

THE **NHG Quality
Improvement**
TOOLKIT



Foreword

As we present this handbook, I am reminded of the enduring wisdom in Albert Einstein's words: "We cannot solve our problems with the same thinking we used when we created them".

In the ever-evolving landscape of healthcare, our commitment to quality and safety remains unwavering.

Despite the remarkable advancements in medical science and technology, we continue to face challenges in the form of errors and adverse events. It is precisely these challenges that underscore the critical importance of quality improvement tools to redesign our systems, enhance reliability and ultimately, improve patient outcomes.

I encourage all members of our healthcare community to embrace the principles and practices outlined in this handbook. By doing so, we not only address current challenges but also proactively work towards preventing future adverse events.

Together, we can create a healthcare system that is not only responsive to problems but also resilient in preventing them.

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Group Chief Quality Officer
National Healthcare Group

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Group Quality.

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Introduction



What is Quality Improvement?

Quality healthcare has been defined as “doing the right thing, at the right time, in the right way, for the right person at the lowest possible cost – and having the best possible results.”

Healthcare delivery is a complex system made up of many interlinked and inter-dependent processes, involving many professional care providers. Problems and lapses may arise due to poor planning of these processes, poor execution or the transition from one step to the next. These problems may result in the failure to address patients’ requirements of healthcare services or the failure to do so at the lowest possible cost.

Quality improvement is about the use of scientific methods to understand problems in our system of care and improve the processes that underlie them. Broadly, it involves the development, testing and implementation of small-scale interventions to improve clinical practice.

The goal of this toolkit is to provide you with sufficient information to understand the fundamentals of quality improvement and the basics of improvement methodologies and tools.

Why Quality Improvement?

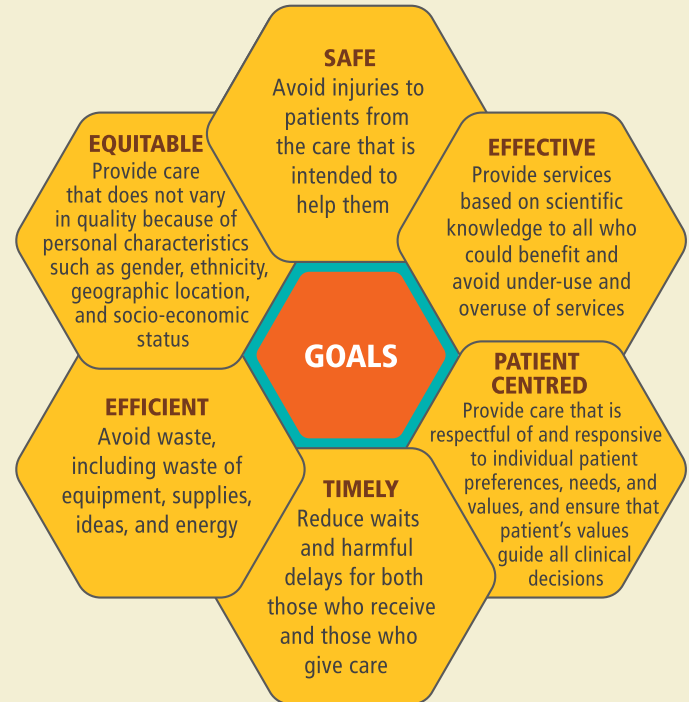
Quality and safety is a priority in NHG. We aim to do our best, so that our patients receive the best care possible. Quality improvement is important so that we can reduce errors and preventable harm, promote the use of evidence-based medicine, improve the timeliness of care, eliminate waste, ensure optimal clinical outcomes for your patients, and increase patient and family satisfaction.

Having great components within the healthcare system (i.e. medicines, technologies and clinicians) is not enough. We need to make them fit together to achieve better outcomes. By analysing work processes and their linkages, we can find opportunities for improvement.

Quality improvement must be an integral part of our job.

Goals of Quality Improvement

The Institute of Medicine (IOM) has proposed six aims for healthcare, specifying that it should be:



The Model for Improvement

The Model for Improvement is a simple yet powerful tool to accelerate improvement in clinical processes. It addresses three fundamental questions:

- What are we trying to accomplish? (p. 13)
- How will we know if a change is an improvement? (p.17)
- What changes can we make that will result in improvement? (p.22)

It also helps you to test changes on a small scale through the use of Plan-Do-Study-Act (PDSA) cycles.

Plan: Develop an Action Plan

Plan means to create an action plan for testing a change. It involves defining the problem, collecting data, establishing a baseline, identifying causes to the problem, determining solutions, and understanding how the process and outcomes of the action plan will be measured.

Do: Implement Solutions

Do means to implement the pilot test, carry out the change, document observations and collect actual performance data.

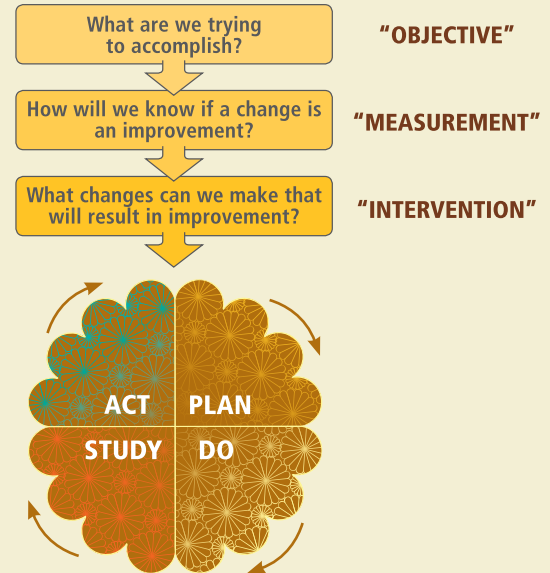
Study: Verify Results

Study involves analysing the effect of the change by comparing actual performance to desired performance targets and to the baseline.

