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Can complexity science inform physician leadership development?

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Abstract

Purpose – The purpose of this paper is to describe research that examined physician leadership development using complexity science principles.

Design/methodology/approach – Intensive interviewing of 21 participants and document review provided data regarding physician leadership development in health-care organizations using five principles of complexity science (connectivity, interdependence, feedback, exploration-of-the-space-of-possibilities and co-evolution), which were grouped in three areas of inquiry (relationships between agents, patterns of behaviour and enabling functions).

Findings – Physician leaders are viewed as critical in the transformation of healthcare and in improving patient outcomes, and yet significant challenges exist that limit their development. Leadership in health care continues to be associated with traditional, linear models, which are incongruent with the behaviour of a complex system, such as health care. Physician leadership development remains a low priority for most health-care organizations, although physicians admit to being limited in their capacity to lead. This research was based on five principles of complexity science and used grounded theory methodology to understand how the behaviours of a complex system can provide data regarding leadership development for physicians. The study demonstrated that there is a strong association between physician leadership and patient outcomes and that organizations play a primary role in supporting the development of physician leaders. Findings indicate that a physician's relationship with their patient and their capacity for innovation can be extended as catalytic behaviours in a complex system. The findings also identified limiting factors that impact physicians who choose to lead, such as reimbursement models that do not place value on leadership and medical education that provides minimal opportunity for leadership skill development.

Practical Implications – This research provides practical applications for physician leadership development and emphasizes that it is incumbent upon physicians and organizations to focus attention on this to achieve improved patient and organizational outcomes.

Originality/value – This study pairing complexity science and physician leadership represents a unique way to view the development of physician leaders within the context of the complex system that is health care.

Keywords Systems thinking, Complexity science, Physician leadership, Physician leadership development

Paper type Research paper

Introduction

One of the most oft-used adjectives to describe both the health-care environment and the health-care organization is "complex" (Chadwick, 2010; Falcone and Satiani, 2008; Scott, 2010; Heine and Maddox, 2010; Leatt and Porter, 2003). There is considerable diversity in internal systems and processes and in the professions working within this sector. There are multiple stakeholders: patients, professionals, the public and the government.

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This presents "formidable challenges to its leadership, such as defining strategies, promoting common values, and integrating processes" (Billou *et al.*, 2010). The interdependency between the administrative and the clinical components of health-care organizations means that changes to one component rapidly affects all other components of the system. Increasingly, decision-making is difficult in organizations where ambiguity prevails and the pace of change is unrelenting.

Complexity science is not considered a single theory but is the study of complex adaptive systems. They are considerably diverse and include ant colonies, forest ecosystems, hospitals, stock markets and human bodies. Complexity science and health care have been increasingly paired in recent years. The national health service in the UK produced a study related to complexity science and service improvement (Mowles *et al.*, 2010). Researchers in Australia have found that viewing their mental health system as a complex adaptive system has provided useful insights for "leadership for change in such systems," and that "command and control styles of leadership are dead" (Minas, 2005). Complexity leadership theory has also received increased attention. This theory recognizes that leadership is similar in nature to complex organizations because it "emerges in the interactive spaces between people and ideas", and that it "is a dynamic that transcends the capabilities of individuals alone" (Lichtenstein *et al.*, 2006). Plsek and Greenhalgh (2001) emphasize that historical solutions for clinical and organizational problems have been limited by "reductionist thinking". They refer to "Newton's clockwork universe in which big problems can be broken down into smaller ones, analyzed and solved by rational deduction". They suggest that this model no longer applies to health-care organizations and systems because they have become more complex. The authors suggest abandoning models of linearity for complexity science, which provides the premise for a flexible response "to emerging patterns and opportunities" (Plsek and Greenhalgh, 2001). Chadwick (2010) writes that "health-care organizations can no longer function under the traditional view of 'the machine model' where standardization and control are the primary drivers".

Leadership and physicians

Traditional leadership in health care remains entrenched in current bureaucratic structures that emphasize trait-based models and the "dyadic relationships between leaders and follower" (Weberg, 2012, citing Bass, 2008). Weberg's review of traditional leadership theories implies that the goal for a leader is to "control uncertainty and work toward absolute stability". He goes on to say that it is these very linear traditional leadership models that have produced the fragmented health-care system that we have now. He suggests that leadership based on complexity science can provide a different and improved way of leading in organizations. This way of thinking about leadership is particularly relevant to physicians behaving as autonomous professionals within organizations that are formal in their structure and operations.

