

Untangling complexity as a health determinant: Wicked problems in healthcare

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Abstract:

As the healthcare system has modernized, it has also become rich with complexity. This complexity continues to foster the creation of *wicked problems* that, at first consideration, appear inherently insoluble. To compound matters, policy and decision-makers continue to view the healthcare system in a reductionistic and linear manner. The following article advocates that all stakeholders within the system (policy-makers, providers, and patients) become comfortable with complexity as a determinant of health, and offer tools for productively working with complexity, instead of trying to solve it. These tools include: complexity heuristics, adjusting to an emergent decision-making paradigm, and easing anxiety associated with ambiguity and paradox by becoming antifragile. By adopting these methods, complexity, as a health determinant within the Canadian healthcare system, can be effectively handled, thus leading to sustainable and scalable interventions, strong patient-partners in care, and efficient use of monetary and human resources.

Introduction

The structure of healthcare in Canada appears to balance on a precipice as successive provincial governments restructure the delivery of health care and providers grapple with multiple macro-level challenges. Since the beginning of the century, large scale challenges such as an aging population [1,2], tighter fiscal constraints [3,4], and disruptions to service provision [5] have been abundant. These challenges have contributed to the spiralling cost of healthcare in Canada (at a cost of \$264 billion in 2019, and forecasts of even higher costs in 2020) with middling patient outcomes [3]. In addition, the cyclical political environment and high expectations from the public means that there is no catch-all solution. As the layers of data, technology, and administration have accumulated, so too, has the complexity of the healthcare system [6,7]. At the heart of this complexity are so called *wicked problems* [8]. First formally described in *Management Science* in 1973 by Horst Rittel and Melvin Webber, wicked problems contain several aspects which makes them unsolvable including: connection to other problems, range and variety of stakeholder opinion regarding proper action, economic burden, and imperfect or paradoxical knowledge for best action. Consequently, the operating environment of healthcare provision has created a strained system at every interface – from reducing wait times, to constraining operations costs [3] – ultimately, wicked problems have significantly hindered our ability to provide healthcare to Canadians.

We believe that a key to untangling these problems is not only recognising them, but also by accepting complexity as foundational to the healthcare process to enable the system to perform and meet the additional strain it will face in the 2020s. To do so requires adopting certain tools and heuristics to ease the transition of moving from a linear and stable environment to a complex and ambiguous one.

Health determinants primarily focus at the individual-level, with a neo-liberal assumption of individual responsibility, ignoring the role of systems [9]. This individualistic approach is even evident in the implementation of the social determinants of health, where public health messaging places responsibility for change at the local-level. In this short article we assert that positioning our discussion of health determinants within a framework of complexity will allow for adoption of new ideas, new approaches, and new solutions to the myriad of challenges facing current health systems [10,11].

Procedural vs. conceptual problem-solving

Evidence-based policy has long been the gold standard for constantly improving and informing service provision under the Canada Health Act. Systematic reviews and randomized control trials are commonly referred to when amending health policy or crafting novel health strategy, as rigorous methodology is a backbone of the evidence-based approach

[12]. Once enough evidence has accumulated, rules are dictated for best practice, which are then applied in a linear fashion (outcome Y is solved by intervention X, with measurable indicators Z and W [12]). Rules help turn a conceptual problem into a procedural one – where the solution can be executed by simply following a proscribed methodology; and not worrying about the accompanying context. Healthcare policy, as well as implementation techniques, have tried to capitalize on this linear way of thinking [13,14]– assuming the healthcare system operates in a bounded, rule-driven environment [15]; this is not the case.

The healthcare system operates in a much more fluid environment. This “zone of complexity” (see Figure 1; [16]) fosters the creation and growth of wicked problems, as the rules of operation in the interdisciplinary healthcare system are constantly changing, and it is not immediately clear how rules relate to outcomes [6]. A great example of policymakers’ failure to understand the important difference of working in a zone of complexity is the \$20.6 billion-dollar implementation of the National Programme for Information Technology (NPfIT) by the NHS in England [15]. While this example is borrowed from a British context, there are many interesting parallels to the contemporary Canadian system. The largest being the similar guiding principles of healthcare provision within a universal healthcare paradigm. Secondly, following the COVID-19 pandemic, the interest in virtual care and clinical information systems has since exploded. Implementing pan-national electronic health initiatives is difficult, in part due to lack of precedent. Canadian implementors would be wise to study this case as interest in electronic health begins to yield tangible interventions. Lastly, this is a pre-emptive example of policy-makers sticking to an evidence-based, linear approach even in the face of failure and complexity which

can also be seen in the limited large-scale Canadian eHealth projects, such as Nova Scotia’s MyHealthNS [17].

