapping[7]



Case example:

Healthcare quality issue

Evidence suggested that primary care physicians were not satisfied with communication at transition points between inpatient and ambulatory care and that information was often not provided in a timely manner, omitted essential information or contained ambiguities that put patients at risk.[8]

Method selection

Safe patient transitions depend upon effective and co-ordinated processes and the patient journey was therefore reviewed using process mapping.

Implementation

Process mapping illustrated handover practices in place between ambulatory and inpatient care settings, identifying existing barriers and effective transitions of care and highlighting potential areas for quality improvement. Focus group interviews were conducted to facilitate a process mapping exercise with clinical teams in six academic health centres in the USA, Poland, Sweden, Italy, Spain and the Netherlands. High level processes for patient admission to hospital through the emergency department, inpatient care and discharge back in the community were found to be comparable across sites.

Impact on quality

The process mapping exercise highlighted barriers to providing information to primary care physicians, inaccurate or incomplete information on referral and discharge, a lack of time and priority to collaborate with counterpart colleagues, and a lack of feedback to clinicians involved in handovers. Process mapping was effective in bringing together key stakeholders to make explicit current and required processes, exploring the barriers to and changes necessary for safe and reliable patient transitions, for quality improvement, through process revision.

Further information (full reading list on page 29):

- NHS Institute Improvement, A conventional model of process mapping[i]

7. NHS Institute for Innovation and Improvement, 2008. *A conventional model of process mapping*
8. Johnson, J.K., and Farnan, J.M., et al., 2012. *Searching for the missing pieces between the hospital and primary care: mapping the patient process during care transitions.* British Medical Journal Quality & Safety

Root cause analysis

Use to: Uncover the physical, human and latent causes of events affecting quality.

Most effective: When events affecting quality, are noted and analysis is required to identify the root causes of events, for improvement.

Prerequisites: Events affecting quality and stakeholders.

Overview: Root cause analysis (RCA) is a structured process, often used as a reactive method, to identify causes after an adverse event has occurred, or as an investigative tool to identify causes after clinical audit findings demonstrate shortfalls in the quality of care. However, RCA also affords insights which make it useful as a pro-active method to forecast or predict possible events before they occur, at system or process design or review stage. RCA enables the source of an issue or problem to be identified, so that resources for quality improvement can be appropriately directed towards the true cause of the issue or problem, rather than towards the symptoms. Patient safety RCA investigations should be conducted at a level appropriate and proportionate to the adverse event under review, and should involve all associated stakeholders by way of relevant multidisciplinary team involvement, with remedial action planning and associated audit and re-audit to prevent adverse event recurrence. Where adverse events are significant, affected patients/carers should be invited to take part for their valuable perspective and insight, as appropriate.

How to use it: A tool often used in RCA is the fishbone cause and effect diagram. The fishbone diagram helps identify a broad range of possible causes behind an issue or problem and the associated effects, known as care/service delivery problems (C/SDPs). It can be used to structure a creative thinking session around potential cause categories, placing sticky notes with contributory factors along the spines of the diagram, identifying clusters. With each line of enquiry identified it is helpful to ask 'Why does this happen?' five times, known as 'The Five Whys Technique', to explore causes and remedial actions (see fig.8).

Figure 8: Fishbone cause and effect diagram[9]

Case example:

Healthcare quality issue

Fluctuation in overdue medication dose rates in an acute teaching hospital.[10]

Method selection

Root cause analysis meetings were an essential component of a wider review to identify and investigate the causes of changes in overdue medication dose rates.

Implementation

To investigate the changes in overdue medication dose rates over a four year period in an acute teaching hospital, retrospective time-series analysis of weekly dose administration data was reviewed. Prescription data was extracted from the locally developed electronic prescribing and administration system, with an audit database containing details on every drug prescription and dose administration. Four interventions were implemented at the hospital: (1) the ability for doctors to pause medication doses; (2) clinical dashboards; (3) visual indicators for overdue doses and (4) executive-led overdue doses RCA meetings, at which findings were evaluated for cause and effect, and plans for remedial action were drawn up.

Impact on quality

Missed medication doses decreased significantly upon the introduction of these interventions coupled with overdue doses RCA meetings to drive improvement.

Further information (full reading list on page 29):

- NHS Improvement, Root cause analysis using five whys[i].

