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‘Complexity-compatible’ policy for integrated care? Lessons from the implementation of Ontario’s Health Links

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Abstract

Complex adaptive systems (CAS) theory views healthcare as numerous sub-systems characterized by diverse agents that interact, self-organize, and continuously adapt. We apply this complexity science perspective to examine the extent to which CAS theory is a useful lens for designing and implementing health policies. We present the case of Health Links, a "low rules" policy intervention in Ontario, Canada aimed at stimulating the development of voluntary networks of health and social organizations to improve care coordination for the most frequent users of the healthcare system. Our sample consisted of stakeholders from regional governance bodies and organizations partnering in Health Links. Qualitative interview data were coded using the key complexity concepts of sensemaking, self-organization, interconnections, coevolution, and emergence. We found that the complexity-compatible policy design successfully stimulated local dynamics of flexibility, experimentation, and learning and that important mediating factors include leadership, readiness, relationship-building, role clarity, communication, and resources. However, we saw tensions between preferences for flexibility and standardization. Desirable developments occurred only in some settings and failed to flow upward to higher levels, resulting in a piecemeal and patchy landscape. Attention needs to be paid not only to local dynamics and processes, but also to regional and provincial levels to ensure that learning flows to the top and informs decision-making. We conclude that implementation of complexity-compatible policies needs a balance between flexibility and consistency and the right leadership to coordinate the two. Complexity-compatible policy for integrated healthcare is more than simply 'letting a thousand flowers bloom'.

Keywords: Canada; complex adaptive systems; healthcare policy; integrated care; networks; care coordination

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Introduction

Integrated care interventions encourage linkages among professionals and services across the health and social care continuum to improve patient outcomes and contain costs. (Evans, Baker, Berta, & Barnsley, 2013; Kodner, 2009). When caring for individuals with multiple co-morbidities, these interconnections are especially important to overcome system fragmentation and shift focus away from a single-disease orientation (Tinetti, Fried, & Boyd, 2012).

Despite increased effort to better integrate care, outcomes remain varied (Bardsley, Steventon, Smith, & Dixon, 2013; Low, Yap, & Brodaty, 2011; Wodchis, Dixon, Anderson, & Goodwin, 2015). Evaluations of successful integrated care programs show that there is no single approach to integration; we see both cases of bottom-up initiatives as well as top-down structural change (Wodchis et al., 2015). Attempts to identify success factors have highlighted the importance of factors at both the macro-level (Ashton, 2015) and the local context (Friedman & Goes, 2001; Ling, Brereton, Conklin, Newbould, & Roland, 2012). Integrating care needs to be supported by policy action, while ensuring that initiatives are context-specific, implemented from the bottom-up, and focused on the front-lines (Evans, Grudniewicz, Baker, & Wodchis, 2016; Wodchis et al., 2015).

In this paper, we argue that a complexity science perspective can provide important insights on policies aiming to stimulate integrated care solutions from the bottom-up. Complex adaptive systems (CAS) theory views healthcare as numerous sub-systems characterized by diverse agents that interact, self-organize, and continuously adapt (Cilliers, 1998). Here, we examine the extent to which a complexity-compatible policy in the area of integrated health and social care stimulated new and productive interconnections, sensemaking, self-organization, emergence, and co-evolution. We

contribute to the literature by operationalizing these high-level CAS theory concepts and examining how they manifest (or fail to manifest) in response to a complexity-compatible policy.

We present the case of 'Health Links', a policy intervention by the Ministry of Health and Long-Term Care (the Ministry) to improve care coordination in Ontario, Canada for the most frequent users of the healthcare system. The Health Links were implemented as a low-rules policy, essentially taking a complexity-compatible approach to stimulate grass-roots solutions to local problems. The policy encouraged new relationships between organizations across medical and social service settings to integrate care for patients with complex needs and frequent health system utilization.

Following an introduction to CAS key concepts, we provide an overview of the CAS literature on integrated care and bottom-up policy implementation, and the results of our analysis of interviews with Health Links stakeholders. We then discuss how our exploration of the case of the Health Links sheds light on complexity-compatible policies.

Complex Adaptive Systems

There has been increasing interest in the use of CAS theory as a framework for understanding the implementation of health policy initiatives (Geyer & Cariney, 2015; Kernick, 2004; Kickert, Klijn, & Koppenjan, 1997; Rhodes & MacKechnie, 2003). The term 'complex' signals diversity and multiple connections between components and is used to describe systems that cannot be understood in their entirety as a result of many interacting variables and forces (Edgren & Barnard, 2012; Zimmerman, Lindberg, & Plsek, 2008). CAS are characterized by diverse agents that interact with each other and can spontaneously self-organize without external direction or influence (Cilliers, 1998). The

continuous adaptation of agents and their relationships contribute to novel and unpredictable behaviours which no single agent can know or control (McDaniel & Driebe, 2001). Since CAS rely on local sensemaking to devise solutions, attempts to force or prescribe change in CAS can be de-stabilizing or counter-productive (Olson & Eoyang, 2001). The emergent design of initiatives, according to a CAS lens, should enhance scope for novel and productive interconnections, sensemaking, self-organisation, emergence, and co-evolution (See Table 1)

Complexity, Integrated Care, and Policy Implementation

The CAS perspective is particularly pertinent to the study and implementation of integrated care. Integrated care initiatives attempt to create coherence in fragmented health and social systems to increase efficiencies, quality of care, and patient satisfaction (Kodner, 2009). These initiatives require adaptation to local contexts, the building and maintaining of relationships, and facilitation of communication (Edgren & Barnard, 2012). It is, therefore, not surprising that the CAS perspective has been applied to integrated care problems in the literature (Edgren & Barnard, 2012; Nugus et al., 2010; Tsasis, Evans, & Owen, 2012). Integration of health and social care is well suited for complexity analysis given the "mix of the predictable and unpredictable" in both systems, resulting in the highest degree of complexity (Edgren, 2008).

