Quality Improvement Tookit

Society of Interventional Radiology

How to Conduct a Quality Improvement Project (H2QIP)

Introduction:

In the words of William Edwards Deming, addressing those who remain skeptical about quality improvement and quality driven healthcare processes, “It is not necessary to change. Survival is not mandatory”.

Quality is not a static goal but a moving target. The National Academy of Medicine defined it as ‘Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with the current professional knowledge’. Interventional Radiology is a rapidly growing, technologically-driven specialty which strives to provide the highest quality healthcare. It is useful to know the evolution and history of quality management and the work of various quality theorists from Florence Nightingale and Earnest Codman to William Shewhart and William Edwards Deming and many others (1). Work and research of Shewhart and Deming launched the process improvement concepts of Six Sigma (2) and lean management(3) to achieve stunningly low failure rates and eliminating waste, respectively. These concepts and philosophies derived primarily from the Toyota Production System apply to delivery of healthcare as well. Institutions like the National Academies, The Joint Commission (TJC), Centers for Medicare and Medicaid services (CMS), Institute for Healthcare Improvement (IHI), Agency for Health Research and Quality (AHRQ) and others have focused on improving the quality and safety of healthcare delivery in the United States.

A few definitions and concepts in Quality Improvement are described below and are helpful when getting started (1,4-5):

Lean is a quality improvement methodology that emphasizes waste identification and elimination. Lean focuses on finding value-added process steps and removing non-value added process steps (5). Lean is often used in combination with Six Sigma as a complementary process.

PDSA, short for Plan, Do, Study, Act, is a method that uses rapid cycles of improvement to achieve quality improvement (5). Given its nimbleness, PDSA is best used for small projects.

Quality Assurance (QA) and Continuous Quality Improvement (CQI) are the 2 major approaches utilized to improve quality in health care. QA is focused on ensuring the delivery of health care services are meeting standards or expectations through the identifications of problems or defects in the system, developing solutions, and monitoring the effectiveness of the solutions. CQI is aimed at performance improvements through assessing the current conditions and developing strategies for improvements. Whereas QA reacts to individual problem events or providers, CQI attempts to anticipate problems and improve processes (6).

Six Sigma is a quality improvement methodology that uses a data driven approach to reduce defects by decreasing or eliminating variation. The term arises from the statistical standard deviation from the mean applied in looking at defects per million. At six sigma, there are 3.4 defects per million opportunities, resulting in reliability of 99.9997% (5). Six sigma is often used in combination with Lean as a complementary process.

Total Quality Management (TQM) is a customer focused management system that uses data and effective communication techniques to integrate quality into the culture of an organization, congruent with the organizations mission, vision, and goals. TQM shifts responsibility from a hierarchical and bureaucratic approach to a holistic or decentralized one.

Waste in healthcare exists in many forms. The New England Journal of Medicine has an excellent review of waste in healthcare. The eight types of waste in healthcare include waiting/idle time, motion, overproduction/underproduction, over-processing, inventory, rework rejects, untapped human potential, and transportation (5).

SIR H2QIP Toolkit:

The goal of developing the SIR H2QIP Toolkit is to provide Interventional Radiologists (IRs) with resources and tools that can help improve their practices using validated, actionable quality improvement tools.

With the launch of the Society of Interventional Radiology (SIR) VIRTEX registry, practices will be able to compare themselves against aggregated benchmark data. The H2QIP toolkit will provide IR practices the basic tools to implement a quality improvement project. Eventually, individual disease states/procedures will have toolkits to supplement the basic information provided here using best practices from high-performing sites. Additionally, these QI projects may also allow members to satisfy American Board of Radiology (ABR) Maintenance of Certification (MOC) Part 4 Practice Quality and Improvement.

Here we provide a step-wise process of implementing a quality improvement project with a focus on the PDSA methodology. A PDSA form is included at the bottom for convenience.

A Stepwise Process for Implementing a Quality Improvement Project using PDSA

A. Plan

1. *Define the problem:* Your problem should well-defined and clear. The problem scope should also be determined to determine the optimal quality improvement methodology. A problem that is small and confined to one area/group is ideal for PDSA. A PDSA project should be implemented and completed in days to weeks.