9. American Society for Quality, 2014. *Fishbone cause and effect tool*
10. Coleman, J.J. and Hodson, J. et al., 2013. *Missed medication doses in hospitalised patients: a descriptive account of quality improvement measures and time series analysis.* International Journal of Quality in Health Care

Model for improvement

Use to: Decide upon measurable quality improvements required and test and refine them on a small scale, prior to wholesale implementation.

Most effective: When a procedure, process or system needs changing, or a new procedure, process or system is to be introduced, for measurable quality improvement.

Prerequisites: A procedure, process or system which needs changing, or a new procedure, process or system to be introduced for measurable quality improvement and a small cohort of associated stakeholders.

Overview: The model for improvement accelerates improvements in the quality of healthcare processes and outcomes, via two phases:

1. Three fundamental questions, asked and addressed in any order, to define required changes and measures of improvement
2. The plan, do, study, act (PDSA) cycle (see next entry) to test changes in live settings and determine improvements

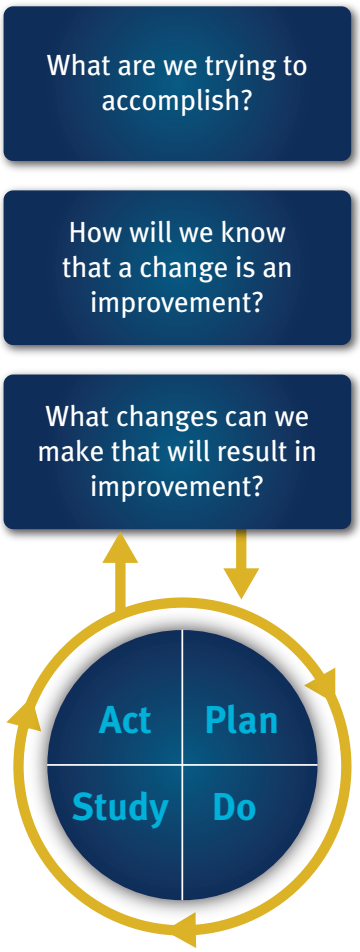
How to use it: With an understanding of the current situation, where problems lie in a process, and what needs to change, quality improvements are designed, tested, measured and refined. For successful quality improvement it is vital that an appropriate stakeholder team is formed as ideas for change arise from the insight of those who work in the system.

Three fundamental questions are answered by the team (see fig.9):

1. **What are we trying to accomplish?** The required quality improvements and specific group of patients that will be affected are defined
2. **How will we know that a change is an improvement?** Time-specific, measurable improvement aims are set
3. **What changes can we make that will result in improvement?** For each change to be tested, specific quantitative measures are established to determine whether or not the changes lead to improvement

Changes are tested using a PDSA cycle on a small scale, in the live setting: planning the change, testing it out, evaluating and acting upon results. After testing, learning and refining through several PDSA cycles, the change is implemented on a wider scale, for example, for an entire pilot population or hospital.

Figure 9: The Model for Improvement[11]



Case example:

Healthcare quality issue

A hospital wished to introduce a quality improvement programme to reduce preventable harm, using high-reliability practices and microsystem-based multidisciplinary teams.[12]

Method selection

The model for improvement was chosen in order to introduce high-reliability practices and microsystem-based multidisciplinary teams, to reduce preventable harm and to evaluate and measure the changes introduced through PDSA cycles.

Implementation

Change packages were devised by a group of stakeholders using the model for improvement, answering the three fundamental questions to: define the required quality improvements (reduction in preventable harm events), the group of patients to be affected (hospital-wide), set time-specific, measurable improvement aims (preventable harm events to decrease year on year), and for each change to be tested, to establish specific quantitative measures to determine whether or not the changes led to improvement (decrease in serious safety event rate and hospital mortality rate). Extensive error prevention training was provided for employees in using high-reliability practices in microsystem-based multidisciplinary teams. The impact of the change packages was evaluated through PDSA cycles, coupled with specific quantitative measures defined to establish whether changes implemented had led to improvement.

Impact on quality

Preventable harm events decreased by 53%, from a quarterly peak of 150 in the first quarter of 2010, to 71 in the fourth quarter of 2012. Further substantial reductions in serious safety event rate and hospital mortality rate were seen after wide scale implementation of the change packages.

