The foundations of quality improvement science

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ABSTRACT

As an alternative to 'big bang' initiatives, plan-do-study-act (PDSA) cycles are an increasingly popular approach to conducting tests of change to support quality improvement in healthcare. Using PDSA cycles can help clinicians deliver improvements in patient care through a structured experimental approach to learning and tests of change. The PDSA approach facilitates individual, team and organisational learning, making it an essential tool for the future hospital.

This paper provides an example of the benefits of using PDSA in practice to test and develop a change idea to ensure it is fit for purpose. As with any new skill or competency, learning to use PDSA cycles takes time and practice and is necessary to ensure that the method is being used to its full effect. This paper explores some of the challenges encountered by clinicians in learning to use PDSA cycles well, and provides advice on how they can be overcome to help practitioners get more out of using the method.

KEYWORDS: Clinicians, education, learning, mastery, plan-do-study-act, quality improvement

Introduction

Many clinicians working in healthcare today experience change fatigue because they are bombarded with new national and local improvement initiatives on a monthly, if not weekly, basis. With much talk of transformational change, the involvement of external consultants and the pressure for quick wins, it is sometimes difficult to know exactly what an individual can do to make a difference.

Quality improvement (QI) methods are increasingly deployed in healthcare to support the delivery of high-quality patient care and improved patient outcomes. Teams or individuals can deploy these methods to great effect within their sphere of influence. Drawing on other stakeholders as needed during an improvement initiative, the plan-do-study-act (PDSA) cycle is one of the central QI tools; it focuses on the crux of change – the point where ideas and intentions are put into practice.[1]

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PDSA cycles are not a standalone QI approach in themselves but instead provide a central component to many quality approaches, including the model for improvement, Lean Six Sigma and total quality management.[2]

PDSA provides a structured experimental learning approach to testing changes.[1,3] The purpose of PDSA cycles is to learn as quickly as possible whether and how an intervention works in a particular setting and to make adjustments accordingly to increase chances of delivering and sustaining the desired improvement, or to stop the intervention and try something else.

This paper provides a hypothetical example of the benefits of using PDSA in practice to test and develop a change idea to ensure it is fit for purpose, and then shares some of our experience in how to start applying PDSA in practice.

Application of PDSA to support improvement

A hospital-based improvement team establish a project to improve quality of care for pneumonia patients. They identify a care bundle that they believe will help, based on research evidence and on successful improvement work in another hospital. At the team meeting on 1 June, it becomes clear that within the team there are two different views on how the implementation of the care bundle should proceed:

- Strategy 1 – design of changes to be made to the process of care within the team involving staff and patients, followed by launch across the hospital. The launch event will be held on 1 November to raise awareness of the new way of working.
- Strategy 2 – design of changes to be made to the process of care through iterative PDSA cycles; starting with simulated tests of the changes, and working up in scale through small trials with a few patients to full scale implementation across the hospital. An awareness raising event will be held on 1 November to highlight progress to date, as well as the remaining challenges.

Suppose that there are (at least) two issues that the team have not thought about that will impact on their improvement attempt:

1 They are unaware of quite how influential junior doctors are going to be on the successful implementation of the care bundle.
2 They have not taken into account the fact that a key piece of clinical information required to complete the bundle may not be available in accident and emergency at the time they are intending the bundle to be completed.

Table 1. Exploration of two different strategies for the implementation of a care bundle

