Reviewer's report

Title: Is US Healthcare a Real System? A strategic perspective from systems science.

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Reviewer's report:

Major Compulsory Revisions

1. This paper uses the principles of systems science to assess the US healthcare system. There is a recent literature (not cited in this paper) on the use of systems science to examine social systems including healthcare systems, and interest in this topic is growing. But this is still a relatively new field, and the underlying concepts can be difficult to understand. These are outlined in the introduction to the paper, but this is short and explanations very abbreviated. There is also relevant material in the methods section, where, for example, the key characteristics of a fully functioning open system are listed, and overlap with material in the discussion section, where the Bertlanaffy quote is repeated. None of this is helped by the structure of the paper, which is in the standard introduction, methods, results, discussion, conclusions format. I suggest a different structure. First, a short introduction explaining what the author is trying to do. Second, an expanded section on the concepts of general systems theory, incorporating and developing the material in the present methods section. Then a section covering the comparison of the US healthcare system with the key characteristics of a complex adaptive system. Finally discussion and conclusion sections as before.

2. The expanded second section should include:

- a brief summary of the development of systems science to give the reader more detail about the theoretical foundations of the paper. The author quotes three authorities. It would be useful to link these insights to the rationale for the paper. As it stands some questions are left hanging. These include:
  (a) the fact that higher level systems have “unique characteristics” compared with lower order systems (Boulding). But does this have implications for any attempt to develop a single set of key characteristics for all complex adaptive systems, and therefore enable comparison between systems? Or, if not, why not?
  (b) the implications of Ashby’s theorem. Is external control of a self organising, self adaptive, evolutionary complex adaptive system possible? If so, under what circumstances?
- a summary of the key characteristics of a complex adaptive system in non-technical terms.
- followed by an expanded account of the structure and functioning of complex adaptive systems, using the model developed in the author’s previous paper. In addition to the points already covered, this should explain:

(a) more about the relationships between components of the system and how these relationships evolve. One aspect of complex adaptive systems is the emergence of specific types of behavioural patterns called structural attractors. These are important in helping us understand and influence what seems like the highly complex behaviour of agents within a system. But structural attractors are not mentioned in this paper. It would be helpful if they could be discussed.

(b) why it is appropriate to use this model (or metaphor) based on a biological system to diagnose another, social, system, as is done in this paper. (This issue is currently raised in the discussion section, but would be better addressed up front) In particular the author might wish to address the objection that social systems such as healthcare systems are fundamentally different from biological systems because humans have intention and knowledge. Such a difference might be thought to preclude comparison.

3. The third section of the paper is currently labelled “results”. A more informative title such as “A comparative analysis of US healthcare against the key characteristics of a complex adaptive system” would be helpful.

4. This third section is the core of the paper, but it is very short. An expanded discussion of the key conclusions, the reasoning behind them, and the implications for the healthcare system would be useful. For example: talking about the external environment for healthcare, the paper notes that the healthcare system’s balance is negatively influenced by the high cost of pharmaceuticals, and that these costs result from manufacturers attempting to maximise their own domain rather than contribute to the optimisation of the overall system of which they are members. In Table 1 the proposed solution for such problems is re-establishing semi-permeability and flexible adaptation. It would help if the author could explore what sort of concrete changes this solution might involve in this instance.

5. The paper attempts two things: to compare the US healthcare system with key complex adaptive system characteristics, and to draw out the implications of that comparison. The discussion should cover what has been learnt in attempting both these tasks.

Minor Essential Revisions

6. The third section currently labelled “results” links to Table 1. It would help if these links were made clearer by numbering each of the characteristics/features of a complex system in the table and using those same numbers in the text.

7. There is a growing and recent literature on complexity and healthcare systems but this is not cited in this paper. It would help if it could be.
Discretionary Revisions

7. Some of the language used in systems science is opaque. For example “health territory” has a specialist meaning, but when the system in question is a healthcare system this can confuse. A glossary would be helpful.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.