Further information (full reading list on page 29):

- Institute for Healthcare Improvement, Model for improvement[i]

11. Institute for Healthcare Improvement, 2012. *Model for Improvement*
12. Brilli, R.J., and McClead, R.E.Jr., et al., 2013. *A comprehensive patient safety program can significantly reduce preventable harm, associated costs, and hospital mortality.* Journal of Pediatrics

Plan do study act

Use to: Introduce and test potential quality improvements and refine them on a small scale, prior to wholesale implementation.

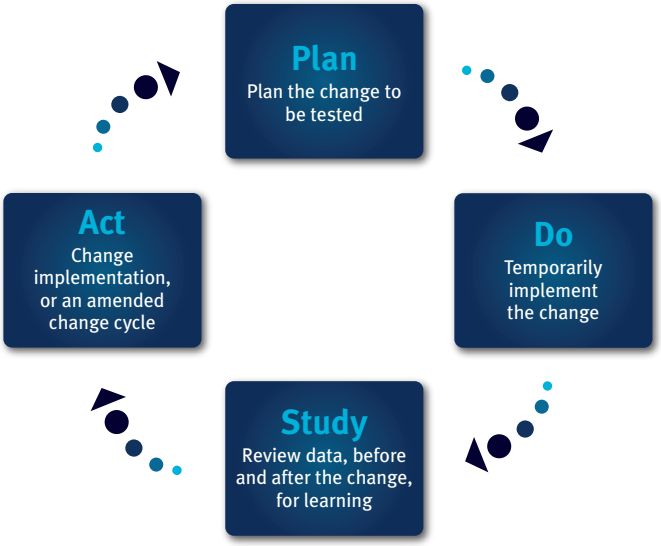
Most effective: When a procedure, process or system needs changing, or a new procedure, process or system is to be introduced.

Prerequisites: A procedure, process or system which needs changing, or a new procedure, process or system to be introduced and a small cohort of associated stakeholders.

Overview: Plan, do, study, act (PDSA) cycles test changes to assess their impact, ensuring new ideas improve quality before implementation on a wider scale. Making changes to processes can give unexpected results, so it is safer and more efficient to test quality improvements on a small scale before wholesale implementation, allowing a sample of stakeholders involved to assess the proposed changes in action. Such small scale change introduction also enables interactions with other systems to be tested without causing large scale disruption to service quality, for example, completing a new patient assessment proforma with a limited group of patients before using the proforma for all patients.

How to use it: A procedure, process or system which needs changing, or a new procedure, process or system to be introduced is developed (plan), implemented for a specific timeframe on a small scale with a minimal cohort of stakeholders (do), evaluated (study) and adjusted (act), with repeated PDSA cycles, until it is fit for purpose and wholesale implementation. Involving stakeholders in all four stages of the PDSA cycle fosters engagement with changes proposed and enables input for adjustment where potential users are aware of barriers to change (see fig.10).

Figure 10: The four stages of the plan, do, study, act quality improvement cycle



Case example:

Healthcare quality issue

A multidisciplinary team from an infectious diseases unit were keen to introduce care bundles for central venous catheters to their hospital, in the light of the international success of care bundles in reducing catheter-related bloodstream infection.[13]

Method selection

PDSA cycles were chosen in order to introduce changes to central venous catheter care on a small scale, and to evaluate these changes before further adjustment and PDSA cycles, until fit for wide scale implementation.

Implementation

A care bundle for peripheral venous catheters (PVCs) based on drafts developed nationally was introduced to an intensive care ward. A senior medical student collected care bundle percentage compliance data weekly for each patient. Data consisted of measures to assess clinical performance for insertion (recording date, indication and location) and maintenance (daily review of necessity, clinical appearance of site, duration less than 72 hours and timely removal). The medical student carried out monthly PDSA cycles, evaluating and adjusting the PVC care bundle design where shortfalls in compliance were identified, and displaying and sharing the results and required changes on the ward until percentage compliance rates were satisfactory. Weekly evaluation and feedback was shared, with monthly patient safety meetings to discuss issues with compliance. Significant improvement in PVC management within this single hospital ward was demonstrated and in order to improve the quality of PVC management organisation-wide the PVC care bundle was implemented throughout the hospital.

