

THE CARE PLANNING PROCESS - A CASE FOR SYSTEM DYNAMICS

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Health care is a complex dynamic setting suitable for system dynamics analyses. The method has the potential to be an important quality improvement tool in the near future. However, it will be necessary to develop the models beyond the pure production model focus on the clinical care process from a patient perspective and in doing so it is inevitable that variables such as health, communication and care planning are involved. Consequently, valid models for modern health care must involve variables that are unfairly designated as intangible. The present paper describes an exploratory conceptual model of the care planning process. It draws on a range of studies and theories about the process but also from an observation study. The paper discusses how it could be possible to incorporate and validate variables alongside the more traditional way.

Key words: health care process, care planning, and system dynamics

INTRODUCTION

The main purpose of the present paper is to apply a simple model of the care planning process. The purpose is related to the fact that several studies have indicated deficiencies in the care planning process (Ehrenberg et al. 1999a, 1999b). In spite of the development of advanced technology for diagnosis and treatment and well-educated professionals, a large number of mistakes occur in health care. Evidence states that undeveloped care systems, processes and conditions cause clinicians to make mistakes when making judgements about diagnosis and treatment plans (Medicine 1999). Studies in the United States have estimated that as many 98, 000-hospital deaths per year are related to health care system errors that could have been prevented (Science 2003.).

The key point in care planning is the decision-making process. This process involves a judgement (assessment of the need and diagnosis) of patient health and decisions about actions for care intervention (Bjorvell et al. 2003; Ehrenberg 2001; NANDA 1999). The selected intervention should preferably be documented explicitly in a care plan for the individual patient (Ehrenberg et al. 1999a; Hansebo et al. 1999; NANDA 1999; SOSFS 1993). Information about planned intervention in the patient's records should be documented in agreement with the patient. The care professionals who meet the patient throughout the care period thus have a written document to monitor their contact with the patient (Ehrenberg 2001; Ehrenberg et al. 2003; Hansebo et al. 1999; SOSFS 1993). In that sense, essential information is available for the relevant providers who are responsible for patient care.

Traditional care planning has relied mostly on verbal messages or temporary notes in the patient's records, which results in communication failures. Care planning may be performed at team conferences but the decisions are not always documented properly. The planned interventions are consequently difficult for other care professionals to follow, which has a negative influence on the continuity of care (Bjorvell et al. 2003; Carpenito 1997; Ehrenberg 2001; Hansebo et al. 1999; Lindgren et al. 1992). Explicit care plans ensure the patients' involvement in their own care. Unarticulated care actions are impossible to discuss and control for the patient (Kaplan et al. 2001).

Legislation stresses that professionals are required to document care interventions and that the patient's records should include an obvious care plan (SOSFS 1993). However, studies have shown that records often lack a structured care plan that is based on patient needs (Ehrenberg et al. 2003; Ehrenberg et al. 2004). Moreover, evidence shows that notes in the patient's records are seldom based on clinical guidelines or evidence-based recommendations about care (Ehrenberg et al. 2003; Ehrenberg et al. 2004; Idvall et al. 2002). This may affect the quality and effectiveness of care (Ehrenberg et al. 1999c).

The administrative work has increased since documentation regulations became more rigorous (Bjorvell et al. 2003). The quality of explicit and structured care planning is still insufficient despite the time invested in administration (Bjorvell et al. 2000; Bjorvell et al. 2003; Ehrenberg 2001; Ehrenberg et al. 2003; Sosialstyrelsen 2000). Duplicated notes are not unusual but are useless and time-consuming. In contrast, it is difficult to find relevant information on the patient that could guide the various professionals in the patient's health process (Bjorvell, 2003).

