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Complexity theory and family medicine: a new symbiosis

In a "symbiotic" relationship, family medicine would gain from complexity theory *and* complexity theory would gain from family medicine, since the unique questions raised by family medicine, and our efforts to answer them via systematic research, can contribute to the development of theory in the study of complex systems. In this paper, I argue for (a) a more disciplined and refined theory of complexity and (b) greater recognition of the role of science and technology in family medicine.

Complex systems are characterised by adaptiveness to local feedback, unpredictability and paradox, and emergence. These basic principles are extremely useful as a general world view. They take us beyond the positivistic assumptions, methodological fetishism and quantitative biases which dominated heath services research in the 1990s and early 2000s. That is an important frame shift – but it falls short of being a *theory*, because it lacks precision. It offers no detail, for example, on such things as human agency or morality or on how technological progress links to social change.

Sociotechnical change might be considered as a "triple helix" in which social structures, human agency and technologies coevolve in a nonlinear way, each influencing the other two. Let us take the three strands in the triple helix in turn. We could consider first the individual agent – say a person with diabetes. The role of this person has gradually evolved to include monitoring her own diabetes, delivering peer support to others, and accessing and challenging her own medical record. In the "social structures" strand of the helix, changes have included patient empowerment, disability rights, the information society, the rise in consumerism and accountability in healthcare, and the civil liberties movement who are concerned about security and identity fraud with electronic patient records. In the technology strand, people with diabetes have seen, in the space of a single lifespan, the discovery of insulin, near-patient testing for blood glucose, the possibility of "designer drugs" tailored to the individual genome, the Internet, electronic medical records, and so on.

In order to produce a precise and disciplined analysis of a complex phenomenon in an aspect of healthcare, we need to overlay these three evolving strands and ask, at a series of time points, what configuration of people, technologies and social structures is producing what action, and what are the consequences of that action – both intended and unintended (fig. 1)?

Take the case of Fatima, a young woman who immigrated from rural Bangladesh to London at the age of 15 for an arranged marriage and who is now suffering from gestational diabetes in her first pregnancy. Fatima struggles with multiple and conflicting norms, expectations, meaning-systems and values. Out of these, she must construct her own hybrid identity and live a life that is somehow meaningful, fulfilling and ethical. In order to study the conflicting pressures on Fatima, and to make sense of her behaviour, we must both "zoom in" and consider Fatima herself, and also "zoom out" and consider the wider context in which Fatima lives and makes choices.
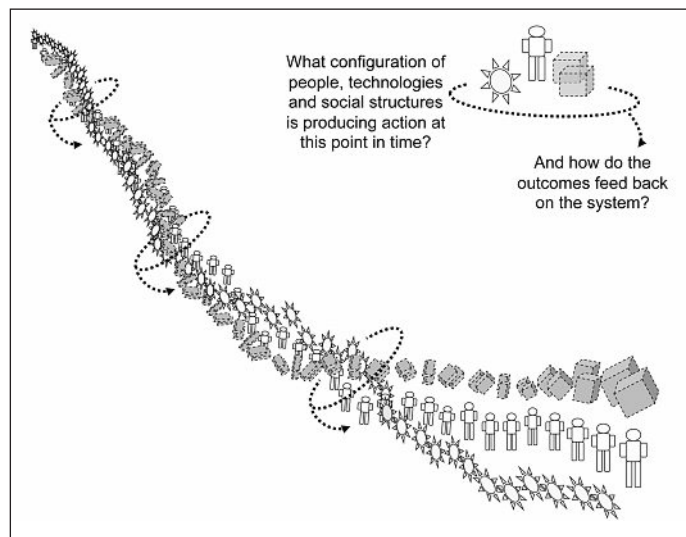

Figure 1
What configuration of people, technologies and social structures is producing what action, and what are the consequences of that action?

When we zoom in, we need to ask questions about Fatima's personality, her genetic predispositions and risk factors, her educational and cultural background and so on, as well as asking very specifically about why she made particular choices in particular situations, and the impact of those choices on the people around her and more indirectly, on the wider system. When we zoom out, we must also systematically consider the various economic, institutional and cultural realities which create a very particular context for Fatima's choices. We also ask questions about the key *technologies* that are linked to Fatima's care – such as her home blood glucose machine, the electronic record that is shared between her GP and the hospital, and the computerised decision support software that is built on evidence-based guidelines. At the micro level, how do they work and what opportunities do they offer Fatima and the people caring for her? At the macro level, where did these technologies come from; whose values and standards are inscribed in the software? How are the technologies actually used (if at all) in practice – and what are the consequences of this, feeding back into the system? The online version of this paper develops this theoretical outline further and suggests avenues for further research.

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