Impact on quality

The initial care bundle compliance rate of 54% gradually improved to 82% on the intensive care ward through a series of PDSA cycles. This was attributed to multiple quality improvement interventions including daily assessment of PVC necessity, weekly evaluation and feedback, monthly patient safety meetings to discuss issues with compliance, the introduction of new PVC dressings and the promotion of new PVC care plans, subsequently implemented across the organisation.

Further information (full reading list on page 29):

- NHS Improvement, Plan do study act (PDSA) and the model for improvement[ii]
- Institute for Healthcare Improvement, Plan do study act work sheet[ii]

13. Boyd, S., and Aggarwal, I., et al., 2011. *Peripheral intravenous catheters: the road to quality improvement and safer patient care.* Journal of Hospital Infection

Lean/Six sigma

Use to: Analyse healthcare systems to eliminate waste and redirect resources towards a more efficient, improved and consistent quality of care.

Most effective: When healthcare systems are inefficient, wasteful and inconsistent in quality of care.

Prerequisites: A procedure, process or system which needs changing to become more efficient and consistent and associated stakeholders.

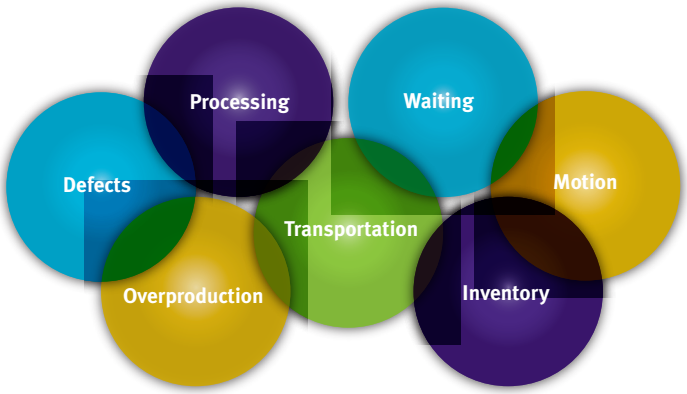
Overview: Lean seeks to improve flow in the value stream and eliminate waste. Six sigma uses the framework Define, measure, analyse, improve and control (DMAIC), with statistical tools, to uncover and understand root causes of variation and reduce them. Repeatability and reduced variation in healthcare services helps ensure a consistently high quality experience for patients, whilst waste reduction enables resources to be used where they are most effective. A combination of Lean and Six sigma provides a structured approach to quality improvement with effective problem-solving tools. Rapid transformational improvement results, with cost savings.

How to use it: Lean uses **process mapping** with associated stakeholders to identify inefficiencies affecting the quality of care, enabling action planning for improvement (see fig.11). Process mapping with Lean adjustment eliminates activity carried out 'just-in-case' or in a batch, holding excess inventory, waiting patients, excess transportation, defects, unnecessary staff movement, and unnecessary processing. In Six sigma, DMAIC and control charts are used to study adjusted processes over time. DMAIC is comprised of:

- **Define:** state the problem, specify the patient group, identify goals and outline the target process
- **Measure:** decide the parameters to be quantified and the best way to measure them, collect the necessary baseline data and measure after changes have been made
- **Analyse**: identify gaps between actual performance and goals, determine the causes of those gaps, determine how process inputs affect outputs, and rank improvement opportunities
- **Improve:** devise potential solutions, identify solutions that are easiest to implement, test hypothetical solutions and implement required improvements
- **Control:** share a detailed solution monitoring plan, observe implemented improvements for success, update on a regular basis and maintain a training routine

Statistical process control charts are combined with DMAIC, whereby data are plotted chronologically, with a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit, determined from historical data. By comparing current data with these lines after adjusted processes, conclusions are drawn about process variation. Such studies identify areas for improvement to ensure consistency of quality in health care, ultimately improving the patient experience.

Figure 11: Lean elimination of waste



Case example:

Healthcare quality issue

Surgical disruption was known to prolong session times, affect quality of patient care, increase waiting lists, cause surgical error and found to be costly.[14]

Method selection

Lean process mapping was chosen to eliminate waste and redirect resources towards a more efficient, improved and consistent quality of care.

Implementation

A study was carried out using Lean process mapping principles to identify the sources of preventable disruption affecting perioperative process time and to effectively reduce it. Events inside and outside operating rooms that disturbed the operative time were recorded for 31 elective surgeries over a period of five months. Disruption events were classified and the findings were reviewed by surgical teams.

