Chapter 13

Individual and Collective Mindfulness

Consistency versus Variability

The reduction of unsafe acts has become one of the primary objectives for those who manage and control complex hazardous systems. Errors and violations are viewed, reasonably enough, as deviations from desired or appropriate behaviour. The managers attribute unreliability to unwanted variability. As with technical unreliability, they see the solution as one of ensuring greater consistency of human action and hence of the system performance as a whole. They do this, as we have seen in Part II, by standard operating procedures, automation, and defences-in-depth.

What these technical managers often fail to appreciate, however, is that human variability in the form of timely adjustments, tweakings and adaptations is what preserves imperfect systems in an uncertain and dynamic world. And therein resides one of the many paradoxes of safety management.[1] By striving to constrain human variability to only those behaviours that are judged *a priori* to be both safe and productive, they are also undermining the system's most important safeguards. The heroic recoveries, discussed earlier, testify to this.

A Dynamic Non-Event

The essence of this is captured by Karl Weick's insightful observation[2] that 'reliability is a dynamic non-event'. It is dynamic because processes remain within acceptable limits

1 Reason, J. (2000) 'Safety paradoxes and safety culture.' *Journal of Injury Control and Safety Promotion*, 7: 3–14.

2 Weick, K.E. (1987) 'Organizational culture as a source of high reliability.' *California Management Review*, 29: 112–127.

due to moment-to-moment adjustments and compensations by the human operators. It is a non-event because safe outcomes claim little or no attention. The paradox is rooted in the fact that accidents are salient, while 'normalcy' is not.

Weick and his colleagues[3] have challenged the received wisdom that an organisation's reliability depends upon consistency, repeatability and the invariance of its routines and activities. Unvarying performance, they argue, cannot cope with the unexpected. To account for the success of high reliability organisations (HROs) in dealing with unanticipated events, they distinguish two aspects of organisational functioning: cognition and activity.

The cognitive element relates to being alert to the possibility of unpleasant surprises and having the collective mindset necessary to detect, understand and recover them before they bring about bad consequences. Traditional 'efficient' organisations strive for stable activity patterns, yet possess variable cognitions, and these differing perceptions are most obvious before and after a serious accident. In HROs, on the other hand, 'there is variation in activity, but there is stability in the cognitive processes that make sense of this activity'.[4] This cognitive stability depends critically upon an informed culture – or what Weick and his colleagues have termed 'collective mindfulness'.

Collective Mindfulness

Collective mindfulness allows an organisation to cope with unpleasant surprises in an optimal manner. 'Optimal' does not necessarily mean 'on every occasion', but the evidence suggests that the presence of such enduring cognitive processes is a critical component of organisational resilience.

Since catastrophic failures are rare events in well-defended complex systems. Collectively mindful organisations work hard to extract the most value from what little incident and accident data they have. They actively set out to create a reporting culture by commending, even rewarding, people for reporting their

3 Weick, K.E., Sutcliffe, K.M., and Obstfeld, D. (1999) 'Organizing for high reliability: processes of collective mindfulness.' In B. Staw and R. Sutton (eds) *Research in Organizational Behaviour*, 21: 23–81.

4 Ibid.

errors and close calls. They work on the assumption that what seems to be an isolated failure or error is likely to come from the confluence of many upstream contributing factors. Instead of localising failures, they generalise them. Instead of applying local repairs, they strive for system reforms. They do not take the past as an infallible guide to the future. Aware that system failures can take a variety of yet-to-be-encountered forms, they are continually on the look out for 'sneak paths' or novel ways in which active failures and latent conditions can combine to defeat or by-pass the defences, barriers and safeguards. In short, collectively mindful organisations are preoccupied with the possibility of failure.

In talks, I often use the grey squirrel as an example of a high-reliability rodent (they abound outside my window). They are probably the smartest creatures on four legs for their size. They have few predators. Dogs and cats are despised. Human beings are largely ignored. But yet they appear to maintain high levels of chronic unease and a twitchy vigilance. They, like the local birds who alternate between pecking the ground and looking around, are a good model for mindfulness.[5]

In this chapter, I want to take the notion of collective mindfulness forward by combining it with individual mindfulness and arguing that both are necessary for maintaining a state of intelligent wariness. My examples in this chapter are drawn mainly from health care – but they are easily generalised to other domains. Let me remind you of some of the reasons why I have selected patient safety as my principal focus here:

- Much of my work over the last ten years has been in the medical area. I mentioned earlier that the patient safety problem is huge and it exists everywhere. About ten per cent of acute care patients are harmed or killed by iatrogenic factors.
- Health carers are not especially error-prone; it is just that their business is extremely error-provoking. The problem is not helped

5 I must exclude free-range chickens that just seem to peck. They are an avian exemplar of unwarranted insouciance. I'm referring to my neighbours' chickens, taken by a vixen, which we mourn on both sides of the dry-stone wall. They were excellent egg layers. Let that be a lesson to all those who claim 'it couldn't happen here'.

by a medical culture that equates error with incompetence. Medical training is based upon the assumption of trained perfectibility. After a long and arduous training, doctors expect (and are expected) to get it right; but they are fallible, just like the rest of us.

- The US Institute of Medicine and the UK's Department of Health have strongly endorsed a systems approach.[6] While this is better than an exclusive reliance on the 'human-as-hazard' model, it has its limitations. The people on the frontline, nurses and junior doctors, have little chance to change the system; but they still need something to help them. This is from where the notion of individual mindfulness arose.