CAS theory also has an increasing profile in public policy, public management, and policy implementation literature (Cairney, 2012; Geyer, 2012; Haynes, 2015; Mischen & Jackson, 2008; Room, 2011; Sanderson, 2006). A range of scholars have argued that policy design and implementation processes consistent with a CAS approach are more likely to lead to better results, and avoid pitfalls of 'mechanistic' and 'linear' approaches (Geyer, 2012). Public policy literature in general, and policy implementation literature in particular, contains a well-established tradition of

critique of 'linear' and 'top-down' approaches to policy design and implementation (Tenbensel, 2015). Examples include a shift from implementing policies from the top-down to incorporating 'bottom-up' strategies (Sabatier, 1986), incorporating space for iterative learning from policy experience, and considering unintended consequences (Sanderson, 2006; Schofield, 2001).

As such, the recommendations from CAS theory regarding policy implementation appear to align with a 'bottom-up' approach. This approach emphasises maximizing the autonomy of implementers, to which 'higher-up' agents then evaluate and learn from multiple implementation experiences. What is unclear from these recommendations, however, is how learning from the bottom can or should be channelled to 'the top' to produce effective policy implementation. This issue reverses the central question in top-down policy implementation research which tries to follow the flow of learning downwards from policy decision to implementers (Pressman & Wildavsky 1973).

A 'Complexity-Compatible' Integrated Care Policy: The Implementation of Health Links in Ontario, Canada

To address our research aim, we explored the Health Links, a case of a complexity-compatible integrated care policy in Ontario, Canada. Health Links were introduced in 2012 by the Ministry of Health and Long-Term Care to improve care for seniors and people with complex conditions by bringing together healthcare providers to better coordinate care. With support from Local Health Integration Networks (LHINs), regional governance bodies that fund and coordinate services within their geographic boundaries, interested organizations came together to form a voluntary network, called a 'Health Link.' Readiness assessments and business plans were submitted to the Ministry for approval and the Ministry provided one-time seed funding of approximately $175,000 for each

approved Health Link. Starting with 19 early adopters, the initiative had grown to 82 approved Health Links (as of January 2017) across all 14 LHINs, each in various stages of implementation and many still in early and planning stages. Each Health Link is led or co-led by healthcare organizations such as primary care practices, hospitals, Community Care Access Centres (CCACs) (regional agencies providing home care and coordination services within LHIN boundaries) and social service organizations. The Health Links do not replace existing, or provide new, healthcare services; instead, they provide an added coordinating service that aims to increase access and bring together patients' health and social care teams.

We argue that the Ministry took a complexity-compatible approach to the design and implementation of the Health Links. The implementation was announced as a low-rules approach meant to stimulate new, voluntary networks (Angus & Greenberg, 2014). The policy was based on Accountable Care Organizations in the US and a local study of informal geographic networks by Stukel and colleagues, who argued that health reform initiatives should exploit naturally-occurring provider relationships (Stukel et al., 2013). Network design was intentionally left up to the lead and partner organizations, including the network structure, patient identification and recruitment, and how to best care for patients with the highest needs within their geographic boundaries (Angus & Greenberg, 2014). Language in official documents and presentations aligns with a complexity-compatible approach; for example, the initiative was described as a "voluntary, self-organizing system" (Hamilton Niagara Haldimand Brant LHIN) that made use of a "flexible approach" with "provincially driven objectives; locally driven solutions" and the use of "local solutions" with no "single defined group of providers" (Angus & Anderson, 2013). In this way, the Ministry attempted

to balance structure with flexibility to allow for change through improvisation given the multitude of variables present in health and social care systems (Edgren & Barnard, 2012).

Methods

We interviewed a sample of clinicians and administrators involved in implementing and managing Health Links in Ontario between August 2014 and February 2015 as part of a project examining organizational factors in the implementation of integrated care (Evans et al., 2016). At the time of the study, the 56 approved Health Links were in various stages of implementation, ranging from early planning stages to operating for two years. Interviews were conducted in two phases by AG and JE. Participants were told the purpose of the study was to understand the early implementation of the Health Links. In phase 1, we recruited LHIN employees identified from a Ministry mailing list of LHIN personnel working with the Health Links. LHIN representatives (primarily senior managers and directors of systems planning, innovation, or strategy) were asked to describe the LHIN's approach to implementation and support of the Health Links, what is working well and why, what challenges the organizations have experienced, and what similarities and differences exist between Health Links.

Upon completion of Phase 1 interviews, we asked participants to recommend clinicians and administrators actively working in Health Links within their LHIN, including physicians, allied health professionals, care coordinators, executives, and administrators across health and social services organizations. In phase 2, we stratified recommended individuals by Health Link and profession and selected participants to ensure breadth of representation. We asked representatives to outline what it has been like to work as part of a Health Link, how they felt their organization fits

with partnering organizations, what makes an organization a good candidate to partner, and what are the key organizational characteristics that contribute to success. We recruited both LHIN and Health Link stakeholders to get a breadth of perspectives at the meso and micro levels of implementation. The interviews were conducted with 1-4 individuals over the telephone or in person, depending on the location of the participants, and were audio recorded and transcribed verbatim. Research ethics board approval was granted and informed consent was given prior to the start of the interview.

Interview transcripts were qualitatively analysed in NVivo11 using an iterative, deductive process of thematic coding (Braun & Clarke, 2006; Hsieh & Shannon, 2005). Coding was conducted in duplicate by AG, JE, CSG and informed by discussions among AG, JE, CSG, TT. To create the initial codes for this study, JE and TT summarized the complexity literature and identified key concepts and preliminary definitions. Several interviews were deductively coded for these themes followed by a team discussion. Due to the rich theoretical nature of CAS theory, it was challenging to operationalize the concepts, particularly in regards to level of analysis (i.e., network, region/LHIN, province) and categorize participant utterances under specific concepts. As such, we coded only two interviews at a time, independently and in duplicate, then met to discuss and refine themes. Coders made note of their own possible biases and discussed as a team where participant utterances may have been misinterpreted as a result. This process was repeated four times, until definitions were finalized (see Table 1). To ensure concepts were accurately captured, all interview data were then re-coded in duplicate with the finalized definitions. For coding purposes, we differentiated between (a) self-organization and (b) emergence and co-evolution by focusing the former on the network-level (within Health Link networks) and the latter on the LHIN- and provincial-levels.