Act: Make Adjustments to the Action Plan

Act is about adopting, modifying, receiving feedback, reflecting and learning. If the pilot test is not successful, the cycle repeats (i.e. next PDSA). Changes that are successful are monitored for effectiveness before they are made part of standard operating procedures.

Improvement is the result of a continual series of short PDSA cycles made in a systematic fashion, built on previous results, that leads to a steady improvement in process over time.

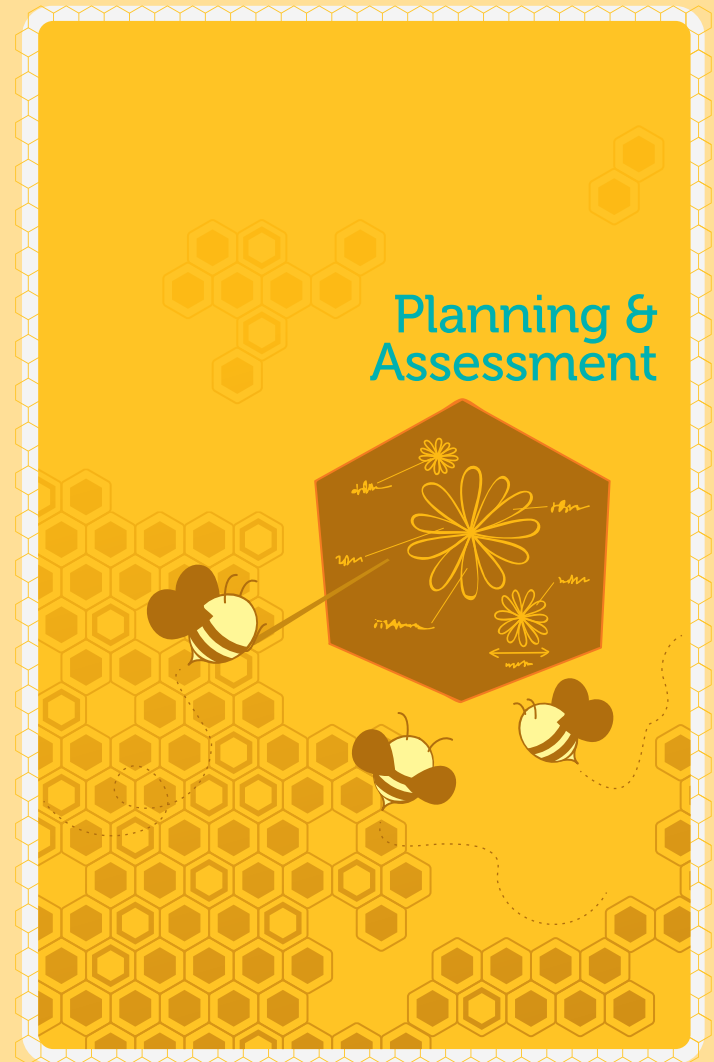


The Use of Quality Improvement Tools

Quality improvement tools facilitate the process of improvement and are useful in:

- Understanding processes and possible causes of problems
- Gathering information
- Displaying information and testing theories
- Understanding variation and relationships
- Monitoring processes after changes have been implemented

Although quality improvement tools may be effective in problem solving, they are only instruments for implementing improvement work. What is critical is the proper selection and application of these tools.





Identifying an Opportunity for Improvement

Opportunities for improvement may be identified by conducting needs assessments and surveys, by observation, by listening to the complaints of patients and families, by “shadowing” patients and families, by rounding (i.e. visits or feedback checks on patients) or by waste identification. Other sources include: benchmarking, clinical indicators, adverse events data, and incident reports.

In any improvement project, it is important that you select a process that:

- Has supporting data verifying the existence of a problem
- Has direct impact on patients
- Occurs on a regular basis
- Is not undergoing major transitions or being studied in another project
- Is relatively simple, with clearly defined start and end points

A literature search may be useful for identifying best practices for the problem being studied and gaps in current practice. It is important to learn how to localise ideas and solutions that have worked elsewhere in your own work environment. This can help you to avoid “reinventing the wheel”.

Organising a Team

Improving a process often requires that people from different work areas and hierarchical levels think and work together. Major gains in quality result from the pooling of skills, talents and knowledge.

In organising a team to drive improvement, there are three types of expertise and responsibility that should be considered: senior leadership, day-to-day leadership, and technical expertise. It is also important to partner colleagues from multiple disciplines to ensure that all aspects of the problem are examined. An optimal group size is around five to nine members.

Some of the important attributes of a team and its members include:

- Multi-disciplinary
- Involved in the process, equipped with core knowledge
- Engaged, willing and adaptable
- Mutual trust among members
- Have a shared mental model

Identifying Key Customers and Their Expectations

The primary focus of quality is the customer – both internal and external. Internal customers are those who are part of the healthcare delivery process, while external customers are those who receive healthcare, i.e. patients, families, and the general community.

You need to know clearly who your primary internal and external customers are, their requirements, expectations and needs. Customers can give you insights to the parts of the process that work or don't work, and the parts which they think are important or essential. Customer input can be sought through surveys, telephone interviews and focus groups. The key is to listen to your customers to understand what they need.

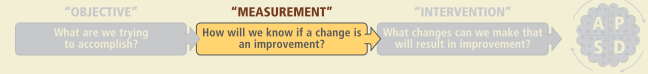
Setting the Aim

In setting an aim for the project, consider these four things:

- Ideas, processes or systems involved
- Target population
- Time frame
- Target level of performance

Setting an aim and achieving agreement on the aim are essential. This allows everyone on the team to be focused on the same problem to be solved.

An aim should be specific, unambiguous and focused, time scheduled, with numeric goals to direct measurement. Once the aim has been set, the team should be careful not to drift away from it, but also be prepared to refocus it when necessary.



