

*Thought paper May 2012*

---

**Erik Hollnagel**

# Proactive approaches to safety management

---

In this thought paper, Professor Erik Hollnagel explores the importance of proactive approaches to safety management. He argues that safety management must look ahead and not only try to avoid things going wrong, but also try to ensure that they go right.

At the Health Foundation, we are working to identify, test and demonstrate ways to manage risk in systems of care, and reduce the number of failures. We are conducting research and running improvement programmes in order to provide vital evidence and learning that can be shared across the health service.

Health Foundation thought papers are the author's own views. We would like to thank Professor Hollnagel for his work, which we hope will stimulate ideas, reflection and discussion.

## About the author

### **Professor Erik Hollnagel**

Erik Hollnagel is Professor at the University of Southern Denmark, Industrial Safety Chair at MINES ParisTech, France, and Professor Emeritus at the University of Linköping, Sweden. He has worked at universities and research centres, in industries in several countries, and with problems from many domains, including nuclear power generation, aerospace and aviation, software engineering, land-based traffic, and healthcare. His professional interests include industrial safety, resilience engineering, patient safety, accident investigation, and understanding large-scale socio-technical systems.

## Summary

The delivery of appropriate healthcare in today's world depends on the safe and efficient functioning of multiple systems, functions, and specialised services. Because these are often tightly coupled, it is not possible to manage them independently and rely on the ability to respond whenever something goes wrong.

Safety management that follows, rather than leads, developments runs a significant risk of lagging behind and becoming reduced to uncoordinated fire-fighting. In order to prevent this, safety management must look ahead and not only try to avoid things going wrong, but also try to ensure that they go right. Proactive safety management must focus on how everyday performance usually succeeds rather than on why it occasionally fails, and actively try to improve the former rather than simply preventing the latter.

## Safety management as process control

The purpose of safety management is to make sure that a system functions in a way that is safe. This is usually taken to mean that the number of adverse outcomes is reduced, or that safety culture improves by moving from, say, a calculative to a proactive level.<sup>1</sup> In these cases, management concerns the direction in which a development takes place, but it could equally be about the speed or rate of change. For instance, how fast – or by how much – do we want to improve safety?

From a control theory point of view, managing safety is just like managing anything else and can therefore be done in two fundamentally different ways. The first is to manage by keeping an eye on what happens and to make the necessary adjustments if it turns out that either the direction or the speed of developments are different from what they should be. This is called ‘reactive’ or ‘feedback’ control, because it is based on information that is fed back to the process. The second is to manage by adjustments based on the prediction that something is going to happen, but before it actually happens. This is called ‘proactive’ or ‘feedforward’ control.<sup>2</sup>

## Reactive safety management

In reactive safety management, adjustments are made when unacceptable outcomes have occurred. In order for reactive safety management to be feasible, one condition is that responses can be implemented faster than the process changes. Another way of saying this is that the mean time between

two events that require a response must be appreciably longer than the time it takes to complete a response. The reason is easy to understand: if an event requiring a response occurs before the previous response has been completed, the two responses will interfere and make the situation more complicated to manage. If this condition prevails, then the responses will sooner or later lag behind the process, which effectively means that control has been lost.<sup>3</sup>

Practical examples of this are easy to find. If, for instance, the rate by which patients are admitted is higher than the rate by which they are discharged, the ability to treat them will soon be exhausted. This can easily happen in an emergency room (ER), or during an epidemic. Doctors in Hong Kong, for instance, had to use powerful antibiotics during the severe acute respiratory syndrome (SARS) outbreak of 2003 in order to shorten hospital stays and prevent the health system from becoming overburdened.<sup>4</sup> On a more mundane level, most hospitals are struggling to keep ahead of a maelstrom of incident reports that are mandated by law. Even when only the most serious reports are analysed, there may still be insufficient time to understand and respond to what happens.

A second condition for reactive safety management to be feasible is that the process being managed is so familiar and regular that it is possible to prepare responses ahead of time. The worst situation is clearly when something completely unknown happens, since valuable time and resources must then be spent to find out what it is and what to do. For reactive safety management, it is

necessary that events can be recognised quickly so that the organisation can initiate a prepared response with minimal delay. The downside of this is that hasty and careless recognition may lead to inappropriate and ineffective responses.

Practical examples of this condition are similarly easy to find. A local hospital may, for instance, have an emergency ward that can receive and treat minor injuries, bruises and bites, but not major injuries, poisoning, burns, heart attacks, etc. It is prepared for a limited set of events only, and would presumably not be able to respond effectively to other events. Similarly, if a patient who has been admitted for orthopaedic surgery suddenly gets a myocardial infarction or sepsis, they must be transferred to the intensive care unit (ICU) for treatment.

Companies and organisations are, in general, prepared to react to some events or contingencies, but not to others. A recent spectacular case was the Eyjafjallajökull volcanic eruption in 2010, where the coarse and unprepared response was to close the airspace over northern Europe – at least for a while. In the aftermath of such events, organisations usually solemnly promise to mend their ways, but rarely take it as an opportunity to look ahead.