   For larger projects that can take months to implement and cross service lines/hospital groups, consider a Lean Six Sigma approach such as DMAIC (Define, Measure, Analyze, Improve, Control) or an A3. These are beyond the scope of this discussion, but a great resource for tools to utilize these methods is “The Lean Six Sigma Pocket Toolbook” by Michael George.

2. *Plan the project:*

   a. Objectives - Determine the project objective/aims, the Who/What/When/Where, metrics, and the data collection methods. A SMART Framework (Specific, Measurable, Attainable, Relevant, Time-based) can be helpful here. Ensure your aims are aligned with your organization’s strategic goals. Project planning forms in Q&A and Tabulated formats are provided below.

   b. Process mapping – Understanding the process can be helpful in this phase. Putting together a team of stakeholders and together creating a flowchart or a swimlane diagram can be useful methods to map the current process out and identify the Who, What, When, and Where. Swimlane diagrams are particularly useful in Interventional Radiology given the interactions between physicians, technologists, nurses, administrative staff, and others. An example swimlane is provided below. The current state and future state (ideal state) can both be mapped out to help identify the problem areas.

c. Waste – Determine the problem areas, or waste, in the process. These are going to be your candidate areas to target for elimination or improvement. If your team has created this on a whiteboard, use different colored sticky notes to indicate processes that provide value and processes that are wasteful.

d. Analyze – Once the problem areas are identified, work to identify the root causes. This can be accomplished using a fishbone diagram, included below. Once the problem areas are placed on the fishbone, a "5 Whys" approach can be used to determine the root cause. This involves asking why the process is problematic, then asking why the answer is problematic and continuing until a root cause is found. Note that a root cause may be found after only 2 or 3 "Whys" – 5 "Whys" is not always needed (though sometimes more than 5 "Whys" may be required). Alternatively, a Driver Diagram (provided below) can be used.

e. Develop Solutions – Once your team has identified the root causes, determine your solutions and confirm what you are going to measure. If there are numerous possible solutions, a PICK (Possible, Implement, Challenge, Kill) Chart can help narrow down the highest impact solutions. A PICK Chart is included below and is divided up into 4 quadrants. The quadrants represent the following: (a) Possible - Low Impact/Low Effort, (b) Implement – High Impact/Low Effort, (c) Challenge – High Impact/High Effort, and (d) Kill – Low Impact/High Effort. Assign each solution a quadrant. Based on your chart, choose which solutions to implement.

B. Do: Carry out your team's plan, collect your data, and document any problems.

C. Study: Evaluate your results. Did it go as planned? If not, why? What did your team learn? Were there unintended consequences? Were all of the appropriate data points captured**?**

D. Act: Re-visit the planning phase. Are there areas where continued improvement is needed? Was it a success, are small tweaks needed, or is it necessary to revisit the plan entirely? Keep in mind that this is a continuous process, and repeating the PDSA cycle is common.

Below are 6 tools that can be helpful in a PDSA project, and we list several additional tools that can help in project development. (7)

Essential Tools of the SIR H2QIP Toolkit are:

1. Project Planning Form – 2 types: Q&A & Tabulated
2. Swimlane Diagram
3. Plan-Do-Study-Act (PDSA) Worksheet
4. Cause and Effect Diagram
5. Driver Diagram
6. PICK Chart

Additional Tools:

Graphical Data – Histograms, Run and Control charts, Pareto Charts, Scatter diagrams to display baseline data, follow-up data, progress made, as applicable.

References:

1. Dlugacz Yosef D. Introduction to Health Care Quality: Theory, Methods, and Tools (First Edition). Josey-Bass, A Wiley Brand, 2017

2. McCarty T. The Six Sigma black belt handbook. New York: McGraw-Hill, 2005.

3. Womack JP, Jones DT, Roos D. The machine that changed the world: how Japan's secret weapon in the global auto wars will revolutionize western industry, 1st ed. New York: Harper-Perennial, 1991.

4. Steele JR, Wallace MJ, Hovsepian DM, James BC, Kundu S, Miller DL, Rose SC, Sacks D, Shah SS, Cardella JF. Guidelines for establishing a quality improvement program in interventional radiology. J Vasc Interv Radiol. 2010 May;21(5):617-25. doi: 10.1016/j.jvir.2010.01.010. Epub 2010 Mar 17. PMID: 20299244.

