CURRENT OPINION

Mazes, Conflict, and Paradox: Tools for Understanding Chronic Pain

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■ **Abstract:** This article presents an argument for framing chronic pain within a complex adaptive systems (CAS) paradigm. The first aim of this article is to demonstrate how chronic pain can be framed as a CAS and how paradox, one of the core characteristics of a CAS, exists within the chronic pain experience. The second aim is to illustrate how paradox exists at multiple levels within the health care encounter and ongoing experience of chronic pain. Finally, the article will use the example of interactions at the patient/clinician level to illustrate how health care workers' efforts to deal with issues emergent from the range of paradoxes have for the most part been ineffective, and at times harmful, to persons experiencing chronic pain.

This article uses the example of chronic pain to explore how the manner in which health care providers and patients recognize and deal with paradoxes can either worsen the pain experience or help generate creative new ways to manage the chronic pain condition. The CAS principles discussed in this article hold application across a range of chronic conditions for which a traditional biomedical paradigm proves insufficient. ■

Key Words: chronic pain, complex adaptive systems theory, chronic illness

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Imagine you are walking in the park and decide to try your luck at navigating the Yew tree maze. You know that the exit is on the opposite side to where you started but every time you chose a path that takes you in that direction it seems like a dead-end. Finally, frustrated that you are not making progress you give up and start to choose paths that seem to be going in the direction to take you back to where you started into the maze. Suddenly, you end up, quite by surprise, out the other side of the maze! How can it be that every time you made a decision that was contrary to logic you actually, unknowingly, moved closer to your goal? Yet this is exactly how mazes are designed.

Or instead of puzzling yourself with mazes perhaps you remember reading as a child this conversation between the Red Queen and Alice?

> *Alice laughed, "there's no use in trying," she said, "one can't believe impossible things." "I daresay you haven't had much practice," said the Queen. "When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast."*
>
> (Lewis Carroll, Alice's Adventures in Wonderland[1])

Mazes where the solution is to go the "wrong" direction and the importance of believing impossible things (like telephones, television, and space travel from your great-grandfather's perspective) are examples of paradox. A paradox is defined as "an apparently true statement (or event) that appears to lead to a

Table 1. Key characteristics of complex adaptive systems[19]

- Relationships are central to understanding the system.
- Complex systems are described by their structure, processes, and patterns.
- Actions are based on internalized simple rules and mental models.
- Underlying attractor patterns explain complex behavior.
- Complex systems are in constant adaptation.
- Experimentation and pruning must occur for the system to adapt.
- Complex systems are inherently nonlinear.
- Complex systems are embedded within other systems and coevolve.

contradiction or to circumstances that defy intuition (http://en.wiktionary.org/wiki/paradox). Things like medicine can make you better but too much medicine can make you sick, or, a doctor is there to keep you healthy but he needs people to be sick or he's go out of business are other examples of the paradoxes we experience in life. Paradoxes are not just interesting tricks of perception. Paradoxes and how we deal with them can be very powerful forces in our lives. Paradox is considered to be one of the tools we can use to achieve change within complex adaptive systems (CASs). It is proposed with increasing regularity that many chronic illnesses have characteristics of CASs (see Table 1).[2–4] Paradox is one such characteristic.

The first aim of this article is to demonstrate how chronic pain can be framed as a CAS[5] and how paradox, one of the core characteristics of a CAS, exists within the chronic pain experience. The second aim is to illustrate how paradox exists at multiple levels within the health care encounter and ongoing experience of chronic pain. Finally, the article will use the example interactions at the patient/clinician level to illustrate how health care workers' efforts to deal with issues emergent from the range of paradoxes have for the most part been ineffective, and at times harmful, to persons experiencing chronic pain.

WHAT IS CHRONIC PAIN?

