Safe Equitable

Patient-Centred

Focused on Population Health

Integrated

Accessible

Appropriately Resourced

Effective

Quality Improvement Guide

Ontario
Health Quality Ontario

Quality Improvement (QI)

Quality Improvement (QI) offers a proven methodology for improving care for patients, residents and clients. In this guide, QI refers to a QI team, working towards a defined aim, gathering and reviewing frequent measures and implementing change strategies using rapid cycle improvements. QI science provides tools and processes to assess and accelerate efforts for testing, implementation and spread of QI practices. This guide is an introductory resource to support practitioners of QI in Ontario.

This guide was prepared by the Health Quality Ontario (HQO).

We gratefully acknowledge
the Institute for Healthcare Improvement
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1 INTRODUCTION

Quality Improvement (QI) is a proven, effective way to improve care for patients, residents and clients, and to improve practice for staff. In the healthcare system, there are always opportunities to optimize, streamline, develop and test processes, and QI should be a continuous process and an integral part of everyone's work, regardless of role or position within the organization.

The **Health Quality Ontario (HQO)** has developed this guide to give healthcare teams and organizations in Ontario easy access to well-established QI tools. We provide examples of how to adapt and apply these tools to our Ontario healthcare environments.

Our objective is for the guide to help you start and support QI initiatives.

1.1 WHAT IS QUALITY IN HEALTHCARE?

Ontarians share a common vision of a high-performing health system. We want a publicly funded system that is accessible, effective, safe, patient-centred, equitable, efficient, appropriately resourced, integrated and focused on population health. These are the nine attributes of a high-quality health system identified by HQO.

ATTRIBUTES OF QUALITY	OUTCOMES
Accessible	People should be able to get the right care at the right time in the right setting by the right healthcare provider.
Effective	People should receive care that works and is based on the best available scientific information.
Safe	People should not be harmed by an accident or mistakes when they receive care.
Patient-centred	Healthcare providers should offer services in a way that is sensitive to an individual's needs and preferences.
Equitable	People should get the same quality of care regardless of who they are and where they live.
Efficient	The health system should continually look for ways to reduce waste, including waste of supplies, equipment, time, ideas and information.
Appropriately Resourced	The health system should have enough qualified providers, funding, information, equipment, supplies and facilities to look after people's health needs.
Integrated	All parts of the health system should be organized, connected and work with one another to provide high-quality care.
Focused on Population Health	The health system should work to prevent sickness and improve the health of the people of Ontario.

LINK! **For more information about the nine attributes of a high-quality health system, see HQO's annual reports at www.hqontario.ca.**

1.2 WHAT IS QI?

When we say QI, we are referring to the science of QI developed over the past few decades by Dr. W. Edwards Deming and Dr. Joseph Juran, and promoted by Dr. Donald Berwick of the Institute for Healthcare Improvement (IHI). QI is based on an understanding of the system in which we function, the complexity of dealing with people, the variation of outcomes created by the system and the use of knowledge to influence those outcomes. QI initiatives are applied by local staff and leaders who are proficient at problem solving and managing group dynamics, and involve the people being served in the design of how care is delivered.

A QI initiative has the following features:

- Local interdisciplinary teams empowered and trained to set goals for improvement
- Teams identifying causes of problems, barriers to quality or flaws in system design that lead to poor quality
- Teams trying out different ideas for improving how care is delivered in multiple brief, small experiments of change
- Teams conducting frequent, targeted measurement of quality in a way that gives them instant feedback on whether the changes they are testing are heading in the right direction

What is healthcare QI?

"A broad range of activities of varying degrees of complexity and methodological and statistical rigour through which healthcare providers develop, implement and assess small-scale interventions, identify those that work well and implement them more broadly in order to improve clinical practice."[1]

QI science provides tools and processes to assess and accelerate QI efforts through testing, implementation and spread. But QI is more than tools; it is a culture of continuous Quality Improvement. QI uses structured improvement methods and models, including the Model for Improvement, Six Sigma and Lean. It makes use of incremental change and a testing model called Plan-Do-Study-Act (PDSA). And it acknowledges that successful QI requires leadership from senior management and clinicians, an appropriate and supportive culture, and people trained in group processes and change management. All of this needs to be aligned with the organization's strategic objectives, and with the quality management systems in place.

A QI project, like any other project, has a beginning, a middle and an end. The QI team has a defined aim, gathers relevant data and develops and tests changes as it works towards implementing successful improvements. It is assumed that any QI project fits into an organizational framework that supports and promotes Continuous QI (CQI).

[1] The Ethics of Improving Health Care Quality & Safety: A Hastings Center/AHRQ Project, Mary Ann Baily, PhD, Associate for Ethics & Health Policy, The Hastings Center, Garrison, New York, October, 2004

A successful QI project team uses structured improvement models and methods similar to those discussed in this guide. In some cases, the QI project team is a group of people already working together as a clinical team. However, it is most common for a team to come together as a unique group, with each member selected to represent a particular aspect of the process being addressed. However it is constituted, the QI project team works together to achieve the project aim.

1.3 WHAT CAN YOU EXPECT FROM THIS GUIDE?

This guide is intended as a jumping off point in the QI journey, and provides foundational knowledge necessary to start improvement projects. HQO has developed modules focused on various change concepts and strategies, including access and efficiency. We will develop additional modules to address other crucial elements that support the success and spread of Ontario QI initiatives.

This document is divided into three main sections:

- **QI Project Cases** — An introduction to structured improvement methods and examples of projects
- **QI Model for Improvement** — More details about the structured improvement model, including discussions and examples related to each component
- **QI Methods and Tools** — Examples of methods and templates of tools presented in the earlier sections of the guide

LINK! **QI teams can optimize quality by improving access and efficiency. HQO has developed two modules, focused on access and efficiency, to accompany this guide. They are available on the HQO website at www.hqontario.ca.**

2 QI PROJECT CASES

2.1 INTRODUCTION

Ideas for healthcare improvements come from countless sources. Leaders may identify a gap related to organizational objectives, or teams may identify opportunities based on provider and patient/client experiences. In some cases, quality monitoring issues, public reporting on quality indicators or new best practice guidelines serve as an impetus for QI projects.

This guide presents a methodology — **the Model for Improvement** — and tools that a team can use to make improvements. QI practitioners have found this methodology and these tools useful over the past 20 years. Keep in mind that the Model for Improvement is a framework for making improvements with others. Within each project, a number of tools and techniques may be useful on their own or in combination with others. No two projects will be identical in their tests of change or the tools and techniques they use, but common situations in which specific tools might be useful. The right tool at the right time can help construct a great outcome.

There are two QI case studies in this section. These are not actual cases, but amalgams of real case studies. In the sidebar next to each story, we provide a list that refers the reader to the key QI tools and techniques relevant to the team's QI journey.

2.1.1 QI Case #1

REDUCING FALLS IN A REHABILITATION HOSPITAL

TOOLS QI PROJECT ACTIVITIES	RELEVANT QI AND TECHNIQUES
The new director of a rehabilitation hospital (RH) pointed out that the organization's falls rate was much higher than that of other similar organizations. After exclamations that RH's patient population was much sicker, managers and clinicians finally agreed that the rate was too high. RH held a facility-wide "Falls Fair" to educate staff about the common causes of patient falls and prevention. Unfortunately, the falls rates for the next three months remained high. Looking at the data, the organization saw that the unit with the highest number of falls cared for relatively mobile residents with mild to moderate dementia who were getting stroke rehab. RH created a QI team made up of a manager, a registered nurse (RN), an aide and a rehabilitation therapist.	**Starting out** **Assembling the team (Section 3.2)**
At the first team meeting, everyone had a lot to say about the causes for the large number of falls. They questioned why things happened as they did and had many suggestions for change. Working with the team leader, the team's facilitator described IHI's Model for Improvement and rapid cycle improvements. At their second meeting, the team worked to clarify their project aim, and then set an improvement target of 40%. To find out more about falls at RH, the team looked at a year's worth of incident data and the reason for each fall. Much has been written about falls reduction, with evidence from successful programs, and this offered many good improvement ideas. The team decided to implement a falls risk assessment process to prevent falls.	**Brainstorming, Fishbone Diagram (Section 4.1.1)** **Five Whys (Section 4.1.2)** **Model for Improvement: Aim (Section 3.3)** **Model for Improvement: Measure (Section 3.4)** **Check Sheet (Section 4.1.4)** **Model for Improvement: Change (Section 3.5)**
The first task was to find examples of falls risk assessment tools. One tool developed by another organization with a similar patient population seemed promising, and the team planned a small test. Jane, a rehabilitation therapist, tried the tool with two cognitively aware patients to see how long it took and whether the tool seemed workable. Jane presented her results: with a few tweaks, she thought the tool could be used for the majority of the patients in the unit. Jim, the RN, worked with a unit nurse to see how she felt about using the tool. After several more PDSA cycles, the assessment process began to work. Within two weeks, test results were available on almost all patients in the unit. The team then started working on how the risk assessment could trigger a falls prevention protocol that included multiple strategies (strength/balance training, medication review, simple changes such as bed height adjustments, etc.).	**Model for Improvement: PDSA (Section 3.6)** **Process Mapping (Section 4.1.3)**
Over the following months, the team continued to test changes, measure results and build changes into the procedures and orientation for new staff. After nine months, the falls rate had reached and sustained the team's target. RH celebrated its successes and continued the work to maintain and increase the improvement. Administration supported the spread of the new changes and procedures, and encouraged other units to test them.	**Continuous Quality Improvement**

2.1.2 QI Case #2

REDUCING SURGICAL SITE INFECTIONS AT AN ACUTE CARE MEDICAL CENTRE

TOOLS QI PROJECT ACTIVITIES	RELEVANT QI AND TECHNIQUES
In a presentation to the board of an acute care medical centre (ACMC), the centre's surgical site infection (SSI) rate was reported to be higher than that of comparable organizations. The board asked senior leaders to address the problem. In response, the CEO signed up ACMC to participate in the national Safer Healthcare Now! (SHN) initiative and asked the chief of surgery to organize the effort to reduce SSI rates. The chief of surgery and perioperative care director assembled a QI team that included the head of orthopaedics, two operating room (OR) nurses, another orthopaedic surgeon, an infection control coordinator and a QI facilitator. The team looked at infection rates by service and considered which one might have the best chance of early success.	**Starting out** **Assembling the team (Section 3.2)**
The team discussed the SHN bundle of interventions, including appropriate use of prophylactic antibiotics, appropriate hair removal, maintenance of post-op glucose control and post-op normothermia. The team's facilitator described IHI's Model for Improvement and rapid cycle improvements, and the team developed a clear project aim — to reduce the hospital's SSI rates by 50% within one year. They decided to begin by focusing on one intervention with a specific type of surgery, rather than all surgical procedures: the use of prophylactic antibiotics in hip and knee replacements. These were procedures performed by the two surgeon team members. They needed baseline data to know how many patients actually received their pre-operative antibiotics within one hour before surgery, so they used a one-page form that they found on the SHN website. For one week, the OR nursing supervisor ensured that the form was completed for all hip and knee replacement patients. The team learned that only 36% of patients received their antibiotics within 60 minutes of their surgery, with no consistency about who ordered, administered or recorded this task. When the team flowcharted the actual antibiotic administration process steps, mapping who did what and when, they saw that the anaesthetists played a role, so one was asked to join the QI team.	**Model for Improvement: Aim (Section 3.3)** **Model for Improvement: Measure (Section 3.4)** **Check Sheet and Pareto Chart (Section 4.1.4 and 4.1.5)** **Fishbone Diagram (Section 4.1.1)** **Model for Improvement: Change (Section 3.5)** **Process Mapping (Section 4.1.3)**
The team brainstormed ideas for how to make the process more consistent. One idea was to amend the pre-operative order set to include the recommended antibiotics and dosage. The anaesthetists could take responsibility for administering and recording the antibiotics within 60 minutes prior to incision. The two surgeons agreed to test the amended pre-operative order set for the next week. The anaesthetist agreed to speak to colleagues who were scheduled for those cases and ask them to administer the antibiotics in the pre-operative holding area.	**Model for Improvement: PDSA (Section 3.6)**
The following week, the team studied the data. It showed that more than 95% of the patients received their antibiotics within 60 minutes of their surgery. They presented their experience to the OR quality committee, which recommended that the other surgical services try the same approach.	**Continuous Quality Improvement**

2.2 OBSERVATIONS ON THE CASE STUDIES

Although the two case studies are different and did not follow exactly the same path, there are commonalities between them and with most other successful QI projects:

- QI projects are team-driven
- QI work starts with a strong aim statement that the team may revisit after they understand their problem better
- Teams decide what measures they should collect
- Teams identify strategic areas for improvements or key change ideas
- Teams use a series of PDSA cycles to develop and test small changes on a small scale in different contexts; after building confidence that the changes do lead to improvement, teams implement the changes
- Management and teams work to spread improvements to other parts of the organization, if appropriate

The PDSA cycles, supported within the Model for Improvement, provide structure for changes and the learning process. The next chapter discusses the Model for Improvement and how to use it.

2.3 SUMMARY

The QI journey has multiple phases, with each step building on the previous one. For example, you must analyze your current processes before you can implement improvements. Furthermore, all settings can use QI tools to map and understand their processes, and using the right tools will allow the team to work smarter rather than harder.

The PDSA cycle is a way to keep QI initiatives small and manageable and, at the same time, to generate momentum by creating early successes. Building on each cycle of PDSA, for each category of change being tested, helps teams achieve short- and long-term goals.

The rest of this guide offers an introduction to start you on your way. We recommend that you talk to colleagues, share ideas and share stories so that everyone can learn from each other's experiences.

3 QI MODEL FOR IMPROVEMENT

3.1 INTRODUCTION

The Model for Improvement has two basic components: the first addresses three fundamental questions, and the second is the rapid cycle improvement process comprising a series of PDSA cycles to develop, test and implement changes for improvement (see **Figure 1**).

The Model for Improvement is a simple but powerful framework for structuring any QI project. QI teams that use this model have the highest chance of success. This chapter focuses on the components of the model.

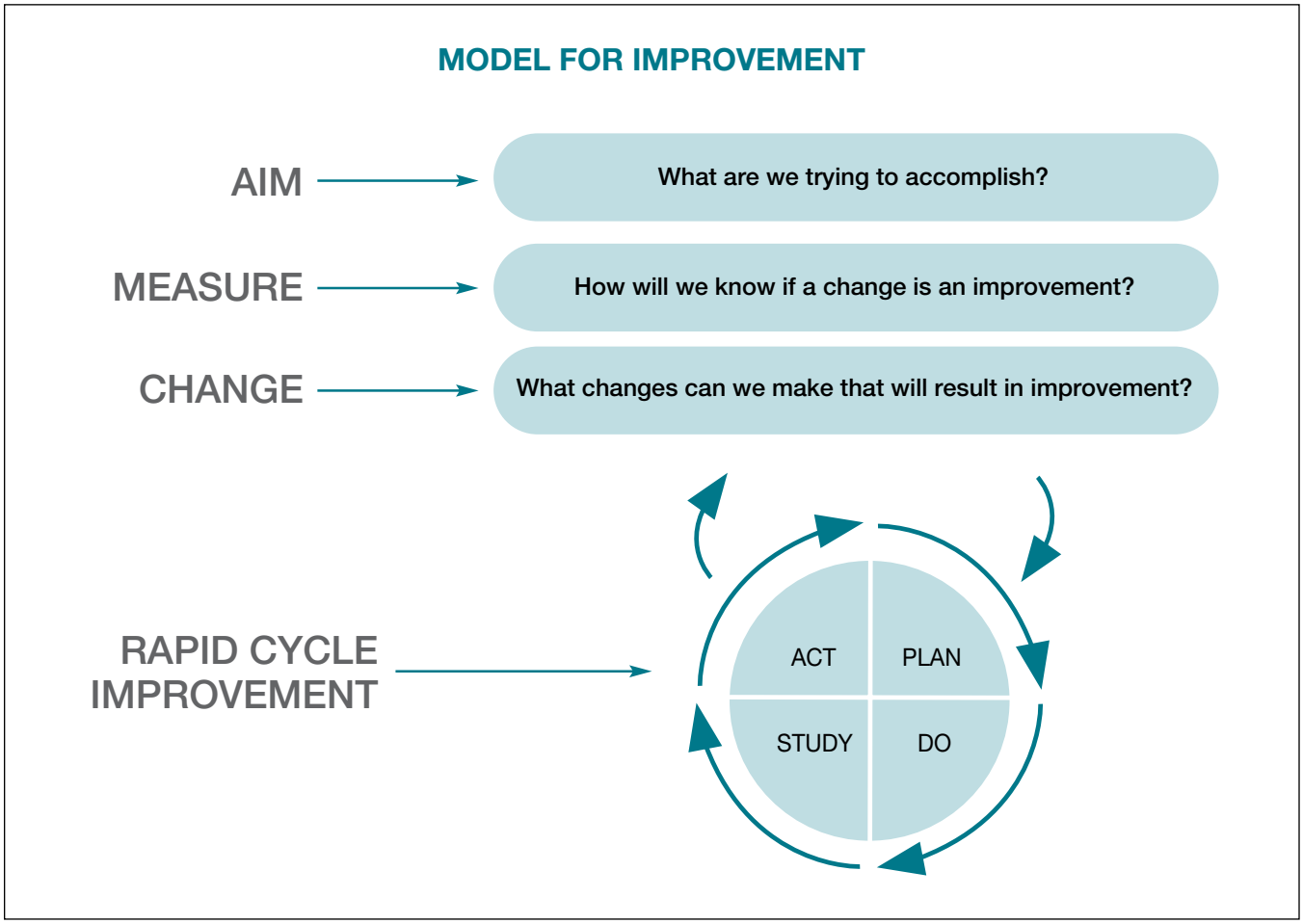


FIGURE 1 | The Model for Improvement

3.2 ASSEMBLING THE TEAM: WHO SHOULD BE ON THE QI TEAM?

To be successful, a QI initiative needs the support of the whole team — from the receptionist and clerk to managers, providers and others. That said, although the team needs to be inclusive, inviting a maximum of 10 people to join keeps it manageable. Identify a leader who is respected and has credibility among peers. Be open to including constructive skeptics who have legitimate concerns but are open to change. Sometimes, teams choose to include a member from outside their service group because of an interdependency with other parts of the system. For example, the emergency department may consider someone from the lab, or primary care may consider a local diabetes education representative.