Establishing Measures, Performance Baseline and Collecting Data

Measures tell the team whether the changes they are making actually lead to improvement. Process measures monitor the completion of steps in a process, while outcome measures track its results.

Before any improvement project, it is important to determine the current level of performance by collecting data. You need to base decisions on data that are free from measurement errors. Operational definitions (i.e. how a concept is measured and applied) and procedures should also be developed for consistency. Good data must be reliable, valid, and unbiased so that the effectiveness of other quality improvement tools can be maximised.

In the collection of data, you should start with a plan that includes:

- What data will be collected
- How they will be collected
- Why are they collected
- Who will collect them
- When and where they will be collected

Check Sheet (or Tally Sheet)

What is it?

A check sheet or tally sheet is a simple data collection form in which the occurrence of some event or behaviour is systematically recorded and tallied.

When do you use it?

Check sheets are appropriate for use when the data can be observed and collected repeatedly by either the same person or at the same location.

How do you use it?

- Ensure that your check sheets are clear, simple to use, with no more than 10 categories against which to make tally marks.
- Develop operational definitions so that the categories are interpreted in the same way.
- Incorporate a visual element to get information from the data without having to do any calculations.

EVENT	TALLY OF OCCURRENCES					
	Day 1	Day 2	Day 3	Day 4	Day 5	SubTotal
Cause 1	III	II	I	II	II	10
Cause 2	HHH	HHH I	IIII	III	HHH I	24
Cause 3	I	II	I	II	I	7
Cause 4	III	III	HHH I	IIII	HHH	21
Counts of Event	12	13	12	11	14	62

Run Chart (Baseline)

What is it?

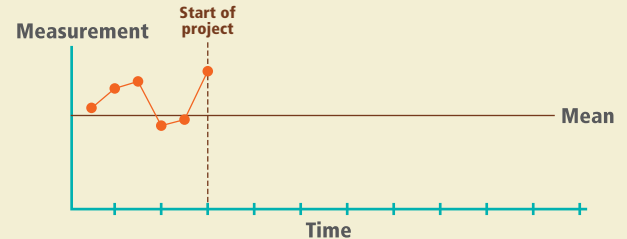
A baseline run chart plots data points on a graph to present a baseline measure, before the start of an improvement project.

When do you use it?

A baseline measure allows you to track progress over time and subsequently helps you to determine if your interventions result in improvement over time.

How do you use it?

- Label the horizontal axis with the unit of time, and the vertical axis with the measure of interest.
- Plot the data values.
- Calculate the mean of the plotted points and draw the line on the graph.



See Page 48 for Run Chart (Annotated)

Histogram

What is it?

A histogram shows the frequency distribution of a set of continuous data and displays the pattern of variation in a process.

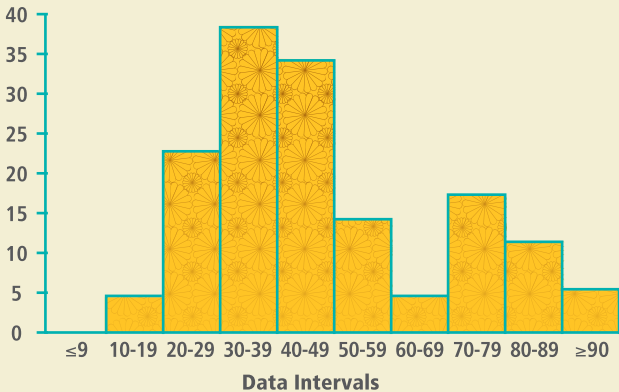
When do you use it?

Histograms can be used to show the distribution (shape and spread) of continuous variable data for analysis of patterns.

How do you use it?

- Calculate the range of the data and decide on the number of data intervals.
- Determine the interval boundaries by dividing the range by the number of intervals.
- Array vertical bars on the horizontal axis. The length of the bars shows the number of data points falling within that interval.

Number of Data Points



Scatter Diagram

What is it?

A scatter diagram illustrates the relationship between two variables. If they are unrelated, the points will be randomly scattered. If they have positive (negative) correlation, the points will cluster in an area running from lower (upper) left to upper (lower) right.

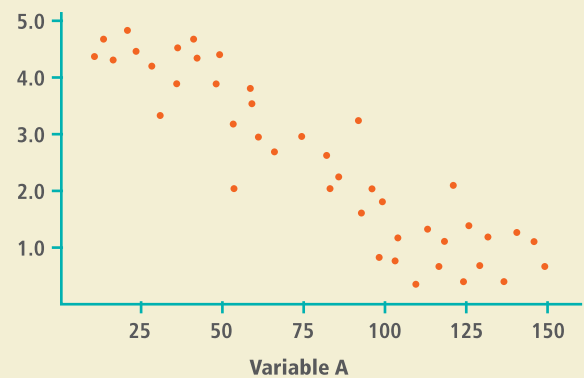
When do you use it?

Scatter plots are used when you want to compare two continuous variable data items to see if there is a relationship between them.

How do you use it?

- Collect 50 to 100 paired samples of data and record them on the data sheet.
- Plot the variables against the axes and look for patterns made by the dots.

Variable B





Diagnosing the Problem

Having decided on the problem or process to be investigated, set aims to define the boundaries of the project, and established the baseline measure, the next phase is to determine the causes of the problem.

Do not fall into the trap of taking short cuts at this juncture. Many teams have the tendency to decide on the solution to a problem early in the improvement process before the real problem is identified. You need to accurately establish the nature and extent of the problem to identify the most appropriate solutions.

Flowchart

Developing a flowchart of the current process is one of the first tasks the team should undertake. The ability to improve a process will depend largely on how well the team understands the process.

What is it?

A flowchart depicts the sequence of steps performed in a specific clinical, administrative or operational process. It helps you to investigate each aspect of the process, identify inefficiencies, and see more clearly the complexity of the process and the opportunities for improvement.

