Original Research Paper

Journal of Patient Safety and Risk Management
1–7

DOI: 10.1177/25160435231191318
journals.sagepub.com/home/cri
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Why did it make sense at the time? Applying an ecological dynamics perspective to analyse local rationality

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Abstract

Increasingly, a compassionate and curious approach to patient safety recognises the importance of recognising local rationality, asking why decisions made sense at the time they were made. This approach enables increased learning and removes the potential judgement resultant from hindsight bias. The guidance from safety science literature as to how to most effectively learn from this perspective, however, is lacking. Ecological dynamics is a methodology utilised in high-performance environments, where they seek to understand decision making in dynamic, complex environments. This paper explores how ecological dynamics can provide a method to enable organisations to learn more effectively from patient safety events when understanding local rationality. A framework is provided to enable organisations to shift from a response that invokes blame to one that generates rich learning and improvement opportunities, which could be used alongside or incorporated within other systemic methodologies currently used such as SIEPS 2.0.

Keywords

Patient safety, governance, organisational learning, learning from adverse events, root cause analysis

Introduction

Patient safety increasingly values adopting a curious perspective of workplace decisions, rather than succumbing to hindsight bias and retrospective judgement. This perspective is 'localised rationality'. Localised rationality shifts from asking 'where did people go wrong?' to '*why did this assessment or action make sense to them at the time?*'[1] This new view of human error and performance creates an alternative paradigm for learning and improving capacity to manage risk. What this new paradigm lacks, is a language and conceptualisation to effectively apply it.

Practical advice for adopting the principle of local rationality does exist. This includes to '*listen to people's stories*' and to '*seek multiple perspectives*'.[2] Whilst this advice is valid, it lacks depth. A more robust mechanism is required. There is interest in applying the principle of local rationality within patient safety. There will be people who feel that they apply this concept within their investigations. Without equipping practitioners with the ability to access the systemic learning that this perspective could avail, the opportunity to learn and improve is compromised. Patients and healthcare workers alike require more.

Embracing local rationality

The 'old view' of human error considers that human error is the cause of most accidents.[1] The systems, sometimes referred to as work-as-prescribed,[3] are effective to create a condition of safety if it wasn't for variable and unreliable actions of humans. Reason offered a more progressed notion of error from the classical Scientific Management Theory approach, recognising that systems had in built weaknesses and as such work-as-prescribed would be insufficient to create a condition of safety.[4] A 'new view' of human error has emerged that recognises human error is a symptom of systemic weakness. The old view of human error is widely susceptible to hindsight bias, which uses post event knowledge as a basis for understanding.[1] A frequent outcome of this approach is to blame the person involved in the final decision making or action.[2]

The shift to the new view of human error incorporated the importance of local rationality. The local rationality principle originated in the 1960s. People do what makes sense to them at the time, it must do, otherwise they would make a different choice.[1] When investigating an adverse event, this new view of human error recognises that people behaving erratically or criminally dangerously are rarely the cause. Healthcare has seen a considerable shift from the Cognitive Psychological

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School of James Reason, to the Joint Cognitive Systems School, developed by luminaires such as Rasmussen, Hollnagel, Woods et al.[5] This views errors as a consequence of the system, rather than a cause. This different perspective seeks deeper understanding of the system. Consequently, the investigator is curious why particular decisions appear to be poor or dangerous when the person who made it thought it was the appropriate, and by inference a safe, choice course of action (see Figure 1). This is a mechanism that offers understanding how the system is producing the conditions whereby such decisions seem considered to be acceptable.

Applying local rationality is incredibly important. In order to cultivate true just and learning cultures in healthcare investigations should be compassionate and curious.[6] The decisions made that contribute to an adverse event should be a source of systemic learning. Local rationality is a Rosetta Stone to these changes.

