Quality Improvement Toolkit

A guide to enhancing healthcare quality and safety

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Safer Care Victoria

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Contents

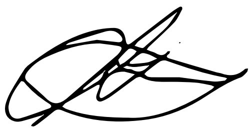
Foreward

As the Chief Executive Officer of Safer Care Victoria (SCV) and Victorian Chief Quality and Safety Officer, I am delighted to share the new SCV Quality Improvement Toolkit (QI Toolkit).

The delivery of high quality care that is safe, timely, effective, equitable and person-centred care consistently for every person, every time is at the heart of the Victorian Clinical Governance Framework. Moreover, the Framework highlights the significance of continuous learning and evidence-based improvement methods to achieve this. The SCV QI Toolkit has been designed as a collection of 'pick up and go' practical resources, templates and tools to start continuously testing, implementing, measuring, spreading, and scaling up changes that lead to improvement. SCV support many improvement projects with Victorian health services using the methodology outlined in this toolkit, examples of these improvement projects can be found on the SCV website

The QI Toolkit has been designed in partnership and collaboration with quality improvement leaders and change agents working in the Victorian health system, and we would like to thank all those who have generously contributed their time and support to its development.

Together with the broader SCV team, I look forward to partnering with you as we continuously strive to provide high-quality healthcare for all Victorians.



Louise McKinlay

Chief Executive Officer,
Safer Care Victoria

Chief Quality and Safety Officer Victoria

Quality Improvement Toolkit Matrix

Method or Tool		Purpose of Tool	**Holistic Understanding your system:** System of Profound Knowledge	**Aim statement:** MFI QI	**Developing Measures:** MFI Q2	**Identifying and prioritising change ideas:** MFI Q3	**Testing changes:** PDSA
1	**Improvement science for quality improvement**	To understand methods to systematically enhance processes, systems, and outcomes to achieve better efficiency, effectiveness, and satisfaction	✓	✓	✓	✓	✓
2	**Model for Improvement (MFI)**	Identify, define, and diag-nose a problem, create a theory of change and test change ideas	✓	✓	✓	✓	✓
3	**Partnering for quality Improvement**	How you can partner in your QI work as well as utilise Safer Care Victoria's Partnering in Healthcare framework	✓	✓	✓	✓	✓
4	**Co-design and partnering planning canvas template**	Provides a framework for planning your partnering and/or co-design work	✓	✓	✓	✓	✓
5	**Understanding Variation**	Helps understand the sys-tem, diagnose problems, and know if change leads to an improvement.	✓	✓	✓		
6	**Building your QI Team**	Identify diverse range of talent, knowledge, and skill for improvement work	✓	✓	✓	✓	✓
7	**Aim Statements**	Identify diverse range of talent, knowledge, and skill for improvement work		✓			
8	**Theory of Change**	What you want to achieve from your improvement project and a timeframe for achieving it.	✓	✓	✓	✓	
9	**Driver Diagrams**	A visual tool that helps to build and communicate your theory of change	✓	✓	✓	✓	
10	**Process Maps**	Simple picture of process/system		✓	✓	✓	

Method or Tool		Purpose of Tool	**Holistic Understanding your system:** System of Profound Knowledge	**Aim statement:** MFI QI	**Developing Measures:** MFI Q2	**Identifying and prioritising change ideas:** MFI Q3	**Testing changes:** PDSA
11	**5 Whys**	Uncover understanding or reasons behind problems		✓		✓	
12	**Cause & Effect Diagram**	Organise knowledge about possible causes of a problem/outcome		✓	✓	✓	
13	**Family of Measures**	A set of measures to really understand the impact of your changes		✓	✓	✓	
14	**Run Chart**	Display data over time, visualise variation in a system/process	✓	✓	✓	✓	✓
15	**Control Charts**	Tools used to determine if a process is stable (in a state of statistical control)	✓	✓	✓	✓	
16	**Pareto Chart**	Identify areas for improvement in a stable process		✓		✓	✓
17	**Histogram**	Understand location, spread, shape and pattern of data			✓	✓	✓
18	**Scatter Plot**	Understand association or relationship between 2 variables		✓	✓	✓	
19	**PDSA (Short and Long forms)**	Plan, organise and keep track of testing, implementation and spread of changes			✓		
20	**PDSA Ramping**	Testing your change ides under different conditions to grow your degree of belief the change idea will result in improvement			✓		✓
21	**RASCI Matrix**	Visually displays the different roles for each member involved in a project	✓	✓	✓	✓	✓
22	**Effort Impact Matrix**	Focus your activity and energy and prioritise your change ideas		✓		✓	✓

TOOL 01

Improvement science for Quality Improvement

Overview

Improvement science is an applied science founded by W. Edwards Deming. The focus of improvement science is on proposing, studying, and applying methods for changing systems with the aim of achieving better results than the current system is producing.

Deming's four concepts: appreciation of a system, understanding variation, the theory of knowledge, and the psychology of change, can be applied to improve the performance of processes, systems, organisations, and communities.

Quality Improvement requires the proper application of improvement science – improvement methods and tools are combined with subject matter expertise to develop, test, implement, spread, and scale up changes that lead to improvement.

The system of profound knowledge

The system of profound knowledge is a lens through which we can view our systems or problems to help us develop holistic understanding to lead effective change.

Appreciation of a system (systems thinking)

A system is an interdependent group of items, people, or processes working toward a common purpose. Systems in healthcare can vary greatly in size and complexity. Systems may be straightforward, such as booking a follow-up outpatient appointment, or highly complex, such as a hospital's healthcare delivery system, where numerous departments, professionals, and technologies interact in multifaceted and dynamic ways.

If a system is not producing the desired quality of services or products, then the system must be changed and improved. The greater the understanding of the system, the greater the likelihood a change idea will be generated that will result in an improvement. Tools such as process maps, Cause-and-Effect diagrams, and control charts can be used to understand a system and identify areas for improvement.

Understanding variation

Variation refers to the measurable differences, fluctuations, or changes observed in a set of data or a process. In healthcare, it encompasses the inherent diversity in patient characteristics, care delivery processes, and patient outcomes. Understanding variation is central to understanding what is occurring within a system. The ability to answer the question 'do the two medication errors that occurred this month indicate an undesirable trend?' is grounded in Quality Improvement, and knowledge of variation is needed to ensure appropriate action is taken. Tools such as run charts, control charts and Pareto analysis gives us greater insight into the variation occurring within systems.

Theory of knowledge

The Theory of Knowledge teaches us that knowledge is built on theories, and in order to validate them, these theories need to be tested. In Quality Improvement, making a change is like making a prediction – 'Change X will result in an improvement in Y'.

Making decisions about which change ideas to implement should be based on data and evidence, rather than assumptions or guesswork. This starts with establishing a theory of change that outlines what we believe we need to do, (along with when, where and how we need to do it), to achieve the desired outcomes. We can then design tests to validate this theory. Tools such as Driver Diagrams and Affinity Maps also aid in developing and visualising a Theory of Knowledge.

Psychology of change (human side of change)

Understanding human motivation, behaviour, and psychological needs are key to understanding what is occurring within a system and crucial to successfully leading and managing improvement activities. The human side of change focuses on ideas, methods and tools to help integrate changes into the social system. It teaches us how to harness people's intrinsic motivations to produce the desired outcomes and change, how to manage resistance to change and how to foster ownership of change through collaboration and co-design. Tools such as the partnering planning canvas and empathy maps can help us understand and relate to those who may affected by a change to the system.

Important considerations

Although there are four components of the system of profound knowledge, they shouldn't be applied individually. Improvement science is most effective when the focus is on how the components inform and interact with each other. For example, focusing only on the Theory of Knowledge without considering variation will not produce effective ideas for changing the system.

The ability to produce improvements is further enhanced when the System of Profound Knowledge is combined with subject matter expertise.

Model for Improvement

Overview

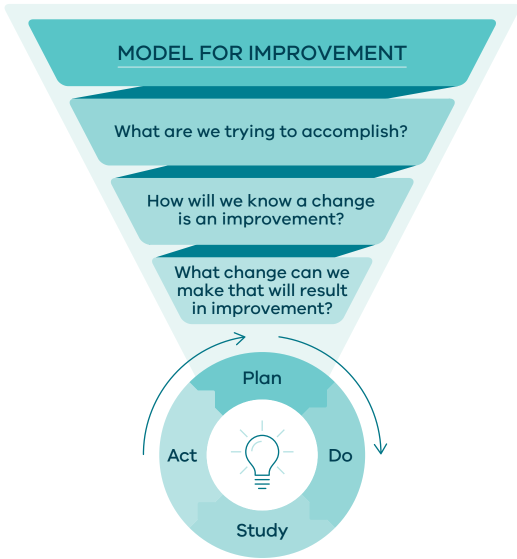
Improvement science is a methodology commonly used to define problems and inefficiencies in a system and identify areas for improvement so that the system delivers the desired outcomes.

The Model for Improvement (MFI) was developed by the Institute for Healthcare Improvement (IHI). The MFI helps to identify, define and diagnose a problem, create a theory of change, and test 'change ideas' to determine if they will improve system performance.

The IHI and Safer Care Victoria use the MFI to guide healthcare quality and safety improvement initiatives.

The MFI has two parts:

- **Three fundamental questions** that enable you to set aims, establish measures, and select changes.
- **A systematic testing cycle** called Plan Do Study Act (PDSA) to test the impact of the proposed changes.



This toolkit includes a number of different quality improvement tools and templates to support your work. To learn how to use the PDSA cycle to test your ideas you can use the SCV PDSA Toolkit Resource.

Planning for your improvement activity

When planning any improvement or change to work processes, it is essential to know what you want to achieve, how you will measure improvement, and to be explicit about the idea you are testing. You may not get the results you expect so it is safer and more effective to test out improvements on a small scale before implementing them across the board.

Before you start to work through the three fundamental questions of the MFI, it is important to think about who you need to work, consult and partner with. Ensuring that those who are most affected by the work you are seeking to improve are involved in your improvement efforts is fundamental to quality improvement. You may want to start by mapping out who has decision-making authority, and the patients, carers and other people with relevant lived experience you might want to work with. This includes the people who help deliver the service. Refer to the Partnering with consumers Toolkit Resource and the Planning Canvas for more information.

How to use the Model for Improvement

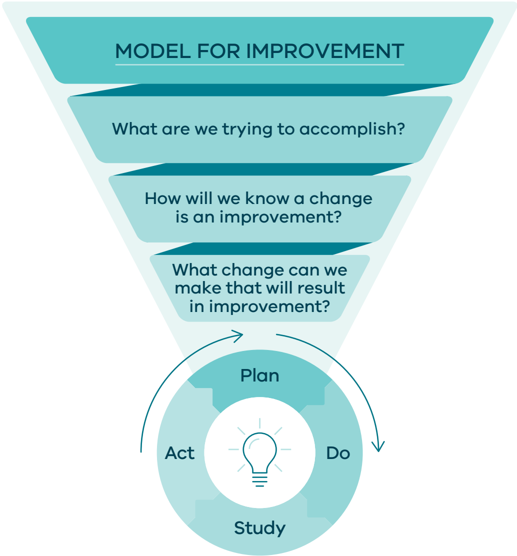
Answer the three fundamental questions:

What are we trying to accomplish? (aim):
You will need to write a clear and concise aim statement for your improvement work. Refer to the Aim Statements Toolkit Resource.

How will we know that a change is an improvement? (measurement):
You must measure the impact of your improvement work to know if you are achieving your aim. Learn more in the Family of Measures Toolkit Resource.

What change can we make that will result in an improvement?
(ideas for change):
You will need to decide what ideas you will test to achieve your aim. Remember, your change should be able to bring about differences in performance that are measurable. This is where you generate ideas of new actions and different ways of working that may lead to an improvement. Creativity tools can help to generate change ideas. There are also tools to help you to prioritise which change ideas to test first.

Next steps
Once you have worked through the three fundamental questions it is time to test your ideas for change. Refer to the SCV PDSA Toolkit Resource to learn more about testing your change ideas.



TOOL 03

Partnering for Quality Improvement

Why partner for quality improvement?

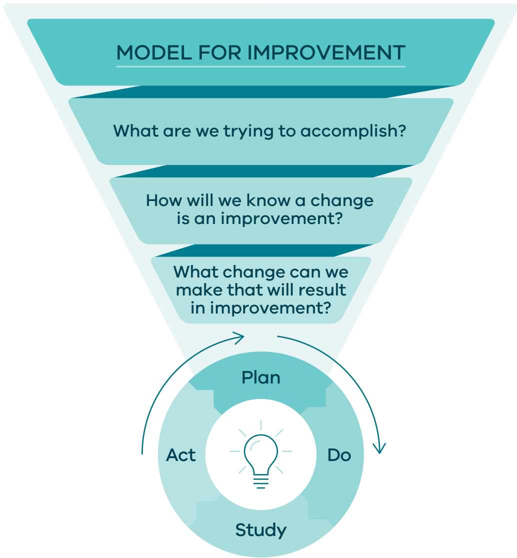
The Institute for Healthcare Improvement (IHI)'s Model for Improvement is focused on working together with people who use, deliver and are affected by the work being improved.

The Model for Improvement's emphasis on working with others is highlighted by the word 'we' in the model's three key questions:

- What are 'we' trying to accomplish?
- How will 'we' know that change is an improvement?
- What changes can 'we' make that will result in improvement?

Working with those who use, deliver and are most affected by the areas of work:

- ensures a diverse range of perspectives, expertise and experiences are considered, which can broaden understanding of the problem, inspire new ideas and help identify possible changes that might result in improvement.
- builds ownership of the quality improvement work.



How will you partner?

The IAP2's Spectrum of Public Participation (Figure 1) is the model that the Victorian Department of Health uses as a guide for public participation and engagement. Consider where on the spectrum your current partnering approach sits and where you would like it to be. Is your partnering practice more similar to the one-directional communication at the 'Inform' level or the multi-directional communication and shared ownership of decisions and outcomes of 'Collaborate' and 'Empower'?

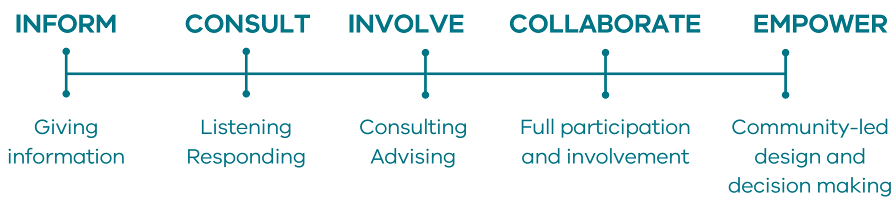


Figure 1. Spectrum of Public Participation, International Association for Public Participation (IAP2)

You should aim for collaborative forms of partnership where possible and be clear about what type of partnering you want use and why. It is important to establish and communicate the type of partnership approach early. This helps manage expectations for how the partnership will work, guides decision-making processes and supports stronger stakeholder relationships.