The coders reviewed each interview together code by code and resolved disagreements with discussion and consensus. The coded data were then analysed and presented back to the team by AG using framework analysis (Gale, Health, Cameron, Rashid, & Redwood, 2013), which summarized data into cells where each column was a theme and each interview a row. Results were interpreted through discussion with the full research team.

Results

We conducted 37 interviews with 55 participants. In phase 1, we interviewed 26 managers and administrators from all 14 LHINs. In phase 2, we interviewed 29 participants representing 38 of the 56 then-active Health Links across 14 LHINs (some participants worked with more than one Health Link). Participants were recruited from a variety of organizations including primary care practices (48%), hospitals (35%), and community-based organizations (17%). The majority of participants worked in the Health Links initiative in addition to their regular full-time duties.

Below, we present the results of the thematic analysis of the interview data. Interconnections, the most prevalent theme, was strongly intertwined with sensemaking and self-organization, hence we discuss interconnections in the context of these two concepts. We then present results on co-evolution and emergence, of which we have little data, likely due to the early phase of implementation at the time of the interviews. We conclude the results by discussing overarching themes.

Sensemaking and Interconnections

We defined sensemaking as the process through which individuals work to understand novel, unexpected, or confusing events (Maitlis & Christianson, 2014). The sensemaking process can

generate shared/overlapping goals and perceptions, which have been identified as fundamental to the success of collaborative efforts, such as integrated care initiatives (Evans & Baker, 2012; Evans, Baker, Berta, & Barnsley, 2014). We present two key sensemaking processes discussed by participants, selection of partner organizations and approaches to patient identification, followed by sensemaking mediators.

Partnerships

Criteria for selecting the lead organization(s) and partners were not pre-defined by the Ministry. Therefore, organizations came together across the province in various ways, under the leadership of one or two primary care practices, hospitals, or CCACs. Participants noted that where there was a lack of awareness of local organizations and their mandates, it was challenging to select partners. This problem was compounded by the number of potential partners among health and social services organizations, especially in urban areas. Organizations' mandates and scope of practice became clearer as organizations exchanged information about their services, in most cases, for the first time:

> *"...the journey has really shown me, as providers are working together, there's a lot of light bulbs going off in terms of saying, "Wow, you do that, you offer that service? I didn't know that existed…?" So that's been really positive. I think just the act of bringing people together and forcing them to have discussions about what it is they do...that's been one of the real benefits that I've seen..." LHIN Interview 12*

Instead of engaging potential partnering organizations formally, some Health Links had success bringing in partners when needed for a specific patient, to ensure meaningful contributions. For example, one Health Link reached out to their local food bank on an ad hoc basis to address food security issues for some of their patients.

Through the partnering process, the Health Links generated novel interconnections between organizations and professionals across health and social care services. These interconnections stimulated collective sensemaking, as individuals came together to understand, interpret, and apply the initiative within their own context:

> *"The Health Link is about the people. It's not bricks, it's not mortar, it's not programs. It's about the people coming together to think differently about how to wrap care around these patients. So it's been that development of trust, the development of common goals, and having really broad engagement." LHIN10*

Another participant added that through relationship-building they realized "*that they all had a common stake in bettering the person's care pathway." (LHIN5)* By coming together, partnering organizations were able to better understand patient needs, identify gaps from multiple perspectives, and find solutions through collaboration: *"…we did collective conversation about those patients to get some aha's. So that's how we started to look at who is our patient population and where were the gaps in the system."(HL9)*

Patient Identification

The aim of Health Links was to coordinate services for high need, high cost patients. However, the criteria for patient eligibility to receive care from a Health Link was left intentionally ambiguous by the Ministry. The criteria were meant to be tailored to the needs of the patients in each region, and as such, it was one of the first sensemaking processes required of newly formed Health Links. In cases where Health Links had access to data on their catchment population, they often started the process by identifying patients by condition type (e.g., congestive heart failure). However, they generally abandoned this approach because identifying and reaching these patients was difficult (health and

social service organizations in Ontario often have poor access to population-level data), and because of the limiting nature of a single-condition approach.

While a shared vision emerged among many Health Links that focusing on specific single conditions was counterintuitive to capturing a high-needs multi-morbid patient population, target populations continue to vary across Health Links, often based on geography and lead organization preferences or capacity. Despite challenges, some participants noted that once patients were identified, Health Links "took off". Putting the focus on patient care facilitated the remainder of the sensemaking process.

Sensemaking Mediators

LHIN Role

The LHINs play a role as both fund holders and system integrators. Together with CCACs, they were involved across the province as either formal or informal partners in Health Links in their region. However, their role in the initiative lacked clarity and some participants felt LHIN resources were insufficiently leveraged. Most LHINs helped develop relationships, brought together organizations to create Health Links, shared lessons, and engaged physician champions. Instead of a single clearly defined role, each LHIN found its own approach, some seeing themselves as 'hands-off' facilitators, and others taking a structured, directive approach, effectively overriding the low-rules aspect of the policy.

Receptivity to an Iterative, Low-Rules Approach

The low-rules policy meant *"…nobody had an answer, nobody had the formula, there was no binder that anybody held up."(LHIN11)* One participant captured the nature of the Health Links as *"I feel [the* Health Link*] is an amoeba that reacts to its environment and changes." (HL18)* This approach to implementation was easier for individuals and organizations who were comfortable with uncertainty

and who saw the low-rules policy as an opportunity to foster creativity and innovation. For example, some individuals that had been involved in the implementation of Family Health Teams, a voluntary and incrementally implemented primary care model, by the Ministry in 2005 (Ministry of Health and Long Term Care, 2005) felt more prepared for Health Links.