Currently, the quality and quantity of systemic improvement that local rationality can provide is unknown. This may be due to variable nature of its application. How to adopt local rationality is not clear. In 'Systems Thinking for Safety: A white paper' ten systems thinking principles were outlined. The white paper defined systems thinking as '*considering the interactions between the parts of the system (human, social, technical, information, political, economic and organisational)*'.[7] One of the principles was local rationality. There is much merit in all the principles outlined, although from a segmented and hierarchical concept of what a system is. A scenario considering alarm management within air traffic control applied each of these the ten principles. The application of local rationality was that '*operators trying to make sense of the situation in high demand*'.[7] It is difficult to reconcile the potency of the principle with the vagueness of the guidance application and their outputs.

Increasingly in healthcare, SIEPS 2.0 is being used to understand the system as part of an investigation. Within this, SIEPS 2.0 places the person at the centre of the system to consider how facets of work, such as tools and technology and tasks, contribute to the systemic outcome.[8] This systemic view is changing the way healthcare learns from patient safety events. If patient safety is to successfully incorporate local rationality into learning and maximise the potential of this perspective, we should consider alternative views than that of a segmented notion of systems. Decisions within complex adaptive systems should not be analysed like a problem that requires an engineered solution. They are momentary choices within a rich, intricate ecosystem. Whilst tools such as SIEPS 2.0 allow for a view of the system, learning requires multiple perspectives. For example, SIEPS 2.0 may enable an overarching systemic view, such as the result of a tennis match, but to understand a particular action or decision as well as its relative success, requires another. The system is more than a socio technical one. We can learn more if decisions are considered as part of an ecological system.

Ecological dynamics

High-performance environments, such as elite sport, have an interest in human error and appreciate the importance of understanding decision making in complex environments. Increasingly, Ecological Dynamics are embraced to understand decisions made at the time in which they were taken. Ecological Dynamics is an example of systems thinking; albeit one that differs from the orthodox approach to systems thinking within patient safety. Here, context is key. Ecological Dynamics differs from the standardised notion of understanding systems of direct effects – the probability that an intervention will itself produce a certain outcome. Instead, it enables indirect effects which are context dependant to be more fully considered. Juarrero extends this argument, stating that '*science 2.0 and medicine 2.0 are all about context dependence*'.[9] It diverges from considering the person, the clarity of their role, training and broad considerations of things such as workload and stress which existing models such as SIEPS 2.0 considers and instead seeks understanding of the person and their actions within the specific context of the moment they are operating in.

Ecological dynamics seeks to understand behaviour through the relationship between the individual and the environment.[10] Individual actions emerge as a consequence of the interactions between the individual and their environment.[10,11] Systems thinking within patient safety widely considers actions or decisions to be resultant of the properties within the environment or system.[12] This allows analysis to focus the different parts of the system such as the technical, human, social, political aspects, etc and how they may influence a decision. Rather than peel away strata of systemic perspectives in the hope that one shall reveal knowledge if the soil is brushed away with sufficient care and wisdom, the ecological perspective would consider all of those important facets at the given time or space under consideration. It is the overlay of the systemic strata that creates the context of the decision.

Ecological dynamics recognises that all work results from interactions between humans. Those interactions occur within specific contexts and dynamic environments, and not in homogenised, controlled constructs. Rather than understanding a system as interacting components, human work is carried out by intelligent, largely well meaning, skilled agents that synthesise and rationalise a variety of perspectives and components permanently. It is not surprising that local rationality is difficult to fully apply, when the concept of a system is one which is founded on an engineered conceit that fails to fully recognise the complex sophistication of people at work. Decisions are made with consideration of political, technical, social components simultaneously. Agency is aggregated into a consideration of a person with an illusion of coherence which hides deeper learning.

Figure 1. Understanding human performance via classical approach with hindsight bias (left) and local rationality (right).