When thinking about the expertise and perspectives that can inform your work, ask 'who is most affected by and involved in the work we are doing?' Be creative about how you engage. Is establishing a diverse and representative committee the only way to partner for your work? Perhaps you have a committee that works with a critical friends group as well? Combine different types of partnering to ensure the project is informed by the right people, experience, and expertise. How will you create a safe space for people to explore new ideas, perspectives and share ownership of the work? Understanding power dynamics within a group, opportunities and barries for inclusion are important aspects to creating and facilitating a safe and effective working collaborative relationship. Creating a shared agreement to guide your partnership's ways of working is a great way to start exploring how to create a shared safe space together.

Partnering in healthcare domains

The Partnering in Healthcare Framework was developed in 2019 as part of a collaborative process. Health professionals and lived experience representatives came together to identify important considerations when partnering with consumers in the health sector. Five domains were identified from those discussions:

- **Working together:** How will you work together with diverse stakeholders? What will you do to help create a psychologically safe space for partnering for all involved?
- **Personalised and holistic:** Understanding individual needs and practicing flexibility to meet these needs is critical to any working relationship. For example, consider how scheduling meetings during traditional work hours can be a barrier to engagement – consumers who work during the day or have family or care commitments may be unlikely to register their interest if meetings are not scheduled at times they can participate. Consider adjusting meeting times to reduce this barrier to participation.
- **Equity and inclusion:** What decisions are you making about who is included in your work and who is not? What barriers and opportunities for engagement are you aware of and addressing?

Figure 2: Partnering in Healthcare Framework domains (2019)

- **Effective communication:** Are you always clear about who the audience is? How are you adapting your communication to reflect the communication and comprehension needs of your audience?
- **Shared decision-making:** How are decisions being made in your QI work and how much ownership do your partners have over the decisions being made? Co-design and co-development work requires shared ownership of the decisions and outcomes. If this is not possible, be clear about where the opportunities for shared decisions are and what decisions might be more limited.

Additional resources

This toolkit comes with a Partnering Planning Canvas. SCV adapted this template as part of the Co-design NOW! Partnering in Action learning program and it draws on the work of co-design leaders KA McKercher and Co-design.Tools. Use the canvas to think through who you need to partner with in your quality improvement work and how you might do this.

Understanding variation

Overview

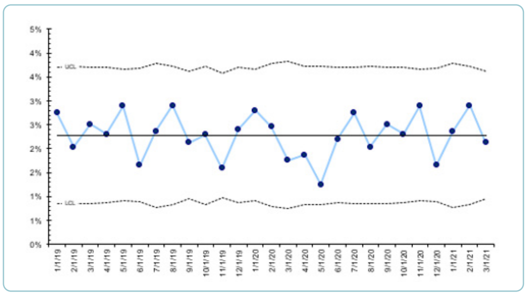
Variation refers to the measurable differences, fluctuations, or changes observed in a set of data or a process. In healthcare, it represents the inherent diversity in patient characteristics, care delivery processes, and patient outcomes – it is very rare to get the exact same performance or outcome. There are two types of variation, common and special cause These terms are often used interchangeably with random and non-random variation. Reducing and managing variation enables systems to become more predictable, efficient and produce better outcomes. For quality improvement you need to understand where it comes from and the tools to make it visible.

Types of variation

Common cause variation

- Occurs due to regular, natural causes that are inherent in the design of a system or process
- Affects all the outcomes of a process
- Results in a 'stable system' or one in statistical control.
- A stable process indicates that the variation is predictable
- Also referred to as random variation

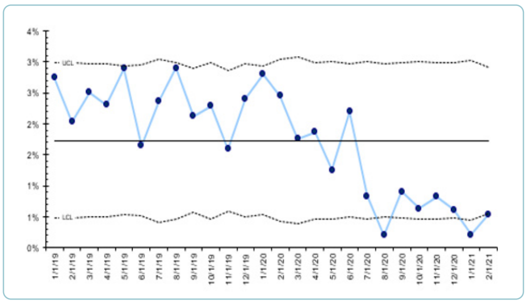
Figure 3. Example of common cause variation



Special cause variation

- Occurs due to irregular or unnatural causes that are not inherent in the design of the process
- Acts as a 'signal' to investigate what is causing the non-random pattern
- Affects some but not all aspects of the process
- Results in an 'unstable' process that is not predictable.
- Also referred to as non-random variation

Figure 4. Example of special cause variation



Where does variation come from?

Understanding and controlling variation is a central tenant of quality improvement. To do this, we must understand where variation comes from. Variation can either arise from either intended or unintended causes.

Intended variation refers to deliberate changes or adjustments made to processes or systems to achieve specific goals or outcomes. Intended variation is an important part of effective patient-centred healthcare. It is desirable to have variation with the intent to best match the care being provided to patient preferences. Quality improvement initiatives also be another source of intended variation within a system

Unintended variation occurs due to changes introduced into a healthcare process that are not purposeful, planned or guided. Usually, these changes arise from factors such as equipment, supplies, environmental or human factors. This variation creates inefficiencies, waste, re-work, ineffective care, errors, and harm in our healthcare system.

Focussing on reducing unintended variation that is occurring within a process/system usually results in improved outcomes and reduced costs.

Making variation visible

In quality improvement, visual presentation of data over time such as well-annotated run charts and control charts are used to identify and learn from variation in our data.

A **run chart** is a type of line graph showing data over time (figure 5.). They are easy to construct, simple to interpret and can help you to understand your system and determine if the changes you made are leading to improvement and begin to distinguish between common and special cause variation.

For a more statistically robust understanding of your system, its stability, or if you have more than 30 data points a control chart is required.

A **control chart** looks very similar to a run chart. However, it includes an upper control limit (UCL) and a lower control limit (LCL) (figure 6.). These are lines marked above and below a mean line (instead of a median line).

Be aware that both run and control charts have an individual set of rules for interpreting data. More information on run charts and control charts can be found in the [SCV Quality Improvement Toolkit]

Figure 5. Example of a run chart

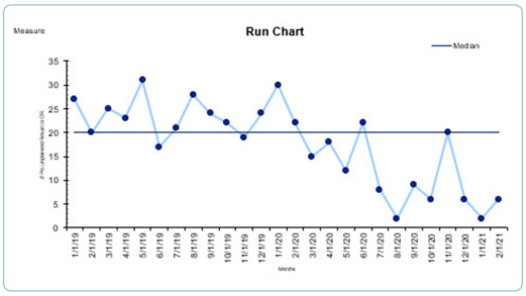
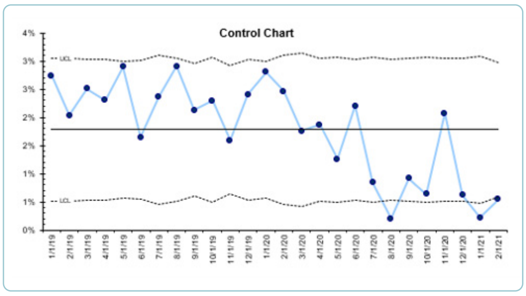


Figure 6. Example of a control chart



Responding to variation

Understanding the difference between common and special cause variation enables us to ensure we are responding appropriately to what is occurring within the system.

Common cause variation (act on system):

- In a stable system, the system is performing as well as possible and would require a process redesign to improve.
- If you're not satisfied with current level of performance of a system that only displays common cause variation, you should first develop and test theories that might result in improvements to the system before implementing changes.
- Reacting by making adjustments to a stable process can lead to increased variation and inefficiencies. This is called tampering.

Special cause variation (act on points):

- The response should be focused on the circumstances surrounding the special cause, not the underlying system or process.
- If the outcome of the variation is undesirable: investigate to find the assignable causes and take steps to eliminate the opportunity for this to reoccur.
- If the outcome of the variation is desirable: investigate to find the assignable causes and take steps to ensure this is instituted as part of the standard process.

Additional resources

To learn more about variation you can access the following resources

- IHI Video: Learning about Variation by Counting Candy (2mins)

TOOL 06

Building your Quality Improvement (QI) Team

Overview

A dedicated project team is at the core of any successful quality improvement initiative. Understanding the unique skills and perspectives each team member brings is central to the successful implementation of quality improvement (QI) initiatives.

A high-performing team is successful productive and effective and leads to greater innovation than individuals working alone.

There are five key elements to building high-performing teams:

- **Psychological safety:** Can we take risks on this team without feeling insecure or embarrassed?
- **Dependability:** Can we count on each other to do high-quality work on time?
- **Structure and clarity:** Are the goals, roles, and execution plans on our team clear?
- **Meaning of work:** Are we working on something that is personally important for each of us?
- **Impact of work:** Do we fundamentally believe that the work we're doing matters?

What is a QI Team?

A QI team is a group of individuals with diverse backgrounds, expertise and perspectives assembled to implement specific improvement initiatives within an organisation. The purpose of a QI team is to identify areas for improvement, develop and implement strategies to address these areas, and monitor progress towards achieving defined quality goals. A QI team can as also be known as a project team or a working group.

A steering committee is a group of high-level stakeholders responsible for providing guidance, oversight, and strategic direction for a project or initiative. Unlike a QI team, a steering committee usually does not engage in the day-to-day implementation of improvement efforts but rather sets overall goals, approves plans and budgets, and monitors progress at a higher level.

Who needs to be on your QI Team?

Each of the following QI team roles will contribute unique perspectives, skills, and knowledge to the QI team, ensuring a comprehensive approach to problem-solving and improvement efforts. Ensuring you have representation across all of these roles and skill sets will foster collaboration, promote innovation and buy-in, and increase the likelihood of achieving and sustaining quality improvement goals.

Project lead:
responsible for the planning, execution, and monitoring of initiatives They coordinate the QI team's efforts, ensure adherence to project timelines and quality standards, and facilitate continuous improvement efforts to achieve organisational goals.

Project sponsor:
provides leadership, strategic direction, resources, and support to ensure the success of the initiative. They secure necessary funding, communicate its importance to stakeholders, remove obstacles and provide guidance to the project team.

Subject matter expertise:
offers specialised knowledge and insights related to the specific area targeted for improvement. They provide guidance on best practices and identify opportunities for enhancement to ensure that proposed solutions are effective and aligned with current evidence.

Consumer/lived experience:
someone with real-world experience of the problem to be solved. These individuals help shape the project's goals, design, and outcomes, ensuring that solutions are relevant, user-friendly, and meet the needs of those directly impacted by the improvement efforts.

Quality improvement expertise:
someone with specialised knowledge and skills in methodologies to analyse processes, identify areas for improvement, implement strategies to enhance efficiency and effectiveness, and measure outcomes to ensure sustained progress and organisational excellence. They can provide guidance on selecting appropriate measures, collecting data systematically, and interpreting results accurately.

System/Process expertise:
someone who will be affected by the change and who has a deep understanding of organisational systems, workflows, and operational processes that will also be affected by the change. Try to include a range of perspectives on the same process.

Additional resources

To learn more about building your QI team you can access the following resources

- Video Resource: IHI Your QI Team (2 mins)

QI Team Member Matrix

Effective QI teams are multidisciplinary and include different areas of expertise.

1. Write the names of your team members along the left column.
2. Check off the boxes below to reflect the expertise they bring or perspective they are representing *(team members may fill more than 1 role)*

Project:

NAME / ROLE	PROJECT LEAD	PROJECT SPONSOR	SUBJECT MATTER EXPERTISE	CONSUMER/ LIVED EXPERIENCE	QUALITY IMPROVEMENT EXPERTISE	SYSTEM/ PROCESS EXPERTISE	OTHER:

Content adapted with permission from the Institute for Healthcare Improvement (IHI)

TOOL 07

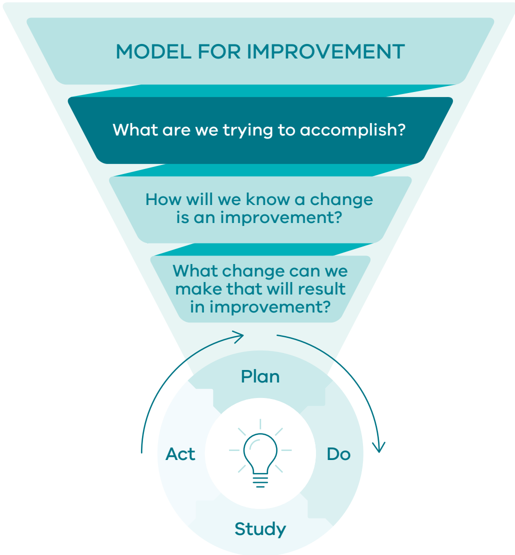
Aim Statements

Overview

An aim statement is a critical component of quality improvement work. It defines the direction of your work and is the tool to help answer the first question in the Model for Improvement 'What are we trying to accomplish?'

An effective aim statement is the cornerstone of improvement work and should:

- enable a shared understanding
- establish clarity of intent
- set out the scope of the improvement activity
- foster motivation and support for the change
- support communication
- improve your chance of success



How to write an effective aim statement

An effective aim statement should clearly articulate:

- **What?** State the focus of your improvement effort.
- **How good?** Declare a numerical goal for the desired outcomes. The goal should be ambitious but achievable, and you should consider if can it be achieved in the desired timeframe.
- **By when?** Clearly specify the timeframe within which the aim should be achieved.
- **For whom?** Name the consumer group or focus population. Who are the primary people or groups who will benefit?
- **Where?** Define the process or system you want to improve. What is the scope? Where are the boundaries? What are the starts and stops of the project?
- **Why?** An aim statement should communicate the importance of what you are working towards. It needs to capture the 'heart' of the work. An effective aim statement needs to outline the benefit of the project to individuals and society, beyond a numerical value.

Which is the more effective aim statement?

We aim to reduce unnecessary hospital transfers by 20% by June 2021.	OR	We aim to reduce unnecessary hospital transfers from Rural Health Service X to metropolitan services by 50% by June 2021 to ensure more patients are able to stay close to family and local support.

Important considerations

Avoid: Aim statements should be outcome focused. Avoid making assumptions about the solution to the problem you are trying to solve. For example:

Outcome-focused aim: We aim to reduce avoidable harm to children undergoing appendectomy procedures in Victorian hospitals by reducing perforation-related complications by 20% by June 2024.

Solution-focused aim: We aim to implement an appendicectomy protocol into the paediatrics department by June 2024.

Collaborate: It is essential to work collaboratively with key stakeholders (including consumers) to develop and review aim statements. Consider who you might need to work with and the different ways you can work together to ensure your aim draws on the range of knowledge and experience needed.

Consensus on the aim can be more easily achieved if those involved are provided with relevant information and context early in the process. For example, relevant information may include baseline data about the process being investigated: e.g. admission rates, infection rates, and length of stay.

Review: Teams should avoid drifting from the original aim but be willing to review and intentionally re-focus the aim based on growing experience, testing results, and emerging evidence. Be mindful not to constantly change your aim statement.

TOOL 07

Developing an aim statement worksheet

Use the prompts below to help your team write an effective aim statement. Use the checklist to double-check your work.

What? What is the problem or opportunity?

How good? By how much will you improve?

By when? What is the date by which you will achieve your improvement?

For whom? Who is the consumer or population who will benefit from the improvement?

Where? What are the boundaries of the process or system you're trying to improve?

Why? What is at the heart of what you are trying to achieve?

Complete aim statement: Combine the above answers to complete your aim statement.

Aim statement review checklist

- ☐ Is the problem or opportunity clearly stated?
- ☐ Do you know what the team is going to do about the problem?
- ☐ Has the team set a numerical goal to quantify the amount of improvement they would like to achieve?
- ☐ Do you know the calendar date by which the team plans to achieve the goal?
- ☐ Is it clear who will benefit from the improvement?
- ☐ Is the scope of the project clear?