At the same time, increased focus is being placed on physician leaders. In their clinical capacity, physicians are well-positioned to contribute substantively to health-care transformation of a sustained and potentially more affordable, publicly funded patient-centred model (Vimr and Thompson, 2011; Goodall, 2011; Scheck McAlearney *et al.*, 2005). While it is recognized that physician leaders add value to health-care management, only a minority of health-care organizations have acted on this, although those that have cite benefits to performance, bottom-line accountability

and patient-focused care. Despite the recognized value of physician leaders, structural and cultural barriers continue to exist in organizations with a command and control style of leadership. Such leadership does not value the collective intelligence of all leaders, neither does this model support leadership development in a progressive, fundamentally adaptive manner. Physician leaders can contribute significantly to improved patient care; however, organizations find minimal guidance in defining roles and supporting their development.

Many agree that the value of physician leadership cannot be underestimated. This is especially the case because health-care organizations have increased in complexity. The healthcare sector has been slow to recognize the competitive advantage that physician leaders can bring to an organization and to follow what has been the practice of "frontrunner organizations" in the business sector that invests in leadership development for a culture that is performance-oriented (Stoller, 2009). Physicians as members of the Canadian Medical Association have identified "both a need and a void" (Collins-Nakai, 2006) in the area of leadership in medicine. They stated that their medical training did not provide them with this skill set, and further development as a leader is needed to deal with the increasingly complex health-care issues (Collins-Nakai, 2006). Falcone and Satiani (2008) suggest that a swing of the pendulum is evident as physician leadership increases in importance in a system that is "complex, troubled and challenging". Mounting pressures in health-care over the past two decades have only served to further frustrate health-care executives that bemoan the dearth of physician executives that "can articulate and implement" (Guthrie, 1999) the vision of health-care organizations. And all of this takes place against a background of increased corporatization of health care, which also requires greater leadership participation by physicians (McNulty and Ferlie, 2002).

Physicians that choose to lead see the potential to have an impact on health care on an organization-wide basis. They are able to see the whole, the sum of all the parts (Guthrie, 1999). Developing physician capacity to lead may be viewed as a way to improve patient care, reduce costs and strengthen strained relationships between hospitals and physicians. Fostering leadership and increasing the opportunities for physicians to be involved in organizational decision-making can lead to decreased turnover and improved ability to deliver on strategy (Misra-Hebert *et al.*, 2004; Vimr and Thompson, 2011).

The purpose of this article is to describe research based on principles of complexity science that examines physician leadership development within health-care organizations. This research was focused on the actions and/or behaviours of physicians and the processes of change that maximize opportunity for creativity, continuous learning and connectivity between agents that can lead to improved outcomes for patients and/or the organization.

As the study of complex systems primarily focuses on the relationships between parts, patterns of behaviour and interdependencies within a dynamic system, applying the same principles to health care and leadership provides guidance in practice and presents an alternative leadership model that enables physicians to embrace leadership suitable for the twenty-first century. There is greater demand for leadership that understands and values the nature of this high level of interactivity. Strategies to develop physician leaders who are able to function well in this complex system which is based on complexity science are likely to be more relevant than using traditional hierarchical approaches to leadership. These traditional approaches are not only outdated but incongruent with system (organizational)

behaviour. The scientific principles of complexity were used because leadership is viewed as a process that involves many individuals. Complexity science emphasizes the adaptability, creativity and flexibility of leadership, not as a set of values existing in any one individual. In the words of Gareth Morgan, "Leadership is a verb and a process, not a noun" (Morgan, 2006).

Methodology

The research focused on five principles of complexity science – connectivity, interdependence, feedback, exploration-of-the-space-of-possibilities and co-evolution – based on Mitleton-Kelly's (2003) work. The five principles were grouped into three areas for purposes of research discussion: relationships between agents (encompassing connectivity, interdependence, feedback), patterns of behaviour (exploration-of-the-space-of-possibilities) and enabling functions (co-evolution).

The research design was consistent with the inductive reasoning of grounded theory methodology (Charmez, 2006). The value of this method is the constant comparison of data and interplay of data collection and analysis-informed theory by identifying relationships between concepts. The inquiry fits with constructivism and the approach to theory generation based on an interpretive analysis of data. Consistent with the approach used by Charmez, theory related to this research was built not only on the data but also on the lived experience of participants. Grounded theory was also chosen based on the premise that this topic was inciting fresh discussion among scholars, operational directors and physicians. It was expected that most participants would be knowledgeable about the more common management structures and approaches to physician leadership development, however, less familiar with principles of complexity science. The ability to build from each interview and use data to inform subsequent interviews provided the opportunity for further probing of concepts, producing new data.

