Reliable design

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NHS England and NHS Improvement
Reliable design

What is it?

Patients receiving the right care, in the right place, at the right time is one way of describing reliability in healthcare service delivery.

Reliable design will help to ensure that staff are getting things right first time. This can reduce delays for patients, save staff and equipment time, improve the safety and quality of care and free up resources.

Another approach is to focus on the reliability of a clinical pathway. This focus helps promote the mindset of providing a ‘guarantee’ for patients. A reliable pathway means that resources are not spent tracking and pushing patients through the pathway just to meet specific national targets.

The Institute for Healthcare Improvement offers a definition for reliability as ‘failure-free operation over time’ and highlights how this connects with aims around effectiveness – where failure can result from not applying evidence, timeliness – where failure results from not taking action in the required time - and patient-centredness – where failure results from not complying with patients’ values and preferences. (Nolan et al, 2004).

A useful technical definition of reliability is provided in the Handbook of Reliability Engineering. It defines reliability as ‘...the measurable capability of something to perform its intended function in the required time under specified conditions.’

When to use it

If you feel there is ambiguity in the definition of reliable service, you need to take steps so that staff have a common understanding and definition. Only when you have reached a consensus on this issue are you in a position to determine if there is an acceptable level of reliability in the service.

How to use it

This tool describes a staged approach to developing more reliable services. There is a strong emphasis on providing reliable clinical care, but you can apply the principles to any aspect of service.

There are three stages to improving the reliability of a service:

- **Stage 1** – have a common agreement across a team (this could be single/core elements of the service or centred around patient outcomes).
- **Stage 2** – measure how often common agreement happens.
- **Stage 3** – make improvements (your approach will depend on how often everything is right).
Stage 1

Work towards a common agreement on what the right care in the right place at the right time actually means in practice. Include the core elements of care that the majority of patients receive and key components that ensure patient safety is included in your discussions. Focus on something measurable and agree ‘good enough’ definitions to enable you to get started.

As well as clinical care, it is possible to look at the reliability of administrative and other support processes.

The following improvement strategies will help:

- Protocol-based care – protocols are about developing common agreements.
- Developing care bundles – to pick up on the core elements of care that are evidence-based and measureable; A bundle is a structured way of improving the processes of care and patient outcomes: a small, straightforward set of evidence-based practices — generally three to five — that, when performed collectively and reliably, have been proven to improve patient outcomes.
- Using process mapping to uncover differences in clinical practice.

Protocol-based care enables NHS staff to put evidence into practice by addressing the key questions of what should be done, when, where and by whom at a local level. It provides a framework for working in multi-disciplinary teams. This standardisation of practice reduces variation in the treatment of patients and improves the quality of care.

Local protocols are the descriptions of the steps taken to care for and treat a patient. They are sometimes called the ‘integrated care pathway’ and are designed to:

- Implement national standards such as national services frameworks and guidelines and appraisals produced by the National Institute for Clinical Excellence (NICE)
- Determine care provision by using the best available evidence if national standards are not available.

Developed by multi-disciplinary teams, local protocols reflect local services and staffing arrangements. They identify who carries out key parts of the care or treatment and where they should be delivered.
Stage 2

The next stage is measuring how often the right care happens. An approach to reliability tends to focus on how often the wrong thing happens as a rate or percentage. The Institute for Healthcare Improvement in America, which initially developed this approach for use within healthcare, developed some specific notation to describe reliability:

- Reliability = the number of actions that lead to the intended results ÷ total number of actions.

Another way of expressing reliability is the failure rate which is calculated as 1 – reliability (which gives the notation shown below of $10^1, 10^2$, etc). The equation for how reliability is calculated shows that as the number of actions within a system increase, the reliability for the system will decrease, i.e., if there is a simple process that involves only three actions and these are all performed as intended 95% of the time, the reliability of the system as a whole is $0.95 \times 0.95 \times 0.95$ which equates to 86%.

There are four levels of reliability:

Level 1: basic level of reliability (also known as $10^1$)
- 80 to 90% success – or one or two failures out of 10 based on the common definition of success or failure.

Level 2: standard level of reliability (also known as $10^2$)
- More than 95% success – or five failures or fewer out of 100 opportunities.

Level 3: high level reliability (also known as $10^3$)
- Five failures or fewer out of 1,000 opportunities.

Level 4: highly reliable (also known as $10^4$)
- Five failures or fewer out of 10,000 opportunities.

Stage 3

Make improvements based on how often care is right. If you have identified which elements of care are ideal and which can be measured by their reliability, you now need to compare the reliability of what you have measured to the different levels.

