

Parasitic Resilience: Dynamic Symmetry and NHS Winter Pressures

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Abstract: Dynamic symmetry theory, or Edge theory, offers a distinctive way to understand why the National Health Service appears to “cope” with winter pressures year after year while simultaneously exhausting the people and institutions that sustain it. Rather than treating resilience as a vague label for systems that do not collapse outright, Edge theory treats it as a structured relationship between stabilising forces – rules, routines, infrastructures – and exploratory forces – improvisation, variability, dissent. Winter in the NHS is a revealing test case for this perspective, because it shows how that relationship can be pushed into pathological regimes while official metrics still look acceptable. This paper develops that argument and suggests how dynamic symmetry theory, informed by recent work on the Dynamic Symmetry Index, might sharpen both diagnosis and policy.

Winter, symmetry and parasitic resilience

Public discussion of NHS winter usually presents two overlapping narratives. One is a story of strain: rising emergency attendances, an ageing population, outbreaks of influenza or respiratory viruses, delayed discharges, and the cumulative effects of funding constraints. The other is a story of heroism: staff “pulling out all the stops”, hospitals “coping remarkably well in difficult circumstances”, and communities rallying to “support our NHS”. Both capture aspects of reality. Neither addresses the structural question that Edge theory raises: in what sense is this system resilient, and for whom.

Dynamic symmetry theory begins from the observation that many systems, from hearts and brains to markets and institutions, function well only within moving bands between rigidity and disorder. They rely on coupled stabilising and exploratory processes that keep them able to respond without disintegrating. In physiology, for instance, Denis Noble and others have argued that fluctuations in ion channels, heart-rate variability and gene expression are not merely tolerable noise but essential ingredients in robust function; living systems “harness stochasticity” to maintain adaptability under changing conditions. In social and institutional life, similar patterns appear when organisations balance rules and discretion, or when democracies maintain both constitutional constraints and avenues for dissent.

The NHS, especially in winter, is an archetypal edge system. It has stabilising forces in the form of national standards, staffing norms, bed numbers, protocols, capital stock, and deeply ingrained professional practices. It has exploratory forces in the form of local improvisations, informal triage, bending of rules, contingent uses of space, and the unremunerated labour of patients and families who pick up gaps in formal provision. Under moderate load, this coupling allows the system to handle shocks. Under sustained overload, however, it moves into what Edge theory would describe as a parasitic symmetric state. The macro-structure retains its outward appearance – hospitals remain open, emergency departments operate, targets are still reported – but the symmetry between stabilisation and exploration is maintained only because variability and risk are pushed into domains that are hard to see and easy to ignore: unpaid overtime, chronic stress, missed breaks, hidden near misses, postponed home care, early discharges, families silently absorbing additional caring tasks.

In that regime, the NHS exhibits what might be called parasitic resilience. It adapts, in the narrow sense that it does not collapse outright during a bad winter, but it does so by consuming the adaptive capacity of those inside it. Edge theory insists that this should not be treated as a minor nuance. A system that survives by exhausting its own substrates is not resilient in the relevant sense. It is living

off capital – physiological, psychological and social – that cannot be replenished at the rate it is being spent.

Order, disorder and the missing half of the dashboard

This diagnosis is sharpened by placing it alongside the formal work on the Dynamic Symmetry Index. The DSI paper begins from a problem familiar in complexity science: how to quantify a system's proximity to an "edge-of-chaos" regime without relying on domain-specific, hard-to-calibrate measures. It proposes that adaptability and innovation often peak when measures of order (regularity, predictability, coherence) and measures of disorder (randomness, unpredictability, diversity) are both moderate and appropriately balanced. The Index operationalises this by defining normalised order and disorder metrics, O and D , in the interval $[0,1]$, and combining them into a single quantity that is high when O and D are both in a mid-range and roughly matched, and low when either dominates. The precise functional form can vary, but the logic is clear: extreme order (high O , low D) and extreme disorder (low O , high D) correspond to low adaptability, while intermediate, balanced regimes correspond to high adaptive potential.

Crucially, the DSI framework does not prescribe which metrics must represent order and disorder. It sets criteria for their choice: they must be normalised, complementary rather than trivially inverse, and sensitive to dynamical features that matter for the system's performance. Examples include synchrony indices and multiscale entropy for neural systems, trophic coherence and biodiversity measures in ecology, graph modularity and communication entropy in organisations, or autocorrelation and transaction entropy in financial markets.