In total, 21 participant interviews and documents provided by those participants provided data for this study. The sole researcher completed all interviews, transcriptions and document analysis. Digitally recorded interviews were 1 h in length and conducted in person or by phone. Using purposive sampling, participation was sought from individuals associated with physician leadership development or health-care organizations and/or those that would have an understanding of current realities of health-care leadership.

A staged approach to interviews and data gathering was planned, starting with Type 1 participants and moving through to Type 2 and then Type 3; however, this did not happen consistently and interviews were conducted when most convenient for participants. Type 1 included authors, academics and advisors (national) in health care. Type 2 included physicians and non-physicians considered to be employed by, or associated with, health-care organizations at the senior and mid-management level. Type 3 included physicians and non-physician members of the Ontario Hospital Association's Provincial Physician Leadership Council. Participants were considered highly knowledgeable contributors with an average of 18 years of experience in any, or all, of three areas: health-care management, physician leadership and leadership development. About half of the interviewees were physicians and evenly represented by both the genders. The majority lived, and worked, in Ontario. The first area of discussion, relationships between agents, invited participants to share their thoughts on the ways in which physicians can foster relationships, build trust and promote effective feedback to improve outcomes for patients based on the principles of

connectivity, interdependence and feedback in complex systems. The second area of discussion, patterns of behaviour, explored how physicians can encourage team members to try new strategies based on the exploration-of-the-space-of-possibilities principle. The third area of discussion, enabling functions, sought to identify how physicians may be an agent of change alongside administrators within an organization premised on the principle of co-evolution.

The analysis included sequential steps for initial coding (line-by-line), focused coding (comparing data with data) and theoretical coding (beginning the process of theorizing through connections between data), although there was a shifting between initial and focused coding as categories emerged. Comparing data with data necessitated refining codes as new ideas emerged. This was consistent with the constant comparison method identified by Glaser and Strauss (1967), which values ongoing checking of data and the researcher's observations at each stage of analysis. Additionally, memo writing was a process used throughout the analysis stage, allowing for key points from interviews and documents to be captured and providing opportunity to expand upon themes that arose through the coding process.

Results

Relationships between agents

The research explored the concepts of connectivity, interdependence and feedback to better understand the quality of relationships between agents, in this case, health-care professionals. According to Mitleton-Kelly (2003), "connectivity and interdependence means that a decision or action by any individual (group, organization, institution, or human system) may affect related individuals and systems".

Physicians were seen as influential in fostering crucial relationships, although with varying degrees of success. Four distinct relationships were highlighted by participants: physician and patient, physician and team, physician and administrators and physician and physicians. Data show that physicians are adept at cultivating the most critical of relationships within health care, those between themselves and the patient. Patients are their livelihood and caring; connected relationships are often built over a long period of time, from cradle to grave. This linear relationship, however, can limit a physician's ability to view the patient within a system of interconnecting agents that require ongoing feedback to adjust the course of providing care to that same patient. Second, data demonstrate that although physicians are viewed as taking a lead role (with the patient, with a team), they do not necessarily demonstrate leadership qualities that inspire or influence others most of the time. Physician participants noted:

> In the medical system, it's set up with the physician being primarily responsible for the patient. They're seen as having a leadership role although I'm not sure there's always insight on the part of physicians in this regard.

> If you're going to practice as a team you need to work as a team. It's some of the basic things – make sure people have opportunity to speak, make sure they're heard, make sure you ask for their opinion, you actually attend to their opinion when they give it

A physician's singular focus on one patient at a time further restricts his/her capacity to demonstrate leadership that can impact a population of patients because of either tense

relationships with administration or careful positioning among their peers. Participants identified that physicians, however, play a valuable role as agents of collaboration. Where physicians were identified as good communicators, they were also credited with being able to act as facilitator for team development to support the team and the patient. One example illustrated the value for the patient when the physician demonstrated trust in the team; a surgeon who covered several hospitals taught a critical level of skills to a team of nurses so that they could ask the right questions and do the right things and so that conversations with him, in an emergency situation, would convey specific information for him to know how to and what to address. This was referenced by the participant as "training up to almost a resident level" and that "they became a very smooth functioning team". Conversely, if the physician showed up "thinking they were the smartest person in the room", then team members acted to protect their personal emotional safety and limited their interactions. This type of behaviour is generally associated with a hierarchical structure and not one that is consistent with complex-system dynamics or an inter-disciplinary team approach. One physician even pointed out that there are challenges in relationships among peers which impact patient care:

> There are times when specialists look down on family physicians and will do that in front of the patient. There are times when family medicine will say, well they obviously didn't take the time to get to know you.