Consider the following checklist when forming a team:

- Have we included a representative from each discipline that touches the work?
- Have we considered including non-registered staff who also support the work?
- Have we identified a team leader?
- Do we have a physician champion on the team?
- Should we include a constructive skeptic on our team?
- Do we have someone with QI skills to facilitate our progress?
- Should we consider an external stakeholder?

TIP! **The people who do the work need to be the ones to change the work.**

3.3 DEFINING THE AIM: WHAT ARE WE TRYING TO ACCOMPLISH?

Every QI initiative needs a clearly defined aim. The aim should answer the question, *"What are we trying to accomplish?"* It should also have the following characteristics:

- **Clear** — To create a clear plan, you need a clear aim.
- **Time-specific** — Set a goal date for when you want to accomplish your aims.
- **Stretchable** — To support your aim, establish a stretch goal. Aiming for small, incremental change (e.g., moving from below average to average, or changing by 10%) does not represent a real breakthrough in quality, and may not justify the investment in people's time to participate. To help you set a stretch goal, look at what leaders in the field are doing. If there are no clear examples of leading practices, aim to decrease suboptimal care, adverse events or undesirable wait times by half as a first step.
- **Providing real value** — Ensure that your aim has real value to your patients and clients.

EXAMPLE

Poor aim statements:

"Through the implementation of an electronic medical record (EMR), our chronic disease patients will get better care."

or

"We will create a truly interdisciplinary team to provide specialized patient-centred care for those with chronic conditions."

Good aim statements:

"We will improve management of diabetes patients served at the Brown Street Clinic. By May of next year, we will aim to increase the percentage of patients meeting their targets for A1C and blood pressure from 35% to 75%."

or

"We will reduce wait times for new patients referred to our specialty clinic from 53 days to 26 days. We will accomplish this within seven months."

3.4 IDENTIFYING THE MEASURES: HOW WILL WE KNOW IF A CHANGE IS AN IMPROVEMENT?

Measures tell you whether the changes you make are actually leading to tangible improvement. They give you concrete evidence to support your case for change, and they also increase buy-in for the initiative.

3.4.1 Types of measures

QI initiatives should use three types of measures to help create targets and achieve their aims:

- **Outcome measures** are the "voice of the patient or customer" and capture system performance. In other words, what are the results? Examples include infection rates, wait times and falls rates.
- **Process measures** are the "voice of the workings of the system." In other words, are the steps in the processes that support the system performing as planned? Examples include bundle compliance rates, supply and demand and high-risk patient intervention rates.
- **Balancing measures** look at a system from different perspectives. In other words, are changes designed to improve one part of the system causing new problems in other parts of the system? Examples include staff satisfaction, financial implications and restraint rates.

3.5 DEFINING THE CHANGES: WHAT CHANGES CAN WE MAKE THAT WILL RESULT IN IMPROVEMENT?

Change ideas are specific changes that focus on improving specific steps of a process. They are practical ideas that can be readily tested.

Change concepts, on the other hand, are the broader principles that provide general direction for planning improvements.

For example, "balance supply and demand every day" is a change concept. Scheduling pre-booked appointments on days of the week that have the least demand is a change idea.

All improvement requires making changes, but not all changes result in improvement. ***Source: www.ihi.org***

3.5.1 Change ideas

QI teams may have ideas about what changes need to be made. It is important to tap into the wisdom of the group when considering possible areas for improvement.

First, identify all the different ideas for addressing a problem or improving care by:

- Asking the team for ideas
- Seeking best practices from elsewhere
- Creating process maps or fishbone diagrams to identify where problems are occurring and potential solutions
- Considering generic change concepts (a general approach to improving quality) and then brainstorming about how to adapt/apply these ideas in a local setting

Second, narrow down the list of ideas to the changes that are most likely to result in improvement. Using measures to understand current processes will help to identify the changes the team should explore further.

Shigeo Shingo incorporated mistake proofing into the Toyota Production System. See Appendix A for more change concepts.

3.5.2 Change concepts

Many change concepts offer improvement opportunities to healthcare:

- Lean focuses on change concepts to reduce waste
- Six Sigma focuses on change concepts to improve the reliability of a process
- Advanced access change concepts focus on balancing supply and demand for health services
- Efficiency change concepts promote flow within health services

Here are some examples of change concepts, along with change ideas that a QI team can use to apply the change concepts:

CHANGE CONCEPT	CHANGE IDEAS RELATED TO THE CHANGE CONCEPT
Remove constraints	Arrange for the provider's assistant administer a screening survey and supply educational handouts, freeing up the provider to see more clients
Use visual cues	Place a visible sticker above the bed of patients/residents who are at high risk for pressure ulcers to trigger staff to carry out interventions
Have contingency plans	Develop a vacation scheduling plan to ensure that supply is able to meet anticipated demand

See Appendix A for examples of Change Concepts

3.6 IMPLEMENTING RAPID CYCLE IMPROVEMENTS: WHAT ARE PLAN-DO-STUDY-ACT (PDSA) CYCLES?

3.6.1 Testing and implementing change ideas

This section describes tools that help QI teams test and refine change ideas, and then implement them more broadly.

Once you have identified possible QI change ideas, test each of them thoroughly using a quick succession of small tests, and trying different variations and combinations of ideas. Use the PDSA cycles and ramps (described in detail in Section 3.6.3 and 3.6.4) to implement and assess the change, and to keep the team and project on track. After analyzing the results, spread successful changes to other parts of the organization.

PDSA cycles offer the most robust approach for improvements, because what seems to be a cutting-edge practice in one place may not work well somewhere else. It may have to be adapted to your environment, since every organization has a different mix of skills, people, equipment and policies. Also, the patients and healthcare consumers that an organization serves will vary in age, culture, language, education and socioeconomic status.

Trying to change a system all at once can generate resistance. We often fear change, are skeptical about the benefits and are attached to old ways of doing things. Small tests of change can be a low-risk way to try new ideas that people might be hesitant about at first. They can demonstrate the benefits of a new initiative and encourage buy-in.

Furthermore, any change may have unintended consequences. Small tests of change can help uncover undesirable effects early so the QI team can modify or abandon a change idea.

3.6.2 Laying the groundwork before conducting PDSA cycles

Before you start to conduct PDSA cycles:

1. Organize your change ideas into groups, each of which represents a similar notion or approach to change, or change concept
2. Decide which change ideas are high-priority and should be tested first (use the system analysis tools described in Section 4.1 to help identify priorities)
3. Identify different ways each change idea could be implemented

Now you are ready to start your PDSA cycles.

3.6.3 Step-by-step instructions for conducting PDSA cycles

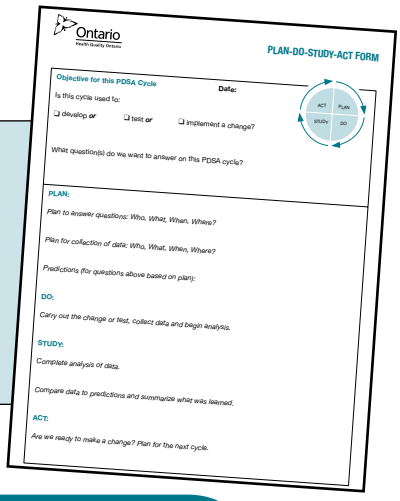
You can use PDSA cycles to develop change ideas, test small-scale changes and implement changes across your area and organization.

Follow these steps to conduct a **PDSA cycle**:

Step 1	**PLAN**
	State the purpose of the PDSA — are you developing a change idea, testing a change or implementing a change? What is your change idea? What indicator(s) of success will you measure? How will data on these indicators be collected? Who or what are the subjects of the test? How many subjects will be included in the test and over what time period? What do you hypothesize will happen?
Step 2	**DO**
	Conduct the test. Document any problems and unintended consequences.
Step 3	**STUDY**
	Analyze the data and study the results Compare the data to your predictions. Summarize and reflect on what was learned.
Step 4	**ACT**
	Refine the change idea, based on lessons learned from the test. Prepare a plan for the next test.

TOOLS

You can find a full-sized copy of the PDSA Worksheet template, pictured here, in the sample tools section of this guide. You can also download the latest template from **www.hqontario.ca**.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PLAN-DO-STUDY-ACT FORM

Objective for this PDSA Cycle

Date:

Is this cycle used to:

❑ develop *or* ❑ test *or* ❑ implement a change?

What question(s) do we want to answer on this PDSA cycle?

PLAN:

Plan to answer questions: Who, What, When, Where?

Plan for collection of data: Who, What, When, Where?

Predictions (for questions above based on plan):

DO:

Carry out the change or test, collect data and begin analysis.

STUDY:

Complete analysis of data.

Compare data to predictions and summarize what was learned.

ACT:

Are we ready to make a change? Plan for the next cycle.

TIP! **Remember to document all PDSA cycles. This is important to keep track of changes that led to an improvement and will enable you to annotate run charts — a graphical way of tracking your data, described in the next chapter.**

3.6.4 Using PDSA ramps

Each change idea requires a series of PDSA cycles to test it — possibly first with one patient/client or exam room, expanding to two or three patients/clients or rooms, and then expanding to a larger group of patients/clients or rooms. This process of using a series of PDSA cycles to test an idea is called a PDSA ramp. The QI team can implement PDSA ramps one after the other or simultaneously.

In **Figure 2**, a community health centre is trying to improve care for people with diabetes. The QI team is considering three change concepts represented by each of three PDSA ramps. The first tests a change idea to improve self-management; the second tests a change idea for a diabetes patient/client registry; and a third tests a change idea for a reminder system for routine diabetes tests and follow-up visits.

Along the "patient/client self-management" ramp, the team might try a series of PDSA cycles to test giving patients/clients copies a clinical care checklist at each visit. This would involve giving one patient/client a copy of his/her self-management checklist at each visit, seeing whether the patient/client uses that information to improve self-management and asking for patient/client feedback on the checklist. The next cycle might involve two or three patients/clients, again assessing the impact on their self-management and asking for feedback, and so on, until patients/clients agreed the checklist was user-friendly, and it was shown to support self-management for a defined group of patients/clients.

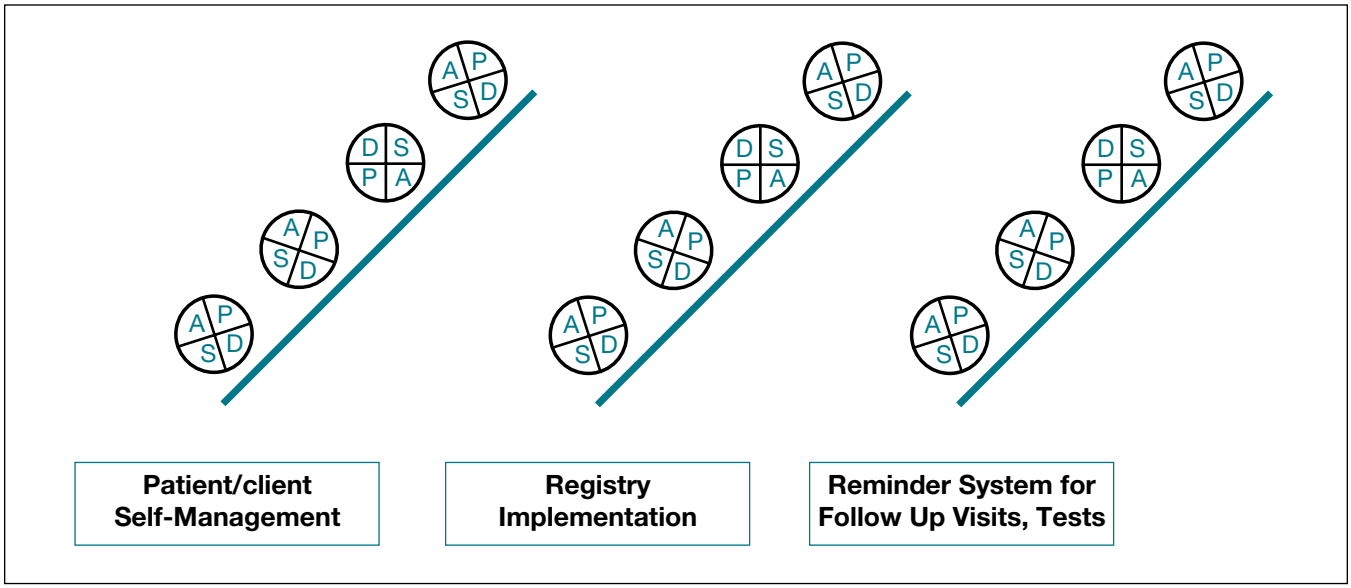


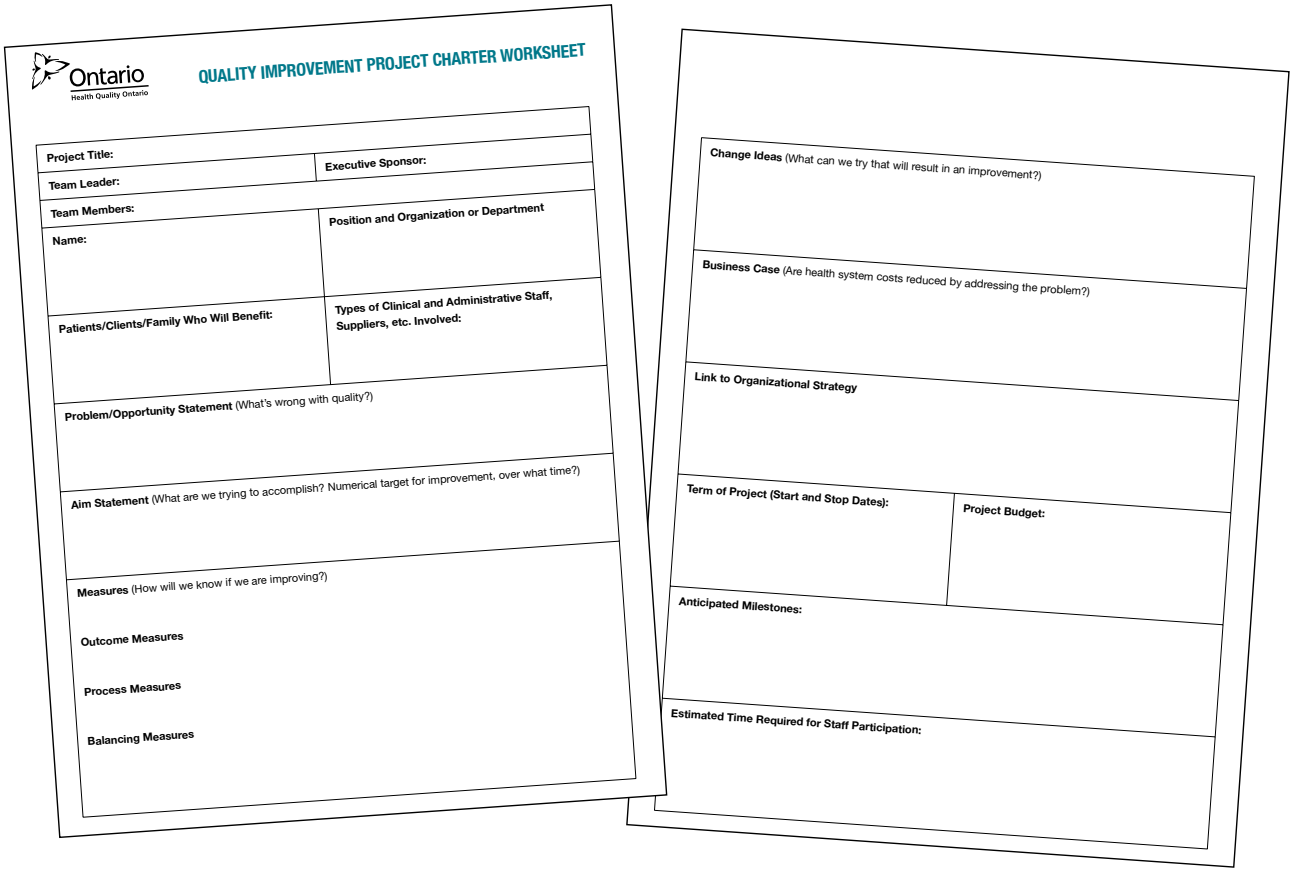
FIGURE 2 | Example of a Community Health Centre Trying to Improve Diabetes Care

3.6.5 The project charter: Pulling it all together

A QI project charter documents your aim and describes your QI initiative. Specifically, it sets out the purpose, scope, measures and targets for success. It identifies the key members of the QI team and specifies the time and resources to be invested, as well as the potential payoff. A clear project charter provides focus and promotes success.

