LUND UNIVERSITY

Complicated, complex and compliant: Best practice in obstetrics

Dekker, Sidney; Bergström, Johan; Amer-Wåhlin, Isis; Cilliers, Paul

Published in:
Cognition, Technology & Work

DOI:
10.1007/s10111-011-0211-6

2013

Link to publication

Citation for published version (APA):
Dekker, S., Bergström, J., Amer-Wåhlin, I., & Cilliers, P. (2013). Complicated, complex and compliant: Best practice in obstetrics. *Cognition, Technology & Work*, *15*(2), 189-195. https://doi.org/10.1007/s10111-011-0211-6

Total number of authors:
4

General rights
Unless other specific re-use rights are stated the following general rights apply:
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.
• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: https://creativecommons.org/licenses/

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Complicated, complex and compliant: Best practice in obstetrics

Sidney Dekker[1], Johan Bergström[2], Isis Amer-Wahlin[3], Paul Cilliers[4†]

[1] PhD, Professor and Director of the Key Centre for Ethics, Law, Justice and Governance, Griffith University, Mt. Gravatt, Queensland 4122, Australia

[2] Doctoral Scholar, Lund University Centre for Risk Assessment and Management, PO. Box 118, SE-22100, Sweden

[3] MD, PhD, Department of Women and Child Health, Karolinska Institute, SE-17176, Stockholm, Sweden

[4] PhD, Professor at the Centre for Studies in Complexity, Department of Philosophy, University of Stellenbosch, Private Bag X1, Stellenbosch 7602, South Africa

Corresponding author: Johan Bergström,
Email: Johan.Bergstrom@lucram.lu.se
Telephone: +46462884506

Abstract

In this study the distinction between complicated and complex is used to shed some light on compliance with best-practice guidelines. Data was gathered related to obstetric practice in labor wards and operating theatres at two Scandinavian hospitals, one of them being a university hospital, and in a training facility. The complexity of obstetrical intervention is analyzed in this paper, as is the potential of compliance-based routines in obstetrics. Complex situations are different from complicated ones and patient safety management efforts should recognize and enhance the sort of diversity that helps the emergence of resilience in complex situations.

Keywords

Patient safety, Complexity, Intervention, Compliance, Diversity, Resilience

1. Introduction: Complicated vs. complex

Most of healthcare can be seen as a complex system, and the literature as well as practice often refer to it as such (Buckle, Clarkson, Coleman, Ward & Anderson 2006; Carayon 2010; Cook, Noyes & Masakowski 2007; Cook & Woods 1994; Plsek & Greenhalgh 2001; Woods, Dekker, Cook, Johannesen & Sarter 2009; Xiao, Hunter, Mackenzie, Jefferies & Horst 1996). Complex, however, is not the same as complicated, and conflating the two notions can lead to confusion about ways to best govern a complex system like healthcare. Best practice guidelines pervade medical research, education, management, administration, payment, compensation and practice (Holmes, Murray, Perron & McCabe 2008) and can be seen as having animated politics and ideologies of healthcare quality improvement (Greene 2009; McDonald & Harrison 2004). But such compliance-based approaches are founded on particular assumptions about the nature of the system in which they are supposed to work. In this paper, we use the distinction between complicated and complex to illuminate the problem of compliance with best-practice guidelines and so-called "red rules," drawing on our own empirical data from obstetrics practice in a Scandinavian country (Amer-Wåhlin, Bergström, Wahren & Dekker 2010).

Both complicated and complex systems consist of a large number of interacting components, but that is where their commonality ends (Cilliers 1998, 2010; Heylighen, Cilliers & Gershenson 2007; Waldrop 1992). Complicated systems are ultimately knowable. They afford a complete, exhaustive description. A set of rules (or equations) can be drawn that fully captures their workings. Because of this, complicated systems are controllable, similar to machines. Order in complicated systems is achieved by figuring out one best (e.g. efficient) method to operate them. Stability is achieved by compliance with this one best method. There is a clear boundary where the system ends and its environment begins. A jet airliner, for example, is a complicated system. A continuous-flow anesthetic machine is too.

