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Change Can Be Challenging

Introduction To Changes and Implementation of Computerized Technology In Health Care

Thesis for the degree of Philosophiae Doctor

Trondheim, November 2010

Norwegian University of Science and Technology
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Endring kan være utfordrende - **introduksjon av endringer og implementering av computerteknologi i helsevesenet**

Utvikling og introduksjon av ny teknologi i samfunnet og i helsevesenet spesielt er krevende og åpner både for nye muligheter og utfordringer. På tross av at mye ressurser brukes i forhold til innføring av ny teknologi er det lite fokus på menneskers forhold til teknologi og computere spesielt. Helsevesenet opplever et økende krav om effektivisering og kvalitetsutvikling. Innføring av teknologi forventes å kunne bidra til dette. De forskjellige profesjonene som arbeider i helsevesenet kan ha ulike tradisjoner og kulturer som påvirker måten de tar i bruk ny teknologi. Team bestående av forskjellige profesjoner er generelt sett på som en måte å oppnå både effektivitet, kvalitetsforbedring og endring. I helsevesenet er dannelse av slike tverrfaglige team en utfordring både i forhold til kultur og arbeidsrutiner. Innenfor palliativ omsorg kan pasientenes spesielle tilstand og situasjon gjøre at de er ekstra sårbare for endringer i rutiner og implementering av ny teknologi.

Hovedmålsetningen med prosjektet var å fremskaffe ny kunnskap om hvordan helsepersonell kan ta i bruk computerteknologi og hvordan holdninger, kultur og bruk av tverrfaglige team kan influere på helsepersonells evne og mulighet til å gjennomføre endringsprosesser som innebærer implementering av computerteknologi.

For å studere hvordan helsepersonell kan oppleve implementering av computerteknologi ble det gjennomført en studie blant helsepersonell ved en palliativ avdeling. Respondentene deltok i et dybdeintervju med to forskjellige mål. Det ene var å belyse forhold ved opplevelsen av en implementeringsprosess ved en palliativ avdeling og det andre var å finne ut hvilke faktorer som kan virke fremmende i en implementeringsprosess. Mangel på deltagelse i beslutningsprosesser og forståelse av nytteverdien ved bruk av computere var noen av opplevelsene respondentene rapporterte. Flere uttrykte også at palliative avdelingers målsetting og pasientenes totale situasjon gjorde bruken av slik teknologi vanskelig og at det var uforenelig med deres målsetting og tanker om god omsorg. I forhold til spørsmålet om faktorer som virker fremmende mente respondentene at et aktivt og motiverende lederskap og nøkkelpersoner som var til stede på avdelingen kunne være avgjørende for en vellykket implementering. For å undersøke kulturelle forskjeller blant to profesjoner i helsevesenet, sykepleiere og leger, ble det gjennomført en studie ved 6 sykehus i Norge. Det ble identifisert forskjeller mellom de to profesjonene som kan være av betydning for dannelsen av tverrfaglige team. Forskjellene som ble identifisert var imidlertid av mer strukturell karakter enn kulturell, og dannelse av velfungerende tverrfaglige team kan derfor bli en realitet fordi strukturelle forskjeller er lettere å endre enn kulturelle.

Avhandlingen viser at utfordringene som finnes i helsevesenet knyttet til implementering av computerteknologi er i forhold til de barrierene som er identifisert i studien og de faktorene som kan virke fremmende på implementering av computerteknologi. Strukturelle barrierer mellom profesjoner i helsevesenet kan virke hemmende på dannelsen av velfungerende tverrfaglige team og dette kan igjen virke inn på gjennomføringen av noen endringsprosesser i helsevesenet.

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Ovennevnte avhandling er funnet verdig til å
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To you who only live in the harts of us who
loves you- my sister Jannike, my father
Georg and my beloved son Anders.
Knowing you have made my life richer

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Acknowledgments

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Trondheim 2010.

Beate André

Abbreviations

PAT-C	= Palliative Assessment Tool Computerized
EAPC =	European Association of Palliative Care research Network
CT =	Computer technology
QoL	= Quality of life
HRQoL	= Health related quality of life
TAM	= Technology acceptance model
IT	= Information technology
SPGR =	Systematizing the Person Group Relation
PMU - base	= Special database at the Palliative Medicine Unit
PMU	= Palliative Medicine Unit

List of papers

The thesis is based on the following publications:

I. Beate André, Gerd I. Ringdal, Toril Rannestad, Jon H. Loge, Hallvard Laerum, Stein Kaasa. **Experiences with Implementation of Computerized Tools in Health Care Units - A review article.** *International Journal for Human-Computer Interaction* 2008; 24, 8: 753-775.

II. Beate André, Gerd I. Ringdal, Jon H. Loge, Toril Rannestad, Stein Kaasa. **Implementation of Computerized Technology in a Palliative Care Unit.** *Palliative & Supportive Care* 2009; 7: 57-63.

III. Beate André, Gerd I. Ringdal, Jon H. Loge, Toril Rannestad, Stein Kaasa. **The importance of key personnel and active management for successful implementation of computer-based technology in palliative care – Result from a qualitative study.** *CIN: Computer, Informatics, Nursing* 2008; 26, 4: 183-189.

IV. Endre Sjøvold, Frode Heldal, Beate André, Jan Tore Lium. **How professional culture influences interdisciplinary teamwork.** 2010; Submitted.

1.0 Introduction

The development of new technology in our society opens up for a diversity of opportunities and challenges. The relation between technology and the humans, who shall take its advantages in use, is an area which has received much less attention than the development of the technology itself (Andrew, 1996; Ash et al., 2000). The use of computers is erasing, but with less attention on the relationship between human beings and computers (Lorenzi, 2004). The relationship between computers and humans is therefore under consideration, but still many people are alienated in relation to computers and some feel threatened by them. As long as the computers are used as tools to make our other tasks easier, the acceptance of the computers should not be so difficult. However, when people feel that the computers control the standard of their own decisions, they can be perceived as a threat (Andrew, 1996). This is an area with less attention than the development of the technology itself.

The demand for improvement of patient care and the efficiency in health care institutions is increasing. New technology has been expected to play an important role in supporting these changes. Implementations of new technology in health care units are required. This may be problematic due to some of the health care workers` barriers against learning and practicing new technology. To be able to meet the needs of both health care workers, patients and the society, it is important to identify and systematize the knowledge in this area for initiating change (Bagian et al., 2001; Clarke et al., 2007). How people considerate changes can be both on an personal or on an organizational level (Lorenzi, 2004). Different conditions and experiences can thus influence on how these changes are perceived both on an organizational level, a

relation level and on a personal level. Sometimes it may, however, be difficult to differentiate among these levels.

There are several different professions in health care, and the relationship and cooperation among them can both hamper and promote a chancing process. Increasing use of “team work” as well as new technology can demand development of new routines and challenge established work patterns (Massaro, 1993; Herbert, 1998; Ash et al., 2000). Different professions can inhibit different traditions towards using new technology and changing routines (Coeling & Wilcox, 1990). Heath care workers can vary in skills and personal experience when it comes to computer use. To be able to understand the interplay among all these elements knowledge about the health care system in general and about important factors in this process, will be essential.

The special conditions for palliative care can demand different approaches in the connection with the implementation, because of the patients special situation and that patients` experience of their own situation; their wishes and hopes are in focus for the health care workers (Kaasa & Loge, 2003). In supporting a new implementation of computerized tools in palliative care, such knowledge is useful and important.

The present study was part of a larger European multi-centre study, the Palliative Assessment Tool Computerized (PAT-C) which was organized and conducted through the European Association of Palliative Care research Network (EAPC 2006). The overall objective was to improve clinical symptom management and individual assessment of symptoms while minimizing the burden of the patient by developing a computer-based tool for self-report assessment of symptoms and functioning in

palliative care patients. This thesis contains a part of the PAT-C project and deals with how to successfully increase the use of computer technology (CT) among the health care workers. The attitudes to and the use of CT among the health care workers may have an impact on the patients' use of CT in the future, and how the work environment (culture) can play a part in facilitate these changes among the health care workers.

2.0 Aims of the thesis

The aims of this thesis were to increase the knowledge about implementation of computerized technology in palliative care and how this implementation is experienced by the health care personnel, and how the work environment (culture) at a hospital unit can influence on the ability to participate in changing processes and participate in team work.

The main research questions are as follows:

1. What are the main challenges the health care personnel face when computer technology is introduced in health care? (Paper I)

2. How do health care personnel experience the implementation of computer technology for symptom registration in palliative care? (Paper II)

3. What kinds of responses and attitudes do the personnel in palliative care unit's show towards the implementation of CT in symptom assessment, and factors that can promote or hamper the implementation of CT in palliative care? (Paper III)

4. The aim of this study was to investigate the nature of differences between professions in hospitals and whether these differences are caused by distinctly different professional cultures. (Paper IV)

3.0 Theoretical foundations for this thesis

The theoretical foundation for the phenomena under investigation in this thesis, introduction of CT in health care, the relation between health care workers and CT, the special conditions for implementation in palliative care and how the work environment (culture) influences on the health care workers behavior and facility to change, are presented in this chapter. To illuminate this complex area it is important with a broad theoretical perspective and obtaining knowledge from health psychology, technology management, science of medicine and nursing (Benestad & Laake, 2004).

3.1 Palliative care

All work with dying patients should be based on respect for the patient and close attention to her/his distress. Furthermore, this work should focus on care for the patient and not solely treating the patient's disease (Saunders, 1965). When palliative medicine was established as a specialty, the goal was to attain as high quality of life (QoL) as possible both for patients and their families (Stromgren et al., 2001; van Kleffens et al., 2004). This is also described in the existing definitions of palliative care. The palliative care population is not a well- defined group of patients. A suggestion for a common classification is proposed in Table 1 (Kaasa & Loge, 2003).

Table 1 Patient population in palliative care (Kaasa & Loge, 2003).

A suggestion for classification		
	Expected survival	Karnofsky
Primary palliation	>6 months	70-90
Early palliation	2-3 months	50-60
Late palliation	B 1 month	20-40
Imminently dying	B 1-2 weeks	B 10

As shown in the table the palliative care population, as measured by the Karnofsky scale (Karnofsky et al. 1948), is heterogeneous with a broad range of needs and desires. The patients' expectations towards the health care personnel in meeting these needs and desires are a part of the special conditions related to palliative care. Symptoms in palliative care can be both subjectively and objectively perceived (Kaasa & Loge, 2003) Patients in palliative care have high levels of various subjective symptoms (Coyle et al., 1990).The situation can easily be experienced as overwhelming an systemization of the symptoms might reduce some of the burden on the patients and make the situation more easy-to-understand for the health care worker. The most common symptoms among the palliative patients are displayed in Table 2.

Table 2 Incidence of symptoms with patients submitted to a Palliative Medicine Unit in a one-year period (Kaasa S, 1998, p 24).

Fatigue	85%
Pain	74%
Changed eating habits	74%
Reduced appetite	67%
Dry mouth	56%
Constipation	50%
Thirst	49%
Dyspnea	42%
Nausea	38%
Depression	55%

In reaching the goal of optimal QoL for the patients receiving palliative care, there is a need for improved assessment and control of symptoms and distress (Kaasa & Loge, 2003). Traditionally, most assessment tools are paper based. The patient completes

the questionnaire or forms, or a health care worker asks the patient and marks the response. Subsequent, the paper and pen methodology has been brought forward into computerized questionnaires (Cella et al. 2005, Bjorner et al. 2005). Palliative care units comprise of patients that frequently are frail, with constant decreasing health and multiple symptoms. These factors can hamper a precise symptom registration. Assessment tools for palliative care must therefore be short and easy to understand as assessment burden is an important aspect in frail patients. In palliative care units the potential conflicts between “high tech” and “high touch” are rather visible. The introduction of CT in health care units as well as in palliative care units is, however, therefore a challenging task. The focus on being close to the patients and to meet their needs and wishes can easily be seen as opposed to technological symptom registration. More knowledge on this field has been asked for (Bartholomew & Curtis, 2004; Rabinowitz, 2005; Kole, 2003).

3.1.1 Quality of life assessment in palliative care

A central concept in palliative care and in health care in general is the patients’ QoL. In health care research QoL can contain a range of components, which are measurable and related to health, disease, illness and interventions. In health care as well as in life in general QoL has different meanings for different people and takes on different meanings according to the illness, experience, culture and values. QoL is further related to symptoms, functioning, psychological and social wellbeing (Kaasa & Loge, 2003). Despite the ongoing discussion about how to define QoL most researchers and clinicians agree that QoL in palliative medicine is related to symptom control, physical function, psychological well being and meaning and fulfillment (existential and spiritual issues). This multidimensional health oriented concept has been named

as health related quality of life (HRQoL) (Kaasa & Loge, 2003). The specific goals for palliative care, such as improving QoL, controlling symptoms and supporting the family must be reflected in all work with patients with short expected time to live (Kaasa & Loge, 2003; Harding & Higginson, 2003). HRQoL concerns the health related aspects of symptoms, functioning, psychological and social wellbeing and is a highly relevant concept to use in palliative care, because the health status of the patients is important and can influence the total wellbeing or status. Whether improved pain control will lead to improved functioning and HRQoL is under debate (Klepstad et al., 2000). One can assume that improved symptom control, as for instant pain, can lead to improved function and improved HRQoL. Substantial improvement in pain assessment and control has been reported to lead to improved functioning and improved HRQoL (Fredheim et al., 2006). To improve a patients` QoL it is important also to take into account those subjectively perceived aspects of the patient's life that are not easy to measure, like pain, cognitive function, fatigue.

3.1.2 Symptom assessment

In reaching the goal of increased QoL in palliative care, there is a need for improved assessment and control of symptoms and distress (Kaasa & Loge, 2003). Studies demonstrate that for instant pain is still unsatisfactorily managed in cancer patients and inadequate pain assessment is suggested as one of the contributing factors (Caraceni & Portenoy 1999, Higginson et al 2003, Holtan et al 2005). One way to achieve improved symptom assessment is by using CT to register and track symptoms. The goal is to minimize the patient's burden while at the same time produce patient data that are available through the institution's data network. CT allows the assessment of the symptoms to be performed faster, more accurate and

more efficient than with a standard paper format. Palliative care is particularly time-sensitive, because of the patients' short life expectancy (Kaasa & Loge, 2003).

3.2 Implementation of new technology

In general as much as 50% of all information system may fail or people fail to use the systems to their full capacity (Lorenzi, 2004). Preparation, action and maintenance stages need to be completed properly, if not, frustration may lead to higher probability of failure (Lorenzi, 2004). To create quality systems three sets of skills are needed, according to Lorenzo & Riley (2003), three sets of skills are needed: technical skills, project management skills, and people and organizational skills. The relationship between the health care personnel, the organizational skills, and the project management skills are important factors (Lorenzo & Riley, 2003) . The technology acceptance model (TAM) developed by Davies (Davis, 1989) gives some explanation on why people do or do not use information technology.

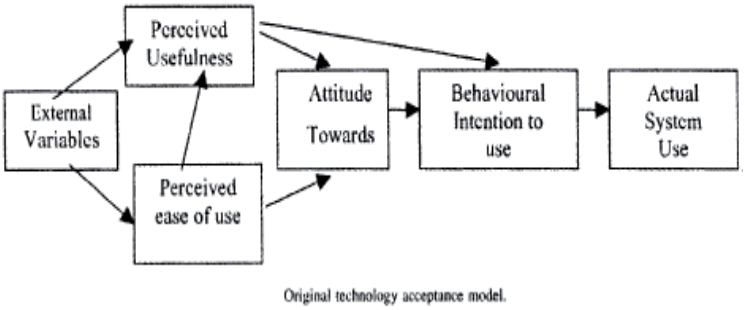

Figure 1 Technology acceptance model (Legris et.al 2003)

Figure 1 shows the model TAM which is much used to predict user acceptance and has been proven valid (Legris et al., 2003). This model shows that the external variables, such as economy, management, organizational issues can influence the internal factors as attitudes and behavioral intention. All these factors are important to address in order to promote health care personnel ` use of new technology. External factors as cooperation among health care personnel and culture at the unit can also be important to examine.