Impact on quality

Preventable disruption had caused an increase in surgical time of approximately 25% and Lean process mapping revealed poor information flow, failure to follow concepts of a methods study, lack of communication, lack of coordination, and failure to follow the principles of motion economy. The study enabled remedial action to reduce operative time considerably for patients, ease the pressure of emergency cases, reduce waiting lists for elective surgery, increase operating room utilisation and reduce medical errors.

Further information (full reading list on page 29):

- NHS Improvement, Vital signs: an improvement practice[i]
- NHS Improvement, Lean Six Sigma: some basic concepts[ii]

14. Al-Hakim, L. and Gong, X.Y., 2012. *On the day of surgery: how long does preventable disruption prolong the patient journey?* International Journal of Health Care Quality Assurance

Technological innovations

Use to: Automate processes and systems to increase reliability, reduce human error and variation in care, for quality improvement.

Most effective: When processes and systems require automation for reliability, ultimately saving resources.

Prerequisites: Processes and systems which require reliability and reduced variation, stakeholders such as clinicians, information governance and IT specialists.

Overview: Technological innovations automate processes and systems, offer reliability, reduce human error, and variation in care, and thus drive quality improvement. Life expectancy has increased and the healthcare system faces future crises with elderly care provision, a predicted rise in dementia diagnoses, obesity and associated conditions such as diabetes and cardiovascular disease and the need for wise use of limited resources. Efficiencies through technology are therefore vital to the sustainability of high quality healthcare provision.

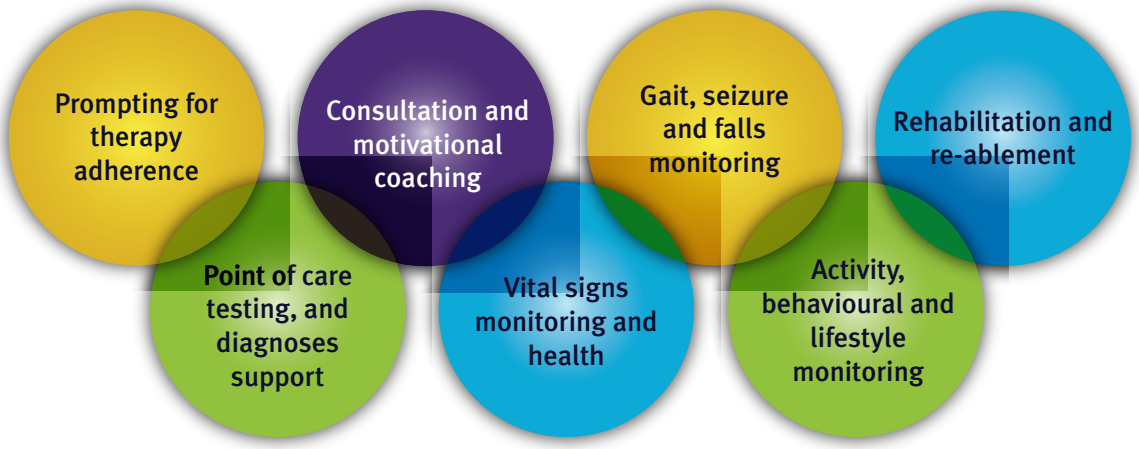
How to use it: Growth in the telehealth, telemedicine and telecare sectors, whereby technologies and related services concerned with health and wellbeing are accessed by people remotely, or provided for them at a distance, reduces time absorbed through routine appointments. It also enables patients to move from a state of dependency towards more flexible and empowered self-care arrangements, improving quality of life and healthcare experience.[15] Technological innovations can incorporate alarms and early warning alerts where deterioration in patient health occurs, preventing serious decline.

Technological innovations and interventions have the power to improve and streamline the quality of care for patients of all ages and demographics, affording convenience and accessibility, and enabling patients to normalise and prevent medical conditions.

The move towards integrated electronic healthcare records affords shared real time data retrieval, active safety warnings and mandatory searchable fields, and sets the platform for further technological innovations to efficiently and effectively improve the quality of healthcare (see fig.12).