Beyond past experiences, participants also noted that personality was an important determinant to how well a low-rules policy was received. Some people simply *"don't have an appetite for that." (HL9)* Where possible, some LHINs tried to encourage people to *"give themselves permission to think outside the box and… not be confined to policies and practices that may be in place currently." (LHIN1)*

Individuals had to shift their thinking toward a flexible, low-rules approach focused on partnering and sharing resources and away from an inward focus on their own organization's goals. Coordinating care for Health Links patients included bending or stretching organizational mandates and making processes flexible to meet patient needs. *"And we're saying to people, you've got to bend your mandate. In some instances, you're going to have to bend and we're going to bend. But it's to support the patient." (HL9)* Participants also needed to be flexible when shaping Health Links processes by using rapid evaluations, testing different approaches, and making iterative modifications to the model:

> *"It's a constant interchange of identifying how things are going, looking at barriers, defining those barriers, looking at policy shifts that can occur, understanding and appreciating from a policy point of view, seeing other things that are coming down that could be advantageous…*

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So continuously after people have tested things, going back and revising what you're doing." (HL17)

Self-Organisation

The sensemaking process included and resulted in self-organization, often making it difficult to differentiate the two concepts. We defined self-organization as a process of agents mutually adjusting their behaviours to achieve 'order' spontaneously without external direction or control (Comfort, 1994; Marion & Bacon, 2000). We present two contrasting approaches to self-organization identified in our data, how the policy influenced existing self-organizing networks, and self-organization mediators.

Structured Versus Iterative Approach

Two main approaches to starting up a Health Link emerged in the data: Health Links that placed up-front emphasis on structure and governance development and those that 'jumped in' and took an iterative approach. Health Links that conducted intensive up-front planning took on large bureaucratic processes and seemed to advance well 'on paper' but were hindered and delayed in actually starting up their Health Link and enrolling patients. One LHIN participant reflected on this:

"… there is a risk in this initiative to get bogged down, I think, in planning mode, trying to make sure you've got the right people, you've got everything kind of figured out. And it is one of those initiatives where you need to try some things and learn as you go… So I guess courage to kind of take a leap and move forward even though things may not be all figured out [is important]." (LHIN14)

Participants from Health Links that took an iterative approach shared their success in starting patient-identification early; they said once patients were on board, everything else 'fell into place.' This approach was seen in Health Links where partners had a shared understanding that the model would require testing and refining.

Pre-Existing Self-Organizing Networks

Our interviews revealed that there were several cases of self-organization similar to Health Links before the policy; organizations voluntarily working together to improve care coordination for patients with complex needs. For these networks that appeared to be ahead of the Ministry initiative, the Health Links policy

> *"…in part validated and gave them more credibility … a little bit of funding, and structure behind projects and initiatives they were already looking to move forward. That's where we've seen the biggest impact of Health Links, in environments that were ready for Health Links, who were practicing Health Links long before Health Links." (LHIN7)*

Since the policy was low-rules and complexity-compatible, it was able to support existing practices and networks with similar objectives.

Self-Organization Mediators

Network Size

Organizations where there was only one signing body (i.e., limited bureaucracy) were more likely to quickly approve Health Links processes than large organizations that required multiple layers of approvals. On the other hand, large organizations (in particular hospitals), had data systems and informatics capability for patient identification – the starting point for self-organization in Health

Links. As such, participants appeared to be divided about the type of organization that is ideally suited to lead a Health Link; large organizations with more resources often delayed processes and lacked flexibility while small, flexible organizations that were able to drive iterative Health Link design lacked access to important resources.

LHIN Support and Funding Role

The LHINs were important catalysts for self-organization as they facilitated partnerships and established commonalities across Health Links within their boundaries. Some LHINs encouraged an iterative approach to self-organization. One LHIN participant said:

> *"…we didn't take an approach of you must become a Health Link. We left it wide open, gave a list of providers in each of our Health Link areas and said, get together if you want to become a Health Link. This is a voluntary process. If you're interested, you can start meeting and think about it." (LHIN4)*

Furthermore, many LHINs supported their Health Links by providing bridge funding when approvals were delayed at the Ministry. These delays were a frequently voiced challenge; they stifled innovation and momentum as organizations were working to create their Health Link.

On the other hand, some LHINs hindered self-organization. In one case, one LHIN chose to dictate the implementation of Health Links in the region and excluded primary care organizations from decisions related to Health Link design. These actions effectively stifled the low-rules approach and contributed to highly standardized Health Links. As a result, an entire network pulled out and started functioning as their own independent Health Link – foregoing LHIN and Ministry resources and having no official Health Link status. *"…we just used our own resources in-house. And then*

whenever we couldn't provide or we weren't the appropriate person, we navigated to whoever was in the community." (HL16)

Partnerships

Lastly, interconnections among new partners fuelled self-organization. One Health Link participant captured this sentiment: *"I think once you get a number of organizations sitting around the table, and you give them that focus, all these others things start to fall into place." (HL15)* Interconnections were relied upon to exchange information, inform policy shifts, and inform practice as Health Links worked to constantly test and revise their models.

Co-Evolution & Emergence

We defined co-evolution as the process of the system influencing its environment, and the environment influencing the system simultaneously (McDaniel & Driebe, 2001). Emergence was defined as the creation of new properties of a phenomenon or system which are at a higher level of abstraction than the antecedent actions or system components (Rhodes et al., 2011). Early signs of co-evolution and emergence were identified in the data, but are limited likely because many Health Links were still in the early stages of implementation at the time of study. Signs of co-evolution and emergence were identified mostly in participants' preferences and desires for next steps for the Health Links rather than in completed actions. We identified participants' push toward moving from local to systems-level change, desire to influence the Ministry and the broader initiative, and novel approaches to information exchange across regions as early-stage examples of co-evolution and emergence.

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Moving to System-Level Change

Although a low-rules environment allowed sensemaking and self-organization to develop local solutions, participants also highlighted a need to think more strategically about a vision for Health Links going forward and to *"…collectively start discussion so there is some standardization and commonalities across our 5 [Health Links], and to show more of an impact collectively."(LHIN1)* There was an evident desire for stronger governance, memorandums of understanding, and the creation of Health Links structures separate from, or less dependent on, LHINs. Participants requested a clear vision from the Ministry for the future of Health Links and said that there is a need to shift focus from coming together to making sustainable improvements in care coordination for complex patients. A systems focus was identified as needed to move resources across organizations to where they are required most.

Influencing the Ministry

Some Health Links wanted to be the first to develop solutions at a local level to inform Ministry action. Instead of waiting for promised Ministry solutions and directives for information technology platforms and performance measures, participants shared that they developed local initiatives they felt could be scaled up and used to inform province-level solutions across all Health Links: "*…let's move this forward and maybe we can inform the Ministry. So instead of it being a challenge, they want to actually advocate for a solution from the local level going forward." (LHIN1)*

Information and Knowledge Exchange Across Regions

To support cross-level (from Health Link to LHIN to province) and cross-Health Link learning, participants discussed the emergence of LHIN-wide forums for information and knowledge exchange, such as the Health Links Community of Practice and the Health Links Collaborative.