QI is consistent with key elements of project management, as well as good business practices. It addresses problems that are important to the organization, promotes cost avoidance and ensures high-quality service that increases patient/client and provider satisfaction. Healthcare settings can promote the organizational spread of their improvements by documenting the information outlined in the project charter so the benefits of the improvement project are clearly articulated.

Dr. Deming's philosophy is that *"by adopting appropriate principles of management, organizations can increase quality and simultaneously reduce costs (by reducing waste, rework, staff attrition and litigation while increasing customer loyalty)."* [2]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QUALITY IMPROVEMENT PROJECT CHARTER WORKSHEET

Project Title:

Team Leader: | **Executive Sponsor:**

Team Members:

Name: | **Position and Organization or Department**

Patients/Clients/Family Who Will Benefit: | **Types of Clinical and Administrative Staff, Suppliers, etc. Involved:**

Problem/Opportunity Statement (What's wrong with quality?)

Aim Statement (What are we trying to accomplish? Numerical target for improvement, over what time?)

Measures (How will we know if we are improving?)

Outcome Measures

Process Measures

Balancing Measures

Change Ideas (What can we try that will result in an improvement?)

Business Case (Are health system costs reduced by addressing the problem?)

Link to Organizational Strategy

Term of Project (Start and Stop Dates): | **Project Budget:**

Anticipated Milestones:

Estimated Time Required for Staff Participation:

[2] Dr. W. Edwards Deming, Dr. Deming's Management Training, April 27, 1998. www.dharma-haven.org/five-havens/deming.htm

4 QI METHODS & TOOLS

INTRODUCTION: WHAT ARE OUR QUALITY PROBLEMS?

The first step in planning a QI initiative is to analyze your processes and understand the problems.

A process is a series of connected steps or actions to achieve an outcome. It has a start point and an end point. A process has a purpose and function of its own, but it cannot work entirely by itself. Rather, it interacts with the system as a whole. To improve a process, you must refine and optimize the steps in that process, making it more efficient.

There are a variety of QI methods and tools that are relevant at different times during a project or to meet specific needs. For example, there are tools that help you understand and analyze your process, as well as tools that show the impact of your changes using graphical and statistical methods.

4.1 TOOLS THAT HELP YOU UNDERSTAND AND ANALYZE YOUR PROCESS

QI science offers a variety of tools to help identify the source of quality problems and focus improvement efforts. Each tool has its own purpose, and it is important to select the right tool for each analysis. The following table lists the QI tools described in this chapter and when to use them.

TOOL	SECTION	WHEN TO USE
Fishbone/Ishikawa/ Cause & Effect Diagrams	4.1.1	To brainstorm about the main causes of a quality problem, and the sub-causes leading to each main cause
Five Whys	4.1.2	To drill down deeper to get to the root cause of a problem
Process Mapping	4.1.3	To understand all the different steps that take place in your process; a fundamental tool for any QI project
Check Sheets	4.1.4	To collect data on your quality problem and identify the most important source of the problem
Pareto Charts	4.1.5	To plot your defects, or causes of defects, graphically

TOOLS

The tools described in this section are available as templates at **www.hqontario.ca**, where you can also find examples and further explanations.

4.1.1 Fishbone/Ishikawa/Cause & Effect Diagrams

The Fishbone Diagram, also known as an Ishikawa Diagram or Cause & Effect Diagram, is a simple tool that can be used to brainstorm and map out possible causes of a quality problem. A Fishbone Diagram (see **Figure 3**) is an important first step, because many QI teams jump into trying to fix one cause without assessing other possible causes.

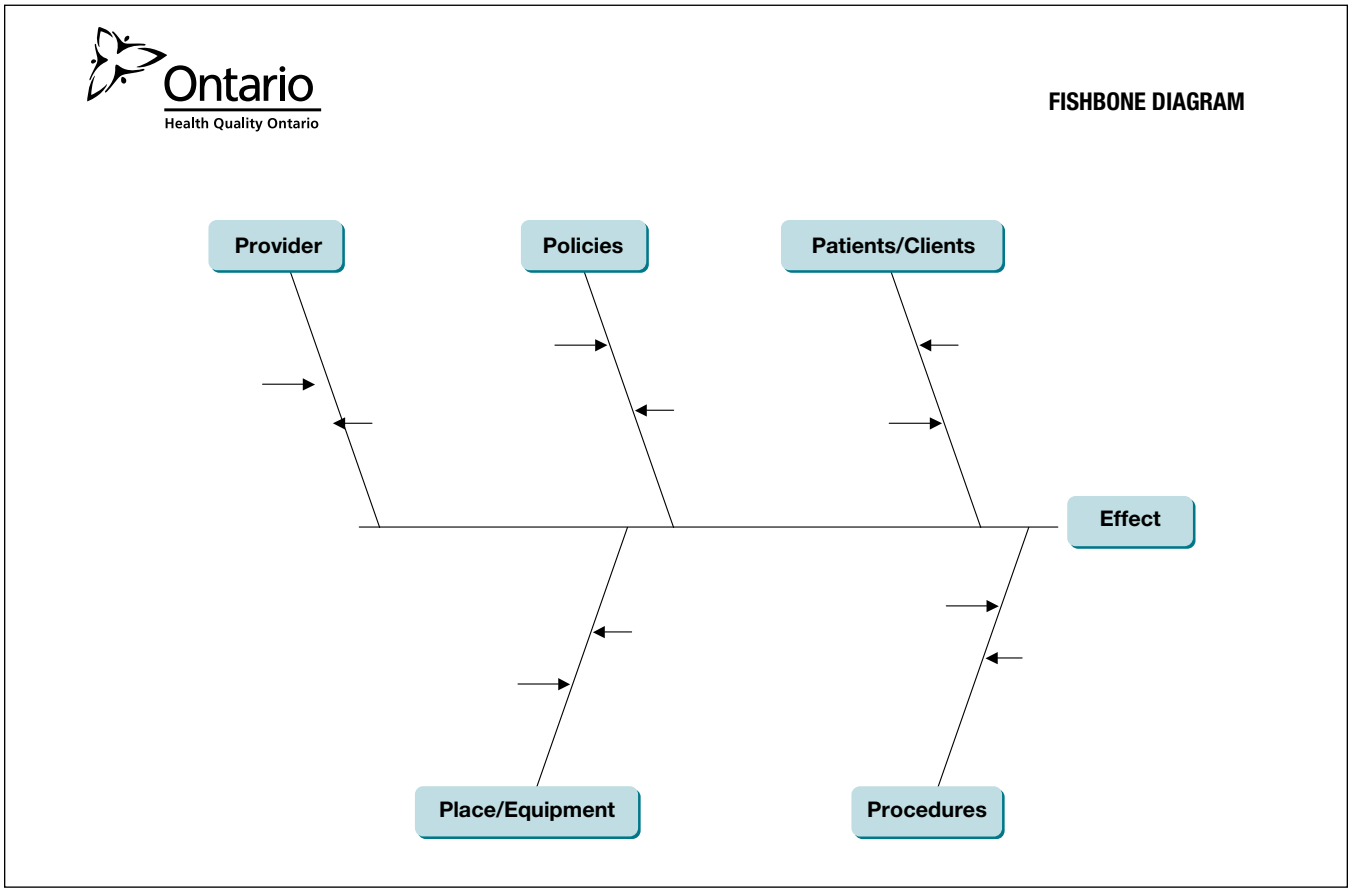


FIGURE 3 | Sample Fishbone/Ishikawa/Cause & Effect Worksheet

Step-by-step instructions

1. Put the name of the quality problem (the effect) in the box at the far right of the diagram.
2. To the left of this box, draw a central line (the spine), and from this central line draw diagonal lines (fish bones) representing different groupings of causes of the problem. For example, some teams use the five Ps (patients/clients, providers, policies, processes and procedures, and place/equipment); some use the six Ms (machine, method, materials, measurement, man and Mother Nature); and some use the four Ss (surroundings, suppliers, systems and skills). Pick groupings that make the most sense for your organization and problem.
3. Ask team members to identify different causes and list them along the appropriate diagonal line or grouping.
4. Team members may take any cause and draw a line and more branches off the line to describe other factors that contribute to the cause.

After deciding on the major groupings, allow plenty of opportunity for group creativity in identifying different causes. Encourage teams to consider all arms of the diagram, and not to focus too much attention on only one or two categories of causes. This is brainstorming, and it is best not to discuss the ideas during this part of the activity.

Once the Fishbone Diagram is complete, the team can start reviewing it to understand and analyze the cause(s) of the problem (or effect). The QI team can also use the Fishbone Diagram to document ideas they may not address initially, but want to consider in the future.

Process-style Fishbone Diagram

Depending on your setting, you may find it helpful to use the Fishbone Diagram to analyze a particular process or service. In that case, you can use the process-style variation (see **Figure 4**):

1. Identify some key processes used to deliver a service where there is a quality concern.
2. Plot these processes in a horizontal sequence.
3. Draw diagonal lines from each process.
4. Ask team members to identify problems that arise at each step or process and plot them along each diagonal line.

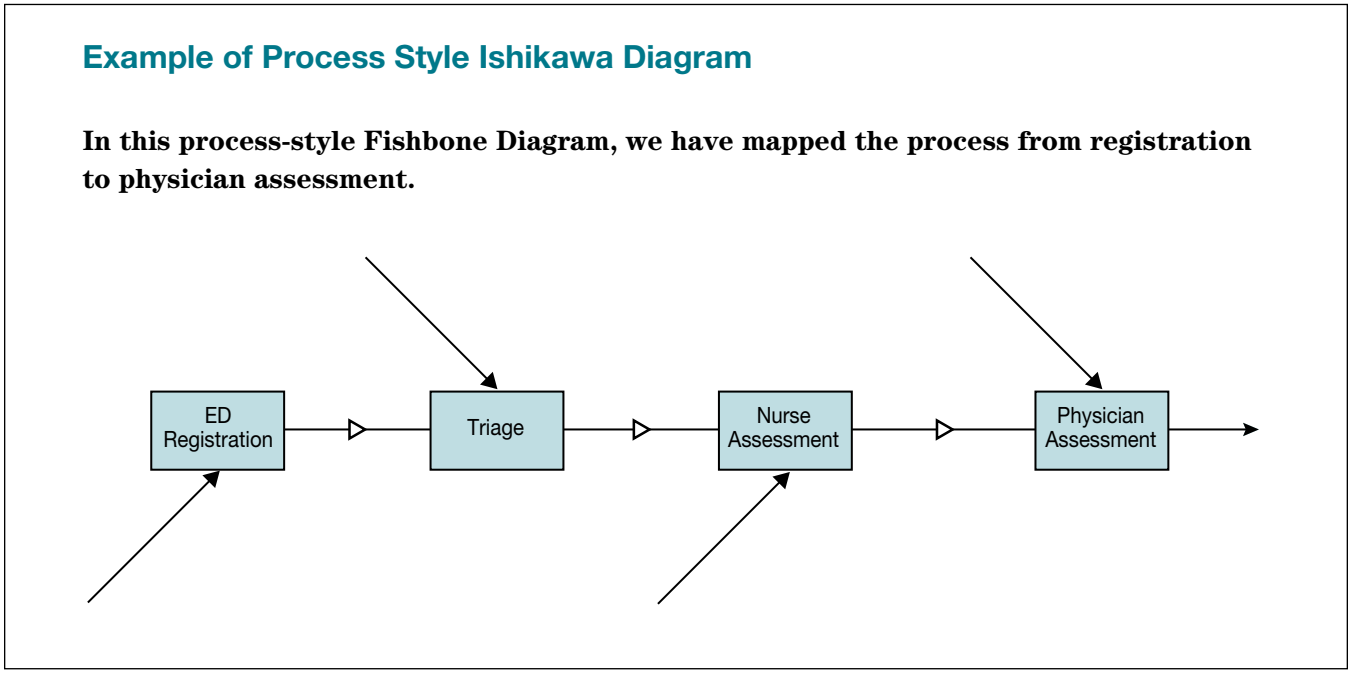


FIGURE 4 | Process-style Fishbone Diagram

4.1.2 Five Whys

The Five Whys is a simple brainstorming tool that can help QI teams get to the root causes of a problem. For a problem you have identified (either using the Fishbone Diagram or Process Mapping), ask "why" questions to drill down to the root causes. This tool allows teams to move beyond obvious answers and reflect on less obvious explanations.

Step-by-step instructions

1. State the problem you have identified as a strategic problem to work on.
2. Start asking whys related to the problem. Like an inquisitive toddler, keep asking why in response to each suggested cause.
3. Ask as many whys as you need in order to get insight at a level that can be addressed (asking 5 times is typical).

The Five Whys is a strategy that is often used to further explore an issue identified using another tool, such as a Fishbone Diagram or Process Mapping. Guard against using the five 'why's question alone in order to guard against a narrow focus or bias.

The Five Whys at Work

A diagnostic lab was consistently running late, keeping patients waiting and having to pay staff overtime. They used a process style Fishbone Diagram to get some context, They discovered from a defect check sheet that the main cause of overall delay was the fact that about identified that 55% of patients were late for appointments. They then used the Five Whys to get at the actual cause.

Why are patients always late? They can't find parking. Why can't they find parking? They don't realize that parking is difficult in this area. Many don't know that there is a parking area behind the building next to us, so they end up parking far away and walking. Why don't they know about the parking near the lab? We don't mention it in our appointment letters or when we book appointments on the phone. Why don't we let them know? … Maybe we should!

Based on this analysis, the lab revised its appointment letters and the booking clerk makes a point of discussing parking with all patients. As a result, 90% of patients are now on time, they receive services quickly and are more satisfied, and the lab is operating more efficiently.

TIP! **It is recommended that you create a Fishbone Diagram first, and then use Whys to dig into the causes that the QI team believes are most important. Drill into the specific causes where you can make a change.**

4.1.3 Process Mapping

A Process Map, also known as a flowchart, outlines all the different steps in a process — for example, all the steps that a practice or clinic takes to deliver a particular kind of service. Process Mapping helps QI teams identify problems that can be fixed. It is a fundamental tool that should be used with all QI initiatives because it gives the team clear insight into its processes. If the team cannot agree on where the problems occur, data should be collected to support each argument.

QI teams should start with a high-level Process Map (with five to twelve steps). They may then choose to go into greater detail on any particular set of processes where problems are believed to be the greatest, and generate a more detailed Process Map.

TOOLS

A Process Mapping worksheet is available at **www.hqontario.ca**.

Step-by-step instructions

1. Assemble a group to work on the Process Map. Include representatives of every type of provider who contributes significantly to the service. Include users and/or patients.
2. Use a neutral facilitator.
3. Agree on the first and last steps or activities — the start and end points that will be mapped.
4. Focus on mapping the steps or activities that account for 80% of what's happening. (Don't waste time on the exceptions.)
5. Map the actual — not the ideal — process.
6. Write each process identified on a post-it note and display it on a white board. (You may want to specify who does the process and where.)

If key team members are not able to meet together to build the Process Map, try this alternative:

1. Post a white board with processes partially mapped in a location providers pass through frequently (e.g., a lunch or staff room).
2. Invite providers to use post-it notes to add missing parts of the process. If someone disagrees with how part of a process is mapped, he or she can post an alternative set of processes below.
3. Leave the board up for a set period of time (e.g., one day or one week).