When do you use it?

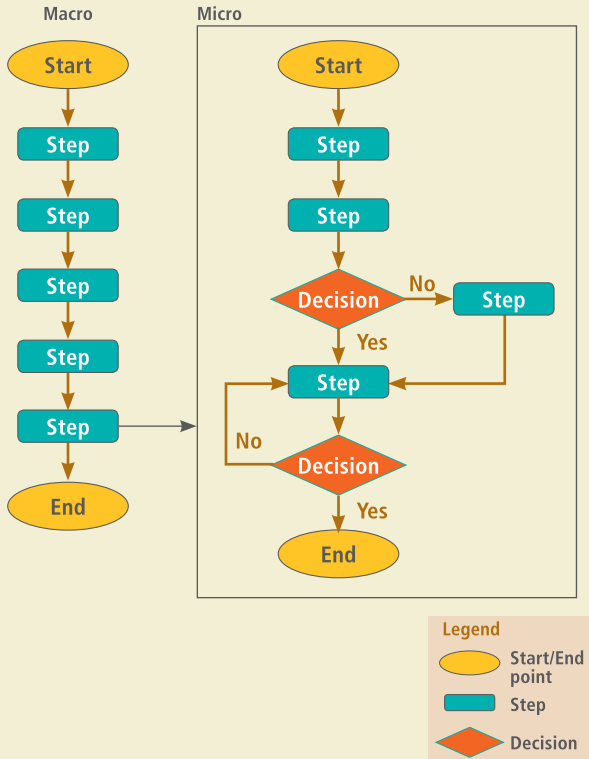
A flowchart can be used when designing new processes, when identifying problems or analysing them to determine causes, and when planning for solutions.

How do you use it?

- Decide on the start and end points of a process.
- Record all the activities and decision points involved in the process and arrange them in sequence.
- The start and end of the process are drawn in oval symbols. The actions involved are drawn in rectangular boxes. The points of decision-making are denoted by diamond symbols.
- Connect the steps with arrows to indicate the process flow.

Macro vs. Micro Flowchart

A macro flowchart shows the major blocks of activity in a process. A micro flowchart, on the other hand, is a close-up view of the process and is useful in identifying rework loops and complexity in a process.



Brainstorming

What is it?

Brainstorming is a structured approach to generate a large number of ideas in a short time, and it is useful in getting every member of the team to participate.

When do you use it?

Brainstorming can be used in identifying possible causes of problems, generating solutions to problems, and identifying reasons for resistance to implementation.

How do you use it?

- Establish the purpose and topic of the brainstorm.
- Everyone is given a minute or two of silence to think about the issue.
- Team members then write down their ideas individually on sticky notes.
- All ideas are collated after everyone in the team has run out of ideas.

[Note that there should not be any criticism, discussion or evaluation of ideas during the brainstorming exercise.]

Affinity Diagram

What is it?

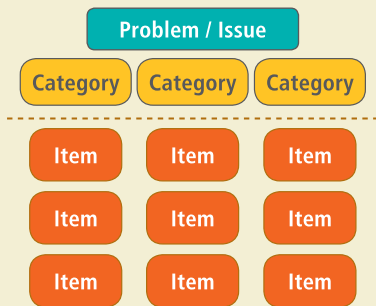
An affinity diagram is used to bring order to the ideas or issues generated in a brainstorm by sorting them into meaningful groups with appropriate headings.

When do you use it?

An affinity diagram is useful when the team is confronted with many ideas or when the issues seem too large and complex to grasp.

How do you use it?

- Sort similar items into groups by asking if a particular item is connected to any of the rest.
- Move the items around, combine or remove them until consensus is reached.
- Discuss the shared meaning of each group and create headers.



Root Cause Analysis (5 Whys)

In quality improvement, addressing the root causes of a problem rather than its symptoms is necessary for developing permanent solutions.

What is it?

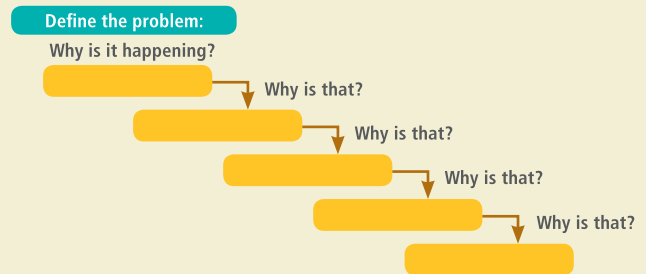
The 5 Whys is a simple root cause analysis tool for solving problems. By repeatedly asking the question “why”, you can peel away the layers of an issue, get to the origin of the problem, and uncover its root causes and their relationship.

When do you use it?

This tool is used when you need to identify the source of an issue, so as to focus resources in the correct areas.

How do you use it?

- Write down the specific problem.
- Ask why it occurs, then write the answer down. Continue to ask “why” until the root cause of the problem has been identified. This may take fewer or more than five “whys”.



Cause-and-Effect Diagram

What is it?

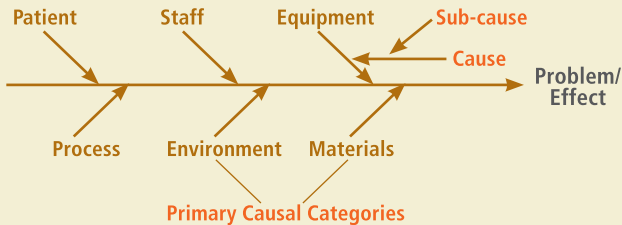
A cause-and-effect diagram is a pictorial display of a list of possible causes of an identified problem or effect.

When do you use it?

A cause-and-effect diagram is used to help the team generate possible causes of a problem, classify them and drill down to the root causes. It establishes causality between the problem and its possible causes.