This chapter will be organised around the elements of Figure 13.1. The basic structure is in the 'background'. It shows an organogram of a health-care system beginning with top management and then senior managers, line managers and the clinicians (often junior doctors and nurses) who are in direct contact with patients. The interface is drawn as a straight line, but the reality is that it is very turbulent, full of ups and downs,

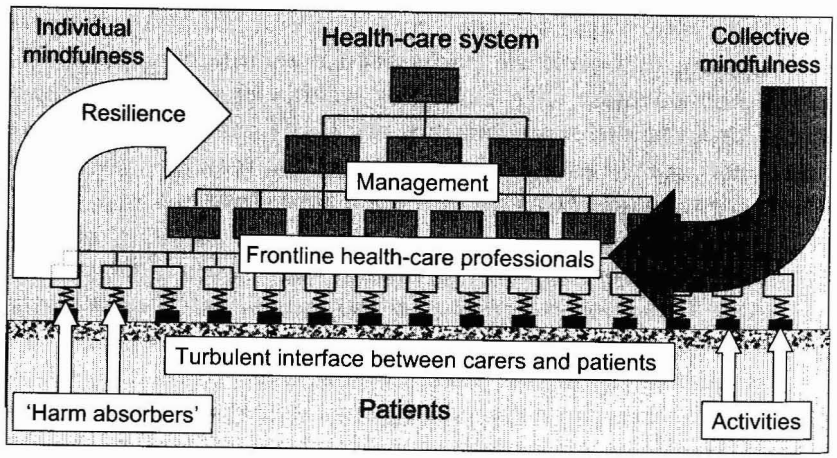

Figure 13.1 Combining individual and collective mindfulness to enhance patient safety

6 Kohn, K., Corrigan, J., and Donaldson, M. (2000) *To Err is Human*. Washington DC: National Academy Press. Donaldson, L. (2000) *An Organisation with a Memory*. London: The Stationary Office.

like a very rough road. The zig-zag lines are analogous to shock-absorbers that soak up the pounding of the bumps. In this metaphor, they are harm-absorbers – they act to minimise threats to patient safety. The rectangles touching the interface are the tasks that sharp-end health carers are required to perform. These are highly variable and frequently involve a diversity of equipment.[7] In what follows I want to focus on the upward arrow to the left of the figure: individual mindfulness leading to systemic resilience.

Individual Mindfulness

In order to explain the development of the notion of individual mindfulness, it would be helpful to begin by referring to a well-documented case study involving the fatal intrathecal injection of the cytotoxic drug vincristine. This has been discussed at length elsewhere,[8] so I will only deal with the events that demonstrate the need for individual mindfulness. It was this case, in particular, that led me to thinking about the ways in which we can enhance 'error wisdom' and risk awareness on the frontline.

An 18-year-old male patient, largely recovered from acute lymphoblastic leukaemia, mistakenly received an intrathecal injection of the cytotoxic drug vincristine. The treatment was given by a senior house officer (SHO) who was supervised by a specialist registrar (SpR). The former was unfamiliar with the usually irreversible neurological damage caused by the intrathecal administration of vincristine, and the latter had only been in post for three days.

It was a requirement that the spinal administration of drugs by SHOs should be supervised by a SpR. This supervisory task fell outside the scope of the SpR's duties at that time, but no one else seemed to be available and he wanted to be helpful. The error was discovered very soon after the treatment and remedial efforts were begun almost immediately, but the patient died just over three weeks later.

7 This diversity often exists within equipment items having a common function, as in the case of infusion pumps. There may be as many as 40 different types of infusion devices, having quite different calibrations.

8 Toft, B. (2001) *External Inquiry into the Adverse Incident that Occurred at Queen's Medical Centre, Nottingham, 4th January 2001*. London: Department of Health.

The hospital in question had a wide variety of controls, barriers and safeguards in place to prevent the intrathecal injection of vincristine. But these multiple defences failed in many ways and at many levels. The main 'upstream' defensive breakdowns and absences are listed below – they are also discussed at length elsewhere:[9]

- Administrative and procedural safeguards failed.
- Many indicators, warnings and physical barriers failed.
- There were failures in supervision and instruction of the junior doctors.
- Communication failures and workarounds created defensive gaps.
- There were also collective knowledge failures and false assumptions.

At 17.00 hours, 20 minutes before the drugs were administered, the large majority of the ingredients for the subsequent tragedy were in place. The many gaps and absences in the system's defences had been unwittingly created and were lining up to permit the disaster-in-waiting to occur. Two inadequately prepared junior doctors, each with inflated assumptions about the other's knowledge and experience, were preparing to give the patient his chemotherapy.

It was a Thursday afternoon, normally a quiet time on the ward. The locum consultant was working in his office; the staff grade doctor whom the SpR was supposed to shadow was a part-timer and not on duty that day. The ward sister had gone home. There were no other SpRs available that afternoon. There was no senior medical presence in the vicinity to thwart a sequence of events that was now very close to disaster. To compound the situation further, the patient and his grandmother had arrived unannounced and unscheduled for that particular time. The last 'holes' were about to move into alignment.