Adapted with permission from the Institute of Healthcare Improvement (IHI).

TOOL 08

Theory of Change

Overview

A Theory of Change makes explicit what we believe we need to do to achieve our aim, and when, where and how we need to do it. Theory of Change focuses on the 'theory of knowledge' component of W. Edwards Deming's System of Profound Knowledge. It provides a roadmap for understanding the relationships between the interventions, outcomes, and broader aims of a quality improvement project. A Theory of Change can also help you craft a measurement strategy for an improvement initiative. You may have multiple theories of change for a single problem.

Steps for creating a Theory of Change

Work through each part of the following statement to help you develop and articulate your Theory of Change:

In order to achieve this aim... → **We need to ensure that...** → **Which requires...** → **Our idea to make this happen is...**

1. **In order to achieve this aim...**
   Clearly define the ultimate aim or desired change that you want to achieve. For more information on crafting an aim statement see SCV Quality Improvement Toolkit.
2. **We need to ensure...**
   Consider the high-level factors or themes that you need to influence to achieve the improvement aim.
3. **Which requires...**
   Determine when and where your efforts will have the most significant impact and consider the specific contexts and settings where the change is most crucial.
4. **Our idea to make this happen is...**
   Identify the key areas where change is needed to address the problem. Identify potential change ideas that you can test to understand their influence.

Change ideas versus change concepts

When coming up with change ideas for a Theory of Change, people often identify broader themes of change (change concepts) rather than specific and actionable ideas that can be tested (change ideas). It is important to understand the difference between the two.

Change concepts

- Broader and more abstract understanding of how change can occur within a system or context through a variety of specific change ideas
- General approaches to change that are useful for developing specific ideas for changes that lead to improvement
- Example: team communication

Change ideas

- Specific, actionable and testable ideas for changing a process
- Changes you can specifically implement and test to see if they make a difference.
- Example: introduction of a weekly huddle to improve team communication

Theory of Change example:

Reducing emergency department wait times

Aim: Reduce the number of patients waiting two hours or more in the emergency department by 40% by December 2025 to improve patient care and flow.

In order to achieve this aim... → **We need to ensure that** there are models of care (MOC) that support patient flow → **Which requires** patients to be assessed in a timely manner on presentation to Emergency → **Our idea to make this happen is** to develop and test a screening tool to identify patients suitable for nursing fast track MOC

How to visualise a Theory of Change

A **Driver diagram** is a visual tool that helps build and communicate the overall Theory of Change for your quality improvement project. Driver diagrams articulate what parts of a system need to change in which way. This ensures that everyone working on improving the system has a shared sense of why. A Driver Diagram is made up of multiple theories of change. More information on driver diagrams can be found in the SCV Quality Improvement Toolkit.

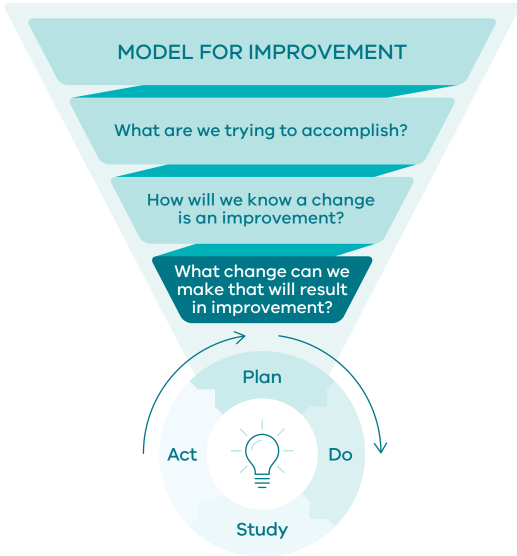
Driver diagrams

Overview

A driver diagram is a visual tool that helps to build and communicate your Theory of Change for your quality improvement project. It outlines what is needed to achieve your quality improvement aim and answers the third question of the model for improvement What change can we make that will result in an improvement?

A driver diagram clearly outlines the relationships between the aim of the improvement project and the changes to be tested and implemented. It outlines your rationale and exactly how you expect your change ideas to help you achieve your quality improvement aim.

A driver diagram can help craft the measurement strategy of an improvement initiative. Outcome measurements should be embedded in the aim statement for most driver diagrams. A driver diagram will also help to define which aspects of the system should be measured and monitored to see if the changes and interventions are effective, and if the underlying causal theories are correct.



Driver diagrams are living documents. Not all changes tested will lead to improvement, and driver diagrams are intended to be reviewed with your stakeholders and team and updated based on the learning and evidence gathered through the testing and measurement stages.

Components of a driver diagram

A driver diagram is composed of:

- **Aim statement:** An aim statement is written documentation of what you want to achieve with your improvement project and a timeframe for achieving it. It should cover what will be improved, by how much, for whom, by when and why. Establishing an agreed-upon aim statement is the first step to creating a driver diagram. For more information on crafting an aim statement see SCV Quality Improvement Toolkit
- **Primary drivers:** Primary drivers are high-level factors or themes that you need to influence in order to achieve your improvement aim.
- Primary drivers should be written as clear statements rather than numerical targets. Try to limit your primary drivers to a total of three. If you need more, you may need to scale down your aim statement.

- Primary drivers can be based on three elements. (Please note not everything may fit into these.)
  - Structures that comprise the system, i.e. the physical design of a space, product, or software. For example, patient wards, operating rooms, and diagnostic facilities.
  - Processes that represent the workflow of the system, and how things are accomplished. For example, patient admission, medication administration, and discharge planning.
  - Operating norms, or the accepted rules and expectations that govern how individuals within a group or organisation behave, interact, and make decisions in their day-to-day activities. They can be described as 'the way we do things around here'. For example, a lack of reporting of near-miss incidents.
- **Secondary drivers:** Secondary drivers are specific factors or interventions that are necessary to achieve the aim through at least one primary driver. You must consider the specific contexts and settings where the change is most crucial. One approach used for secondary drivers is to consider them the **'When?' 'Where?' and 'Who?'** within the process or system that you need to influence to achieve your aim.
- **Change ideas:** Change ideas should be specific, actionable ideas which can be tested to understand their influence. Each change idea will contribute to at least one secondary driver (shown using 'relationship arrows').

  Avoid defining your change idea as a task or a specific action or activity that needs to be completed.

  - Task: design a new assessment form
  - Change idea: implement assessment form for X

  Avoid including change concepts, which are general notions or approaches to change that are useful for developing specific ideas for changes that lead to improvement.

  - Change concept: improve team communication.
  - Change idea: introduction of a weekly huddle to improve team communication.

  For more information on change ideas and Theory of Change see SCV Quality Improvement Toolkit.

How to build a driver diagram

1. Identify and invite people you need to collaborate with to develop your Theory of Change.
2. Develop your aim statement: what will be improved, by how much, for whom, by when and why. For more information on crafting an aim statement see SCV Quality Improvement Toolkit.
3. Once there is an agreed improvement aim, driver diagrams can be created. Decide if your next step will be to:
   a. identify the important themes or factors (primary drivers) and build your theory of change from left to right, or
   b. brainstorm change ideas and create your driver diagram right to left.

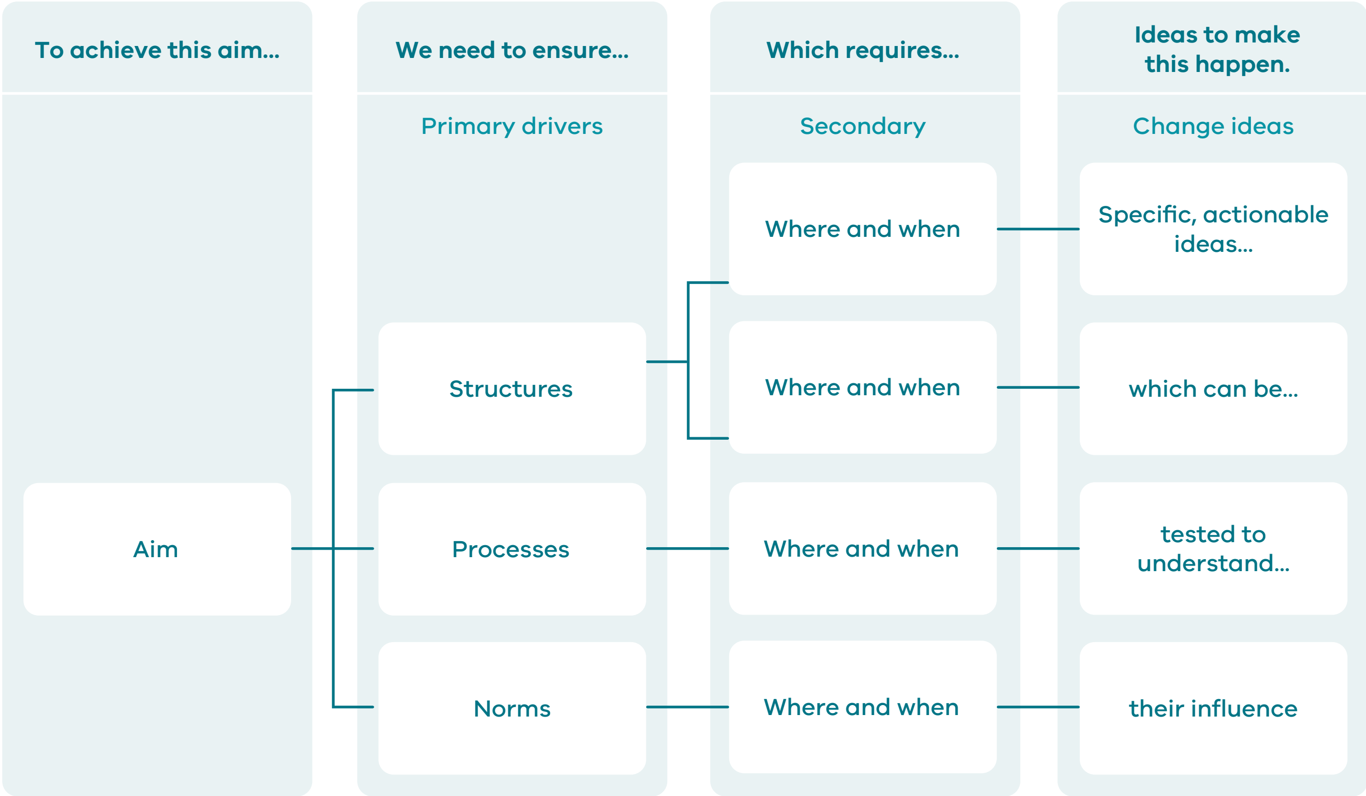


Figure 7: Structure of a driver diagram

Summary

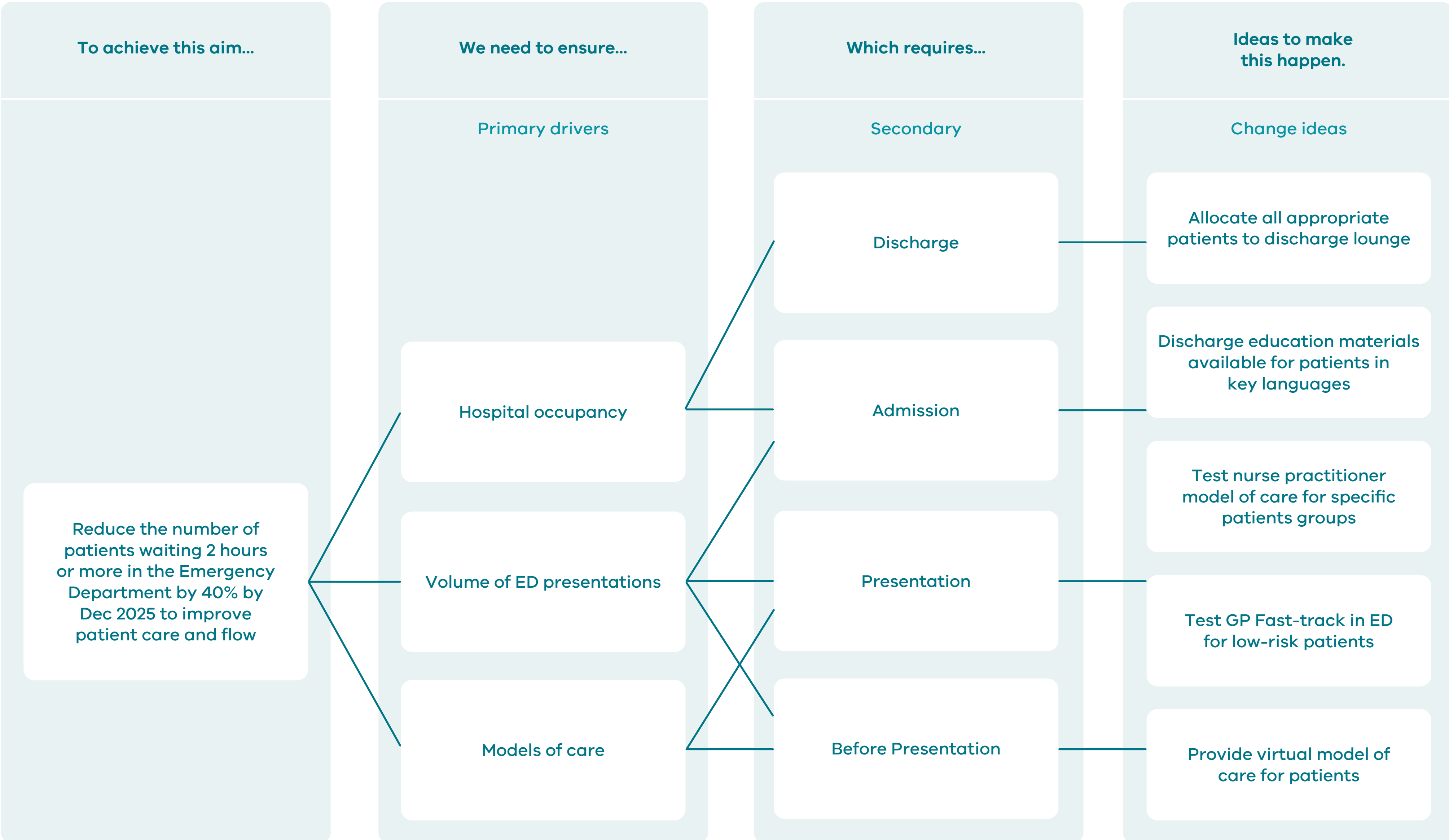
A driver diagram is a tool for planning and visualising an improvement initiative. It can help teams stay focused when the diagrams are regularly reviewed and updated as the team acquires new knowledge and experience. A driver diagram will also help to define which aspects of the system should be measured and monitored to see if the changes and interventions are effective, and if the underlying causal theories are correct.