Pain is an integral part of the human experience. From a 21st century perspective chronic pain is a significant problem within industrialized nations.[6,7] It has been estimated that in Europe and North America between 12% and 35% of the population at any one time, and 49% to 80% of people across the life span will experience pain. Health economists estimate that the cost of chronic low back pain alone in the U.K. was £1,632 million in the late 1990s. When additional indirect costs (like informal caregivers, lost wages, etc.) were included, the figure rose to £10,668 million thus making back pain (not even considering all the other common forms of chronic pain) one of the most costly conditions for which economic analysis has been carried out in the U.K.[7]

Addressing this pervasive problem, with its high social and personal costs, has produced thousands of research publications. A Scopus search (http://www.scopus.com/scopus/home.url), retrieved over 28,000 articles published on chronic pain in the last 10 years. To put that in perspective, in the same period less than 7,000 articles were published on the topic of myocardial infarcts. Despite all this attention, as any one with chronic pain can tell you, our understanding of why people have chronic pain and what can be done about it seems as illusive as panning for gold with our bare hands.

Chronic pain seems to divide people into a tug-of-war of opinions. On one side are those who believe that chronic pain has an underlying biological cause that can be cured if the right medication or surgical procedure is discovered. Pulling from the other side are those who believe that chronic pain is actually a consequence of many interacting social forces (like medical care, insurance companies, and the workplace) and personal traits (like lifestyle, anxiety, and self-image) all of which interact to create a unique and unpredictable experience—chronic pain. Not surprisingly, research shows that persons with pain and their health care providers hold many different views about pain—sometimes they agree but often they do not.[8–10] When people with pain and health care providers were shown the results of a survey demonstrating this lack of agreement, most participants suggested that this type of communication breakdown and erroneous assumptions were very problematic in managing chronic pain.[11] In the same study, health care providers widely overestimated the number of treatments that people with pain thought were important. In actuality people with pain were very selective and idiosyncratic in what they thought was an important treatment.[11] These findings are consistent with previous accounts that many of the beliefs patients and care providers have about each other are inaccurate assumptions that do not hold up to scrutiny.[12–15]

CHRONIC PAIN IS A CAS

People hold a range of beliefs and attitudes about pain, making it a highly individual experience the outcomes of which depend on a diverse range of interactions. At times these outcomes seem unpredictable and random,

seldom following a linear pathway. This state is consistent with the characteristics of a CAS as outlined in Table 1.

Researchers have demonstrated that applying linear thinking to complex problems and focusing on searching for "the single best solution" is ineffective. Trying to make a complex event follow a straight line will bring everything to a standstill.[14–16] It is like trying to get a group of 4-year-olds to carry out a highly choreographed dance routine. Because you cannot know all of the influences on their behavior (for example a sick puppy, a sleepless night because of a nightmare, stage fright, or a mother who is late for the start of the performance), you cannot control for all of the behaviors that can emerge. Your dance event will not be a linear experience. You can have the same children, same music, same time of day, and the same dance but each time new influences are acting upon them and new, unanticipated behaviors will emerge. By the same principle trying to determine the "best" treatment for everyone with the same diagnosis of chronic pain is illogical. It makes no allowance for the unpredictability of people and their lives. Some theorists call this the assumption of rationality. We know that, just like a dance group of 4-year-olds, people with chronic pain are a heterogeneous group who will not respond in a predictable and uniform manner. Human nature is not unfailingly rationale and the logic behind many decisions often lies beyond the beholder's grasp.

A growing number of researchers suggest that a CAS model is ideally suited to current health care issues like chronic pain because it provides a way of looking at health problems that recognizes complex problems require a flexible and diverse range of strategies and paradigms dependent on the presenting situations and relationships at play.[16,17] CAS theory helps us understand that for some problems (like a broken arm, a ruptured appendix, or a bacterial infection) a biomedical perspective is exactly the right tool. But other tools, for other people, in other contexts, will be more effective under other conditions at different times. Using only one perspective is like buying only one-size-fits-all clothing; not a good fit for anyone.