Complex systems, in contrast, are never fully knowable (Cilliers 2002). A complete, exhaustive description is impossible to attain, and they are mathematically intractable. No set of rules or equations can capture their nature or full workings (Page 2008). Complex systems consist of numerous components or agents that are interrelated in all kinds of ways, and they are open systems. They keep changing in

interaction with their environment, and their boundaries are difficult to determine. It can be hard to find out (or it is ultimately arbitrary) where the system ends and the environment begins. More than one description of complex systems is always possible and even necessary, even though the system will probably have changed before any description is even finished. No intelligent designer or governor is required to put a complex system together or control it—complexity emerges from a network of local interactions. In fact, complex systems are held together by local interactions only. The horizon of each component is quite limited, and the further away, the more unpredictable the consequences of its actions become. If there were one component that understood the whole system, then that component would have to be as complex as the complex system, which is a practical and philosophical impossibility (or possible only if the system weren't complex). In a complex system, because of the deep and extended webs of interactions and interconnections, any agent's action controls very little, but influences almost everything. Complexity theory does not necessarily provide the exact tools with which to solve complex problems (in fact, that sheer possibility is antithetical to complexity) but it can provide rigorous accounts of why complex problems are so difficult:

> "…because complex systems are open systems, we need to understand the system's complete environment before we can understand the system, and, of course, the environment is complex in itself. There is no human way of doing this. The knowledge we have of complex systems is based on the models we make of these systems, but in order to function as models—and not merely as a repetition of the system—they have to reduce the complexity of the system. This means that some aspects of the system are always left out of consideration. The problem is confounded by the fact that that which is left out, interacts with the rest of the system in a non-linear way and we can therefore not predict what the effects of our reduction of the complexity will be, especially not as the system and its environment develops and transforms in time" (Cilliers 2005, p.258)

Order in complex systems cannot be imposed, it "emerges" from the multitude of relationships and interactions between component parts. An emergent property is a characteristic of a complex system, which cannot be deduced by examining the components of the system in isolation. The emergence is a

result of a complex set of non-linear interactions between all the components comprising the system. Success in a complex system flows not from having it follow one best method—but from a diversity of responses that allow it to cope with a changing environment (Dekker 2011a, 2011b; Dekker, Cilliers & Hofmeyr 2011; Feltovich, Spiro & Coulson 1997; Hollnagel, Woods & Leveson 2006).

Health care has a range of unique inter-professional relations, and in emergency situations its practitioners typically continue to operate with unclear definitions of responsibilities and accountabilities, some with relatively traditional and low-technology practices, and a limited reach of evidence-based medicine. Obstetrics is an area that offers a large number of such ambiguous situations, both normal and operative, which represent valuable empirical/clinical encounters for the research we intended to perform. The aim of this study was to investigate obstetric practice in complex situations.

2. Method

We studied clinical practice in obstetrics in a Scandinavian country where nurses with a specialty in midwifery have significant medical authority. In order to study the complexity of medical intervention several methodological approaches were applied, namely field study, semi-structured interviews, focused interviews, and informal interviews with health care staff in (or close to) their naturalistic environment. We conducted the studies over a seven months period and in different settings, explained below.

2.1 Field study

We used a field study to answer the question "what do they do?" We conducted the study at a mid-size Scandinavian hospital by intense weeks of around-the-clock presence, where our researcher moved freely between operating theatres and labor ward, followed normal as well as non-normal labor, elective as well as emergency Caesarean sections (CS). Our researcher functioned as an outsider-ethnographer in the sense that he did not have a professional background within medicine but within the field of human factors and systems safety. In that sense we aimed at interpreting the complexities of normal, as well as non-normal, work in obstetrics. During the field study notes were taken of the observations made as well as of the informal conversations that were held with midwives, obstetrician attendings, anesthesiology

nurses, anesthesiologists, operation nurses, residents, and assistant operating nurses. In addition, we spent time on surgical wards, and were present when policies related to hand washing were introduced and policed.