Innovations in information technology must actually be deployed to have a positive impact on quality and productivity. Yet, innovation researchers have known for some time that a new technology may be introduced with great enthusiasm and enjoy widespread initial acquisition, but nevertheless still fail to be thoroughly deployed among many acquiring firms. Fichmann & Kemerer describes a gap between user acceptance and acquiring of new information technology (Fichman & Kemerer, 1999). Even if the health services are increasingly in need of the benefits that information technology can promise, the capability to bring about these benefits is being severely compromised by inability to adequately address the problems that organizations present. So, even if the organizations need the benefit the new information system can bring us, lack of people and organizational skills can hamper the implementation (Lorenzi, 2004). Implementation strategy, used in several organizations to implement information technology (IT), may not be fully applicable in health care organizations due to their complexity. The nature of the organization and its interaction with the implementation strategy also brings out special issues in health care organizations (Southon et al., 1999). Further on, the focus on technologies-in-practice also allows an examination of the extent to which users

realize designer's intention for a technology, or if it is user governed. It has long been recognized that technologies are often not used as designed or intended, but generating an adequate understanding of how, where and why the slippage between design and use occurs in practice has been difficult (Orlikowski, 2000). There are several challenges in health care organizations concerning implementation of IT. The professions working in health care are not engaged in development and implementation of IT. Both the usefulness of these tools and how to develop an ownership to them are important issues in introduction of IT in health care organizations. If this introduction is going to succeed it occurs important that health care workers' experiences are included in the research of developing and implementation of IT in health care.

3.3 Change in organizations

The increased use of technology in an organization may challenge basic institutional assumptions, disturb traditional patterns of conduct and force people to modify established routine practices (Massaro, 1993; Herbert, 1998; Ash et al., 2000; Anderson et al., 2002; Patel et al., 2001). Models from health psychology can describe connections and causes concerning how people tend to react. These models assume that perceived behavioral control indirectly affects behavior by affecting underlying intentions (Strobe, 2000). Under certain conditions, perceived behavioral control can also directly affect behavior that is not originally mediated by intentions, such as when health care workers are busy with clinical work most of the day and have little or no time for working at the computer. Thus, although health care workers may intend to use the computer, the actual lack of control over their workday may casually

and directly influence their behavior. Health workers' motivation to help patients, their ability to improve the quality of patient care with or without changing routines (Friedman, 1999; Ash et al., 2003a), and their perceived behavioral control in situations in which they experience changes are all important factors in a changing process. For instance, a change can be incorrectly interpreted as a threat or a personal loss (Brown & Coney, 1994; Lorenzi & Riley, 2000c; Friedman, 1999). It is said that the heart and the soul of every organization can be found in the knowledge, the skills and the value systems of its people (Andrew, 1996). Accordingly, the leadership of an organization should take care in introducing innovations that are not consistent with the organization's existing values (Friedman, 1999; Anderson & Aydin, 1997). The subjective norms in every single person as well as in different groups of people must be acknowledged (Shefter, 2006).

It will be necessary to obtain knowledge about changes and the process of changing in health services. Special programs for implementation of computer based registration of symptoms in a hospital wards can be designed. Bastøe & Dahl (1996) describes "the strategic method" for changing in six phases in an implementation process. They describe a review of a changing process, as shown in Table 3.

Table 3 Phases in a changing process (Bastøe & Dahl, 1996)

1. Anchoring phase – the goal is to make sure if the leaders know what they want and what they are doing
2. Demanding phase – everyone participate to formulate what problems it is significant to focus on and everyone can express their view
3. Analysing phase – the organisation is challenged to analyse the material from the charting phase
4. Problem solving phase – to account and find both short term and long term goals for chancing and make clear who is responsible for the progress
5. Carryout phase – going thru with the chance
6. Evaluating phase - the new knowledge, skills and attitudes is evaluated, together with the changing process

(My own translation from Norwegian)

As shown in this table introduction of changes in organizations has to be planned with concern and knowledge. The effect that changes and implementations has on the culture, on behavior and in the organization has been described (Massaro, 1993). The cultural and behavioral problems seem to be more important problems than the user-friendliness of the new technology. Further it is stated that "it is widely appreciated that the introduction of a major new technology can be a destabilizing event" (Massaro, 1993). This fact has been accepted by parts of the business world, but it has been given little attention in health care where new technologies are introduced frequently. An IT is not culturally neutral; the values of the organization and their responses to this cultural assault are predictable, and cannot fix problems that it did not create (Massaro, 1993). However, Massaro found that such technology can accentuate existing problems by diverting attention from the underlying causes and fundamental issues involved. Cross-functional innovation in an institution structured along functional lines requires active and constant support from the top management team (Massaro, 1993).

The culture and values in an organization may expect to be of importance when changes are introduced. A method to analyze group and organizational culture was developed by Sjøvold (1998). The basic idea is that mastering the process of polarization and unification is the most important aspect of successful change in organizations (Sjøvold, 1998).

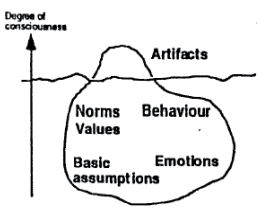

Figure 2 The Elements of Group and Organizational Culture (Sjøvold, 1998).

One way of describing organizational culture is by its elements, as shown in Figure 2 (Sjøvold, 1998). A polarization always exists between groups or individuals acting in different “Basic Assumptions”. While norms represent rules of behavior which connect the personality of individuals to the roles required for maintaining group culture, and values legitimate the sanctions administered to those who break the norms, the “Basic Assumptions” govern the way group members should think (Sjøvold, 1998).

In a well-functioning group culture the nature of the polarization changes frequently, and shift between polarization and unification is rapidly and dynamic. A less functional culture is dominated either by severe polarization (a destructive conflict) or by the same type of polarization over a considerable amount of time. The purpose of

the polarization analysis is to enable the identification of what remedies to consider in developing a group or an organization to a full-fledged state (Sjøvold 1998). Every person's behavior is a fundamental part of you which is developed over many years. Both to change your own behavior and to break the norms and expectations of your colleagues, to maintain the customary behavior are challenging. The culture at the unit has the equal development trails. It has developed over many years, and is maintained by the expectations of continuity. Resistance to change behavior or culture will occur when one does not understand the intention or purpose of the change (Sjøvold, 2003).

3.4 Reactions to change

When people are presented with innovations that require changes in their behavior, such as the introduction of new technology to health care units, they may react in a variety of ways (Ash et al., 2000). A common reaction by many may be to resist these changes (Friedman, 1999). Different categories of resistance have been identified: resistance to environmental changes, resistance to general organizational or systems changes, general resistance to changes, and resistance to specific changes (Lorenzi et al., 2001; Ash et al., 2000). These reactions may represent a psychological and educational challenge (Andrew, 1996; Friedman, 1999). In addition, people are more likely to resist technology that they perceive as imposed on them than technology that is voluntary (Lorenzi & Riley, 2000b). Requiring workers to use new technologies may well be perceived by the workers as behavior regulation and, as has been known for some time (Brehm, 1989), people generally resist the introduction of new technology that may require change of work habits. Furthermore, people have a tendency to react negatively when their freedom of action is limited or restricted. The

theory of psychological reactance posits that one habitual response to change is the desire to restore threatened behavior regulation (Brehm, 1989).

3.4.1 Intentions and goal achievement

Implementation research is the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of services (Eccles & Mittman, 2006). There is a substantial gap between people's goal intentions and their goal achievement, because forming a goal intention does not prepare people sufficiently for dealing with self-regulatory problems in initiating, maintaining, disengaging from, or overextending oneself in goal striving. Goal striving should be regulated effectively, and goal achievement should thereby be facilitated. Even with goal intention it does not guarantee goal achievement. Understanding which factors determine whether people succeed or fail in achieving desired outcomes is a fundamental concern in both basic and applied psychology (Gollwitzer & Sheeran, 2006).

It is proposed that successful goal achievement is facilitated by a second act of willing that furnishes the goal intention with an if-then plan specifying when, where, and how the person will investigate responses that promote goal realization. These plans are termed implementation intentions (Gollwitzer & Sheeran, 2006). However, correlations between goal intentions and future behavior may overestimate the strength of intention-behavior relations because it is possible that future behavior and goal intentions are both determined by self-perceptions of past behavior (Bem, 1972). The implication is that analyses should control for previous performance in order to

determine to what extent goal intentions are associated with behavior change (Sheeran et al., 2003). Producing significant changes in goal intention strength only generates a modest change in goal achievement which can led to a substantial "gap" between people's goal intentions and their subsequent attainment (Gollwitzer & Sheeran, 2006). One can conclude that the single act of willing involved in forming a goal intention is not sufficient to ensure goal achievement; some additional psychological concepts are needed. People often become inclined opponent rather than inclined actors. Developing self-regulatory strategies to help and understand how people "bridge" the gap between their intentions and their behavior will be important (Gollwitzer & Sheeran, 2006).

People who pursue their goals using means that have a natural fit to the content of the goal have better chance of goal attainment. For example, people with promotion goals, which focus on gains and achievement, are more likely to realize those goals using eagerness means whereas prevention goals, which focus on safety and security, are more likely to be realized by vigilance means (Higgins, 2000). Implementation intentions facilitate effective self-regulation of goal striving and should enhance people's ability to initiate, maintain, disengage from, and undertake further goal striving and thereby increase the likelihood that strong goal intentions are realized successfully. This form of planning is expected to bridge the intention-behavior gap. To form this implementation intention, the person must both identify a response that will promote goal attainment and anticipate a suitable occasion to initiate that response. As a consequence, a strong mental link must be created between the critical situation and the goal-directed response. People who form implementation intentions are in a good position to recognize opportunities to act and respond to these

opportunities swiftly and effortlessly. The concept of implementation intentions is valuable both in understanding the processes of goal attainment and in providing a self-regulatory strategy to help people reach their goals (Gollwitzer & Sheeran, 2006).

3.5 Barriers and resistance

Computer implementation may lead to occupational stress, both directly and indirectly (Smith et al., 1999). Also the strategies used to implement computer technology may effect the level of employee stress (Smith et al., 1999). How specific job factors produce stress will probably vary according to type of job. Computer users in less skilled jobs have greater amounts of stress than those in higher skilled jobs (Smith et al., 1999). Understanding a work group's culture is essential to facilitate the change process (Coeling & Wilcox, 1990). Different health care professions will demand different approaches in the introduction programs, because they hold different cultures as well as different work tasks. Different work task may lead to different approaches to the same problem.

Negative attitude, resistance and behavior problems can be viewed as barriers to implementation (Massaro, 1993; Lee et al., 1996; Brown & Coney, 1994; Newton, 1995; Newton, 1995; Paré & Elam, 1999; Getty et al., 1999; Mikulich et al., 2001;). Studies suggest that attitude is a stable factor that is not influenced by the implementation process. Attitude, anxiety, resistance or other behavioral problems are difficult to identify, establish and to measure and they can be perceived and handled in different ways.

Barriers can be seen as underlying intentions that may have indirect effect on behavior. If the underlying intention is a negative attitude toward the use of computers in the hospital ward, health care personnel will most likely avoid using them and/or focus mainly on negative implications of computer use. Changing underlying intentions may then produce more positive behavior. Perceived behavioral control is mostly connected to knowledge through the concept of self-efficacy (Bandura, 1977; Bandura, 1986). Lack of knowledge can make people perceive less self-efficacy, which again can lead to feelings of lack of control and resistance to change. Self-efficacy relates to the individual's confidence that he or she can perform a certain task and is a sense of being competent and effective. Efficacy is an important factor in determining individual decisions to use a computer. Efficacy beliefs may be more important than direct experience (Henderson et al., 1995; Hill et al., 1987). The assumptions are that attitudes and beliefs are major determinants of behavior; these models are rational reasoning models which assume that individuals consciously deliberate about the likely consequences of behavioral alternatives that are available to them before engaging in action.

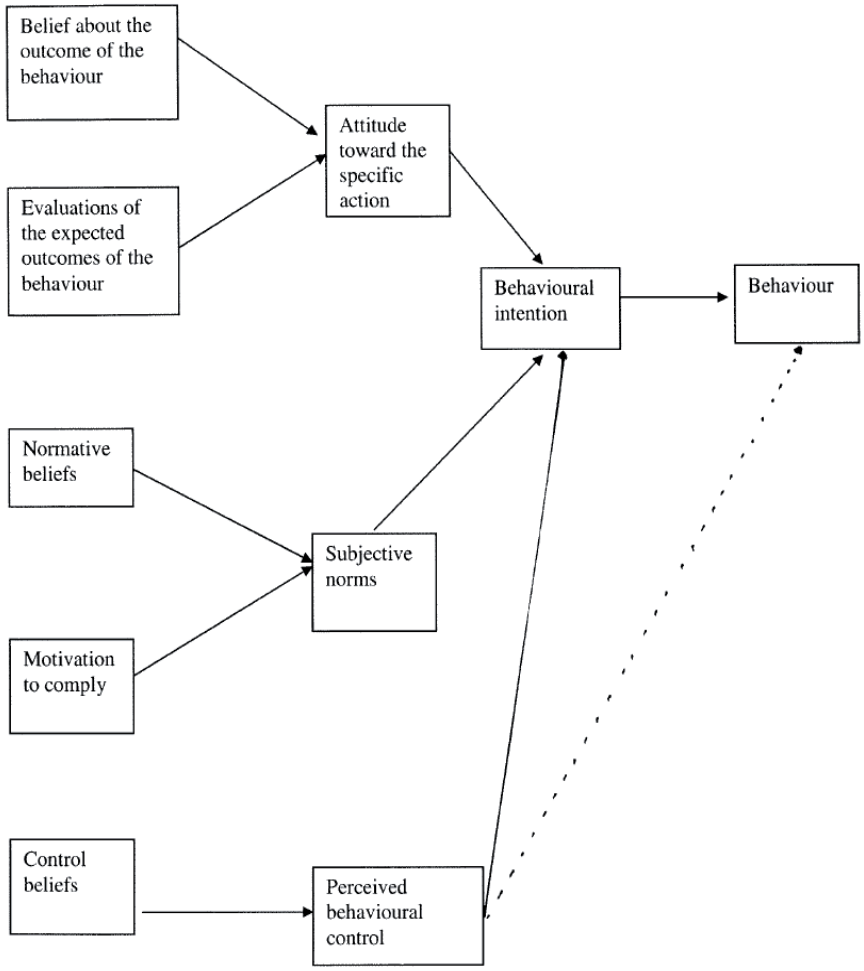

Figure 3. The theory of planned behavior (from Ajzen, 1991).

The theory of planned behavior (Ajzen, 1991) is displayed in Figure 3. In this case the wanted behavior is use of CT. Perceived behavioral control with a direct effect on behavior not meditated by intentions may be exemplified by available computers or lack of available computers (Laerum et al., 2001). Such a direct effect can be easier to change than an indirect effect, because one can change the factors that cause the

effect. Problems such as lack of available computers or discontent with the software can be remedied. Furthermore, self–reported skills are an important predictor of baseline computer anxiety and computer attitude. When people state that they have few skills, this can be an expression of low expectations with respect to the use of new technology. Low expectations constitute a central component in the social learning theory of computer aversion (Brown & Coney, 1994). Thus, low expectations can indirectly lead to resistance to computer technology. The role or behavior patterns may be closely related to attitude, behavioral intention, subjective norms and perceived behavioral control (Ajzen & Fishbein, 1975). To achieve successful implementation of CT, it is important to investigate the attitudes of health care personnel (Lorenzi & Riley, 2000a). Newton found that the introduction of CT leads to a shift of power from those with professional knowledge, to those with technological skills (Newton, 1995). Health care personnel, whose power is rooted in their professional skills, may feel their power eclipsed by the need for new technological skills. The relationship between technology, professional skills and caring roles must be illuminated to overcome this problem, where the goal must be that computers should be viewed as support tools rather than replacements for humans.

