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Quality improvement science

Understanding processes and how to improve them

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ABSTRACT

This is the second in a series of articles about the science of quality improvement. Many quality improvement initiatives are aimed at improving the process of care and ensuring that high-quality care is delivered reliably. In this article, we explain why it is important to understand healthcare processes in order to improve them and how this can be achieved. We explain the use of logic models to determine what information to collect (from surveys, interviews, direct observations and other sources) and how to analyse this information (using techniques such as process maps, critical-to-quality trees, driver diagrams and cause-and-effect diagrams) to design more reliable and higher quality healthcare processes.

Keywords: general practice, primary care, processes, quality improvement, reliability

Introduction

This is the second in a series of articles on quality improvement tools and techniques, in our primer for quality improvement[1] following on from the article in the previous issue on 'Frameworks for improvement'.[2] Many quality improvement methods in healthcare are directed at improving processes and increasing reliability in order to consistently deliver high-quality care. To some, the idea of 'process' may sound overly mechanistic; it may resemble the notion of industrial processes in manufacturing and the conveyor belt or a factory line. Linked to this is the implication that reliability and consistency means treating everyone the same, whatever their needs. These are basic misconceptions: a misunderstanding of what is meant by 'process' and by 'reliability'.

If we look more deeply into these ideas we see that the underlying principles are the same whether for manufacturing or service industries, including health, an idea that Deming understood and explained over half a century ago.[3] As we examine the idea of processes and reliability, we will draw on work from the intellectual giants of the quality improvement movement including W Edwards Deming, Joseph Juran and more recently Davis Balestracci.

There are some basic assumptions here which need to be clarified: quality healthcare is that which is effective, safe and improves patient experience.[4] All work is a process and processes can be defined as a series of activities or inputs that lead to outputs: inputs include people, work methods, equipment, materials, environment and measurements. Understanding and improving processes can reduce inappropriate and unintended variation. We should examine these ideas in turn.

Processes

Everything we do involves a process.[5] Healthcare processes are the steps that are taken or involve, either explicitly or implicitly, whether sequentially or in parallel, by people or machines, carrying out activities which are designed to improve or maintain health. For example, the process of a referral to hospital can

involve the decision to refer (a cognitive process), following discussion with a patient of their needs or wants, a communication (e.g. letter) transferred to the hospital, an electronic appointment, letter (or call) to the patient to let them know a date or time, etc.

This example is relatively straightforward, compared with many health processes which are often more complex. They may involve many more steps, actors, equipment, materials, environments and interactions between these. The timing of the appointment (one possible output measure) can vary depending on how this is measured, as well as other inputs such as the content of the referral letter, the material used (paper vs. electronic), how it is sent (post vs. electronic) and all of this can affect patient experience of the referral. A delayed or lost referral can lead to a poor patient experience, waste (the patient calling the surgery to find out when the referral will be), rework (resending the referral), additional costs and poor outcomes including premature death, in the case of a patient with cancer who has a referral delayed.

A better understanding of processes can make them more reliable and reduce inappropriate or unintended variation. In relation to health, this can improve effectiveness, safety and people's experience of the healthcare they are receiving. Quality healthcare therefore meets patients' needs by improving their health, increasing levels of satisfaction and reducing any errors.[6] To understand how to improve care, we need to understand how to improve the processes involved, to understand how to reduce impropriate or unintended variation in these processes, and to understand how to make processes more consistent and reliable where this is required to improve outcomes of care. An important rider to applying these concepts in health systems is that some variation is inherent in the different presentations of disease, differences between patients and disparities of choice between individuals.[7]

A number of conceptual and practical tools are available for understanding and improving processes and we will examine some of these. The range of tools considered in this article is not comprehensive but includes those we consider the most important and practically useful (Box 1).

Box 1 Activities for understanding and improving processes

Problem, population and priorities
1. Interviews (discovery, narrative), focus groups.
2. Patient or practitioner surveys.
3. Direct observation.

Inputs
4. Process maps.
5. Cause and effect ('fishbone') diagram.
5. Driver diagrams.
7. Critical to quality (CTQ) trees.

Outputs
8. Process or outcome indicators/measures.