The last line of defence was the junior doctors on the spot. The SHO had wanted to administer the drugs in order to gain experience in giving spinal injections. The SpR handed him the

9 Reason, J. (2004) 'Beyond the organisational accident: the need for "error wisdom" on the frontline.' *Quality and Safety in Health Care*, 13: ii28–ii33.

syringes. In doing this, he read out the patient's name, the drug and the dose from the syringe label. He did not read out the route of administration. There were also other omissions and errors:

- He failed to check the treatment regimen and the prescription chart with sufficient attention to detect that vincristine was one of the drugs in the packet, and that it should be delivered intravenously on the following day.
- He failed to detect the warning on the syringe.
- He failed to apprehend the significance of the SHO's query – 'vincristine intrathecally?' – on being handed the second syringe.

These errors had grievous consequences. But the SpR's actions were entirely consistent with his interpretation of a situation that had been thrust upon him, and which he had unwisely accepted, and for which he was professionally unprepared. His understanding that he was required to supervise the intrathecal administration of chemotherapy was shaped by the many shortcomings in the system's defences. He might also have reasonably assumed that all of these many and varied safeguards could not have all failed in such a way that he would be handed a package containing both intravenous and intrathecal drugs. Given these false assumptions, it would have seemed superfluous to supply information about the route of administration. It would be like handing someone a full plate of soup and saying 'use a spoon'.

It was clear to see what had lured the SpR into this dreadful situation. But what would have set the alarm bells ringing in his head? There were many indicators: his inexperience, the absence of local supervision, the fact that he was not supposed to engage in clinical work for two weeks and the unscheduled arrival of the patient. The road to disaster was paved with false assumptions – that both drugs in the package were intended for intrathecal delivery, and that the SHO knew the patient – and the lethal convergence of benevolence – the SpR wanted to be helpful, as had the person who put the two drugs in the same package (the local protocol required them to be in separate packages and administered on separate days; but the patient was a poor

attender and so unlikely to be persuaded to come to the day ward on two separate occasions).

Acquiring Error Wisdom

Nurses and junior doctors have little opportunity to improve the system defences. But could we not provide them with some basic mental skills that would help them to recognise and, if possible, avoid situations with a high error potential? The 'three-bucket' model shown in Figure 13.2 leads to a possible strategy.

In any given situation, the probability of unsafe acts being committed is a function of the amount of 'brown stuff'[10] in all three buckets. The first relates to the current state of the individual(s) involved, the second reflects the nature of the context, and the third depends upon the error potential of the task. While most professionals will have an understanding of what comprises 'brown stuff' in regard to the self (e.g., lack of knowledge, fatigue, negative life events, inexperience, feeling under the weather and the like) and the context (e.g., distractions, interruptions, shift handovers, harassment, lack of time, unavailability of necessary materials, unserviceable equipment, etc.), they are less likely to know that individual task steps vary widely in their potential to elicit error. For example, omission errors are more likely in steps close to the end of a task, or where there is lack of cueing from the preceding step, or when the primary goal of the task is achieved

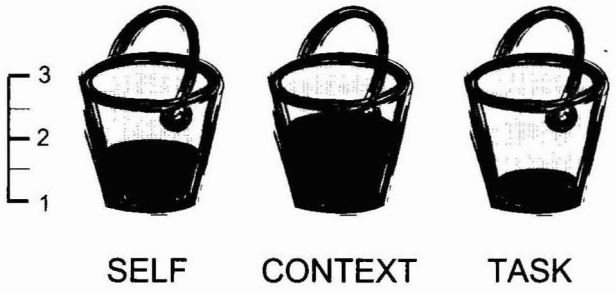

Figure 13.2 The 'three-bucket' model for assessing high-risk situations

10 An internationally understood colour coding – 'brown stuff' is what hits the fan.

before all necessary steps have been completed, and so on. These factors have been discussed at length elsewhere.[11]

Full buckets do not guarantee the occurrence of an unsafe act, nor do nearly empty ones ensure safety (they are never wholly empty). We are dealing with probabilities rather than certainties.

People are very good at making rapid intuitive ordinal ratings of situational aspects. Together with some relatively inexpensive instruction on error-provoking conditions, frontline professionals could acquire the mental skills necessary for making a rough and ready assessment of the error risk in any given situation. Subjective ratings totalling between six and nine (each bucket has a 3-point scale, rising to a total of 9 for the situation as a whole) should set the alarm bells ringing. The buckets are never empty: there is no zero on the scale. Figure 13.3 shows how the ratings might be interpreted by junior staff. Though it must be accepted that in a health-care setting there are other imperatives at work. But more of that later.

There is considerable evidence to show that mental preparedness – over and above the necessary technical skills – plays a major part in the achievement of excellence in both athletics

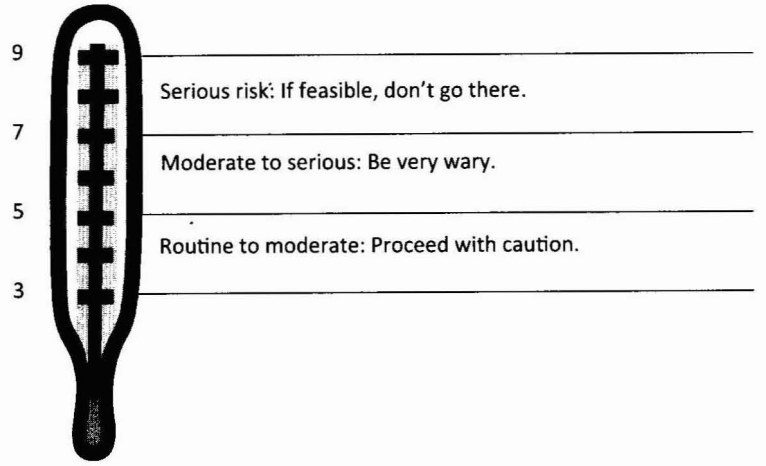

Figure 13.3 How the bucket contents might be interpreted

11 Reason (2004).

and surgery.[12] The 'three-bucket' model and its associated toolkit emphasise the following aspects of preparedness:

- Accept that errors can and will occur.
- Assess the local 'brown stuff' before embarking upon a task.
- Have contingencies ready to deal with anticipated problems.
- Be prepared to seek more qualified assistance.
- Do not let professional courtesy get in the way of checking your colleagues' knowledge and experience, particularly when they are strangers.
- Appreciate that the path to adverse incidents is paved with false assumptions and the lethal convergence of benevolence.