An attitude can be seen as a learned predisposition to respond in a consistent manner to a given object or situation (Ajzen & Fishbein, 1975; Jayasuriya & Caputi, 1996). Negative attitudes towards computers may cause people to avoid using computerized systems or to resist the introduction of such systems (Jayasuriya & Caputi, 1996; Anderson, 2002; Ash et al., 2003c). One of the main factors that effect attitudes towards computers is previous experience with them. Positive computer experience is

found to have a positive effect on computer attitude by both reducing computer anxiety and increasing motivation to use the computer (Yaghmaie et al., 1998). There is accordingly both a personal and a technological challenge in introducing new technology into routine practice. It has been claimed that changing the attitudes of physicians is more challenging than overcoming the problems presented by the technology itself (Anderson et al., 1986; Kaplan et al., 2001 ; Herbert, 2004). Computer anxiety has been identified as a variable related to resistance and commitment to use computers (Kay, 1990; Jayasuriya & Caputi, 1996). One study found that the nursing staff may exhibit high levels of computer anxiety (Jacobson et al., 1989). In the business sector it has been experienced that the attitude of the user is a key determinant of the effective use of computers in the work place. However, the employees may resist the introduction of such systems to the organization (Igbaria & Parasuraman, 1991). It is thus reasonable to assume that attitude and resistance problems affect most people who are faced with the introduction of CT, yet, little is known about this coherence.

3.6 Organizational culture as barrier to change

To successfully implement the use of CT in health care, it is important to evaluate the attitudes of health care personnel with respect to this implementation (Lorenzi & Riley, 2000d). Bate (2000) conducted a case study of a large-scale program that was undertaken in a hospital, in which it was concluded that successful implementation was dependent on changes in culture, relationships and skills. The concept of culture or organizational culture is not consistently described in the literature. It can be thought of as the “normative glue” in organizations (Sleutel, 2000) or the sense-making and control mechanisms that guide and shape the behavior and attitudes of an

organization's members (Weick & Quinn, 1999). One of the more cited frameworks (Schein,1992), says that the culture manifests itself at three fundamental levels, represented in a hierarchical fashion: the observable artifacts as tangible or visible aspects of culture; the values as explicitly articulated norms, social principles and ideologies; and the basic underlying assumptions as the deepest level or core elements of culture, which all provide expectations that influence perceptions, thoughts and feelings about the organization (Schein, 1992; Scott-Findlay & Estabrooks, 2006). Cultural differences can imply different mental models. Such differences easily lead to misunderstandings, conflicts of value and increased polarization (Sjøvold, & Hegstad, 2008).

Culture represents acquired maps of reality or models for action, and the incomplete interpretations based on these maps of models are perceived as representing the objective reality. This shared "reality" defines members identity and borders to other groups, organizations or professions. Strong professional cultures may therefore be a strong hindrance for smooth cooperation between members of different professions. Their interpretation of problem at hand and their superior goal may be too different. The increasing demands to organizational and technological changes are challenging for health care organizations. This together with increasing demands from society concerning both quantity and quality of hospital services with less tolerance for mistakes increases the pressure on the health care professions. One possible way to successfully meet such demands is to increase smooth and well-functioning cooperation among health care professions (Sjøvold, 2007).

To active successful implementations and changes in the heath care sector knowledge about both psychological reactions to changes, barriers and organizational culture is important. In order to examine which factors influence on different processes of changing (Lorenzi, 2004) it will be important how the health care workers perceive their reactions to change, barriers to change and their organizational culture.

3.6.1. Interdisciplinary teams and the hospital organization

Most professions in current health care are highly specialized. It has been stated that the different professions have different concepts within different paradigms that describe their different "worlds" or perception of the health care organization. The concept "cure" stands for a treatment philosophy mostly inhabited by physicians, while "care" stands for a caring approach and are mostly inhabited by nurses. The concept of "control" is in the "world" of managers and mercantile professions (Glouberman & Mintzberg, 2001; Nortvedt, 2005). Consequently, the professionals can perceive a given situation or problem differently. Despite the different professions` perception of the same task an interdisciplinary team can benefit from these various perceptions and thereby induce improved health services. The main benefit of an interdisciplinary team is that members with various backgrounds, skills and knowledge may perceive problems or situations differently and solve these in various and sometimes better manner than a single-disciplinary approach. However, procedures and established role patterns can be difficult to change, especially if these are upheld by distinct different professional cultures (Sjøvold, & Hegstad, 2008). The conditions for a well functioning interdisciplinary team are that its members respect each other as equally important, share a compatible perception of the

organizational reality and that no structural or social barriers for cooperation exist (Sjøvold, 2007).

When the health care services are facing changes the interdisciplinary team is often suggested as means to meet these changes (Friedman, 1999; Scott et al., 2005). However, this can be challenging because there are traditionally borders between the different professions and their culture in health care (Sjøvold, & Hegstad,2008). To be able to meet these challenges it will be important to investigate the different cultural borders between professions in health care. Health care professions may support changes and systems that will improve the quality of patient care, as long as these changes are not perceived as a threat to current professional tasks (Alexander et al., 1983; Ash et al., 2000). However, when these tasks are perceived to be threatened by change, it might be easier to resist the change (Andrew, 1996). The role or behavior patterns may be closely related to attitude, behavioral intention, subjective norms and perceived behavioral control (Ajzen, 1991). Thus, making changes in an hospital organization can be a challenging risk, and when introducing new ideas, leadership should strive to choose innovations that are consistent with the organization's existing values (Friedman, 1999; Scott et al., 2005).

4.0 Methods

In this thesis, several of research methods have been used. Due to the heterogeneous and complex nature of both clinical work and hospital organization, methodological rigidity remains a disputable goal by itself. To understand and to learn how to investigate and evaluate medical information systems it is valuable to use both quantitative and qualitative research methods (Friedman & Wyatt, 1997). This chapter presents the theoretical foundation for the methods used. The materials are introduced in chapter five. An overview of the research methods used in each paper is given in Table 4.

Table 4 Methods used in thesis

	Qualitative			**Quantitative**
Method / Paper	Systematic literature search	Narratives	Interviews	Questionnaires
Paper 1	X	X		
Paper 2		X	X	
Paper 3		X	X	
Paper 4				X

4.1 Paradigms guiding this study

Different professions are embedded in different scientific paradigms. These paradigms exist side by side in an organization and can make team-work difficult, inspiring depending on how we are able to integrate these different perspectives in real life. Traditionally, natural science seeks an explanation or a causal conjunction; while social science seeks an understanding of the phenomena that is studied. This division has been used to differentiate natural science from humanities, but these boundaries are no longer so clear (Benestad & Laake, 2004). Traditional discussions differentiate between body and soul. Supporters of an holistic paradigm claim that it is "time to move beyond the mind-body split" (Bracken & Thomas, 2002). This implies that integrations of cultural, historic or personal dimensions with natural science contribute towards a holistic view of human beings. In palliative care this holistic view has been the foundation for the Hospice movement (Saunders, 1978; Kaasa & Loge, 2003). Palliative care embraces a number of different frameworks and approaches to meet the needs of the "whole" person. As soon as we speak about the many dimensions of dying and the aim to provide maximum comfort and support, we are engaged in broad endeavors. Moreover, the origin of palliative care lies in areas of religious care and nursing, rather than medicine (Kellehear, 2001).

The different scientific paradigms determine the use of varied research methods, such as qualitative and quantitative. Descriptive studies, with the goal of extending knowledge about the subject or phenomena under investigation are useful to gain knowledge and study "phenomena" (Miles & Huberman, 1994). To be able to influence on the behavior or the behaviors` intentions, it is important to describe both

structures surrounding the health organization and characteristics of the health care population itself. Knowledge from different sciences as nursing, medicine, psychology and technology management are important to promote a broader view (Benestad & Laake, 2004). Uses of such different approaches in understanding these phenomena under investigation can be challenging, but can also provide extended knowledge and more thorough explanations (Foss & Ellefsen, 2002).

4.2 Methodological approaches

Within research and scientific theory, two main traditions can be found; an objectivistic and a subjectivist tradition (Benestad & Laake, 2004). The strength of the objectivistic approach is seen in exact, quantitative measures of effects, and the potential to demonstrate causal relationships among variables. In the subjectivist approach, on the other hand, the strength can be seen in explanation of observations and narratives, and in the inclusion of the context. The point of view is broader, thus unexpected or new facts can be identified (Ammenwerth et al., 2003). While quantitative approaches bring a broad, general view to the surface, qualitative approaches generate data that provide a deeper and more multifaceted insight (Foss & Ellefsen, 2002). Investigation of implementation processes may benefit from using different methods because of the complexity of the area. In the area of medical informatics and implementation, which deals with both technical and social aspects, both the objective and the subjective approach can be used to complement each other. On this basis we conducted our study, with both a quantitative and a qualitative approach.

4.3 Systematic literature search

The aims of a systematic literature review are to evaluate and interpret all available research evidence relevant to a particular question. In this approach a concerted attempt is made to identify all relevant primary research, a standardized appraisal of study quality is made and the results from studies of acceptable quality are systematically synthesized. The main advantages of systematic review are that they improve the ability to study the consistency of results and improve the statistical power by combining data in studies that have attempted to answer the same question. Secondly, similar effects across a wide variety of settings and designs provide evidence of robustness and transferability of the results to other settings.

Including studies with different designs in a systematic literature search can be challenging, in selecting, in analyzing and in interpretation of the data, and is an important topic for discussion. Still, it can be a distinct advantage to include both qualitative and quantitative methods because of the ability to enhance the generalizability and transferability of data (Glasziou, 2001). The use of both qualitative and quantitative data in one study has been a subject for discussion. Green et.al. (1989) state that such studies can help sequentially by expanding the scope and breadth of a study. However, to gain this, some key issues must be addressed by the researcher. The phenomena under investigation and the implicit paradigms used must be considered together with the purpose for using them (Miles & Hubermann, 1994). The research question will influence on the choice of study design. Different types of research questions require different study designs, and consequently different methods of systematic review (Glasziou, 2001).

Different approaches have been suggested to assess quality in studies to be included in a review study. If unstructured appraisals are used, there is a tendency to look more critical at the studies with conclusions we dislike (Glasziou, 2001). There exist no gold standards as to which criteria one should use in quality assessment of study designs (Vistad et.al. 2006). Several different methods or evaluation form are recommended and qualitative analysis involves indexing textual information to ensure that nothing relevant is lost (Fitzpatrick et.al.1998). The main aim of quality assessment is to address the different studies` overall strength and applicability of any result and conclusion and it is suggested that the main focus should be on individual quality features (Glasziou, 2001).

The main disadvantage with the systematic reviews is that even small biases or flaws, which most studies can contain, can be past on in the review study and give an apparent effect. Selection bias and publication bias can be a problem in review studies. Systematic exclusion of unpublished trials from review studies introduces bias if the unpublished studies differ from the published (Glasziou et al., 2001). To avoid selection bias standardized checklists should be assessed. Even if most of the systematic reviews provide quantitative synthesis of the data, it is neither necessary nor sufficient to use quantitative synthesis to make a review systematic (Glasziou et al., 2001). Systematic literature search was used in Paper I.

4.4 Narratives

Narratives are stories about a specific past event with common properties (Riessman, 1993). Narratives can be stories or statements with clear beginnings and endings and tells not only about the past actions but how individuals understand those actions,

about the perceived meaning. A narrative can also be described as a reflexive mode where people respond to pictures of themselves and their environment (Miles & Huberman, 1994). In evaluation clauses, which typically permeate narrative, a teller stands back from the unfolding action and tells how he or she has chosen to interpret. The social context surroundings the narratives are important for the interpretation of the narratives, the text is not autonomous of its context (Riessman, 1993). The most common use of narratives is in written text or story telling, but it is also, to some extend, used in analyzing interviews. Narratives were used in Paper I, II and III.

4.5 Interviews

Qualitative research interview has sometimes been dismissed as not being scientific. Some claim that it might provide interesting results and serve as preparation to scientific investigations, but the interview as such is not a scientific method (Kvale, 1996). The definition of a scientific method will be vital for the view of the research interviews as a scientific method. In a broader definition science is understood as a methodological sensible production of new, systematic knowledge, which includes the qualitative research methods (Kvale, 1996). Interviews are used if the researcher needs to gain a deeper insight into aspects like people's opinion, feelings, emotions and experiences than generated from questionnaires. Furthermore, this approach allows new and unexpected issues to be identified; data not thought of before. In-depth interviews is often concerning issues considered as sensitive (Denscombe, 2007). In analyzing the data from qualitative interviews (Kvale, 1994; 1996), the goal is to condense the meaning into forms that can be presented in a relatively abbreviated manner, and to work out meanings implicit in these texts or statements. Five steps are employed: categorization of meaning, condensation of meaning, structuring of

meaning, interpretation of meaning, and ad hoc methods for generating meaning (Kvale, 1994; 1996).

The semi-structured interviews are characterized by both structure and flexibility. The interviewer has a clear list of issues to be addressed and questions to be answered but is prepared to be flexible in terms of the order in which the topics are considered, and to let the interviewee develop ideas and speak more freely on the issues raised by the researcher (Denscombe, 2007). This method was used in Paper II and III. The interview guide used in paper II and III is presented in Appendix.

4.6 Questionnaires

For gathering information from a large group of informants, a standardized questionnaire can be useful. It is easily to collect and analyze the data and it is not so time consuming for the respondents. The data from questionnaires can be systemized in another way than data from interviews. In more general terms a questionnaire shall be designed to collect information which can be used subsequently as data for analysis, each person who answers the particular questionnaire reads identical set of questions. Opinions, attitudes, views, beliefs, preferences etc. can also be investigated using questionnaires. Respondents are required to reveal information about feelings, to express values and to weigh up alternatives in a way that calls for a judgment about things rather than reporting facts (Denscombe, 2007). This method was used in Paper IV. The questionnaire used in paper VI is presented in Appendix.

4.6.1 The Systematizing the Person Group Relation method

This method describes the development of interactions within a social system, and analyzes interaction patterns on individual, group and organizational levels. The Systematizing the Person Group Relation (SPGR) method is based on Bales' theory of social interaction systems (Bales, 1999), Parsons' functional model of group development (Parsons, 1953) and Bion's theory of group emotionality (Bion, 1961). The SPGR method draws from the principles of the System for the Multiple Level Observation of Groups (Symlog) instrument (Bales & Cohen, 1979); however, the three SPGR dimensions have a different orientation in the factor-analytical space. The systematic approach of the Symlog theory and methodology gives a reliable set of data for the analysis of polarization-unification concerning the behavior level. However, the original analyses of polarization based on Symlog do not sufficiently emphasize the influence of emotions on the process of polarization. On the other hand the "Basic Assumptions" (see Figure 2) seems to act as focal points in polarization. Since it has been proved possible to identify these "Basic Assumptions" within the Symlog-space it became possible to combine this theory and the theory on group emotionality (Sjøvold, 1995). In addition a psycho-social growth model was included for analysis of developmental aspects of group and organizational culture (Mills, 1971; Mills, 1976;). The SPGR is a balance model and this means that if there is more of something, for instance loyalty and acceptance, there is less of the opposite, creativity and task-orientation. The theoretical foundation for SPGR has been elaborated by Sjøvold (2007) and the psychometric properties have been presented (Sjøvold, 1995; Sjøvold, 2002).The validity and reliability of the scale used in this study has been confirmed in by others (Koenigs et al., 2002; Koenigs et al., 2005).