Different types of Process Mapping

There are several different types of Process Mapping:

- **Detailed** — the most common kind of Process Map
- **High-level** — the fastest, simplest and least detailed Process Map
- **High-low (Top-down)** — adds depth to a high-level Process Map, but without detailed mapping
- **Swim lane** — shows what different functions/people do in a detailed Process Map

Each type of Process Mapping frames the process a little differently. To decide which map to use, you need to understand how you need to visualize your process based on your particular needs during a project. Sometimes a high-level Process Map is all you need. You may opt to create detailed or swim lane Process Maps on subsets of your process only when you need them. Resist the desire to map all parts of your process in detail!

1. Detailed Process Map

The detailed Process Map usually maps processes in a sequential manner from start to finish (see **Figure 5**).

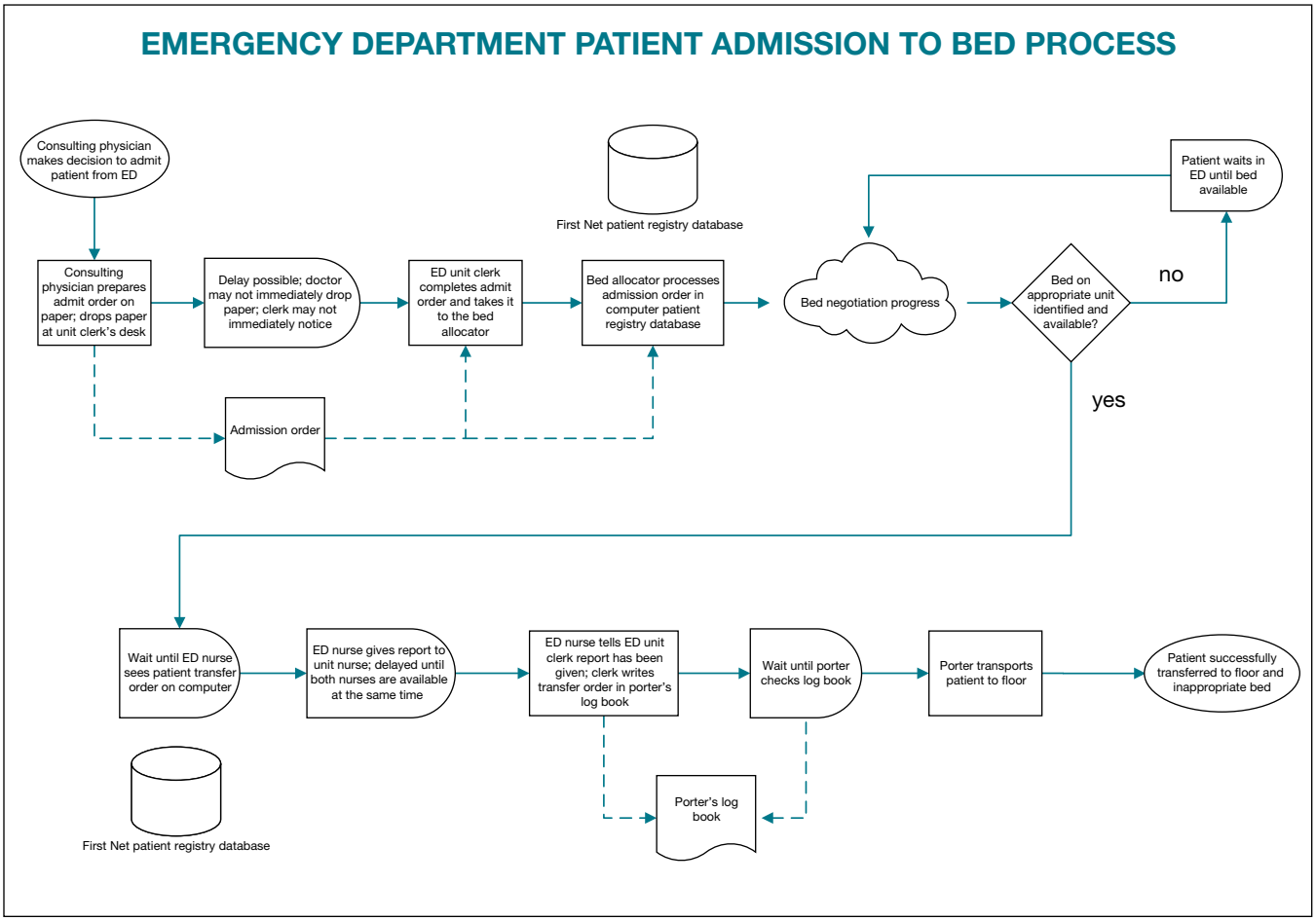


FIGURE 5 | Example of a Detailed Process Map

When you display a Process Map, remember to include a Process Map Key (see **Figure 6**).

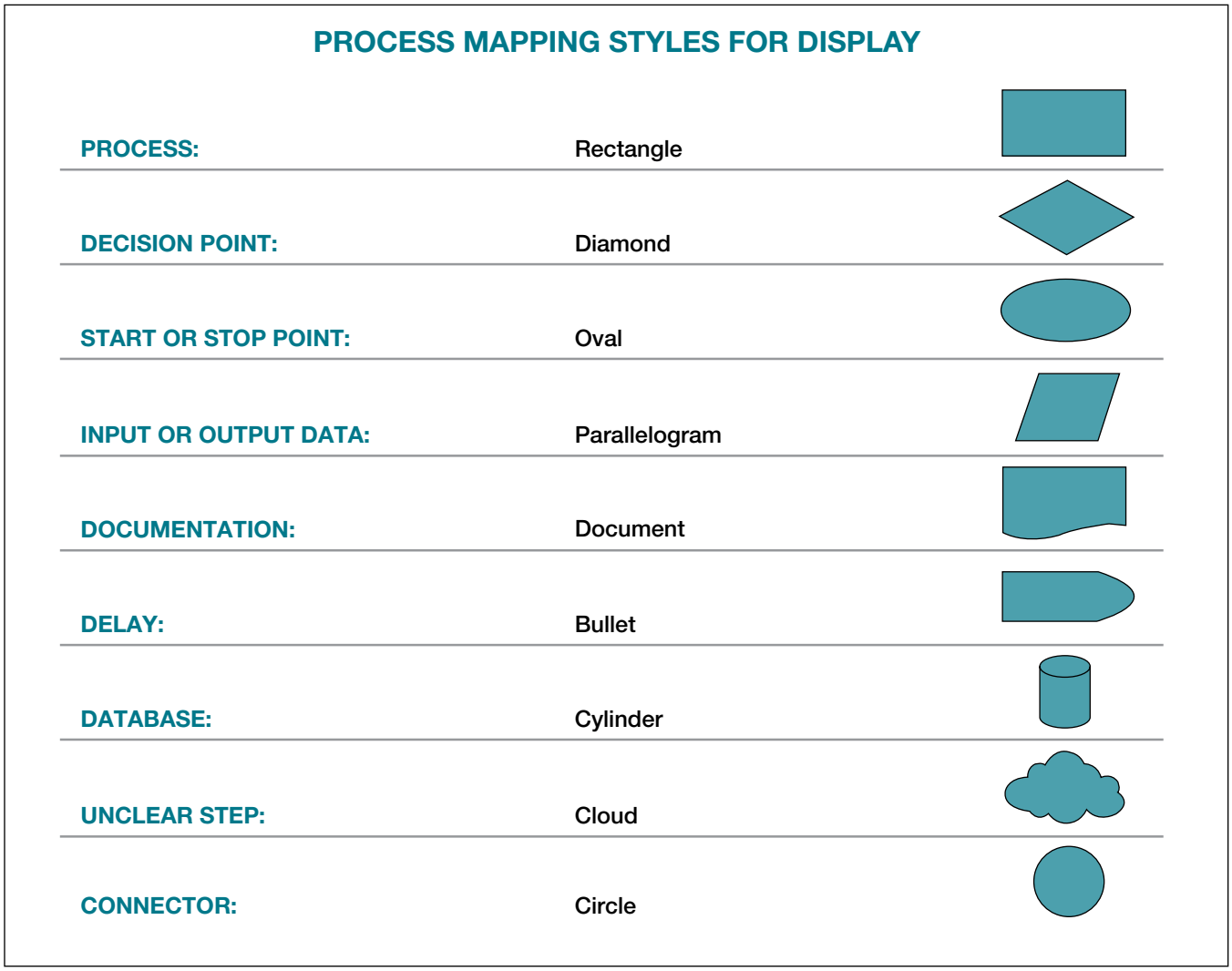


FIGURE 6 | Example of a Process Map Key

2. High-level Process Map

A high-level Process Map is the most basic of all (see **Figure 7**). It lists the main steps in a process — usually five to twelve of them. It is a great start, and it is often followed by a top-down Process Map.

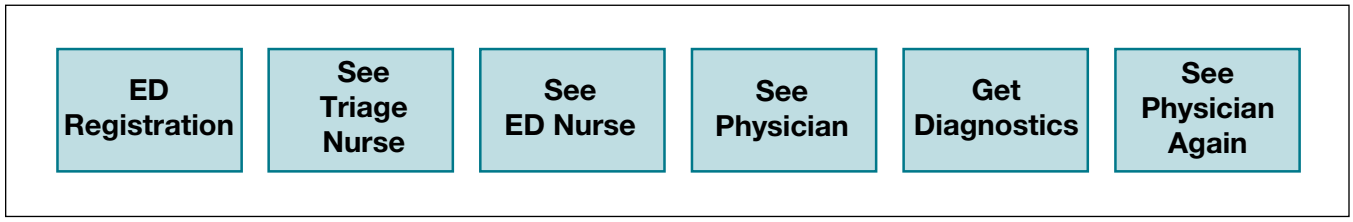


FIGURE 7 | Example of a High-level Process Map for Emergency Department visit

3. High-low Process Map

To create a High-low Process Map (see **Figure 8**), place the steps of the process in the top row. Under each high-level process step, list the detailed steps that must take place in order for it to happen. This style of Process Map reveals the amount of work that is required at each step of the process.

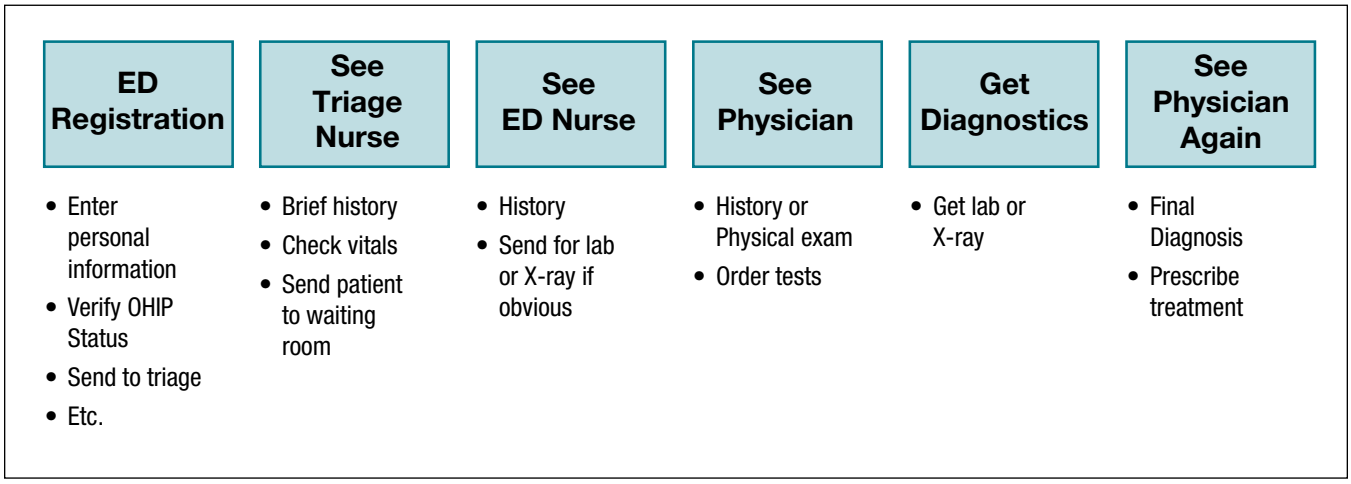


FIGURE 8 | Example of a High-low Process Map

TIP! **The High-low Process Map can be useful if the team is struggling with the appropriate level of detail. If your team has a lot of detail-oriented people on it, you can park these details, while still maintaining a view of the big picture.**

4. Swim lane Process Map

In a Swim lane Process Map, each "lane" is labeled with a care team member or location that is critical for the process to succeed. Do not forget to include the patient/client. Each step of the process is placed in the appropriate swim lane according to who is handling it. A Swim lane Process Map allows the QI team to see how many hand-offs occur during the process from start to finish. Unnecessary hand-offs signal inefficiencies and an increased opportunity for mistakes to occur.

Figure 9 shows the process of a patient going for a scheduled primary care visit. Five hand-offs occur during the process: the patient sees the receptionist, then the nurse to check blood pressure and weight, then the doctor for the examination, then the lab for a test, and finally the receptionist again to book a follow-up appointment.

TIP! **The Swim lane Process Map is useful for identifying hand-offs where a problem might occur, and for keeping track of who is responsible for which process.**

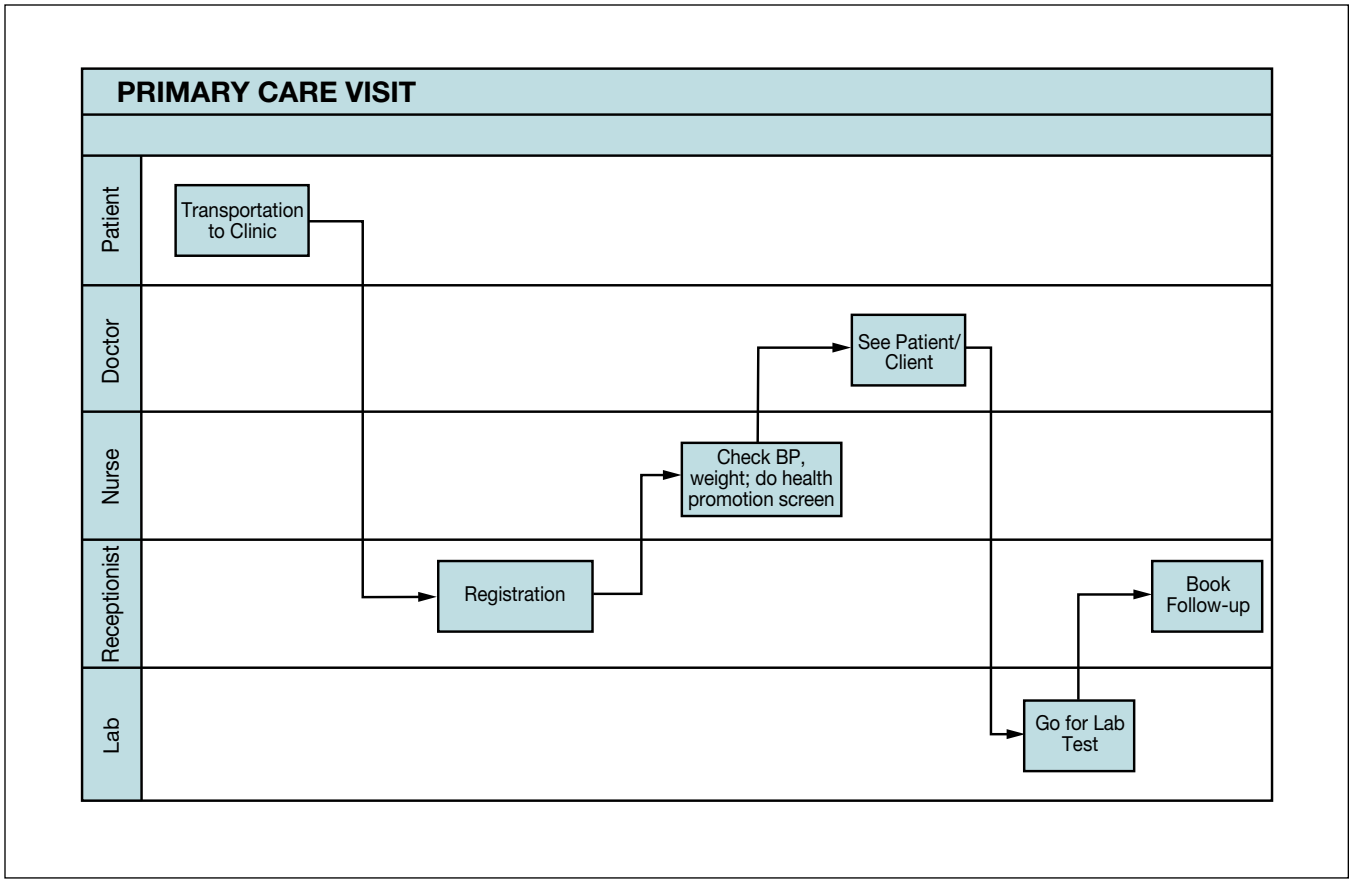


FIGURE 9 | Example of a Swim Lane Process Map

Analyzing your Process Map

Once you have completed your Process Map, ask the following questions:

- Where are the bottlenecks? How could we address these?
- Are there inconsistencies in how things are done? What can be standardized?
- Can things be done:
  - In a different order?
  - In parallel?
  - By a different person with better or same quality, at lower or same cost?
- Can steps be located closer to each other to reduce travel?
- Does each step add value? If not, can it be eliminated?