Lesson	Strategy 1	Strategy 2
1 Find opportunities to learn about and practise PDSA	The team have limited opportunity to learn and practise their approach to implementation of the care bundle – everything rests on the 'big launch'.	The team have opportunities to apply the PDSA approach in simulations and on a small scale tests. This supports learning and builds competence and confidence prior to more complex and larger tests of change.
	During the launch event, colleagues raise a lot of valuable questions and issues that could improve the care bundle – but the team, having not run an event like this previously, have no means of capturing these issues and can only recall some of these issues after the meeting. They are disappointed the idea wasn't better received after all of the work they had put in.	After one of the initial small scale tests, the study phase reveals only 2/10 forms have been filled in. Only by asking the people doing the test did they understand the reason why: it was difficult to obtain the information to complete the forms. The team learnt the importance of getting feedback from staff and of building good relationships with them. They also realised the test had been too large, and the same conclusion could have been reached from one or two patients rather than 10.
2 Stop doing what isn't working and start spending more time on PDSA	A significant portion of work undertaken by the team prior to the launch may be wasted if it turns out that the care bundle is not fit for purpose.	By devoting time to developing the intervention through PDSA cycles, the team are able to avoid extensive rework of the care bundles later on, and can build engagement with more staff as they go.
	Following the launch event they realised that they need to redesign the form and have to recall the hundreds of forms they had printed. The project has already been running for 6 months and only 2 months remain, staff morale is low and no new people have volunteered to get involved.	In an early PDSA cycle, the team realise that junior doctors will play a bigger role than they had thought at the start. At this point, they engage a junior doctor as a project champion and plan PDSA cycles testing out the care bundle with them.
3 Encourage clinicians to learn safely from failure	By undertaking the 'do' stage as one big launch, the team deprive themselves of the potential to incorporate related learning into the design of the care bundle ('study' and 'act'). This means the first point of failure in practice is the launch itself, resulting in a high profile, high cost failure.	Being involved in the testing and development of the care bundle increases buy-in and allows failure of the care bundle to occur on a small scale in a safe and contained manner. This enables rapid learning without using up physical and emotional resources of other staff unnecessarily.
	They discover after the launch that the clinical information needed is not available in A&E at the time it is required, and have limited time and resource left to remedy it.	The team test the care bundle with one patient and realise that the clinical information that they need is not available in A&E at the time it is required. They are then able to modify the information flow through several more tests of the bundle to eliminate this problem.

A&E = accident and emergency department; PDSA = plan-do-study-act

Thinking about how these two strategies might unfold over time provides a useful example of the benefits of applying PDSA to support the testing and development of change to achieve improvement (Table 1).

Using strategy 1, the team waste time, effort and willpower on launching an intervention that will not work without substantial work to address the issues of junior doctor engagement and information flow. There is a real risk that the project will fail completely, with staff devoting effort toward other initiatives. With strategy 2 they are much more likely to pick up these problems early on with time to address them prior to scaling up. As a result, they are more likely to end up with a care bundle working well within the hospital system, with staff engaged and supportive of the work.

Your foundation in quality improvement science

While the premise of the PDSA approach is simple – to *plan* a test of change or learning activity, to *do* it, to *study* what happens, and to *act* on the learning obtained – the conceptual simplicity of the method can mask the skills, knowledge and experience required to master its use.[4]

Drawing on our experience, we recognise that learning how to apply PDSA in clinical practice is challenging. PDSA needs to be used by clinical teams alongside their normal daily practice. Often their previous experience of making changes may be very different to the principles of PDSA, and they might be uncertain about, and even resistant to, testing changes using PDSA.

The selected lessons and challenges presented in this article will be applicable to anyone attempting to build a future hospital or service with workforce capacity to use PDSA. They are targeted at those taking their first steps with PDSA, but are applicable to advanced use of the method too.

Make a commitment to get started

One of the most effective ways to move from awareness to familiarisation is to create opportunities for people to try

using PDSA so that they can see and experience the benefits for themselves. PDSA can offer a structured way to address the frustrations and concerns of daily practice, such as not being able to find patient notes, not being able to read the notes, or test results not getting back in time. Identifying what matters to staff can help create motivation and commitment to any improvement effort.

Make time to practise

A good tactic for engaging people in PDSA practice is to notice what they are doing already. Often people are doing informal PDSA activities – taking intervention ideas to a committee meeting for review, trying out a new handover process with one patient or attempting to introduce a new practice on a ward. Asking them about their learning from such experiences provides a good opportunity to get people thinking about how they might achieve more through the use of a more formalised and PDSA-structured approach.

Another tactic is to encourage people to retrospectively record their change in a PDSA template. An experienced QI practitioner can help the learner think through questions related to each stage of the PDSA, to consider what they did and what opportunities may have been missed. Getting help from an experienced QI practitioner to write the first one can go a long way to building confidence and helping them overcome what might seem, at first, a substantial hurdle. This can build the learners' confidence in their use of the method, and they can then move on to start writing PDSA cycles prospectively, documenting the plan in advance of the test cycle. A PDSA documentation template is included in the supplementary material (S1).