Health care has developed various systems for supporting the care planning process. The development and implementation of computerized patient records and informatics systems have been stressed worldwide (Ammenwerth et al. 2003; Bakken et al. 2004; Stewart 2001). Recently, the focus has been directed at the clinician's decision-making processes in order to develop more advanced technology support systems (Ammenwerth et al. 2003; Bakken et al. 2004). However, supporting the decision-making process is not only about an intelligent informatics system. It is primarily an issue of developing and reinforcing the care context in order to support the optimal assessment of patient needs.

Optimal care planning is crucial to facilitate patient-centered care and avoid routine care (Bjorvell et al. 2003). Patient-centered care can be defined as a philosophy of care that defines the patient's needs as the primary factor for shaping care delivery practices and processes as well as supportive services. Patient-centered care focuses on individual needs rather than routines, tasks and professional boundaries. The patient's own experience of illness within her/his unique context is regarded as important. The care should be provided in collaboration with the patient and family members (Baumann et al. 1998; McLaughlin et al. 2000; Mead et al. 2000). Communication seems to be one of the most important factors for obtaining patient-focused care (Lewin et al. 2002; Mead et al. 2000; Stewart 1995).

In conclusion, the evidence suggests that care planning may be an essential component in effective and patient-centered health care. A care plan may reduce errors and improve patient care. However, there is still a lack of comprehensive knowledge about the underlying structure that determines an optimal care planning process. The purpose of the present paper is to apply a simple model of the care planning process. The model is based on structural, process and outcome variables identified in the literature. The variables are suggested as being the factors that determine the quality of the patient care planning process. Moreover, the paper argues that system dynamics should be an essential quality improvement tool in the health care setting. Furthermore, the paper demonstrates how it could be possible to include and validate variables alongside the more traditional method.

METHODOLOGY

The significance of using the system dynamics method is that it provides a method for quality improvements in health care that takes into account large numbers of interactions. Care planning is dynamic and complex, especially when it involves several professionals and units.

Furthermore, system dynamics is based on a holistic view, which is a comprehensible approach for many health care professionals. According to McCormack (2002), the health care context includes the underpinning culture of the system, the physical environment and the way care is provided. The culture creates the place for the health care practice, "the forces at work which give the physical environment a character and feel" (Kitson et al. 1998 P. 157). Described in system dynamics terms, the health care environment can be represented as a system in which all parts are potentially related to

each other (Benkő et al. 2000; Kitson et al. 1998; McCormack et al. 2002). The relationships between the different parts create the structure of the system.

The development of models based on a holistic approach is well known for health care (Benkő et al. 2000; Donabedian 1988). Probably, the most frequently used model is Donabedian's structure, process and outcome model (Donabedian 1988). Despite the clear and reliable explanation of the relationships between the factors the model is limited to a single level description of the care process. The model can, however, be used as a framework for system dynamics modeling. In Figure 1 Donabedian's model is presented as a system dynamics model.

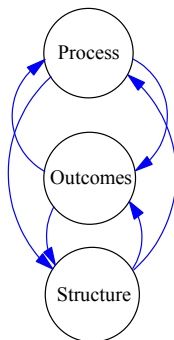


Figure 1. Donabedian's model interpreted as a system dynamics model

In the present paper the software Vensim™ (2004) was used to develop the causal diagram (Figure 2). Powersim™ (2002) was used for modeling stock and flow structure of the process (Figure 3). Donabedian's (1988) theory was also used as a framework for the modeling process.

Data collection methods

The model is based on evidence-based variables from the literature and data from an observational study. A literature review was conducted for the concepts of the model. Empirical studies concerning care planning and related concepts were searched for in the literature review.

The empirical data for the model were collected during a two-week period in 2003 (Elf 2003). A non-participant, structured observational assessment method was used. The observations were focused on care plans and activity events mentioned in the literature. Each time the staff member started a new activity, the time was noted and the activity described. After a shift, the observer and the nurse discussed the activities that took place during the shift. The observational data were analyzed qualitatively with the aim of exploring their content. The aim was to achieve a picture of the care planning activities and how the staff organized their work on the ward. After each observation occasion, the notes were categorized in terms of the activities listed in the schedule. Reflections were noted in writing (Elf 2003).