Driver diagram template

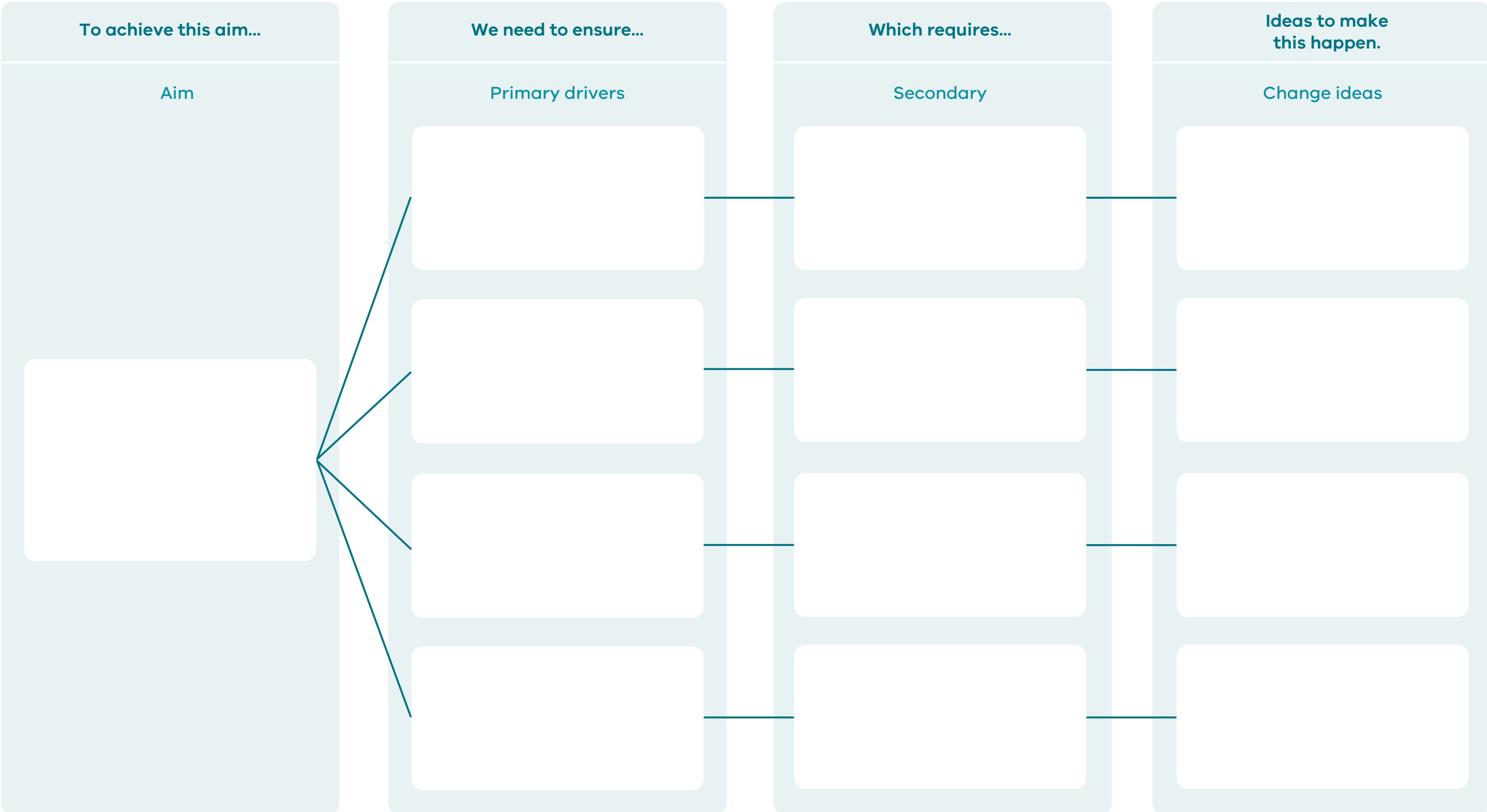
Below is a basic driver diagram template, which can be used to help you start creating driver diagrams. It has not been designed for complex projects.

Remember: It's unlikely that a single individual has a clear view of an entire complex system. When developing a driver diagram, enlist the help of team members and stakeholders who are familiar with different aspects of the system under review.

Example of a completed driver diagram



Basic Driver Diagram Template



Process Mapping

Overview

Processes are a series of connected steps or actions taken to achieve a particular goal or outcome. In healthcare, this could include admitting a patient or issuing a medical device (e.g. a four-wheeled frame)

A process map (or flowchart) is a visual representation of the people, tasks and decisions that make up a specific process. It is a useful tool for breaking down complexity within a system and assisting in the development of a team's shared view of that system. It also helps you understand each step in the current process and identify potential bottlenecks, waste, errors, and variation that may occur in a process. It is important to understand the process as it currently operates when developing ideas about how to improve it.

What can a process map show?

- What waste exists in a process.
- If the process can be simpler, faster, less confusing, more efficient.
- If there are any unnecessary steps in a process.
- Bottlenecks or points where things slow down.
- Whether there are any steps where errors commonly occur.
- The potential risks of changing the process.
- Variation in how different people do the same process.

Types of Process Maps

High-level flow

High-level flow is the simplest form of system or process description. They provide a helicopter view of the process, show the basic steps of the process and help visualise where to focus. High-level flow is the first step in process mapping to establish a shared vision of the process. If it contains more than eight blocks or steps, consider either simplifying or redefining boundaries.

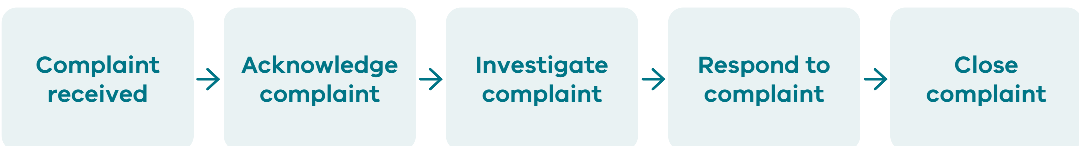


Figure 8: Structure of a driver diagram

Detailed process map

Detailed process maps illustrate each step of a process, including decision points, sub-processes, and points where documentation or data is required. They allow the project team to engage key stakeholders and identify steps that may be impractical and in need of change.

Example process map:

Comsumer complaints process

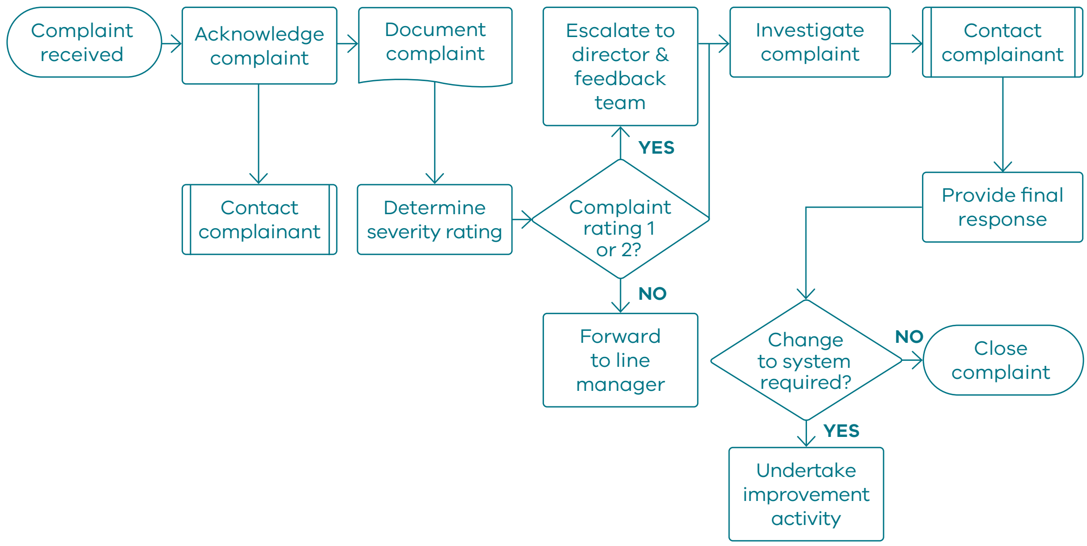


Figure 9: Example of a detailed process map

How to create a process map

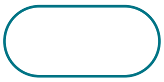
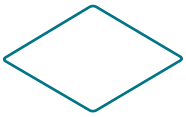
1. Define the process to be visualised.
2. Invite key stakeholders (those most affected by and involved in the process) to participate in the process mapping exercise.
3. Consult with process participants and/or conduct observations of the process.
4. Define the boundaries.
5. Identify the activities that take place.
6. Arrange the activities in proper sequence from first to last.
7. Draw arrows to show the flow of the process.
8. Review the process map with others involved in the process (workers, supervisors, suppliers, consumers)
9. Discuss the different experiences of the process to help identify areas for improvement.
10. Identify any problem areas (e.g. bottlenecks) for improvement and change ideas.

Remember: It's unlikely that a single individual has a clear view of an entire complex system. When developing a process map, enlist the help of team members who are familiar with different aspects and have different experiences of the system under review.

It is recommended that project teams initially draft process maps collaboratively using whiteboards or wall pads and post-its. The process map can then be transcribed electronically using software such as Microsoft Visio, PowerPoint or online resources such as Miro.

Common process mapping symbols

Table 1: Data reference

Symbol	Name	Description
	**Start/end points**	Indicates the beginning and end of the process.
	**Process/task**	Documents each high-level step to get from the start to the end of the process.
	**Sub-process**	Shows a series of actions related to a specific task which is part of a higher-level process.
	**Decision point**	The point at which a decision needs to be made. The arrows from the decision shape are usually labelled either yes, no, true or false.
	**Connector/arrow**	Shows the direction of process flow and can only point in one direction.
	**Document**	Indicates a process step that generates a document or report.
	**Data**	Represents material or information entering (input) or leaving (output) the process. For example, receiving a report is an input and generating a report is an output.

Additional resources

To learn more about process maps you can access the following resources:

- IHI Flowchart Video 1 (8mins)
- IHI Flow Chart Video 2 (7mins)
- Tom Wujec: Got a wicked problem? First, tell me how you make toast (9mins)

TOOL 11

5 Whys

Overview

The 5 Whys is a simple approach to help a team identify underlying reasons for a problem. By repeatedly asking the question 'Why?' (use five as a rule of thumb), you can peel away the layers of an issue. This can lead you to the root causes of a problem.

You may need to ask 'Why' more than five times before you get to the root cause of a problem.

How to create a process map

1. Write down the specific problem you are trying to solve.
2. Use brainstorming to ask 'Why?' the problem occurs.
3. 'Why?' until you have reached a useful level of detail — that is, when the cause is specific enough to be able to test a change and measure its effects

It can also be helpful to use the 5 Whys in conjunction with cause-and-effect analysis to explore the different types of causes. For more information on using the Cause and Effect tool see the SCV Quality Improvement Toolkit.

Problem:
Why do tennis balls used as walker pads stop working?

↓

Cause:
Because the ends of the walker break through the tennis balls

↓

Cause:
Because the material of the tennis ball breaks down

↓

Cause:
Because tennis balls have a limited lifespan and they are being used for too long

↓

Root cause:
Because there is no standard policy for checking on tennis ball wear on walkers

Figure 10: 5 Whys Example

Important considerations

The key is to avoid assumptions and encourage the team to keep drilling down to the real issues that underlie why different factors have contributed to something going wrong.

TOOL 11

5 Whys template

Problem:

WHY?

Cause:

WHY?

Cause:

WHY?

Cause:

WHY?

Cause:

WHY?

Root Cause:

Cause and Effect Diagram

Overview

A Cause and Effect Diagram (also called a fish bone diagram or Ishikawa diagram) is an effective tool that allows people to easily see the relationships between factors to plan and study processes and situations.

A Cause and Effect Diagram provides a visual display that identifies and organises possible causes of problems to help ensure the success of a project or activity.

When to use it

Use this tool when you are trying to determine why a particular problem is occurring. It will help you to better understand the issue and to identify a wider range of possible underlying factors – not just the most obvious.

A Cause and Effect Diagram should be completed with diverse people who are affected by the identified problem or 'head event' as part of a collaborative brainstorming and discussion activity. This type of diagram is useful in any analysis, as it illustrates the relationship between cause and effect in a rational manner.

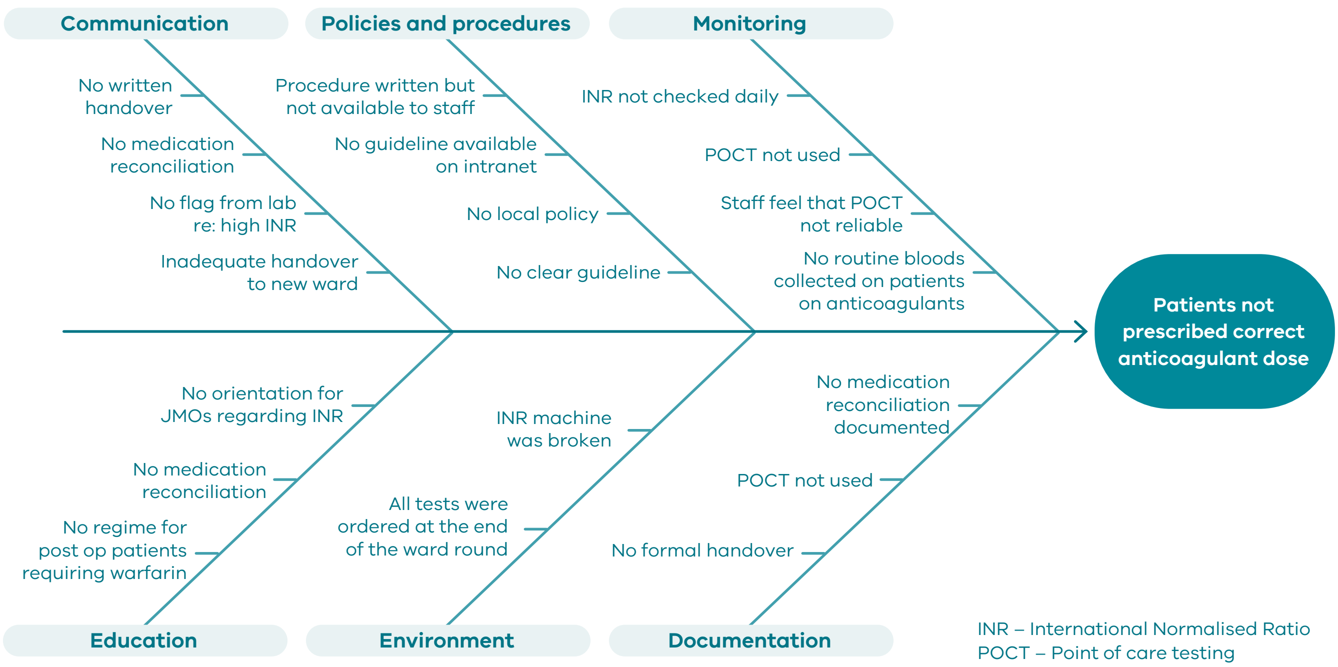


Figure 11: Example of a Cause and Effect Diagram: Reasons why patients are not on a standardised anticoagulation pathway.

How to create a Cause and Effect Diagram

1. Identify the problem you are trying to solve, describe it in detail (who is involved, when and where it occurs), write the problem in a box and draw an arrow pointing towards it.
2. Decide on five or six categories of causes for the problem or effect. You can develop your own or use the following traditional categories:
   - Materials
   - Methods
   - Equipment
   - Environment
   - People
3. Draw diagonal lines above and below the horizontal line to create 'fishbones', and label each line at the end with one of the categories you have chosen. Draw a box around each label.
4. For each category, generate a list of the causes that contribute to the effect. List the causes by drawing 'branch bones'. Draw additional branch bones from the causes to show sub-causes as needed.