5. Giardino AP, Riesenberg LA, Varkey P, eds. Medical Quality Management: Theory and Practice. Springer International Publishing; 2021. doi:10.1007/978-3-030-48080-6

6. Applegate KE. Continuous quality improvement for radiologists. Acad Radiol 2004; 11:155–161.

7. Quality Improvement Essentials Toolkit from Institute for Health care Improvement. http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx

Project Planning: Q&A Form

When initiating a project, the Q&A Form asks the key questions that will help plan and initiate the project in a systematic fashion. It can also be used by the Department QI committee for internal review and approval as well as can be utilized for IRB approval as needed.

A) Project Goal(s)

1. What is the overall goal of the project?
2. What is the gap in quality of care that your project aims to address?

B) Project Details (as applicable)

1. What is the target population that will be studied?
2. What is the intervention that will be studied?
3. What improvements in quality or patient care are anticipated?
4. What is the anticipated project duration?

C) Project Endpoints and Measurement

1. What is the baseline performance that will be measured (before the study intervention)?
2. What are the study endpoints or performance measures of interest?
3. What will be the comparison or control group?
4. What is the anticipated sample size and how was it determined?
5. What data sources will you use, and are the data readily available?

D) Analytic Plan

1. How will the intervention be evaluated?
2. How did you select your analytic approach?
3. How will you determine if there has been a meaningful impact on quality or patient care?

E) Project Team

1. Who is the project team leader?
2. Who are the project team members?
3. What are the specific responsibilities of project team members?
4. At what points of the project will the team meet and what is the timeline?

Project Planning: Tabulated Form

When used in project planning, the tabulated form provides the big picture view of the project and can be used to keep track of progress. “Drivers”, which are the key leverage points that influence outcomes are listed numerically, followed by descriptions of how to measure them and what are the measurable goals. Then, the change idea, people responsible, PDSA cycles and timeline are described.

Project Title:				Team Members:						
Driver	How to measure Driver and Define measurable Goals	Change Idea	PDSA	Person Responsible	Timeline (T=Test; I=Implement; S=Spread) Month					

