Challenges in complex adaptive healthcare systems

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A dynamic combination of several parties makes induce challenges in health care. In the framework of complex adaptive system (CAS), challenges are approached as the tensions between different management principles. We have carried out two studies focusing on change cases in a health care organisation and a social and health care network. On the basis of interviews, we identified the challenges which were revealed during the change process and examined them within the framework of tensions in CAS. The results show that change cases induce such tensions in system and they should not be ignored when a change is managed.

Keywords: challenge, tension, health care, complex adaptive system, CAS, change

1. Introduction

A dynamic combination of several parties makes health care as a challenging working environment. Chronic diseases, is moving the focus in health care from individual consultation towards a more complex multi-professional system (Ouwens et al. 2005). Integrated care interventions have targeted to control the variation in system. Formal tools like process flow diagrams and guidelines have been typically applied and the changes have been structural. The ideas of lean manufacturing have been popular in the improvement of health care processes (see e.g. Newell et al 2011). However, these attempts to standardise and simplify the health care processes have also been criticised. It has been suggested that health care should be treated as a complex adaptive system (CAS) (McDaniel & Driebe 2001). CAS is composed of independent interacting actors forming a self-organising, nonlinear and dynamic system which is uncontrollable in the traditional sense. The management of a CAS is balancing between various tensions rather than changing the formal structures. (Reiman et al 2015). This study examines the challenges which emerge when new operations models are introduced in health care. The analysis is carried out through the framework of tensions in organisational CAS.

2. Methods

We carried out case studies in two health care organisations. In the first case, a social and healthcare workgroup implemented a new clinical pathway for geriatric patients. It describes principles, activities, responsibilities, several check lists and sources of additional information which are specific for the care of geriatric patient. The initiative party was a primary health care unit. Several health and social care organisations from private and public sector are involved. The new clinical pathway guidelines were introduced in more than 20 sessions arranged for this purpose and the organisations were encouraged to apply the guidelines. The follow-up meeting of the working group was arranged six months after the introduction sessions. It was noted in the meeting that organisations have found it difficult to mobilise the guidelines even though the implementation sessions were mostly successful.

In the second case, a hospital aims to improve medical care by introducing automated medication storage devices. The new automated storages would replace the conventional medication storage rooms that are used currently. The implementation of the automated medication storages is a big project which has required years of planning and technical preparations. The case was carried out in the one of the biggest hospitals in Finland. Multiple
wards, units and actors – mainly doctors, nurses and pharmacists – were involved. With the automated medication storages, the medical treatment process is as follows: 1) the physician prescribes the medication in the medication information systems which 2) then allows the nurse an access to a medication storage 3) to get medicine to a patient. All these steps are necessary. New instructions concerning the responsibilities in the medical treatment were delivered in connection with the project. The implementation of the automated medication storages was not yet finalized at the time of our study.

In both cases we analysed the change on the basis of interviews and the material given to us. In the second case we also actively participated in the change by arranging workshops and meetings in hospital to support implementation of the change.

We interviewed representatives of the relevant organisations and professions. 24 interviews lasting 1-1.5 hours were carried out before the actual use of new guidelines and systems. The interviews were semi-structured and included five main themes: The process to be changed; Quality, patient safety and efficiency of the process; History of the process and previous development activities; Vision of the new process; and Conception of change.

The interviews were recorded, transcribed and coded thematically using QSR NVivo qualitative data analysis software. Four researchers participated in interviews, coding and analysis. The following results are based on the data which was coded both as an obstacle of the change and any of the following: values; roles; confrontation; interaction; influence on quality, safety or efficiency; dynamics; practices and rules; change management.

3. Results and Discussion

Reiman et al. (2015) describe the challenges within an organisation as tensions between different management principles. The four main tensions exist between: 1) standard procedures and flexibility; 2) low and high variance; 3) ties between actors: few strong and multiple weak; and 4) system goals and local goals.

3.1. Case 1: a new clinical pathway for geriatric patients

*Flexibility*. Implementation of a new clinical pathway would require a flexibility. However, many signs of inflexibility were presented in interviews. An interviewee has recognised that usually the personnel do not regard the improvement of their working practices as necessary even though they admit that new ideas were reasonable. The special health care personnel did not attend in the implementation sessions.

Interviewees have also noted a tendency to see elderly patients as kind of “unwanted customers”. They might require special attention or knowledge and thus deviation from normal routines. Further, an interviewee noted that the standard practices should always be adapted to the situation of an elderly patient (suggesting that it is not always done). As an example of this, it was mentioned a “standard practice” to send a patient always from central hospital to primary care hospital for convalesce even if they could be sent directly at home.