2.2 Semi-structured interviews

Semi-structured interviews were used to answer the question "what do they say?" In connection to a training course for emergency obstetrical situations we conducted semi-structured interviews with four Scandinavian midwifes. In the interviews, which were conducted in a focus group, the midwifes were asked to give their own narratives (and reflect on each other's narratives) concerning non-normal labor situations. Specifically we aimed at probing the complexities of the intervention decision to call a doctor (most often the junior resident on duty) for help. In close connection to the field study we also conducted semi-structured interviews with five midwives, two obstetrician attendings, four anesthesiology nurses, three anesthesiologists, one operation nurse, one resident, and one assistant operating nurse. These individual interviews were focused, by asking the respondent to recall specific situations, on the role of the respondent in an escalating labor situation and any difficulties that the respondent perceived related to team coordination in such situations.

2.3 Focused interviews

In order to answer the question: "how do they reconstruct?" we conducted focused interviews. After a serious incident at a Scandinavian university-hospital we were invited to participate in two debriefing sessions with those involved in the case (including three midwifes, two attending obstetricians and one assistant nurse). The debriefing sessions were used, based on a very specific (and recent) case, to probe the complexities and uncertainties as a situation escalates in the health care setting.

2.4 Analyzing the results

We analyzed the data by comparing and contrasting our interpretations of answers to the questions which were studied using the three approaches outlined above (what do they do, what do they say and how do they reconstruct?), as well as the scientific literature concerning compliance-based routines in the health care setting. This comparison and contrasting of different views and perspectives was used to formulate a

discussion about the complexity of obstetrical intervention as well as the potential of compliance-based routines in obstetrics.

3. Results

3.1 Best practice and medical competence

Like any medical field, obstetrics seems immune to normative pressures. Intervention decisions in this field are often a topic in dedicated journals and edited volumes (e.g. *Best Practice and Research, Clinical Obstetrics and Gynaecology*) which develop and help implement best practice guidelines for a variety of interventions based on clinical indications in both parturient and fetus. The language used in these is often as normative as it is prevaricating. "Proper" reading of the evidence by midwives, for example, and "appropriate" execution of the intervention putatively leads to less fetal distress and injury (Benner, Malloch & Sheets 2010). This appeals to an inexplicit standard while hiding the contingent nature of what proper or appropriate might mean—something that is often not obvious until after the event (Hugh & Dekker 2009). "Red rules" (whose transgression is sanctionable) may even be introduced, applicable to obstetric as well as other practice. These have been proposed for everything from the neglect to use IV pumps to hand washing (Wachter & Pronovost 2009).

Obstetrics, like many other parts of clinical medicine, is governed both explicitly and implicitly by a relatively rigid medical competence hierarchy, where the authority and responsibility for diagnosis and intervention decisions, medication orders, control of medical technology and continuation of care decisions rests at the top (Ödegård 2007). In obstetrics as well as in medicine in general the professional identity of doctors implies taking responsibility. This is related to a claim of exclusive authority over particular knowledge and skills and to the sense of authority over a specific area of expertise created by the idea of ability to apply scientific medical knowledge and decipher the non-normal (Whitehead 2007). In fact "the hidden curriculum" of medical training has been described by Hafferty and Franks (1994) as informal factors that socialize medical students making them "feel the legitimacy of their decision-making powers" (p.861). This is replicated in our studies. On one hand in the idea of being individually

responsible for the care that is being delivered, with statements like "I can delegate tasks but never responsibility" often used by the junior residents in our studies. But the other side of the coin is also how not asking for help can be an important aspect of doing well as a doctor:

> You do want to do well and not call the attending. You rather won't eat and drink yourself than call for help. You know that the attending will be on duty as backup the entire weekend and it always affects someone else if you are not doing well in managing your situation. [Junior resident]

The next level in the medical competence hierarchy is nursing, which monitors patient condition, carries out medication orders and offers patient continuity of care (doctors often only "visit" a patient) (Benner, Malloch & Sheets 2010; Ehrenreich & English 2010). Below that is caring, which handles physiological (if not psychological) needs of feeding, cleaning, rehabilitation. And below that is the patient, who is generally assumed not to know much of value about their own disease or condition other than possessing the privileged experience to describe its surface features to clinicians (Ödegård 2007). Interestingly the whish to retain control over particular types of expertise and thus responsibility is often welcomed both by other health care professionals (Allen & Hughes 2002) and patients (Starr, Paul 1982).

3.2 Social and professional complexity

The strict hierarchy makes each layer subordinate to the one above, which can lead to intriguing divergences between expertise and decision authority. The obstetrical model of care we studied is an intermediate model, between the more technological, implying less involvement of midwifes and the less medicalized model, often midwifery-led (Wagner 2001). Midwives occupy a hugely important swath of clinical experience and judgment (Sibley, Sipe & Koblinsky 2004). Nowadays fully registered nurses with extra training and education, midwives accumulate experience from hundreds or thousands of hours spent by bedsides. Intervention decisions, however, belong formally to those who haven't spent such time there but on the other hand are expected to handle complications. In such a medical model, present in several European countries, praxis is to call for the obstetricians only when things are no longer "normal."

> "As a midwife I am certified to manage the normal pregnancy and the normal labour. When it is not normal any longer that's when I call the physician who takes charge over the situation. Emotionally however I still feel responsible for the mother, but practically I go from being autonomous to following instructions". [quote from a specific midwife, but similar statements were made by several of the midwifes involved in the study]

The construction is seemingly complicated rather than complex. The midwifes autonomy is specified (European Parlament 2005) and in hospitals with midwife-led labour, the responsibility of the judgment of all aspects of normality including fetal heart rate interpretation is concentrated to midwifes. When the situation is no longer normal, the responsibility of the situation shifts actively from midwife to the obstetrician, who is then responsible for the non-normal situation (the highest level of the hierarchy-competence model outlined above). The problem, of course, is what this means, and who gets to say what is normal and abnormal. The delineation between normal and pathological is never simple and just like any complex situation needs an interpretation, which can never be more than a "snap-shot" as the future is not known. Signs of "abnormality" are the interpretive and often contested product of the clinical evidence available in the delivery room, where physicians may not be present until "abnormal" has become defined by those who *were* present.

> "When I make the decision to call I call for someone to share my view. I have an idea of how to make progress and I want the doctor that I call to agree with me and follow my suggestion. However sometimes I just stand there hoping that the resident will call the attending. And to call the attending is a decision made by the resident. What we often face is the situation in which we hope that the resident dares to call [an attending] for help. Sometimes the attending is a stern one, whom you may not dare to call when he is on duty at home". [Midwife]

A physician's intervention decision is thus preceded by midwives' construction of evidence and the resulting intervention decision to call the next competence level. But midwives' intervention criteria are not simply complicated, complying with simple if-then rules, even if guidelines exist to simplify and

structure the change from normal to pathological. In fact midwifes' criteria for intervention are as complexly sensitized as the midwifes themselves.

> "A pathological CTG trace is not sufficient to determine that the situation is non-normal. There are numerous factors that need to be taken into account. I have to be able to tell when it is non-normal and ask for help. First of all, you discuss it with a colleague". [Midwife]

The multiple factors weighed into such intervention criteria are time of day, number of patients at the ward, multiple conditions of the specific patients, and they also vary in part with which physician is on duty. Midwives make assessments or predictions on the basis of physician experience, sensitivity to clinical evidence and assumed physician intervention criteria, as well as physician interruptability in the context of estimated ward workload and their historical responses to being interrupted. Physicians, in turn, accumulate their own experience with midwives' criteria for calling them, which affects the perceived urgency of a required response, depending on which midwife does the calling.