Aspects of Resilience

Ron Westrum, the distinguished American social scientist whose work I mentioned earlier (Chapter 5), pointed out that: 'Protecting the organization from trouble can occur proactively, concurrently, or as a response to something that has already happened.'[13] He argued that each of these is a component of resilience, but they are three distinct entities:

1. The ability to prevent something bad from happening.
2. The ability to prevent something bad from becoming worse.
3. The ability to recover something bad once it has happened.

We have considered the last of these abilities at length in Part IV of this book. In this section, I want to present two health-care examples, one of proactive and the other of concurrent resilience. Once again I will be drawing upon the remarkable work of Dr Jane Carthey and her detailed observations of the arterial switch operation (ASO) for examples of health-care professionals acting as harm absorbers.

12 Orlick, T. (1994) *Mental Readiness and its Links to Performance Excellence in Surgery*. Ottawa: University of Ottawa.

13 Westrum, R. (2006) 'Resilience typology.' In E. Hollnagel, D. Woods, and N. Leveson (eds). *Resilience Engineering: Concepts and Precepts*. Aldershot: Ashgate Publishing (p. 59).

Preventing Something Bad from Happening

One per cent of the neonates requiring the ASO procedure are born with a Type B coronary arterial pattern that is extremely difficult to repair. In one case, a pre-operative echocardiogram revealed the presence of the unusual arterial pattern. The surgeon to whom the baby had been referred (Surgeon A) had very little experience of this Type B pattern and had never successfully repaired such a configuration. The surgeon decided to ask another consultant surgeon (Surgeon B), who was known to have had good results with these unusual cases, to perform the ASO procedure on this child. Surgeon B agreed and the operation was performed successfully. Let me quote from Dr Carthey's appraisal: 'He [Surgeon A] may or may not have been successful but the example showed that he used foresight into his own abilities ... to make a decision which optimised the chances of a safe outcome.'[14] This was not an easy decision to make, especially when the prevailing professional culture was that a good consultant surgeon should be able to cope with anything.

Preventing Something Bad from Becoming Worse

During an ASO procedure, the consultant surgeon was distracted and forgot to remove a swab from the pericardial cavity. The scrub nurse repeatedly told the team that her swab count had revealed that one was missing, but her warnings were initially ignored by the surgeon. As he continued the operation, the swab compressed the right coronary artery, though this was not noticed at the time because the baby was on the heart–lung bypass machine. After ten minutes, the scrub nurse forcefully announced that the operation would have to stop because she was no longer going to pass the surgeon suture lines and instruments. The surgeon, unable to continue, had to look for the missing swab. It was successfully recovered and a post-bypass crisis was avoided.

14 Carthey, J. *et al.* (2005) *Safety Management Systems, High Reliability Organisations and Resilience Engineering: Implications for Strategies to Improve Patient Safety*. London: National Patient Safety Agency (p. 17).

Foresight Training at the UK National Patient Safety Agency

In 2005, the UK National Patient Safety Agency[15] set up a programme to develop foresight training. It was initially managed by Dr Jane Carthey and was aimed at nurses in the first instance, though it could also be applied to other staff such as patient safety managers, patient safety action teams, risk managers, medical and nursing directors, heads of midwifery and departmental managers. It was organised around the 'three-bucket model' described earlier.

Foresight was defined as 'the ability to identify, respond to, and recover from the initial indications that a patient safety incident could take place'.[16] Foresight training is designed to give nurses (and others) the mental skills necessary to recognise the initial indications that something is amiss. It also provides a chance for staff to share 'war stories' where foresight was used, or could have been used to avert harm to a patient. Furthermore, the process of foresight training also acts as a trigger, raising awareness amongst other clinical colleagues and managers. Nurses have been described as the glue that holds the many disparate parts of the health-care system together; but, being ubiquitous, they are also in a unique position to pass on foresight training messages.

Foresight training sessions are carried out in facilitated groups and use a variety of scenarios, some paper-based and some DVD-based. These scenarios cover acute, primary and mental health settings, and some are potentially relevant for more than one setting. Their purpose is to improve staff knowledge about factors that can make them more likely to be involved in a patient safety incident. Participants assign 'foresight factors' into the self, context and task buckets. The 'three-bucket' framework is intended to help participants think through potential risk factors. The scenarios fall into four categories:

1. *Reflection on action*: these are written scenarios that enable participants to identify and discuss how aspects of self, context and task can contribute to a patient safety incident. They are also asked to consider how prior detection of the 'foresight factors' would have made a difference.
2. *Storytelling*: these are short, written, story-like descriptions of patient safety incidents. They are designed to generate open discussion within the groups about their own experiences of such incidents and how they intervened to prevent harm coming to a patient. Once again, discussions are structured around the 'three-bucket' categories.
3. *Spot the difference*: these use two video (DVD) versions of the same scenario. One describes a situation in which the opportunity for error escalates; the other presents a complimentary scenario in which the harm opportunity decreases. Each pair of videos is designed to provoke a discussion amongst the participants about identifying the 'foresight factors' that contributed to the incident and how they could have been prevented.
4. *Garden path*: these are DVD-based stories that unfold on the screen. The characters in the scenario ask the participants to identify what happens next. Their purpose is to test the participants in their use of foresight and to consolidate the learning from the preceding scenarios.