How do you use it?

- Describe an identified problem or effect at the right of the diagram, with a large arrow pointing to it.
- Denote branches off this arrow with the main categories of potential causes, such as process, environment, patient, materials, equipment, and staff.
- Explore specific causes of the problem for each causal category. Draw smaller arrows, representing sub-categories, from each main branch. Continue branching off until the end points are measurable.



Verifying Causes with Data

After identifying possible causes of the problem, you need to have existing relevant data that could help you determine the actual causes. Collect additional information or data if necessary and check your conclusions about causes with those knowledgeable about the process.

Multi-Voting

The Pareto Principle states that in any group of things that contribute to a common effect, 80% of the consequences stem from 20% of the causes. Multi-voting can therefore be used to help the team obtain a prioritised list of root causes or a Pareto diagram.

What is it?

Multi-voting involves several rounds of voting to select, with limited discussion and difficulty, the most important or popular items from a list.

When do you use it?

When the team is presented with many choices, voting by the simple majority rule may not be the best method for identifying the top few options for immediate attention. Multi-voting helps to reduce the list of options to a manageable number.

How do you use it?

- First round voting: Number each option (e.g. 1 to 25). Each team member gets votes equivalent to half the number of options (e.g. 12), and distributes votes across all options – only one vote to one option. Tally the number of votes for each option and those with no votes are eliminated.
- Second round of voting: Count and number the remaining options. Each team member gets votes equivalent to one third the number of options and distributes votes across all options – one or more votes to each option. The top few options can then be plotted in a Pareto diagram.

Pareto Diagram

What is it?

A Pareto diagram displays the factors that contribute to an overall effect according to their magnitude of effect. This ordering differentiates the “vital few” (the factors that have the greatest impact) from the “useful many” (factors that, while useful to know about, have a relatively smaller effect).

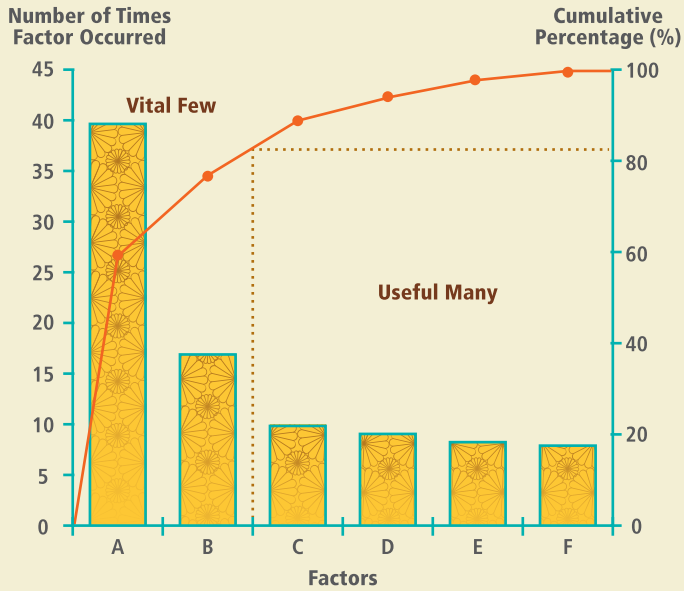
When do you use it?

A Pareto diagram is used to narrow down to the most important factors of a problem that should be addressed first.

How do you use it?

- Collect data on each factor and plot a bar chart.
- Order the factors according to the magnitude of the effect. Working from the largest to the smallest, determine the cumulative percentages.
- Draw and label the horizontal axis with the factors, the left vertical axis with the unit of comparison, and the right vertical axis with the cumulative percentage.
- Plot the cumulative percentage line. Draw a horizontal line across from the right vertical axis at 80%. Where it reaches the cumulative percentage line, draw a vertical line down. Those factors to the left are the “vital few” that should be addressed first.

Pareto Diagram



Identifying Solutions

After identifying the problem and its root causes, the team must come up with possible solutions and interventions to mitigate the problem. These should be evaluated for feasibility, cost, length of time for implementation and effect so that you can select the most effective ones. A good solution will solve a problem by tackling its root causes.

In developing solutions, there are several criteria for assessment:

- Are there systems in place to support changes?
- Will the environment, culture and leadership of your organisation support such changes?
- Are there resources to provide training for staff if necessary?
- Will you be able to change procedures if you need to?
- How will the changes affect the current process?

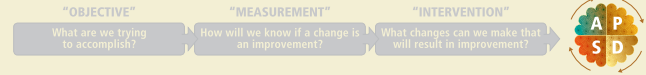


Change Concepts

The ability to develop, test and implement change is essential for continuous improvement. A change concept is a general notion to change considered within the context of a particular situation and then turned into specific ideas describing how the change can be tested and implemented.

Some examples of change concepts:

1. Find and remove bottlenecks
2. Do tasks in parallel
3. Use proper measurements
4. Implement cross-training
5. Focus on core process and purpose
6. Share risks
7. Develop cooperative relationships
8. Focus on outcomes to customers (patients)
9. Standardise (create a formal process)
10. Develop operational definitions



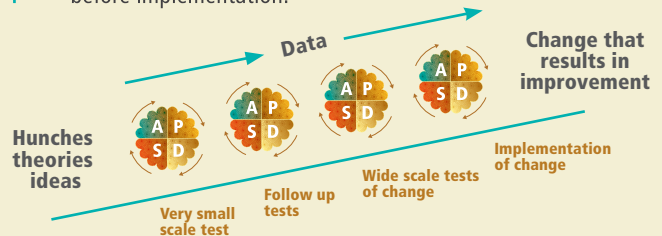
Testing Change (PDSA)

Once a change has been developed, it should be further explored and refined by testing under “real world” conditions, involving people who will be carrying out the improved process. Tests should be designed so that as little time, money and risk as possible are invested while at the same time, enough is learned to move toward full-scale implementation of the change. This is part of the Plan-Do-Study-Act (PDSA) cycles.