Many participants still felt there were insufficient opportunities and a lack of formal structures to learn from others across the province. CCACs and LHINs were thought as well suited for information exchange, but often were insufficient. Participants felt strongly that to ensure this was a successful initiative, the sensemaking process needed to be shared with the Ministry. Despite various forums for information exchange, some participants noted that governance structures and mechanisms to facilitate knowledge exchange and to move learning upward were lacking.

Implementing a Complexity-Compatible Policy: Overarching Themes

The low-rules policy elicited a variety of unique approaches and responses across the province as individuals and organizations made sense of the initiative and began to self-organize. We present three main themes: moving from sensemaking to practice change, standardization versus flexibility, and fragmented learning and change.

Moving from Sensemaking to Practice Change

Despite interest and willingness to come together for the Health Links initiative, challenges emerged as Health Links moved from sensemaking to practice change. Health Links struggled to leverage and incorporate existing initiatives with the Health Links model (to reduce duplication and resource waste), including complimentary programs run by the LHINs. One LHIN participant noted:

"I think there was potentially a missed opportunity because LHINs have been in place now for 7 years and have developed pretty strong relationships with our health service providers and have worked on a number of integration initiatives … that could have probably been more efficiently and effective leveraged in the process… Because the LHIN has this sort of overview and is part of these different initiatives, we can see where we can leverage each other and align them together. But otherwise they

would all be happening separately. And that has been one of the… It's been a bit complex that way." LHIN4

Participants expressed frustration that though committed, many partners struggled to put resources forward and willingness waned once changes started. Furthermore, meaningful partnership and engagement was sometimes challenged once the Health Links were up and running, in instances where they were led by large complex organizations. In these cases, the limited transparency and internal rules of lead organizations hindered meaningful partnership and engagement and occasionally prevented direct interconnections. This barrier was aggravated by poor or inconsistent communication and accountability between the Ministry, LHINs and Health Links, hindering efforts to move learning back up through the system.

Standardization vs. Flexibility

A clear tension existed in the data between perceptions of the benefits of standardization and the flexible, low-rules approach. One Health Links participant noted that it is important to not be too prescriptive, but also to not "*create more chaos in the system by creating [many] different methodologies that then [they have] to figure out." (HL12)*

Participants strongly in favour of standardization felt that it was a way to avoid duplication and waste. They said that large scale success would only be possible with clear, concrete guidelines with leeway only to fine-tune the implementation. Otherwise, *"in a low-rules or no-rules environment… you spend an awful lot of time herding cats" (LHIN7)* and organizations may deviate from the intended purpose of the Health Links initiative. Most participants advocating for standardization were LHIN employees. There were also concerns that once the low-rules initiative was implemented, it would be too late to standardize, risking the progress to date. *"But it's almost too late. You know,*

people have done the work and they're on their way. And now you want them to conform to something else. It's very difficult. (LHIN9)

Some participants were concerned about 'bad' standardization, where a strategy or process would be dictated by the LHIN without consulting stakeholders, in particular primary care. As described in the previous section, this did occur in one LHIN, effectively pushing a highly functioning team out of the Health Link model. Those more wary of standardization felt that the low-rules approach created the time and space to find ideal, local solutions to local problems. Though it may have decreased momentum and caused frustration among players, it was viewed as an important learning process.

One suggested approach to balance low-rules with standardization was to create "consistency elements" and checkpoints to ensure a certain level of quality and to leverage resources that already exist in the system and work well. *"…you can have lots of local creativity and innovation but you need to have core consistency elements. … One to me would be … a consistent approach around care coordination… Care coordination means lots of things. So what are those things though that we've agreed to?" (HL5)* Targets and performance measures were thought to be another standardisable element to ensure that Health Links channel investment toward set deliverables established in their business plans.

Fragmented Learning and Change

Some Health Links supplemented existing processes, or filled gaps where Ministry-promised standardized tools were not yet available (e.g., electronic care plans), with interim solutions. These interim solutions often resulted in Health Links that were ahead of the Ministry. Other Health Links supplemented existing processes, such as the mandatory care plans, with ones they felt to be more meaningful, such as patient discovery interviews. Some LHIN participants expressed fear that the

low-rules approach encouraged new, fragmented practices emerging ahead of funding and province-wide standardization. LHIN participants also shared concerns about the Ministry's investment into small, disparate initiatives without facilitating the flow of learning from these initiatives into large scale, coherent solutions to health system problems. Given the Health Links' complex and ever changing structures, some participants felt that changes may be too rapid to be well thought out; that with so much change it may be difficult to move the initiative forward and expand across the province.

Discussion

The Health Links case provides us with several insights on the implementation of a low-rules, complexity-compatible policy. We found examples of interconnections, sensemaking and self-organization processes, early signs of emergence and co-evolution, and important mediating factors, including leadership, readiness, relationship-building, role clarity, communication, and resources. While CAS theory has been primarily used as an explanatory tool (Paley & Eva, 2011), this study operationalized CAS concepts for empirical use and demonstrated that the theory may have strong potential to support policy design and implementation.

Although this was just one study of an early-stage implementation, we suggest there are some key messages regarding complexity-compatible policy implementation. The first key message is that this complexity-compatible policy design did successfully stimulate local dynamics of flexibility, experimentation, and learning. However, the willingness and capacity to do this varied substantially. This may mean that the autonomy given to implementers resulted in a piecemeal and patchy approach. As indicated elsewhere in CAS literature, CAS dynamics seem to depend on leaders and

stakeholders having a mind-set in which anxiety, paradox, tension, and uncertainty are viewed as healthy, and inherent complexity is accepted rather than seen as something that needs to be reduced (Edgren, 2008; Haynes, 2015). While we are not in a position to judge how widespread this 'complexity-sympathetic' mind set is, it is clear in our data that some locations did not have this. CAS require leadership skills, albeit different skills from those needed in traditional environments (Edgren & Barnard, 2012; Uhl-Bien, Marion, & McKelvey, 2007). Enabling leadership, which fosters the conditions necessary for emergence, can help with disseminating innovation from the bottom up and into formal systems. These formal or informal leaders can help coordinate the existing top-down, hierarchical dynamics with the emergent, self-organizing properties of CAS (Uhl-Bien, Marion, & McKelvey, 2007). As Uhl-Bien and colleagues (2007) suggest, we need the right mix of leadership to both foster CAS dynamics and enable the structures necessary to coordinate formal organizations and produce outcomes in line with organizational goals.