15 Established in 2001 as a direct result of the Department of Health publication *An Organisation with a Memory*. (London: DoH, 2000).

16 NPSA (2006) *Foresight Training*. London: National Patient Safety Agency.

Feedback from the nurses on the foresight training package was largely very positive. However, a number of potential cautions were expressed, perhaps the most interesting of which was that the notion of foresight training goes against the nursing culture of 'ploughing on to get the job done', and careful thought needs to be given to challenging these attitudes and behaviours. There was also a misperception that the foresight training programme represents a shift away from the system approach to patient safety. I will deal with these issues in the concluding part of the chapter.

Organisational Support

In addition to the upward arrow labelled individual mindfulness, Figure 13.1 has a downward arrow that relates to collective mindfulness. It is clear that programmes designed to improve foresight and 'error wisdom' on the frontline must have strong

backing from middle and top managers. It is not enough simply to provide one-off training programmes to instil the necessary mental skills, and then tick the 'done it' box. Mental skills, just like technical skills, need to be continually managed, practised and refreshed. This must be a long-term venture if this, like so many other safety initiatives, is not to wither on the vine.

The organisation must generate a sense of empowerment that allows front line staff to use their judgement and, where necessary, to step back from potentially dangerous situations and to seek help. This is not always possible in a medical setting; but where it is, staff must feel permitted to stop, stand back, think and, where possible, to act to avoid a patient safety incident. Simply urging frontline staff to exercise 'error wisdom' will not work. Both the organisation's culture and its practices must constantly remind them of the hazards and of the need to respect them. Support for individual mindfulness must be embedded in the organisation; without such an infrastructure the programme would simply fade away, getting lost in the press of everyday events.

A good model for organisational support was provided by the Western Mining Corporation (WMC) in Western Australia.[17] They have a programme called 'Take Time, Take Charge' which aims to get workers to stop and think and then take some appropriate action. What makes this happen is that supervisors ask workers each day about situations in which they had taken time and taken charge. These enquiries are prompted by weekly management meetings where the supervisors report these 'take time, take charge' occasions. Those cases deemed to have wider significance are acted upon and the results fed back to the original reporters. Furthermore, WMC has someone at corporate level whose full-time job is to supervise the whole process. Although greater risk awareness of those at the sharp end is the aim, the programme requires the active participation of the managers and supervisors – and is at this level that the success or otherwise of the scheme will be determined.

17 Hopkins, A. (2005) *Safety, Culture and Risk: The Organisational Causes of Disaster*. Sydney NSW: CCH Australia Limited (p. 19).

Looking Towards the Future

This section returns to the two dichotomies that have played such a large part in this book. The first relates to the person and system models of safety. The second concerns an often-neglected distinction within the person model: the human as hazard and the human as hero.

Because the empirical foundations of the person model come mainly from event-dependent observations, it is inevitable that human errors and violations are seen as dominating the risks to patient safety. But it is sometimes forgotten that health care would not function at all without the insights, recoveries, adjustments, adaptations, compensations and improvisations performed everyday by health-care professionals.

In their more extreme forms, the person and the system models of patient safety present starkly contrasting views on the origins, nature and management of human error. They have been discussed at length in Part II. A brief reminder: the person model sees errors as arising from (usually) wayward mental processes and focuses its remedial activities upon the erring individual. This view is legally and managerially convenient because it uncouples the responsibility of the error-maker from the organisation at large. The system model, on the other hand, views the frontline fallible person as the inheritor rather than the instigator of an adverse event. Like the patient, people at the 'sharp end' are seen as victims of systemic error-provoking factors and flawed defences that combine, often unforeseeably, to cause unwitting patient harm. The questions that follow from this model are not who went wrong, but which barriers and safeguards failed and how could they be strengthened to prevent a recurrence.

A cyclical progress

In what follows, I will trace a patient safety journey that not only takes account of past and present developments but also anticipates their future consequences. It begins during the 1990s with the widespread acceptance of the human-as-hazard aspect of the person model. It then takes us to the present when a strong endorsement of the system model by many high-level reports has, among other influences, led to an increased awareness of

event-causing factors ('resident pathogens') acting at various levels of health-care institutions. But it is also appreciated that systems are slow to change and that we need to provide frontline carers with 'error wisdom' – that is, the mental skills that will help them identify and avoid high-risk situations. It is predicted that the adoption of these error management tools at the 'sharp end' will bring the human-as-hero aspect of the person model into greater prominence. But this can also carry a penalty. Local fixes are likely to lead to the concealment of systemic problems from managers and others with the power to effect more lasting global improvements. It is anticipated that when this process is better understood, there could be a backlash from managers, patients and lawyers that would bring about a reinstatement of the human-as-hazard view, albeit in a more moderate form. At this point, the wheel will have come full circle.

Although these cycles will continue, it is hoped that health-care institutions will learn and mature so that the wide variability evident in the initial go-arounds will gradually diminish to a state when all of these elements can co-exist harmoniously, leading to enhanced resilience and robustness. The main waypoints on this circular path are summarised in Figure 13.4.

