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Improvement Cymru Academy Toolkit Guide

Reliability

What is a Reliability?

Reliability refers to the capability of a process or object to perform its intended function over time under specified conditions. Reliability is a concept from everyday life. When we undertake a process, we expect the process to produce the same correct results every time we follow the process. There are processes in everyday life that we expect to be reliable e.g., a washing machine cleaning clothes, a car turning on every time we put the keys in the ignition. When applied to a healthcare setting, reliability refers to the right patient receiving the right treatment, in the right place at the right time. Our processes must be reliable but also capable of achieving this outcome. The goal of a reliable process should be 95% for non-catastrophic processes (Institute of Healthcare Improvement, 2015). Catastrophic processes are ones like surgeries and emergency situations. Non-catastrophic events are defined by the IHI as events where patients will not be severely harmed within the following 3-4 hours.

Rationale

It is a well-known amongst healthcare staff and the wider public that healthcare systems – not just in the UK but around the world do not perform as well as they should and in some cases are unreliable. With a complex system like healthcare, we know that as humans we are going to make mistakes and errors are going to be made. By understanding human factors, we need to make our processes more reliable to mitigate against human error.

When to use Reliability

When you start to think about the reliability of a service/process, you and your team will need to be able to define reliability in the context of your process and have a shared and agreed definition. Once you have done this, you will need to map your process as it is done – not how you think it should be done and collect data to measure the reliability of your process and then investigate why your process is less than 95% reliable using improvement tools such as Pareto charts, Fishbone, etc… (see Understanding your system toolkit guide).

How to use Reliability

In the current literature (Institute of Healthcare Improvement, 2004), there is a staged approach to redesigning reliable services. Reliability is measured as:

$$\frac{\text{Number of actions that achieve the intended result.}}{\text{Total number of actions taken}}$$

Often, failure rate is used (which can be calculated as 1 – the reliability of a process) or as an index which is expressed as an order of magnitude. Therefore, in a 10^{-1} organisation there is one defect per ten attempts. In terms of healthcare if 90% of patients are seen within eight weeks of a referral, the reliability of that process can be described by the defect rate which is 10^{-1}. Table one shows the reliability described by the defect rate, the number of defects and the defects per million.

Table one: Reliability described as order of magnitude, the number of defects and the defects per million.

Order of magnitude	Number of Defects	Defects per million
10^{-1}	1 in 10	100,000
10^{-2}	1 in 100	10,000
10^{-3}	1 in 1000	1000
10^{-4}	1 in 10000	100
10^{-5}	1 in 100000	10
10^{-6}	1 in 1000000	1

The characteristics of systems that perform at a 10^{-1} level are different to those that perform at a 10^{-6} level. We can see this in everyday life when we look at different types of industries e.g. aviation industry and healthcare industry.

10^{-1} Organisation

Most improvement efforts start with a decision that a change is needed. For example, once we know that we have a problem, we may decide that we need to comply or follow a guideline or policy. An emphasis is placed on understanding whether staff are following the specific guideline or process. This will result in a 10^{-1} performance. Healthcare organisations perform at a 10^{-1} performance because the solution to this problem is that staff need to work harder and better. Human factors principles aim to describe the interaction between the employee, team, tools, and the environment they are in. This can include behaviours and values, communication, leadership, culture and learning styles. Human factors tell us that as humans we will always mistakes so the first step is to look at tools and techniques, we can use to prevent us from making errors.

To move from a 10^{-1} performing organisation to a 10^{-2} organisation**,** you should create and use a standardised approach to the care of patients. There are some standard tools and techniques that you can use to prevent error from occurring. These include,

- Standardisation to help prevent failure because it improves clarity (eliminate the need for guesswork or searching), promotes quality (work is done in a pre-defined and optimised way), reduces error (standardisation of equipment or procedure e.g. taking bloods across all the organisation) (See our Standardisation toolkit guide for more information).
- Memory aids such as checklists to ensure that we do not make mistakes or forget to do tasks.
- Raising awareness through training and you can also put people on specific training to learn new skills or for refresher courses. Although training is essential, to build reliable processes it needs to be used with other techniques.

10^{-2} Organisation

In healthcare, you want to be at least at a 10^{-2} level because at this level you will be more than 95% reliable. Processes are intentionally designed with concepts based on human factors (see our Human Factors toolkit guide for more information). Again, you are seeking to reduce the opportunities to make errors. This concept is referred to as error-proofing and looks to offer ways to reduce the need for a work around and eliminates ambiguities in the way tasks are performed. You can error-proof your systems by using reminders, differentiation, affordances, constraints, making the desired action the default, taking advantage of existing habits and scheduling key tasks.

10^{-3} Organisation

10^{-3} organisations involve using techniques to prevent and mitigate against unreliable processes but also to perform a risk analysis to identify any potential issues that could occur not only within the process but within the systems which may affect the process. You may need to look at the structure of your healthcare system as this could be affecting your process. Examples of this within healthcare are how information is transferred? Are there different processes of care at different locations within the same organisation?

To evaluate the structures of your system and predict potential safety concerns and performance, you can use Failure Modes and Effects Analysis (FMEA) tool. FMEA is a standardised approach for conducting a proactive analysis of a system or process in a systemic way. For more information on how to conduct FMEA see our Failure Modes and Effects Analysis toolkit guide.

What next?

Look at the processes you work with or when you are designing a new service and identify which need improvement. Perform a stakeholder analysis to identify members involved in the process to work together to map out the process. Start with a high-level process map and build on this to create a more detailed map. You should write down steps as they are performed – not how they should be performed. You could also use (FMEA) to identify risks within your process which can lead to unreliable process and find ways to mitigate against them.

Helpful tips

Start with a small process that you and your team want to increase the reliability for. Make sure all the team who are involved in the process have input and use a variety of improvement tools such as Process Mapping, Fishbone, Pareto Charts etc… to get to the root cause of the problem. When building or redesigning remember to incorporate techniques to mitigate against human factors. Use FMEA to identify risks in your process.

Additional Resources

If you are interested in learning more about how improvement practices can benefit your workplace, we offer a range of training courses. Visit our website for more information.https://phw.nhs.wales/services-and-teams/improvement-cymru/improvement-cymru-academy/ or email us improvementcymruacademy@wales.nhs.uk to find about the improvement courses we offer.

Further reading

Institute of Healthcare Improvement (2015). Reliability Series part 1: What is Reliability? Accessed from: https://www.youtube.com/watch?v=tkNGmbE6dCE (Accessed 07 Sep 2023)

Institute of Healthcare Improvement (2015). Reliability Series part 2: How can you make your processes reliable? Accessed from: https://www.youtube.com/watch?v=tSUGfr2RWIA&t=9s (Accessed 07 Sep 2023)

Institute of Healthcare Improvement (2015). Reliability Series part 3: What is the goal of reliable design? Accessed from: https://www.youtube.com/watch?v=axFriWu7GOA (Accessed 07 Sep 2023)

Institute of Healthcare Improvement (2015). Reliability Series part 4: Why develop a back-up plan for a reliable process? Accessed from: https://www.youtube.com/watch?v=kXGEVK4X0D0 (Accessed 07 Sep 2023)

Institute of Healthcare Improvement (2015). Reliability Series part 5: How can data drive reliability? Accessed from: https://www.youtube.com/watch?v=4CbcMXyNktU (Accessed 07 Sep 2023)

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