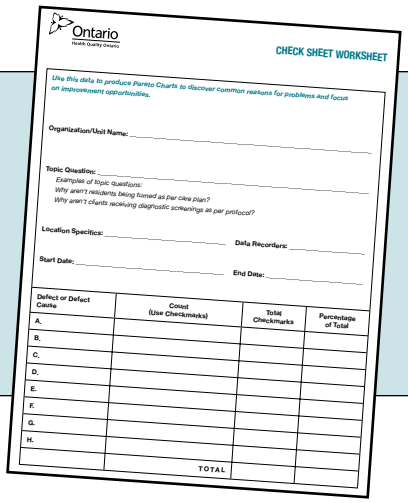
Process Mapping is fundamental to improving quality, because it allows the team to clearly discuss and understand each step in the process.

4.1.4 Check Sheets

A Check Sheet is a simple data collection tool that can help a QI team identify the most important cause of a quality problem. It can also be used to gather information on the problem or different aspects of the problem. This tool is useful when the team has identified a number of causes or a number of problems or defects, and wants to know which one is the most important.

TOOLS

You can find a full-sized copy of the Check Sheet template, pictured here, in the sample tools section of this guide. You can also download this template from **www.hqontario.ca.**


Ontario
Health Quality Ontario

CHECK SHEET WORKSHEET

Use this data to produce Pareto Charts to discover common reasons for problems and focus on improvement opportunities.

Organization/Unit Name: _____

Topic Question: _____
Examples of topic questions:
Why aren't residents being turned as per care plan?
Why aren't clients receiving diagnostic screenings as per protocol?

Location Specifics: _____ Data Recorders: _____

Start Date: _____ End Date: _____

Defect or Defect Cause	Count (Use Checkmarks)	Total Checkmarks	Percentage of Total
A.			
B.			
C.			
D.			
E.			
F.			
G.			
H.			
	TOTAL		

Step-by-step instructions

1. Generate a list of the most common defects or causes. List as many as you wish — a typical list comprises six to 10 defects or causes. Include an "other" category.
2. Create a Check Sheet (see the template in the sample tools section of the guide).
3. Decide how to collect the data — i.e., going forward in time or back in time, using chart audits or other documentation.
4. Pick a timeframe for collecting data. Ideally, the timeframe should be long enough to observe at least 50 defects or causes. If you are collecting data going forward, try to keep the data collection timeframe short (e.g., one to two weeks).
5. Identify who will collect the data (e.g., the chart reviewer or service provider). Have them mark the appropriate place on the Check Sheet (see **Figure 10**) each time a defect or cause occurs. Provide specific instructions on how defects or causes are to be defined.
6. Plot the data on a Pareto Chart.

TITLE OF PROJECT: IMPROVED DIABETES SURVEILLANCE

Defects of Interest: Why was blood work not completed?

DEFECT	COUNTS	TOTAL COUNTS	FREQUENCY (%)
A. Requisition not given at last visit — doctor forgot to order	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	45	48%
B. Requisition given but patient forgot to get it done	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	31	33%
C. Requisition given and patient remembered but thinks it is not important	IIIIIIII	8	9%
D. Requisition given and patient remembered but lab hours inconvenient	III	3	3%
E. Requisition given and patient remembered but too depressed	III	3	3%
F. Requisition given and patient remembered but chooses not to have it done for other reasons	II	2	2%
G. Other: Patient tested but specimen spoiled and test not repeated	I	1	1%
H. Other: Patient refuses all blood work, so requisition not even given	I	1	1%
TOTAL	**94**	**94**	**100%**

FIGURE 10 | Example of a Check Sheet

4.1.5 Pareto Charts

The Pareto Chart (see **Figure 11**) is a tool that helps teams see which causes or problems occur most frequently. The chart plots out the activities or areas that contribute most to poor quality. The Pareto Chart is based on the theory that a small number of causes will have the largest contribution to poor quality. When a few activities contribute to most of the problem, it is called the Pareto Effect. A classic Pareto Effect is observed when 20% of causes contribute to 80% of overall problems.

Step-by-step instructions

1. Place the data captured in the Check Sheet into a table, in descending order. From this table, calculate the percentage frequency and cumulative frequency.
2. Plot this information as a bar chart, where each vertical bar represents a different cause or problem and the left vertical axis represents the number of causes and problems/defects.
3. Identify the bar where the cumulative frequency is high relative to the number of categories.
4. Look for a Pareto Effect, where the first few categories account for most of the problems.

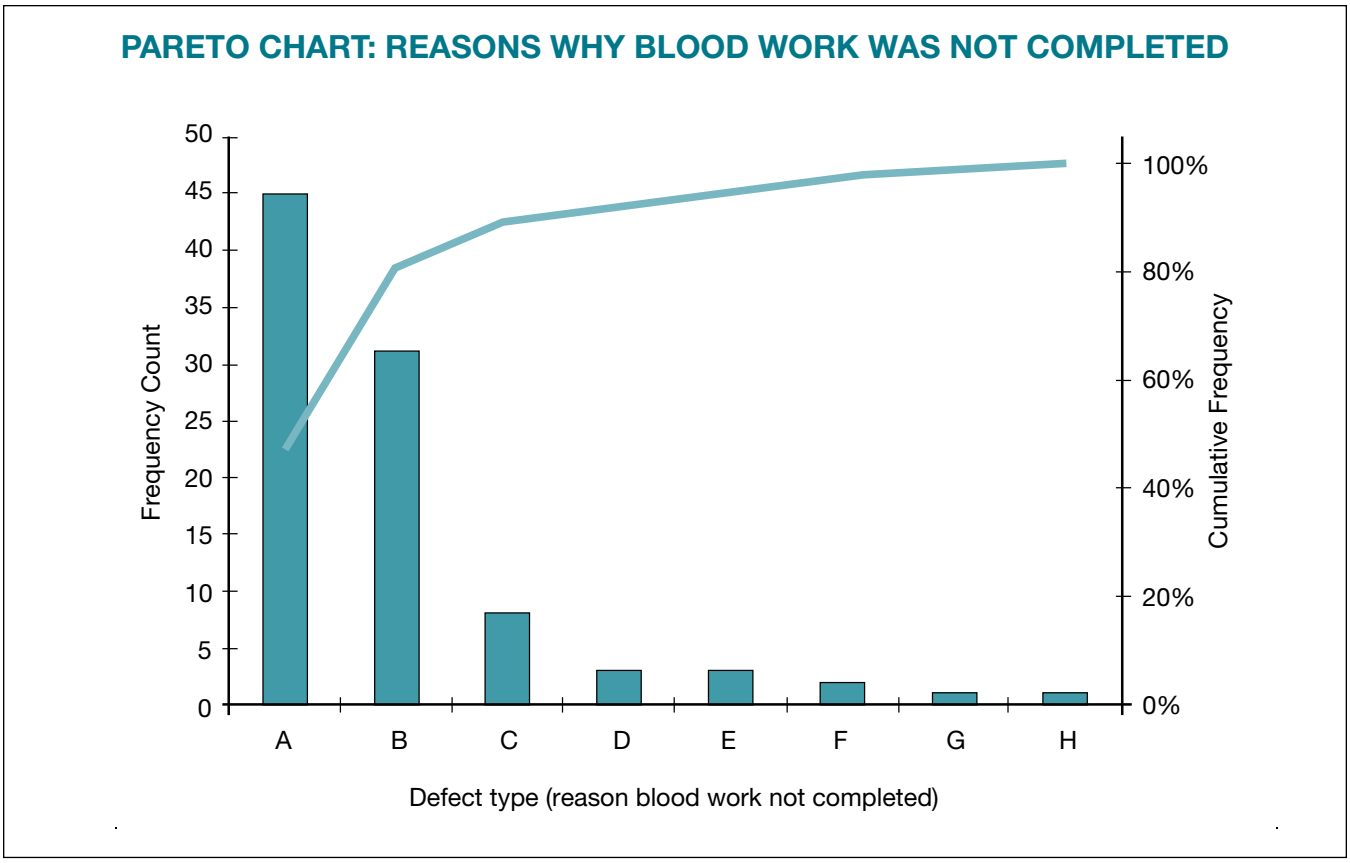
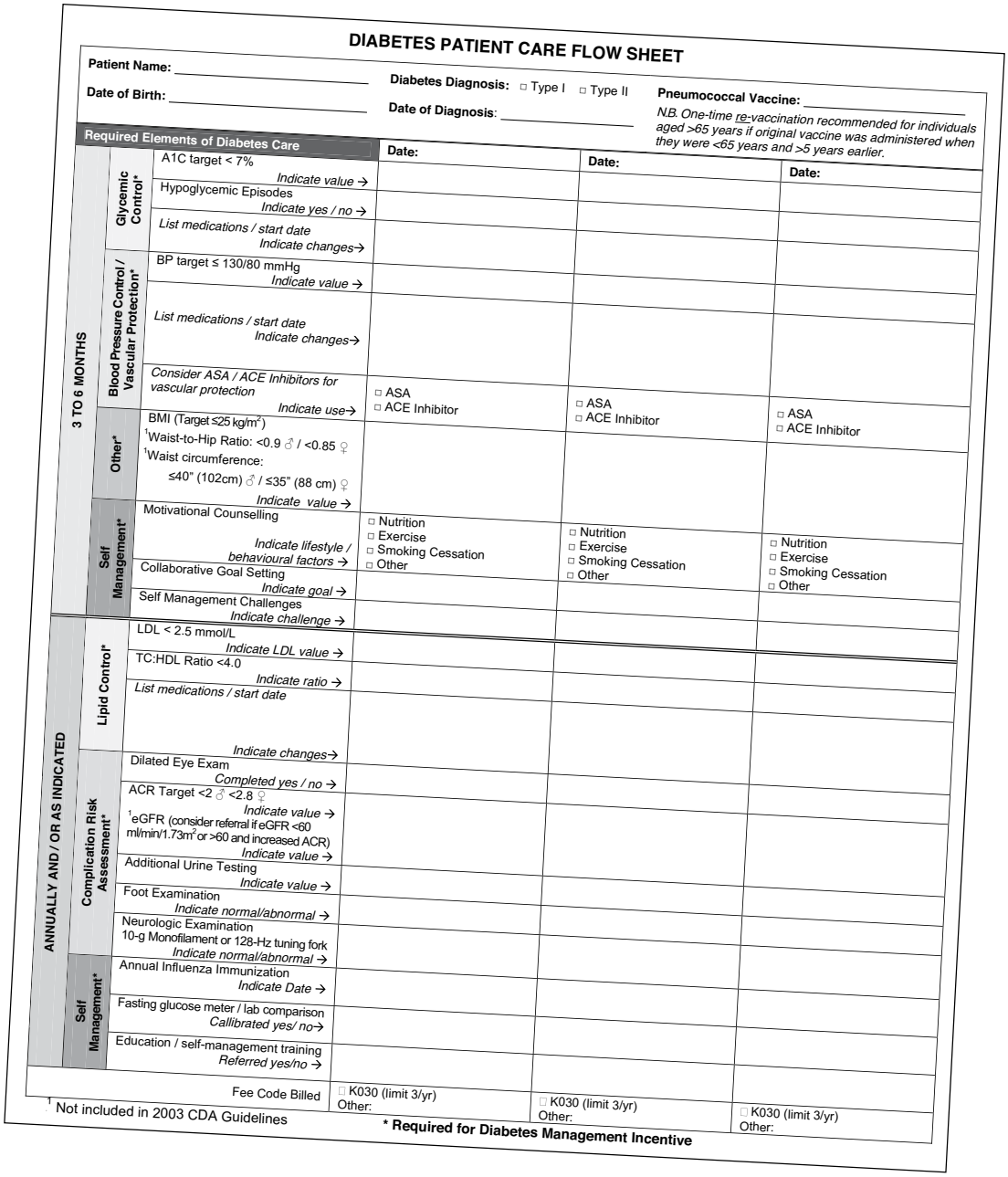


FIGURE 11 | Example of a Pareto Chart

TOOLS

An Excel Pareto Chart template (shown in Figure 11) is available at **www.hqontario.ca**. Click on "Tools for QI Teams," then "Analysing Your System," then "Pareto Charts."



DIABETES PATIENT CARE FLOW SHEET

Patient Name: _____ **Diabetes Diagnosis:** □ Type I □ Type II **Pneumococcal Vaccine:** _____

Date of Birth: _____ **Date of Diagnosis:** _____ *N.B. One-time re-vaccination recommended for individuals aged >65 years if original vaccine was administered when they were <65 years and >5 years earlier.*

		Required Elements of Diabetes Care	Date:	Date:	Date:
3 TO 6 MONTHS	Glycemic Control*	A1C target < 7% *Indicate value →*			
		Hypoglycemic Episodes *Indicate yes / no →*			
		List medications / start date *Indicate changes →*			
	Blood Pressure Control / Vascular Protection*	BP target ≤ 130/80 mmHg *Indicate value →*			
		List medications / start date *Indicate changes →*			
		Consider ASA / ACE Inhibitors for vascular protection *Indicate use →*	□ ASA □ ACE Inhibitor	□ ASA □ ACE Inhibitor	□ ASA □ ACE Inhibitor
	Other*	BMI (Target ≤25 kg/m²) [1]Waist-to-Hip Ratio: <0.9 ♂ / <0.85 ♀ [1]Waist circumference: ≤40" (102cm) ♂ / ≤35" (88 cm) ♀ *Indicate value →*			
	Self Management*	Motivational Counselling *Indicate lifestyle / behavioural factors →*	□ Nutrition □ Exercise □ Smoking Cessation □ Other	□ Nutrition □ Exercise □ Smoking Cessation □ Other	□ Nutrition □ Exercise □ Smoking Cessation □ Other
		Collaborative Goal Setting *Indicate goal →*			
		Self Management Challenges *Indicate challenge →*			
ANNUALLY AND / OR AS INDICATED	Lipid Control*	LDL < 2.5 mmol/L *Indicate LDL value →*			
		TC:HDL Ratio <4.0 *Indicate ratio →*			
		List medications / start date *Indicate changes →*			
	Complication Risk Assessment*	Dilated Eye Exam *Completed yes / no →*			
		ACR Target <2 ♂ <2.8 ♀ *Indicate value →*			
		[1]eGFR (consider referral if eGFR <60 ml/min/1.73m² or >60 and increased ACR) *Indicate value →*			
		Additional Urine Testing *Indicate value →*			
		Foot Examination *Indicate normal/abnormal →*			
		Neurologic Examination 10-g Monofilament or 128-Hz tuning fork *Indicate normal/abnormal →*			
	Self Management*	Annual Influenza Immunization *Indicate Date →*			
		Fasting glucose meter / lab comparison *Callibrated yes/ no →*			
		Education / self-management training *Referred yes/no →*			
		Fee Code Billed	□ K030 (limit 3/yr) Other:	□ K030 (limit 3/yr) Other:	□ K030 (limit 3/yr) Other:

[1] Not included in 2003 CDA Guidelines

*** Required for Diabetes Management Incentive**

TIP!

Patient flow sheets are an important tool for collecting data on quality and supporting QI. In general, different conditions have their own flow sheets, which set out the tests, visits and processes that should occur periodically for patients with that condition.

Patient flow sheets can support QI by reminding both the patient and the care provider of what needs to be done at each visit. They are most useful when the information on the flow sheet is routinely entered into an electronic patient registry. QI teams can generate charts based on the data in the registry to show improvements in quality over time or compare quality among different sites or patient sub-groups. If some steps are not being carried out as appropriate, a Check Sheet can be used to measure the frequency of causes. QI teams can analyze this information, which can help them plan appropriate changes to their processes.

4.2 MEASUREMENT

4.2.1 Creating a Measurement Plan

Identify how frequently you want to collect and show data (e.g., daily, weekly or monthly). It must be frequently enough that your QI team will be able to assess the impact of changes as they are testing them. Collect information related to each of your project's outcome, process and balancing measures using a Measurement Plan template to assist you. The template will help you clarify how you will collect data, and how often. It will also prompt you to outline particular sampling strategies or system analysis strategies you may decide to use.