The letters A–D in Figure 13.4 identify temporal quadrants in which the transitional drivers operate. Each quadrant is discussed separately below.

Quadrant A: From Human-as-Hazard to Awareness of Systemic Problems

This quadrant covers the period between the late 1990s and the present time. During these seven to eight years, low-level concerns about patient safety have escalated into a widespread acceptance that the problem is huge and that it exists everywhere. In other hazardous domains such a dramatic change usually follows a well-publicised disaster. But, aside from some sentinel events, health care has had no 'big bangs' of this kind. Instead, the wake-up calls came from a flurry of influential reports and epidemiological studies. Perhaps the most influential of these was the Institute of Medicine (IOM) publication released in the latter part of 1999.[18]

18 Institute of Medicine (1999) *To Err is Human: Building a Safer Health System*. Washington DC: IOM.

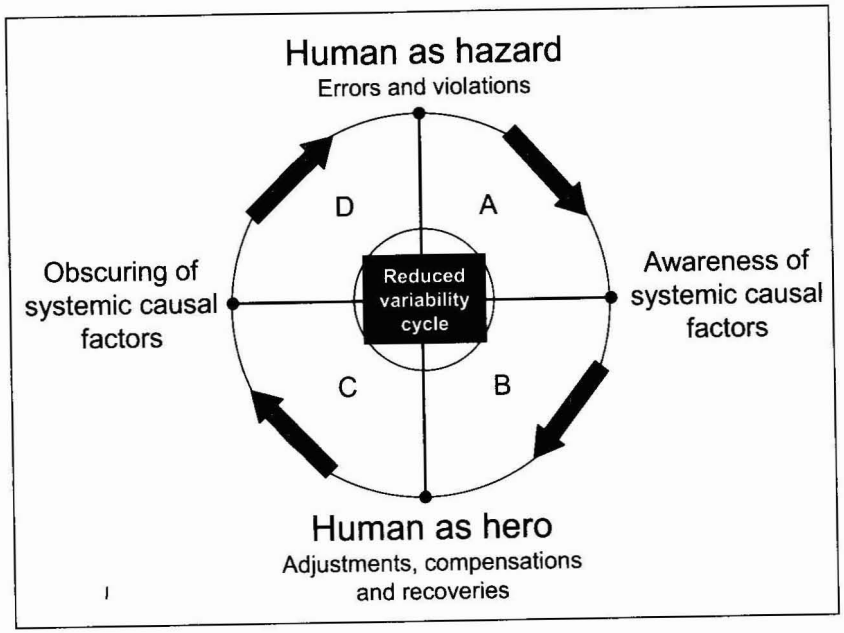

Figure 13.4 Tracing the possible progress of developments in patient safety

The IOM report drew attention the results of the Harvard Medical Practice Study, originally published in 1991,[19] but which had not then received the attention it deserved. Extrapolating from the findings of a patients' notes investigation in New York State, the authors estimated that around 90,000 Americans die each year as the result of medical error – and these numbers have since been revised upwards. Studies in the UK, New Zealand, Australia, Denmark and Canada indicate that around ten per cent of patients admitted to acute care hospitals are killed or harmed iatrogenically.

With the exception of anaesthetists, the human-as-hazard view prevailed among health-care professionals in the 1990s. This naming, blaming and shaming reaction to error was not only intuitively appealing, it was also strongly reinforced by a medical culture that equated fallibility with incompetence or worse. Since then, several factors have combined to create an awareness of the systemic origins of medical error, and a growing recognition that

19 Department of Health (2000).

those practitioners who unwittingly harm their patients are more likely to be the inheritors of institutional 'accidents in waiting' than the sole instigators of bad events:

- As its title suggests, the IOM report condemned the blame culture and strongly advocated a systemic approach to investigating the threats to patient safety. While recognising that human error is perhaps the major contributor to accidents in hazardous systems, the IOM report goes on: '... saying that an accident is due to human error is not the same as assigning blame because most human errors are induced by system failures.'[20] The system approach was similarly promoted by all the high-level international reports mentioned earlier. One of the consequences of such a view is the need to establish standardised incident reporting systems so that organisations might learn from their own mistakes and from those of others. The aim is to create 'organisations with a memory'; that is, ones that recognise not only the proximal causes of patient harm, but also their upstream systemic influences – the 'resident pathogens' or 'error traps' that repeatedly produce the same kinds of errors in different people.
- Following the lead of the anaesthetists (who adopted the system model in the 1980s), health-care professionals now sensibly look to other domains with excellent safety records, particularly commercial aviation, for lessons in risk management. Air accident investigators are required by the International Civil Aviation Organisation (ICAO) to identify which of the many defences, barriers and safeguards failed in order to allow hazards to come into damaging contact with victims, assets or the environment. In each case, the proximal contributions may have involved various kinds of unsafe acts (e.g., errors and violations) but – most significantly – their identification constitutes the beginning rather than the end of the search for causal factors: a search that has, in many cases, led to the discovery of deficiencies in the aviation system as a whole. Moreover, whereas health care is based upon the myth of medical infallibility, aviation, right from its outset a hundred years ago, is predicated on the assumption that people can and will go wrong. Was it Orville or was it Wilbur Wright who devised the first pilot's check list?