4.6.2 The Systematizing Person-Group Relations instrument

The Systematizing Person-Group Relations (SPGR) is an instrument designed for analyzing interaction patterns of behavior within social systems and has also been used in hospital settings in several studies in Norway. The SPGR instrument is an operationalization of SPGR theory (Sjøvold, 2007). SPGR theory is a theory of group development where the group-functions are labeled: 'Control'; 'Nurture'; 'Opposition'; and 'Dependence'. The basic idea is that a group activates the function best suited to deal with the specific problem they face. If the problem at hand is instrumental, then the Control function is activated; if the problem is relational, the Nurture function is activated and so on. When the Control function is active, analytical, task-oriented or even autocratic behavior dominates; when the Nurture function is active, caring, empathic or even spontaneous behavior dominates; if the Opposition function is active, critical, assertive or even self-sufficient behavior dominates; and when Dependence is active, passive, conforming, and obedient behavior dominates. These functions represent poles in the basic dimensions of the SPGR theory: C-N (Control –Nurture) and O-D (Opposition – Dependence) (Sjøvold 2007). A group's level of development is labeled maturity. The level of maturity in SPGR is expressed by a third dimension: S-W or Synergy to Withdrawal. Synergy appears in groups characterized by engagement and constructive goal-oriented teamwork. In a group at a lower level of maturity members commit to their initial role, and tend to restrict themselves from contributing to the common group work. This will in turn result in passive behavior and resistance, i.e. withdrawal (Sjøvold 2006, 2007). Systematized observed behavior is therefore a good indicator on both a group's level of maturity and its culture. The SPGR instrument is developed for this

purpose based on data from direct observati on or, from standardized questionnaires. SPGR was used in Paper IV.

4.8 The Palliative Assessment Tool-Computerized project

Ideally, measuring of subjective symptoms should be precise, easy to administer and filled in with the smallest possible effort by the clinician and the patient. The latter is of special relevance in palliative care due to the patients` reduced general health condition. In palliative care there has been little consistency in how subjective symptoms should be measured. For example, meta - analyses of studies on pain treatment have been severely obstructed by the lack of common measurement tool (McQuay et al., 1997). The lack of international standards also makes comparisons across studies difficult. Comparisons of data among various cohorts in palliative care programs and in studies comparing palliative chemotherapy with best supportive care are nearly impossible due to the use of different measures for similar symptoms (Kaasa & Loge, 2002). Due to the low consistency on how to measure subjective symptoms, the comparisons across studies are very difficult. The overall aim of the PAT-C project is to develop an international computer-based assessment tool for use in palliative care, completed by either patients or proxies. Simultaneous translation of the PAT-C into European languages, study of the barriers to use of the PAT-C and consequent development of strategies to promote worldwide use of the tool were therefore included in the project (Kaasa, 2001). The PAT-C was developed in palliative settings, with majority of cancer patients, where the methodology also opened for use in other patient populations.

4.9 Ethical considerations

The ethical considerations are of vital importance in research. All material published must be original. All data must be collected and dealt with in a professional and scientific manner (Benestad & Laake, 2004).

All respondents presented in the papers of the studies are health care personnel, which are considered competent to make autonomous choices of voluntary participating in the study. This can be a question of consideration because there may have been a pressure to participate. In this case participation in the studies is totally without risk and liability for the single respondent, and both the interviews and survey were done during their working hour. The information we wanted from the respondents can not be characterized as sensitive. Participation or withdrawal had no impact on the health care person's work situation.

In paper II and III each respondent received written and oral information about the study and the importance of their participation. Participation was voluntary and the respondents could at any time withdraw from participation in the study. All registration of the respondents' information was anonymous, and the low numbers of respondents made it necessary to give extra attention to avoiding recognition of a single individual in the presentation of the results. The management at the unit sanctioned the study. The researchers were independent of the unit and the implementers. Also in paper IV participation in the study was voluntary for the informants. They were informed about the aims and purpose of the study. All registration of data abut the informants was anonymous.

5.0 Summary of papers

This section presents the main results from each of the four papers. The methods and material used in each study are presented in tabular forms. The study subjects and the selection of them are described specifically in the tables as well as the methods for analyzing the data. Particular circumstances are commented separately.

5.1 Paper I - Experiences with Implementation of Computerized Tools in Health Care Units - A review article

Several factors that may influence the adoption of new technology have been identified, but to our knowledge these factors are seldom set in the context of a theoretical framework. We have chosen to systematize knowledge about implementations in heath care units through investigation of seventeen existing studies. This approach gave an overview over the most important aspects in an implementation process. In the present paper, health psychology theories, models and concepts were used as a framework to evaluate and discuss the findings.

5.1.1 Research question and methods

Intentions and aims for this paper were mainly to set the several factors that may influence the adoption of new technology in the context of a theoretical framework.

Research question in paper I:

- What is the best way to identify the main challenges facing health care personnel as a result of the introduction of CT in health care?

- How can training help eliminate barriers to the use of CT in health care?
- What factors will promote or hamper the implementation of CT in a hospital ward?

The methods used in the study were aimed at providing a contribution for development of a theoretical framework. Descriptions of special phenomena and the context in which these phenomena occur were found through investigation of literature. A systematic search of relevant databases resulted in 299 hits related to implementation of CT in health care, of which 17 met all criteria for inclusion in this review. Table 5 shows the methods used.

Table 5 Methods used in paper 1

Method	**Systematic literature review**
Material	Essentially literature cited in databases; *PubMed, Inspec, PsycInfo, Embase and* BIBSYS. Internet using search engines such as "*Google*" and hand searching of some Journals. The search included studies published up to November 2006.
Selection	Search terms used: Barriers/computers; Barriers/computers/doctors/nurses; New technology/barriers; Computer/barriers; Computer/attitudes/health/nurse/doctor; Man-machine-systems; and Attitudes/satisfaction/barriers.
Inclusion criteria	Description of implementation of new computerized technology; patient-related situations; hospital wards; with health care personnel.
Comment	Even if the database search yielded a total of 2771 hits closer examination showed that 839 of these were duplicates. Of the remaining 1932 articles, only 299 articles concerned technology implementation in the health care sector and were examined further. Of these 299 articles, only 17 met all criteria for inclusion.
Analyze	We employed a qualitative approach (Kvale, 1994; Kvale, 1996) where the goal is to condense the meaning into forms that can be presented in a relatively abbreviated manner, and to work out meanings implicit in these texts.

5.1.2. Main results and summary

The following barriers to the adoption of CT were identified: Negative attitudes, lack of knowledge, role adjustment related to the disruption of traditional work habits, and

changes in established work roles. The dual needs to both assess and change attitudes were identified as crucial factors for successful implementation of these new technologies. The present review article shows that there is a need for development and introduction of training program before CT is introduced. Furthermore, we found that it is possible to identify barriers, such as negative attitudes, resistance and lack of knowledge, which may hamper the implementation process. The challenges with implementation of CT in health care units generate from the need to modify the behavior and intentions of health care personnel, as well as the need to create employee motivation. The challenges for future clinical work and research will be to influence the behavior and intentions of health care personnel, to focus on the benefits of introducing CT in health care units, and to make certain that the institution's leadership is fully supportive of the change. Furthermore, this review showed that if the introduction of CT is going to succeed, an adequate training program is imperative.

5.2 Paper II - Implementation of Computerized Technology in a Palliative Care Unit.

To investigate personal experiences among health care personnel, a "on site" approach was used. An earlier implementation of CT in palliative care together with an engagement for palliative care made it appropriate to investigate this specific unit. We wanted to explore the responses related to palliative care and its goals, to identify the specific conditions in these units.

5.2.1 Research question and methods

The main aims and intentions of this article were to increase our knowledge about the implementation process from the users' point of view and to focus on specific elements of the implementation of new technology in palliative care. A qualitative approach that both could explain and lead to an understanding of this theme was used. This phenomenological approach is based on both the hermeneutics and the more existentialistic oriented hermeneutic (Gadamer, 1983). The philosophical tradition of this phenomenological approach is "empathy or indwelling with the subject of one's inquiries" and "understanding of group actions and interactions" (Miles & Huberman, 1994). The connection between the different phenomena is also important in this study, "in the investigation of essences one shifts from describing separate phenomena to searching for their common essence" (Kvale, 1996).

The samples in a qualitative study are usually small and tend to be purposive rather than random. The sample was purposive collected to find the respondents with knowledge about the phenomena under investigation (Kvale, 1996). With regard to data saturation it had been possible to stop the data collection at an earlier stage, but to ensure that a total overview over the experiences were given, we decided to include all the respondents that fulfilled the inclusion criteria (Miles & Huberman, 1994).
Research question in Paper II:

- How do health care personnel experience the implementation of CT for symptom registration in palliative care?

Symptom registration was introduced through a handheld computer together with a special database (PMU-base) at the Palliative Medicine Unit (PMU), the Department of Oncology, Trondheim University Hospital in Norway, in 2001. The goal was to improve the symptom registration and give the patients better and more accurate symptom treatment aimed at the specific symptoms. It was also possible for health care personnel, together with the patients, to record the ten symptoms on paper instead of using the handheld computer and punching the data into the PMU-base. The implementation had only partly been a success. A qualitative approach was used in analyzing the data. Seventeen respondents (nurses, physicians and physiotherapists) participated in a semi - structured in-depth interviews. The interviews were held over a two-month period and lasted from 30 to 50 minutes each. Two interviewers participated in each interview. One method to check the creditability of the material and the interviews is to use two persons who read the transcription (Kvale, 1996). Table 6 shows the method used.

Table 6 Method and material in paper 2 and 3

Method	**In-depth interviews**
Subjects	Health care personnel at the PMU.
Selection	A total of 17 health care personnel at the PMU participated in an in-depth interview for the purposes of this study. The sample consisted of 13 nurses, two physicians and two physiotherapists all working full-time or part time (< 75%).
Inclusion criteria	The health care personnel had to been a part of the implementation process.
Comment	The interview guide was used as a guideline and the respondents were requested to speak freely about the themes they were introduced to. Both notes and tape were used.
Analysis	We used a qualitative approach to obtain data to understand why the tool was not used to its full potential. Categories emerged from the data. We examined data that both could explain and lead to an understanding of this phenomenon.

5.2.2. Major results and summary

The result are organized in categories emerged from the data. These are motivation, severely ill patients, “high-tech” and “high-touch”, routine, utility and critical factors for success. Respondents at the hospital ward unit were better motivated for using CT than respondents at the outpatient clinic unit. These findings emerged from the data where the respondents described themselves as more or less motivated. When using qualitative methods the focus is not on frequencies and differences. However, the respondents gave accurate information about their motivation and when this information was gone through we found that there were differences between the two groups, as the respondent stated themselves. The respondents stated that they had become a part of “their work environment” and that negative attitudes and low motivation were contagious. So motivation can both be connected to the personal intention described in 3.4.1 and connected to values and culture at the different units, described in 3.6.

It was also stated by the respondents that the health condition of the patient is important in their perception of the tool as useful or not. The conflict between the “high-tech” and “high-touch” is more visible in palliative care units than in other units and can make the implementation process difficult. If implementation of CT is successful and the implementation process is conducted in such a manner that the health care personnel are involved, the full benefit of the tool can be realized. Participating in the decision making process and understanding the utility and benefit of the tool were said by all the respondents to be factors of vital importance in the

implementation process. Effective implementation and use of "high-tech" can lead to more time released for "high-touch".

5.3 Paper III - The importance of key personnel and active management for successful implementation of computer-based technology in palliative care – Results from a qualitative study.

Use and introduction of CT is rapidly evolving, and has in recent years been introduced as a health care tool both for administrative and clinical purposes. This introduction may pressure health care workers to change their professional habits. To investigate personal experiences among health care personnel with introduction of CT, seventeen respondents, working in a palliative care unit, participated in this study.

5.3.1 Research question and methods

The main intentions of this paper were to increase knowledge about the implementation process from the users' point of view and to focus on specific elements of the implementation of new technology in palliative care and on the factors that can promote such implementation.

Research question in Paper III:

- What kinds of responses and attitudes do the personnel in palliative care unit's show towards the implementation of CT in symptom assessment?
- What factors can promote implementation of CT in palliative care?

Symptom registration was introduced through a handheld computer together with a PMU-base at the PMU, the Department of Oncology, Trondheim University Hospital in Norway, in 2001. The goal was to improve the symptom registration and give the patients better and more accurate symptom treatment aimed at the specific symptoms. It was also possible for health care personnel, together with the patients, to record the ten symptoms on paper instead of using the handheld computer and punching the data into the PMU-base. The implementation had only partly been a success. A qualitative approach was used in analyzing the data. Seventeen respondents (nurses, physicians and physiotherapists) participated in a semi - structured in-depth interviews. The interviews were held over a two-month period and lasted from 30 to 50 minutes each. Two interviewers participated in each interview. One method to check the creditability of the material and the interviews is to use two persons who read the transcription (Kvale, 1996). Table 6 (presented earlier) shows the method used.

5.3.2. Main results and summary

This study examined and evaluated an earlier implementation process and pointed out some factors that can promote this kind of implementation. All respondents had participated in this former implementation process. The themes presented in this article are perceived aims, training, information and communication. The respondents expressed a wish for a resource person, who would promote implementation of CT at the unit. The expectations regarding this person differed however, as this person had to be present at the unit, should provide quick help, should be a driving force and responsible for training and teaching. There is a need for skilled and motivated key personnel at the unit if implementation is to be successful. This process must also lead to a feeling of ownership of the tool. Ownership concerns both a feeling of control

and participation, and respondents expressed lacking both. The creation of a feeling of ownership is a management's responsibility. The need for key personnel is important to keep motivation high and to be of assistance at the unit. There should also be a training program in advance to teach health care workers how to use the tool and how to understand it. The program must focus on moderating the attitudes of health care workers toward this kind of tool. In the future, it will be necessary to develop and evaluate different training and teaching program.

5.4 Paper IV – How professional culture influences interdisciplinary teamwork.

In this paper we investigated the potential for integrated cooperation between health-care professionals. During the last ten years hospital organizations in Norway have been facing increasing demands due to organizational and technological changes. This development coincides with increasing demands from society concerning both quantity and quality of hospital services. One possible way to successfully meet such demands is to increase cooperation between health care professions in interdisciplinary teams.

5.4.1 Research question and methods

The aim of this study was to investigate the conditions for interdisciplinary teamwork in hospitals emphasizing organizational culture. Research question in Paper IV:

- The aim of this study was to investigate the nature of differences between professions in hospitals and whether these differences are caused by distinctly different professional cultures.

In Paper IV we used the SPGR measures. All SPGR measures are peer ratings that use the standardized SPGR behavior scale (Sjøvold, 2002). The instrument consists of a category system for observation of overt behavior in groups and several scales for self and peer ratings (Sjøvold, 1995). This study was based on peer ratings using a 24-item scale where each item was rated according to whether the behavior never or seldom occurred (1), sometimes (2) and often or always (3) in the culture. Health care personnel, 169 physicians and nurses from six Norwegian hospitals participated; all respondents received the same questionnaire. The hospitals were not randomly chosen; both university hospitals and smaller regional hospitals were chosen. The same types of units were chosen and all the hospitals had the same system for electronic patient journal and had removed the paper based journals from every day use. The hospitals had a key person who recommended the personnel to participate in the study. One reminder was sent out to the non respondents. Table 7 shows the method used.

Table 7 Methods used in paper 4

Method	**Questionnaire**
Subjects	Health care personnel working at six Norwegian hospitals
Selection	The total number of respondents is 169 of which 58 were physicians and 111 nurses.
Inclusion criteria	Members from two professional groups, physician and nurses, were chosen in representative numbers from each hospital.
Comment	Questionnaires were distributed and filled in. The response rates were 68% for the physicians and 58% for the nurse.
Analysis	This study used the Systematizing Person-Group Relations method (SPGR) (Sjøvold, 1995; Sjøvold, 2002; Sjøvold, 2007) for data collection and analysis.

5.4.2 Main results and summary

The SPGR instrument was used to identify cultural differences between physicians and nurses. The results show tendencies and significant differences between the two groups. Physicians experience their culture as more empathic as and with more enthusiastic and engaged colleagues than the nurses did. The nurses described the culture as characterized by more caring, but also by more criticism and assertiveness. When comparing physicians and nurses as groups we find no support for the assumption of distinct different professional cultures. The differences we identified between the professions may better be explained by concepts as autonomy, power and status. Such structural artifacts represent barriers to mature interdisciplinary teamwork and may be hard to change. They are however open for discussion and as such a lot easier to handle than barriers due to cultural differences.