Interviewees also doubted whether the initiators would have enough power to make the change happen and insisted that the higher management should specifically determine the tools and time to be used since the voluntary change would not happen. These can also be interpreted as signs of inflexibility in the system.

As a summary on flexibility, the sticking to the standard procedures challenged the change. However, the goal of the change was adoption of new standard procedures.

*Variance*. The new clinical pathway aims to diminish variation by recommending guidelines and shared tools. This raises a tension with a long tradition of individualistic practices allowing personal decisions and arrangements of an independent professional. The call for independency may be related to emphasis on the personal responsibility which was repeatedly expressed in interviews. As an example, an interviewee explained that it is up to each surgeon and the operation team whether they use the recommended operation room check.
The entire goal of the guidelines is to emphasize the special needs of geriatric patients as a group. This was slightly criticized in interviews as too limiting. Instead, it was suggested that each patient should be treated as an individual, even though the need and importance of geriatric knowledge was acknowledged.

As a summary on variance, an attempt to reduce the variance with guidelines challenged the independence of professionals.

*Ties between actors.* Traditionally, health care consist of multiple professions forming rigid silos. Inside a profession (physicians, nurses, physiotherapists, etc.) the ties between individuals are typically strong, for example professional identity, collegial loyalty and shared experiences. Similar silos are formed on the basis of medical specialties and corresponding wards in hospital as well as different organisations in social and primary health care.

New guideline attempts to override these silos. Viewpoints of different professions and parties were considered in the development of clinical pathway guidelines. A multi-professional workgroup of 12 social and health care professionals was appointed to prepare the guidelines. The participation of patients was organised by arranging a quite extensive session involving directly 18 professionals and 8 elderly patients.

The session was criticized by an interviewed participant. She noted that the elderly patients that participated in the session were left as bystanders, the guidelines were already quite finalised and the language was quite difficult for a layperson to understand. Another interviewee suggested that the special health care personnel regard themselves as outsiders because the leader of the implementation was the primary health care unit.

In their daily work, interviewees had experienced the difficulty to take the viewpoint of other parties – both the patients and other professions. An interviewee had found that multi-professional collaboration is not a natural skill but it should be rehearsed and learned. She actually described the process of strengthening of the ties between the different professions as follows: “It requires that all professions identify their strengths and weaknesses and then consider interfaces: how the knowledge and skills complement each other and what kind of flexibility is needed.” The process also loosens the ties inside the profession when own weaknesses and need of complementary skills are openly admitted.

A manifestation of a strong tie between organisations was presented by a small provider of social care service: “We have no problems in implementation of new guidelines. As the service purchaser, the city hall has power to make us to do everything they want.”

As a summary on ties, strongly tied professionals’ silos make it difficult to make changes which require coming out of the silo somehow. Changing ties could make the change possible.

*System goals versus local goals.* Taking into consideration the special characteristics and needs of geriatric patients is a system goal which the clinical pathway emphasizes. This goal and related activities are relevant for most health and social care professionals but usually they have another speciality. A patient of most medical specialties may be geriatric but the geriatric aspect is additional to most medical specialities (except geriatrics). Health care is organised to serve local goals based on medical specialties and silos of professions. The approach, organisation, and structures of the information systems are optimized for diagnosing and treating traumas and diseases rather than treating the patient as a whole. A geriatric patient typically has multiple symptoms at the same time and therefore is a true challenge for current health care. An interviewee has found that nobody gets an overalls picture about the situation of the patient and very few have competence to comprehensively take care of a patient.

As summary on goals, the change introduced a system level goal which challenged the whole health care system based on local goals.

### 3.2. Case 2: new automated medication storages and medication procedures

*Flexibility.* The introduction of automated medication storages requires flexibility from nurses and pharmacists in order to learn and adopt new practices. According to the interviews, the nurses and pharmacists did not oppose this challenge (in advance) but rather were looking forward to it. They were impressed by the promised improvements in their work and working...
environment which the new system would bring. It was suggested by an interviewee that especially experienced nurses feel safer during changes because they have earlier experiences on survival. Inexperienced nurses are more likely to have stronger reactions: fear, anxiety and feeling insulted. Thus, the experienced older personnel may be more flexible.

