Changing how we think about healthcare improvement

Complexity science offers ways to change our collective mindset about healthcare systems, enabling us to improve performance that is otherwise stagnant, argues **Jeffrey Braithwaite**

For all the talk about quality healthcare, systems performance has frozen in time. Only 50-60% of care has been delivered in line with level 1 evidence or consensus based guidelines for at least a decade and a half[1-5]; around a third of medicine is waste, with no measurable effects or justification for the considerable expenditure[6-9]; and the rate of adverse events across healthcare has remained at about one in 10 patients for 25 years.[10-13] Dealing with this stagnation has proved remarkably difficult—so how do we tackle it in a new, effective way?

We need to understand why system-wide progress has been so elusive and to identify the kinds of initiatives that have made positive contributions to date. Then we can ask what new solutions are emerging that may make a difference in the future and start to change our thinking about healthcare systems.

Why change is hard

The overarching challenge lies in the nature of health systems. Healthcare is a complex adaptive system, meaning that the system's performance and behaviour changes over time and cannot be completely understood by simply knowing about the individual components. No other system is more complex: not banking, education, manufacturing, or the military. No other industry or sector has the equivalent range and breadth—such intricate funding models, the multiple moving parts, the complicated clients with diverse needs, and so many options and interventions for any one person's needs. Patient presentation is uncertain, and many clinical processes need to be individualised to each patient. Healthcare has numerous stakeholders, with different roles and interests, and uneven regulations that tightly control some matters and barely touch others. The various combinations of care, activities, events, interactions, and outcomes are, for all intents and purposes, infinite.

When advocates for improvement seek to implement change, health systems do not react predictably; they respond in different ways to the same inputs (staff, funding, presenting patients, buildings, and equipment). In the language of complexity science, this is "non-linearity." The sheer number of variables and the unpredictability of their interactions make it hard to impose order. And health systems are indeterministic—meaning that the future cannot be predicted by extrapolating from the past. They are also fractal and self similar, often looking alike in, for example, organisational culture in different places and at different points in time.

How then is a system as complex and seemingly dynamic as healthcare typically in a steady state, with entrenched behaviours, cultures, and politics? Because the total of the negotiations, trade-offs, and positioning of stakeholders pulls strongly towards inertia.[14 15] No one person or group is to blame; but a complex system clearly does not change merely because someone devises and then mandates a purpose designed solution. Studies of concerted improvement efforts, for example in North Carolina, USA,[16] and in the NHS,[17] show this. Instead, the system alters over time and to its own rhythm (idiosyncratically and locally).[18]

This raises further questions: what circumstances can precipitate changes in complex health systems, and what circumstances frustrate progress? Box 1 summarises selected initiatives. Attractors enable or create sufficient change for the system to be nudged before it settles into a

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KEY MESSAGES

- The key measures of health system performance have frozen for decades—60% of care is based on evidence or guidelines; the system wastes about 30% of all health expenditure; and some 10% of patients experience an adverse event

- Proponents of change too often use top down tools such as issuing more policy, prescribing more regulation, restructuring, and introducing more stringent performance indicators

- We must move instead towards a learning system that applies more nuanced systems thinking and provides stronger feedback loops to nudge systems behaviour out of equilibrium, thereby building momentum for change

- Effective change will need to factor in knowledge about the system's complexity rather than perpetuate the current improvement paradigm, which applies linear thinking in blunt ways

- Yet we should recognise how truly hard this is in the messy, real world of complex care

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Box 1: Selected attractors and repellents of change

Systems can change when:
- Stimulated by medical progress—eg, new diagnostic tests and treatments, imaging technology, or surgical advances
- Incontrovertible evidence shows public benefit—eg, immunising infants or reducing smoking rates in developed countries
- New models of care emerge—eg, the shift to day only surgery or providing GP advice remotely via apps, teleconferences, or telemedicine
- Clinical practices alter by necessity or because of professional acceptance—eg, laparoscopic techniques
- Sources: Thimbleby, 2013[19]; Farmanova et al, 2016[20]; Westerlund et al, 2015[21]; Watt et al, 2017[22]

Systems can reject change when:
- The primary or sole strategy is to mandate solutions from the top down
- The change is not supported by parties with power to resist or reject, such as the medical profession or the media
- The initiative encounters entrenched bureaucracy, particularly in organisations such as public hospitals
- More policies and procedures are issued on top of a multiplicity of existing policies and procedures
- Attempts to alter deep seated politics or cultures are superficial
- Sources: Coiera, 2011[15]; Braithwaite et al, 2017[23]; Khalifa, 2013[24]

Box 2: Initiatives to change the system's hardware

- *Restructuring organisations*—The boxes on the NHS organisation chart have regularly been redrawn to little benefit. Although such reorganisations do produce structural change, they do not greatly alter entrenched cultures, much less downstream clinical outcomes.[25] Two studies assessing structural change showed that merging NHS trusts[26] and restructuring Australian hospitals[27] produced no measurable gains and put things back by 18 months or more.
- *Capital investments*—New buildings and new equipment or technology are necessary changes that can contribute to better, more modernised models of caring. Technology supporting new diagnoses and treatments, tests, and clinical techniques can instigate important gains. These initiatives, however, are mostly left to research and development departments, researchers, or clinicians, while politicians and managers focus on organisational charts, opening new hospitals, and prescribing policy.
- *Financial models and targets*—Studies from the US Commonwealth Fund and international experience indicate that no one financial model is better than any other,[28][29] and perverse outcomes and gaming often result from imposed targets and key performance indicators.[30]

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new state. Resisters or repellents hold the status quo or reject change.