6.0 Discussion

This thesis includes one systematic literature review, two papers presenting a study where in-depth interviews were used, and one paper where a questionnaire was used. This thesis aims to investigate different conditions necessary for optimal change in health care organizations in general, and also how implementation of CT was experienced by health care workers and how cultural differences may influence on the ability to change. In this section the methodological considerations will be presented first. The methodological strengths and limitations related to the different study designs will be discussed. In the second part there will be a discussion of the main findings and their implications for health care.

6.1 Methodological considerations

Every scientific research method has its strengths and weaknesses, and every method can be misused if not applied or interpreted correctly. There have been some major methodological challenges during the work with this thesis. To compensate for the lack of exact control over the research environment, we chose to broaden the methodological approaches to allow for use of different methods. Furthermore, the aims of this thesis induced a broad methodological approach.

Triangulation is the combination of two or more data sources, methodological approaches, theoretical perspectives or analytical approaches (Denzin, 1970; Patton, 1990; Kimchi et al., 1991; Thurmond, 2001). Methodological triangulation can be defined in different ways, as using both quantitative and qualitative methods. The

reason for using this multi-methods can be to balance the weaknesses of one method with the strengths of another or to decrease biases that can stem from any single method (Thurmond, 2001).

The different methodological approaches used in this thesis imply considerations about the relationship among the different methods and the feasibility in comparing the findings. The use of different methods can give a deeper understanding of the phenomenon in question compared to a mono-methodological approach. However, the attempt to join data through using different methods is a challenging task, as data derived through various methodologies are viewed as incommensurable (Foss & Ellefsen, 2002). Triangulation is a valid technique provided that the researchers recognize that their work always is influenced by certain paradigms (Dootson, 1995). Triangulation should be used when it can contribute to understanding the phenomenon; however, the researcher must articulate why the strategy is being used and how it might enhance the study (Thurmond, 2001). The complexity and diversity of reality provides the ontological basis for different epistemological positions. The various methods used should be recognized as generated from different epistemological traditions which, when combined, add new perspectives to the phenomenon under investigation. The different types of knowledge should not be seen as ranked, but as equally valid and necessary to obtain a richer and more comprehensive picture of the issue under investigation (Foss & Ellefsen, 2002). The central issues are that the research question in the study will be of importance to judge which methodological approach it is necessary and useful to employ. The complexity and diversity of the phenomena under investigation are important to take under consideration when choosing the research method. In evaluation research,

triangulation in general means the multiple use of various sources of data, methods and theories in investigation of the same phenomenon (Thurmond, 2001). We applied different methods in data collection; methods and analyzing of data concerning investigation of an implementation process in a palliative care unit and investigation of culture and attitudes toward changing in generally. The benefit we obtained from using this method is that completeness of the result and the different views the method supplied could make us able to obtain a deeper understanding of the phenomena. The survey of the culture in the unit and the respondent's individual understanding expressed in the interviews supplemented each other. Both the validation and comprehensiveness of the results can be supported by using different methodological approaches.

One problem with triangulation may occur when the data from different approaches are analyzed together as one unit. This can lead to errors and misinterpretations (Shih, 1998). In this thesis triangulation was not used as strictly as described in the literature (Denzin, 1970; Patton, 1990; Kimchi et al., 1991; Thurmond, 2001), but the same arguments was used when the results of studies with different methodological approaches are synthesized to give a broader perspective to the phenomena under investigation in this thesis.

6.1.1 Methodological strengths and limitations

Concepts that describe strengths and limitations in methods have different basis in quantitative and qualitative research. In quantitative studies concepts of reliability and validity concern trustworthiness, dependability and credibility. Reliability refers to how consistent the results are, and validity means whether or not a study investigates

what is intended to investigate (Kvale, 1996). In a qualitative study these conditions are described by the concepts of creditability and dependability whereas trustworthiness concerns the authenticity of the findings (Miles & Huberman, 1994).

The sample in a qualitative study is usually small and tend to be purposive rather than random (Miles & Huberman, 1994). The data in literature study (Paper I) are collected in a systematic manner, and by using experienced searchers in the library and in the research team. In the study with the in depth-interviews (Paper II and III) included all respondents that fulfilled the inclusion criteria. The sample was purposive collected to find the respondents with knowledge about the phenomena under investigation. In Paper IV all health care personnel, from the groups involved, were included in the study.

The data collection presented in Paper I was conducted in a systematic manner (Glasziou et al., 2001) and followed the guidelines for narrative reporting (Miles & Huberman, 1994; Kvale, 1996). The context obtained from the theory and from the findings made it possible to categorize the statements. These categories emerged from a broad theoretical basis. Such strategy can be challenging because the findings have to be related to the different aspects of the theory. The purpose of the study was to generate knowledge abut the implementation process of CT in health care and to explain different aspects of this process. The studies included varied in numbers of respondents, with quantitative and qualitative methods and material in general, which make them difficult to compare and can be a weakness of Paper I. In this review article nine studies had a quantitative approach; five had qualitative approaches and three used both (Table 8). We focused both on making a summary of the relevant

studies included and on contracting narratives. We chose to include studies with quantitative and qualitative design to ensure a broadness of relevant and valuable information. Linking qualitative and quantitative data could provide richer details and could initiate a new line of thinking through attention to surprises and paradoxes and provide fresh insight (Miles & Hubermann, 1994). We grouped the included studies by design to see if this could provide more insight than our original ranking (Table 8).

Table 8 Included studies grouped by design; quantitative approaches, qualitative approaches and both approaches.

Authors/Journal/Publication Year	***Design***
Massaro / AcademicMedicine / 1993	Quantitative approach with survey questionnaire
F. Lee et al. / Journal of the American Medical Informatics Association / 1996	Quantitative approach with survey – in two steps
Laerum et al. /British Medical Journal / 2001	Quantitative approach with survey questionnaire - cross sectional
Brown & Coney /Journal of the American Medical Informatics Association / 1994	Quantitative approach with survey questionnaire – two steps
Mikulich et al. / International Journal of Medical Informatics / 2001	Quantitative approach with survey – pre-post questionnaires – time studies of interventions with clocks embedded in the software
Getty et al. / Journal of Clinical Nursing / 1999	Quantitative approach with survey – comparative-questionnaire with three sections
Quinzio et al. / European Journal of Anaesthesiology / 2003	Quantitative approach with survey questionnaire
Moody et al. / Computers, Informatics, Nursing / 2004	Quantitative approach with survey questionnaire - cross sectional
Paré & Elam / International Journal of Healthcare Technology and Management / 1999	Quantitative approach with survey questionnaire
Scott et al. / British Medical Journal / 2005	Qualitative approach based on semi structured interviews
Lapointe & Rivard / Canadian Medical Journal / 2006	Qualitative approach based on observations, documentation and interviews, within-case and cross-case analyses
Lee T-T / Journal of Clinical Nursing / 2006	Qualitative approach based on in-depth interviews.
Costa & Marques /* 2000	Qualitative approach with interviews using a semi – structured questionnaire
Herbert / Health Services Management Research / 1998	Qualitative approach based on interviews, written archival data and observations
Ammenwerth et al./ Journal of the American Medical Informatics Association / 2003	Quantitative approach with survey questionnaire. Explorative qualitative analysis
Lai et al. / Human Factors / 2006	Triangulation of methods – hypotheses development – observation – preliminary interviews - questionnaire
Newton / Nursing Standard / 1995	Qualitative and quantitative approaches using questionnaires – interviews – audits – observations in a survey and case study

* Unpublished manuscript

Narratives emerged from the text and it was important to "let the text speak for itself" and not be explained by the design of the study. Therefore, we did not find it meaningful to group the studies by design.

The studies that met all criteria for inclusion varied in quality. According to Glasziou et al.(2001) the quality of a study should be assessed by checking on the following; appropriate subject selection, description of methods of investigation, combination of methods of investigation, method of intervention assignment, control/discussion of biases, outcome assessment/discussions. As a minimum, an appropriate subject selection, a description of the method and an outcome discussion had to be addressed. All 17 studies fulfilled these criteria (one study gave information about the subject selection indirectly). Description of the implementation at question was addressed by 14 of the studies and seven studies gave a description of controls for or a discussion of biases or limitations in their study. Six studies used a combination of methods for investigations, which could give a broader and more valid result of the study (Miles & Hubemann, 1994). Quality assessment of includes studies is displayed in Table 9.

Table 9 Quality assessment of included studies by times sited and impact factor.

Authors	Appropriate subject selection	Description of methods of investigation	Combination of methods of investigation	Method of intervention assignment	Control/ discussion of biases	Outcome assessment/ discussions
Massaro,1993	X	X		X		X
Lee et al.1996	X	X		X	X	X
Laerum et al., 2001	X	X			X	X
Brown & Coney, 1994	X	X		X	X	X
Ammenwerth et al, 2003	X	X	X	X	X	X
Mikulich et al. 2001	X	X	X	X	X	X
Getty et al. 1999	X	X				X
Scott et al. 2005	X	X		X	X	X
Lapointe & Rivard, 2006	X	X	X	X		X
Quinzio et al. 2003	X	X		X		X
Moody et al 2004	X	X		X		X
Lee,T-T, 2006	X	X		X		X
Lai et al. 2006	X	X	X	X	X	X
Costa & Marques, 2000	X	X				X
Herbert , 1998	X	X	X	X		X
Newton, 1995		X	X	X		X
Paré & Elam, 1999	X	X		X		X

In review articles both selection and publication biases can occur. To avoid such biases in the present review article standardized checklists were used to assess the quality of the studies included (Glasziou et al., 2001). The most concerning problem was that ten of the studies failed to control for or discuss biases or limitations. The lack of such information existed in studies with quantitative as well as qualitative approaches, and among studies published in journals with high impact factor and among studies frequently citied. However, most of the studies that did not control for or discuss biases or limitation were the studies with lowest impact factor and fewest

times sited (Table 9). This may indicate that the use of impact factor and times sited in sorting the studies can be a good "quality" indicator. Both hand searching and using "untraditional" databases as "Google" were used to avoid publication bias. One of the strengths can be the approach with both systematization of data, the qualitative methods with narratives and the original interpretation of the material.

The interview guide used in Paper II and III were based on a guide that was created by the Center for Quality Management Concept Engineering "CQM Quality Improvement ToolKit" and has been used earlier (Center for Quality Management, 1997). The interview guide was used merely as a guideline. The respondents were requested to speak freely about the themes they were introduced to. If a respondent did not talk about all the issues, the interviewers guided him/her back to the theme in question. The interviewers also asked questions to ensure that the content of the statements was understood. If there were any uncertainties the question was repeated. The respondents were asked about their subjective perception of their experience with the implementation process. There are elements of subjectivity from the researchers view during the interview situation, the analyzing process and the interpretation of the findings. In the setting of the research interview, interaction is neither as anonymous nor neutral as when a subject responds to a survey questionnaire. After each interview, the two interviewers discussed their own participation and formulations in order to ensure that the respondents' actual intent regarding the reported information was understood.

One method to check the credibility of the material and the interviews is to use two persons who read the transcription (Miles & Huberman, 1994; Kvale, 1996). Each of

the transcribed interviews was gone through at least three times by both interviewers. In analyzing the data a method developed by Kvale was used and the steps described in the method were used (Kvale, 1996). Still the condensing of the material can contain elements of subjectivity. The material was sorted and worked through and the information from each of the respondents in the sample and each of the themes were discussed. To ensure the dependability of the material at least two views of each statement were made. Interviews are a useful method to gain insights into the respondent's subjective perception, as opinions, feelings, emotions and experiences. The purpose of the study was to obtain knowledge about the respondents experience in connection with an implementation process and to display the contextually and heterogeneity of knowledge. The weakness of this method is the lack of ability to generalize the findings into other groups and units. These papers can, however be used as a basis for further research in this area. The knowledge can be used as foundations in situations were units similar to PMU units are going to start an implementation of CT.

In Paper IV we used the SPGR method with questionnaires, which have been used before and proved valid in several studies (Koenigs et al., 2002; Sjøvold, 2002; Heldal et al., 2004; Koenigs et al., 2005). This study is a one point estimate, including a large number of respondents in various districts in Norway. The SPGR method uses a combination of a theory of social interaction system, a functional model of group development and a theory of group emotionality. This combined with a psycho-social growth model for analysis of developmental aspects of group and organizational culture illuminates most of the elements that are important in an organizational culture. The broadness of units included in the study is also one of the strength of the

study. One can assume that the findings can be used in Norwegian hospitals when culture in work environment and interdisciplinary teams are in question. The response rate was 58% for nurses and 68 % for physicians. This can be a bias in Paper IV, and also the lack of information on the non-responders. Conclusions and generalizations must therefore be done with caution.

6.2 Discussion of main findings

In this chapter the main findings in the different studies will be synthesized to illuminate the challenging elements of changing which is of importance for this thesis. The discussion is divided in two parts, the elements of a successful implementation with the conditions for change, and the internal and external elements of changing.

6.2.1 Elements of a successful implementation

The top management team in the health care system is usually divided in a technical and an administrative department, in addition to the health science department. This division requires an open communication between the groups in order to provide mature cooperation. It is claimed that “physicians will support systems which demonstrably improve the quality of patient care which are not perceived as a threat to current physician tasks” (Alexander et al., 1983). Brown & Coney (1994) found that the respondents strongly agreed with the statement that “computers offer a remarkable opportunity to increase the quality of patient care”. Herbert (1998) claims that “people problems have proven to be much more challenging than the technology problems”, and that the difficulty in using the technology “arises from the organizational changes and issues created through more visible professional

accountability, changing roles and responsibilities, and the effects of increased efficiency and productivity on work" (Herbert, 1998). These findings together with findings in Paper I show that the cultural aspects can include both the health workers` motivation to help the patients and to increase the quality of the patient care without changing the routines. To be able to meet the cultural aspects of the different groups of health care workers in a changing process it will be important to examine the different culture and how the different groups relate to the change.

6.2.1.1 Key personnel

Specially trained people stationed at the units who have the skills and motivation needed was seen as a key factor for successful implementation of CT. Findings in Paper II suggested that there were several expectations regarding the role these key personnel should play. Key personnel should be a driving force to keep motivation high and be able to provide quick practical help. These different expectations towards key personnel place them in different roles in the implementation processes, such as clinical and administrative leaders, opinion leaders or support staff (Ash et al., 2003b; Shefter, 2006). The key personnel are important both in keeping the motivation high and in assisting the health care workers at the different units. The respondents in our study presented in Paper II expressed a need for specially trained people stationed at the unit who had both skills and motivation; this was seen as a key to successful implementation. Respondents had different expectations regarding the role these key personnel would play as reported Paper III. Some thought these key personnel should be a driving force to keep motivation high. Some also said they wanted a person to give them quick practical help. This means that a group of key personnel with different roles in the implementation process is needed, and their role in the clinical

setting needs to be clarified. It will be difficult for one person to meet all these demands, and there can be different demands and expectations in different units, so this must be clarified.

6.2.1.2 Ownership

Ownership can be defined as the role and identity the persons perceive them as having in the organization. Ownership can also be perceived as a sense of control over processes and data that the individual operates or is associated with (Hart & Whymark, 1999). If health care personnel do not develop a sense of ownership for the CT it might hamper a successful implementation (Hart & Whymark, 1999; Lorenzi & Riley, 2000e). Ownership concerns both a feeling of control and a feeling of active participation. The health care personnel's feeling of ownership is a management responsibility as well as the single person's responsibility to be an active participator at his/her workplace. The feeling of ownership can be an important determination for positive attitudes towards the implementation of CT or other changes, Paper I and II (McAlearney et al., 2004). The respondents in our study presented in both paper II and III stated that the project was initiated by and provided benefits only to research and that their view had not been taken in consideration from the start. This view is supported by Anderson who states that lack of ownership can make people less open and motivated for the change (Anderson, 2000). This is consistent with other findings stating that success is dependent on the extent the users´ active participation is addressed (Oliver & Demiris, 2004). Previous studies have found that introduction of such equipment requires substantial involvement from the users (Oliver & Demiris, 2004). Respondents in our study in Paper II and III reported a lack of feeling of participation in the decision making process. Participating in the decision making

process and understanding the utility and benefit of the tool were factors of vital importance in the implementation process (Paper I). If implementation of CT is successful and the implementation process is conducted in such a manner that the health care personnel are involved, the full benefit of the tool can be realized (Paper II). This can be difficult to achieve, because of the culture barriers and lack of mature cooperation reported in Paper IV. To give health care personnel both active participation and ownership in changing processes are dependent of everyone taking part in the process and perform mature cooperation. Ownership is an aspect not only for every single person, but also for the management at the hospital. The management must organize this and take responsibility also for the human factors in the implementation process. One way of doing this is using interdisciplinary teams (Paper IV).