> "At night I feel that the midwifes rather increase the labor-inducing infusion-rate than give me a call". [Junior resident]

It gets more intricate still, because the midwife can call upon a senior colleague for backup or second opinion before calling the physician on call. However this is depending on staffing level and in most centers in the western world the model of care is technological (Hafferty & Franks 1994). Patients are then monitored by electronic fetal monitor (EFM), acting as "midwife by proxy", allowing the midwife to care for more than one patient even if one to one care is known to have obvious advantages (Villar, Carroli & Gülmezoglu 2001). To make the problem even more complex, some centers use central monitoring allowing EFM traces from various delivery rooms available in the control room and lunchroom. The silent knowledge that others could, unbeknownst to oneself, be watching the very evidence trace on which you would be taking action or not, was enough to affect clinicians' intervention criteria yet again. With this latest technological intervention, the boundaries of the complex system were made fuzzier still—where exactly did the delivery room end now?

Furthermore, the physician on duty can in most centers call for a backup. The backup is often senior of age but not necessarily more experienced. Obstetrics and Gynecology as a medical field is vast and many specialists work with completely different medical areas during daytime and suddenly become involved in the labour ward work at night. During the on call period a backup doctor may be anywhere in the hospital, or at home, indeed blurring the borders between the obstetric system and the environment.

4. Discussion

Through our study we could observe the interaction between professions in the complex context of medical intervention. Midwives, when they believe backup was needed, tuned the timing, tone and substance of their calls to their estimation of the physician's criteria for calling backup. None of this seems driven by a cognitive calculus of interacting intervention criteria, but is rather based on narrativized identities of those currently present in the system: the stories clinicians know and tell about each other (McDonald, Waring & Harrison 2006). The obstetric culture present, will determine how successful the tuning inside and between different categories will be. Even within a hierarchical system, communication and relationship between health care professionals can be valuable. Gittell et al (2000) describe the relational coordination concept developed from the airline industry research to improve quality of care. Collective cognitive responsibility is another concept described by Scardmalia, where the collective responsibility of all the members of a team is linked to success (Scardamalia 2002).

If the problems associated with obstetric intervention were merely complicated, the solution would lie in optimizing, through best practice guidelines, the intervention criteria and sensitivity to evidence of those closest to the obstetric process. But a complex system cannot be reduced to the behavior or compliance of individual components. It is about understanding the intricate web of relationships they weave, their interconnections and cross-dependencies, and the constantly changing nature of these as people come and go and technologies get adapted in use (Dekker 2010; Woods & Dekker 2000). Where does that leave compliance-based quality interventions (McDonald & Harrison 2004; Wagner 2001)? Complex work of

course has pockets of "mere" complicatedness (Gittell, Fairfield, Bierbaum, Head, Jackson, Kelly, Laskin, Lipson, Siliski, Thornhill & Zuckerman 2000). Identifying these could be a fruitful exercise. At least it might generate a discussion on the usefulness of certain compliance-based routines. In obstetrics such a situation could potentially be a midwife's call for the obstetrician once the complex intervention decision has been made. In some situations, such a call could be reduced to a merely complicated situation, following communication guidelines known by both parties of the conversation. Once a labour situation has potentially deteriorated even further and the intervention decision to make a Caesarean section has been taken, another merely complicated moment could be the time-out (ref?) procedure in the operation room before the intervention. This helps "amortize" complexity (Hutchins 1995) by having decisions and role allocations in place before the situation becomes open, dynamic, fuzzy and non-linear (Amalberti, Auroy, Berwick & Barach 2005; Svenmarck & Dekker 2003).