A key message from the examples in box 1 is that change is accepted when people are involved in the decisions and activities that affect them, but they resist when change is imposed by others. Policy mandated change is never given the same weight as clinically driven change.

Systems hardware and software

Much has been written about the many efforts to initiate change in health systems around the world, most of which seems to presuppose two familiar pathways. One is to alter the system's "hardware" by restructuring the organisation chart, upgrading the infrastructure, or changing financial models or targets, for example (box 2). The NHS and other systems have invested heavily in many such efforts. But the gains have been modest, and the extent to which such changes have contributed to better patient care is unclear. The other approach is to change the "software" of the system by tackling the culture of clinical settings (and the quality of leadership offered by managers and policy makers) and using implementation and improvement methods (box 3).

Changing our collective mindset

Instead of using the metaphor of hardware and software, we could change our thinking. We need to recognise three problems. Firstly, implementing and securing acceptance of new solutions is difficult, even when armed with level 1 or other persuasive evidence—this is the take-up problem. Secondly, disseminating knowledge of an intervention's benefits across the entire system is hard—this is the diffusion problem. Thirdly, even if a new model of care, technology, or practice is successfully taken up and widely spread, its shelf life will be short—this is the sustainability problem. The pace at which new ideas are being generated, and previous ones discarded, is accelerating, particularly so over the past 20 years.

So paradoxically, although nothing lasts, genuine transformational improvement remains frustratingly elusive. Adding to the challenge, as Contandriopoulos and colleagues remind us, knowledge (even level 1 evidence) is unevenly distributed, poorly understood, and always contested.[38]

Accepting this reality is uncomfortable for those promoting improvement. "Agents of change" tend to prefer optimism or even the delusion that their new policies or initiatives are widely adopted.[14] This dichotomy has been described as "work-as-imagined" by policy makers and managers and as "work-as-done" by the clinicians at the coalface.[39] Policy makers and managers try to instigate change remotely; clinicians try to deliver care proximally. This leads to much antagonism—or merely ignorance of the other's role.

Understanding emergence and resilience

How do we move forward? Whatever solutions we choose must reflect the complexity of the system and respect its resilient features.[40] We must change our approach to understanding health systems and their intricacies.[41][42]

One way is to break with the NHS's pattern of attempting systems improvement from the top down. Complex adaptive systems have multiple interacting agents with degrees of discretion to repel, ignore, modify, or selectively adopt top down mandates. Clinicians behave how they think they should, learning from and influencing each other, rather than by responding to managers' or policy makers' admonitions. Frontline clinicians in complex adaptive systems accept new ideas based on their own logic, not that of those in the upper echelons. Healthcare is governed far more by local organisational cultures and politics than by what the secretary of state for health or a remote policy maker or manager wants.

Change, when it does occur, is always emergent. This is when features of the system, and behaviours, appear unexpectedly, arising from the interactions of smaller or simpler entities; thus, unique team behaviours emerge from individuals and their interactions.

Those on the frontline of care (clinicians, staff, patients) navigate change through their small part of the system, adjusting to their local circumstances, and responding to their own interests rather than to top down instructions. Thus, healthcare is naturally resilient, always buffering itself against change that does not make sense to those who are on the ground, delivering care.

Towards a nuanced appreciation of change?

Here are six principles on which a new approach to change might be built. Firstly, we must pay much more attention to how care is delivered at the coalface. Bureaucrats and managers, among others, will not improve the system or make patients safer by issuing swathes more policy, regulating more avidly, introducing more clunky IT systems, or striking off doctors.[43]

Box 3: Initiatives to change the system's software

- *Enhancing organisational and workplace culture*—A systematic review found a consistent association in over 62 studies between organisational and workplace cultures and patient outcomes across multiple settings.[31] Encouraging positive organisational cultures to promote better patient outcomes seems time well spent. But these are localised solutions.
- *Implementation science and improvement studies*—Studies have tested models for creating implementable interventions and for getting more research evidence into routine clinical practice.[32][33] Ideas have emerged—such as the PARiHS framework[34] and models that take a more system-wide view[32]— that identify important ingredients in change such as context, persuasiveness of the evidence, and active facilitation. But applying such models to systems has shown the limits of progress. For any intervention, the effect size that can be secured when successful (and many interventions yield no or little benefit) is modest; perhaps around 16% on average.[35-37]

Table 1 | Twenty complexity oriented enablers and insights[41 47-56]