Make PDSA your new 'norm'

Counting the time you currently invest in trying to improve or fix things is a good starting point. This might include recognition of 'unproductive time' spent attending meetings with few outcomes, drafting strategies or policies that remain unread, developing protocols that reflect idealised views of how work is really done and do not reflect 'work as is', or collecting data that is never acted on. Then there is time spent on 'unproductive work', eg effort expended but no change or improvement achieved, fixing the same problems repeatedly and creating 'work arounds' for things that don't work. Table 1 illustrates how the PDSA approach can help maximise the time and resource available for change by learning through small scale, iterative tests of change.

Make failure your friend

Once clinically qualified, the prospect of learning from failure is uncomfortable and may, understandably, be actively resisted.[5] It's a particular challenge for the clinician whose training drives for excellence at every stage to underpin their offer of confidence in practice in the face of uncertain outcomes.

Conducted well, PDSA anticipates and even invites the possibility of failure to improve care, secure in the knowledge that the test is small and mitigation is included in the 'plan' to fail safely. This has parallels with clinical experience in simulation. Indeed, initial PDSA cycles are often conducted in a simulated environment or by testing on a very small scale (eg one nurse, one doctor, one room, 1 hour). In this way, PDSA offers a mechanism to fail, learn and improve in the safest and quickest way, with the least disruption to people and services. The reward for such patience could be not halting a major organisation-wide initiative because of an unanticipated negative consequence (Table 1).

Invest and collaborate to maximise learning

The use of a robust and structured change method like PDSA can help teams to maximise learning. Use of the method encourages investment in the planning phase to ensure the problem is understood before the first change in care delivery is made.[6] For example, when used as part of the Model for Improvement, the answers to the three questions of the model set the focus for PDSA cycles. PDSA can also help overcome 'planning paralysis' by encouraging people to test ideas in practice. It can help prompt reflection to counter the pervasive cultural compulsion to 'just get on with it',[7] which presses teams to move too quickly from 'plan' to 'do', or to bypass the 'study' phase altogether, moving directly from 'do' to 'act'.[3]

Conclusions

As more clinicians adopt and acquire mastery of the PDSA method, we expect to see greater impact from its use, greater insight and learning about the problems being uncovered, and less effort expended on things that do not work. However, PDSA is not a magic bullet. Increasingly complex problems require increasingly sophisticated application of the PDSA cycles.[4,8]

It is important for clinicians to build their own foundations in QI science and practice in order to achieve the mastery that they will need in the future hospital. Building capacity and capability to apply PDSA to the big problems facing healthcare services takes time and requires help from people who have already achieved some mastery of the approach. As confidence and competence increases, the more complex or challenging problems will be within reach, and improvement efforts will become better aligned with strategic objectives to deliver better outcomes for patients.

Seeking colleagues with mastery to create a supportive infrastructure for others is critical to establishing future hospitals capable of QI at scale and requires investment and commitment from organisational leaders.[9,10] ■

Conflicts of interest

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Supplementary material

Additional supplementary material may be found in the online version of this article at http://futurehospital.rcpjournal.org/:

S1 – PDSA documentation template

References

1 Langley GJ, Moen R, Nolan KM *et al. The improvement guide: a practical approach to enhancing organizational performance.* San Francisco: Jossey-Bass, 2009.
2 Boaden R, Harvey G, Moxham C, Proudlove N. *Quality improvement: theory and practice in healthcare.* Coventry: NHS Institute for Innovation and Improvement, 2008.
3 Taylor MJ, McNicholas C, Nicolay C *et al.* Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. *BMJ Qual Saf* 2014;23:290–8.
4 Reed JE, Card AJ. The problem with Plan-Do-Study-Act cycles. *BMJ Qual Saf* 2016;25:147–52.
5 Dhaliwal G. Premature closure? Not so fast. *BMJ Qual Saf* 2016: pii: bmjqs-2016-005267. [Epub ahead of print]
6 Batalden P. Making improvement interventions happen – the work before the work: four leaders speak. *BMJ Qual Saf* 2014;23:4–7.
7 Dixon-Woods M. Why is patient safety so hard? A selective review of ethnographic studies. *J Health Serv Res Policy* 2010;15(Suppl 1):11–6.
8 Ogrinc G, Shojania KG. Building knowledge, asking questions. *BMJ Qual Saf* 2014;23:265–7.
9 Ham C, Berwick D, Dixon J. *Improving quality in the English NHS.* London: The King's Fund, 2016.
10 Reed J. Eliminate slogans and remove barriers to pride in work. *J Health Serv Res Policy* 2016;21:206–8.

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