Chronic pain, like other complex systems, is more than the sum of its parts. If we examine the characteristics of a CAS (Table 1) we see that chronic pain demonstrates there characteristics. Chronic pain is strongly influenced by relationships, and because society has certain expectations about how people with pain and health care providers should act,[18] it is difficult to break out of certain ways of thinking about pain. Pain, we see, seems to keep changing regardless of what treatment is tried and the experience of pain appears irreducible. An important consequence of these characteristics is what CAS theorists have termed "emergent" behavior.[4,19,20] Emergent behaviors are the new, unexpected behaviors and events that emerge as the elements of a complex system interact. We have all experienced the feeling of surprise when things turn out differently then last time. We expect that when the same elements are put together, the same outcomes should occur. This linear thinking holds true when you are baking a cake or setting a broken femur, but, returning to our 4-year-olds performing a dance, we need to assume that the emergence of novel behaviors is the norm for many complex health conditions and not the exception to the rule.

We cannot possibly know or control all of the influences on a complex interactive system. In health care we are learning that efforts to understand emergent behavior using linear tools (randomized control trial research, for example) are unsatisfactory. With our group of young dancers we can make some fairly accurate predictions about what will happen if we keep giving them more and more rules to control their behavior. Usually chaos! It begins to feel as if for every rule you make to stop a certain behavior the group will come up with a dozen new undesirable behaviors for which you never imagined needing to make a rule. Obviously it is absurd to think that you can anticipate all of the behaviors that a complex system, (like young children or chronic pain) will display. The most effective strategy for dealing with CASs is to keep the rules simple.[19] In the case of chronic pain a simple rule would be, "pain is what ever the person with the pain says it is".[21] Rules and complex systems are actually another example of a paradox, the more you try to make rules and control for every situation, the less likely you are to succeed in achieving the desired outcome. The words of Hippocrates, "first do no harm", provide perhaps the most enduring and useful example of a simple rule upon which the complexity of health care is built. A very simple rule with far reaching effects that guides our behavior in an infinite range of circumstances.

Chronic pain persists in being chronic. Again and again we see that what emerges from the interaction of the composite elements of chronic pain is more pain. In other words, the emergent behavior of the complex system of chronic pain is chronicity. Regardless of what type of intervention we employ (system input) what is most likely to emerge is continued pain (system output).

The system adapts to a diverse range of inputs and maintains itself in continued pain.[22] Despite the ever-growing volume of research "evidence", the question "*why is chronic pain so resistant to change*?" remains largely unanswered.

ROLE OF PARADOX

The *British Medical Journal* series of articles about CASs theory[19,23–25] is often cited and serves as an important influence as health care practitioners come to understand the uncertainty and paradox inherent in the medical system's dealings with chronic illness. The journals of other health professions have followed suit by also highlighting uncertainty and paradox as key influences in how CAS respond to environmental demands.[26,27] Health care professions are starting to educate practitioners about complexity theory as an important conceptual tool for dealing with chronic, enduring health issues of the 21st century.[4] The elements of CASs are multilayered. In chronic pain these elements are systemic, as well as interpersonal, and, at the most intimate level, comprise an individual's own thoughts, values, and beliefs. The connecting theme is "people"; people with pain, health care providers, family members, employers, and society in all its diversity. Although people have many common understandings, they also hold unique beliefs, values, and assumptions based on life experience and interaction with others. These beliefs and values are enacted at the system's level through policy formation of workers' compensation boards, social support policies, and health care resources distribution for example. Beliefs and values also influence interactions and the formation of relationships between the person with pain and his/her family, employer, and health care provider. At this level assumptions of shared understanding can be strong and the consequences of making these assumptions about shared beliefs can be far reaching. Equally strong, but much more difficult to uncover, is the internal conflict of values, beliefs, and assumptions experienced by many people with chronic pain. These conflicts can critically influence the course of the pain experience as individual's grapple with a pain that seems to defy all previous understanding and beliefs about one's body and well-being.