Delineation and silos erode the true context within which decisions are made. Consequently, Ecological Dynamics' view of a system is more aligned with Complexity Science that recognises the interactions of agents within complex adaptive systems which enable emergent behaviours.[12]

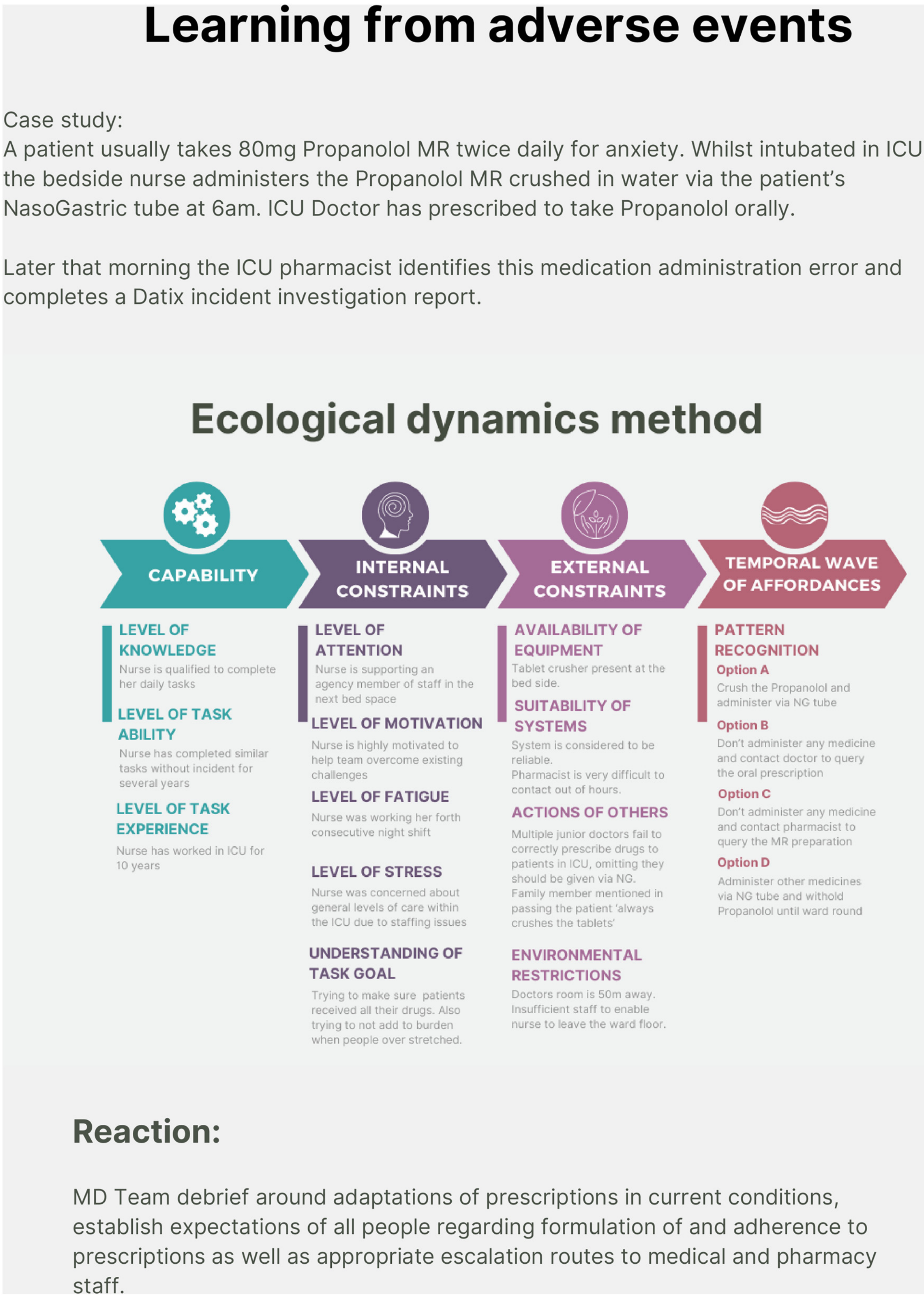

Figure 2. Decision making from an ecological dynamics perspective.