CONCEPTUAL MODEL

Figures 2 and 3 shows a hypothetical model portraying the main variables interacting in the care planning process. The model is based on the view that communication is an important prerequisite in the assessment of patient needs and consequently the planning of various care interventions. Adequate care planning implies a deep understanding of the patient's health needs but also shared decisions between the patient and professionals (Ehrenberg 2001).

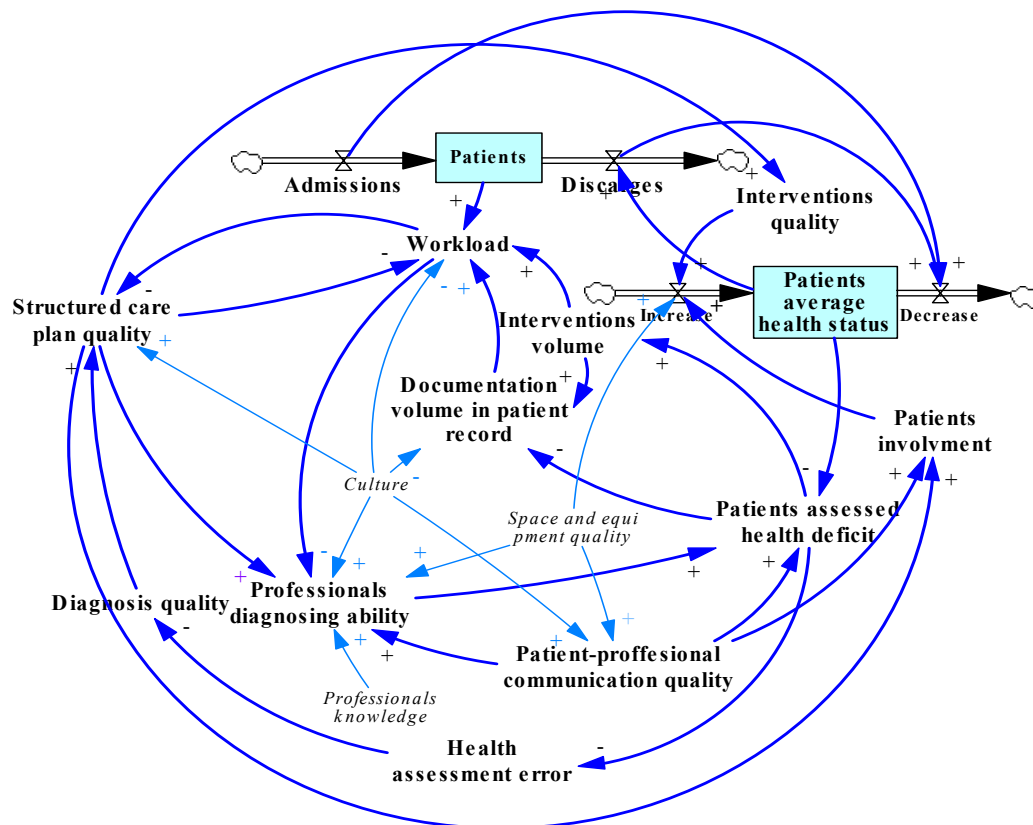


Figure 2. Care planning process

Looking at the model, (Figure 2) the patient's health status is the basis for most of the care activities. The patient enters the health care process with a certain perceived health status, which has its origin in the discrepancy between the patient's actual health status and the desired health status. Today, health is defined as a multifaceted concept and should be discussed from several points of view. Recently, the WHO (2001) introduced a new model of functioning, disability and health. In this model the individual's disability and functioning are viewed as outcomes of interactions between health

conditions (disease, disorder and injury) and contextual factors. The WHO health model thus involves biomedical and social dimensions of disability caused by a health problem. A medical diagnosis alone does not provide guidelines for the multifaceted assessment of patient needs, the level of care or the functional outcomes for most of the patients (Brainin et al. 2004; Indredavik et al. 1998; Nordenfelt 1993; WHO 2001; Willman et al. 2002). An aging population and new treatment possibilities makes chronic diseases and multiple diagnoses the main health care problems in society (Brainin et al. 2004). A new health orientation is thus required since health care is more about symptom management, prevention of complications and long-term relationships, rather than cure (Baumann et al. 1998).