Enabler (what to do)	Insight (why to do it)
For policy makers:	
Take multiple evaluations of what's going on	Different stakeholders have distinguishable views on what's happening in complex systems
Use system tools to uncover the system's features	Causal loop diagrams, social network analyses, role plays, and simulation can provide insights into a system's characteristics
Customise change to local contexts	Culture is unique to the context: tailoring change to the circumstances is crucial
Work with, not against, trends	Going against the currents of change is possible, but is fraught with frustration and risk—the trend is your friend
Balance standardisation and variety	There is constant tension between the push for uniformity and the need for local initiatives
Use the informal system, not just the formal system	Organisational chart thinking only gets people so far; use the informal system and its cultural and political attributes
Take every opportunity to bolster communication, trust, and interpersonal relations	Care is delivered as a system of systems, with multiple interacting networks of people at its heart—communication, trust, and relationships are key to any progress
For managers and improvement teams:	
Model the system's properties	Systems diagrams and models, computer based or hand drawn, can illuminate the dynamics of the system
Use multimethod research and improvement techniques	Randomised controlled trials or single method data gathering approaches rarely expose sufficient dimensions of complex problems
Appreciate less is more in interventions	Resist aiming to control the system through improvement strategies, projects, and change initiatives: spend more time learning about the effects of interventions than obsessing about intricate designs
Leverage complexity thinking	Immerse local teams in complexity science and systems thinking
Focus less on the individual and more on the system	It's much harder to change individuals—seek instead to nudge or perturb the system
Develop and apply feedback to people involved at every opportunity	Change and improvement is a set of feedback loops, not an event or a linear process
Look for things going right as well as those going wrong	This promotes a more balanced view of the system
For frontline clinicians:	
Adopt a new problem solving focus based on systems thinking rather than obsessing with finding "a" way forward	Search for interconnections rather than getting stuck on any one solution
Look for behavioural patterns in the system and listen to the language people use	The rich behaviours and practices of others, and the signals and messages they convey, are full of beneficial cultural and systems information
Beware excessively causal logic	Take care in attributing cause and effect—overgeneralising causation is a common error
Trade-off between constant turmoil and implementing changes before they are ready	All systems sit not far from the edge of chaos: ride the boundary, and remember the old lesson that much in clinical practice and systems is uncertain
Understand that adaptation is almost always micro and granular	Big picture transformational change is rare and is expressed differently in different settings when it does occur
Appreciate that humans have a social brain	Organisational participants are perennially tuned in to the behavioural repertoires of others: use this expertise, and be attentive to others' needs and motivations

Secondly, all meaningful improvement is local, centred on natural networks of clinicians and patients.[44] One size fits all templates of change, represented by standardisation and generic strategies, too often fail. We must encourage ideas from many sources; care processes and outcomes will vary whatever we do.

Thirdly, we must acknowledge that clinicians doing complex everyday work get things right far more than they get them wrong. We focus on the 10% of adverse events while mostly overlooking the 90% of care that has no harm.[40] Understanding errors is critical, as is seeking to stop outmoded, wasteful, or excessive care. But, if we also better appreciate how clinicians handle dynamic situations throughout the day, constantly adapting, and getting so much right, we can begin to identify the factors and conditions that underpin that success.

This leads to a fourth, related, point. A recent book[45] looking at achievements in healthcare delivery across 60 low, middle, and high income countries showed us that every system can tell multiple success stories. These range from organ donation and transplantation in Spain to early warning systems for deteriorating patients in Australia and Qatar, implementing minimum required standards in Afghanistan, making improvements in information technology in Taiwan, and embracing community based health insurance in Rwanda. These apparently disparate achievements have four common factors: begin with small scale initiatives and build up; convert data and information into intelligence and give this openly to the appropriate decision makers; remember the lone hero model does not work and that collaboration underpins all productive change; and always start with the patient at the centre of any reform measure.[46] Such inspiring ideas reflect complexity thinking and are not necessarily predicated on reductionist, cause-effect logic.

Fifthly, we could simply be more humble in our aspirations. Putting the myth of inevitable progress aside, we should recognise that big, at-scale interventions sometimes have little or no effects and that small initiatives can sometimes yield unanticipated outcomes.[47] We must admit to ourselves that we cannot know in advance which will occur.

Sixthly, and most importantly, we might adopt a new mental model that appreciates the complexity of care systems and understands that change is always unpredictable, hard won, and takes time, it is often tortuous, and always needs to be tailored to the setting. Table 1 shows 20 ways to exploit these principles. These enablers and insights need practice but can be used by anyone, including patients. For ease of application, they have been separated into complexity approaches for policy makers, managers and improvement teams, and frontline clinicians.

Conclusion

We need to turn healthcare into a learning system, with participants attuned to systems features and with strong feedback loops to try to build momentum for change. If we construct a shared outlook and draw on new thinking paradigms, perhaps we can move beyond today's frozen systems performance. A final note of caution goes to the proponents of today's most popular strategies: it's time to stop thickening the rule book, reorganising the boxes on the organisation chart, and introducing more key performance indicators—and to do something more sophisticated.

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