Formally, the work of physicians should not be changed, which was remarked by several interviewees. However, the introduction of a technical system challenges the flexible practices. During the planning of the new system, the planners noticed that the medication information should be without exception and correctly prescribed in medication information system by a physician. They also found that current prescription practices are more flexible in such ways that the medication information is not necessarily available in the system when it is needed. This would mean that the nurses would not get the medicine out of the automated system. In current manual system, there are different flexible ways how physicians and nurses can fulfil the medication without formally correct prescription in the system by using other information sources. Introduction of the new automated system would thus require physicians a flexibility to standardize their practices.

The instructions basically insisted the physician to prescribe the medication in the system by themselves or at least confirm it within two hours. This raised objections. Our interviewees presented situations, where new instructions would be unpractical, at least. For example, in night time, a physician may give orders for medication by phone from home. New instructions would require that either the physician would come to the hospital within two hours to confirm their orders in the system or the physician on call would do it. It was expressed that a physician on call should not be encumbered with such routine tasks since they usually are busy with acute urgent tasks.

The interviewees explained that the objections of the physicians in general are mainly against the poor usability of the medication information system. There are many evident ways of how the system could be better. For example, the system would be easier and safer to use if only relevant alternatives would available in menus. Physicians feel that the use of system takes too much time because of its inflexibility.

Nurses expressed their worries about the inflexibility of the new automated system and new instructions since the missing information is a problem for them to be solved. They were afraid of the conflicts with the physicians who will not agree with the new instructions and the resulting potentially aggressive negotiations with other physicians. They expressed their worries concerning the total seizing up of the system or running out of the needed medicine. A separate local stock of medicines for such emergency situations was suggested by an interviewee.

As a summary on flexibility, the inflexibility of the new system challenged the current flexible practices.

**Variance.** The instructions also required that the physician would review the overall medication of a patient when they arrive in hospital, is moved to another hospital unit or is leaving the hospital. This requirement does not take into account certain variance in system. An interviewee suggested that the review of the overall medication of (any) patient would be difficult for many physicians who know mostly only about medication for their own speciality. This lack of knowledge may make the physicians feel insecure to take such responsibility. Physicians are not formally required to update and prove their knowledge on medication as the nurses are: nurses have regular examinations in every five years.

Further, the instructions required that the review of medication should also be especially marked as done by the physician. An interviewee presented that this has been considered an unnecessary and unwanted control over the work of the physicians. This may reflect the physicians’ tradition to expect certain freedom choose the practices which they regard as the best.

As a summary on variance, an attempt to control the variance was challenged by the variation in the competencies and the independence of a professional.

**Ties between actors.** This change would challenge the silos of professions by speeding up the changes in ways of working which may be interpreted as a new distribution of the work
between professions. Traditionally the physicians spoke prescriptions to a voice recorder, the secretaries transcribed the recordings and the nurses then transferred the information into the medication information system. Alternatively the prescriptions were told directly to a nurse. Some physicians (still) do not regard writing into the information system as their task.

The nurses assumed that their knowledge on medicines or medication will weaken when they will get the medicine from an automatic storage. One interviewee referred to the increased automation of hemodialysis machines which had weakened nurses’ knowledge on the dialysis.

As a summary on ties, silos of professions is not – so far – a major challenge in this case.

System goals versus local goals. The planners of the new system suggested that health care professionals stick to the personal practices because they see only their own specific task and a local goal related to it. They are not aware of the whole medication process and their role as a contributor to a system goal: the medication of a patient. The nurses’ worries about the conflicts with ‘disobedient’ physicians certain objection to the new system may indicate the lack of such systemic view.

As a summary on goals, it was suggested that the systemic understanding of the medical treatment process would improve the change.

3.3. Comparison of the cases

Both cases included the introduction of new system-wide guidelines or instructions but only in the second case this was a part of the introduction of a new technical system. The inflexibility of the technical system raised tensions with current flexible practices in the second case whereas; in the first case, sticking to the standard procedures challenged the change. In both cases, the attempt to control the variance induced tension with the independence of a professional. In the second case the variance in the competencies of professionals was relevant.

In the first case, the attempt to override the effect of strong ties within professional and organisational silos created major challenges. However, in the second case, such a strong effect was not found.

An overall care of a patient (geriatric aspects or medication) formed similar systemic goals in both cases. In the first case, a tension between a system goal and the local goals based on the structure of health care system became evident in interview. On the other hand, in the second case, the topic was not clearly handled. In spite of that, a shared understanding about the systemic nature of the medical treatment process was considered as essential for the success of the change.

Analysis of these cases through a framework of tensions in CAS exposed profound differences between seemingly similar cases. Thus, the framework proved to be useful. Even though the framework was originally focused on safety management it also made sense in a more general use – at least in these safety critical organisations. The framework also includes four secondary tensions which could be the framework for further analysis.

References