The care professionals assess the patient's health status to determine the health problem and to make correct decisions about the care. The assessment of a patient's health needs should include a physical examination and communication with the patient with the aim of summarizing the problem in terms of medical and/or nursing diagnoses. The medical diagnosis focuses primarily on disease in contrast with the nursing diagnosis, which focuses on human response to actual or potential health problems (Ehrenberg et al. 1999a; NANDA 1999). In the assessment process the various professionals should focus on their care responsibility for the individual patient. In that way a comprehensive picture of the patient's care needs will be obtained.

The quality of the diagnosis and subsequent care interventions are determined by the professional's ability to assess the patient's health status (Carpenito 1997; Davis et al. 1994; Ehrenberg et al. 1999c; NANDA 1999; Sutcliffe 1990). The more effort that is made to extract information about the individual patient the better the diagnosis and consequently improvement in the intervention quality. The ability to make an accurate assessment of a patient's health status also depends on the care professional's knowledge, experience and skills (Bareford 2001; Brainin et al. 2004; Davis et al. 1994; Langhorne 2002). Study results show that skilled professionals make more precise observations and assessments of the patient's health problem. They know what to assess related to their professional accountability and how to use various instruments to make a more comprehensive and accurate assessment of the patient's health status (Brainin et al. 2004; Langhorne et al. 2003). The error in health assessment will thus be reduced and thereby improve the quality of the diagnosis.

The model illustrates that communication with the patient is a key factor that influences the quality of the assessment and subsequent diagnosis and care planning. In a review paper, Stewart (1995) reported that effective professional-patient communication is related to improved health outcomes. Effective communication is linked to patient recall of, compliance with and satisfaction with information. The interaction between the care professionals and the patient entails a mutual exchange of information, which should promote the patient's progress towards health (Stewart 1995; Stewart et al. 1999).

Referring back to the model (Figure 2), the structured care plan has a direct influence on the given care interventions. It is more likely that the patient receives planned interventions with a minimum of variation in the performance despite the various professionals that are responsible for the patient. Moreover, the professional's ability to

make a correct diagnosis is supported by the previous information in the patient's records.

The model indicates that the power to make an optimal assessment of a patient's health status highlights particular aspects of space, such as privacy. Nearly all activities in the care process require privacy (Back et al. 1998). Patients and professionals need to communicate about the patient's health status and it may be necessary to perform intimate physical examinations. Administrative activities, such as documenting care plans, should be done in collaboration with the patient at the "bedside". Additional demands on the space are comfortable furniture and an area for patient records and computers. A caring process that is individualized and less task-oriented needs space for professionals to reflect on care activities. The environment should include areas for private communication and the multidisciplinary care team needs space for discussions (Nord 2003).

A patient's health may also be influenced directly by the physical space. Several studies have shown that the physical space influences the patient's well-being and health status (Ulrich et al. 2004). Ulrich (1991; 1992) has shown that positive distracters in the environment, such as nature and art, have positive effects on the length of stay and a reduction in drug use. Ulrich (1992) states that a supportive health care design should promote stress reduction and support coping with illness by fostering control and privacy, promoting social support and providing access to nature and other positive distractions. Patients should have authority over decisions regarding their own care process. This can be supported by a design that facilitates access to staff and information, such as the patient's records. Furthermore, a supportive design should provide a low level of noise, have visible areas for privacy and easily found routes. Patients should have control over light, sound and social contact.