Sometimes, results of a test turn out opposite from what was predicted. This should not be seen as a failure since the success of a test lies in what is learned from it.

Some principles for testing change:

- Try the interventions one at a time. If appropriate, introduce interventions that work together.
- Keep tests on a small scale initially and increase the scale of the test (with differing conditions) for learning.
- A failure modes and effects analysis (FMEA) may be conducted to assess the impact of the proposed change before implementation.



The key to making effective changes is to conduct many cycles of tests and make necessary modifications before implementing the changes more broadly. For each cycle of test, it is good practice to document the team's observations.

Project Name:		Team:				
Key Contact:		Measures:				
Aim:						
Cycle	Change Concept Used	Change Tested	Outcome Measurement	Person Responsible	Weeks/Days	Change Implemented Yes/No
1						
2						
3						

Failure Modes and Effects Analysis

Often, potential problems can be avoided if processes are reviewed to look at things that could possibly go wrong before the implementation of any change.

What is it?

Failure modes and effects analysis (FMEA) is a systematic method for evaluating a process to identify where and how it might fail, and to assess the relative impact of these failures before they happen. It includes the review of the following:

- Steps in the process
- Failure modes (What could go wrong?)
- Failure causes (Why would the failure happen?)
- Failure effects (What would be the consequences of each failure?)

When do you use it?

FMEA is particularly useful in evaluating a new process for possible failure prior to implementation and in assessing the impact of a proposed change to an existing process.



How do you use it?

- Define the focus and scope of the process to be examined.
- Draw the process flowchart.
- Brainstorm points of potential failure, determine potential adverse consequences, and identify the causes of failure.
- Assign a severity rating, an occurrence rating and a detection rating on each failure mode based on a 10-point scale. [A severity rating estimates how severe the effects would be if the stated failure did occur. An occurrence rating states how often a failure mode will happen. A detection rating looks at the likelihood of detecting a failure or the effect of the failure.]
- Calculate the risk priority number (RPN) for each failure mode by multiplying the three ratings.
- Take corrective actions to eliminate or reduce the high-risk failure modes.



Force Field Analysis

Many good ideas do not work out because of people or systems getting in the way. By looking ahead and anticipating these problems, you can identify barriers to improvement and work around them.

What is it?

Force field analysis enables you to analyse the forces impacting the proposed change, identify obstacles, and determine if it can get support. “Driving forces” help to achieve the change, while “restraining forces” work against the change.

Some types of forces to consider:

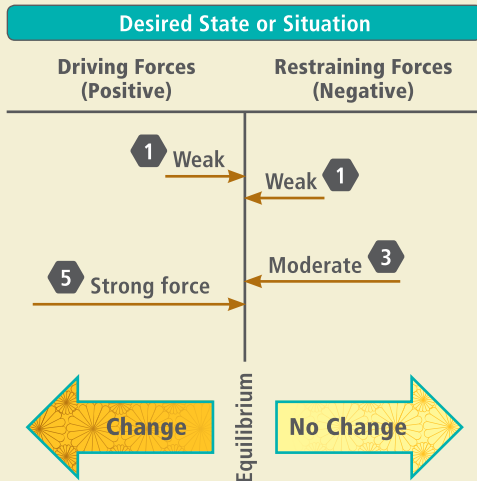
- Available resources and costs
- Traditions, institutional policies and norms
- Organisational structures
- Attitudes of people and values
- Regulations
- Political sensitivities

When do you use it?

Force field analysis is useful in helping you weigh the pros and cons of a proposed change before deciding whether it is worth implementing.

How do you use it?

- State the desired state or situation.
- List the positive forces for change in one column and the negative forces against change in another column. Assign a score to each force, from 1 (weak) to 5 (strong).
- Draw a diagram showing the forces for and against, and the size of the forces.
- Determine whether the change is viable and discuss how the strength of the restraining (driving) forces can be reduced (strengthened).



Implementing Change

Implementing a change means making it a permanent part of how things are done day-to-day. To do so, support structures (e.g. training, documentation, standardised procedures) need to be created to increase the likelihood of achieving and sustaining the gains.

Depending on the situation, change can be implemented in several ways. It can be as simple as asking others to follow a new process flow. It can also be accomplished in phases if the change has multiple components. In every action plan, remember to consider the 4'W's and 1'H':

- What is the specific change to be implemented?
- Which area are we implementing the change in?
- When is the change going to be implemented?
- Who is responsible for the implementation, monitoring of results and allocating of resources?
- How often are the results tracked and reviewed?

Since the actual implementation of the change involves more people, there may be greater resistance to the change, and you may need to come up with an effective change management plan.



Evaluation

Performance Measurement

For any quality improvement initiative, evaluating the project after it is implemented is essential to deciding on the next steps. If data are available from both before and after a planned change, you can see if the change has resulted in improvement. Ongoing measurements and audits should be conducted to ensure that the improvement is sustained.

Run Chart (Annotated)

What is it?

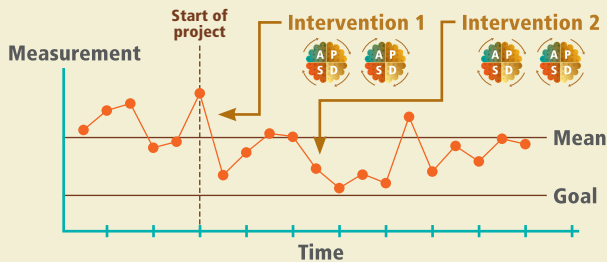
A run chart plots data points on a graph to show levels of performance over time. It displays trends and shows how well (or poorly) a process is performing.

When do you use it?