The landscape of affordances and constraints

Ecological dynamics offers the theory of affordances.[13] Affordances are the possibilities of action afforded by the environment. This is an important acknowledgement of non-linear dynamics within Complexity Science, recognising that performance is a continuous coadaptation between agents and their environments.[9] Consequently, affordances are not a static component within a system. They ebb and flow, evolve and decay.[14] The rate of decay of affordances will be determined by the dynamics within the environment and the context of the work. For example, an ICU doctor may be afforded the opportunity to prescribe a patient a drug for a few hours, whereas a trauma response team may have an affordance window of less than a minute.

Rietveld and Kiverstein extend the concept of affordances, outlining a rich landscape in which affordances are dependent on abilities of a particular agent.[15] The temporal wave of affordances that emerge in a complex system is dependent on an individual's capability. For example, a road traffic accident may afford an individual an opportunity to perform CPR on the roadside, but only if they possessed the requisite skills and knowledge to do so, or were talked through the process by an emergency call operator. Equally, the same environment may afford a specialist emergency doctor the opportunity to undertake a trauma thoracotomy. Fully considering an individual's capabilities to perform in any given context is crucial to understanding why a decision made sense at the time. Human agents will act in an inconsistent manner.[16] Therefore, the landscape of affordances will remain fluid. Often decisions are made from a range of options. In order to understand why a decision made sense at the time, it is worth considering the choices that were not taken. Complex systems often provide agents with a range of options, not binary choices that are either good or bad. The research of decision making adopting naturalistic decision-making approaches would describe how an agent recognises patterns within the temporal wave of affordances before selecting an action.[17] Ecological dynamics allows practitioners to consider this greater degree of complexity and context in which the decision was made with greater clarity.

An ecological dynamics methodology does not only delineate between individual capability and what the environment affords by way of potential action. There is also a consideration of constraints. Constraints are '*features that surround a complex system and reduced the number of configurations that are available to it as it interacts with the performance environment*'.[18] When understanding performance within socio-technical systems, there needs to be appropriate scope for both social and technical aspects to be considered. Constraints can be specific to an agent. These are internal constraints. The research regarding individual limitations will shape understanding of whether someone tends to utilise a specific capability within a specific context. Motivational and emotional states form part of these constraints, such as being hungry, angry or tired. Ecological dynamics allows for a more holistic perspective of decision making, '*safety engineering literature has focussed on the cognitive elements of performance, it has paid little attention to emotions*'.[19] This classical approach views the 'brain as a computer', or the agent as a component in the system, rather than a complex system in their own right. A more nuanced and contextual lens is now available. Rather than restrict a view of human error to whether someone was capable and suitably trained, we recognise that an individual is a complex system themselves. Consider two FY1 doctors that fail to successfully cannulate a patient. Both fail to execute the required skill to the required level. The first doctor does so as they need greater experience to develop this capability sufficiently. The second doctor routinely completes this task, but this occasion is at the end of a challenging night shift resulting in their internal constraints contributing to the failed execution in this instance. Healthcare professionals are not merely cognitive elements of a system. The internal constraints will perpetually shift, resulting in our consideration shifting from if someone could/should have done something, to the tendency for someone to enact a specific capability.

No man is an island

Constraints may also be shaped by social and cultural factors surrounding performance.[20] Typically in Ecological Dynamics, these have been classified as 'task' and 'environment',[21] but for the purposes of this model have been classified as external. The usability of equipment, resources and systems will all act as external constraints within the decision-making paradigm.

This understanding has been embraced within elite sports. Ecological dynamics has been utilised as a pedagogical approach to shape how skills are developed. Coaches in complex systems develop training that is constraints led.[22] They create environments in which decisions are made with consideration to specific constraints and explore how they can create consistently good outcomes in that context. For example, football coaches may restrict spaces for certain tasks to encourage more effective control and manipulation of the ball. The players then develop strategies to allow them to succeed when space is limited which will transfer to their real performance arena, having gained experience of working within that specific constraint. In healthcare, simulation training could be an opportunity to equally develop constraints led approaches to skill adaptation.

