Correspondence

To the Editor:

Greenhalgh and colleagues produced a remarkable review of the diffusion of innovations (Greenhalgh et al. 2004). We are also intrigued by their new methodology, “meta-narrative review,” and look forward to the publication describing their methodology that is currently in press.

We would like the authors’ opinion on whether complexity science and the theory of complex adaptive systems (CAS) explain some of their observations on the diffusion of innovation. Although they mentioned complexity studies in their review, they did not mention CAS. The core of their summary in Figure 3 is mechanistic process, although some of the properties inventoried on the perimeter of the figure are attributes of a CAS. For example, the authors described observations such as the nonlinearity of assimilation as “organic” that other authors, including Dr. Greenhalgh, have described as reflecting CAS (Plsek 2001; Plsek and Greenhalgh 2001).

In the appendix, “Redesigning Health Care with Insights from the Science of Complex Adaptive Systems,” of the Institute of Medicine’s report *Crossing the Quality Chasm: A New Health System for the 21st Century*, Plsek defines a CAS as “a collection of individual agents that have the freedom to act in ways that are not always predictable and whose actions are interconnected such that one agent’s actions change the context for other agents” (Plsek 2001, 312–3). In health care, agents may be individuals or groups of individuals who contribute to the provision of care.

Thus, the relationships and the history of agents are important. Complexity science posits that in order to understand the organization, one cannot look at individual parts in a mechanistic way. Rather, one must study relationships and patterns within those relationships over time. The state of a given system at a given time is a nonlinear function of the state of that system at a previous time.

A critical tenet of complexity science is the nonlinear dependencies among agents. Health services researchers often use linear models to

attempt to explain phenomena. But what if the phenomenon we are trying to explain does not fit this model? Complexity science argues that when we try to model a nonlinear dynamic system with traditional statistical models, we can never begin to understand spontaneous, self-organizing systems like those in health care (McDaniel and Driebe 2001). This may help explain why we find low r-squares in explanatory models, why the speed of innovation varies in different organizations, and why similar interventions in different settings may have different “uptakes.”

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Author's Response

I agree with Drs. Badgett and Pugh that complexity science is an excellent explanatory model for analyzing the spread of innovation in service organizations, for precisely the reasons they have outlined. Table 1 of our article lists “complexity studies” as one of 13 research traditions that contributed to our systematic review. But the other 12 traditions provided additional insights that enriched our overall model. Depending