A good example of reactive safety management is provided by the Global Trigger Tool (GTT), which the Institute for Healthcare Improvement (IHI) describes thus:

---

*Hospitals need a more effective way to identify events that do cause harm to patients, in order to select and test*

*changes to reduce harm... The use of 'triggers', or clues, to identify adverse events (AEs) is an effective method for measuring the overall level of harm in a healthcare organization. The IHI Global Trigger Tool for Measuring AEs provides instructions for training reviewers in this methodology and conducting a retrospective review of patient records using triggers to identify possible AEs.<sup>5</sup>*

---

The purpose of the GTT is to improve safety by strengthening the ability to react, based on analysing prior adverse events. The learning thus focuses on what has gone wrong (or could have gone wrong) and the 'triggers' or clues are used to identify adverse events during a manual review of the records. The GTT does not, in itself, provide guidance on how to deal with the adverse events that it has helped to identify, but it is useful to demonstrate whether the chosen types of intervention have had the desired effects.

### **Proactive safety management**

In proactive safety management, adjustments are made before something happens rather than after. While this has obvious advantages, it also presents some problems. The main advantage is that responses can be given in time, or perhaps even ahead of time, so that it is possible to prevent something from happening. Another is that early responses, on the whole, require less effort because the consequences of the event will have had less time to develop and spread. And early responses obviously save valuable time.

Proactive safety management may also enable the organisation to prepare a response before it is actually needed, and possibly change from a state of normal operations to a state of high alert. This can be done if the organisation is able to monitor the situation – ie, to define valid leading indicators and to keep an eye on them. This in turn requires both the ability to learn the right lessons from past experiences – not just from past failures – and the ability to anticipate what may happen beyond the short term.

A good example of proactive safety management is provided by the precautions following the World Health Organization's (WHO)'s warning in 2009 of a possible H1N1 flu pandemic. After the warning was issued, European and other governments began to stockpile considerable amounts of drugs and vaccines to ensure that the necessary resources were in place. Although it later turned out to have been a false alarm, it illustrates the essential features of proactive safety management: anticipate, prepare, respond, and monitor. Anticipate that something may happen, be prepared to respond when the situation requires so, and monitor developments to know whether and when it happens. Proactive safety management is also practised on a smaller scale in the way a hospital or an emergency ward gets beds and medical supplies ready for upcoming challenges – for instance, a public holiday, a major political demonstration, severe weather, an epidemic, etc.<sup>6</sup>

For proactive safety management to work, it is necessary to foresee what could

happen with acceptable certainty and to have the appropriate means (people and resources) to do something about it. That in turn requires an understanding of how the system works, how its environment develops and changes, and how functions may depend on and affect each other. This understanding is developed by looking for patterns and relations across events rather than for causes of individual events. To see and find those patterns, it is necessary to take time to understand what happens rather than spend all resources on reactive fire-fighting.

The main problem with proactive safety management is that the future is uncertain and that an expected situation may, therefore, never happen. In that case, preparations will have been made in vain, hence wasted. Another, and possibly worse, problem is that predictions may be imprecise, so that the wrong preparations are made. When a system prepares to respond, the human and material resources that are allocated to the response will not be available for other purposes. Proactive safety management thus means taking a risk, not least an economic one. On the other hand, not being ready may be even more costly in both the short and the long run.

### **Risk assessment versus resilience engineering**

The usual way of overcoming the uncertainty problem is to use some kind of risk assessment to identify the possible hazards and estimate their likelihood of occurrence. The engineering fields have

developed a number of methods for doing that, some of which have been transferred to other domains, including healthcare. The limitation of a formal risk assessment is, however, that it only works for target systems that are well described, such as technical equipment and standardised work procedures. Healthcare, however, is a complicated socio-technical system where things usually happen or change quickly, where people have to be mindful and remain sensitive to the possibility of failure, and where demands and resources are often unpredictable. As formal risk assessment methods are of little value for such work situations, the success of proactive safety management depends more on how resilient the system is, rather than whether it can be made less unpredictable.

Resilience is formally defined as the intrinsic ability of a system to adjust its functioning before, during, or after changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.<sup>7</sup> Informally, resilience denotes the ability of a system to go on working despite adverse conditions and unexpected events. To do so requires the abilities to anticipate, to monitor, to respond, and to learn – all of which are also required for proactive safety management.

In practice, it is easier to be proactive for large-scale events than for small-scale ones. For large-scale events, such as a pandemic or a recurrent challenge, the situations develop relatively slowly. They are regular rather than irregular, and there are clear indicators for when a response is needed.

The appropriate responses are furthermore known, and preparations can be made ahead of time.

The situation is dramatically different for the myriad of small-scale events that constitute everyday work situations. Here, things may develop rapidly and unexpectedly, there are few leading indicators, and resources are often stretched to the limit. There may also be fewer resources to allocate, and less time to deploy them. The pace of work leaves little opportunity to reflect on what is happening and to act strategically. On the contrary, work pressures and external demands often lead to opportunistic solutions that force the system into a reactive mode. To get out of this – to switch from a reactive to a proactive mode – requires a deliberate effort. While this may not seem to be affordable in the short term, it is unquestionably a wise investment in the long term.