20 Institute of Medicine (1999), p. 63.

- Although emotionally satisfying (and driven by strong psychological pressures), as well as being legally and organisationally convenient, many health carers are conscious that a blame culture carries severe penalties. By isolating the erring individual from the context in which the event occurred, it is very difficult to discover the latent conditions that provoked and shaped the unsafe acts. More seriously, a person-oriented approach makes it impossible to identify the recurrent error traps discussed in Chapter 6. Identifying and removing these error traps is a crucial part of risk management. This problem is compounded by the fact that a blame culture and reporting culture cannot easily co-exist – and a functioning incident reporting system is essential for the discovery of error traps. In short, blame has little or no remedial value.

Quadrant B: Restoring the Balance Between the System and the Person Models

Clearly, a systemic approach to the patient safety problem is a vast improvement over the simplistic human-as-hazard approach. But it is not without its drawbacks. Some of the more important of these are listed below:

- Unlike aviation, the activities and the equipment of health care are exceedingly diverse, and while some of the latter may be less sophisticated than in aviation, the interpersonal dynamics are far more complicated, both psychologically and organisationally. Moreover health care has more in common with aircraft maintenance than with the stable routines experienced by commercial jet pilots. Treating patients is a very 'hands-on' activity and, as such, is rich in error opportunities. And although neither the patients nor the clinicians like to acknowledge it, the practice of medicine still has many unknowns and uncertainties. All of these features make the commission of errors more likely, while the fact that patients are already vulnerable people makes the likelihood of causing harm much greater. In addition, the hitherto localised investigation of adverse events makes it harder to learn and disseminate the wider lessons – unlike the extensive publicly reported investigations of aircraft accidents.

- In dangerous industries where the hazards are known and the operations relatively stable and predictable, it is possible to employ an extensive range of automated safety features – or 'defences-in depth'. Whereas some health-care professionals (e.g., anaesthetists, intensivists, radiologists) use comparable automated safeguards, physicians, surgeons and nurses depend heavily on their own skills to keep patients out of harm's way. Patient injury is often just a few millimetres away.
- Nurses, in particular, obtain a great deal of professional satisfaction from fixing system problems at a local level. However, as we shall see below, these workarounds carry a penalty.

Quadrant C: The Downside of Human-as-Hero

At this point in the cycle, we move into the near future and the arguments become more speculative. Nonetheless, there are pointers available from current research to indicate how organisations might become increasingly disenchanted with too much individual autonomy, even of the heroic kind. An example is given below.

Tucker and Edmondson[21] observed the work of 26 nurses at nine hospitals. Their primary interest was in the way that they dealt with local problems that impeded patient care. These problems included missing or broken equipment, missing or incomplete supplies, missing or incorrect information, waiting for a human or equipment resource to appear and multiple demands on their time. On 93 per cent of observed occasions, the solutions were short-term local fixes that enabled them to continue caring for their patients but which did not tackle the underlying organisational shortcomings. Another strategy – used on 42 per cent of occasions – was to seek assistance from another nurse rather than from a more senior person who could do something about the root problem. In both cases, an opportunity for improving the system was lost. In addition, the nurses experienced an increasing sense of frustration and burnout, despite the satisfaction obtained from appearing to cope.

21 Tucker, A.L., and Edmondson, A.C. (2003) 'Why hospitals don't learn from failures: organisational and psychological dynamics that inhibit system change.' *California Management Review*; 45: 55–72.

At a local level, these well-intentioned workarounds appear to smooth out many of the wrinkles of the working day. But from a wider perspective, it can be seen that they carry serious penalties: the concealment of systemic problems from those whose job it is to correct them, and the bypassing or breaching of system safeguards. By their nature, these adverse consequences are not immediately evident. In the short-term, things appear to be working normally. This attitude of 'muddling through' is familiar to all those working in complex systems with less than adequate resources. But, over time, latent pathogens are obscured and others are seeded into the system. This is an insidious process and it is often only after a bad event that we appreciate how these disparate factors can combine to bring about patient harm.

In addition, organisations that rely on – and even encourage – these local fixes come to possess three inter-related organisational pathologies that are symptomatic of poor safety health:

- *Normalisation of deviance*: this is an organisational process whereby certain problems or defects become so commonplace and so apparently inconsequential that their risk significance is gradually downgraded until it is accepted as being a normal part of everyday work. Such a process within NASA was cited as being a factor in both the *Challenger* and *Columbia* shuttle disasters.[22]
- *Doing too much with too little*: this was another factor identified by the Columbia Accident Investigation Board as contributing to the *Columbia* tragedy. It is also a natural consequence of expecting busy frontline health carers to fix local problems as well as giving their patients adequate care.
- *Forgetting to be afraid*: because bad events do not appear to happen very often (at least from the limited perspective of the individual nurse or doctor), health carers can lose sight of the way in which apparently minor defects can combine unexpectedly to cause major tragedies. If there is one defining characteristic of high reliability organisations it is chronic unease, or the continual expectation that things can and will go wrong.

22 Vaughan, D. (1996) *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA*. Chicago, Il: University of Chicago Press.

Quadrant D: The Reinstatement of the Human-as-Hazard Model

This is likely to occur at some time in the future and so is the most speculative of our transitional periods. Many of the processes described in Quadrant C are likely to be invisible to senior management on a day-to-day basis. It will probably take a number of well-publicised events to bring them to light. But once their significance has been appreciated, it is likely that strong countermeasures will be introduced aimed at limiting the freedom of action of frontline health carers. This backlash is likely to involve a number of top-down measures, the net result of which will be a return to the human-as-hazard model, though it will almost certainly be in a more moderate form.