15. TeleSCoPE, 2014. *Telehealth services code of practice for europe*

Figure 12: Remote technologies for healthcare quality improvement



Case example:

Healthcare quality issue

The quality, timeliness and cost of outpatient surgical processes in hospitals were found to be adversely affected by problems in locating supplies and equipment and by post-operative infections.[16]

Method selection

Radio Frequency Identification (RFID) technology, the wireless use of electromagnetic fields to track data and equipment, automates identification systems to increase reliability and reduce human error and variation in care, for quality, timeliness and cost improvement.

Implementation

A study was designed to research the benefits of implementing RFID, limiting scope to outpatient surgical processes in hospitals. The study used the Define, measure, analyse, improve, control (DMAIC) approach (see previous Lean/Six sigma entry), work flow diagrams, value stream mapping and discrete event simulation, to examine the impact of implementing RFID equipment tracking on improving the effectiveness (quality and timeliness) and efficiency (cost reduction), of outpatient surgical processes.

Impact on quality

The study analysis showed significant estimated annual cost and time savings in carrying out surgical procedures with RFID technology implementation, largely due to the elimination of non-value added activities: locating supplies and equipment, and the elimination of the "return" loop created by preventable post-operative infections. Several fail-safes developed using RFID technology improved patient safety, the cost effectiveness of operations and the success of outpatient surgical procedures. Many stakeholders in the hospital environment were positively affected by the use of RFID technology, including patients, physicians, nurses, technicians and administrators. Computations of costs and savings helped decision makers understand the benefits of the technology.

Further information (full reading list on page 29):

- NHS Improvement, Digitilisation[i]
- NHS Digital, NHS interoperability toolkit[ii]

16. Southard, P.B. and Chandra, C. et al., 2012. *RFID in healthcare: a Six sigma DMAIC and simulation case study. International journal of health care quality assurance*

Decision trees

Use to: Improve the quality and consistency of processes in healthcare.

Most effective: When decisions around healthcare options require consistency of approach.

Prerequisites: A healthcare pathway and stakeholders.

Overview: A decision tree is a flowchart whereby each intersection represents a test and each branch represents the outcome of the test, designed by stakeholders of a multidisciplinary team to improve quality and consistency of decisions taken throughout a process.

How to use it: Decision trees can be applied in healthcare when choices for treatment are uncertain, providing clear choices such as diagnostics, referrals, medication and next steps, involving established algorithms and healthcare criteria.

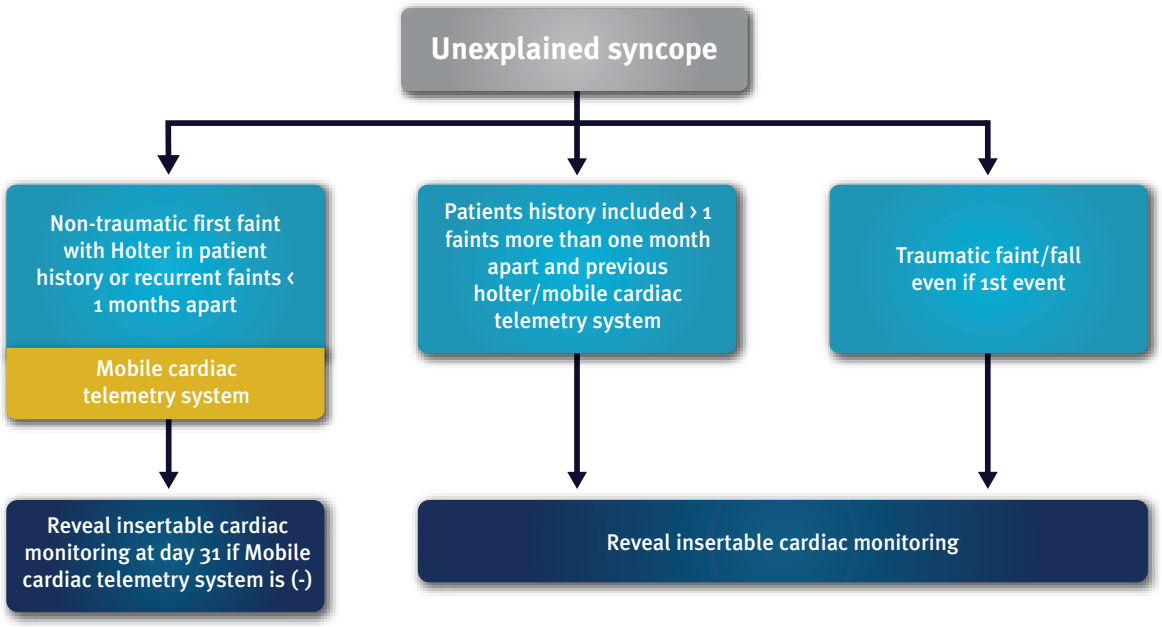
Decision trees allow clinicians and patients alike to identify the most favourable treatment options, and may also include the risks and benefits of each treatment and the potential sequence of events where risks are realised, improving the quality of care.