In complex systems, orders of various kinds exist, but they emerge from the multitude of relationships and interconnections and the resulting ways of working. As illustrated by our results, norms for clinical intervention in complex systems are contextual and contingent, varying with time, technology and social-clinical composition. As people and technologies come and go and learn about each other, relationships change, and thus the system constantly reshapes what counts as normative in all kinds of subtle ways. That does not mean that all these ways are desirable or beneficial to the efficiency of care delivery or even patient safety. Efforts, however, to impose a single norm onto complex practice are, not surprisingly, characterized as colonial patronage—as a totalizing, colonizing form of management that ignores the social and professional richness of clinical work (Wagner 2001), and that may get subverted as a result (Holmes, Roy & Perron 2008).

Theoretically, success and resilience in complex systems derives not from compliance, but from diversity (Cilliers 1998, 2010; Dekker 2011a). In the case of obstetric practice, it could mean different practitioners who deploy differing and mutually sensitive repertoires for responding to what they see as evidence—and to each others' constructions of, and concerns about, such evidence. It also challenges the idea that healthcare situations are open to categorization that suggests they are complicated (e.g. with clear lines between such stable states like the distinction between normal and non-normal labor). Patient safety

efforts, then, might recognize, celebrate and enhance the positive aspects of diversity that guarantee the emergence of resilience in complex situations. Such efforts can be made in activities of inter-professional team training where medical staff representatives are given the opportunity to identify complex as well as complicated situations in their work to achieve more efficient and effective patient-centered care.

5. Conclusion

Hospitals and other healthcare organizations aiming to improve quality and gain greater control over outcomes can become quite taken by compliance-based approaches, even if those get implemented in areas that are complex, not complicated. Max Weber—famous 19th century sociologist—warned how bureaucracies, as formal organizations imbued with legal-rational authority, suffer negative consequences when they adhere rigidly to their own model of the world (Vaughan 1999). It can be little more than an administrative palliative to hope that the world is merely complicated, and that it can therefore be controlled, or managed. It means believing that existing structures, guidelines and policies are the instruments of order, and any deviations from them (violations, workarounds) are instances of disorder—the undesirable dark side of human nature that is best contained by more calls for compliance, more guidelines and rules, and more "accountability" (in healthcare often coincident with sanctions (Wachter & Pronovost 2009)). Complex organizations like modern hospitals have been shown to reliably depart from the rationalist expectations of the Weberian model (Hastie & Dawes, Robyn M. 2010). "Best practice," and "compliance," and their disordered opposites "workarounds" and "violations" are the normative rhetorical commitments that belong to a complicated system whose functioning is, in principle, exhaustively knowable, closed to environmental contingency, and for which single best methods can be drawn up. They are all misleading, or even meaningless, in a complex system that knows no one best method, that is open to contingency and is continually reshaping itself. There, order emerges from the constantly changing socially and clinically organized circumstances of work, and the local rationality of its practitioners who pursue their goals using their knowledge and understanding of the situation. Universal rules and norms that apply to everybody equally all the time, amounts to a kind of

fundamentalist rational Enlightenment ideal, which of course has epistemological as well as practical limits (Cilliers 1998, 2005, 2010).

References

Allen, D., & Hughes, D. (2002). Nursing and the division of labour in healthcare. Houndmills, Basingstoke, Hampshire; New York, N.Y.: Palgrave Macmillan.

Amalberti, R., Auroy, Y., Berwick, D., & Barach, P. (2005). Five system barriers to achieving ultrasafe health care. Annals of Internal Medicine, 142(9), 756-64.

Amer-Wåhlin, I., Bergström, J., Wahren, E., & Dekker, S. W. A. (2010). Escalating obstetrical situations: An organizational approach [Peer reviewed abstract accepted for presentation at the Annual conference of the Swedish Association of Obstetrics & Gynaecology].

Benner, P. E., Malloch, K., & Sheets, V. (2010). Nursing pathways for patient safety. St. Louis, Mo.: Mosby Elsevier.