Tip: Develop the causes by asking 'Why?' until you have reached a useful level of detail — that is, when the cause is specific enough to be able to test a change and measure its effects

Remember: It's unlikely that a single individual has a clear view of an entire complex system. When developing a Cause and Effect Diagram, enlist the help of team members who are familiar with the problem and different aspects of the system under review.

Template

To help get you started with developing a Cause and Effect Diagram, you can find a basic template on the SCV Quality Improvement Toolkit. This has not been designed for complex projects.

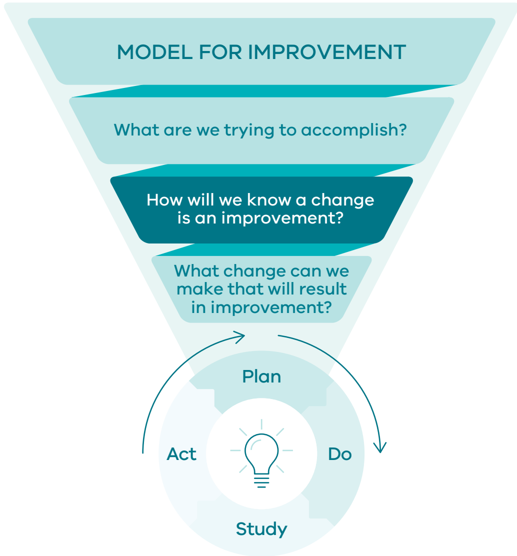
It is recommended that project teams initially draft Cause and Effect Diagrams collaboratively, using whiteboards or wall pads and post-its. The diagram can then be transcribed electronically.

Family of Measures

Overview

Measurement is an essential part of testing and implementing changes in any quality improvement project. Establishing measures answers the second question of the Model for Improvement, 'how will we know a change is an improvement?

When you're trying to make a change in a complex system, it's not enough to use a single measure to determine if you're driving improvement. Instead, you need to track a set of measures to really understand the impact of your changes on the many parts of the system. Improvement teams typically use a 'Family of Measures' that consists of three types of measures: outcome, process and balancing measures.



Outcome

- Directly relates to the aim statement
- Should represent the voice/ experience of the consumer
- Should have 1–2 outcome measures
- Helps determine whether inteded outcomes are being achieved

Example:
% of patients being readmitted within 30days after surgery

Process Measures

- Helps to determine whether teams are doing the 'right things' to achieve the outcome measure(s)
- Used to determine efficacy of change ideas
- Should have 3-5 process measures
- Helps to understand whether changes are having a positive or negative impact - can be an early indicator of an improvement in the outcome measure(s)
- Acts as a pulse check assessment of the inner workings of the system

Example
% of patients who received post-surgical dischage bundle prior to discharge

Balancing Measures

- Helps to determine if the changes introduced in one part of the system are having unintended impacts on other parts of the system (either positive or negative)
- Defined at the outset of the project and measured across the project lifecycle
- Should have 1-2 balancing measures
- Not directly related to the aim

Example
Average length of stay
Average clinic waiting time

Figure 12: Types of measures

TOOL 13

Family of Measures Template

When you're trying to make a change in a complex system, you need to develop a Family of Measures that you will collect as data throughout the duration of your project to understand the impact of your changes.

Filling the below table with your measures can help ensure you've got the details you need to start.

Measure name	Operational definition	Data collection plan
Provide a logical name for your measure. Most measures contain the words 'number of', 'per cent of', or '___ rate'.	Define the measure in clear, specific terms. Indicate the type of measurement: count, percentage, time period, etc. If the measure is a percentage or rate, provide the numerator and the denominator used.	Explain how the data will be collected. • Who is responsible for collecting the data? • How often will the data be collected (e.g. hourly, daily, weekly)? • What should be included or excluded (e.g. should you include only inpatients or inpatients and outpatients)?
Outcome measures		
Measure name	**Operational definition**	**Data collection plan**
e.g. inpatient pressure injury rate.	e.g. total number of pressure injuries obtained during inpatient admission per 1000 occupied bed days.	e.g. export from VHIMs monthly, exclude all pre-existing pressure injuries.
Process measures		
e.g. per cent of inpatients assessed for pressure injuries.	e.g. numerator: total number assessed for pressure injury. denominator: total number of inpatients.	e.g. export assessment rates from electronic medical record monthly.
Balancing measures		
e.g. additional time spent conducting pressure injury assessment.	e.g. time spent conducting normal assessment vs comprehensive pressure injury assessment.	e.g. nurses to time and record 10 normal and 10 comprehensive pressure injury assessments over 1 week.

Run charts

Overview

Observing patterns of data over time can help us understand how well a process or system is performing and if any improvements are being sustained.

Run charts (sometimes called trend charts or time series charts) are a simple tool that display data over time. They are one of the most important tools in quality improvement.

Using run charts has a variety of benefits:

- They help teams formulate aims by depicting how well (or poorly) a process is performing.
- They make progress visible for key improvement measures.

- They help determine if changes have resulted in improvement.
- They help determine if improvements have been sustained over time.

How to create a run chart

Run charts can be created in many ways – the simplest is to simply draw one on a white board or paper. They can be started with only one data point.

Elements of a run chart

X-axis – time series, for example, week, month or year

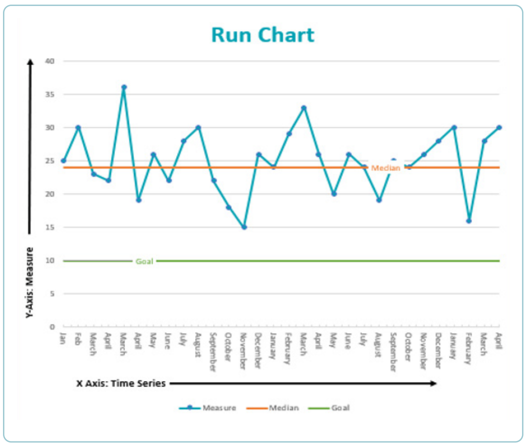
Y-axis – the measure you are focusing on

The centre line is a horizontal **median line**. The median represents the middle value of the data set and is only added to a run chart once 10 data points are available.

A **goal line** (aspirational target) can also be included as a horizontal line to indicate the desired direction and target of the chart.

A run chart works best if there are at least 10 data points, for example, 10 days of data or 10 audits/observations.

Figure 13. Anatomy of a run chart



Rules for interpreting a run chart

Run charts use statistical principles to begin to differentiate between common and special cause variation, providing a systematic approach for understanding the impact of changes in a process or system over time.[1]

- **Shift:** a shift in the process is indicated by **six** or more consecutive data points all either above or below the centre median line. Skip values that fall on the median and keep counting (values on the centre line/median do not add to or break a shift).
- **Trend:** a trend is indicated by **five** or more consecutive data points all going up or down. If the value of two or more consecutive points is the same, ignore one of the points when counting (like values do not add or break a trend).
- **Astronomical point:** a data point that is an obviously, unusually, and blatantly different value (an outlier). Remember, every data set will have a highest and lowest data point – this does not make them astronomical points.

A shift, trend or astronomical data point are all 'signals' special cause variation and should be investigated to gain a better understanding of the process under review.

For a more statistically robust understanding of your system, its stability or if you have more than 30 data points a control chart is required. For more information see understanding variation and control chart resources

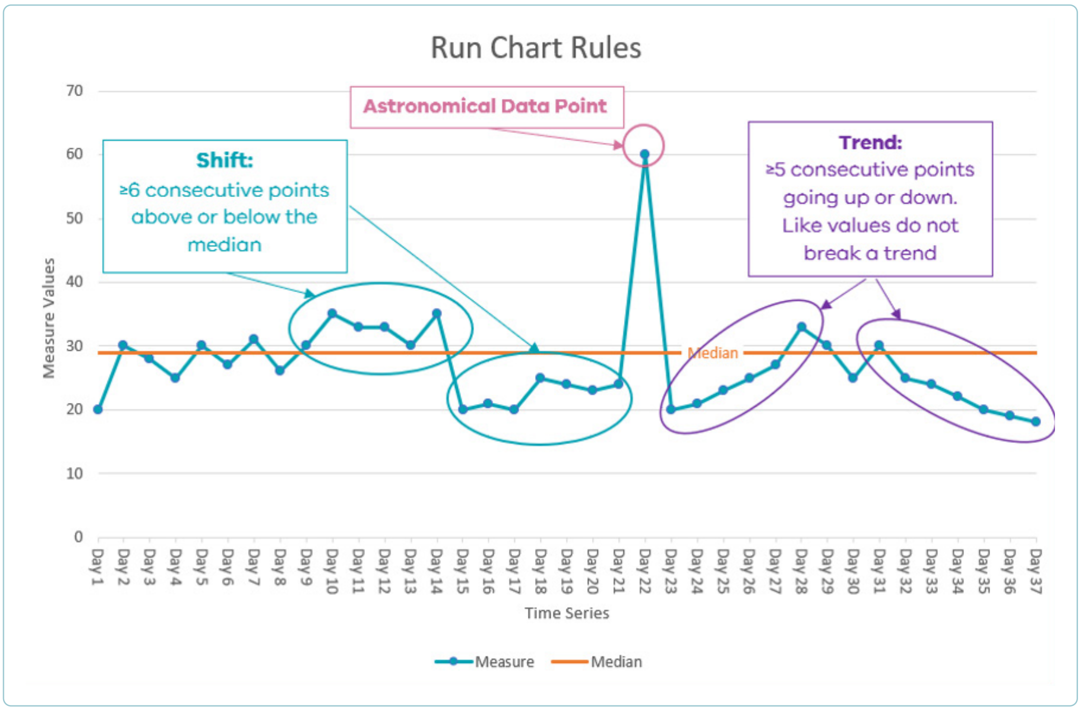


Figure 14: Run chart rules

[1] This guide to the run chart rules is based on Lloyd & Provost (2011): The Health Care Data Guide – Learning from Data for Improvement, Chapter 3

How to interpret a run chart

In the example below (Figure 15), the infection rate of a particular ward is monitored every month. New systems and processes were introduced onto the ward in May and the team have set a stretch goal (an aspirational target they want to achieve) of 1% infections per month.

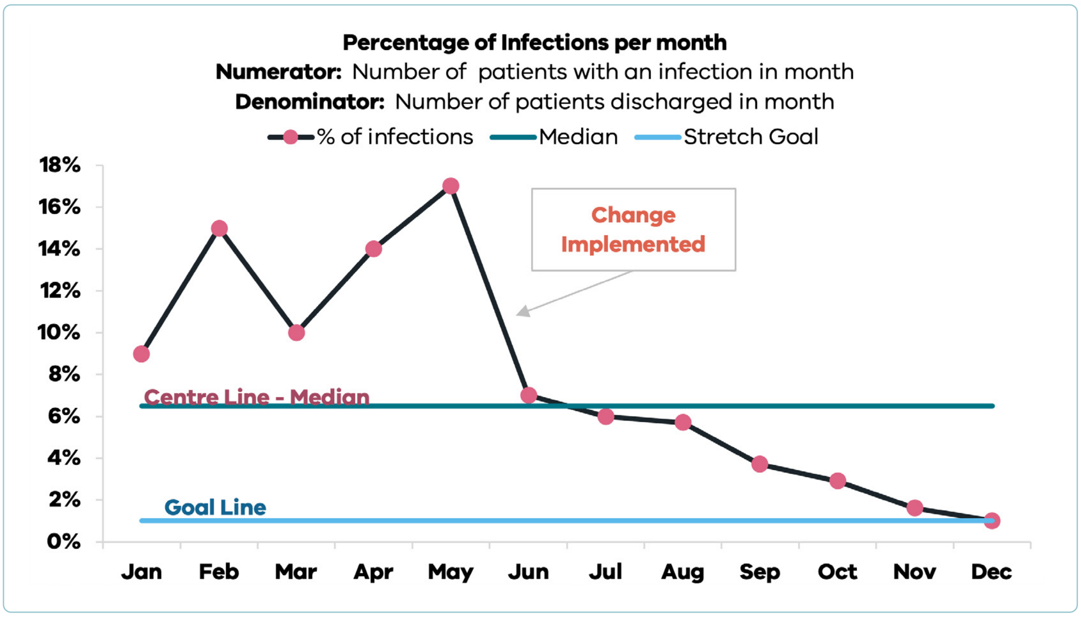


Figure 15: Run chart example – infection rate over time

Interpretation of the run chart:

- There was a **trend** from May – December where the rates decreased every month.
- There was a **shift** that occurred between July – December

The new systems resulted in a desired downward trend (decrease) in the infection rate. In December the team achieved their goal of 1% infection. Continued monitoring and more data will be needed to determine if the results are sustainable.

Additional resources

To learn more about run charts you can access the following resources:

- IHI Using Run and Control Charts to Understand Variation by Robert Lloyd (56mins)

TOOL 15

Control chart

Overview

Improvement takes place over time, and you must observe patterns in your data over time to determine if your initiative has actually achieved long-term improvement. Run charts and control charts can help us do this.

Control charts, also known as Shewhart charts or statistical process control charts, are used to determine if a process is stable (in a state of statistical control). A process is considered stable when there is a random distribution of the plotted points within established limits.

We can use control charts to:

- learn how much variation exists in a process.
- assess stability and determine improvement strategy (common cause or special cause strategy).
- monitor performance and correct as needed.
- find and evaluate causes of variation.
- tell if our changes yielded improvements.
- see if improvements are 'sticking'.

Control charts are more sensitive than run charts. They allow us to predict process behaviour, future performance, and process capability more accurately than run charts. Like a run chart, a control chart is used to display data over time (or sequential order), with time on the horizontal axis and the measured value of the process characteristic on the vertical axis.

However, there are two key differences:

1. Data is plotted against a mean central line (instead of a median).
2. Control charts have control limits. The upper control limit (UCL) and lower control limit (LCL) are derived from statistical analysis of the process data. These are based on the level of variation that is tolerated within the system you are monitoring.

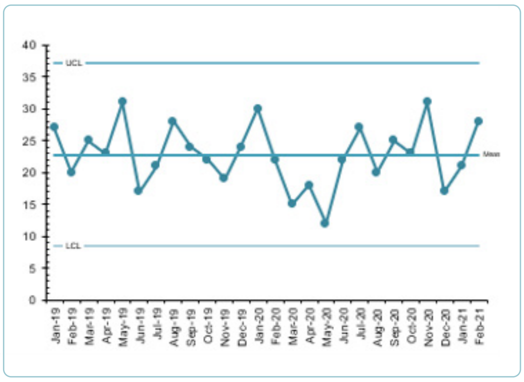


Figure 16: Example of a Control Chart

Making a control chart

1. Begin plotting your data on a run chart.
2. When enough data becomes available (minimum 30 data points), a centre line (mean) and upper and lower limits can be calculated.
3. The type of data you are collecting will determine which type of control chart is most appropriate.

There are many different types of control charts, and you are encouraged to seek training/advice to create the right chart. There are also many different types of software readily available that can complete the calculations required to display the charts visually.