Patterns of behaviour

Generating variety in strategies is referred to by Mitleton-Kelly (2003) as exploration-of-the-space-of-possibilities. Less dependent on "pin-point forecasting, top-down planning, or elaborate controls" (Weber, 2002), natural system behaviour morphs to create a new structure through exploration. The ability to explore allows organizations to identify multiple strategies before a significant investment of resources is made. In this study, exploring the space of possibilities and generating variety is examined through the lens of new strategies and new ways of doing things.

Behaviour patterns in teams are formed over time and processes can become ingrained. The dynamic nature of complex systems requires that processes change as needed and that teams demonstrate a nimbleness that can provide the fluidity to adapt. Leadership behaviour is instrumental to either the encouragement or discouragement of a team's ability to embrace change, including its capacity for generation of new ideas or to be innovative. One physician participant noted that although he was working in an academic hospital, a recent opportunity to take part in a ground-breaking study on neonatal care was not embraced by the team of professionals that were accustomed to the "way things have always been done". Fortunately, he was cognizant of the dynamics of change and was able to move the team forward. Two themes in particular were noted in discussions about patterns of behaviour: a physician's training may encourage them to explore various options when treating patients, but they are constrained by the policy-driven structure of health-care organizations and the health-care system, and physicians in particular, are slow to adopt innovative practices.

Data highlighted the challenge for physicians working within an organizational structure that, at times, is conflicting with their culture and how they were trained. Physicians are considered adaptive regarding patient procedures, and their medical

training supports a professional autonomy that can be seen as giving them permission to skirt policy. They are competent at managing the care of the complex system of the human body that is in a constant state of evolution; however, they are less capable when allowing others to be innovative. A distinct paradox was identified relative to a physician's capacity to be exploratory in a risk-averse industry. Two participants, both physicians, addressed this:

> A physician is taught, here's the problem and here's where we'd like to get to and then physicians basically find their way to the end point. So there's not just one way to do most things in health care.

> Health care is a very risk averse extremity. The acceptable error rate in medical procedures is zero. Zero. If you have 2 mistakes in 1,000 that's 2 too many for the people it happened to.

They often lack trust in the contributions of others and/or administration. Other than being exploratory with patient procedures, physicians were largely seen as leaning towards a cautious, evidence-based approach even beyond life-or-death matters, where exploring possibilities would benefit patient care. One participant indicated that physicians must let go of their "knowingness" to allow trust to build and innovative approaches to be taken. Data demonstrate that physicians are able to impact patient outcomes when they can harness the value of curiosity that comes from not knowing and by their willingness to encourage innovative solutions that can lead to a new structure. Participants highlighted that because of a reimbursement system that is considered out-dated, physicians are restricted in their efforts to be innovative:

> The fee schedule lags so far behind in many ways and is so anti-innovative that if you do something different there's a good chance you're not going to be paid for it. Well why would you then?

Enabling functions

Mitleton-Kelly (2003) differentiates between co-evolution and adaptation as change that is seen in relation to "all other related systems" and not simply adapting to a "separate and distinct environment". For instance, in a social system, each "fully participating agent" "both influences and is influenced by" the related agents or organizations. Within a health-care organization, both clinical and non-clinical leaders are influenced by unique forces because of their specific tasks, their professional affiliations and their role in the organization. Looking at how each co-evolve and influence change can provide some insight on how best fit can be determined and where collective leadership capacity can be most valuable.

Health-care organizations have two distinct types of leadership, the administrative side that tends to the business of operations, whereas the clinical side, or physicians, tend to matters of clinical operations. This divide continues to be a strong deterrent to an effective collaboration between the sides, and conscious effort is required to recognize that one cannot operate without being influenced by the other. The way in which administrators and physicians work together can either enable or disable the capacity of the organization.

In an ecosystem, there are numerous entities influencing each other, producing an ongoing dynamic but also a system whose behaviour cannot be pre-determined.

Interactions among team members, external influences, such as government or suppliers, and political, cultural or economic forces vary all the time with each entity evolving constantly but together or co-evolving. Negative past associations between clinicians and administrators challenges their ability to collectively lead. Data generated in relation to this area of discussion highlighted the division that exists within most organizations and related to the criticality of the shared focus on improved patient outcomes and linked to the shared responsibility for developing physician leaders. A physician and an operational director spoke to this challenge:

> It's about getting on the same page as far as goals. We have to acknowledge as physician that we have a conflict internally as well. Often what we default to is "I'm just advocating for the patients".