Wherever possible, collect data that gives you a detailed picture of each individual's experience. For example, measure how many hours it took per patient to get an incontinence assessment, rather than whether it took more than 24 hours after admission. Do this even if your analysis might eventually be about a percentage of patients meeting a target value (e.g., 24 hours).

TOOLS

A Measurement Plan template is available at **www.hqontario.ca**.

Key measurement guidelines

- Choose measures that support the team's aim statement
- Use existing data collection systems, whenever possible
- Integrate measurement into the daily routine
- Plot measures each month
- Use a set of five to seven measures to track progress throughout your QI project

Sometimes, QI teams need simple ways to collect data in order to be able to collect it frequently enough to assess the impact of changes. Two simple ways to collect data are mini-surveys and sampling.

TIP!

When creating a Measurement Plan:

- **Seek usefulness, not perfection**
- **Use sampling**
- **Do not wait for information systems**
- **Report percentages and rates as appropriate**
- **Try to use patient-level values whenever possible**
- **Use actual numbers whenever possible**

4.2.2 Mini-surveys

Mini-surveys can help a QI team determine a baseline for quality, analyze the possible causes of poor quality and identify potential solutions before starting the QI initiative. Mini-surveys are a particularly good way to test change ideas before implementing them. They can also be used during a QI initiative to monitor progress.

TIP! **Mini-surveys can show whether a particular small test of change is resulting in improvement, and provide data for the "Study" part of Plan-Do-Study-Act cycles.**

Step-by-step instructions

1. Design your survey. Select one to five questions and keep them simple.
2. Pre-test the survey questions on five to 10 people.
3. Create a sampling plan. How many people will you survey? Whom will you survey? When?
4. Identify a method to distribute the surveys and collect the results. If you are surveying patients about a service they receive, collect the data immediately after the service is provided, if possible. A simple one- page or half-page paper survey works well. Avoid mail or phone surveys weeks after the fact.
5. Provide an anonymous method for people to submit completed surveys (e.g., a shoebox with a slot) to protect patient/client confidentiality.

TIP! **Count how many surveys were put out and how many remain at the end of the day. This allows you to calculate an overall response rate.**

4.2.3 Sampling

Block sampling and systematic sampling are the two main methods of QI sampling.

METHOD	DESCRIPTION	EXAMPLE
Block Sampling	Make x observations consecutively. Do this at regular intervals.	Every Monday morning, give a mini-survey to the first 15 patients/clients who arrive.
Systematic Sampling	Make observations on every n^{th} patient.	I want 10 observations per week. I see 100 patients/clients per week. So, I'll give every 10^{th} patient/client a mini-survey.

To track your measures effectively, it's important to develop a data collection plan. This will involve discussing where and how to obtain the data required for your measures, identifying data sources and deciding on a sampling plan.

DATA SOURCES: In an ideal situation, the QI team will be able to use existing automated data sources — such as a hospital's information technology (IT) system or a primary care practice's electronic medical records — to obtain the data they need for their measures. If these data sources are not available, the team may consider adapting the IT system to collect the new data, creating a new automated system or collecting data manually. If you are collecting data manually, keep the information required brief and focused.

SAMPLING PLAN: As part of the data collection plan, the team decides how often it will collect data — for example, daily, weekly, bi-weekly or monthly. Measures should be collected frequently enough to guide the project. For QI initiatives, smaller and more frequent data collection or sampling is helpful. The team will also decide on the timeframe for reporting results from the data collection.

When working towards improvement, analyze your data using techniques that display the variation in the process. To do this, employ one of the charts outlined in the next section.

4.3 DEMONSTRATING YOUR IMPACT

Analyzing data over a period of time makes it easier to assess the impact of QI changes. A graphical display of results is very useful to show changes in measures across the life cycle of a project. Both run charts and control charts can achieve this.

Run charts are useful regardless of how much data you have collected. They are simple to produce and interpret, and they are guided by simple rules. Control charts provide a more powerful way of analyzing your results, though they require more data for input and more sophistication to produce and interpret.

TIP!

To facilitate analysis:

- **Plot data over time**
- **Track a few key measures over time — this is the single most powerful strategy a team can use**
- **Try not to aggregate data (e.g., show consecutive individual patients' times, rather than the percentage of patients reaching a target over a one-month period)**
- **Display the data as soon as possible after the event**

4.3.1 Run charts

Run charts should be set up at the start of a QI project and updated with new data as the project unfolds. A run chart is a graph that illustrates changes in quality over time. Measurements are taken at frequent points in time and connected with a line. This provides a graphical display of variation across time, and can help a team see if their changes have led to improvement.

An annotated run chart (see **Figure 12**) has comments with arrows pointing to times when different ideas for improvement were tested. This helps explain any sudden changes in quality that may have occurred.

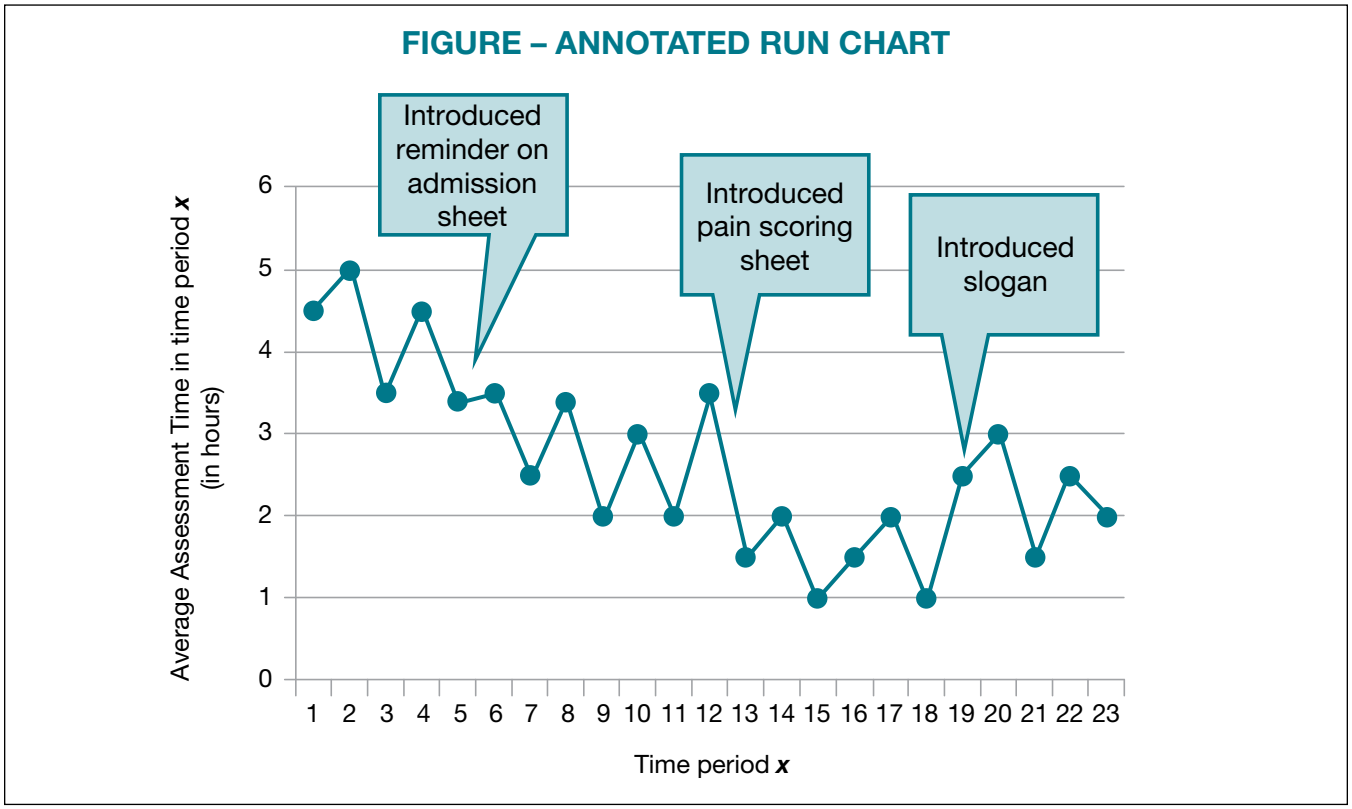


FIGURE 12 | Example of an Annotated Run Chart

Step-by-step instructions

1. As you gather your data, create a graph where the measure of quality is on the vertical axis and time is on the horizontal axis. Connect each data point with a line.
2. Show your target for improvement by drawing a horizontal line across the graph, labeled "target."
3. Show the median point of your data by drawing a horizontal line across the graph at the level where half the data points are above, and half are below that line.
4. Annotate the run chart with comments to tell the story of the different improvements the team has tried.

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Percentage of Diabetes Patients in Dr. Jones' Family Practice with Good Blood Sugar Control (HbA1c <0.07)	49%	48%	50%	50%	49%	53%	55%	55%	56%	59%	62%	63%

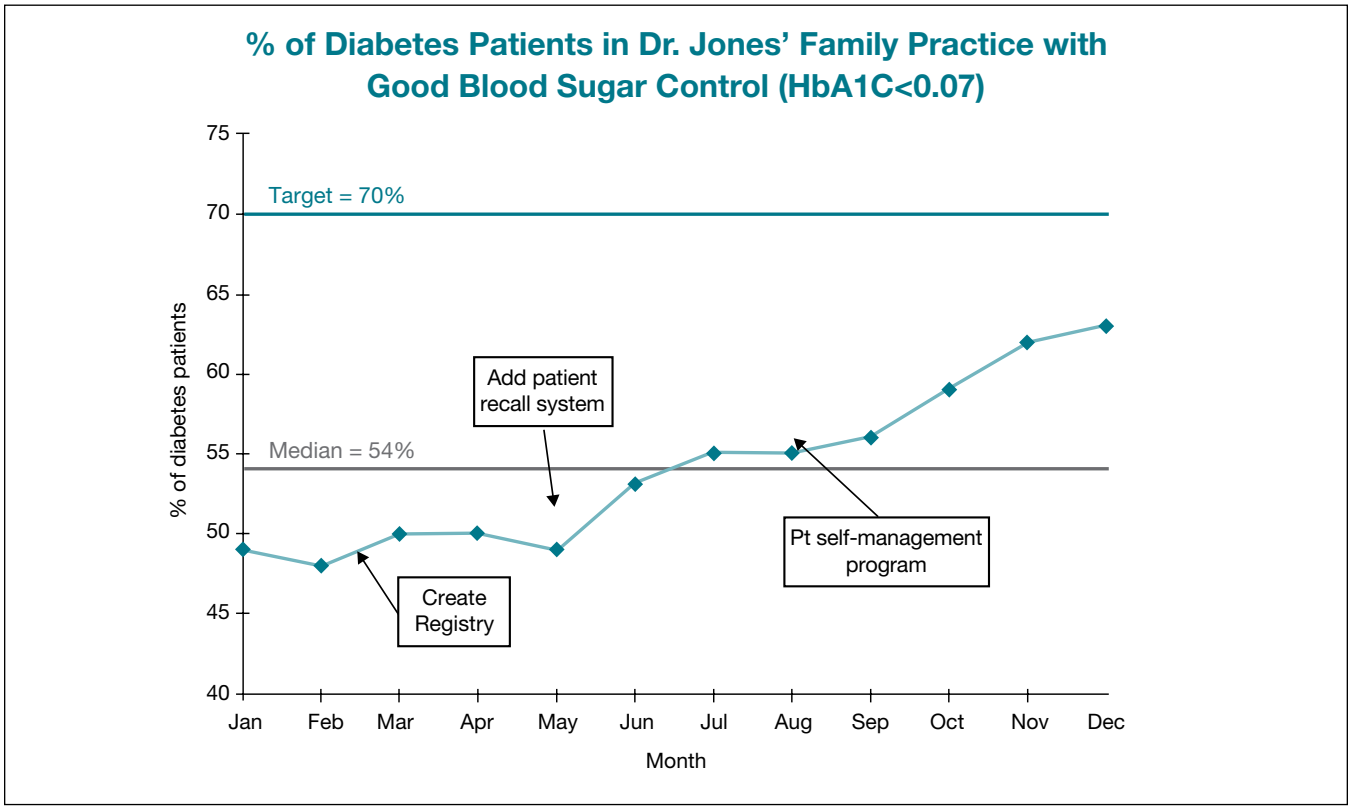


FIGURE 13 | An Annotated Run Chart at Work

QI teams can recognize significant changes — hopefully, improvements — by carrying out two simple tests on a run chart (see **Figure 13**):

1. Are there six or more consecutive points above the median?
2. Are there six consecutive points moving upward or downward?

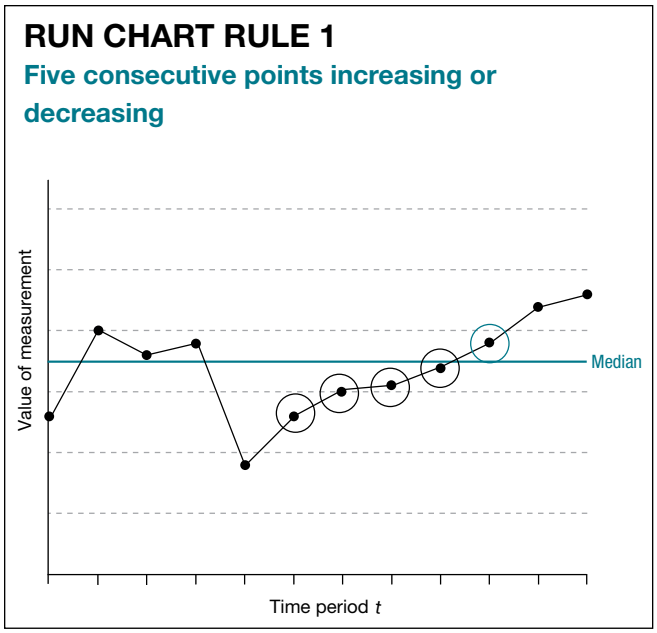


FIGURE 14 | Run Chart Rule 1

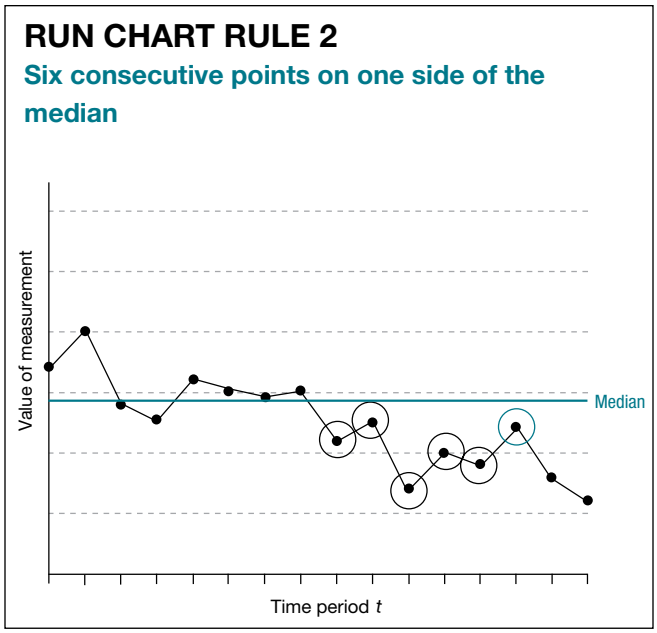


FIGURE 15 | Run Chart Rule 2

If we see evidence of either of these rules in our chart, it indicates that a significant change has occurred within the process. Now, the QI team's task is to maintain progress and continue to improve.

Once a run chart has more than 11 points, consider turning it into a control chart.

4.3.2 Control charts

Control charts are like run charts, but they have much more statistical power to detect changes and improvements. This section of the guide provides an introductory look at control charts, including their construction and interpretation.

When to use control charts, and with what data

Control charts are used for QI, and also for performance monitoring (e.g., dashboards or scorecards). Data may be presented in various forms:

- Percentages
- Rates
- Counts
- Individual values

Many kinds of control charts are needed to work with different types of data — but all control charts look similar and are interpreted in much the same way. [3]

Understanding variation: common and special cause

Control charts help QI teams understand the nature of the variation of their processes. They may answer questions such as:

- Do we have a stable or in-control process with common cause variation?
- Do we have an out-of-control process with special cause variation?
- What does the variation tell us about the level and range of performance of the process?

Variation is to be expected. Processes rarely produce the same measurements every time. It takes different times to get to work; golf scores vary; blood pressures fluctuate; patient volumes in emergency departments are never identical; and waiting times vary from one patient to the next.

The combination of small variations of a process adds up to common cause variation. Control charts can demonstrate whether a process is in statistical control (showing only common cause variation) or showing special cause variation. In QI projects, we test and implement changes to try to influence the process to show improvements, and this would be "special cause."