We can expect to find dissenting opinions and paradoxical beliefs within a CAS. Paradox exists, for example, when occupational therapists, who espouse the practice of patient empowerment and client-centeredness, are employed by insurance companies and workers compensation boards, and thus need to make choices between the goals of the employer and the injured worker with chronic pain.[28] Paradox also exists in social assistance and disability welfare systems that actually serve as disincentives for injured workers to return to work.[29] Programs that do not allow for modified workforce reentry or that do not allow an injured worker to "top-up" a part-time salary during the rehabilitation/reentry phase with sufficient benefits to maintain the basic standard of living afforded by remaining on benefits alone are examples of policies that result in an apparently "no-win" situation. Paradoxically the injured worker is in a program to facilitate return to work but return to anything less than full-time work will actually result in financial loss. Given the complex, rapidly changing, and unpredictable nature of the chronic pain experience, we should also expect paradoxical beliefs within individuals themselves. Persons with pain experience dissonance between their beliefs and their experience, "pain is supposed to get better, but my pain is lasting. I'm doing what the physiotherapist says and I'm taking my pills, maybe its all in my head?" Patients relate how they perceive a need to deny the periods of lessoning in their symptoms so as to maintain the support required to cope from family and health care providers (for example, "if I say I feel good today she'll stop giving me the help I need at work", and "if I play with the kids while my pain is under control this morning, they will not understand why I can't play with them this evening too").

Resource allocation is another example of an aspect of chronic pain where paradox, disagreement, and dissent are significant features.[30] In many stakeholders' perspective the reality of resource allocation conflicts with the ethos of care. Service users want improved service but lower taxation. Service providers want to give better care but also want to meet their duty of fiscal responsibility and rationalization. They are only too acutely aware that spending 10 extra minutes with patient "A" to discuss her concerns will mean being reductionist with patient "B" and not attending in a similar fashion to his account. Trying to juggle these competing realities (dealing with the "whole ball of wax" or just the "tip of the iceberg") places many service providers in a perpetual state of internal conflict and moral distress.[31] The goals are perceived as equally important but it is impossible to fulfill both within the current health care system.

Typically, in linear ways of looking at the world, dissent and paradox are seen as warning signs that something is wrong. These warning signs trigger corrective actions to ensure that the illusionary harmony of

consensus of opinion is maintained and dissenting voices are silent. In a linear way of looking at problems, agreement and consensus are important so that energy is not wasted in fighting over who (or what) is right. However, chronic pain is not a linear problem, it is complex. Theorists who study CASs remind us that these paradoxical beliefs and dissent between and within individuals don't have to be a case of determining who is "right." Indeed, in complex systems there are multiple "right" answers. When working in a complex system the tension created by paradox and dissent can be used as a positive force catalyzing information exchange, and stimulating new ideas and strategies.[32] An example of this creative force is the groundswell of willingness within an international arena to discuss and debate apparent paradox surrounding the use of opioid medication by persons with chronic pain.[33] This willingness is even more striking given that for many clinicians the personal medicolegal risk of prescription increases in tandem with increased efforts to provide evidence-based practice. This creates a significant paradox in itself.[34] Although it is true that these powerful drugs help many people, it is also true that opioids are harmful if a person becomes addicted. This is a paradox; both statements are true under certain conditions at certain times for certain people. It would be foolish, and counterproductive, to argue over which statement ("opioid drugs help/harm") better represents the truth. The answer will always be "it depends." Arguing about this paradox continues to divert valuable time and resources into defending dichotomous positions, instead of freeing these scarce resources for creative problem-solving and improved chronic pain management.

Typically, questions in health care are viewed as dichotomous, demanding an either/or choice. And this is exactly the right approach for linear problems such as whether to have surgery for a ruptured appendix or not. However, as we come to understand what health and illness means within the context of the 21st century, paradoxes arise that must be viewed through a different lens. For example, people with chronic pain search for relief but fear medication because of society's pervasive beliefs about addiction. Research has shown that both people with chronic pain and their service providers can hold paradoxical beliefs about what treatments are important and how they should be delivered.[35] Participants in this study simultaneously held beliefs based on apparently contradictory biomedical (linear) and the biopsychosocial (nonlinear) ways of looking at health and how health care should be provided.[35]

CASs theory suggests that, instead of directing efforts to suppress alternative viewpoints (for example pro-opioid drug use/anti-opioid drug use), incongruence and paradox should be made overt, actively sought out, and examined as tools for change. When paradox is made overt the energy previously directed into winning the argument can now be channeled into creative problem solving that recognizes both perspectives are valid—one is not privileged over the other.