The NPfIT was implemented from 2003 to 2010 and saw limited overall success (largely measured by the uptake of clinical information systems in small, disjointed private practices). The entirety of the implementation process was rife with technical, operational, economic, and political complexities which resulted in poor uptake of electronic health initiatives under the national program. Despite this, those at the helm of the implementation process continued to defend – and fund – the program, believing there was an invisible “tipping point” in which the entirety of the system would unexpectedly apply the changes they were advocating. This change never came, and the implementation debacle of the NPfIT was a major point of contention heading into the 2010 UK elections. Ultimately, the election resulted in a hung parliament, and required the coalition of the Conservative Party and Liberal Democrat Party – two polar political entities. Even with the rhetoric of altering or abolishing unpopular aspects of the NPfIT, the coalition did nothing. Further evidence that even at the highest levels of leadership, and with massive monetary stakes, not appreciating the complexity of the healthcare environment, and adjusting the tools to make decisions within it, leads to unmitigated collapse [15].

Continuing to engage in rational decision-making while not acknowledging the complexities of large-scale implementation was flagged as a contributing factor for the relative failure of the NPfIT. Figure 2 [16] explores an appropriate paradigm for decision-making while working in a zone of complexity: emergent decision-making. Emergent decision-making requires individuals to acknowledge that paradox and ambiguity are common in a complex adaptive system, and allow for the engagement of wicked problems in a

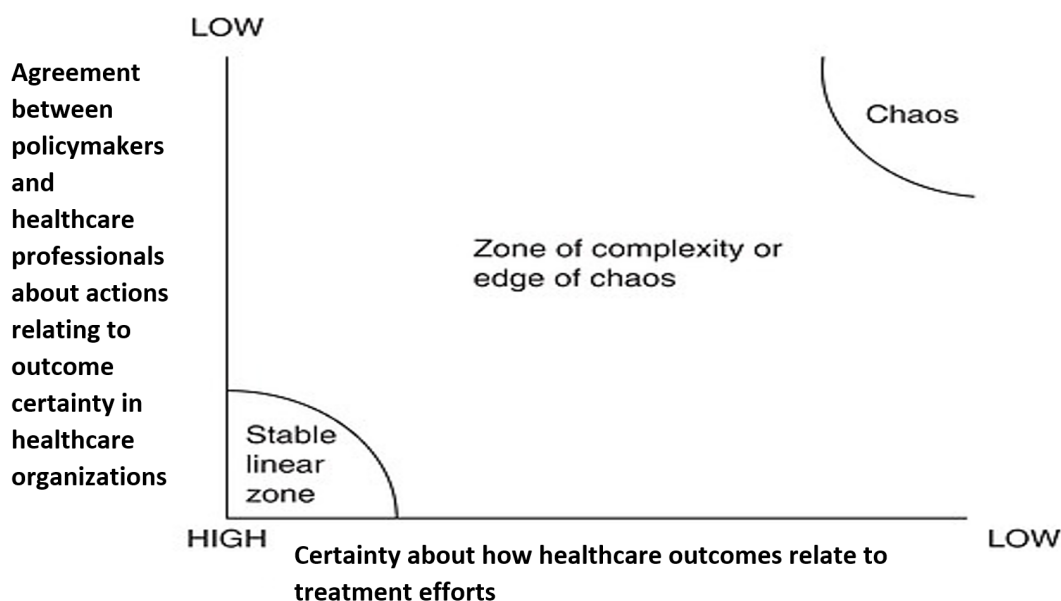


Figure 1 | A representation of organizational categories as a function of certainty of outcomes and inputs and agreement of decision-makers. Adapted from Stacey et al.

productively holistic manner, rather than the positivist method of attempting to break them down piecemeal. These methods have been shown to be impactful when used in smaller settings, such as clinicians deciphering medication dosage [18], and has even been shown to occur naturally within cell signalling pathways [19].

Rational decision-making is decidedly linear. It posits that intervention X will address outcome Y, and be measurable by some variable Z. Using this type of logic has contributed to Canada being a “nation of pilot projects” [20], with a vast majority of programmes failing to scale up and become sustainable at a broader level of healthcare organization. At a time where all resources (both monetary and human) need to be maximized, it is a tragedy that so much time, money, and effort is wasted in the pilot project stage of the healthcare arena. Utilizing emergent decision-making could help implementors and policymakers adjust their beliefs while working in an interdisciplinary, complex environment [21] such as the healthcare system.