Buckle, P., Clarkson, P. J., Coleman, R., Ward, J., & Anderson, J. (2006). Patient safety, systems design and ergonomics. Applied Ergonomics, 37(4), 491-500.

Carayon, P. (2010). Human factors in patient safety as an innovation. Applied Ergonomics, 41(5), 657-65. doi:10.1016/j.apergo.2009.12.011

Cilliers, P. (1998). Complexity and postmodernism: Understanding complex systems. Psychology Press.

Cilliers, P. (2002). Why we cannot know complex things completely. Emergence, 4(1), 77-84.

Cilliers, P. (2005). Complexity, deconstruction and relativism. Theory, Culture &Amp; Society, 22(5), 255-267.

Cilliers, P. (2010). Difference, identity and complexity. Complexity, Difference and Identity, 3-18. doi:10.1007/978-90-481-9187-1_1

Cook, M., Noyes, J. M., & Masakowski, Y. (2007). Decision making in complex environments. Aldershot, England ;: Ashgate.

Cook, R. I., & Woods, D. D. (1994). Operating at the sharp end: The complexity of human error. In M. S. Bogner (Ed.), Human error in medicine. Hillsdale NJ: Lawrence Erlbaum Associates.

Dekker, S. W. A. (2010). We have newton on a retainer: Reductionism when we need systems thinking. Joint Commission Journal on Quality and Patient Safety/Joint Commission Resources, 36(4), 147.

Dekker, S. (2011a). Drift into failure : From hunting broken components to understanding complex systems. Farnham; Burlington, VT: Ashgate Pub.

Dekker, S. (2011b). Patient safety : A human factors approach. Boca Raton: CRC Press, Taylor & Francis Group.

Dekker, S., Cilliers, P., & Hofmeyr, J. H. (2011). The complexity of failure: Implications of complexity theory for safety investigations. Safety Science. doi:10.1016/j.ssci.2011.01.008

Ehrenreich, B., & English, D. (2010). Witches, midwives, and nurses : A history of women healers. New York: The Feminist Press.

European Parlament. (2005). European parliament european council. Directive 2005/36/EC of the european parliament and of the council of 7 september 2005 on the recognition of professional

qualifications. Retrieved from http://eur-lex.europa.eu/LexUriServ/site/en/oj/2005/l_255/l_25520050930en00220142.pdf

Feltovich, P. J., Spiro, R. J., & Coulson, R. L. (1997). Issues of expert flexibility in contexts characterized by complexity and change.

Gittell, J. H., Fairfield, K. M., Bierbaum, B., Head, W., Jackson, R., Kelly, M., . . . Zuckerman, J. (2000). Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: A nine-hospital study of surgical patients. Medical Care, 38(8), 807-19.

Greene, W. H. (2009). Healthcare payment reform at the sharp end: Translating policy into practice at SBUMC [Paper presented at the New York Presbyterian Quality Symposium].

Hafferty, F. W., & Franks, R. (1994). The hidden curriculum, ethics teaching, and the structure of medical education. Academic Medicine : Journal of the Association of American Medical Colleges, 69(11), 861-71.

Hastie, R., & Dawes, Robyn M. (2010). Rational choice in an uncertain world. Los Angeles: SAGE.

Heylighen, F., Cilliers, P., & Gershenson, C. (2007). Complexity and philosophy. In J. Bogg & R. Geyer (Eds.), Complexity, science and society. (pp. 117-34). Oxford: Radcliffe Publishing.

Hollnagel, E., Woods, D., & Leveson, N. (2006). Resilience engineering, concepts and precepts. Aldershot: Ashgate Publishing Company.