The model points out the culture at the unit (what do the professionals prioritize as important) as a factor of importance for the quality of the care planning process. The dynamic relationships that determine the quality of the care are suggested as being culturally bounded. The culture determines prevailing values, beliefs and assumptions about care. Clearly defined and shared goals for the professionals are important for a successful workplace (Kitson 1998; McCormack 2004; McCormack et al. 2002; Rycroft-Malone et al. 2002; Rycroft-Malone et al. 2004). Clinical effectiveness, practice development and successful outcomes are all influenced by the culture (Kitson 1998; McCormack 2004; McCormack et al. 2002; Rycroft-Malone et al. 2002; Rycroft-Malone et al. 2004). It is thus important to understand the culture that exists in the context (Rycroft-Malone et al. 2002; Rycroft-Malone et al. 2004). For instance, the adoption of a patient-centered philosophy in which shared decisions with the patient are emphasized means that the professionals strive to organize the work to facilitate this view. This view implies a new way of thinking and acting in which the patients are supported in exerting control over their own care.

Kitson (1998) states that cultural factors, such as a learning organization, patient-centered philosophy and continuing education, may support quality improvements in the organization. McCormack and co-workers (2002) have defined a strong culture as a culture that is capable of defining the underpinning beliefs about care and humans. A

strong culture values individual members of staff and patients but at the same time promotes teamwork and relationships with other individuals. It is essential that each professional have the authority and power to act within his/her area of responsibility. Aiken and co-workers (1998; 2001; 2002) have explored factors that may have an impact on the quality of practice performance. Interpersonal teamwork, a high nurse-to-patient ratio and decentralized decision-making are associated with job satisfaction, reduced failure-to-rescue and patient mortality rates.

The workload in the organization influences the professional's potential to assess a patient's health status as the diagram (Figure 2) indicates. Professionals, such as nurses, often state "lack of time" as a barrier to optimal, structured care planning (Bjorvell et al. 2000). The workload results in fragmentation of care planning, with interruption of thoughts and lack of time for reflection (Bjorvell et al. 2000). This could influence the quality of the care planning and consequently care intervention. The workload may result in more routine-based work instead of individual-based care since the professionals have limited time to make an optimal assessment based on individual needs. In contrast, the workload may be decreased by an effective documented care plan. The various professionals who meet the patient throughout the care period thus have a written document to monitor in their contact with the patient (Ehrenberg et al. 2003; Ehrenberg et al. 2004; Hansebo et al. 1999). In that sense, essential information is available for the relevant care professionals who are responsible for the individual patient's care.