6.2.1.3 Culture

The main benefit of an interdisciplinary team is that members with different background, skills and knowledge may see problems differently and thereby come up with better solutions than single-profession teams. A coordinated process may get the best out of each member, while the flow of ideas and challenging views in a co-working team adds a lot more organizational and individual learning (Sjøvold, 2007). Such learning processes are prerequisite for effectively meeting the new demands of hospital organization. The health sector and hospital organizations are facing increasing challenges of changes to become more cost and time efficient. Organizing in interdisciplinary teams is often suggested as means to meet these challenges, but establishing such teams is difficult in hospital organizations due to static social borders between groups of professionals (Paper IV). These differences can be caused

by different professional cultures, by organizational structures or established professional behavior (Skjorshammer, 2002). Our findings, in Paper IV, also suggest that nurses focus considerably more on caring behavior when describing the hospital culture while at the same time they seem to be exposed to more assertiveness and ruling than the physicians. This easily leads back to the suggested image of the hospital comprising various "worlds" where the world of "cure" is inhabited by physicians and the world of "care" by nurses (Glouberman and Mintzberg, 2001). While physicians strive for active problem-solving and isolated interventions, nurses strive for a more holistic understanding of the patient and his or her well-being (Glouberman and Mintzberg, 2001; Nortvedt, 2005). However, our findings presented in Paper IV are better explained by asymmetric power relationships than by differences in perceiving a shared reality. Both parties are well aware of these differences and as such they represent organizational artifacts rather than cultural differences.

The combination of finding explanations of our results within organizational artifacts rather than within culture, and that the statistical significance we have identified in Paper IV is weak, we would rather conclude that we find no severe differences between professional cultures in our study. The differences we found are more likely of more structural character. In other words, the findings in Paper IV are better explained by asymmetric power relationships than by differences in perceiving a shared reality. That is not to say that the differences identified are less important. Daily experiences with criticism and assertiveness may lead nurses to be less motivated to engage in interdisciplinary teamwork (Paper IV). In a well-functioning interdisciplinary team, members respect each other as equally important, share a

compatible perception of the organizational reality and do not encounter any structural or social boundaries for cooperation (Sjøvold, 2007). If the perception of the different "worlds" is a reality among the health-care professions, one would expect that members across professions perform coordinated task-solving and that mature interdisciplinary cooperation is fairly unlikely (Glouberman and Mintzberg, 2001). However, since cultural differences imply different mental models that are not open for discussion, it is a lot easier to renegotiate established routines and status hierarchies, although it may be difficult. Interdisciplinary teams are an important tool in developing an effective hospital organization. Findings in Paper IV indicating that different professional cultures are not necessarily a barrier to developing mature interdisciplinary teams, can be used as means to meet future challenges in hospital organizations.

Differences in motivation between two groups, hospital ward unit and outpatient clinic unit, are found in the statements from the respondents reported in Paper II. Motivation can be influenced by values and culture in an organization. If the majority of the health care personnel working at a unit have low motivation regarding implementation of new technology, all health care personnel working at the unit may adopt this attitude. Keeping the motivation high should therefore be addressed both on an individual as well as on an organizational level.

6.2.1.4 "High tech" can led to more time released for "high touch"

The respondents stated that since the severely ill patients often are more tired than other patients and have less energy, they need more time to answer questions than other patient groups (Paper II). The respondents perceived this as an ethical issue, and

did not feel comfortable using the limited time these patients have to fill in the forms (Paper III). Because the palliative patient group has a limited survival time, time itself is a valuable resource (Kaasa & Loge, 2003). Several respondents in our study, presented in Paper II, stated that the condition of the patient is important in their perception of CT as useful or not, which is in accordance with other findings (Oliver & Demiris, 2004). Thus, both the health condition of the patients and the tasks of the health care personnel can affect their attitudes toward the implementation process of CT, as findings in Paper I and II suggests, which also is in accordance with other findings (McAlearney et al., 2004; Horsley & Forster, 2005). However, other studies show that other factors as ethical dilemmas, knowledge, autonomy and the balance between hope of cure and the acceptance of death in palliative care can affect this situation (Sandelowski, 1999; Bunch, 2002; Clark, 2002; Barnard, 2002). Both "high touch" and "high tech" will be important factors in meeting the needs of dying patients. The health care personnel must use both "high touch" and "high tech" in meeting the patient's needs and one can ask if this distinction between "high touch" and "high tech" is of a more philosophic or semiotic character (Sandelowski, 1999; Clark, 2002; Barnard, 2002). This needs further investigation.

The readiness to adopt CT in palliative care must be addressed because of this possible conflict between the "high-tech" and "high-touch" in these units. The implementation process can otherwise be hampered (Paper II). Further research in this field should focus on gaining more knowledge about the main factors, such as motivation, "high-tech" and "high-touch", routine and utility in the implementation process in palliative care units. CT can influence communication between the patient and the health care personnel. Our finding in Paper II showed that "high-tech" was

looked upon as an obstacle to “high-touch”. The respondents in Paper II stated that using CT could make communication too artificial and systemized.

If implementation of CT is successful and the implementation process is conducted in such a manner that the health care personnel are involved, the full benefit of the tool can be realized. This effective implementation and use of “high-tech” can lead to more time released for “high-touch” and possible improved QoL for the patients (Paper II).

6.2.1.5 Introduction program

Implementations of CT that may disturb workflow, relationship or traditional patterns must be carried out with the goal of giving people an ownership to new technology. To obtain this goal it is important to use a systematic approach to give people information, training and supervision (Olsson et al., 2007).

There is a gap between expectations and outcome when CT is introduced (Paper I). Training and an information program could have been one factor to help shrink this gap. In our study presented in Paper II and III we found lack of motivation, or decreasing motivation was reported by several of the respondents. There was also a connection between a lack of motivation and an unfavorable attitude towards the tool, as well as a low score on the self-reported experience in computer use (Paper III). This can indicate that training both in computer use in general and in using this particular tool could be a factor in boosting motivation to use the tool, as presented in Paper II.

When new technologies are introduced into health care, all sorts of reactions such as negative attitude and barriers can occur among the staff. To overcome these problems and barriers is it necessary to develop an adequate training program if the implementation shall be successful. Based on the findings in Paper I, II and III development for an introduction program seems necessary. This program will make it easier to influence on the behavior and intentions of health care personnel, and to focus on the positive benefits of changes as a motivational factor (Paper I). The aim of such an introduction program is to motivate the health care personnel to use the CT. The program should, according to our findings be focused on utility, teaching and preparing the health care personnel for the new method. Important issues for the introduction program are also use of key personnel, focus on ownership and establishment of interdisciplinary teams, as shown in Paper II, III and IV.

6.2.2 Internal elements of changing

The internal elements of changing concern elements that make an influence on an individual level.

The model of planned behavior, presented earlier, highlights the connection between the underlying intentions, behavior control and role (Ajzen & Fishbein, 1975; Stroebe, 2000). The safe feeling and comfort in one's earlier behavior connected to one's role makes it difficult to change behavior. Even if one's intention as health care personnel is to change behavior in favor of using CT failing to do so is common. Understanding which factors that determine whether people succeed or fail in achieving desired

outcomes is a fundamental concern and has lead to the development of the concept implementation intentions (Gollwitzer & Sheeran, 2006). This concept includes a plan for how the person will investigate responses that promote goal intention. Findings in the studies presented in Paper II and III indicates that there was a lack of motivation concerning using the CT, both of personal reasons and reasons related to values. The personal reasons were associated with lack of knowledge and experience with computers, Paper III, that can be related to the concept self-perception of past behavior (Bem, 1972). If they have experienced lack of success using computers earlier, in their private life or professionally, this may affect their present goal intentions. People who pursue their goals using means that have natural fit have a better chance of goal attainment. If the implemented CT does not fit the goal or values of the people working at the unit the implementation process can be less satisfactory (Paper I). This can lead to a conflict between their values and the values they perceive is underlying the CT implementation. This conflict can lead to a barrier against the implementation (Paper II and III). One way to avoid this conflict will be by assessing the most central values among the health care workers at the unit. In the implementation process it will be important to give credit to these values as well as if necessary try to adjust to them (Paper I). A training program can also give the users more confidence in using the tool and can promote the goal intention on an individual level.

In the model of planned behavior the assumption is that attitudes and beliefs are the most important determinant of behavior (Ajzen, 1991). The findings from the studies in this thesis, Paper I, II, and III are not consistent in connection to negative attitudes. Some studies in Paper I identified negative attitudes and some found both positive and

negative attitudes. When the results are analyzed together, problems with negative attitudes toward the use of computers can be considered as a problem. Even if general attitudes toward computerized care planning were favorable, many subjects harbored feelings of resistance, as supported by others (Getty et al., 1999). To be able to influence this attitude, the underlying intention should be addressed (Ajzen, 1991). Positive experience with computers and increasing knowledge about the use and benefit of the computer can change the attitudes of the users. Important for negative resistance is the fear that the introduction of CT may be perceived as a threat to the quality of patient care (Paper I and II). The main aim of health care in general is to help patients achieve best QoL possible, particularly important in a palliative setting (Kaasa & Loge, 2003; Harding & Higginson, 2003). Seeing an improved QoL among the patients after the implementation of CT can influence or change the underlying intention of the health care personnel and then lead to a more positive attitude towards CT.

People are more likely to resist changes that they feel are imposed on them (Brehm, 1989; Lorenzi & Riley, 2000f). Resistance to the implementation will most likely occur if people feel uncomfortable or in lack of control over the situation. Active participation in the implementation process can be important to achieve a successful implementation (Paper II), both in identifying goals of the implementation and practical and technical considerations. Lack of control is connected to the concept of self-efficacy (Bandura, 1977). Giving people more control in a situation can increase their feeling of self-efficacy, which is important to avoid resistance towards a change. An increased feeling of control may lead to more positive attitudes and greater motivation in obtaining necessary knowledge about the utility of and the use of CT

(Paper III). Ownership can be seen as the role and identity of a person (Hart & Whymark, 1999). Since ownership is given such a substantial part in both the person's role and identity, it is a crucial issue to consider in the implementation process of CT (Paper I, II and III). Challenges concerning role adjustment can be related to the occupational stress factor. Using a computer can, directly or indirectly, increase the stress level in employees. The indirect effects are primarily mediated by the specific job category, such as routines and patterns. It has been argued that negative attitudes is an indirect effect of implementation of CT and can also be viewed as a fear of change in established work roles (Smith et al., 1999). This fear can be a genuine fear of losing control or a fear of loosing power (Newton, 1995). These aspects are challenging in a changing process, since changes often concern changes in established work roles or patterns and can challenge the power or hierarchy in the heath care organization (Paper I and II). Introduction of CT can led to a shift of power from those with professional knowledge to those with technological skills (Newton, 1995). A genuine feeling of ownership might play an important part in avoiding these challenges in work roles and resistance against the implementation. This can be obtained by using a training program that includes the health care workers in the decisions concerning the implementation process (Paper I).

It is important to explore the ways in which the implementation may be most successfully accomplished in palliative care units. The readiness to adopt information technology in palliative care must be assessed because the possible conflict between "high-tech" and "high-touch" can be more visible in these units (Paper II) than in others and therefore make the implementation process special difficult (Kole, 2003; Bartholomew & Curtis, 2004). The focus on being close to the patients and to meet

their needs and wishes can easily be seen as opposed to an efficient and accurate symptom registration (Paper II).However, information technology can be an opportunity to improve the “high touch”. Improving efficiency and reducing the time required for paperwork may translate into more time spent on “high touch” (Gloth, III et al., 2005). Using CT to register symptoms can give the patients improved symptom control or relief and the personnel can spend more time on “high touch”. Such a benefit can not be achieved until the CT has been used over a period of time. Learning to use the tool and utilize it can be time consuming the first period, and thereby be a genuine threat to the “high touch” (Paper I and II). If implementation of CT is successful and the implementation process is conducted in such a manner that the health care personnel are involved, the full benefit of the tool can be realized. Effective implementation of CT and as such use of “high-tech” can lead to more time released for “high-touch” and a potential higher QoL for the patients(Paper II and III).

Health care providers protect themselves against ongoing changes because of lack of self confidence as well as negative attitude are potential reasons why resistance towards CT occur (Paper I). Attitude’s may influence the intention to change the behavior (Stroebe, 2000). If the attitudes can be influenced in a positive direction, also the intentions to change behavior can be influenced in a positive manner, and consequently the implementation can be successful. Culture as an internal element that makes an influence on an individual level concerns values and attitudes the health care personnel have adopted from their work place or have as a basis from the knowledge and skills that distinguish their profession (Paper IV). An individual’s change of behavior in areas that concern values and attitudes is difficult to achieve,

but not impossible. Measuring culture and values may give a guideline towards how to influence on this change (Paper IV).

6.2.3 External elements of changing

The external elements of changing concern elements that make an influence on a group or organizational level, both environmental and systemic in the health organization.

When culture is seen as an external element of change important issues are values, the organization and how the health care personnel perceive the situation around them. This perception is connected to the environmental and systemic issues in the health organization (Paper IV). Among health care personnel environment and culture may influence on their barriers and behavior change. The use of key personnel as well as an introduction program is necessary to obtain the desired changes in the culture and to assist the health care personnel to change behavior. The use of an introduction program may motivate health care personnel; give them a feeling of ownership and increased control over the situation (Paper I, II and III).

In Paper IV we found no significant difference in behavioral culture between two professions in Norwegian hospital. One can assume that interdisciplinary teams should easily be developed to reach a higher level of maturity and as such be used to meet the challenges hospital organizations are facing. The different “worlds” of the health care professions could have lead to deep underlying cultural differences between the different professions. According to our findings in Paper IV this seems

not to be the case. It is more likely to believe that differences between the professions are of a structural character, like status hierarchy or established routines (Paper IV). An implementation process can lead to a shift of power from those with professional knowledge to those with technological skills (Newton, 1995), and that shift can lead to a change in established routines (Paper I). Even though renegotiating established routines and status hierarchies can be a tough barging, structural barriers are open for discussion. Interdisciplinary teams can be a resource in the changing and implementation process and can help health care personnel to adjust their behavior to the benefit of both a more efficient health organization and an improved QoL for the patients.

7.0 Conclusion

The results from the presented papers can be added up into the following conclusions.

- The main challenges in an implementation process according to the findings in paper I were identified as:

  -The challenges with implementation of computer technology in health care units derived from the need to influence the behavior and intentions of health care personnel, as well as the need to provide employee motivation by focusing on the benefits of computerized tools.

  -To achieve successful implementation it is vital to identify the barriers such as negative attitudes, resistance and lack of knowledge.

  -There is a need for development and introduction of training programs before computerized tools is introduced in health care units. Such programs should focuses on attitudes toward this kind of tool and how to use and understand the benefit of it.

- The experiences of implementation by the health care personnel in a palliative unit according to the findings in paper II were identified as:

  -The health condition of the patient is important in the health care personnel's perception of computer technology as useful or not.

  -The possible conflict between the "high-tech" and "high-touch" is very obvious in palliative care and can hamper the implementation.