An annotated run chart displays the measure over time to track progress, identifies the type of variation in the process and helps you to determine if changes result in improvement. The annotation helps us understand how each intervention impacts the performance of the system.

How do you use it?

- Label the horizontal axis with the unit of time, for example, weekly or monthly intervals, and the vertical axis with the measure of interest.
- Plot the data values.
- Calculate the mean of the plotted points and draw the line on the graph. Include a goal line if necessary.
- Annotate the graph during the testing and implementation phase to show when interventions were initiated and to indicate any external events that may have affected the performance of the process.



Control Chart

What is it?

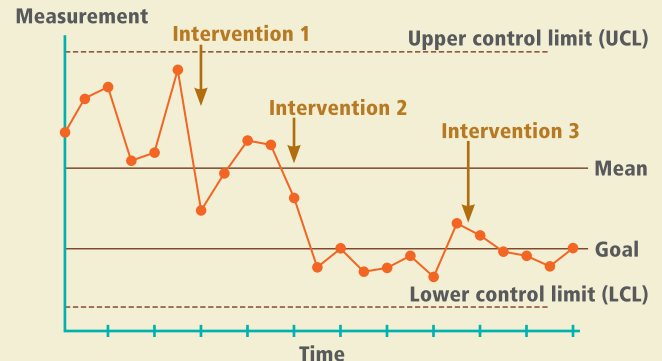
A control chart is a run chart with upper and lower control limits used to check if a process is in statistical control. Data points within the limits indicate that most variation is coming from common causes, i.e. chance occurrence is unlikely, and the only way to improve is to change some fundamental aspect of the process (e.g. procedures, equipment, training).

When do you use it?

A control chart is used when you want to distinguish between variation due to common causes and variation due to special causes in the monitoring of performance measures.

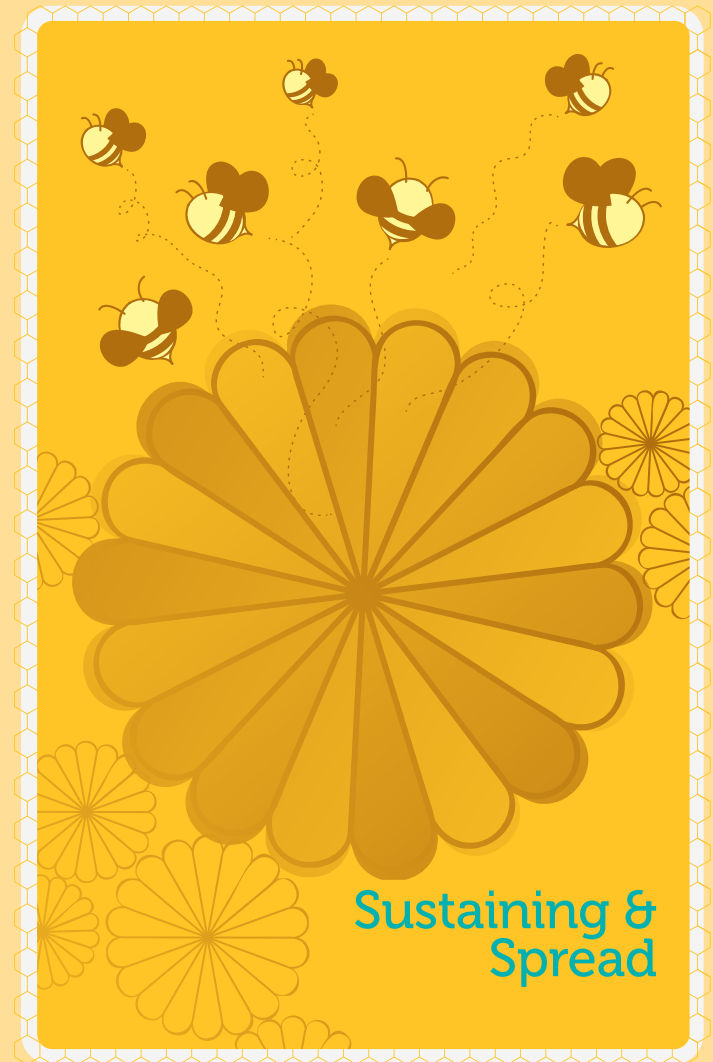
How do you use it?

- Using the data collected, plot a run chart.
- Set the upper and lower limits at three standard deviations above and below the mean and interpret the graph.



Refining and Standardising Change

Based on the data collected on the effectiveness of the change, the team may then consider refining the change using another PDSA cycle or standardising the new procedures. Transfer the responsibility for ongoing monitoring to those involved in the day-to-day work.



Sustaining the Gains

The quality improvement process does not end with the implementation of a solution. Specific steps must be taken and mechanisms established to hold the gains, for breakthroughs in results come from permanent changes. This may involve the following:

- Standardisation of existing systems and processes
- Documentation of associated policies, procedures and guidelines
- Measurement and review to ensure that the change becomes part of daily practice
- Training and education of staff
- Sharing of measurement and status of quality improvement initiatives

At this juncture, it is also necessary to identify a “process owner” who will be responsible for the ongoing assessment of the process and the documentation of progress at different stages.

Spreading Improvement



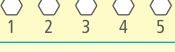


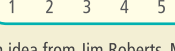
Today, many good ideas are not being spread. Spreading a change means having it adopted by others at multiple locations. Every change has a technical aspect (the nature of the change itself) and a social aspect (how people feel about doing it). The foundation of spread is communication. For a change to spread, people must first believe that it addresses an existing problem.

These are five characteristics of changes that spread easily:

- Clear advantage compared to the current way of doing things
- Compatible with the current system and values
- Simplicity of the change and its implementation
- Ease of testing before making a full commitment
- Observability of the change and its impact

(Source: Rogers E.M. Diffusion of Innovations, 4th Edition. New York: Free Press, 1995)

The spread potential worksheet helps you to increase the probability that an idea will spread.