Stacey[36] defines paradox as, ". . . the presence together at the same time of self-contradictory, essentially conflicting ideas, none of which can ever be resolved or eliminated". The last section of this definition provides perspective about where problem-solving energies should be focused. If the opposing ideas/forces cannot be resolved nor eliminated then focusing efforts on attempting to do so will be futile. CAS theory tells us that efforts should be exerted to make the opposition explicit, developing an understanding of the patterns of interactions in play and using this understanding for decision-making.

Taking a nonlinear perspective is not easy in many current health care systems. In the U.K. for example, researchers propose that the barriers to using approaches that facilitate creative exploration of paradox within the health care system include:

- Conflicting goals within the system (for example, equity and efficiency).
- A multitude of stakeholders with different agendas, perspectives, and knowledge.
- Emotionally laden health care decisions (particularly around the issue of rationalization or "who is entitled to what resource".[3]

Encouragingly many university programs and educators now recognize the important role that ethics, political awareness, and communication play in health care provision. Reflexive practice and emotional competence,[37] medical ethics, humanities, and communication skills[38] are rapidly becoming integral parts of the curriculum. Socratic questioning and critical thinking are pragmatic skills[39] for examining assumptions. These are tools for opening nonjudgmental exchange of idea between agents at all levels so as to make paradox and conflict explicit, consequently channeling energy into creative, as opposed to communication. We also need to attend to the local context[5] and find the right words to frame the concept of "paradox" (for example "catch-22," "no-win situation," or "caught between a rock and a hard place") so patients feel

validated and invited to discuss these conflicts in accessible language.

IMPLICATIONS OF PARADOXICAL BELIEFS

Paradox and dissent are expected responses to demands in a complex system. The problem lies in how an organization deals with these inherent features. Ironically, we see that linear-problem solving applied to complex adaptive issues generates a cumulative feedback loop where increasing efforts to "eliminate" paradoxical beliefs result in exacerbation of the precipitating problem.[3] In the case of chronic pain, clinicians' attempts to silence dissenting voices and force intervention into a "one-size-fits-all" answer, can actually result in the pain experience becoming more resistant to change. Experts in the area of chronic pain have called this an iatrogenic effect where treatment elements actually compound aspects of the health problem, making it worse instead of better.[40]

To take a nonlinear perspective, organizations must think differently about paradoxes. For example: "everyone deserves treatment/we cannot afford to treat everyone" and "opiates help relieve pain symptoms/opiates lead to addiction" are paradoxical statements that can never be resolved, BUT, they can be lived with.[41] Giving more attention in health care to processes and interactions will facilitate the trust and learning needed to adapt to complex events. Although there is importance in making dissent and conflict overt,[32] this attitude to conflict does not come easily to many health service providers. Poor skills in understanding and using conflict creatively will interfere with the ability to take on new policies and behaviors.[42]

> *Needless to say, surprise and complexity are the norm and not the exception.*[43]
>
> (Crabtree 2003)

Depending on ability to reframe and adapt one's perspective the area of pain management presents some challenging paradoxes. These situations can be used either to suppress dissent, promote group thinking, and homogeneity of service providers' beliefs and values or, conversely, to facilitate the creative process that can emerge from a non-prejudiced sharing of ideas. For example, the British Pain Society has an multidisciplinary membership and has stated that pain management programs need to be multidisciplinary (including the patient) in nature. Depending on the level of trust and respect within these groups, ideas can either be exchanged to foster broader cross-disciplinary perspectives, or more powerful members can use the forum as an opportunity to influence others toward a "party-line". Service providers in the area of chronic pain are members of the larger health care community, and so it is not surprising to find that they share many of the communication problems, power dynamics, culture, and much of the ethos of the predominantly linear way of looking at the world that forms the biomedical system. A linear approach to the problem of managing chronic illness will be no more useful than using a magnifying glass to get "perspective" on what direction to travel in a maze. To navigate the maze of chronic pain we need an elevated viewing platform from which to see the range of available perspectives and directions.