The use of “high-tech” in palliative care can lead to more time released for “high-touch” and thereby increased quality if life of the patients.

-Making the computer technology a part of the daily routine is important to achieve successful implementation.

- To realize the full benefit of the tool, the implementation of computer technology must be successful and conducted in such a manner that the health care personnel are involved.

- The factors that can promote implementation of computer technology in palliative care according to the findings in paper III were identified as:

  -There is a need for introduction of key personnel for successful implementation of computer technology.

  -Implementation planning connected to management, organization and training, particularly in a palliative care setting are important and must be focused on keeping the motivation high.

  - “Ownership” of the computer technology concerns both a feeling of control and participation. Participating in the decision making process and understanding the utility and benefit of the tool is of vital importance for successful implementation.

- Investigation of the nature of differen ces between professions in hospitals and whether this differences are caused by distinctly different professional cultures were according to the findings in paper IV identified as:

-The cultural differences between dif ferent health professionals seem not to be a ba rrier to in terdisciplinary team work. Dif ferences in culture among the health care personnel seem not to be the reason why differences or conflicts occur and are therefore no barrier to change.

-Interdisciplinary teams can be a re source in the changing and implementation process and can help health care personnel adjust their behavior to the benefit of a more effective health organization.

8.0 Future research

The findings from the studies in this thesis are promising and call for future research in both health care organizations and palliative medicine units. A total picture of the challenges of changing and implementations in health care can not be given by this thesis. Even if this thesis is based on cooperation among several different instances and disciplines, the task of giving a total overview over the conditions for change in the health care organizations demands an even more extended cooperation among researchers. To avoid barriers against ongoing changes and implementations in health care personnel it will be necessary with more knowledge drawn from both descriptive research and interventions studies. Since evidence exists that interdisciplinary teams are not hindered by cultural differences it may be more constructive to investigate structural barriers that may prevent the mature development of these teams. The barriers found in the palliative medicine units concerning implementation of computerized tools were of an individual as well as structural nature. Future research can reveal if such barriers are found in other palliative medicine units and the extent of these barriers on a more general basis. Research on overcoming the barriers is also important and can be linked to the findings presented in this thesis, for instance how key personnel can be helpful and how to achieve ownership. Research testing introduction programs must give attention both to the external and internal aspects of the changing process.

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Paper I

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Implementation of computerized technology in a palliative care unit

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ABSTRACT

Objective: Symptom assessment is important in palliative care. Computerized technology (CT) is now available for use in such assessments. Barriers against implementation of CT in health care in general are well known, but less is known about how such technology is perceived by palliative health care personnel. The aim of the present study was to investigate the experience with implementation of CT among personnel in symptom assessment at a palliative care unit.

Method: Seventeen respondents from a hospital ward unit and an outpatient clinic unit participated in an in-depth interview. A qualitative approach was used in collecting and analyzing the data.

Results: Respondents at the hospital ward unit were better motivated than respondents at an outpatient clinic unit. It was stated that the health condition of the patient is important in their perception of the tool as useful or not. Conflicts between "high tech" and "high touch" were reported in both units.

Significance of results: When the implementation process is conducted in such a manner that the health care personnel are involved, benefits of the tool can be realized. Thus, effective implementation and use of high tech can lead to more time released for high touch.

KEYWORDS: Palliative care, Implementation, Computerized technology, High-tech, High-touch

INTRODUCTION

Demands for changes in all kinds of health care units can be met by resistance and feelings of loss of control (Lorenzi & Riley, 2000). Several reactions may occur when an individual is introduced to changes where the utilities of the changes are not well understood or where it is difficult to determine how to integrate the changes into an established daily routine (André et al., 2008). Furthermore, computer implementation can lead, both directly and indirectly, to occupational stress. However, understanding a work group's culture may facilitate the change process (Coeling & Wilcox, 1990). The potential benefit of using computer technology (CT) in health care units is improved efficiency, both in reducing the amount of time needed to do a task and in providing more timely documentation (Hendrickson & Kovner, 1990). To overcome resistance and barriers to change and to exploit the benefits of change, it is important to examine the factors that lead to resistance (Lorenzi et al., 2001). Awareness of the benefits may be an important factor in overcoming some of the barriers when introducing computerization in health care.

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We chose to explore a previous implementation of CT to increase our knowledge about the implementation process from the users' view.

The care of dying patients should be based on respect for the patient as well as close attention to her or his distress. Furthermore, this work should focus on care for the patient as a human being, a total care, and not solely treating the patient's disease (Saunders, 1965). When palliative medicine was established as a specialty, the goal was to attain as high a quality of life (QOL) as possible both for patients and their families (Stromgren et al., 2001; van Kleffens et al., 2004). In reaching the goal of increased QOL in palliative care, there is a need for improved assessment and control of symptoms and distress (Kaasa & Loge, 2003). One way to achieve improved symptom assessment is by using CT to register and track symptoms. This can be done by regular assessment with handheld computers. The goal is to minimize the patient's burden while at the same time registering patient data that are available through the institution's data network. CT allows the assessment of the symptoms to be performed faster and more reliably, and it is simpler than with a standard paper format. Palliative care is particularly time-sensitive because of the patients' short life expectancy (Kaasa & Loge, 2003). The introduction of CT both in health care units and in palliative care units is, however, a challenging task, even if it is relevant given the increasingly common role that computers are playing in health care. It is important to explore the ways in which it may be most successfully accomplished, because in palliative care units the possible conflicts between "high tech" and "high touch" are more visible. The focus on being close to the patients and to meet their needs and wishes can easily be seen as opposed to more technical, efficient, and specific symptom registration (Kole, 2003; Bartholomew & Curtis, 2004; Rabinowitz, 2005).

One study has concluded that the introduction of CT facilitates quality improvement, reduce errors, and may improve patient care (Gloth et al., 2005) whereas other studies have recorded an increase in errors after implementation of CT (Anderson, 2000; Han et al., 2005; Koppel et al., 2005). A study concerning introduction of telemedicine concludes that hospice agencies follow a low-tech approach, that readiness for an innovation will reduce risk for failure, and that success in implementation depends on the extent to which it addresses the users' needs and expectations (Oliver & Demiris, 2004). The experience with handhold computers was investigated and this showed that they helped the users to increase productivity and improve patient care. Barriers were identified to be concerns about the device itself and personal and perceptual constraints, such as comfort with technology, preference for paper, and that the devices are not easy to use (McAlearney et al., 2004). Trying to examine the attitudes and the usefulness of a hospital information system among different groups working in health care concluded that replacing the paper-based medical records benefits the medical secretaries most and lesser the nurses and physicians. This emphasizes, in their opinion, the need for a multidisciplinary approach when evaluating the experience with these kinds of tools (Laerum et al., 2004).

In the course of our investigation presented in this article, we wanted to explore the responses related to palliative care and its goals. Against this background we examined the following research question: How do health care personnel experience the implementation of CT for symptom registration in palliative care?

METHODS

The Earlier Implementation

Computerized symptom registration was introduced by the use of a handheld computer in addition to a special database (PMU-base) at the Palliative Medicine Unit (PMU), the Department of Oncology, Trondheim University Hospital in Norway in 2001. The symptom registration system supports a method based on the Edmonton Symptom Assessment (ESA) Scale. It measures 10 symptoms in the PMU-base; a Palm T-PAT (PalmT is the term of the handhold computer and PAT stands for Palliative Assessment Tool) was used to register symptoms (Lærum et al., 2002). One goal was to improve the symptom registration and to give the patients better and more accurate symptom treatment aimed at the specific symptoms. It was also possible for health care personnel, together with the patients, to record the 10 symptoms on paper instead of using the handheld computer and punching the data into the PMU-base afterwards. This implementation was only partly a success. The handhold computer is currently not in use. On the other hand, the PMU-base is used by some.

Background for This Study

It was of interest to explore both the experience with the handheld computer and the use of the paper registration of the 10 symptoms when we conducted our study 3 years later. A qualitative approach that both could explain and lead to an understanding of this theme was used. This phenomenological approach is based on both the hermeneutics and the more existentialistic oriented

hermeneutic (Gadamer, 1983). The philosophical tradition of this phenomenological approach is "empathy or indwelling with the subject of one's inquiries" and "understanding of group actions and interactions" (Miles & Huberman, 1994, p. 8). The connection between the different phenomena is also important in this study; "in the investigation of essences one shifts from describing separate phenomena to searching for their common essence" (Kvale, 1996, p. 53).

Subjects

A total of 17 health care personnel at the PMU participated in an in-depth interview for the purposes of this study. The sample consisted of 13 nurses, 2 physicians, and 2 physiotherapists.

The inclusion criteria were that the health care personnel had to be a part of the implementation process when the PMU-base and the Palm T-PAT were introduced in 2001 and that they had experience with using the PMU-base with paper registration and/or the Palm T-PAT. The samples in a qualitative study are usually small and tend to be purposive rather than random. The sample was purposively collected to find the respondents with knowledge about the phenomenon under investigation (Miles & Huberman, 1994). The ward consisted of a hospital ward unit (HWU) and an outpatient clinic unit (OCU). In total, 13 of the respondents were from the HWU and 4 from the OCU. All the respondents were women.

Qualitative Research Interview

The qualitative research interview is an interpersonal situation, a conversation between two partners about a theme of mutual interest. It is a specific form of human interaction in which knowledge evolves through a dialogue. The interaction is neither as anonymous nor neutral as when a subject responds to a survey questionnaire, nor as personal and emotional as a therapeutic interview (Miles & Huberman, 1994; Kvale, 1996). There are some criteria that can establish the quality of the interview. The extent of spontaneous, rich, specific, and relevant answers can be a sign of quality as well as the degree to which the interviewer follows up and clarifies the meaning of relevant aspects. The interviewer attempts to verify the interpretation of the respondents' answers in the course of the interview (Riessman, 1993; Kvale, 1996).

The interviews were held over a 2-month period and lasted from 30 to 50 min each. Two interviewers participated in each interview. The respondents were told that their experiences and perceptions were important. In addition, they were assured that their information would be treated anonymously and would have no effect on their personal situation in the unit. The latter point was also important with regard to the respondents' sense of safety in commenting on the negative aspects of the implementation process. The interviews were taped and transcribed by the interviewers.

With regard to data saturation, it had been possible to reduce the number of respondents. However, because a total overview of the experiences was important, we decided to include all the respondents that fulfilled the inclusion criteria (Miles & Huberman, 1994).

Interview Guide

The present interview is based on a guide that was created by the Centre for Quality Management Concept Engineering "CQM Quality Improvement Toolkit" (Center for Quality Management, 1997). The interview guide was arranged in thematically relevant areas as regards the research themes. The interview guide was used as a guideline, and the respondents were requested to speak freely about the themes they were introduced to. In some of the interviews where the respondents did not talk about all the subjects the interviewer guided them back to the theme in question. The interviewer also asked questions to ensure that the content of the statements was understood. If there was any uncertainty, the question was repeated. The four themes, each consisting of a variety of questions, are needs, demands, and expectations; motivation; benefits and obstacles; and critical factors for success.

Analyzing the Data

After each interview, the two interviewers discussed their own participation and formulations in order to be sure that the respondents' actual intent regarding the reported information was understood. One method to check the creditability of the material and the interviews is to use two persons to read the transcription (Kvale, 1996). Each of the transcribed interviews was gone through at least three times by both researchers.

Transcription of the interviews was conducted with a great deal of attention to preserving the meaning of the text (Riessman, 1993; Kvale, 1996). The material was sorted and worked through, and the information from each of the respondents in the sample and each of the themes was discussed. At least two views of each statement were made to focus on the dependability of the material (Kvale, 1996). Thereafter, the material was condensed. Five approaches were used for this purpose: categorization of meaning, condensation of meaning, structuring of meaning through narratives, interpretation of meaning, and

ad hoc methods for generating meaning (Kvale, 1996). The categories were made after emerging from the data (Kvale, 1996). Each statement from the respondents was categorized. The meaning of the statements was highlighted and condensed into groups, still with their original words intact. After the material was condensed, we quoted narratives in each theme. In this process the interpretation of meaning took place in such a way that the interpretative meaning was discussed and seen in connection with the total statement before the final selection was made.

Ethical Issues

Each of the respondents received information about the study and the importance of their participation. Participation was voluntary, and the respondents could at any time withdraw from participation in the study. All registration of the respondents' information was anonymous, and the low numbers of respondents made it necessary to give extra attention to avoiding identification of a single respondent in the presentation of the results. The management at the unit sanctioned the study. The researchers were independent of the unit and of those responsible for the implementation of the CT.

RESULTS

The result are organized in categories that emerged from the data. These are motivation, severely ill patients, high tech and high touch, routine, utility, and critical factors for success.

Motivation

Differences between the HWU and the OCU were reported. At the OCU, respondents reported that they were more motivated at the beginning of the implementation than at the time of the interview. The change in motivation was due to technical problems, lack of results, and nonworking computers, as one respondent explained:

> My motivation is decreasing, and I ask myself: What is the point? I am spending time on the database, but it is not used by everyone and it is not complete.

The respondents at the HWU reported generally lower motivation than respondents at the OCU. Some of them stated that they were motivated but did not have the time to use the database or that they were not certain about how to use CT. The lack of motivation could also be due to negative attitudes that were contagious. This was expressed in different ways among the respondents, as for instance like this:

> I suppose that I am as motivated today as I was when I started, but I have become a part of the working environment at the unit.

Some respondents stated that it would be most challenging to make the patients use the CT whereas others believed that the biggest obstacle was to persuade health care personnel about the benefits in using it. The barriers and resistance to change were expressed this way:

> The resistance is a bit contagious; if you are in a group, it is more acceptable to be negative. It is the attitude that needs to be worked on.

All the respondents reported that their motivation was better than their colleagues. In the systematic comparison we found that there was a distinct difference between the respondents' perception of their own motivation and their understanding of the whole unit's motivation. As stated:

> My motivation is good; I cannot answer for my colleagues.
>
> My colleagues' motivation is not good, I use it, and at least I used it in the beginning.

Severely Ill Patients

To enable the patients to use the symptom registration form is more than just a matter of spending time with them; it is also a question of convincing them that the exercise is useful and necessary. Whether or not to use the symptom registration form with the most severely ill patients was also perceived as an ethical issue. Convincing severely ill patients to participate is made more difficult by both the medical status of the patients and by the fact that not everyone is using the system, which means it does not operate at its full potential, as expressed below:

> I feel that I have to motivate the patient to fill in the form, and that I need good arguments. . . . I feel that I'm lying, because the tool is not used by everyone and then you cannot systematize the data.

The symptom registration form, on paper or with the handhold computer, is supposed to be filled in twice a day. This was perceived as an extra burden on the patient, even if the patient did not fill in the form by themselves, but answered questions orally. These

concerns were mostly connected to a special patient group in palliative care:

> The severely ill patients need time to think. It is not satisfactory to just rush in and ask them to check the symptom registration form. We have to sit down and explain to them several times a day.

The medical condition of the patients in PMU was also used as an explanation of the barriers to using the tool. Both the condition of the patients and the high average age of the patients were reported as important factors. The barriers among the patient groups were reported to be difficulties in expressing emotion with numbers, no desire to use the tool, lack of control over CT, and not able to use CT. For instance, one of the respondents explained it in this way:

> Many patients refuse at once when we come into the room with the symptom registration paper. They are tired and they don't have the energy to relate to it.

High Tech and High Touch

Some of the respondents said that they did not use the symptom registration form of the handhold computer because it did not correspond to their professional way of thinking. These respondents said that the system was based on a purely scientific approach and stated that

> this creates an artificial way of communication.
>
> I like to be able to relate to the patient without this tool—it suits me best to sit down with the patient and talk about things, and not to systematize the conversation.

It was also stated that information technology itself could be an obstacle for communication and interaction with patients:

> I want to focus on helping the patient on the short term, and I push all other things aside.

Routine

Health care personnel at the HWU had less experience with the PMU-base because it had not become a part of the routine and they did not have the time to use it. Common statements were

> It doesn't fit into a busy day.
>
> This system does not fit into our daily workload; it is more suitable for research.