Analytical tools

A useful starting point for understanding and improving processes is the logic model. The logic model (Figure 1) defines what exactly we are trying to improve (the aims or priorities for improvement), describes who we are trying to improve it for (the population for which improvement is intended) and explains why we are trying to improve a particularly area of healthcare (the problem identified as in need of improvement). The model next describes the inputs which include people, work methods, equipment, materials, environment and measurements. It also describes how we will go about improving care in terms of who we will involve (the participants), what they will do to bring about improvement (the activities) and what we wish to achieve in terms of processes (the outputs) which are intended, or have been shown,

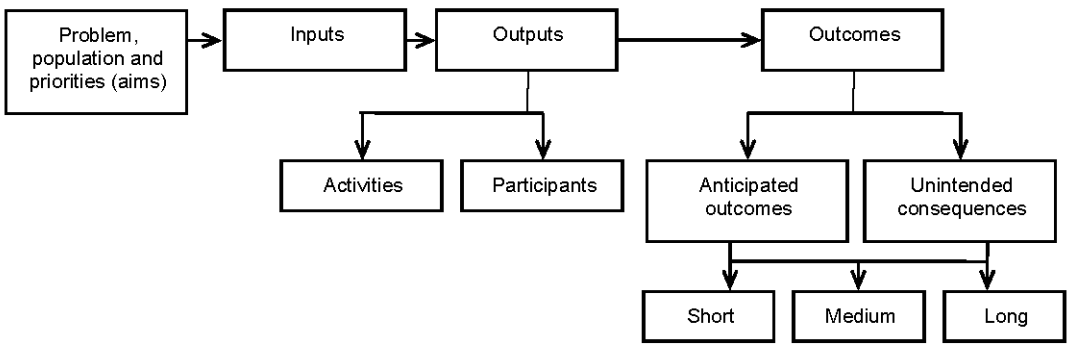

Figure 1 The logic model for analysing and improving processes

to lead to longer term benefits. Benefits are described in terms of health or wider gains as well as possible harms (the outcomes), whether intended or incidental and in the short, medium or longer term.[8]

Various activities can help us understand the elements involved which can then be used to improve them (Box 1). For example, the problem, population of interest and priorities for improvement can be elucidated using interviews or surveys of patients and staff or direct observation.

Patients' views of what is important to them, how to meet their needs for better health, improve their experience and reduce harms can be discerned by asking them directly about these issues using interviews or focus groups, using surveys or direct observation of patients in their interactions with the health system (direct observation, written diaries or audio/video diaries).

Often, it can be helpful to ask practitioners the same question, i.e. what constitutes good care and how can care be improved? Sometimes patients and practitioners agree but at other times their views may be discrepant. For example, patients and practitioners views on how to improve care of insomnia[9] or acute pain,[10] although broadly concordant, differ in some significant areas.

A process map is a tool to show pictorially the series of steps in a process of care. This can be constructed very simply by writing down the steps of a process on stick-it notes and connecting these on a (large) piece of paper using arrows. Often this exercise reveals a great many steps and complex interconnections between them, some of which are redundant or unhelpful. Process maps are sometimes called 'spaghetti diagrams' to convey intricate linkages between many steps. These processes can be confusing, conflicting, complex, chaotic and costly – what Balestracci refers to as the 'five Cs.'[5]

The process map can help us to identify which steps in a process are critical to quality. This enables unhelpful, wasteful or harmful steps to be removed. These measurable characteristics of a process, where standards need to be achieved to meet the quality requirements of the user, can be summarised using a critical-to-quality (CTQ) tree.

The inputs can be expanded, either as a whole or in specific areas to form a 'cause-and-effect' (sometimes called a fishbone or Ishikawa) diagram (Figure 2). The diagram helps elucidate the causes of a problem and is an aid to finding solutions. The central line represents the patient pathway leading to the outcome of interest and this is affected by various inputs, including patients themselves.[8] The inputs include: people, both patients and healthcare providers; work methods and organisational processes; equipment such as machines and materials; and the environment which incorporates features such as policies, guidelines, protocols and organisational culture. Each in turn is influenced by various factors (represented by the subsidiary arrows).

The processes can also be summarised using a driver diagram. Driver diagrams enable a high-level improvement goal to be translated into a logical set of underpinning goals ('primary drivers') and specific actions ('secondary drivers') which can also be converted to measures. There are three stages to improving reliability[11] as represented in a driver diagram in Figure 3.