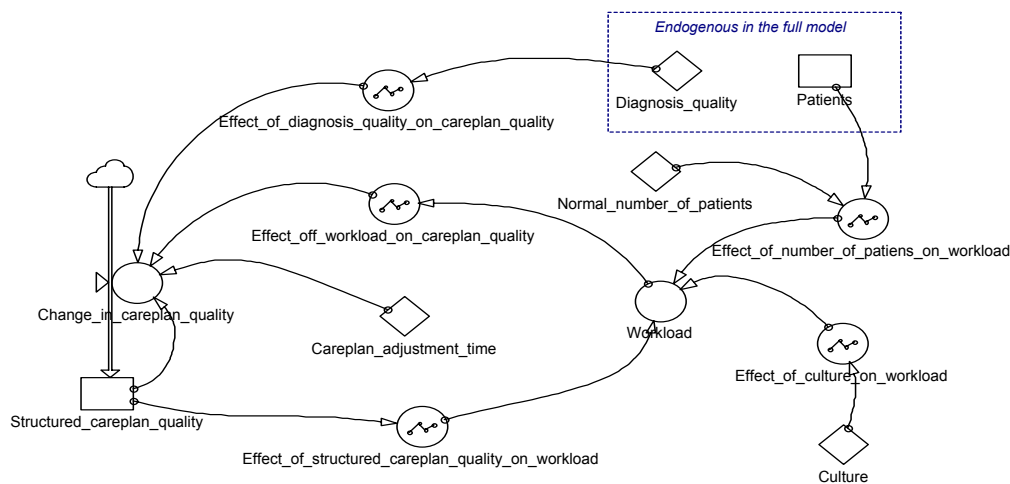


Figure 3. Part of the Stock and flow model of the care planning model

DISCUSSION AND CONCLUSIONS

The model in this paper is generic and simplified and is part of ongoing research. It should be more of an example of the kind of models health care needs in the future. I have created a conceptual model based on experience, observation and scientific evidence. At this level the model can be shared, discussed and calibrated for using in various health care settings. Some interesting issues related to modeling and quality improvements work are highlighted in the following discussion.

Assumptions

When modeling it is necessary to scrutinize the view we have of the care process. The care process can be defined as a flow of activities with the aim of influencing or changing the health status of a patient (NANDA 1999; SOSFS 1993). The process is usually described in terms of a theoretical model with delimited and sequenced steps, such as the general assessment of the patient's health status, diagnosis, planning for intervention and the evaluation of their effects (Ehrenberg 2001; NANDA 1999; SOSFS 1993). This way of presenting the care process can be called into question since it appears to be too mechanical. On a theoretical level, the process appears sequential in the sense that certain phases or steps occur in sequences. At the same time, the process is non-sequential since care is determined by the needs of the individual patient and the interactions between the patient and professionals. The quality of the process is also based on the care professionals' capacity to assess such needs and on their ability to relate to the individual patient as a subject (Bjorvell et al. 2003; Ehrenberg 2001; NANDA 1999; SOSFS 1993; Tyson et al. 1999; Yura et al. 1988). The care process can thus be described as a dynamic interaction between care professionals and the patient, in which the provider satisfies the patient's needs (Yura et al. 1988).

Moreover, it is also necessary to be clear about the way the concept of quality is used. Traditionally, health care has been assessed in terms of efficiency, which is the productivity of health care, e.g. "the number of patients treated" or "the number of patient days" produced. The goal is to treat a high number of patients and have a high patient flow by having a short length of stay. The philosophy is that efficiency is obtained if minimum quantity input produces maximum quantity output. This output indicates whether the chosen treatment is the right one in productivity terms or in technical terms. Production is a deceptive way of measuring quality since it does not identify the patient's feelings, comfort, quality of life or behavior during or after treatment. Effectiveness is concerned with the degree to which treatment produces an improved outcome for the patient, e.g. in quality of life or the management of daily life (Campbell 2000). Those kinds of variables have a high impact on productivity, times and costs in health care. The care system thus needs to be understood from a patient perspective and include outcomes that also represent effectiveness.

Earlier simulation models in health care

There is a rather long tradition of using simulation and modeling in health care. Typically, these models are often adopted from industry and are mainly built on a simplified view of the care process with predetermined steps (Lehaney et al. 1998; Lehaney et al. 1995). This approach has been demonstrated as being suitable for

modeling purely quantitative variables, such as production rate, waiting times or the number of patient beds, i.e. for describing processes that can be conceptualized in steps (Edmonds et al. 1999; el-Darzi et al. 1998; Kalton et al. 1997; Lehaney et al. 1998; McGuire 1997). Without question, such issues definitely have implications for health care with regard to the opportunity to make correct estimates of staff and space dimensions. The problem with the earlier models is mainly the linear view of the care process but also adherence to the efficiency quality approach. These models thus have limitations in current health care, in which there is a need for patient-centered care and the need to introduce model variables, such as patient health, needs, and influences on the care process.