Move from level 1 to level 2 to achieve 90–95% success (or fewer than five failures in 100 opportunities).

This is achieved through intent, vigilance and hard work as well as beginning to standardise some elements of practice as an agreed way of doing things. Interventions include:

- common equipment
- standard order sheets – the doctor only needs to tick a box to confirm standard pain relief prescription
- personal checklists
- feedback of information to staff on the rates of success – daily and weekly
• awareness and training (about the agreed way of doing things around here and using the above interventions).

**Move from level 2 to level 3 to achieve fewer than five failures in 1,000 opportunities**

This requires a more deliberate focus on systems and processes to improve reliability:

• Decision aids and reminders built into the system.
• Desired action is the default.
• Having an independent backup: for example, the patient knows what to expect and when, meaning they can act as a reminder of what should happen on day one after their operation.
• Scheduling and planning.
• Taking advantage of people's habits and patterns.
• Standardisation of processes.
• Care bundles for a few things that have very strong evidence. Measure if patients receive them as an all or nothing.

This focus changes the mindset of teams. For example, the critical care community has found that it increases the vigilance of teams so that everyone questions patients who are an exception, or automatically rectifies obvious omissions. The key is to have no more than around six things for a team to really focus on.

**Move from level 3 to level 4 to achieve fewer than five failures in 10,000 opportunities**

Only focus on this stage of reliability improvement if a system or process has achieved this level of reliability.

There is a three level design: prevent, identify and mitigate.

**Prevent** – is about designing the system to prevent failure. You should aim to have steps in a process that act independently of each other, so failures can be picked up.

**Identify** – is about designing procedures and relationships to make failures visible when they do occur so that they may be intercepted before causing harm.

**Mitigate** – is about designing procedures and building capabilities for fixing failures when they are identified or mitigating the harm caused by failures when they are not detected and intercepted.

**Examples**

1. In a critical care setting, significant evidence exists that shows the following elements of care can improve outcomes for patients on a ventilator:
   
   (a) Prophylaxis against peptic ulceration
   (b) Prophylaxis against deep vein thrombosis
   (c) Daily cessation of sedation
   (d) Elevation of the patient’s head and chest to at least 30 degrees from the horizontal level.
These elements form a ventilator ‘care bundle’. There is overwhelming clinical agreement with the four elements (with individual differences in preferences for how the element may be achieved, eg different drugs preferred for PU prophylaxis), and critical care staff believe that they are taking place within their units. However when adherence to the care bundle is measured to see what actually happens, the reliability is very low, often around 30%. While the adherence to individual elements of the care bundle can be higher than this figure, the number of patients who received all components was within the 30% range.

2. In Torbay Hospital, staff gave patients their own care plans after colon surgery. This meant that patients knew what they needed to do and what to expect for their five day post-surgery recovery. Not only did this act as a reminder for patients about what they needed to do (for example mobilisation – how far they should aim to walk, etc.) but one member of staff commented, ‘sometimes patients remind us – isn’t my catheter supposed to come out today?’ Patients therefore acted as an additional reminder to make sure they were following the agreed care pathway.

3. A study in the United States identified by the Institute for Healthcare Improvement suggested that for 6,712 patients, the success rate in terms of patients receiving scientifically indicated or evidence-based care was in the region of 55%. They concluded that almost all studies that investigate the rate of failure to apply the appropriate clinical evidence in healthcare find the success rate is less than 90%. This suggests that focusing on ensuring a basic level of reliability in all areas of healthcare and higher levels of reliability where there is a greater potential for harm to patients, should significantly improve patient outcomes.

4. NWLH Trust has developed care bundles as part of the saving lives campaign. The Trust looked at the top conditions and implemented care bundles using level 1&2 research evidence. Care bundles are a set of qualitative indicators, for a specific treatment, condition or procedure. They fit well with patient safety, quality and clinical governance frameworks. 10 care bundles have been implemented including thrombo-embolism, MRSA, C Difficile, sepsis, stroke, COPD, heart failure, CVC, ventilator acquired pneumonia and surgical site infection.

**What next?**

To further improve the reliability of systems you may want to consider:

- protocol-based care
- uncovering differences in clinical practice using **process mapping** techniques
- discussing what elements of care the team believe all patients should receive and how to know when that happens
- what people say and what people do can be quite different, so make sure you really do listen. See **active listening**.
**Background**

The Institute for Healthcare Improvement developed this approach based on research and practice mainly in US hospitals. The approach is based on engineering science.

**References**


**Additional resources**

The website of the Clinical Human Factors Group is a useful resource that you may wish to visit. (Available at [www.chfg.org](http://www.chfg.org))