The first stage involves preventing failure which can be achieved through standardisation of processes

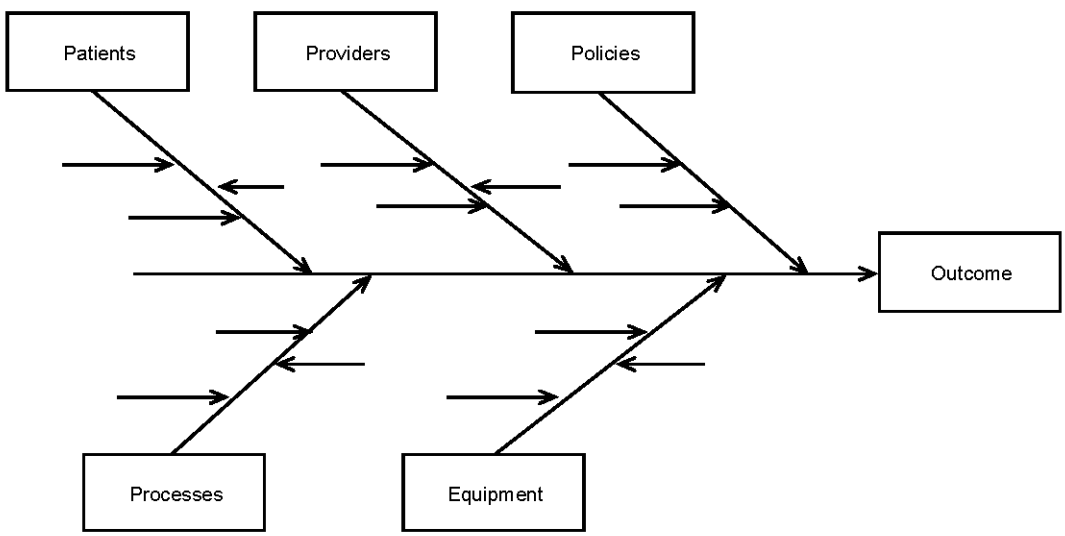

Figure 2 Cause and effect 'fishbone' diagram

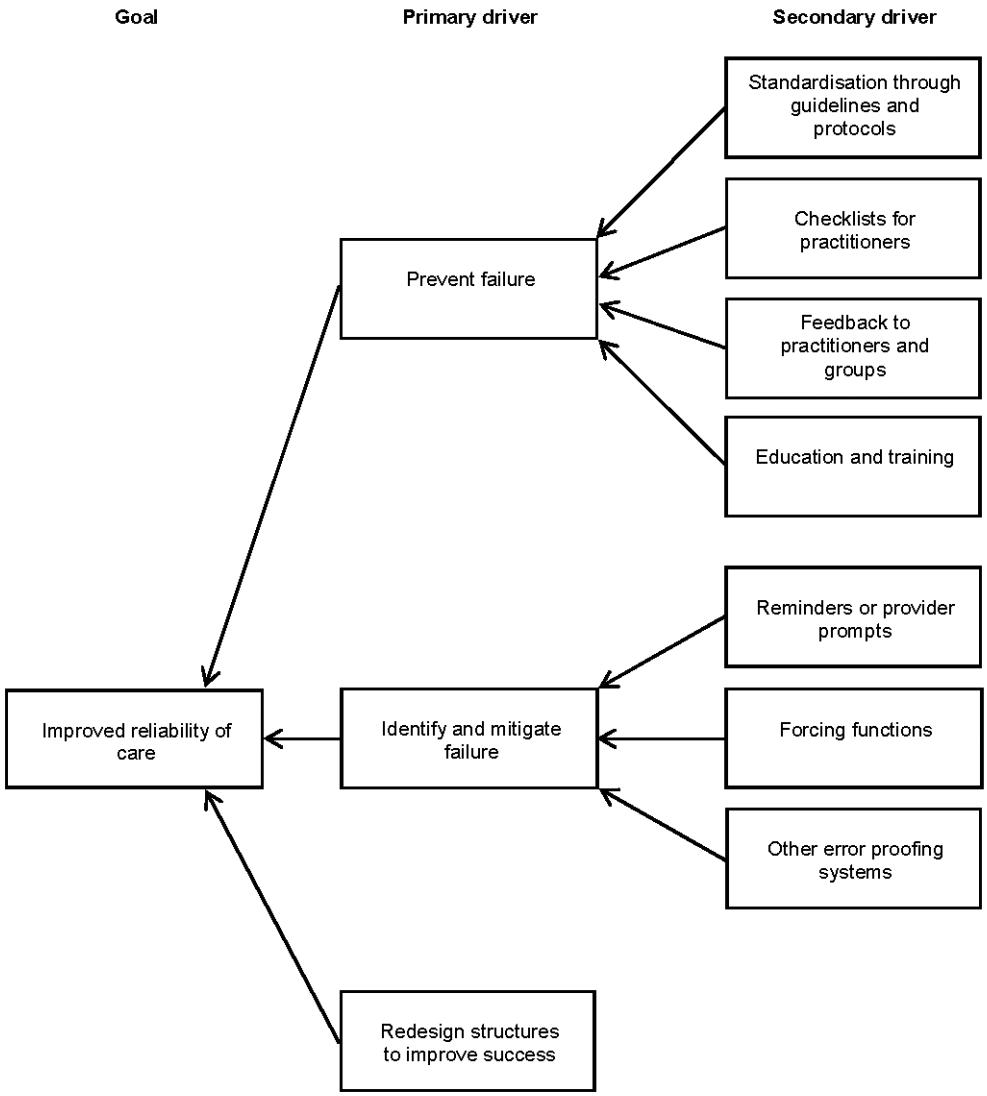

Figure 3 A driver diagram to improve reliability of care

using guidelines and protocols checklists for practitioners, feedback to individual staff or groups, and education and training for staff. The next stage involves provider prompts and 'forcing functions' which prevent failure by ensuring that a (critical-to-quality) process is completed before another can be undertaken. The final phase involves further redesign of the system to ensure that the process is as 'lean' as possible, minimising wasteful steps, reducing rework, reducing the chances of failure and maximising the efficient delivery of the process (Figure 3).

An example of this approach is shown for improving influenza vaccination rates in at-risk groups in primary care using a logic model (Figure 4) and case study (Box 2).

In the next article in the series we will go on to look at the important issue of measurement and the use of statistical process control in determining to what extent, if any, improvement has occurred as a consequence of change in processes.