As tools to support quality improvement in healthcare, decision trees are clear and intuitive and can usefully feature in patient information materials.

Care pathways may be structured using decision trees, helpful in ensuring patients with similar clinical pictures undergo the same journey. Healthcare records may also be designed using the decision tree approach and electronic healthcare records can automate clinical pathways, supporting consistency of quality of care.

Decision tree design requires input from relevant stakeholders to be effective, along with patients for service user insight and when mapped out electronically with corresponding outcomes, values and probabilities, after rigorous testing decision trees become powerful tools in supporting the best healthcare choices for patients (see fig.13).

Figure 13: Decision tree[17]



Case example:

Healthcare quality issue

It was noted that among patients who were discharged from a hospital emergency department (ED), about 3% returned within 30 days.[18]

Method selection

A decision tree was chosen to guide decisions around healthcare options on discharge, with consistency of approach.

Implementation

A decision tree based model with electronic medical record features was developed and validated, estimating the ED 30-day revisit risk for all patients approaching discharge from ED. A retrospective cohort of 293,461 ED encounters was assembled, with the associated patients' demographic information and one-year clinical histories as the inputs. To validate, a prospective cohort of 193,886 encounters was constructed. Cluster analysis of high-risk patients identified discrete sub-populations with distinctive demographic, clinical and resource utilisation patterns, which were incorporated into the ED discharge decision tree.

Impact on quality

Revisits were found to relate to the nature of the disease, medical errors, and/or inadequate diagnoses and treatment during the patient initial ED visit. Identification of high-risk patients using the decision tree enabled new strategies for improved ED care with reduced ED resource utilisation. The ED 30-day revisit decision tree model was incorporated into the electronic health record, and uncovered opportunities for targeted care intervention to reduce resource burden, and most importantly to improve the quality of care and patient health outcomes.

17. Medtronics, 2014. *Decision Tree: Syncope*

18. Hao, S. and Jin, B., et al, 2014. *Risk prediction of emergency department revisit 30 days post discharge: a prospective study.* PLOS ONE Journal

Communication tools

Use to: Improve the quality of care through the structured exchange of essential information.

Most effective: When essential information requires rapid transfer.

Prerequisites: Essential information data set and stakeholders.

Overview: Clear communication in healthcare is essential and carefully designed tools can help ensure comprehensive, complete and consistent communication to improve the quality of care.

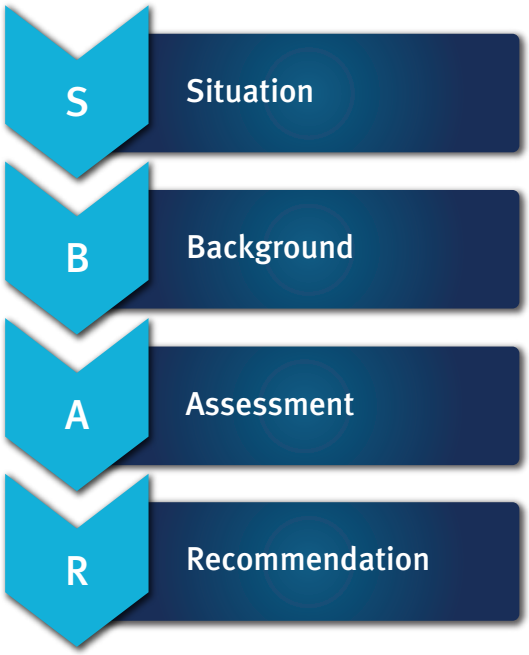
How to use it: Structured communication tools improve the consistency of exchange of essential information between clinicians, and between clinicians and patients and their relatives and carers.

Communication tools are numerous and include patient healthcare records, patient information leaflets and guidance, structured patient consultations, active listening techniques and prompts to encourage patients to ask questions about their care.