Holmes, D., Murray, S. J., Perron, A., & McCabe, J. (2008). Nursing best practice guidelines: Reflecting on the obscene rise of the void. Journal of Nursing Management, 16(4), 394-403. doi:10.1111/j.1365-2834.2008.00858.x

Holmes, D., Roy, B., & Perron, A. (2008). The use of postcolonialism in the nursing domain: Colonial patronage, conversion, and resistance. ANS. Advances in Nursing Science, 31(1), 42-51. doi:10.1097/01.ANS.0000311528.73564.83

Hugh, T. B., & Dekker, S. W. (2009). Hindsight bias and outcome bias in the social construction of medical negligence: A review. Journal of Law and Medicine, 16(5), 846-57.

Hutchins, E. (1995). Cognition in the wild. Camebridge, MA: MIT Press.

McDonald, R., & Harrison, S. (2004). The micropolitics of clinical guidelines: An empirical study. Policy & Politics, 32(2), 223-239. doi:10.1332/030557304773558161

McDonald, R., Waring, J., & Harrison, S. (2006). Rules, safety and the narrativisation of identity: A hospital operating theatre case study. Sociology of Health & Illness, 28(2), 178-202. doi:10.1111/j.1467-9566.2006.00487.x

Ödegård, S. (2007). I rättvisans namn [In the name of justice]. Stockholm: Liber.

Page, S. E. (2007). Making the difference: Applying a logic of diversity. The Academy of Management Perspectives, 21(4), 6-20.

Page, S. E. (2008). Uncertainty, difficulty, and complexity. Journal of Theoretical Politics, 20(2), 115. doi:10.1177/0951629807085815

Plsek, P. E., & Greenhalgh, T. (2001). Complexity science: The challenge of complexity in health care. BMJ (Clinical Research Ed.), 323(7313), 625-8.

Scardamalia, M. (2002). Collective cognitive responsibility for the advancement of knowledge. Liberal Education in a Knowledge Society, 67-98.

Sibley, L., Sipe, T. A., & Koblinsky, M. (2004). Does traditional birth attendant training improve referral of women with obstetric complications: A review of the evidence. Social Science & Medicine (1982), 59(8), 1757-68. doi:10.1016/j.socscimed.2004.02.009

Starr, Paul. (1982). The social transformation of american medicine. New York: Basic Books.

Svenmarckt, P., & Dekker, S. (2003). Decision support in fighter aircraft: From expert systems to cognitive modelling. Behaviour & Information Technology, 22(3), 175-184. doi:10.1080/0144929031000109755

Vaughan, D. (1999). The dark side of organizations: Mistake, misconduct, and disaster. Annual Review of Sociology, 25, 271-305.

Villar, J., Carroli, G., & Gülmezoglu, A. M. (2001). The gap between evidence and practice in maternal healthcare* 1. International Journal of Gynecology & Obstetrics, 75, S47-S54.

Wachter, R. M., & Pronovost, P. J. (2009). Balancing "no blame" with accountability in patient safety. The New England Journal of Medicine, 361(14), 1401-6. doi:10.1056/NEJMsb0903885

Wagner, M. (2001). Fish can't see water: The need to humanize birth. International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics, 75 Suppl 1, S25-37.

Waldrop, M. M. (1992). Complexity: The emerging science and the edge of order and chaos. Simon & Schuster.

Whitehead, C. (2007). The doctor dilemma in interprofessional education and care: How and why will physicians collaborate? Medical Education, 41(10), 1010-6. doi:10.1111/j.1365-2923.2007.02893.x

Woods, W., & Dekker, D. (2000). Anticipating the effects of technological change: A new era of dynamics for human factors. Theoretical Issues in Ergonomics Science, 1(3), 272-282.

Woods, D. D., Dekker, S., Cook, R., Johannesen, L., & Sarter, N. B. (2009). Behind human error. Aldershot, UK: Ashgate Publiching Co.

Xiao, Y., Hunter, W. A., Mackenzie, C. F., Jefferies, N. J., & Horst, R. L. (1996). Task complexity in emergency medical care and its implications for team coordination. Human Factors: The Journal of the Human Factors and Ergonomics Society, 38(4), 636-645. doi:10.1518/001872096778827206