The second key implication is that when flexibility, adaptation, and experimentation are actively encouraged, and such opportunities are taken up locally, the issue of 'standardisation' inevitably arises. It may be useful to think of complexity-compatible implementation processes as requiring a 'dance between flexibility and consistency'. This is a multifaceted issue, covering questions of 'what' to standardise, whose responsibility it is, and when it should happen. Implementation science literature highlights the importance of the 'adaptable periphery', the adaptable elements of an intervention and the organization into which it is implemented, it order to increase fit and reduce resistance among stakeholders. However, interventions must also have clearly defined 'core components,' the "essential and indispensable elements," (Damschroder et al., 2009), which may have been too loosely defined within the Health Links. Furthermore, attention should be given to the fact

that flexibility is likely to create variation in quality and accessibility across a jurisdiction (Evans, Grudniewicz, Wodchis, & Baker, 2015). While we were unable to explore patient perspectives, a lack of consistency may raise concerns of equity, access, and variability in the quality of services for patients.

Low-rules approaches require feedback cycles which address questions around core elements and standardization. This is required if learning from the bottom is to move 'up' the system. Some of this did occur in the implementation of the Health Links as the Ministry responded to calls for standardization in 2015 by launching a 'Guide to the Advanced Health Links Model'. The advanced Health Links model aimed to "standardize and embed many of the innovative practices across core areas" that emerged during the early stages (Ontario Ministry of Health and Long-Term Care, 2015). Standardized components included a common target population, performance measures, structures, accountabilities, and shared best practices. Though this response signals the flow of information from the bottom up, the time to 'trickle up' to policy makers was sufficiently lengthy for our data to show participants' frustration and concerns about decreased momentum.

If a CAS perspective is to be of value in guiding policymakers, these issues need to be addressed. At the provincial level, ensuring that a CAS-compatible approach does not exacerbate fragmentation and create conflicting policy messages is imperative. We suggest a complexity-compatible approach to policy implementation needs to actively incorporate structured opportunities for feedback and shared sensemaking at system and policy levels. In this case, our results point to a need for better communication and coordination between the Ministry and the LHINs. Also, despite the low-rules approach, more clarity around the 'consistency elements' is needed. This clarity could potentially build local comfort with remaining uncertainty and flexibility.

As noted above, leadership is plays a key role in supporting implementation of complexity-compatible policies. Edgren (2008) recommends that leaders perceive health and social organizations as CASs and accept complexity as opposed to attempting to reduce it. This can be done by formulating few, yet simple goals, communicating and giving feedback, measuring performance, and allowing appropriate autonomy for individuals to self-organize and adapt (Edgren, 2008; Edgren & Barnard, 2012; Zimmerman et al., 2008). Acknowledgement of policy and organizational history by policy makers and leaders is also important, as CAS are history-dependent and shaped by past experiences (Zimmerman et al., 2008). Enabling leadership can help to coordinate and balance the effects of history, the need for supporting structures, and the benefits of CAS dynamics (Uhl-Bien, Marion, & McKelvey, 2007.

This paper has both strengths and limitations. It allowed us to identify sensemaking and self-organization, and these areas make up the bulk of our data and analysis. However, to track emergence and co-evolution, we would need to collect data across at least two points (Kozlowski & Chao, 2012), including further into the implementation of the policy. Limitations also stem from the retrospective nature of the analysis; we were only able to examine a complexity-compatible policy after implementation rather than prospectively studying the explicit use of complexity science principles in policy development. Future prospective research should test the effects of explicit use of complexity-compatible policy implementation. Despite a large sample size and broad representation across professions, the results are limited in their generalizability to the Ontario context. There may also be biases introduced by the researchers, the deductive nature of the analysis, and in participant sampling (e.g., perspectives of participants refusing to participate were not captured). However, our findings and discussion may still be of value to other contexts where complexity-compatible policies

are being considered, implemented, or analysed. Furthermore, as we were not able to collect information from patients, future work should examine the relative impact of complexity-compatible policies on patient experiences and perceptions of care.

Our contribution in this paper is twofold. Firstly, CAS theory has been widely applied and deemed useful as a lens with which to re-think and re-frame a range of problems in healthcare (McDaniel & Driebe, 2001; Lanham et al., 2013; Geyer, 2012; Tsasis, Evans, & Owen, 2012). However, its value to inform the design and implementation of healthcare initiatives and policies has been uncertain due to a lack of empirical evidence; much of the literature on CAS in healthcare is conceptual and theoretical in nature (Brainard & Hunter, 2016; Paley & Eva, 2011). This study builds on the existing literature by operationalizing CAS concepts to examine the real-world implementation of a system-wide health policy. The results provide preliminary evidence regarding the impact of health policies designed and implemented with complexity principles in mind. Secondly, many CAS papers encourage the use of flexible, bottom-up approaches to implementing, leading, and evaluating healthcare initiatives and policies (McDaniel & Driebe, 2001; Edgred & Barnard, 2012; Tsasis, Evans, & Owen, 2012). This study supports this advice, but also highlights – particularly for integrated care policies – the importance of identifying core 'consistency elements' and developing feedback mechanisms to ensure local learning moves upward and beyond individual sites.

Conclusion

The implementation of Health Links in Ontario provided an ideal opportunity to deepen our understanding of CAS concepts and complexity-compatible health policy implementation. It shows that a low-rules implementation environment is a necessary, but not sufficient basis for achieving better integrated healthcare through CAS dynamics. Although the policy was successful in fostering

local experimentation and learning, it is at the next level(s) of action (and/or abstraction) – at the regional (LHIN) and provincial level that further analysis and attention is required. There is a need to facilitate the flow of learning from the 'top' to the 'bottom' and vice versa. However, it is unlikely that such processes of system learning emerge spontaneously, so forms of enabling leadership at the provincial and regional level are required.