SIMPLE RULES: TOOLS FOR DEALING WITH PARADOX AND CONFLICT

> *Even in traditional 3-by-3 tic-tac-toe, the number of distinct legal configurations exceeds 50,000 and the ways of winning are not immediately obvious.*[44]
>
> (Holland 1998)

Complexity theorists use the example of the game "tic-tac-toe" to illustrate the concept that simple rules can result in very complex outcomes. As identified in Table 1, a key principle of CAS is that actions are based on internalized simple rules. An example of a widely held maladaptive simple rule related to pain is that "the doctor will do something to take the pain away". This internalized rule contributes to the paradox and conflict experienced in the relationship between persons with chronic pain and service providers. One way forward involves developing new simple rules that allow us to understand the relationship between the elements at play in chronic pain and to respond flexibly to the emerging and unanticipated events that characterize the chronic pain experience.

What does this mean at a practical level? We need to develop new simple rules for working with paradox and conflict. Three foundational rules (Table 2) are rel-

Table 2. Simple rules for working with paradox and conflict

1. Expect the unexpected. Do not assume things will remain static.
2. Expect conflict. People need to feel it is allowed to disagree before more constructive conversations and problem solving can occur. The conflict will occur at both an interpersonal and an internal level.
3. Expect to make small changes often. In nonlinear systems it can be the smallest change that has the biggest impacts.

evant for both health care provider and patient. First, becoming comfortable with the unexpected as a symptom of a complex continually adapting system makes sense (remember the 4-year-olds at the dance recital?)—no one can predict everything. Expect conflict; patients need to know that health care providers expect that they may have different opinions and want to talk about these ideas. Patients also need to know that the service provider understands the paradox a he or she experiences as he or she tries to balance chronic pain and daily life. For example, giving up pleasurable family outings so as to continue with homemaking tasks for the family, only to be confronted with the family's confusion and anger because he or she is "no fun to be with anymore". A third simple rule is to recognize that making changes and adjustments is, like adjusting the taps in the shower, common sense when dealing with complex systems. The biomedical simple rule implying that health care providers have the one-best answer for treatment may work, arguably, for infectious diseases and fractured limbs. When dealing with chronic pain, this rule is no longer helpful and serves to create yet further conflict, paradoxical beliefs, and experiences.

CONCLUSIONS

Developing new ways and rules to deal with paradox, disagreement, and the exchange of information within chronic pain service delivery can present opportunities for creative new behaviors and ideas. Gordon and Dahl[45] speculate that we currently see little change in pain management, despite extensive efforts, because the wrong questions are being asked. They propose that it is not necessarily the methods and technical aspects of pain management that people need more information about but rather interactions within the system itself. "Quality pain management depends on a host of complex relationships and processes . . . little is known about the relationships among these processes and how they impact patient outcomes" (p. 2).[45] They suggest that continuing to examine what are actually systems' problems with clinical tools is akin to trying to break the sound barrier by tinkering with a Ford Model T car.

To summarize, this article explores paradox, one of the key characteristics of CASs. It proposes that paradox is inherent in the experience of chronic pain: serving either as a force for remediation or entrenchment of chronicity within the pain experience. The article concludes that paradox itself is not the barrier to creative new approaches in managing the maze of chronic illnesses. Rather, the problem lies in trying to use linear strategies to reduce and suppress paradoxical and dissenting opinions. Navigating the maze presented by many chronic health conditions requires the fresh vision and alternative tools afforded by a CASs perspective. This article does not claim to have the answers but rather to provoke further discussion and debate. Hopefully it provides sufficient examples and introduction to some basic tools for working with paradox that can be applied within the reader's unique practice context.

CAS thinking applied to health care offers stimulating opportunities to debate, create and apply novel strategies and approaches to current and emerging issues. We can learn many of these lessons from reading the stories of others who have applied complexity principles to practice challenges (for example[4,46–48]). Readers more swayed by experience-based learning, may find that carrying out the Mobius strip experiment found at the BBC website (http://www.bbc.co.uk/dna/h2g2/A337592) will offer convincing evidence as to the existence of paradox and the need of believing in, as recommended by the Red Queen in *Alice's Adventures in Wonderland,* at least one or two impossible things. The necessity to do the believing before or after breakfast, of course, requires further study.

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