> One of the things this calls to mind is they kind of have to know and understand the organizational governance and practice. Where is their power, where is their authority, where is their autonomy within the organization? They've never been trained or educated in the good practices of change management.

The evidence indicates that "systems thinking" is required for effective health-care leadership and that chaos should be seen as opportunity. Participants suggested that physicians are generally unaware of the stages of change, and that they often do not see themselves as part of the organization. Patient-centred-care leadership was suggested as being central to both administration and clinicians, and that having this as the common goal should push them beyond the ever-present us-and-them mentality that limits co-evolution. Data show that physicians and administrators that can find the common ground are able to explore methods to exchange knowledge in mutually beneficial ways. One hospital spent considerable time developing a physician engagement agreement, where both administrators and physicians framed how organizational values could be demonstrated through their collective actions, and this agreement provides the basis for managing performance expectations. Another hospital extended their employee assistance plan to cover physicians and their families, which went a long way to establishing the physician's sense of belonging within the organization. With an improved sense of belonging comes an increased willingness to find common ground around organizational issues.

Agents within a complex system are sensitive to fluctuations in the environment. Agents are both the initiator of change and the receiver of influences from other actions within their environment; physicians and administrators influence each other by their actions. A heightened sensitivity to the dynamics of complex systems allows for the co-evolution necessary for change and movement within a health-care organization. According to Anderson and McDaniel (2000), it is when problems become more complex, as in healthcare, "managers need all of the different points of view they can muster" (p. 87).

Discussion

Physicians as leaders

According to physician participants, the clinician's credibility as leader was often assumed from the get go, but physicians needed to develop leadership skills and "embrace it as an opportunity" rather than the usual scenario as described by Anna,

senior advisor and physician as "it's your turn, you were out of the room so you got the job". Jason, a CEO and a physician recognized that "things won't change unless physicians lead the way". Leadership within a complex system requires one to embrace the constantly shifting nature of the work, capitalizing on the collective intelligence of numerous agents within that system and being able to focus on the relationship between agents which, in turn, influences outcomes. Relationship building is identified as one of eight tasks for leaders when they can shift their understanding of health-care organizations from the industrialized machine model to that of a complex system (Anderson and McDaniel, 2000). This study indicates that most physicians are unprepared in areas of effective communication with team members, change dynamics and systems thinking – all key principles of leadership in complex systems.

Embracing a culture that rewards innovative thinkers is a culture that is prepared to manage change effectively. Adjusting to change is identified as a challenge and a frustration for most physicians, and understanding the concepts relative to change management is identified as having value for physician leaders. This can be partially explained by the high degree of frustration that exists in health care with an ever-increasing level of expectations for new types of reporting or policy changes based on governmental priorities, all of which are viewed as distracting from the work of patient care but pushing the capacity for change to untenable levels. Organizations cannot be identified as innovative unless they put into place learning opportunities for all staff, physicians, especially, on managing change effectively. The dynamic nature of complex systems requires leadership that can embrace, even welcome chaos, which demands innovative solutions.

The organization's role

Organizational support for physician learning and managing change was also noted as important. Action-learning projects (Levy and Delahoussaye, 2000) that are utilized as part of a physician leadership-development program were seen as valuable opportunities for physicians to lead people through change and develop the ability to become a model for innovative thinking and team learning. An advisor with experience in physician leadership development spoke of the powerful changes that happened when physicians were told to "take all of your complaints and turn them into innovations and requests". She noted that when physicians led projects as part of the program, previously insurmountable issues became achievable with the projects taking on their own momentum toward success that had immediate team buy-in because of the physician leading the way.

Piecing together the data and knowledge gained about complex-system behaviours and the physician's role within health-care organizations, we are able to identify insights into physician leadership development and the roles that both the physician themselves and the organization play. Obvious themes included the following: physicians and organizations both have a responsibility in leadership development; understanding complex system behaviour is instrumental in making system changes; moving from a command-and-control leadership model to one that is less hierarchical but still very influential is necessary and organizations can, and must, get creative in using resources to support physician leadership development.

Action-learning projects that can improve patient outcomes while allowing team members to explore, test and implement new models of care delivery have sustained benefits in terms of staff retention and satisfaction, as well as organizational learning. It may provide permission for physicians to think outside the box, which can elicit new ideas and fresh strategies. It is this capacity to understand experimentation as being worthwhile that is a stretch for physicians accustomed to linear solutions and working within a risk-averse environment.