- There is likely to be a renewed outcry from managers, lawyers and the families of patient victims against 'bad' doctors and nurses. This will receive close media attention and cause predictable reactions from politicians and hospital governing boards.
- Barcoding, computerised physician order systems, electronic health records and automated pharmaceutical dispensing systems have all been implemented to some degree over the past five years. Automatisation takes fallible human beings out of the control loop, at least in the places where errors were commonly made. But this does not necessarily eliminate human error; it merely relocates it. It is probable that part of the backlash against the human initiatives at the sharp end will take the form of more urgent attempts to computerise and automate clinical activities. In the past (and indeed, the present), these innovations have been beset by technical and financial problems; but at this future time, it is likely that many of these difficulties will have been overcome. And the history of complex hazardous systems tells us that one of the ways that management commonly deal with human factors issues is to buy what they see as hi-tech solutions.
- Another favoured countermeasure when dealing with the human factor is to write new procedures, protocols and administrative controls that seek to limit 'sharp end' action to behaviours that are perceived as safe and productive. A fairly safe prediction, therefore, is that there will be intensified efforts to reduce clinical autonomy. Procedures, protocols and guidelines have an important role to play in safety management, but they are not without their problems as has been discussed at length in Chapter 4.

At first sight, it looks as though the cycle shown in Figure 13.4 has a 'good' sector (right side) and a 'bad' sector (left side). But each is a complex mixture: there is good in the bad and bad in the good. Nothing is wholly black or white; all have potential downsides, all have potential benefits. A better understanding of these issues will permit the anticipation and manipulation of their effects so as to maximise the positives and minimise the negatives.

Reduced Variability

It is expected that as health-care organisations learn more about these processes, variability over the cycle will diminish. The tensions and transitions implicit in the cycle will remain, but their perturbations will become less disruptive. It is hoped that eventually the person and the system models will operate cooperatively rather than competitively. This diminution in variability is represented in Figure 13.5.

It is not possible to step into the same river twice. By the same token, no organisation remains the same. The inner circle in Figure 13.5 represents more moderate perspectives on the issues shown at the outer extremes. It is in this area of reduced variability that we hope to achieve a more mature balance between the system and the person models and, within the latter, between the human-as-hazard and the human-as-hero distinctions. It is further hoped that one of the more enduring products of this equilibrium will be enhanced system resilience. We cannot expect to eliminate human error, technical failures and organisational pathogens altogether (e.g., communication failures, limited resources, economic and governmental pressures), but we can hope to create systems so that they are more resistant to their adverse effects. Greater resilience (unlike zero defects) is an achievable goal.

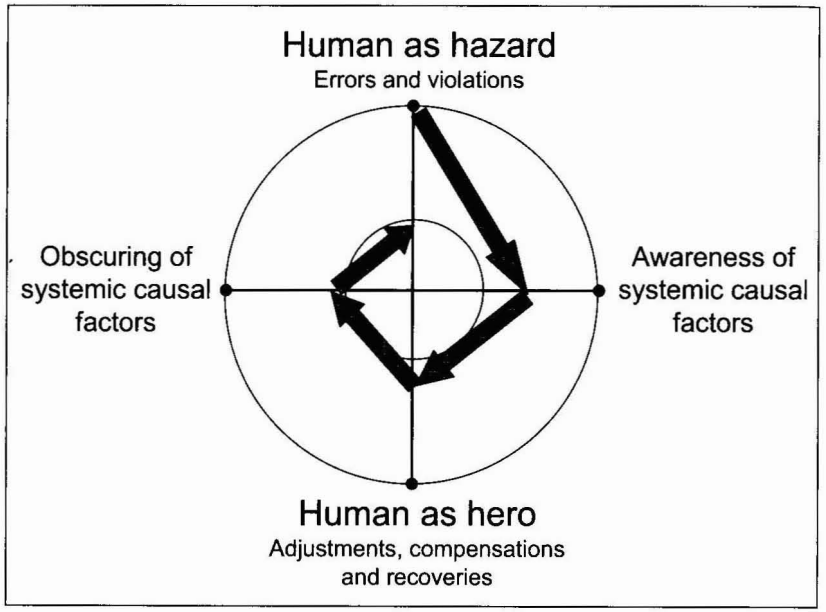

Figure 13.5 Showing the reduction in variability as the cycle progresses

Mindfulness and Resilience

Systemic measures such as standardised equipment, bar-coding, chip-based patient identification, computerised drug ordering and automated dispensing will do much to reduce many of the now commonplace error affordances in patient care, as will establishing the essential components of a safe organisational culture. But while they may be necessary, they are not sufficient in themselves. Ultimately, institutional resilience is an emergent property of the mental and technical skills of those at the sharp end. Richard Cook and his co-authors[23] argued that safe work in the real world depends critically upon 'recognising that hazards are approaching; detecting and managing incipient failure; and, when failure cannot be avoided, working to recover from failure.'

23 Cook, R.I., Render, M.L., and Woods, D.D. (2000) 'Gaps in the continuity of care and progress on patient safety.' *British Medical Journal*, 320: 791–794 (p. 793).

This chapter has sought to reconcile the two dichotomies – person and system, human-as-hazard and human-as-hero – that have concerned us throughout this book. The next and final chapter takes an even broader perspective and presents two metaphors – the safety space model and the rubber-band model – to help us elucidate the rather elusive nature of safety and what is necessary to achieve it at both the organisational and the individual levels.