Common cause variation means that no one thing in particular is causing the result. When we travel to work, for example, all sorts of things contribute to how long it takes: traffic volumes may vary; the number of red lights may vary; and the number of people making left-hand turns may vary. Sometimes, however, variation in a process is due to a special cause. For example, we are driving to work and have to take a long detour because of a water main break. Special cause variation can often be attributed to something unusual, rare or difficult to identify. If it isn't unusual or rare, it is probably common!

EXAMPLE, PART 1

Imagine a QI team working on improving access to primary care appointments in a small practice. The office manager suggests looking at previous patient wait times to see how bad things really are. The clinic assistant pulls five patient charts for each day in the last month and records the time spent between a patient's scheduled appointment time and the time the patient was taken to an examination room. The assistant puts the data into a spreadsheet and discovers that the average wait time was 36 minutes. Several patients were seen without any wait at all, but there were many times when patients waited over an hour for their scheduled appointment. The QI team works for several months to improve scheduling, efficiency and chart retrieval. They monitor wait times to see if they are getting better. Realizing they need a better tool for analyzing their data, they arrange to have someone input their data into a control chart. We will return to this team's story after providing some control chart background and interpretation guidance.

[3] It is beyond the scope of this guide to describe all the possible types of data and related control charts. You'll find references to useful discussions of control charts at the end of the section. Software is available that makes charting relatively easy.

Control chart fundamentals

A control chart is a run chart with a line drawn at the average (or mean), and pairs of control limits. The control limits are calculated to show one, two, and three standard deviation (SD) lines for the plotted data. Most if not all control charts show three SD limits, commonly called the upper control limit (UCL) and lower control limit (LCL). A point beyond one of the three SD limits is evidence that a special cause probably occurred. The QI team's job is to figure out what this might be. Sometimes, as the example of a long detour on the way to work showed, the reason is very obvious. But often it is not.

What about the one and two SD limits? Statisticians have determined that there are other ways data can show special cause — cases when different patterns of measurements involve the other limits. There are many rules, some very similar to rules used to interpret run charts. For example, if we were to see two out of three consecutive measurements beyond a two SD line, this would be statistically unusual and is evidence that a special cause may have occurred. If we see eight points in a row above or below the average, that again indicates a special cause.

EXAMPLE, PART 2

The person helping the QI team build a control chart decided it would be best to look at the average of patient wait times per day. The team's expectation was that daily wait times should have been reduced after all the improvements they had made. The analyst constructed a chart to look at the average daily wait time — a control chart called an XbarR chart. She constructed the chart using the original month's data and used those limits to test for a special cause in the following weeks (see Figure 16).

Despite considerable variation by day, and a relatively poor overall average, the data for the original month did not show any special cause. This data was in statistical control despite week 15 with a low average wait time, and week 8 with a very high average wait time.

Although it took a few weeks to show it, the process improved and several instances of special cause were observed. Although no daily average ever exceeded a three SD control limit, starting in week 7 (the third week after starting to make changes), eight consecutive daily averages were below the original average. This suggested that the changes were starting to make noticeable improvements.

The team continued to work on improving the various processes in their practice, and realized they needed to draw a new control chart because their new process was consistently better than their old one.

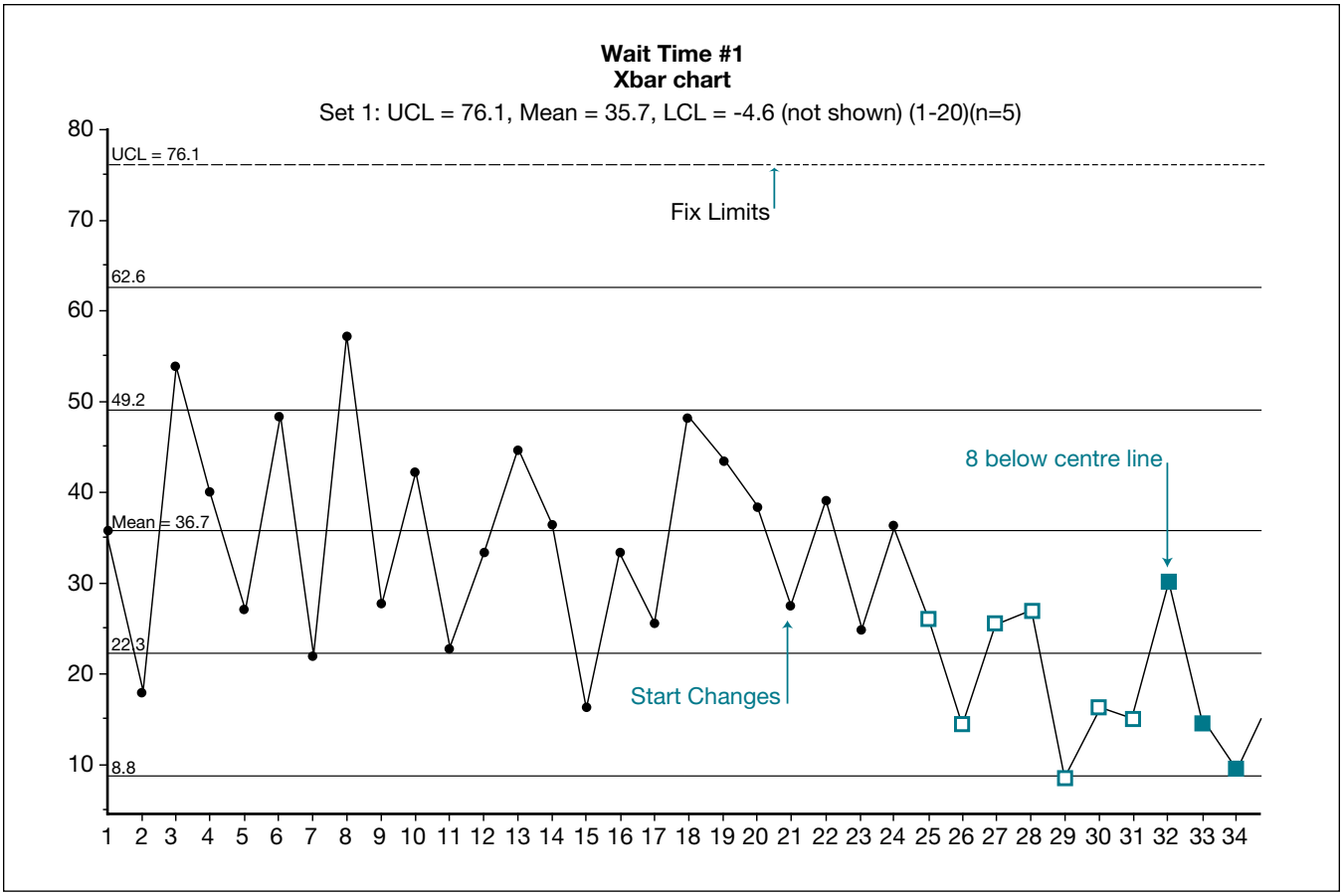


FIGURE 16 | Example of a Control Chart

Control chart interpretation

We look at control charts to see if there is any evidence of special cause in the charted data. Special cause can be observed in several ways, using a number of rules.

If we do not see evidence of special cause, it means our process is in statistical control. We then want to look at the average value and where the limits are. Looking at the average tells us whether the process is good or not on average. A process could be in control, and still be a poor process — "patients always wait a long time at this clinic!" It could also be that there are very wide limits around the average. Imagine that patients typically wait an average of 15 minutes at your clinic, but on some days the average wait time is 20, 30 or even 40 minutes. The overall average may be acceptable, but the variation around it may be unacceptable.

When you have special cause variation, you want to understand why (see Figure 17). In the case of a QI project, the "why" may be because you introduced a change and wanted to see a special cause signal that indicates you've made an improvement. In other situations, when you are monitoring a process, special cause may indicate something that you do *not* want to happen. For example, triage times might have become too long, readmission rates too high or patient satisfaction too low. In these instances, you want to investigate and find out what happened.

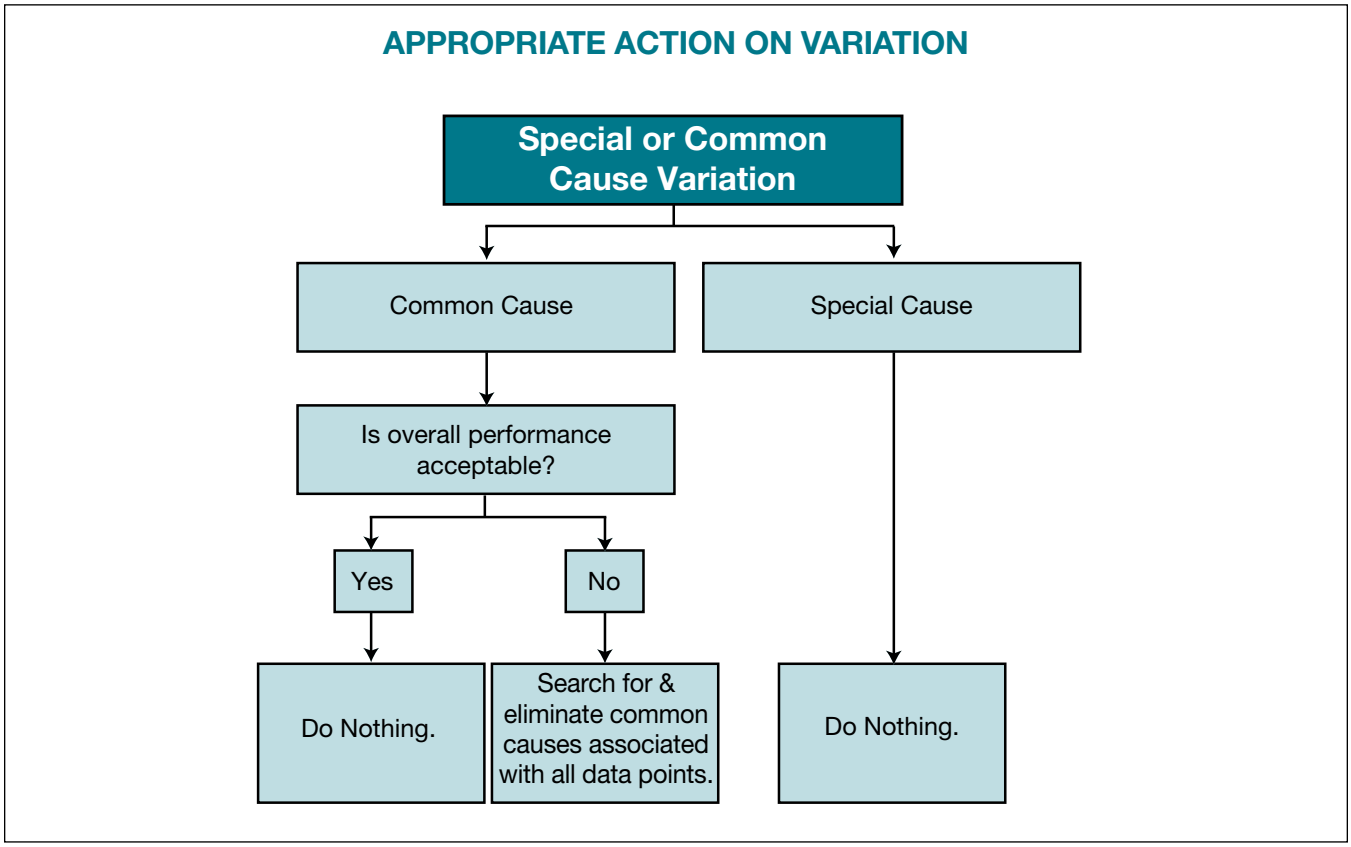


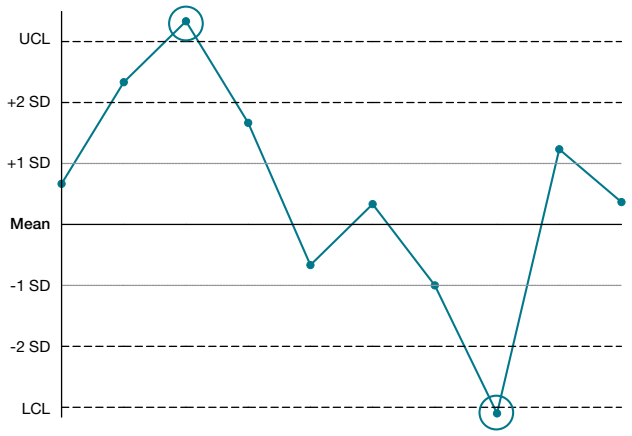
FIGURE 17 | Appropriate Action on Variation

If you are trying to improve your processes, but are not seeing a special cause signal, revisit your tests of change using PDSA and use tools that help you analyze your system.

Control charts are ideally suited to monitoring improvement project outcomes and process measures and helping to determine whether a change is actually an improvement. Easy-to-use software is available.

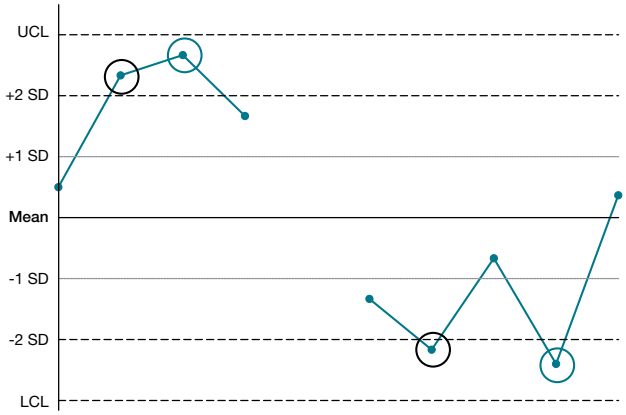
RULE 1

Any point above the UCL or below the LCL



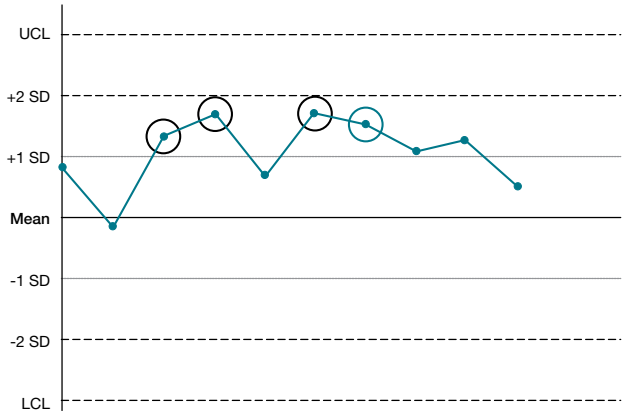
RULE 2

Any two out of three consecutive points fall beyond two standard deviations above or below the mean



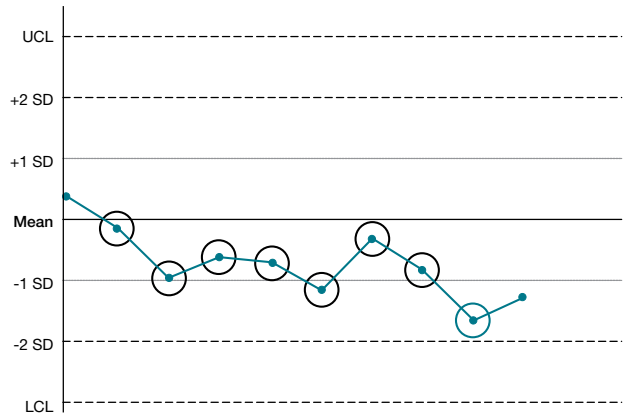
RULE 3

Any four out of five consecutive points fall beyond one standard deviation above or below the mean



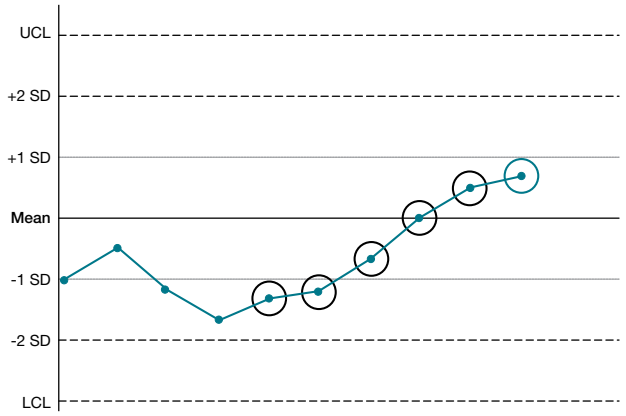
RULE 4

Eight consecutive points fall on one side of the mean



RULE 5

Six (or more) consecutive points continually increasing or decreasing



Control Chart Tests for Out-of-control Conditions

Western Electric Tests

- Apply these tests independently to each side of the centre line:
  - — One point outside three SD
  - — Two out of three successive points outside two SD
  - — Four out of five successive points outside one SD
  - — Eight successive points on one side of centre line

Another Popular Test

- Apply this test to the entire chart:
  - — Six successive points increasing or decreasing (trend)

4.4 CONCLUSION

Public reporting on quality in Ontario shows that Ontario has some leading practices and programs, but with ample room for improvement. Organizations are increasingly interested in leveraging their success to strengthen existing QI activities and develop new QI projects. This guide is meant to serve as a resource for QI practitioners and teams to allow them to continue to develop QI skills sets and expand their QI toolkit.