When should I use a control chart?

- **Statistical analysis:** control charts are based on statistical principles and should be used when a more rigorous analysis of process performance is required than a run chart can provide.
- **Process variability:** if your goal is to improve or monitor the stability of a process and detect deviations from expected performance a control chart should be used.
- **Control:** control charts provide statistical control limits that help in distinguishing between common cause and special cause variations.
- **Large data sets:** if you have over 30 data points, then you should use a control chart instead of a run chart.

Responding to variation

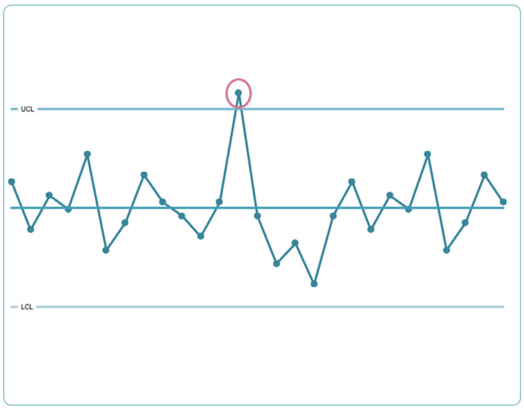
The improvement approach differs depending on whether you have found a common or special cause in the system.

Common Causes: causes that are inherent in the system (process or product) over time, affect everyone working in the system and all outcomes of the system. For common cause, the process is performing as well as possible and requires process redesign to improve. The improvement approach will involve identifying aspects to change, testing, and implementing these through Plan-Do-Study-Act (PDSA) cycles.

Special Causes: causes that are not part of the system (process or product) all the time or do not affect everyone but arise because of specific circumstances (such as unusual events, process instability or changes made in improvement efforts). Special causes mean that something that is not part of the process design is affecting the process. There are five rules for identifying special cause variation in control charts (see next page).

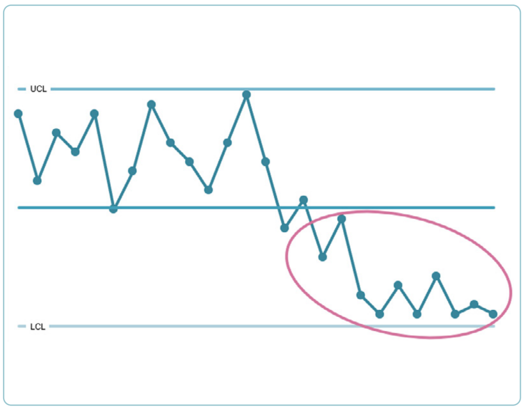
The improvement approach is to identify when the special cause occurred and why (frontline staff are the experts here), learn, and act. If the special cause is undesirable, we should remove it and make it difficult to recur. Where the special cause is desirable, we should try and make it a permanent part of the process. This may require tests of change using PDSA cycles in different parts of the system.

Rules for identifying special cause variation in a control chart



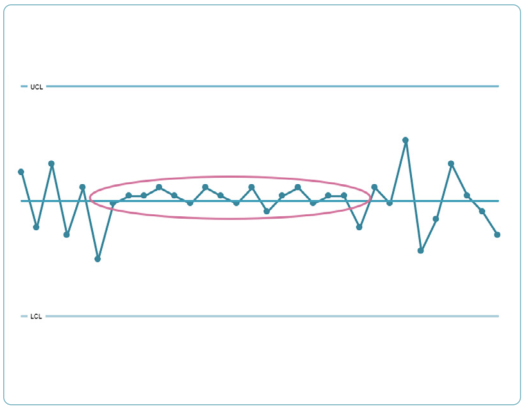
Any point outside the control limits.

A point exactly on a limit is not considered outside the limit.

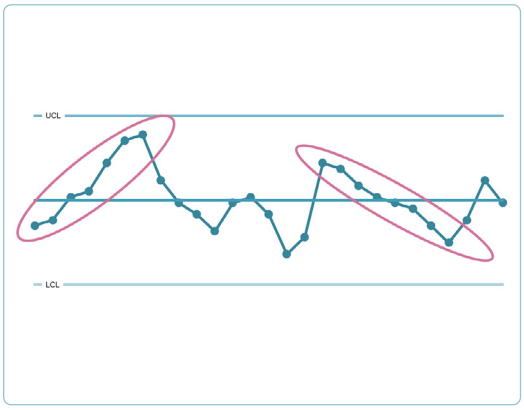


Shift: 8 or more consecutive points above or below the centre line.

A point exactly on the centre line does not cancel or count towards a shift.

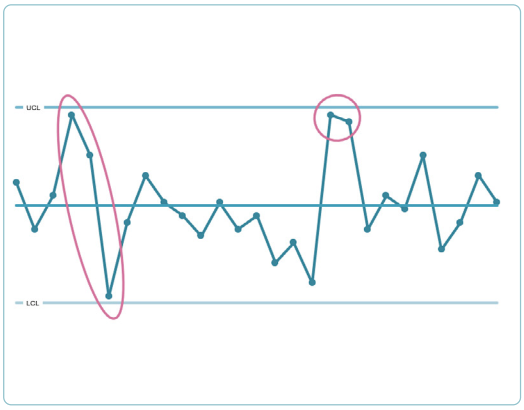


15 consecutive points 'hugging' the centre line (inner one-third).



Trend: 6 consecutive points increasing (trend up) or decreasing (trend down)

Ties between consecutive points do not break or add to a trend.



2 out of 3 consecutive points near a control limit (outer one-third).

TOOL 16

Pareto charts and the 80/20 rule

Overview

Pareto analysis is a technique that helps you to focus efforts on the problems that offer the greatest potential for improvement by showing their relative frequency or size in a descending bar graph.

The **Pareto principle**, also known as the 80/20 rule, states that 'roughly 80% of the effects come from 20% of the causes'. For example:

- 80% of complaints come from 20% of customers
- 80% of sales come from 20% of clients
- 80% of computer crashes come from 20% of IT bugs

Vital few: the factors that have the largest contribution to the effect (problem) and therefore warrant the most attention.

Useful many: the factors that, while useful to know about, have a relatively smaller contribution to the overall effect (problem).

Using a Pareto chart to inform decision making and prioritisation

Pareto charts can to be helpful in your improvement journey when you need to:

- analyse data about the frequency of problems or causes in a process
- determine the most significant problems, causes or change ideas to focus on
- analyse broad causes by looking at their specific components
- communicate to stakeholders about the problem you are trying to solve.

Anatomy of a Pareto Chart

A Pareto chart is a combination of two different graphs: a bar chart and a line chart.

- **Bar Chart:** displays the individual values as bars in descending order (left to right) by highest to lowest frequency
- **Line chart:**
  - Curved line represents the cumulative total percentage of the sample.
  - 80% cut-off-line indicates 80% cumulative frequency of the sample.
  - the vital few box indicates where the 80/20 rule applies. The factors that warrant the most attention sit under the 80% cut off line.
- **X-axis:** Categorical or nominal data, i.e. data that can be grouped.. Each category normally relates to a problem area or cause of a problem and are ordered in descending order of frequency.
- **Dual y-axis:**
  - Lefty-axis: frequency
  - Right y-axis: cumulative percentage

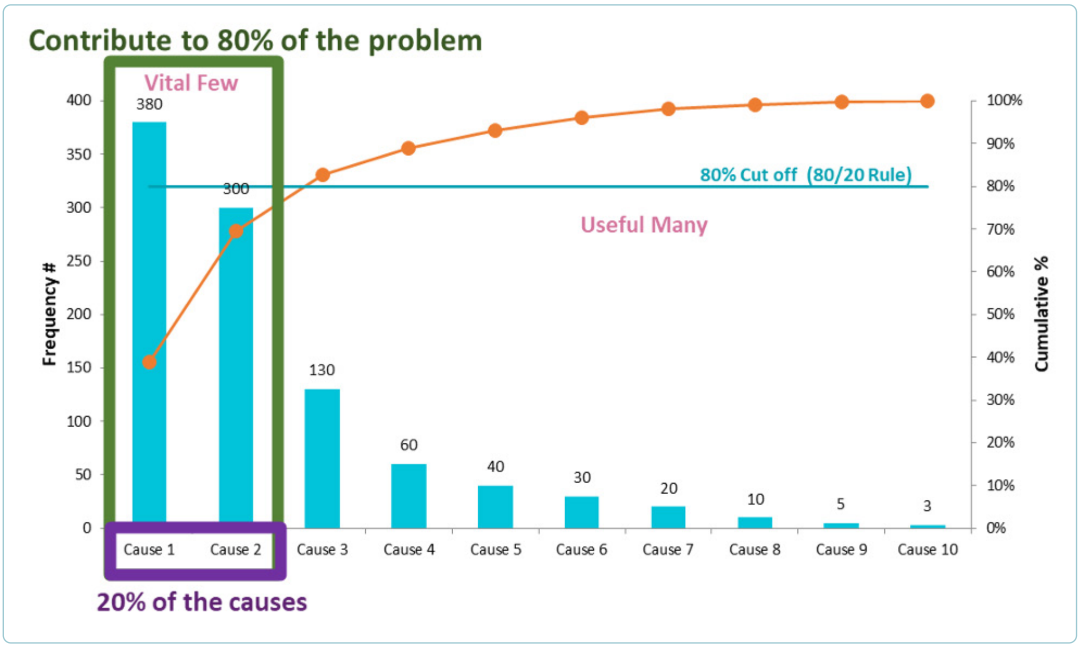


Figure 17: Anatomy of a Pareto chart

How to interpret a Pareto chart

To find the vital few (the factors that have the largest contribution to the effect (problem) and therefore warrant the most attention).locate the spot where the cumulative percentage line crosses the 80% cut off-line. The bars (causes) that fall to the left of this point make up the vital few. These are the causes that you should focus on as a priority (See Figure 17).

Be aware: Pareto charts don't explicitly consider the severity or magnitude of the effects, but rather look at the frequency of occurrence of different causes.

Examples of using a Pareto Chart to support quality improvement

Example: Medication errors

An audit of 426 medication errors was conducted to determine the categories (types) of errors and their frequency. The results were collected and the data was placed in descending order of frequency in a Pareto chart template in Excel.

Based on the Pareto chart, to have the greatest impact on reducing the frequency of medication errors, improvement activities should focus on reducing the following types of errors (the vital few)

- Dose missed
- Wrong time
- Wrong drug
- Overdose

The types of medication errors that sit above the 80%cut-off-line (and to the right of the intersection) are known as the 'useful many'. Addressing these factors is a lower priority than addressing the 'vital few' factors.

Be aware of severe incidents and causes that occur infrequently and those that occur frequently but have very low impact.

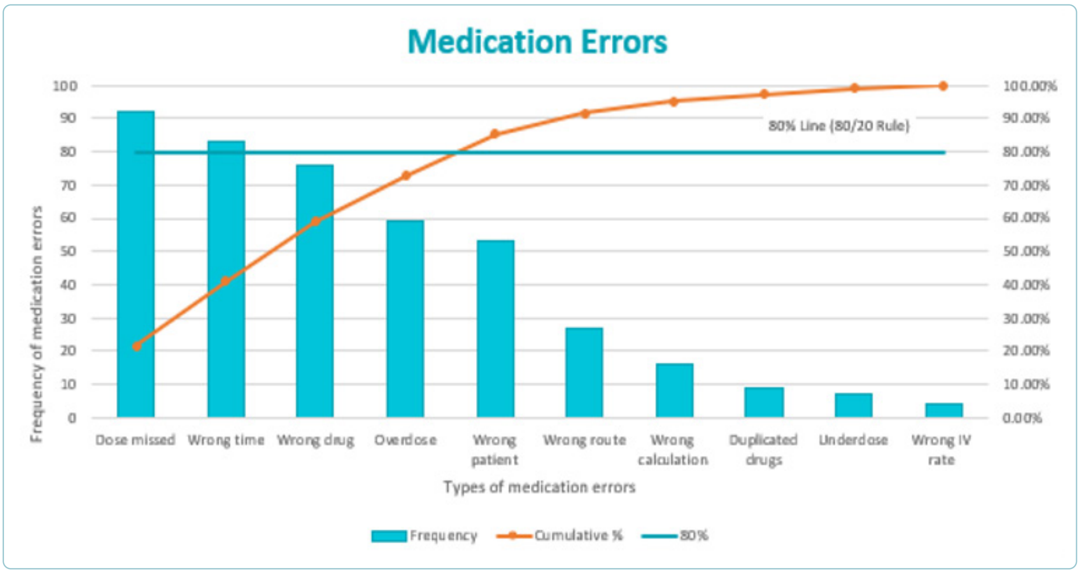


Figure 18: Pareto chart example –Medication errors

How to create a Pareto chart

You can create a Pareto chart using pen and paper or in excel. You can also find a Pareto chart template in the SCV Quality Improvement Toolkit.

It is important to remember that the minimum number of observations of occurrences required to create a pareto chart is 30. With less than 30 observations it is possible that the most frequently occurring categories simply have occurred by random chance.

Additional resources

- Video Institute for Healthcare Improvement (IHI) video Pareto Analysis and the 80/20 Rule (~7 mins)

Histogram

Overview

A histogram is a type of bar graph displaying the frequency distribution of measurements grouped into user-defined ranges or bins. Histograms differ from other types of bar chart, which can display groups with qualities or attributes which have no particular order. The data for a histogram has an intrinsic order which is reflected in the chart.

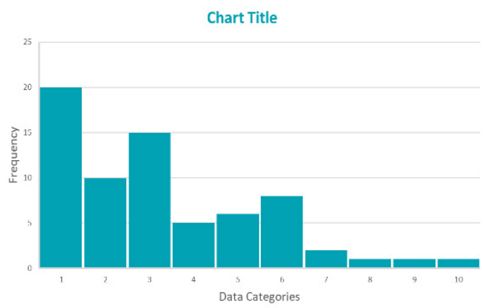
The information can be collected with a checklist initially and then displayed as a histogram to highlight the most frequent category and to understand the variability in your data i.e. location, spread, shape and patterns of data.

When to use a histogram

A histogram is a good tool for understanding your system and determining areas of focus for improvement. Use a histogram if you want to understand the distribution of scaled data, for example:

- age
- time
- money
- workload
- satisfaction ratings

This type of data is known as continuous data. The histogram will give you an idea of the location, shape and spread of the data. The shape and width of the distribution helps identify the cause of problems in a process.



X-axis

- Data categories
- Categories are numerical ranges

Y-axis

- Frequency of data points in each category
- Bar height corresponds to frequency or percentage of total observations.

Figure 19: Histogram Structure

How to create a histogram

1. Gather data on a process you are interested in.
2. Split the data points into several non-overlapping categories of equal width.
3. Decide how many categories (or bins) you want in your histogram. Table 1 suggests how many categories you could use based on the number of data points you have collected.
4. Identify how many of your data points fall into each class and record this information in a table. This will be your frequency table.
5. Plot your graph. Categories are plotted on the x-axis (horizontal) and their frequency is plotted on the y-axis (vertical). Transfer the data from your frequency table onto the graph, so that you have a vertical bar for each category.