One such communication aid is the Situation, background, assessment, recommendation (SBAR) tool, which can be used to shape communication at any stage of the patient's journey, from the content of a GP's referral letter, consultant to consultant referrals, ward to ward transfers, handover of care at shift change, or communicating discharge back to a GP.

The tool enables staff in a clinical setting to make recommendations based upon the current situation, the patient's medical background and an assessment of the current situation (see fig.14).

Figure 14: Situation, background, assessment, recommendation (SBAR)



Case example:

Healthcare quality issue

A group of Macmillan Cancer Support General Practitioner (GP) advisers had been receiving multiple forms of patient status communication from colleagues in secondary care, lacking a cancer diagnosis, treatment summary and ongoing management plan.[19]

Method selection

Effective communication is a key element of quality of care for patients with advanced and serious illness, and to improve the situation, a Treatment summary template was designed by the National cancer survivorship initiative (NCSI), incorporating all the information deemed necessary by stakeholders.

Implementation

The treatment summary was introduced, completed by secondary cancer care professionals at conclusion of treatment, and sent to the patient's GP. It provided important information for GPs, including patient's cancer diagnosis, treatment, an ongoing management plan, possible treatment toxicities, information about side effects and/or consequences of treatment, and signs and symptoms of a recurrence. It also informed GPs of any actions they needed to take and who to contact with any questions or concerns. The patient also received a copy to improve understanding of their condition and to share with other professionals and agents of their choice, e.g. for travel insurance purposes.

Impact on quality

The treatment summary was positively received in both primary and secondary care; 80% of GPs found the summary 'useful' or 'very useful', more than 50% felt it would make a difference to the way they managed patients, and 90% wanted to continue using it. The majority of hospital clinicians recognised the value of recording what could be months of treatment and holistic care into a concise summary.

Further information (full reading list on page 29):

- NHS Improvement, SBAR communication tool – Situation – Background – Assessment - Recommendation[i]

19. Macmillan Cancer Support, 2010. *Treatment summary: a tool to improve communication between cancer services and primary care*

Further reading list

Involving people in quality improvement: Page 4

i. HQIP, 2020. *Patient and public involvement in clinical audit*
ii. HQIP, 2020. *A guide to developing a patient panel in clinical audit*
iii. NHS Improvement, Patient experience framework, June 2018[iii]
iv. NHS Institute for Innovation and Improvement: The experience based design (EBD) approach, July 2017
v. NHS England, 2019. *Patient led assessments of the care environment*

Quality improvement collaboratives: Page 5

i. IHI Breakthrough collaborative series
ii. NHS Improving Quality, 2008. *Patient safety collaboratives*

Clinical audit: Page 7

i. HQIP, 2015. *Clinical audit: a guide for NHS boards and partners*
ii. HQIP, 2015. *Good governance handbook*
iii. National Institute for Health and Care Excellence (NICE), 2014. *Clinical audit tools*

Statistical process control: Page 9

i. NHS Improvement making data count

Performance benchmarking: Page 11

i. NHS Improvement, 2008. *Balanced scorecard*

Process mapping: Page 13

i. NHS Improvement, *A conventional model of process mapping*

Root cause analysis: Page 15

i. NHS Improvement, 2008. *Root cause analysis using five whys*

Model for improvement: Page 17

i. Institute for Healthcare Improvement, 2012. *Model for improvement*

Plan do study act: Page 19

i. NHS Improvement, 2008. *Plan do study act*
ii. Institute for Healthcare Improvement, 2013. *Plan do study act work sheet*

Lean & Six sigma: Page 21

i. NHS Improvement, *Vital signs: an improvement practice*
ii. NHS Improvement, *Lean Six Sigma: some basic concepts*

Technological innovations: Page 23

i. NHS Institute Improvement, *Digitilisation*
ii. NHS Digital, *NHS interoperability toolkit*

Communication tools: Page 27

i. NHS Improvement, *SBAR communication tool*

Further information is available at: www.hqip.org.uk

ISBN NO 978-1-907561-05-4

Dawson House, 5 Jewry Street, London, EC3N 2EX

T 020 3857 5030
E communications@hqip.org.uk

www.hqip.org.uk

Registered Office: 70 Wimpole Street, London W1G 8AX
Registration No. 6498947
Registered Charity Number: 1127049

December 2020