Applied to the NHS, and to winter in particular, this suggests a way to reframe performance monitoring. Existing dashboards focus heavily on order metrics: bed occupancy, four-hour emergency department performance, waiting list size, theatre utilisation, and budget adherence. Disorder metrics – near misses, "no-harm" incidents, staff sickness, overtime, missed breaks, agency dependence, corridor care, out-of-area placements, readmissions and handover delays – are often tracked, but they tend to be secondary, internally focused, or only partially integrated into public reporting. Dynamic symmetry theory argues that this separation is untenable if resilience is the goal. The question is not whether order metrics are within tolerance; it is whether the joint pattern of order and disorder corresponds to a regime in which stabilising and exploratory forces remain usefully coupled.

For example, a trust running at 88% occupancy with modest, stable near-miss rates, acceptable overtime, and limited agency use is arguably operating within a viable band: order is high but not suffocating, disorder is present but not escalating. A trust running at 95% occupancy with sharply rising near misses, frequent corridor care, growing staff sickness and heavy agency dependence is not in a similar position, even if the headline emergency access target is only marginally worse. From an Edge-theory perspective, the latter system has already slid into a regime in which adaptive work is taking place in uncontrolled, undocumented ways; the formal structures are out of sync with the realities of improvisation.

Current winter reporting practices, which often foreground single indicators such as four-hour performance or headline occupancy, obscure this shift. They encourage managers and politicians to treat visible deviations from target as aberrations to be corrected, rather than as signs that system dynamics have changed qualitatively. Dynamic symmetry theory suggests that, instead, winter dashboards should be explicitly joint: occupancy curves should be read alongside near-miss and staff-strain curves; elective throughput should be interpreted in the context of readmissions and community demand. A DSI-style index is one way of formalising this; even without computing such

an index, the underlying discipline – never looking at order without disorder, nor disorder without order – would mark a significant change.

Bands, not thresholds: making Amber meaningful

One of Edge theory's contributions is its insistence on bands rather than sharp thresholds. Many operational frameworks work with binary or stepwise categories: on target or off; Green, Amber, Red, Black. In practice, however, these categories are often either underused or overused. "Green" may describe virtually no days in winter; "Amber" may become the default, with "Red" reserved for the rare moments when the system visibly tips into chaos. The result is a kind of escalation fatigue: labels lose their discriminating power, and staff learn that nothing much happens when status changes.

Dynamic symmetry theory invites a different treatment. If there are bands of viable behaviour, those bands should be defined and governed explicitly. In a winter context, that means moving beyond occupancy alone. An Amber band might be defined by a region in the joint space of order and disorder metrics: for example, occupancy consistently between 90% and 94%, near misses 20–30% above baseline, staff missing breaks on a specified fraction of shifts, and modest but rising agency use. Red might denote occupancy above 94% coupled with sharper increases in near misses, corridor care becoming routine, significant handover delays, and staff sickness trends worsening.

In such a scheme, Amber is no longer "everything that is not fine but not yet catastrophic"; it is a structured band in which the system can operate for limited periods, with known costs and automatic responses. Entry into Amber would trigger pre-agreed measures: activation of small, fully staffed surge capacity; short-term adjustments to elective activity prioritised by clinical urgency; redeployment of staff from non-critical tasks. Prolonged residence in Amber would itself be treated as a failure of design rather than a sign of stoicism, requiring regional and national intervention. Red would signal that dynamic symmetry has broken down to such an extent that routine practice is unsafe; drastic, time-bounded measures would follow.

This way of thinking has two advantages. It aligns managerial incentives with early, honest escalation rather than with cosmetic stability. And it makes visible the difference between transient excursions beyond viable bands – which are probably inevitable in harsh winters – and permanent occupation of those regions, which is a strong signal that the system's envelope is too tight.

Moving slack out of bodies and into structures

Behind these technical shifts lies a more fundamental Edge-theory claim about slack. In many modern institutions, slack has been treated as a sign of waste. The right ambition, it is said, is to "sweat the assets": keep beds full, rotas tightly scheduled, theatres booked to capacity, and staff "fully utilised". Under favourable conditions, such leanness can indeed produce impressive efficiencies. Under adverse conditions, it leaves no room for the exploratory processes that support adaptation.

Dynamic symmetry theory reframes slack as a structural precondition for healthy dynamic symmetry. It is not the opposite of efficiency; it is what allows local exploration without global breakdown. In the NHS, however, the slack that does exist is mostly informal and embodied. It lives in the willingness of staff to stay late, in the quiet adjustments of families who shoulder extra care, in the unrecorded micro-delays that patients tolerate.

One way Edge theory could "change the world" of healthcare, to borrow the earlier question, is by shifting the moral and political status of slack. If winter planning were judged on whether systems

could maintain acceptable dynamic symmetry without relying on hidden human reservoirs, then structural slack – spare staffed capacity, flexible intermediate care, surge-ready primary and community services, realistic rosters, protected time for recovery – would be treated as infrastructure, not luxury. The question would cease to be “how lean can we get away with being?” and become “who is currently carrying the variability, and is that justifiable?”.