To date, there has not been much attention given to how to implement complexity-compatible policies, and what attention there has been is focused on advising 'higher-level' policymakers *not* to be overly prescriptive or bureaucratic (Honig, 2004; Castelnovo & Sorrentino, 2017). In policy contexts in which 'all implementation is local', our research highlights the importance of developing lessons for policymakers regarding 'what to do' as a complement to lessons about what not to do.

From our research into the early implementation of Ontario's Health Links, we identify three crucial recommendations for policy-makers seeking to implement a complexity-compatible policy: (i) foster and leverage local implementation contexts that have the capacity to deal with ambiguity and uncertainty; (ii) develop and encourage flexible feedback mechanisms to support the flow of learning from the bottom to the top, and (iii), if local variety is actively encouraged, counterbalance that with 'nudges' towards consistency. Implementing a complexity-compatible policy for integrated healthcare is more than simply 'letting a thousand flowers bloom'.

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References

Angus, H., & Anderson, M. (2013). *Community Health Links.* Paper presented at the Ways and Means to Make Health Links Work Conference, May 15, Toronto, Canada. Retrieved from http://www.longwoods.com/pages/ways-and-means-speakers.

Angus, H., & Greenberg, A. (2014). Can better care for complex patients transform the health system? *Healthcare Papers, 14*(2), 1-19.

Ashton, T. (2015). Implementing integrated models of care: the importance of the macro-level context. *International Journal of Integrated Care, 15*, 1-3.

Bardsley, M., Steventon, A., Smith, J., & Dixon, J. (2013). *Evaluating integrated and community-based care*. NuffieldTrust. Retrieved from https://www.nuffieldtrust.org.uk/research/evaluating-integrated-and-community-based-care-how-do-we-know-what-works.

Brainard, J., & Hunter, P.R. (2016). Do complexity-informed health interventions work? A scoping review. *Implementation Science, 11*(127).

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Cairney, P. (2012). Complexity theory in political science and public policy. *Political Studies Review, 10*(3), 346-358.

Castelnovo, W. & Sorrentino, M. (2017). Engaging with complexity in a public programme implementation. *Public Management Review, 1-19.*

Cilliers, P. (1998). *Complexity and postmodernism*. New York: Routledge.

Comfort, L. K. (1994). Self-organization in complex systems. *Journal of Public Administration Research and Theory, 4*(3), 393-410.

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science, 4*(1), 50.

Edgren, L. (2008). The meaning of integrated care: a systems approach. *International Journal of Integrated Care, 8*, 1-6.

Edgren, L., & Barnard, K. (2012). Complex adaptive systems for management of integrated care. *Leadership in Health Services, 25*(1), 39-51.

Evans, J. M., & Baker, G. R. (2012). Shared mental models of integrated care: aligning multiple stakeholder perspectives. *Journal of Health Organization and Management, 26*(6), 713-736.

Evans, J. M., Baker, G. R., Berta, W., & Barnsley, J. (2014). A cognitive perspective on health systems integration: results of a Canadian Delphi study. *BMC Health Services Research, 14*(1), 222.

Evans, J. M., Baker, R. G., Berta, W., & Barnsley, J. (2013). The evolution of integrated health care strategies. In J. Goes, G. T. Savage, & L. Friedman (Eds.), *Annual review of health care management: Revisiting the evolution of health systems organization (Advances in health care management)* (Vol. 15, pp. 125-161): Emerald Group Publishing Limited.

Evans, J. M., Grudniewicz, A., Baker, G. R., & Wodchis, W. P. (2016). Organizational context and capabilities for integrating care: A framework for improvement. *International Journal of Integrated Care, 16*(3), 15.

Evans, J. M., Grudniewicz, A., Wodchis, W. P. (2015). Leading the implementation of Health Links in Ontario. *HealthcarePapers, 14(2), 21-25.*

Friedman, L., & Goes, J. (2001). Why integrated health networks have failed. *Frontiers of Health Services Management, 17*(4), 3-28.

Gale, N. K., Health, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research *BMC Medical Research Methodology, 13*(117), 1-8.

Geyer, R. (2012). Can complexity move UK policy beyond 'evidence-based policy making' and the 'audit culture'? Applying a 'complexity cascade' to education and health policy. *Political Studies, 60*(1), 20-43.

Geyer, R., & Cariney, P. (2015). *Handbook on complexity & public policy*. Cheltenham, UK: Edward Elgar Publishing.

Hamilton Niagara Haldimand Brant LHIN. *Health Links - benefits, roles, and implications for you*. Retrieved from http://www.hnhblhin.on.ca/goalsandachievements/Sub-Regions%20and%20Health%20Links/healthlinks.aspx.

Haynes, P. (2015). *Managing complexity in the public services* (2 ed.). Abingdon: Routledge.

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288.

Honig, M. I. (2004). Where's the "up" in bottom-up reform? *Educational Policy, 19(4), 527-561.*

Kauffman, S. (1993). *The origins of order*. New York: Oxford University Press.

Kernick, D. (2004). *Complexity and the healthcare organization: A view from the street*. Oxford: Radcliffe Medical Press.

Kickert, W. J. M., Klijn, E.-H., & Koppenjan, J. F. M. (1997). *Managing complex networks: Strategies for the public sector*. London: SAGE Publicatons Ltd.

Kodner, D. (2009). All together now: A conceptual exploration of integrated care. *Healthcare Quarterly, 13*, 6-15.

ACCEPTED MANUSCRIPT

Kozlowski, S. W. J., & Chao, G. T. (2012). The dynamics of emergence: Cognition and cohesion in work teams. *Managerial and Decision Economics, 33*(5-6), 335-354.

Lanham, H. J., Leykum, L. K., Taylor, B. S., McCannon, C. J., Lindberg, C., & Lester, R. T. (2013). How complexity science can inform scale-up and spread in health care: understanding the role of self-organization in variation across local contexts. *Social Science & Medicine, 93*, 194-202.