Table 2: Data reference

Number of data points	Number of categories
Under 50	5–7
50–100	6–10
100–250	7–12
Over 250	10–20

Example histogram

This example histogram displays the number of falls that occurred over a 12-month period on an aged care ward by patient age range. This example demonstrates a negative/right skew indicating that the older patients on the aged care ward have the greatest number of falls, particularly for those aged between 85–89 years.

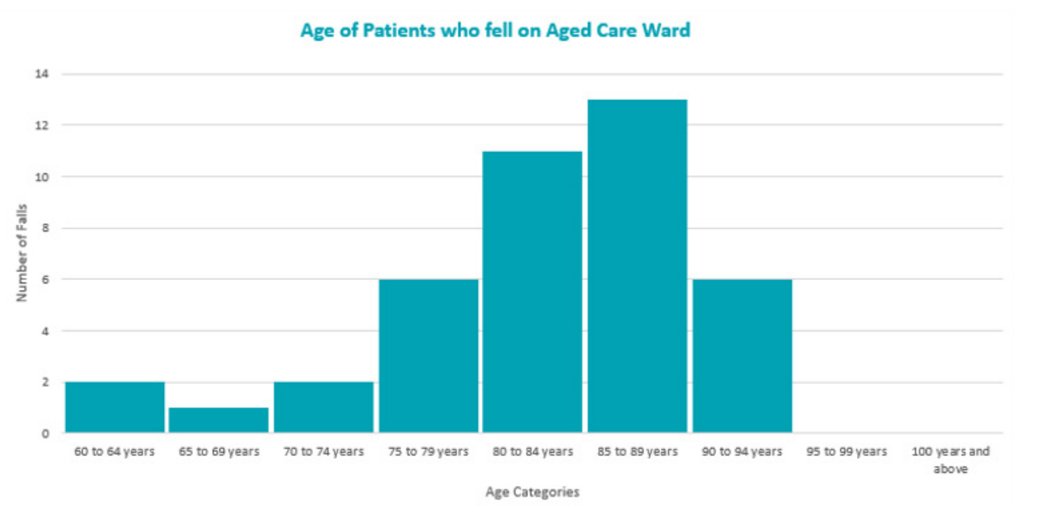


Figure 20: Histogram example - Falls on an aged care ward

Additional resources

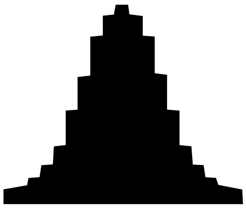
To learn more about Quality Improvement you can access the following resources:

- SCV Quality Improvement Toolkit
- Institute for Healthcare Improvement website
- NSW Clinical Excellence Commission Quality Improvement Tools

Content adapted with permission from the Institute for Healthcare Improvement (IHI) and the Clinical Excellence Commission (CEC)

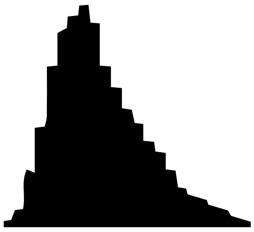
Interpreting a histogram

The shape of the histogram provides insights into how the data is distributed.



Normal distribution

A common pattern is the bell-shaped curve known as the 'normal distribution'. In a normal or 'typical' distribution, points are as likely to occur on one side of the average as on the other. If your data is 'normally distributed' the mean and median is the same.



Skewed distribution

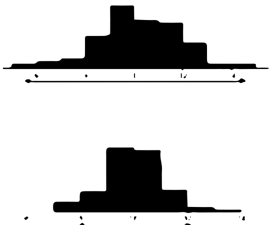
The skewed distribution is asymmetrical because a natural limit prevents outcomes on one side. The distribution's peak is off centre toward the limit and a tail stretches away from it. Skews can be referred to as either right/positively skewed or left/negatively skewed. They suggest that a few data points are significantly higher/lower than the majority.

Double peaked or bimodal

The bimodal distribution looks like a two-humped camel. The outcomes of two processes with different distributions are combined in one set of data.

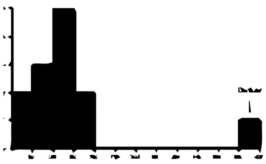
Symmetric/ random/ plateau distribution

A random distribution lacks an apparent pattern and has several peaks. In a random distribution histogram, it can be the case that different data properties were combined. Therefore, the data should be separated and analysed separately.



Spread or dispersion

The width of the distribution in the histogram indicates the spread or dispersion of the data. A wider distribution suggests higher variability, meaning the data points are spread out over a larger range of values. Conversely, a narrower distribution suggests lower variability, indicating that the data points are clustered closer together around the central tendency.



Outliers

Are data points that significantly deviate from the rest of the data. These can appear as isolated bars in the histogram, located far away from the bulk of the data. Outliers may indicate errors in data collection or measurement, or they may represent important but unusual observations.

Scatter plots

Overview

Scatter plots (also known as scatter diagrams or scattergrams) are used to study possible relationships between two variables. The purpose of the scatter plot is to display what happens to one variable when another variable is changed. The scatter plot is used to test a theory that the two variables are related. This can help ensure that you are focusing improvement efforts on the true cause of a problem.

Scatter plots can be used to explore:

- If there is a relationship between outside temperature and cases of the common cold? As temperatures drop, does the number of colds increase?
- Is there a relationship between length of time spent with a doctor and patient satisfaction rates?
- If there is a relationship between number of patients in an Emergency Department and length of wait-time to see a doctor?

Structure of a scatter plot

A scatter plot is composed of a horizontal axis containing the measurements of one variable (independent variable) and a vertical axis representing the measurements of the second variable (dependent variable).

- **X- axis** (horizontal axis): measurements of the independent variable. This variable is the one that you predict may affect the other. For example, age.
- **Y-Axis** (vertical axis): measurements of the dependent variable. This is variable is affected by other factors, and can (potentially) be influenced by the independent variable. For examples, falls.

If you are not sure which variable is which, you can plot them on either axis.

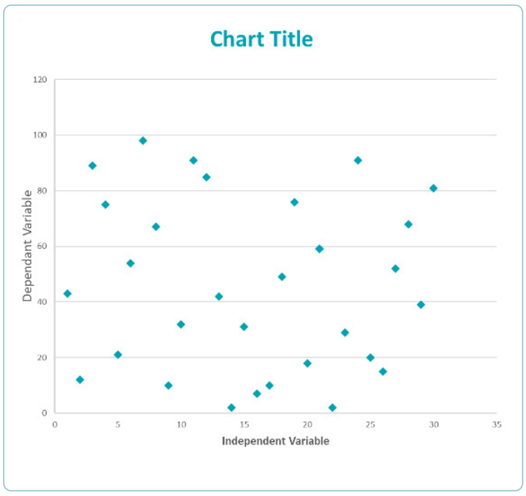


Figure 21: Scatter plot structure

How to create a scatter plot

Scatter plots can be created in many ways, the simplest is to simply draw one on a white board or on paper but they can also be easily created in Excel. Scatterplots can be started with only one data point but they work best with at least 30 observations.

1. Start with a hypothesis, for example:
   - As X (independent variable) increases, do you think Y (dependent variable) will also increase?
   - If X increases will Y decrease?
   - Is there any relationship between X and Y?
2. Collect your data: the data should be collected and recorded in pairs. For example, for each patient has their wait time in minutes 'paired' with their level of satisfaction.
3. Plot the data points or add data to the scatter plot template.
4. Interpret the patterns on the chart which indicate the type of relationship between the variables.

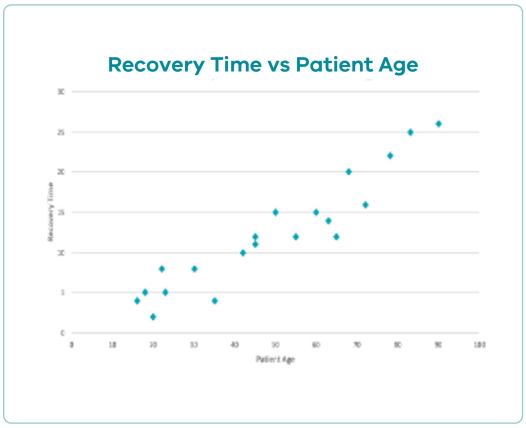
Table 3: Strength of Pearson's r values

Size of Correlation of Pearson's r	Interpretation
.9 to 1	Very Strong
.7 to .9	Strong
.5 to .7	Moderate
.3 to .5	Weak
0 to .3	No Relationship

Important considerations

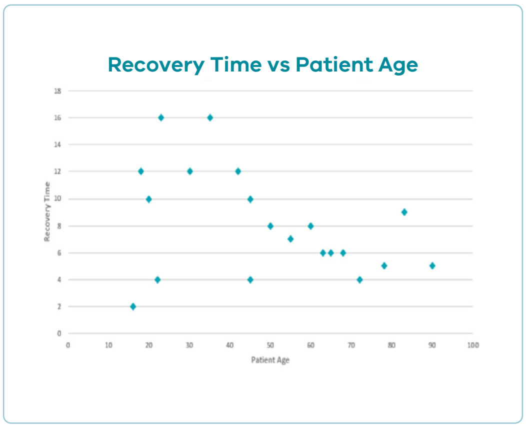
A cautionary note: a scatter plot shows patterns in data and indicate the existence of a relationship between two variables. However, the graph only cannot confirm for sure that there is a direct cause-and-effect relationship between the two variables, as there may be other factors that affect the variables tested.

Scatter plot examples: Relationship between recovery time and patient age



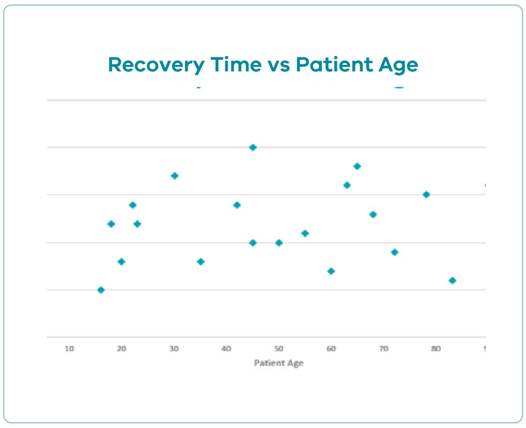
Strong Pearson's r = 0.9
Positive
Linear

Recovery times are likely to increase as age increases



Weak Pearson's r = - 0.4
Negative
Linear

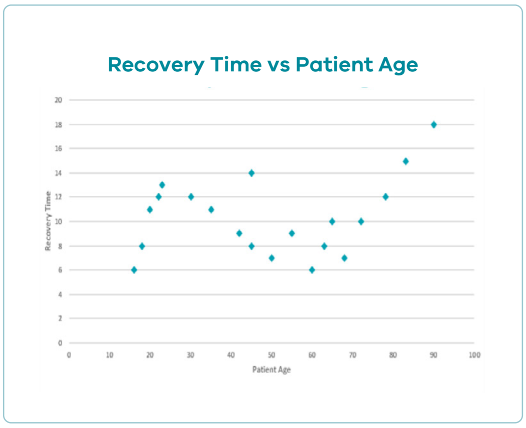
Other variables in addition to age may affect recovery time



Pearson's r = 0.1

No relationship

There is no demonstrated connection between age and recovery time



Pearson's r = 0.17

Non-Linear

Initial increase in recovery time with age but once above 20, recovery time decreases, reaching a minimum, and then increases again as age continues to advance.

Plan Do Study Act cycles

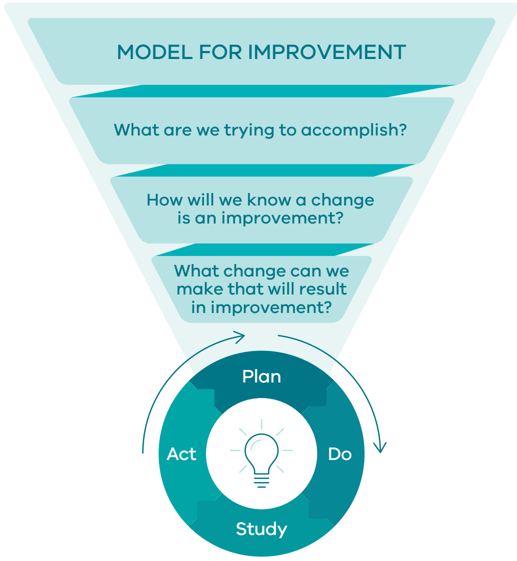
Overview

Once you have answered the three core questions of the Model for Improvement (the model), it is time to start testing your change ideas. This is done by using Plan Do Study Act (PDSA) cycles.

Before you implement any change ideas, you need to assess them using small-scale testing. It is important that the tests are structured, systematic and documented. The PDSA process helps this.

Testing with PDSA cycles starts very small (with one patient, one day, or one team). Small tests are important so that you can test safely and quickly and build confidence in the effectiveness and appropriateness of the change idea. The PDSA approach allows you to gradually increase the size and complexity of your tests, to ensure robust results and to achieve the improvement in the system or process.

Importantly, PDSA cycles are decision support tools. At the end of each PDSA cycle, you can choose if you adopt the change, adapt the change idea, or abandon the change idea altogether.



Safer Care Victoria, in partnership with NSW Health's Clinical Excellence Commission, has developed a PDSA form to help you plan and document your PDSA cycles.

How to use the PDSA cycles?

Plan: the prediction phase

Select a change idea to test, ask yourself the following questions and record your responses:

1. What do you predict will happen? (You will need to compare what actually happened with what you thought would happen to identify 'gaps' in your planning)
2. What exactly will you do? (Clearly define tasks and activities that will be undertaken)
3. Who will carry out the plan? (State the people who will be involved – ownership is important)
4. When will it take place? (Define a short, specific short time period)
5. Where? (State the location the plan will be implemented or improvement will take place)
6. What data do you need? (What data or information will you collect to check the outcome of the change and to know whether there is an improvement)

Do: the execution phase

In the 'Do' phase teams carry out the planned test and collect relevant data and observations. It is important to do the activity and not get caught in the planning phase for too long. The doing phase should be as short as possible. It is important to document what really happened after the plan was carried out. Was the plan executed? Did it meet deadlines? What unexpected events or problems arose?

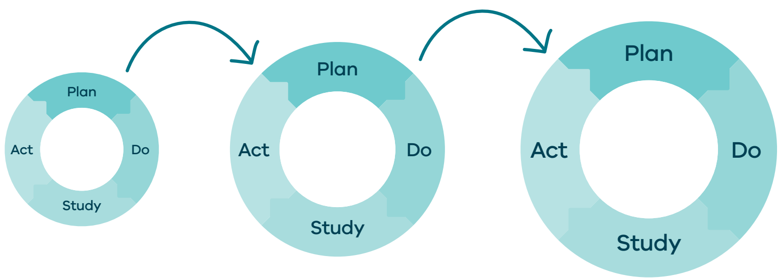
Study: the review phase

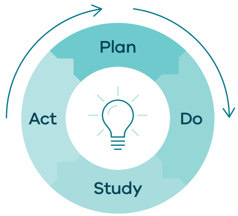
Use this phase to review what happened and study the data collected. In the review phase we consider the impact of the project and what could have been done differently. Where were we, and where are we now? Has it made a difference? Were our expectations met in the real world? What could be done differently? What would I change?

Act: deciding on next steps

In this phase you need to think about what you have learned and what further tests are needed to strengthen your belief in the change idea. Will you adopt, adapt or abandon the change idea? What are your reasons and evidence for the decision?