Grappling with wickedness: Tools for dealing with complexity

There has been a steady increase in the study of wicked problems and complexity across a diverse range of disciplines [22], and decision-makers within healthcare are starting to take notice as well. To thrive in the complex and dynamic environ-

ment of healthcare policy, provision, and front-line treatment, behaviour and attitudes require a fundamental shift. This shift will not occur all at once - akin to the “tipping point” policymakers sought with the NPfIT - but gradually, and with great effort [23].

One of the ways we can become more comfortable with complexity and wicked problems is developing heuristics which can be relied upon in unfamiliar situations. In his book, *Thinking, Fast and Slow*, Daniel Kahneman lays out two systems humans rely upon to reason [24]. Heuristics are a portion of thinking generally referred to as “system one”. This system is distinguished by its quick, emotional, and intuitive foundation. The second system is characterized by slower, more deliberate thought, necessitating the analysis of several streams of information, and rectifying that with internal values and morals. While heuristics have their downsides (no shortcut is right with 100% accuracy), they are still incredibly useful in everyday life, and many people use them without realizing [25]. A potential drawback of heuristics includes stereotyping [26], thus, guarding against this is important in maximizing the development of heuristics to approach wicked problems, making them more easily digestible for both the public, practitioners, and policymakers.

Rogers et al. offered some insight on complexity heuristics in 2013. They highlighted three “habits of mind” which individuals should practice in order to engage productively with complexity and complex systems [27]. The first

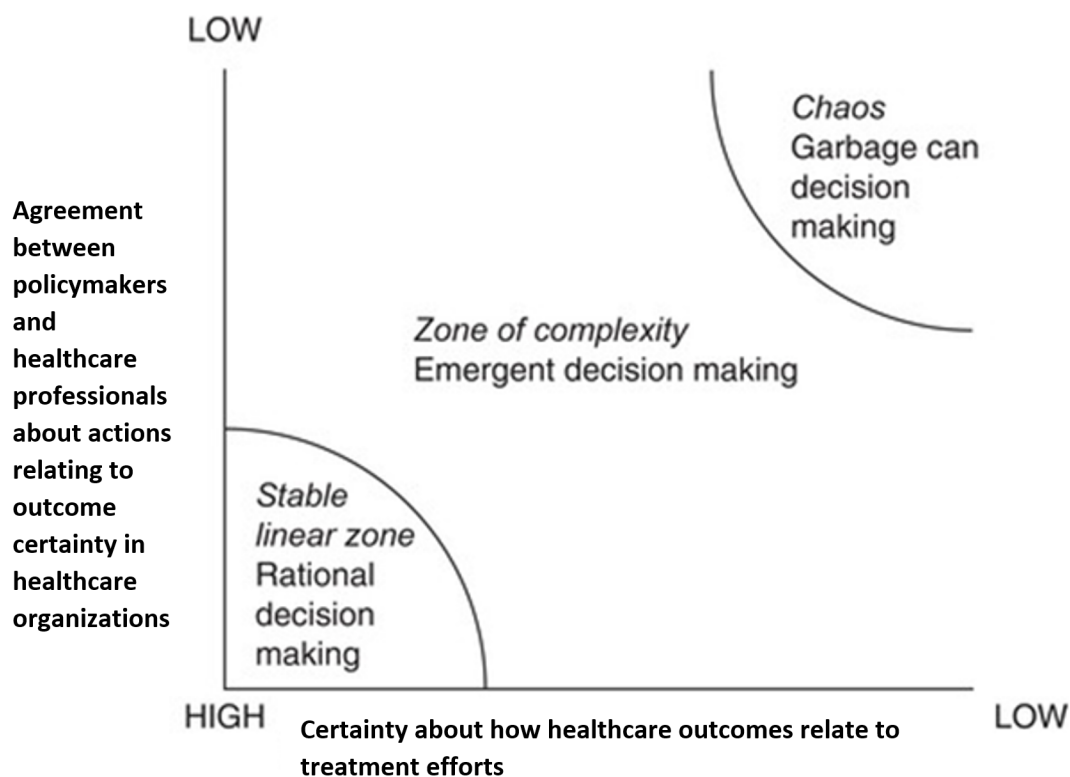


Figure 2 | Decision-making paradigms of each organizational category. Garbage can decision-making is truly random, rational decision-making is truly linear. Emergent decision-making exists in between. Adapted from Stacey et. al.

habit of mind, or heuristic, is *openness*. To be open, hold your strong opinions lightly [and encourage others to do the same], embrace emergence, expect ambiguity and paradox, and value diversity – among a long list of other contributing factors. The second is *situational awareness*, or the ability to assign appropriate appreciation to scale and context. To improve your situational awareness one can consider the importance of relationships between entities (not just the entities onto themselves), reflect often (individually, collectively, formally and informally), and cultivate diverse feedback mechanisms [avoiding echo-chambers and group think]. Lastly, a *healthy respect for the restraint/action paradox* is a heuristic characterized by the ability to act small and local [avoiding large system wide interventions], not being afraid of intelligent mistakes (as they lead to learning), and avoiding the paralysis of uncertainty – accepting that an action undertaken in a certain context has its risks and rewards and act accordingly.