This has obvious implications for funding. It also has implications for design. For instance, if intermediate care capacity is expanded in a way that genuinely reduces readmissions and shortens unsafe hospital stays, the system’s working band widens: the same winter demand can be handled with less recourse to corridor care and fewer frantic workarounds. If, by contrast, nominal “flex beds” are created without staffing and support, the apparent slack is illusory; dynamic symmetry is no better than before. Edge theory emphasises that these are not cosmetic differences. They change where, and on whom, the edges fall.

Resilience as an ethical category

A further distinctive feature of Edge theory, as articulated in Rattigan’s *Edge of Chaos*, is that it does not treat resilience as a purely descriptive category. It carries an ethical charge. If ecosystems, economies and political orders all rely on maintaining workable bands between rigidity and disorder, then driving them far outside those bands is not merely unwise but wrongful. The Schweitzer Institute’s work on environmental ethics, mentioned in the preface, takes this seriously by framing the preservation of dynamic symmetries in ecological and institutional systems as a moral responsibility, because those symmetries enable systems to absorb shocks without collapsing on the most vulnerable.

In the NHS, the ethical stakes are obvious. When winter plans rely on repeated extension of emergency capacity without matching staff and supporting services, when staff sickness spirals and is treated as “regrettable but inevitable”, when patients wait in ambulances for hours because there is no bed available, the question is not only whether the system is performing well. It is whether the burden of maintaining an appearance of order is being unfairly placed on certain groups: front-line staff, people with chronic illnesses, unpaid carers, those who lack the social capital to navigate bottlenecks.

Dynamic symmetry theory gives these concerns a sharper structure. It allows advocates to say: this system is not just under pressure; it is operating in a parasitic regime where dynamic symmetry is preserved only by forcing some people to live on their edges so that others can treat the service as stable. That is an ethical failure even if crude outcome metrics, taken alone, look tolerable.

Potential objections and limits

No theoretical framework is without limits. Several objections arise readily.

One is that the NHS is already saturated with metrics and escalation protocols, and that another layer of abstraction will not help. There is some force to this. The danger of any index, including DSI-style constructions, is that it can become a target to game rather than a tool for thinking. Dynamic symmetry theory tries to mitigate this by insisting that order and disorder metrics be chosen carefully and interpreted with domain knowledge, but the risk remains.

A second objection is that winter pressures are ultimately about resource constraints and demographic trends, and that focusing on “dynamic symmetry” could distract from straightforward calls for more funding and staff. Edge theory does not deny the importance of resources. It does suggest that even with more generous funding, systems can be designed in ways that either respect

or abuse dynamic symmetry. A well-funded system can still be brittle if it suppresses all variability; a leaner system can sometimes be more adaptable if it allocates slack wisely. Both dimensions matter.

A third objection is that Edge theory might encourage technocratic optimism: the belief that, with the right measurement and design, complex human systems can be tuned to sit permanently in optimal bands. The chapters on the limits of Edge theory in *Edge of Chaos* push against this. They emphasise that viable bands move over time, that trade-offs are inescapable, and that different actors experience the same regime differently. What counts as “workable” for a minister under media scrutiny may be intolerable for a junior nurse; what counts as “too loose” for a hospital manager may be experienced as basic breathing space by over-scheduled staff.

Dynamic symmetry theory does not dissolve these conflicts. It offers a way to describe them more precisely, and to reveal when rhetoric about resilience is masking structural exploitation.

Conclusion

“Winter on the edge” has become a familiar description of the NHS. Dynamic symmetry theory takes that phrase at face value and asks what it would mean to move systems back into workable bands, or at least to stop pretending that permanent residence beyond them is normal. When combined with the formal tools of the Dynamic Symmetry Index, it suggests a set of shifts: from single to joint metrics; from sharp thresholds to explicit bands; from human to structural slack; from descriptive to ethical understandings of resilience.

These shifts will not, on their own, secure the resources that winter care requires. They may, however, change the terms of debate. It becomes harder to praise staff for “coping” when dynamic symmetry analysis shows that coping has already tipped into parasitic resilience. It becomes harder to treat winter crises as accidents when order–disorder patterns reveal that systems have been deliberately run in regimes known to be brittle.

Edge theory does not offer a comforting story. It does offer a disciplined way of talking about where edges lie, whose feet stand on them, and what would be required to move them. For a health service that prides itself on being there “from cradle to grave”, that discipline may be one of the few practical resources left that does not depend on exhausted goodwill.

References and further reading

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