The guide provided case studies to illustrate the progression of QI projects and the many resources available to QI teams. It covered the fundamentals of the Model for Improvement and rapid cycle improvements, which often help drive the new culture of Continuous QI. It also shared methods and practical tips to help teams more readily analyze their current processes and identify opportunities for improvement.

It is hoped that this guide provided both guidance and practical tools to help QI practitioners succeed in their aims.

Readers can find updated versions of the guide and all of HQO's QI tools, templates and recommended resources at **www.hqontario.ca**.

Appendix A EXAMPLES OF CHANGE CONCEPTS

Many popular change concept groupings, including the three described here, share common themes. These examples are a small sample of the many change concepts available to QI teams.

EFFICIENCY IMPROVES THE FLOW OF A PROCESS, WHILE REDUCING WASTE.	
EFFICIENCY CHANGE CONCEPT	**COMMENT**
Eliminate Waste	Focus on eliminating waste, particularly by reducing steps or resources that do not add value to the patient/client.
Improve Workflow	Improving the flow of work in processes is an important way to improve the quality of the services provided through those processes.
Optimize Inventory	Reduce and control inventory at all levels of the organization.
Change the Work Environment	The work environment itself offers a great opportunity to seek efficiencies — for example, by moving related steps closer together.
Evaluate the Producer/Customer Interface	Focus on the connections between patients/clients and providers, and the elements that are important to the patient/client in that interface.
Manage Time	Reduce delays, wait times and cycle times for all services.
Focus on Variation	Reduce variation to improve quality processes and outcomes.
Conduct Error Proofing	Redesign the system to make it less likely for people in the system to make errors.
Focus on the Product or Service	Focus on the quality of the actual service (and product), as well as on the process improvement.

MISTAKE PROOFING IS THE PRACTICE OF DESIGNING A PROCESS OR SYSTEM TO PREVENT ERRORS OR MINIMIZE THEIR EFFECT.	
MISTAKE PROOFING CHANGE CONCEPT	**COMMENT**
Forcing Function	Design the system so that it is impossible to make an error.
Constraining Function	Design the system so that it constrains some component from being able to lead to an error.
Reminders and Alerts	Generate a reminder when a particular step needs to be done.
Avoiding Look-alikes	Avoid instances where two items, names, processes or patients look the same. Rename or recode one or more items.
Visual cues	Label or visually code items so that it is easy to spot when they are in the wrong place.

ADVANCED ACCESS REDUCES DELAYS AND IMPROVES CONTINUITY OF CARE.	
ADVANCED ACCESS CHANGE CONCEPT	**COMMENT**
Measure and Understand Supply and Demand	Understanding the patterns of both demand and supply on a weekly, monthly or seasonal basis allows for focused efforts to shape demand to match supply, and/or increase (or decrease) supply during periods of high (or low) demand.
Balance Supply and Demand on a Daily, Weekly and Long-term Basis	Optimize flow by matching supply and demand on a daily, weekly and long-term basis.
Optimize the Care Team	Optimizing the care team service delivery model is critical to maximizing the supply and improving the daily flow of the work. Increase supply by increasing efficiency.
Decrease Demand for Appointments	Reducing demand makes it easier for the system to absorb current or future levels of demand.
Manage Panel Size and Scope of Practice	Managing panel/roster size and the scope of the practice allows a team to balance supply and demand and ensures that they can do today's work today.
Increase Continuity	Increasing continuity reduces the need for repeat visits and allows time for patients who need specialized care.
Reduce Appointment Types	Complex schedules, with many appointment types, times and restrictions, can actually increase total delay in the system because of differential delays and queues. Reducing the complexity ultimately decreases system delays.
Recalibrate the System by Working Down the Backlog	Backlog consists of appointments on the future schedule put off due to lack of space on the schedule to do this work earlier; working down the backlog recalibrates the system to improve access.
Create Contingency Plans	The natural variation in supply and demand that occurs as part of the everyday functioning of a practice often creates problems that contingency plans can address.

Appendix B RESOURCES

Amin S. Control charts 101: a guide to health care applications. *Quality Management in Health Care* 2001; 9(3): 1–27.

Banks N, Palmer H, Berwick D, Plsek P. Variability in clinical systems: applying modern quality control methods to health care. *Joint Commission Journal on Quality Improvement* 1995; 21(8): 407–417.

Carey R. How do you know that your care is improving? Part II: Using control charts to learn from your data. *Journal of Ambulatory Care Management* 2002; 25(2): 78–88.

Carey R. *Improving Healthcare with Control Charts: Basic and Advanced SPC Methods and Case Studies*. Milwaukee: ASQ Quality Press, 2003.

Carey R, Lloyd R. *Measuring Quality Improvement in Healthcare*. New York: Quality Resources, 1995.

Grout J. *Mistake-proofing the design of health care processes*. Agency for Health Research and Quality, Rockville MD, May 2007. AHRQ Publication No. 07–0020. ahrq.gov/qual/mistakeproof/mistakeproofing.pdf

Langley GJ, Nolan KM, Nolan TW, Norman CL, Provost LP. *The Improvement Guide*. San Francisco: Jossey- Bass Publishers, Inc., 1996.

Lim TO. Statistical process control tools for monitoring clinical performance. *International Journal for Quality in Health Care* 2003; 15: 3–4.

Plsek, P. Introduction to control charts. *Quality Management in Health Care* 1992; 1(1): 65–74.

Wheeler, D. *Understanding Variation: The Key to Managing Chaos*. Knoxville: SPC Press, Inc., 1993.

Appendix C REFERENCES

ORGANIZATIONS	
Canadian Patient Safety Institute	**www.patientsafetyinstitute.ca**
Guidelines Advisory Committee	**www.gacguidelines.ca**
Health Quality Ontario	**www.hqontario.ca**
Institute for Healthcare Improvement	**www.ihi.org**
Improvement Foundation, UK	**www.improve.org.au**
Institute for Safe Medication Practices Canada	**www.ismp-canada.org**
Ministry of Health and Long-Term Care, Health Care Improvement Practices Registry	**www.improvementpractices.on.ca**
National Guideline Clearinghouse (NGC)	**www.guideline.gov**
Ontario Association for Non-Profit Homes and Services for Seniors	**www.oanhss.org**
Ontario Hospital Association	**www.oha.com**
Ontario Long Term Care Association	**www.oltca.com**
Registered Nurses Association of Ontario Long Term Care Toolkit	**www.ltctoolkit.rnao.ca**
Quality Healthcare Network	**www.qhn.ca**
Safer Healthcare Now!	**www.saferhealthcarenow.ca**
Senior's Health Research Transfer Network	**https://www.ehealthontario.ca/portal/server.pt?open=512&objID=705&PageID=0&cached=true&mode=2&userID=11862**

Appendix D SAMPLE WORKSHEETS

Use the tools on the following pages as templates, customizing them to work more effectively with your team and organization.

INVENTORY OF QI WORKSHEETS

Model for Improvement Worksheet
Quality Improvement Project Charter Worksheet
Plan-Do-Study-Act Form
Process Map Form
Fishbone Diagram
Measurement Plan Template
Check Sheet Worksheet

MODEL FOR IMPROVEMENT WORKSHEET

Ontario
Health Quality Ontario

TEAM SHOULD PLAN THREE ELEMENTS

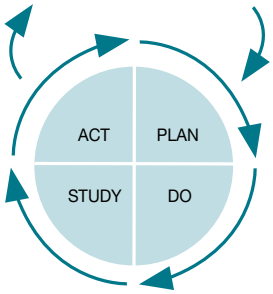
1. **Aim** — clear, time-specific, stretch and valuable to patient

MODEL FOR IMPROVEMENT

What are we trying to accomplish?

How will we know if a change is an improvement?

What changes can we make that will result in improvement?



2. **Measures**

   Outcome Measures

   Process Measures

   Balancing Measures

3. **Change Concepts** (list ideas, things others have tried, hunches and evidence)

QUALITY IMPROVEMENT PROJECT CHARTER WORKSHEET

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Project Title:	
Team Leader:	**Executive Sponsor:**
Team Members:	
Name:	**Position and Organization or Department**
Patients/Clients/Family Who Will Benefit:	**Types of Clinical and Administrative Staff, Suppliers, etc. Involved:**
Problem/Opportunity Statement (What's wrong with quality?)	
Aim Statement (What are we trying to accomplish? Numerical target for improvement, over what time?)	
Measures (How will we know if we are improving?) **Outcome Measures** **Process Measures** **Balancing Measures**	

Change Ideas (What can we try that will result in an improvement?)	
Business Case (Are health system costs reduced by addressing the problem?)	
Link to Organizational Strategy	
Term of Project (Start and Stop Dates):	**Project Budget:**
Anticipated Milestones:	
Estimated Time Required for Staff Participation:	

PLAN-DO-STUDY-ACT FORM

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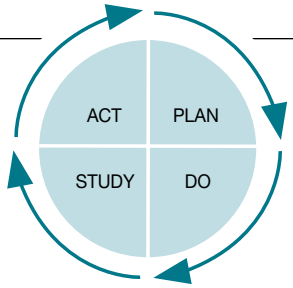
Health Quality Ontario

Objective for this PDSA Cycle **Date:**



Is this cycle used to:

❑ develop ***or*** ❑ test ***or*** ❑ implement a change?

What question(s) do we want to answer on this PDSA cycle?

PLAN:

Plan to answer questions: Who, What, When, Where?

Plan for collection of data: Who, What, When, Where?

Predictions (for questions above based on plan):

DO:

Carry out the change or test, collect data and begin analysis.

STUDY:

Complete analysis of data.

Compare data to predictions and summarize what was learned.

ACT:

Are we ready to make a change? Plan for the next cycle.

PROCESS MAP FORM

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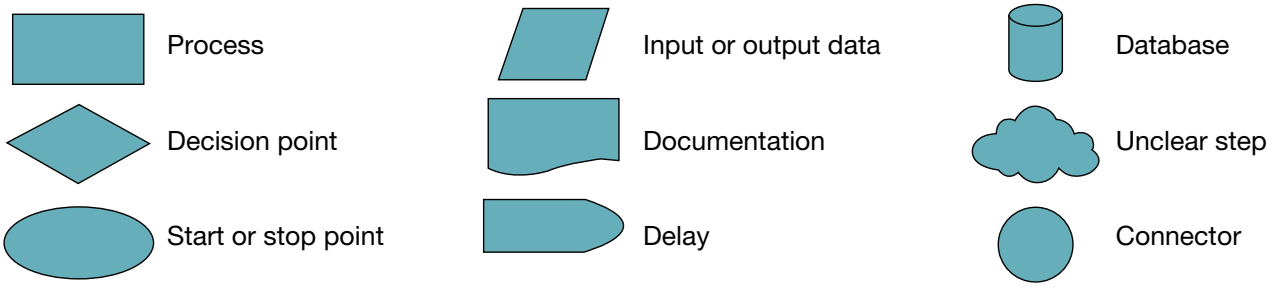
"If you can't draw a picture of your process, you can't improve anything."

Dr. W. Edwards Deming

SYMBOL KEY:



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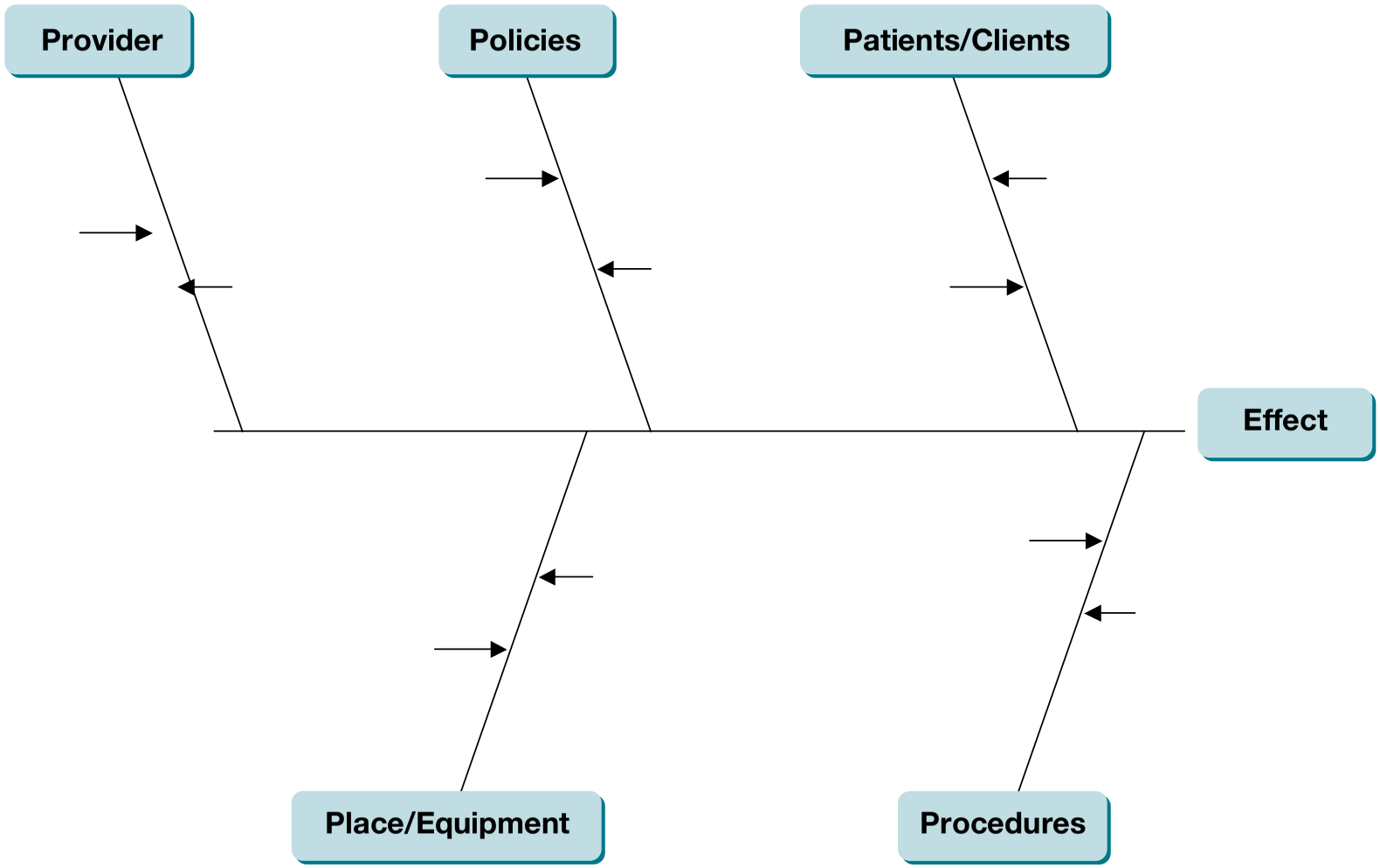
FISHBONE DIAGRAM



MEASUREMENT PLAN TEMPLATE

QI Project:			
Timeframe for Project:			
WHAT ARE YOUR MEASURES?		DATA SOURCE	FREQUENCY
Outcome			
Process			
Balancing			

How do your outcome and process measures link to your organization's corporate dashboard?

Will you measure causes of poor quality? ❑ Yes ❑ No

If so, for which measures of quality?

Will you collect baseline data? ❑ Yes ❑ No

If yes, what is the timeframe for the baseline?

Will you use sampling for any manual data collection methods? ❑ Yes ❑ No

If yes, for each data collection method, indicate sampling method (block or systematic) and protocol.

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CHECK SHEET WORKSHEET

Use this data to produce Pareto Charts to discover common reasons for problems and focus on improvement opportunities.

Organization/Unit Name: _____

Topic Question: _____

Examples of topic questions:
Why aren't residents being turned as per care plan?
Why aren't clients receiving diagnostic screenings as per protocol?

Location Specifics: _____ **Data Recorders:** _____

Start Date: _____ **End Date:** _____

Defect or Defect Cause	Count (Use Checkmarks)	Total Checkmarks	Percentage of Total
A.			
B.			
C.			
D.			
E.			
F.			
G.			
H.			
	TOTAL		

NOTES:

NOTES:

NOTES:

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