Ling, T., Brereton, L., Conklin, A., Newbould, J., & Roland, M. (2012). Barriers and facilitators to integrating care: experiences from the English Integrated Care Pilots. *International Journal of Integrated Care, 12*, 1-12.

Low, L. F., Yap, M., & Brodaty, H. (2011). A systematic review of different models of home and community care services for older persons. *BMC Health Serv Res, 11*, 93.

Maitlis, S., & Christianson, M. (2014). Sensemaking in organizations: Taking stock and moving forward. *The Academy of Management Annals, 8*(1), 57-125.

Marion, R., & Bacon, J. (2000). Organizational extinction and complex systems. *Emergence, 1*(4), 71-96.

McDaniel, R. R., & Driebe, D. J. (2001). Complexity science and health care management. *Advances in Health Care Management, 2*, 11-36.

Ministry of Health and Long Term Care. (2005). *Family health teams: guide to collaborative team practice*. Retrieved from: http://www.ontla.on.ca/library/repository/mon/11000/256235.pdf

Mischen, P. A., & Jackson, S. K. (2008). Connecting the dots: Applying complexity theory, knowledge management and social network analysis to policy implementation. *Public Administration Quarterly, 32*(3), 314-336.

ACCEPTED MANUSCRIPT

Nugus, P., Carroll, K., Hewett, D. G., Short, A., Forero, R., & Braithwaite, J. (2010). Integrated care in the emergency department: a complex adaptive systems perspective. *Social Science & Medicine, 71*(11), 1997-2004.

Olson, E. E., & Eoyang, G. H. (2001). *Facilitating organization change: Lessons from complexity science*. San Francisco: Jossey-Bass/Pfeiffer.

Ontario Ministry of Health and Long-Term Care. (2015). *Guide to the advanced health links model*. Toronto, Ontario. Retrieved from www.health.gov.on.ca/en/pro/.../docs/Guide-to-the-Advanced-Health-Links-Model.pdf.

Paley, J., & Eva, G. (2011). Complexity theory as an approach to explanation in healthcare: a critical discussion. *International Journal of Nursing Studies, 48*(2), 269-79.

Rhodes, M., & MacKechnie, G. (2003). Understanding public service systems: Is there a role for complex adaptive systems theory? *Emergence, 5*(4), 57-85.

Rhodes, M., Murphy, J., & Murray, J. (2011). *Public management and complexity theory: Richer decision-making in public services*. New York: Routledge.

Room, G. (2011). *Complexity, institutions and public policy agile decision-making in a turbulent world*. Northampton, MA: Edward Elgar.

Sabatier, P. A. (1986). Top-down and bottom-up approaches to implementation research: A critical analayis and suggested synthesis. *Journal of Public Policy, 6*(1), 21-48.

Sanderson, I. (2006). Complexity, 'practical rationality' and evidence-based policy making. *Policy & Politics, 34*(1), 115-132.

Schofield, J. (2001). Time for a revival? Public policy implementation: a review of the literature and an agenda for future research. *International Journal of Management Reviews, 3*(3), 245-263.

Stukel, T. S., Glazier, R., Schultz, S., Guan, J., Zagorski, B. B., Gozdyra, P., & Henry, D. A. (2013). Multispecialty physician networks in Ontario. *Open Medicine, 7*(2), e41.

Tenbensel, T. (2015). Complexity theory and health policy. In R. Geyer & P. Cariney (Eds.), *Handbook on complexity and public policy* (pp. 369-383). Cheltenham, UK: Edward Elgar.

Tinetti, M. E., Fried, T. R., & Boyd, C. M. (2012). Designing health care for the most common chronic condition - multimorbidity. *JAMA, 307*(23), 2493-2494.

Tsasis, P., Evans, J. M., & Owen, S. (2012). Reframing the challenges to integrated care: a complex adaptive-systems perspective. *International Journal of Integrated Care, 12*, 1-11.

Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity leadership theory: shifting leadership from the industrial age to the knowledge era. *The Leadership Quarterly, 18*(4), 298-318.

Weick, K. E. (1993). The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly, 38*(4), 628-652.

Wodchis, W. P., Dixon, A., Anderson, G. M., & Goodwin, N. (2015). Integrating care for older people with complex needs: key insights and lessons from a seven-country cross-case analysis *International Journal of Integrated Care, 15*, 1-15.

Zimmerman, B., Lindberg, C., & Plsek, P. (2008). *Edgeware: Lessons from complexity science for health care leaders*. Irving, TX: VHA Inc.

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Table 1. Complex Adaptive Systems Theory: Key Concepts

Concept	Definition	Importance & Impact
Interconnections	Patterns of relationships and interactions among agents, i.e., individuals, teams, and organizations (McDaniel & Driebe, 2001)	The number and intensity of interconnections shape the behaviour of the system (i.e., interconnections influence sensemaking, self-organization, emergence, and co-evolution) (McDaniel & Driebe, 2001)
Sensemaking	Process through which individuals work to understand novel, unexpected, or confusing events (Maitlis & Christianson, 2014)	People act based on the sense they make of what has happened or what is happening (Weick, 1993)
Self-Organization	Process of agents mutually adjusting their behaviours to achieve 'order' spontaneously without external direction or control (Comfort, 1994; Marion & Bacon, 2000)	Changes that arise from self-organization are based on local needs which may not be recognized at higher levels of a system (Lanham et al., 2013)
Emergence	The creation of new properties of a phenomenon or system which are	Changes that arise from emergence are unexpected and cannot be

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	at a higher level of abstraction than the antecedent actions or system components (Rhodes, Murphy, & Murray, 2011)	explained by the properties and interactions of agents (i.e., non-linearity)
Co-Evolution	Process of the system influencing its environment, and the environment influencing the system simultaneously (McDaniel & Driebe, 2001)	CAS seek a point of maximum fitness with their environment (Kauffman, 1993). In the process of seeking 'fit', which is a moving target, each agent changes the landscape for itself and all other agents in the system.

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Highlights:

- We examine a 'low-rules' policy in Canada from a complexity science perspective
- The 'low-rules' environment stimulated local experimentation and learning
- Tensions exist between stakeholder preferences for flexibility versus standardization
- Mechanisms needed to enable learning from local networks to flow to system level

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