A further crucial component of external constraints is the actions of fellow agents within the system. The decision made can only be understood within the specific context in which it was taken. Other agents within the system will also be active. Their decisions will form part of the constraints that the agent in question is working within. A football attacker may not shoot at goal if a defender moves sufficiently close, or a nurse may not attend to a patient if a colleague requests immediate help with another task. Those external constraints shaped by other decisions made within the system will alter the probabilities of which affordance is selected.

In complex systems, where there is a multi-person interface, greater consideration of inter-personal interaction is required. Adding the cognitive elements of a system together may be considered by some to be a systems thinking approach. Such an approach would still be a simplified and somewhat linear mechanism that fails to consider the relationship between the individual and the environment at the moment the decision is made. An ecological approach is a more suitable method.[14] Not only will someone's prior decision create external constraints within an agent's decision, but complex systems often demand concurrent decision making. For example, one police officer may call for additional resources whilst their partner moves to apprehend a suspect. This requires individuals to co-adapt to each other. Decision making in complex systems is often within a joint system of perception-action, which has been named as '*interpersonal synergy*'.[23,24] Decisions can only be viewed as successful if both decision makers select actions independently, simultaneously generating the successful outcome. This explains why teams with similar capabilities and experiences can perform in dramatically different ways. Interpersonal synergy is the seed of emergence within socio-technical systems. Team cohesion and consequential performance can be informed by understanding the role of interpersonal synergies within specific contexts. Understanding how interpersonal synergies may affect team performance should help inform for effective talent recruitment and deployment. By ceasing to view performance through a capability-based lens and to a context ecological perspective, there is a mechanism to more scientifically manage the art of team 'fit'. Research regarding multidisciplinary huddles have demonstrated improved teamwork and problem solving.[25] By adopting an ecological dynamics method, not only can we learn more effectively from local rationality, proactive approaches to safety management can also be enhanced.

Conclusion

For organisations to develop learning cultures, there must be a compassionate and curious response when understanding decisions made within the workplace. The principle of local rationality is central to this evolution in learning, and the aim of consequential improvement in managing risk. The proposed model above, that adopts the principles of ecological dynamics, is a tool that can more clearly and effectively apply this principle when compared with the existing guidance which is vague. It also further embraces insights from complexity science as well as including best practice from high-performance environments. This could be used alongside other approaches to understand the system, such as SIEPS 2.0, or be assimilated into such an approach when considering the person to adopt a different perspective. Indeed future iterations of the SIEPS family could explore how Ecological Dynamics could be incorporated to provide a different understanding of the person within the system.

The application of this model could be wide reaching. Analysis of decision making, particularly within investigations of adverse events within complex adaptive systems, would be transformed. There would also be implications for developing capabilities and competencies within these organisations. Ecological dynamics have been embraced as a pedagogical concept within high-performing environments, such as elite sport, where coaches increasingly consider their role to be one of designing constraint-based skill adaptation, rather than the repetition of skill acquisition. Furthermore, team performance would be viewed in light of synergistic interactions, rather than an accumulation of individual capabilities. This could affect the manner in which talent is identified and recruited. It could also help inform roster patterns in order to maximise team synergies in order to effectively manage risks.

We should be able to do much more than simply listen to people's stories.

Acknowledgements

Many thanks to Prof Keith Davids for his comments on the initial concept and Dr Catherine Stretton for feedback regarding healthcare applications.

Author contributions and guarantor

All work (both conceptual in developing concept, and in writing this manuscript) has been completed by the primary and corresponding author, Paul Stretton. As guarantor, I accept full responsibility for the work, and have controlled the decision to submit for publication.

Declaration of conflicting interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

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