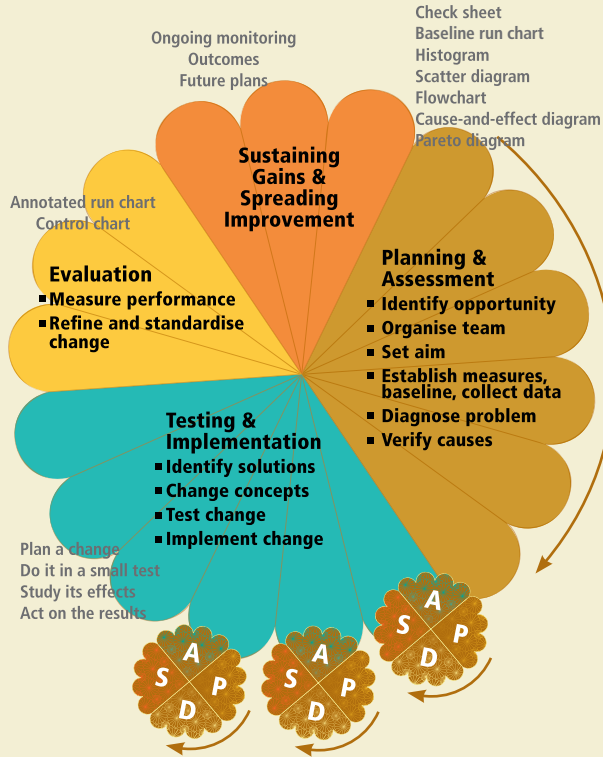
	Score (1: Low, 5: High)	Plan to increase (What can we do to increase the score?)
Strength of evidence		
Relative advantage		
Simplicity		
Compatibility		
Trialability		
Observability		

(Based on an idea from Jim Roberts, M.D. VHA and the work of Everett Rogers.)

One way of sharing the team’s results is by presenting to key stakeholders the outcome of the project, the results achieved, the lessons learned, and the changes to work practices. You can also publish your project in your organisation’s newsletter or display it on a notice board for others to read.

The most direct method of distribution of gains is cloning, i.e. the application of the solution to similar problems and processes elsewhere in the organisation. Quality improvement can also spread through spinoffs, experimentation and adaptation, i.e. reinventing ideas as they spread. It is therefore important to capture ideas as they occur, so that they can be incorporated in future projects.

Summary



Useful Resources

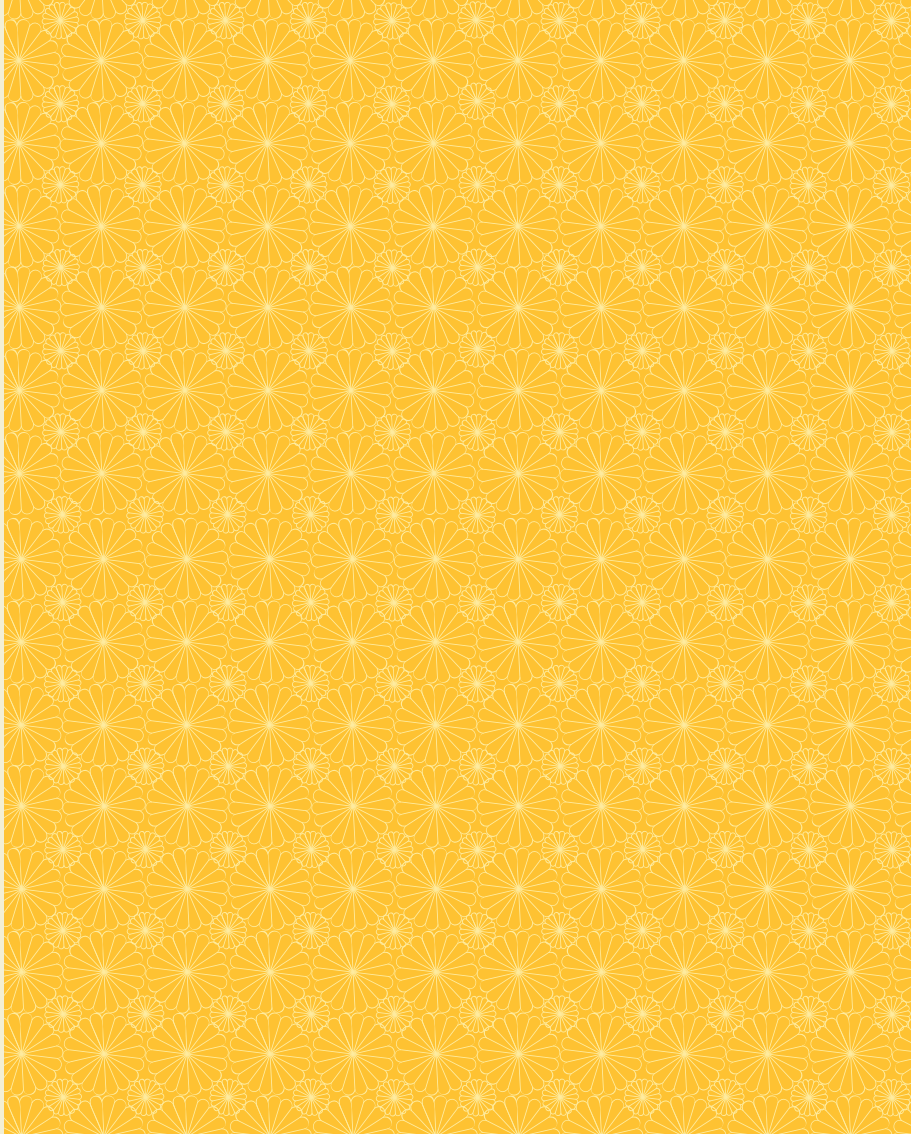
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