Most health care studies that use system dynamics have studied patient flows throughout a health care system (González-Busto 1999; Roysten Geoff 1999; van Ackere 1999; Wolstenholme 1999). These models have often been on a macro-level. However, system dynamics will not contribute very much when simply adopting earlier production models. To improve the comprehension of the care process it is necessary to model the clinical care process on a micro-level, i.e. day-to-day care, as is the case in the present study. Earlier macro-level models have adopted an industrial view of processes, which are often well defined and can be easily controlled and predicted. This is not typical of the clinical care processes, which are characterized by uncertainty, largely arising from the involvement of human beings. It is important to create models with a clear patient focus. This results in very complex models that involve variables such as health and/or care culture (Sterman 1994; Sterman 2002).

Validation of health care models

At this stage, the present model needs to be considered as valid for the purpose of acting as a support tool in understanding and exploring the care planning process. Moreover, the concepts and subsequent model structure are based on scientific evidence from several empirical studies of care planning and this strengthens the validity. Notwithstanding this, the present model is the first step in further work. Ranges of assumptions are made that naturally vary according to local conditions. Several of the concepts within the present model may need to be disaggregated and described in more detail to achieve greater clarity. The concept of space, for instance, is treated very superficially and needs to be described in more detail, with a description of concepts such as privacy, accessibility and safety. In addition, it might in the future also be worth adding the flow of patients through the care system since this impacts on several capacity issues in the care system.

I have argued that models like the present one are indispensable in order to understand the health care context and the care process. It is thus inevitable to involve variables such as health. It is by necessity difficult to attach exact importance to many existing health care variables and the relationships between them. The patient's perceived health for example, is a subjective variable but is still measurable although not in the same way as a variable such as the number of patients admitted per day. Variables such as patient health or quality of the care plan can be quantified anyway by setting them against an index of some kind, such as 0-100, and defining what the magnitudes stand for (Caulfield et al. 2002). Briefly, in the present model 0 stands for a total absence of a

structured care plan while 100 is taken to be fulfillment of the quality of the structured care plan. However, it is not very creative to use the concept of intangible variables for all the variables that are unknown to the system dynamics community. The variables of health, quality of life and patient satisfaction are well defined and have been measured for a long time. Consequently, they are possible to quantify in a model.

Furthermore, health care must become more evidence-based (Kitson et al. 1998; McCormack et al. 2002). Health care decisions cannot be based purely on clinical experience and ideas about care. Evidence-based health care can be described both as an attitude to knowledge and as a process of gathering evidence about care. The goal is to always have the best evidence for decisions about care for the patient (Kitson et al. 1998). This should also be significant for the modeling process. It is not enough to adjust models against field experience. The variables that are manipulated within the model should be generated from significant theories of health care and based on scientific evidence. Otherwise there is a risk that old, traditional patterns in the system are conserved despite the ambition to use the models for improvements and to look ahead. Models should be used to scrutinize the care organization against a hypothetical, evidence-based model in order to improve practice towards best possible.

In the future the model will be modified and transformed into a formal mathematical model to provide further potential for asking, "What happens if?". The transformation will not be straightforward since the care process is extremely complex, with numerous non-linear links between several variables, the value of which needs to be estimated from further literature and field studies. However, a first step of the developing is presented in Figure 3.

Conclusions

Using modelling and simulation, the expectation is to enhance the potential for discussion about the care planning process and how to improve this process. The method is not used frequently in health care, especially not for the kind of questions presented here. Decisions about patient care and the care planning of interventions are part of a complex process and it is of some urgency to improve them in order to secure the safety, continuity and patient satisfaction with the care provided. In the present case, the model will hopefully give insight into the problem and generate new ideas for improvements. Moreover, the model organises knowledge and creates a theoretical framework for the further study of this specific care process.

Key message:

- Modern health care models should be models from a patient perspective and involve variables such as health, communication and decision-making
- The models should incorporate evidence-based variables in order to avoid the old pattern of the system being conserved
- Analyse the intangible variables – they might not be so intangible

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