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Taxonomy for complexity theory in the context of maternity care

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ABSTRACT

Background: The linear focus of 'normal science' is unable toadequately take account of the complex interactions that direct health care systems. There is a turn towards complexity theory as a more appropriate framework for understanding system behaviour. However, a comprehensive taxonomy for complexity theory in the context of health care is lacking.
Objective: This paper aims to build a taxonomy based on the key complexity theory components that have been used in publications on complexity theory and health care, and to explore their explanatory power for health care system behaviour, specifically for maternity care.
Method: A search strategy was devised in PubMed and 31 papers were identified as relevant for the taxonomy.
Findings: The final taxonomy for complexity theory included and defined 11components. The use of waterbirth and the impact of the Term Breech trial showed that each of the components of our taxonomy has utility in helping to understand how these techniques became widely adopted. It is not just the components themselves that characterise a complex system but also the dynamics between them.

Contents

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Introduction

Debates about the best approach to health care provision are persistent and contentious within and between countries across the world. For many high and medium income jurisdictions, discussions about the quality of health care have become heavily colonised by concepts of risk and safety, where risk of an adverse event is only seen to be acceptable when it is reduced to the lowest (infinitely small) level. Management of risk in health care tends to be seen as a simple linear 'input/output' process, in which screening identifies those at increased risk and then treatment eliminates the risk. Much of the evidence for this approach is based on 'large trials with simple protocols' (Peto et al., 1995). However, this assumes that the relationship between a particular risk factor and a specific adverse event is predictable, simple, linear, and generalisable to a wide range of contexts and individuals. It also assumes that removal of a risk factor for one condition does not increase risk for another one.

The flaws in this approach are evident, for example, in the growing controversy over the unintended consequences of routine screening for breast cancer for women (Autier et al., 2011; Roukema, 2013), and in the increasing concern about the longer term (and even epigenetic) potential for adverse effects associated with the continuing rise in the use of caesarean section for an ever wider list of indications in maternity care (MacDorman et al., 2008; Dahlen et al., 2013; Witt et al., 2014). Both seem logical, as a means of preventing adverse events. In the event, both have been shown to have unintended consequences in practice, both for individuals (iatrogenic mortality and physical, psychological emotional morbidity need for further treatment, and decreased quality of life), and for society, in terms of diversion of health resources, and economic consequences (Van der Steeg et al., 2011; Moynihan et al., 2013; Witt et al., 2014).

As knowledge accumulates about the lack of generalisability of trials evidence when it is extended to actual practice (Worrall, 2010; Humphreys et al., 2013), there is a growing critique of the so-called (current) 'normal science' approach (Kuhn, 2000). Although, large simple trials may work in certain tightly controlled contexts, the highly circumscribed interventions tested in such studies (often on carefully selected samples of service users) cannot cope with the messiness of real life in most practical situations (Enkin, 2006; Treweek and Zwarenstein, 2009). Politically, strongly positivist risk-averse health care is perceived by some to delimit the expertise of professionals, depersonalise care provision, and increase litigation risk and consequent health care costs (Reinders, 2008; Goodman and Norbeck, 2013). More recently concerns about disrespect and abuse in health care across the world have illustrated the moral and ethical consequences of the scientific-bureaucratic turn in health care (Bernstein and Fundner, 2002). In this interpretation, the excessive reliance on rule-based and protocol driven health care based on population trials evidence leads to a lack of concern for individual needs and circumstances. This, in turn, leads to emotional burnout for health care professionals who can no longer do the kind of vocational caring they came into their profession. Emotionally burnt-out professionals cease to see patients as people, and, in the scientific-bureaucratic context, they begin to treat them as units, to be processed. This strips out compassion, and allows disrespect and abuse to flourish.

Practitioners and researchers who want to reverse this phenomenon have turned to a number of theories to try to take account of the wide range of factors that might influence the specific situation of one specific individual, and their encounter with a clinician and health care system. For example, recent analyses have included realist research and experience based co-design (Pawson et al., 2005; Bate and Robert, 2006; Robert, 2007). Many of these emerging theories have their roots in aspects of complexity theory, either explicitly, or, more often, implicitly (Pawson, 2013).

Complexity theory emerged as a way of understanding and taking account of discrepant findings in physics. It specifically marked a shift from classic linear science as exemplified by Einstein's theories, towards the more dynamic, unpredictable physics of thermodynamics (Prigogine, 1997; Holden, 2005). It has been used in many different fields, for example, to improve weather prediction, to explain phenomena in economics, biology, and to understand social systems. In his book 'Complexity & Postmodernism' Cilliers (1998) explained how systems work based on complexity theory. He described complex adaptive systems as non-linear systems in which diverse agents interact with each other and are capable of undergoing spontaneous self-organisation. Since 2001, when the British Medical Journal launched a series of articles on complexity in health care (Fraser and Greenhalgh, 2001; Plesk and Greenhalgh, 2001; Plsek and Wilson, 2001; Wilson et al., 2001), there has been a growing debate around the use of the theory in the health care context (Reid, 2001; Paley, 2007; Sturmberg, 2007; Dattée and Barlow, 2010; Greenhalgh et al., 2010; Paley and Eva, 2011; Sturmberg et al., 2012).

The rather dense concepts that underpin complexity theory have been expressed in a range of metaphors and phrases. These include 'small in, large out', 'the whole is more than the sum of the parts' or 'tipping points'. The over use of some of these terms has led to accusations of naivety against those attempting to use complexity theory in a range of settings. Although there is a concept analysis in this area (Holden, 2005) and some previous publications offer an overview of a number of components in the light of health care (Chaffee and McNeill, 2007; Sturmberg and Martin, 2009), a comprehensive taxonomy for complexity theory in the context of health care has not been published to date.

Taxonomy is the practice and science of classification. It brings together the key characteristics of a concept, defines these characteristics and puts them together in a relationship scheme. This can be a hierarchical scheme, but may also be a network structure. A taxonomy can be used as a practical heuristic to assess the degree to which the theory has been effectively translated into fields, such as health care. Identifying a taxonomy of complexity theory for health care is a potentially significant contribution to the search for something beyond simple linear solutions. This paper therefore aims to answer two questions;

1. What are the key complexity theory components that have been used in publications on complexity theory and health care?
2. Do they have explanatory power for health care, and specifically for maternity care?

Maternity care was chosen as a paradigm case for the taxonomy for four reasons. It affects millions of women, neonates and

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