PDSA cycles should be scaled up over time if they show benefit/improvement. This means deciding on the different conditions you will combine together for your tests. Conditions may include different times, locations, expertise and experience of people involved in testing, or the number of people involved in the testing. Gradually increasing the size and complexity of your tests is called **PDSA ramping**. As the complexity of the conditions that you test increases, you can become more confident that your change idea will help you achieve the desired improvement.

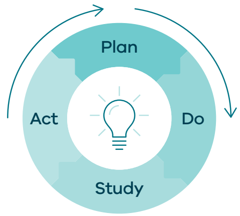




PDSA Form – completed example

Plan	Cycle #: 2 Date: 12/9/2023
Change you will be testing Describe the change you will be testing	We will be testing the use of a new patient feedback survey using QR code access to have better understanding of patient satisfaction.
Questions: What do you want to learn?	Will patients be able to use the QR code to access the feedback survey? Will patients experience of using the QR code be positive?
Aim What are your predictions?	We aim to test the patient feedback survey & QR code access on 5 patients attending the outpatient podiatry outpatient clinic next Tuesday (19/09/2023) to ensure that the survey is easy to read, understand & complete. We predict that patients will find the tool easy to access and understand and that it will help motivate them to provide feedback.
Team Members Names, roles and responsibilities	Sue – podiatrist Mike – allied health assistant Beth – administration
How are you going to test? What/when/how	During clinic hours we will ask 5 patients if they would like to test and provide feedback on the newly developed tool and the method for completion.
Data to be collected What/when/how	Survey completion Time to complete Number of issues faced by participants Qualitative data / feedback on tool and collection method
Do	
Observations What happened?	Most patients found the survey easy to complete. One patient required carer/relative support to complete.
Problems/barriers Did PDSA go as planned? If not, why not?	PDSA went as planned – patients were eager to provide feedback and overall found it easy to access and use but language was a difficulty for 1 patient.
Study	
Data Analysis What did you learn? Any surprises? Were your predictions accurate?	5 people tested survey Average completion time was 4.5mins For patients who spoke English the tool worked well. Adaptation needed to support patients who speak languages other than English to complete the survey.
Act	
Decision:	Adopt: ☐ Adapt: ☑ Abandon: ☐
Next Steps: Is this change ready to be scaled-up, implemented, or spread?	Identify main language groups among patients. Translate into main language other than English & test.

Plan Do Study Act (PDSA) Cycles



PDSA Form

Plan	Cycle #:	Date:
Change you will be testing Describe the change you will be testing		
Questions: What do you want to learn?		
Aim What are your predictions?		
Team Members Names, roles and responsibilities		
How are you going to test? What/when/how		
Data to be collected What/when/how		
Do		
Observations What happened?		
Problems/barriers Did PDSA go as planned? If not, why not?		
Study		
Data Analysis What did you learn? Any surprises? Were your predictions accurate?		
Act		
Decision:	Adopt: ☐ Adapt: ☐ Abandon: ☐	
Next Steps: Is this change ready to be scaled-up, implemented, or spread?		

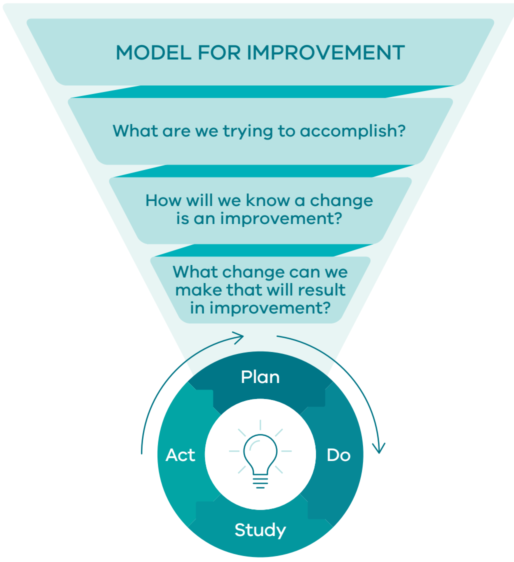
PDSA Ramping

Overview

Once you have answered the three core questions of the Model for Improvement, it is time to start testing your change ideas. This is done by using the 'machine' of the Model for Improvement – Plan Do Study Act (PDSA) cycles.

PDSA cycles should start very small and be scaled up over time. This means making decisions each cycle about the conditions (e.g. size, scale and context) you will test your change under. The more conditions, and combinations of conditions you test, the greater the degree of belief you will have that your change idea will result in improvement when implemented.

The process of gradually increasing the scale and complexity of the testing conditions is called **PDSA ramping**.



Progressing up the PDSA ramp (figure 22) represents moving from learning from safe to fail towards confirmed knowledge that your change idea will result in an improvement.

How to use PDSA ramps

Plan: the prediction phase

The following steps outline how to ramp up your PDSA cycles.

1. **Very small-scale test:** PDSA cycles should start very small (think one patient, one day, or one team member). Small tests are important so that you can test safely and quickly and build confidence that the change idea is effective and appropriate.
2. **Testing under a variety of conditions:** conditions may include different times, locations, expertise and experience of people involved in testing, or the number of people involved in the testing.
3. **Wide scale tests of change:** expanding the scale and complexity of your testing conditions i.e. involving more staff or expanding the time period of testing.
4. **Implementation of change:** embedding the change into daily practice.
5. **Spread:** disseminating or replicating a successful improvement initiative across different settings, departments, or levels within an organisation or community.

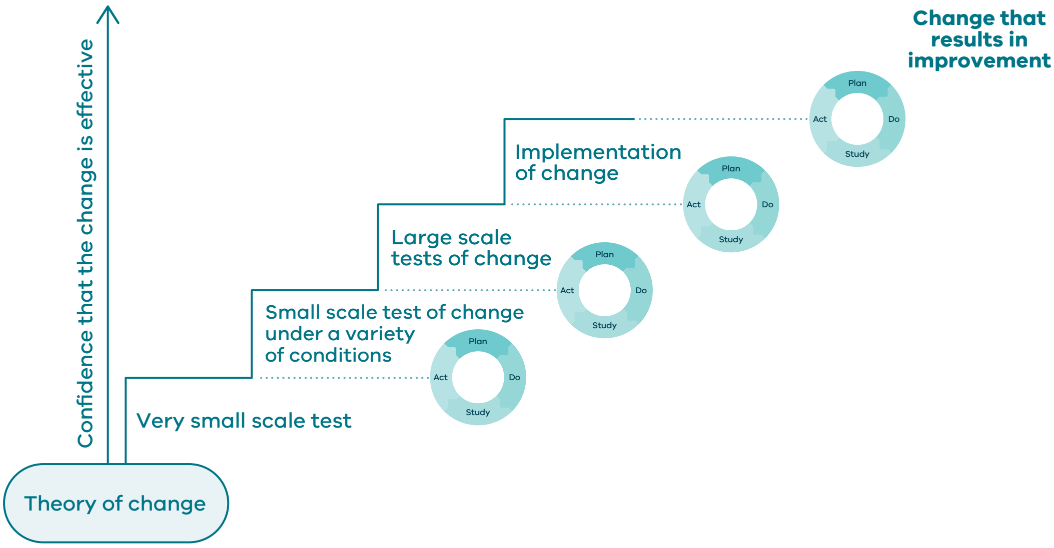


Figure 22: Improvement ramp adapted from Langley et al.

Important considerations

The below table is a useful tool for determining what scale you should use for your PDSA test. This table considers the potential stage of the improvement journey and what the next steps should be.

Current Situation		Staff readiness for change		
		Resistant	**Indifferent**	**Ready**
Low Confidence that current change idea will lead to improvement	Cost of failure large	Very small scale test	Very small scale test	Very small scale test
	Cost of failure small	Very small scale test	Very small scale test	Small scale test
High Confidence that current change idea will lead to improvement	Cost of failure large	Very small scale test	Small scale test	Large scale test
	Cost of failure small	Small scale test	Large scale test	***Implement***

Table 4. Determining the appropriate scale for PDSA cycle test adapted from Langley et al.

PDSA ramping planning template example

Project: **Improving the feedback management process at Westside Hospital**

Date:

CHANGE TO BE TESTED: DOCUMENTING FEEDBACK AT THE POINT OF CARE

CYCLE NUMBER	DATE	STAFF READINESS	DEGREE OR BELIEF IN CHANGE	COST OF FAILURE	RAMPING LEVEL	CONDITIONS FOR TESTING
1	25/2/2024	Resistant	Low Confidence	Small	Very small	Documenting 1 complaint on 1 ward with 1 nurse
2	1/03/2024	Resistant	Low Confidence	Small	Very small	Document 1 complaint with aid of quick reference guide
3	9/3/2024	Indifferent	High Confidence	Small	Small	Documenting 5 complaints on 1 ward with a different nurse
4	20/3/2024	Ready	High Confidence	Small	Large	Documenting all complaints received on 1 ward for week
5	1/4/2024	Ready	High Confidence	Large	Large	Documenting all complaints on 1 ward for 1 month
6	1/5/2024	Ready	High Confidence	Small	Implement	Implement across all of Ward X

PDSA ramping planning template

Project:

Date:

CHANGE TO BE TESTED:

CYCLE NUMBER	DATE	STAFF READINESS	DEGREE OR BELIEF IN CHANGE	COST OF FAILURE	RAMPING LEVEL	CONDITIONS FOR TESTING

TOOL 21

RASCI matrix

Overview

The RASCI matrix is a project management tool that visually displays the different roles for each member involved in a project. It shows the level of involvement required from each role on the required tasks.

Using the RASCI Matrix can:

- eliminate confusion by assigning specific tasks to project team members
- ensure all project responsibility is documented and distributed appropriately
- help ensure accountability within the team
- identify if an individual is overburdened with task assignments
- improve speed of decision-making processes

What is a RASCI matrix?

The RASCI matrix is a responsibility assignment chart. It maps out every task, milestone or key decision throughout the different phases involved in completing a project. By using the acronym 'RASCI' (Responsible, Accountable, Supporting, Consulted and Informed) the matrix helps you assign and identify which roles are required for each action item.

Responsible: the person/people assigned to complete the task or deliverable. There can be more than one person assigned to this role for each item.

Accountable: the person who is accountable has the final authority or approval for the task's completion. There should only be one accountable person for each task.

Supporting: people who provide input and supplementary work for a task. Unlike the two categories above, this can consist of many individuals or teams.

Consulted: a consulted role is an adviser to a task. They usually provide subject matter expertise or guidance. Try not to assign too many consulted roles as this can create time delays and risk poor performance.

Informed: people in informed roles are kept up to date on progress on a task. The task may impact their work, but they are not involved in decisions about, or delivery of, the task.

How to use the RASCI matrix

There are five key steps to using a RASCI matrix.

1. Identify the members of the project team and their roles.
2. Identify the project tasks/deliverables within the different phases of your project.
3. Assign a RASCI category to each role and task.
4. Seek agreement from your team and key stakeholders about the assigned RASCI categories. to make it clear to everyone when and how they are involved in the project.
5. Keep your RASCI matrix up to date as things change in your project.
6. Revisit steps 1–4 during project meetings and stakeholder updates.

Important considerations

Try to keep the 'Responsible' and 'Accountable' roles limited to one person per individual task. For each task, one member on the team must be held responsible.

There will be projects where an individual task does not need an 'Supporting', 'Consulting' or an 'Informed' role assigned. Having gaps in your matrix is not an issue in this case and is quite normal – not every cell needs to be filled in a matrix.

RASCI template

Project:

Date:

CHANGE TO BE TESTED:

#	TASK	DUE DATE	PROJECT LEAD	PROJECT SPONSOR	SUBJECT MATTER EXPERT	CONSUMER/ LIVED EXPERIENCE	QUALITY IMPROVEMENT EXPERT	SYSTEM/ PROCESS EXPERT	OTHER

R: Responsible **A: Accountable** **S: Supporting** **C: Consulted** **I: Informed**

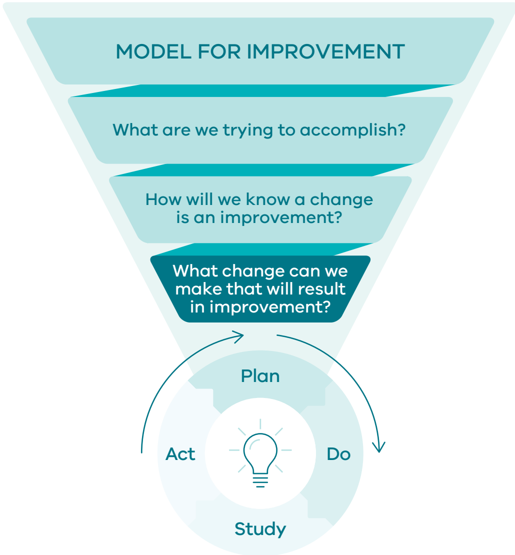
TOOL 22

Effort-Impact Matrix

Overview

In any improvement project there may be many different change ideas that could help you achieve your aim. Prioritisation matrixes are a structured visual tool designed to help you and your project team decide which change ideas to test first.

The Impact Effort Matrix is a structured visual tool to help focus your activity and energy and prioritise your change ideas. It's best to complete this with your team to help build buy-in and communicate to stakeholders why you have chosen to test certain ideas before others.



How to create and use a prioritisation matrix

An Impact Effort matrix is created as part of a structured brainstorm once your team has generated their improvement ideas.

1. Draw a large 2x2 matrix on a whiteboard or a piece of flipchart paper (or use below template).
2. Label your axes.
   - Vertical axis: Impact.
   - Horizontal axis: Effort
3. Write all your improvement ideas from your brainstorming onto a post-it-note..
4. As a team, for each idea each idea, determine the level (high/medium/low) of impact the change will have and effort it will take to implement (high/medium/low).

   To determine the **impact** the change will have, consider:
   - Evidence: is there global or local evidence this change makes a difference?
   - Contribution: how much does this change contribute to our overall aim?

   To determine the **effort** it will take to implement the change, consider:
   - Speed: how quickly can we do this?
   - Resources/Cost: how many resources does it take to implement?
   - Acceptability: is this change likely to be adopted by the users of the system
5. Place each post-it-note in the most appropriate quadrant.

Making decisions based on Effort – Impact Matrix	**Quick wins (High Impact, Low Effort):** These tasks are usually prioritized first as they provide significant benefits with minimal effort. **Major projects (High Impact, High Effort):** These tasks are important but require substantial effort. They are typically pursued next. **Fill-Ins (Low Impact, Low Effort):** These tasks are not very impactful but can be done when there is extra capacity or as fillers between major tasks. **Hard slogs (Low Impact, High Effort):** These tasks provide minimal benefit and require a lot of effort. They are often deprioritized or reconsidered.
Important considerations	A person's perspective of impact or effort may be different to others and influenced by their 'place' in the system. When using prioritisation tools such as this matrix, the conversation and collaboration that occurs in order to reach consensus is a vital part of this process.

Effort-Impact Matrix

Project:

Date:

IMPACT: High / Low

Quick Wins High Impact / Low Effort	Major Projects High Impact / High Effort
Hard Slogs Low Impact / Low Effort	Fill-Ins Low Impact / High Effort

EFFORT: Low / High

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