Swimlane Diagram

PROJECT NAME	
ADMIN	
NURSING	
TECHNOLOGIST	
PHYSICIAN	

Plan-Do-Study-Act (PDSA) Worksheet

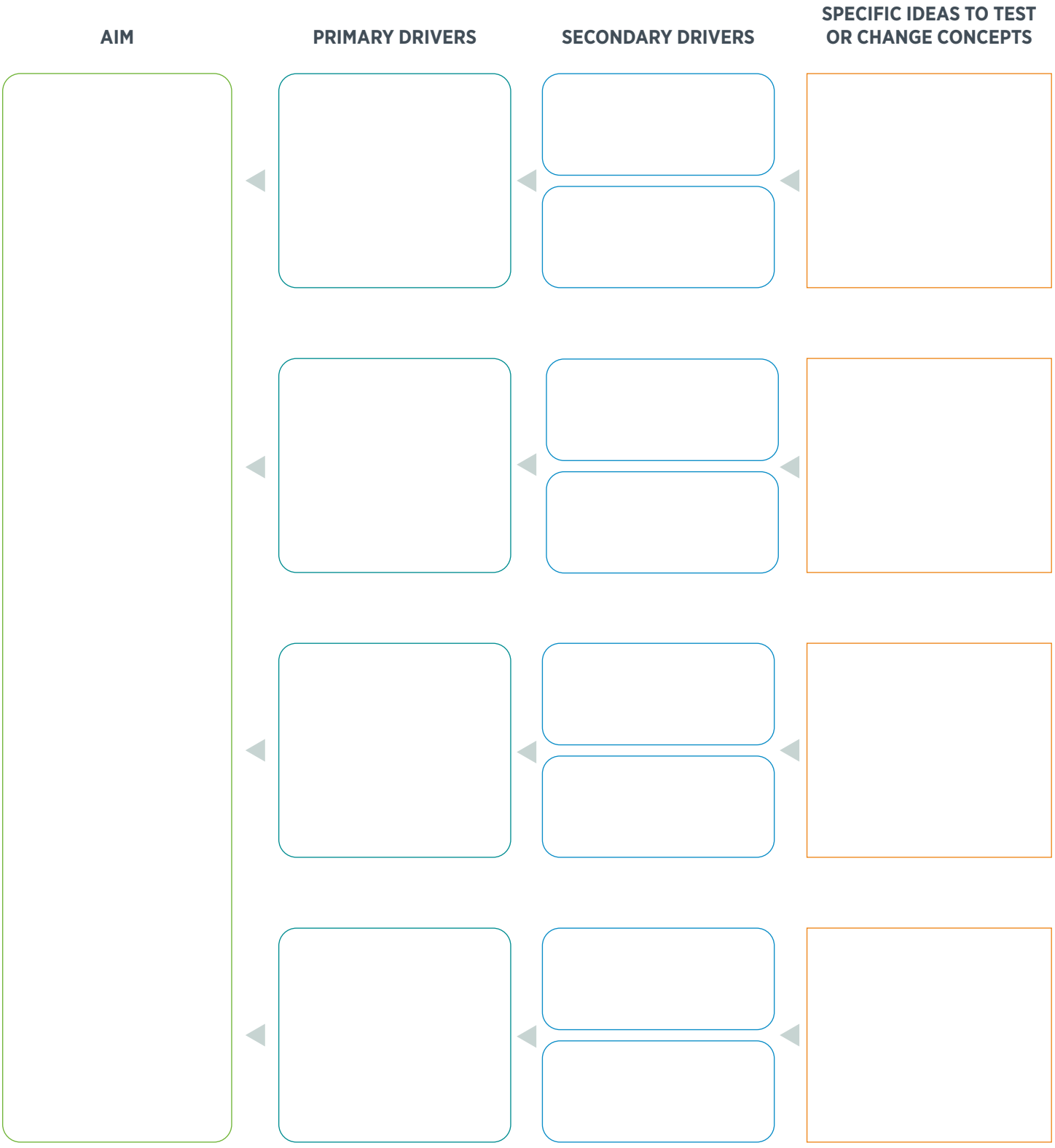
The PDSA worksheet is a tool for documenting a test of change. First you Plan to test the change (Plan), then carry out the test (Do), evaluate and analyze from the test (Study) and determine what modifications, if any, to make for the next cycle. (Act). In most QI projects, more than one change is tested. One PDSA worksheet for each change you test. Each change may go through several PDSA cycles as you continue to learn the results. An example of a PDSA worksheet can be found in the Percutaneous Image-guided Biopsy Toolkit and IVC Filter Removal Toolkit.

OBJECTIVE:

PLAN	**Plan the test, including a plan for collecting data.** What is the question and what are your predictions What is the plan to test the change, who is involved, how will you go about it. What is the plan for collecting data
DO	**Run the test on a small scale.** Describe what happened What data was collected, what were the problems and unexpected observations Collect and begin to analyze data
STUDY	**Analyze the results and compare them to your predictions.** How did the data compare to your prediction Summarize and reflect on what you learned:
ACT	**Based on what you learned from the test, plan for your next step.** Determine what modifications you should make — adapt, adopt, or abandon Prepare the plan for the next PDSA

Driver Diagram

A visual display of what 'drives', or contributes to, the achievement of a project aim. It demonstrates the relationship of the overall Aim with the Primary (key) and Secondary drivers and specific change ideas to test. Primary drivers are the high influencers that directly influence the aim and the secondary drivers influence the primary driver. Driver diagram should enlist help from all team members to develop a clear view of the entire complex system. It is also a tool to communicate with other stakeholders where a team is testing and working. An example of a Driver Diagram can be found in the IVC Filter Removal Toolkit.



Cause and Effect Diagram (also Ishikawa /Fishbone diagram)

One of the challenges faced by QI team is to determine what changes must be tested to improve a process. Cause and Effect Diagram is an organizational tool to help display graphically the possible Causes to the Effect and to each other; that can help identify areas of improvement. Typical categories of causes are: Materials, Methods, Equipment, Environment and People. The desired effect you wish to influence is to be written in the box on the right side of the page. An example of a fishbone diagram can be found in the Percutaneous Image-guided Biopsy Toolkit.

PICK Chart

	LOW IMPACT	HIGH IMPACT
LOW EFFORT	**Possible**	**Implement**
HIGH EFFORT	**Kill**	**Challenge**