## Key points

Reactive safety management focuses on things that go wrong or could go wrong, such as near misses, incidents, and accidents. This corresponds to a definition of Safety-I as situations where little or nothing goes wrong. Proactive safety management focuses on how to adjust performance so that risky situations do not occur. In order to achieve this, safety management must look ahead and not only try to avoid things going wrong, but also try to ensure that they go right. This corresponds to a definition of Safety-II as situations of everyday work where things go right. Safety-II can be achieved by facilitating the performance adjustments that are necessary for everyday work to succeed, hence by being proactive. (Further details can be found at [www.resilienthealthcare.net](http://www.resilienthealthcare.net).)

## Conclusion

Day-to-day safety management is already both proactive and reactive, but the balance is unstable. The pressure in everyday work is towards being efficient rather than thorough, which reduces the possibilities for being proactive.<sup>8</sup> Proactive safety management requires that some efforts are invested up front – to think about what could possibly happen, to prepare appropriate responses, and to allocate resources and make contingency plans.

Here are some practical suggestions for how to begin that process:

- Look at what goes right, as well as what goes wrong. Learn from what succeeds as well as from what fails. Indeed, try to learn from the situations where nothing out of the ordinary seemed to happen, by understanding what actually took place. Things do not go well because people simply follow the procedures. Things go well because people make sensible adjustments according to the demands of the situation. Find out what these adjustments are and try to learn from them!
- Look at what happens regularly and select events based on their frequency rather than their severity (magnitude of adverse effects). It is much easier to be proactive for that which is frequent (and regular) than for that which is infrequent and irregular. A small improvement of everyday performance may count more than a large improvement of exceptional performance.



- Allow time to reflect, to learn, and to communicate. If you are always busy trying to make ends meet, you will never have time to consolidate experiences or replenish resources – including your own understanding. It must be legitimate in the culture to allocate resources – especially time – to reflect, to share experiences, and to learn. Without that, how can something ever improve?
- Remain sensible to the possibility of failure. Try to make a list of undesirable situations and imagine how they may occur. Then think of ways in which you can either prevent them from happening, or recognise that they are happening and respond while they are still happening. This is the essence of proactive safety management.

---

*To share your thoughts about this paper, please visit [www.health.org.uk/HollnagelTP](http://www.health.org.uk/HollnagelTP). You can also follow the Health Foundation on Twitter at [www.twitter.com/HealthFdn](https://www.twitter.com/HealthFdn)*

---

## References

- 1 Benn J, Healey AN, Hollnagel E. Improving performance reliability in surgical systems. *Cogn Technol Work* 2008;10(4):323-3.
- 2 Weinberg GM, Weinberg D. *On the design of stable systems*. New York: Wiley; 1979.
- 3 Hollnagel E, Woods DD. *Joint cognitive systems: Foundations of cognitive systems engineering*. Boca Raton, FL: CRC Press; 2005.
- 4 Antonio GE, Griffith JF, Ahuja AT. Aftermath of SARS. In: Ahuja AR, Ooi CGC (eds), *Imaging in SARS*. Cambridge: Cambridge University Press; 2004:159-64.
- 5 Institute for Healthcare Improvement (IHI). *Global trigger tool for measuring adverse events*. Cambridge, MA: IHI; 2009.
- 6 Cook RJ. Being bumpable. In: Woods DD, Hollnagel E. *Joint cognitive systems: Patterns in cognitive systems engineering*. Boca Raton, FL: CRC Press; 2006.
- 7 Hollnagel E, Paries J, Woods DD, Wreathall J (eds). *Resilience engineering in practice: A guidebook*. Farnham: Ashgate; 2011.
- 8 Hollnagel E. *The ETTO principle. Efficiency-Thoroughness Trade-Off or why things that go right sometimes go wrong*. Farnham: Ashgate; 2011.

The Health Foundation is an independent charity working to continuously improve the quality of healthcare in the UK.

We want the UK to have a healthcare system of the highest possible quality – safe, effective, person centred, timely, efficient and equitable.

We believe that in order to achieve this, health services need to continually improve the way they work. We are here to inspire and create the space for people to make lasting improvements to health services.

Working at every level of the system, we aim to develop the technical skills, leadership, capacity and knowledge, and build the will for change, to secure lasting improvements to healthcare.

The Health Foundation  
90 Long Acre  
London WC2E 9RA  
T 020 7257 8000  
F 020 7257 8001  
E [info@health.org.uk](mailto:info@health.org.uk)

Registered charity number: 286967  
Registered company number: 1714937

For more information, visit:

**[www.health.org.uk](http://www.health.org.uk)**

Follow us on Twitter:

**[www.twitter.com/HealthFdn](https://www.twitter.com/HealthFdn)**

Sign up for our email newsletter:

**[www.health.org.uk/enewsletter](http://www.health.org.uk/enewsletter)**