Organizations should strive to adopt a culture of innovation in order that new ideas can come forward. The Council of Academic Hospitals of Ontario, in particular, should demonstrate their advocacy for continual learning about new approaches by recognizing and rewarding physicians and staff for thinking creatively.

Challenges exist between physicians and administrators because they both use a "different language", and areas of authority in decision-making remain muddy. This is further challenged in academic hospitals, where physicians can be accountable to more than one organization. Successful physician leaders are those that act as collaborative agents and who engage early, and often, in relationships. Their credibility with their peers was viewed as having significant merit related to organizational change. Patient outcomes were seen to be optimal when physicians recognize their role in supporting the entire team along with the patient with a particular impact in areas of patient safety. Physicians are being asked to lead, but an out-dated reimbursement model and the lack of training in leadership development create barriers. Both factors are more consistent with a linear-based model of command and control and inconsistent with functioning in a complex system with multiple priorities.

Limitations of study

The topic of this study was a strong area of interest to participants. Therefore, the results may be more representative of a valuation of the need for physician leaders and supportive of efforts to encourage their development than a study in which random sampling was used. All physician participants held leadership roles currently or in their recent past. Although there are some who feel that developing physician leaders take them away from what physicians are trained to do, which is to care for patients, no effort to seek their participation was made.

The path forward

Future research would be beneficial to identify the value of physician leadership consistent with principles of complexity to patient and organizational outcomes. Opportunities may exist within participant organizations to enable development of physician leaders through action learning projects that are context-specific and can produce near-immediate benefits to patients and on-the-ground leadership development for physicians and/or the study of organizational learning to better understand the most effective methods or tools for knowledge transfer between physicians and administrators.

Conclusion

The need for physician leaders will continue to be difficult to address until national and provincial policy-makers remove the barriers that exist to support their development and reward them for leading in a system where they are already viewed as leaders. Out-dated

medical education and reimbursement models reduce the pool of leadership candidates among physicians that could have a transformational effect on the way health care is delivered.

If better patient outcomes are the common attractor in health care, then patient-centred care must be mission critical. This applies to organizations and, by default, to all staff and physicians that work within them. It is not only about processes that fit patients but also about encouraging patient-centred leadership among all leaders. This is not optional. Patients are driving change within health care and that is influencing the physician–patient relationship. Health-care consumers are more informed than ever and want to be engaged in their care, expecting to be part of discussions with their health-care team, and no longer shunted aside, while the teams steps into the hallway to discuss their prognosis.

Developing physicians to lead in today's complex health-care organizations means that they must but able to understand the nature of complex systems and acquire the skills to be effective leaders. It also requires that health-care organizations and policy-makers recognize the crucial role they play in establishing the infrastructure that supports physicians to lead. Only then can patients expect to receive the well-coordinated care that they deserve from a health-care system that can sustain the increasing weight on it as the population ages.

The data indicate that physician leadership requires both a personal investment by the physician to lead and an organizational investment to engage and support them in their way forward. It requires that physicians understand not only complex systems but complex-system behaviour. It also requires that physicians break away from past associations with what leadership is and how their medical training has placed limitations on their ability to function well in a health-care organization that is patient-centred with team-based delivery of care. Physicians cannot achieve leadership skills and worthy position of leading by themselves. Organizations must find creative solutions to provide resources to support physicians in leading in today's complex health-care environment to achieve improved patient outcomes. It is about a different way of leading in a system that is different.

This study demonstrated that by virtue of being a physician, leadership is assumed, although their capacity to lead cannot be assumed unless there is dedicated effort to acquire the appropriate skills for effective leadership. Physicians should be considered a significant stakeholder group, with the capacity and ability to utilize limited health-care resources, and supported in their leadership to do so. Physicians that are engaged and active within organizations can have a powerful impact on patient outcomes but must demonstrate patient-centred leadership, which is a different model than the traditional notion of a provider-centred focus. Complexity science provides us with insights into the behaviours within the complex system of health care and prompts us to consider what enables, or disables, physician leadership development. In addition, by considering complex behaviours, organizations can be proactive in supporting the development of physician leaders, which has been shown to have an impact on improving patient outcomes. There are numerous examples of outstanding physician leaders and front-runner organizations that are investing in their development to ensure that health care in Canada can meet the challenges that lie ahead. There needs to be many more.

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