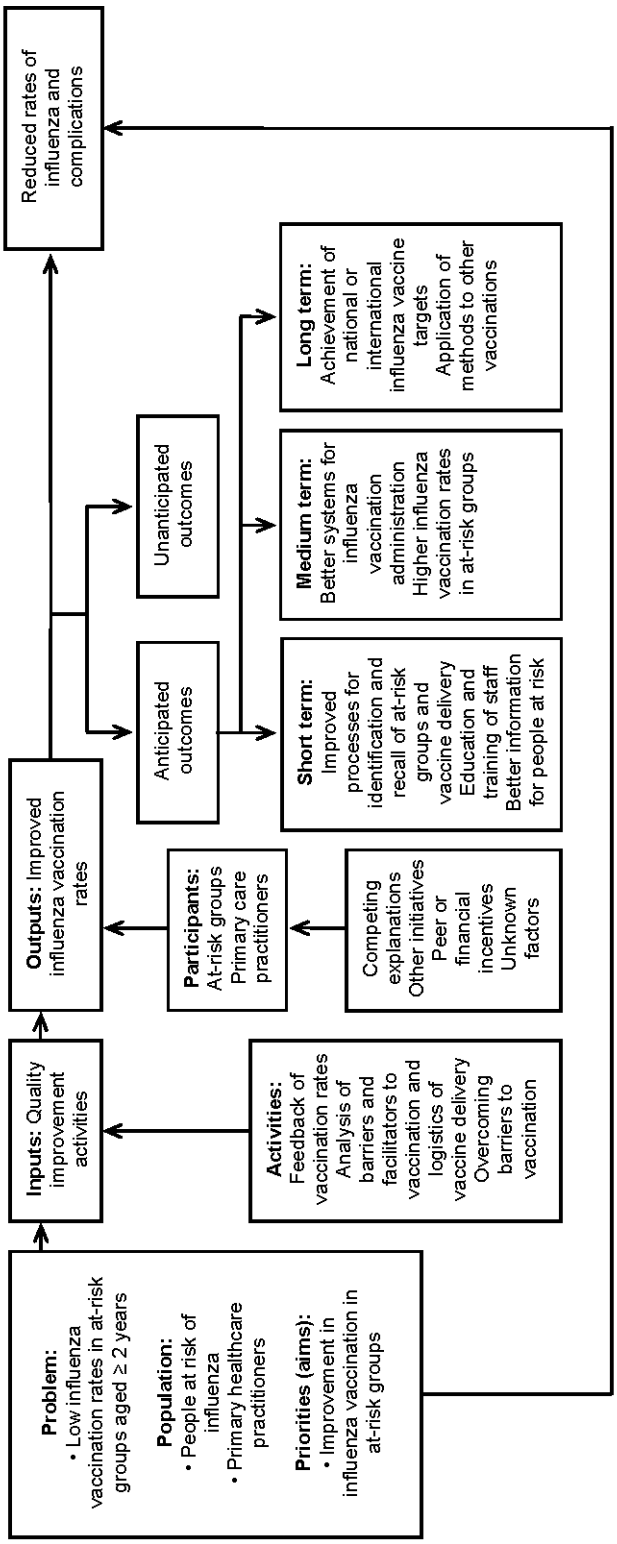

Figure 4 Improving influenza vaccination rates: logic model

Box 2 Case study: improving influenza vaccination

Background: problem, population and priorities

Influenza (flu) is a common, potentially severe, but preventable infection that places a high burden on patients and healthcare providers. A safe, effective vaccine is offered annually by general practices to at-risk groups in the UK. People in high-risk groups, including the elderly aged 65 years or over and those aged 2 years or over with specific conditions (heart disease, lung disease, diabetes, chronic kidney, liver or neurological disease and immunosuppression), comprise 27% of the population and have a higher chance of severe influenza infection or its complications. There are 36/100 000 population deaths per year in the UK (an additional 12 000 per year) due directly to influenza, and of these, approximately two-thirds are in a vaccination risk group, whereas only one quarter receive vaccination. Uptake of seasonal influenza vaccination in the UK's at-risk population is below the national and international target of 75%. The number of influenza vaccinations needed to prevent one death is 120. We aimed to improved influenza vaccination rates in at-risk groups in primary care.

Identifying strategies: activities

We elucidated key strategies that were associated with higher rates of influenza vaccination through reviewing the research and surveying patients and practitioners. These included patient factors such as perception of being at-risk of influenza, a belief in vaccine effectiveness and fewer concerns about vaccine side effects; provider factors such as clear guidelines, consistent advice from the primary care team, and vaccination reminders and information for those patients in high-risk groups eligible for influenza vaccination; organisational factors such as identifying a lead member of staff responsible for running the vaccination campaign, identifying a lead member of staff to identify eligible patients, using the practice computer system to identify eligible patients more accurately, sending personal invitations to all eligible patients, working with community nurses and midwives to offer/provide vaccination to housebound and pregnant women respectively, continuing vaccination until targets are achieved, and reviewing the success and actions of those involved in the flu campaign.[12]

Implementing changes: inputs

We used a combination of strategies for improving influenza vaccination rates including guidelines, practice leaflet and poster campaigns, prompts for practitioners to provide opportunistic reminders during consultations, practice strategies such as disease and vaccine registers to generate patient reminders (letters to patients and messages on repeat prescriptions advising influenza vaccination), more efficient vaccine supply and storage, better access through special clinics or home vaccination, together with benchmarking of practice performance and feedback to practices.[13,14]

Effect of changes: outputs

We implemented these strategies in two studies. In a primary care trust study where we undertook an organisational intervention involving 32 of 39 practices: there were improvements in influenza vaccination rates in patients with heart disease (19% higher) and diabetes (17%) and those over 65 year olds (24%).[13]

In a countywide study involving similar organisational interventions in 22 of 105 practices there were significant improvements in vaccine rates in patients with heart disease (11%), diabetes (9%) and patients with a splenectomy (17%).[14]

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CONFLICTS OF INTEREST

None declared.

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