The above heuristics offer basic behaviours which can help navigate complex systems. Many of them go against the contemporary norms seen in mass media and social media. Advocating for strong listening, loosely held opinions, and embracing ambiguity seem out of place in the urgent, partisan, and absolute environment we find ourselves in in 2020; this, of course, has had its influence on policy, and by extension healthcare. The saying “patience is a virtue” has never rung more true – and should be recited *ad nauseum* as we wait to see if the above habits of mind can help the healthcare system meet the rigorous needs of Canada’s future.

Working downstream instead of swimming upstream

Another way to tackle these wicked problems is to actively work *with* complexity, rather than trying to *solve* it. One potential avenue to explore this is by creating components of the system, both people and interventions, more antifragile. Antifragile entities stand to gain stability from volatility, rather than be harmed by it [28]. Antifragility has been used in other disciplines as a guiding principle in project design [29], as well as in healthcare [33]. It is intuitively appealing because it aligns with the holistic, realist approach to health implementation advocated by some academics to help an overburdened healthcare system meet demands. Interventions are antifragile by capitalizing on different functions at the project design level (such as starting small, ensuring optionality, and non-linear evaluation), and maximizing the probability they will thrive in a given healthcare environment. Thriving projects may also have an easier time scaling to other contexts and proving sustainable within these new spaces. The reputation Canada has of a nation of perpetual pilot projects could gradually change as stale and deterministic initiatives are replaced by more agile and innovative interventions.

Besides developing policy and projects, which can help unravel these wicked problems, the people within the system (known as *agents*) must become antifragile as well. Mentioned in the heuristic of openness, one must be comfortable with am-

biguity and embrace emergence. Patients also must find their voice and push for a patient-partnered system where they have just as much power as the physician or nurse in their treatment. In his book, *Range*, David Epstein posits that generalists fair much better than specialists, even though the world is generally specialized [30]. This is especially true in healthcare, as specialization is evident at all levels of the healthcare system. Patients, providers, and policymakers need to have significant breadth of knowledge when interacting with one another to create a system where paradox, if not understood, is at least tolerated and worked with. Sufficient knowledge, habits of mind, and advocacy help smooth a system smothered in complexity.

Conclusion

An ignorance of wicked problems and system complexity by policy-makers, planners, and politicians have contributed to an unsustainable healthcare system and a misunderstanding of how to appropriately address the foundational determinants of health. In order to improve how health systems respond to macro-level (global, national, regional) and micro-level challenges (institution, community, individual), a complex systems approach is necessary. Wicked problems must slowly be unwrapped, allowing a breath of fresh air into a labouring healthcare system and a re-orientation away from linear-thinking and one-size-fits-all approaches to major issues. To do so will not be quick, nor easy, but there are some clear and simple practices we propose to facilitate that change.

First, moving policymakers from a rational decision-making paradigm [31], most suitable for linear systems, to an emergent one tailored for the inherent complexity in healthcare system is an essential start. A good example is the response to potential pandemic threats. In the early days of the transmission of a novel virus, policymakers and health professionals must make critical decisions with limited knowledge. Decisions pertaining to transmission method, incubation rates, and effective drug regimens are not overtly apparent – and instead practitioners must settle for being vaguely right instead of precisely wrong. Emergent decision-making in this case is the only available pathway, and it has performed well in the face of SARS, MERS, and NCoV-2019 [32].

Second, establishing habits of mind such as openness, situational awareness, and respect for the restraint/action paradox can help policy-makers and planners become more comfortable in a complex environment. For example, as medicine moves from a patient-centered model into a patient partnership one, this necessitates greater transparency and communication between a care team and the patient. In order to productively engage in patient partner techniques, practitioners would be wise to keep the habits of mind discussed close at hand to create a reciprocal relationship with their patient-partner.

Third, working with complexity instead of against it could increase the uptake of initiatives and pilot projects to improve the system. This example can be seen in the world of

electronic health, where eHealth projects in rural communities that are designed to be inherently antifragile – or account for complexity within the design phase – have a greater chance of scaling and sustaining in multiple rural contexts [26].

Essential to the implementation of the above practices is the necessity to include the basics of complexity in graduate education programs, whether in medicine, public health, or foundational health science research. The tension for change is high in Canada, and the tools outlined above could help bring it about. One thing is for certain: 2020 and beyond will test the healthcare system to its limits – how it responds is up to us.

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