Respondent said that they did not have time to use the PMU-base. Although lack of time was commonly stated as a reason not to use the tool, some of the respondents said that time and opportunity were not sufficiently acceptable reasons for avoiding using the system. This was expressed in different ways, such as,

> It is like everything else, you have to take the time.
>
> A lot of other units are busier than we are.

Utility

Respondents reported that the PMU-base was a useful tool and that the purpose of the database was good. However, some respondents said that the system demanded double the amount of work or simply extra work and that they were uncomfortable in using the database because they did not remember how to use it. As stated,

> It does not work today; it means more and double work and change in routine.
>
> If you use the tool seldom, you forget how to use it.

Whether or not this tool represented an improvement was also commented on:

> The goal has to be that this can be a useful tool.

When the respondents explained why they did not use the tool, several mentioned the utility of the tool and that the results were not useful for them. They did not agree or did not have relevant information about the reasons for the introduction of the tool, saying,

> I feel that this has been decided above our heads.

This together with technical problems makes the tool even more inaccessible:

> You get irritated when you sit down and are going to work on the computer, but it doesn't work.

Critical Factors for Success

Some respondents mentioned that the cost of the project should be closely compared to the expected benefit, saying,

> Productivity is a crucial factor, and everything must be measured towards that, including the usefulness of this project.

Also usefulness was commented on:

> The tool must be more useful in a clinical setting, more useful in a busy day.

Also, participating was stated as important:

> Every one must participate in the decision process from the start; at least we must understand why we shall use this.

And about motivation:

> I can very easy lose motivation.

About high tech and high touch the respondents said:

> That patients are able to express their need and what they perceive as their reality is the most important aspect, not systematizing.

DISCUSSION

An implementation process is characterized by both general and context-specific elements. Our main focus was to investigate factors that are specific to palliative care. Even though all the respondents came from a palliative care unit, they also expressed statements of a more general character that one could expect as responses in health care units in general.

In any changing process one must question if the change will improve the conditions, in this case for the health care personnel and for the patients. Introduction of CT can lead to both unexpected and to negative consequences (Anderson, 2000; Han et al., 2005; Koppel et al., 2005). This study was limited by the fact that it consisted only of 17 participants from one single PMU, with few respondents in each profession. The transferability is, however, not only dependent on sample size, but also of representation (Miles & Huberman, 1994). Although it is difficult to know if the sample is representative for health care personnel on these units in general, the main groups working at these kinds of units were represented. In the following the main findings from the research question will be summed up.

How Do Health Care Personnel Experience the Implementation of CT for Symptom Registration in Palliative Care?

Several respondents described the process of making a change as difficult and not very satisfying. When changes are introduced, it is natural to feel resistance to the change (McAlearney et al., 2004; André et al., 2006). The respondents stated that the project was initiated by and provided benefits only to research. Respondents stated that their view had not been taken in consideration from the start, and that can make people less open and motivated for the change (Anderson, 2000). This is consistent with other findings stating that success is dependent on the extent the users' active participation is addressed (Oliver & Demiris, 2004). Previous studies have found that introduction of such equipment requires substantial involvement from the users (Oliver & Demiris, 2004). Respondents in this study reported a lack of feeling of participation in the decision-making process.

Respondents in the present study also stated that the new tool did not fit into their routine and resulted in extra work. Furthermore, resistance was perceived as contagious, and several respondents stated that they had been more motivated at the start of the project, but had subsequently become less and less motivated. Decreased motivation and changed attitudes are typical problems of implementations and changing processes. However, both motivation and attitude can be influenced by training (Harrington & Walker, 2002). Also, awareness of the benefits can be a motivational factor in an implementation process and may thus influence attitudes (Laerum et al., 2004; Oliver & Demiris, 2004).

The respondents at the HWU reported they were less motivated and did not see the benefits of the tool, whereas the health care personnel at the OCU reported they were more motivated and that they used the PMU-base, except the handheld computer, on a daily basis. Both the work conditions for the personnel and the health conditions of the patients are different in the two units. At the OCU, the patients live at home and their health condition is better. The health care personnel meet more independent patients, and their own work tasks are more independent as well (Smith et al., 1999). Thus, both the health condition of the patients and the tasks of the health care personnel can affect their attitudes toward the implementation process (McAlearney et al., 2004; Horsley & Forster, 2005).

Technical problems were also reported as barriers to the use of CT. These problems can be both personal and organizational errors. The present study did not investigate these factors further, but applicability is relevant in the implementation process (Horsley & Forster, 2005).

CT can influence communication between the patient and the health care personnel. The high tech was looked upon as an obstacle to high touch. The respondents stated that using CT could make communication too artificial and systemized. If the CT does not become a part of the daily routine, this observation can become a self-fulfilling prophecy.

The respondents stated that because the severely ill patients often are more tired than other patients and have less energy, they need more time to answer

questions than other patient groups. The respondents perceived this as an ethical issue and did not feel comfortable using the limited time these patients have to fill in the forms. Because this patient group has a limited survival time, time itself is a valuable resource (Kaasa & Loge, 2003). Several respondents stated that the condition of the patient is important in their perception of CT as useful or not, which is in accordance with other findings (Oliver & Demiris, 2004).

Conclusion

This study was designed to provide insight into the implementation process of CT in a PMU. Participating in the decision-making process and understanding the utility and benefit of the tool were said by all the respondents to be factors of vital importance in the implementation process. The readiness to adopt information technology in palliative care must be assessed because the conflict between high tech and high touch is very visible in these units. The implementation process can otherwise be hampered. If implementation of CT is successful and the implementation process is conducted in such a manner that the health care personnel are involved, the full benefit of the tool can be realized. This effective implementation and use of high tech can lead to more time released for high touch and possibly more QOL for the patients. Further research in this field should focus on gaining more knowledge about the main factors, such as motivation, high tech and high touch, routine, and utility in the implementation process in palliative care units.

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Paper III

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Paper IV

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Appendix

REGISTRERING AV SYMPTOMER I PALLIASJON

Ved bygging av nytt sykehus vil det også bli innføring av en del nye systemer både administrativt og faglig. Blant annet vil computere bli brukt i større grad.

I den forbindelse jobber vi med et prosjekt som tar sikte på å registrere subjektive symptomer hos døende pasienter ved hjelp av en håndholdt computer. I forbindelse med innføring av ny teknologi i helsevesenet står man overfor mange utfordringer. En av dem er å få personalet til å endre arbeidsrutiner og holdninger til å ta i bruk ny teknologi. Som et ledd i min doktorgrad vil jeg utvikle et introduksjons- og opplæringsprogram for innføring av denne nye måten å registrere symptomer på. Dette vil bli gjort for å sikre at det blir tatt hensyn til både anvendelse og brukervennlighet.

Ved Seksjon lindrende behandling ble det bl.a. det innført et system for symptomregistrering på papir og ved bruk av en håndholdt computer. Den håndholdte computeren ble ikke tatt i bruk av forskjellige årsaker. For å kunne høste mer erfaringer fra dette til bruk i innføringen av nye metoder for å registrere symptomer, ønsker vi å gjennomføre en spørreundersøkelse blant det personalet som har vært med på innføringen av hele SLB- basen.

Personalet deltar på frivillig basis og vil bli anonymisert. Resultatene vil utelukkende bli brukt i forskningsøyemed. Personalet vil bli intervjuet i sin ordinære arbeidstid og intervjuet vil vare i 30-45 min. Intervjuet vil bli foretatt av en stipendiat ved DMF, NTNU og en medhjelper som er mastergradsstudent ved IØT, NTNU.

Vennlig hilsen

Stein Kaasa
professor

Beate André
stipendiat

Intervjuguide

Prosjektets bakgrunn
Prosjektet skal blant annet kartlegge hvordan innføringen av SLB-basen foreløp. Formål, erfaringer, behov, forventninger, gevinster, barrierer, konsekvenser, motivasjon, medvirkning, kommunikasjon, opplæring og informasjon er blant aspektene som ønskes belyst.

Intervjuets formål

Forutsetninger
Fagperson / ressursperson skal:

- Har vært med på innføring av SLB-basen
- Inneha god kjennskap til bruk av SLB-basen

Status	
Navn	
Arbeidssted	
Stilling	
Spørsmål	
Formål	Hva oppfattet du som formålet med å innføre SLB-basen ? Svar:
Behov/krav/ forventninger	Hvordan vil du beskrive dine behov for dette nye systemet? 1. Hva er bra med SLB-basen slik den fungerer i dag? 2. Hva er galt med SLB-basen slik den fungerer i dag? 3. Hva må være bedre i et evt. Nytt system? 4. Har du sett/ erfaring fra andre og bedre systemer innen ditt fagfelt Svar: Hvordan syntes du SLB-basen passer inn i : 1. Rutinene på avdelingen? 2. Din yrkesmessige fagutovelse? 3. Andres yrkesmessige fagutøvelse?
Gevinster/barrierer	Gitt at dine krav til et nytt system blir oppfylt, hvilke gevinster kan oppnås i fremtiden? Svar: Hva er hindrene for at det du har beskrevet skal oppnås? Svar:

Motivasjon	Hvordan vil du karakterisere avdelingens (dine kollegaers) motivasjon for å benytte SLB-basen? Hva tror du eventuelt var årsaken til det? Svar: Hvordan vil du karakterisere din egen motivasjon for å benytte SLB-basen? Hva tror du eventuelt var årsaken til det? Svar:
Opplæring	Hvilken opplæring fikk du i forhold til SLB-basen? 1. Form (kurs, manualer, opplæringsprogram) 2. Relevans (hvor spesifikk har opplæringen vært for egen arbeidssituasjon) 3. Tidsaspektet (tidspunkt for opplæring i forhold til implementering) 4. Omfang 5. Kvalitet Svar: Hvilke konsekvenser har opplæringen medført? Svar: Hvordan hadde du ønsket at opplæringen var organisert? Svar: Hvilke forventninger har du til opplæring av fremtidas systemer? 1. Form (kurs, manualer, opplæringsprogram) 2. Relevans (hvor spesifikk har opplæringen vært for egen arbeidssituasjon) 3. Tidsaspektet (tidspunkt for opplæring i forhold til implementering) 4. Omfang 5. Kvalitet Svar: Gitt installering av nytt system med håndholdte computere hvordan kan du tenke deg at opplæringen skulle være? 1. Hvor mange brukere må læres opp? 2. Hvor mange dager i snitt må den enkelte sette av? 3. Hvordan kan dette gjøres i forhold til arbeidssituasjonen? 4. Hvor mange arbeidsdager vil du sette av for å bli kjent med et nytt system? Svar: Hva er viktigst for deg, å lære å bruke et system eller å forstå hva systemet skal brukes til? Svar: På en skala fra 1-5, hvor 1 er lavest og 5 er høyest, hvor erfaren PC bruker er du? • Hva skal til for at du bedrer dine ferdigheter?

	Svar: .
Informasjon	Hvordan var informasjonen i forbindelse med innføringen av SLB-basen? 1. Form (ulike kilder) 2. Relevans (aktuelt i forhold til egne arbeidsoppgaver) 3. Omfang (bredde, dybde, tilstrekkelig) 4. Informert på rette tidspunkt i forhold til innføring Svar:
Kommunikasjon	Hvordan vil du beskrive kommunikasjonen mellom prosjektet som innbefattet innføring av SLB-basen og deg som bruker? Svar: Hvordan vil du beskrive kommunikasjonen mellom prosjektet som innbefattet innføring av SLB-basen og avdelingen? Svar: Hvordan var kommunikasjonen mellom ansatte i avdelingen rundt dette prosjektet? Svar: Hvilke krav til støtteapparat ser du for deg i forbindelse med innføring av et nytt system? Svar:
Kritiske suksessfaktorer	Er det noe du ser er avgjorende for at et nytt prosjekt skal svare til forventningene din avdeling og du har? Svar:
Annet	Er det noe annet "viktig" du og dine avdelingskollegaer er opptatt av som ikke er kommet frem i løpet av dette intervjuet? Svar:

H. Avdelingskultur

Nedenfor finner du 24 påstander som beskriver ulike sett av verdier som kan komme til uttrykk i samarbeidssituasjoner. For hver av disse påstandene skal du ta stilling til hvor ofte verdisettet beskriver ***den kulturen som råder i din enhet i dag.***

Det er viktig at du tar stilling til ***alle 24 leddene.*** *Se alle adjektivene på hver enkelt linje som en helhet, selv om du synes dette i enkelte tilfeller kan være vanskelig. Ikke dvel for lenge ved hver beskrivelse. Det er ditt umiddelbare inntrykk som skal markeres.*

	Sjelden	Noen ganger	Ofte
1. Åpenhet og aktiv sosial kontakt	☐	☐	☐
2. Konstruktivt og engasjerende samarbeid	☐	☐	☐
3. Uperspnlig og effektiv styring	☐	☐	☐
4. Sterk kontroll, orden og kritikk	☐	☐	☐
5. Selvhevdelse og tøff konkurranse	☐	☐	☐
6. Provoserende selvsentrert umedgjørlighet	☐	☐	☐
7. Innfallsrik og dramatisk selvutfoldelse	☐	☐	☐
8. Beskyttende omsorgsfullhet og varme	☐	☐	☐
9. Vennlig og uformell likeverdighet	☐	☐	☐
10. Oppmuntrende og støttende samarbeid	☐	☐	☐
11. Konsentrasjon og rasjonell saklighet	☐	☐	☐
12. Strenge disiplinerte arbeidsrutiner	☐	☐	☐
13. Individualisme, være "seg selv nok"	☐	☐	☐
14. Likegyldig egenrådighet	☐	☐	☐
15. Spontanitet og utradisjonell væremåte	☐	☐	☐
16. Omgjengelighet, medfølelse og endringsvilje	☐	☐	☐
17. Trofast hensynsfullhet	☐	☐	☐
18. Forsiktig, men forpliktende samarbeid	☐	☐	☐
19. Lydig strevsomhet	☐	☐	☐
20. Oppofrelse og selvmedlidende motvillighet	☐	☐	☐
21. Avvisende tilbakeholdenhet	☐	☐	☐
22. Motløshet og oppgitt giddesløshet	☐	☐	☐
23. Angst, anspenthet og manglende selvtillit	☐	☐	☐
24. Stillferdig velvillighet	☐	☐	☐

Dissertations at the Faculty of Medicine, NTNU

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2. Karl Erik Viken and Arne Ødegaard: STUDIES ON HUMAN MONOCYTES CULTURED *IN VITRO*

1978

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4. Alf O. Brubakk: METHODS FOR STUDYING FLOW DYNAMICS IN THE LEFT VENTRICLE AND THE AORTA IN MAN.

1979

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1980

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1981

8. Jens Hammerstrøm: CYTOSTATIC AND CYTOLYTIC ACTIVITY OF HUMAN MONOCYTES AND EFFUSION MACROPHAGES AGAINST TUMOR CELLS *IN VITRO*

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117. Sigrid Hørven Wigers: CLINICAL STUDIES OF FIBROMYALGIA WITH FOCUS ON ETIOLOGY, TREATMENT AND OUTCOME.
118. Jan Schjøtt: MYOCARDIAL PROTECTION: Functional and Metabolic Characteristics of Two Endogenous Protective Principles.
119. Marit Martinussen: STUDIES OF INTESTINAL BLOOD FLOW AND ITS RELATION TO TRANSITIONAL CIRCULATORY ADAPATION IN NEWBORN INFANTS.
120. Tomm B. Müller: MAGNETIC RESONANCE IMAGING IN FOCAL CEREBRAL ISCHEMIA.
121. Rune Haaverstad: OEDEMA FORMATION OF THE LOWER EXTREMITIES.
122. Magne Børset: THE ROLE OF CYTOKINES IN MULTIPLE MYELOMA, WITH SPECIAL REFERENCE TO HEPATOCYTE GROWTH FACTOR.
123. Geir Smedslund: A THEORETICAL AND EMPIRICAL INVESTIGATION OF SMOKING, STRESS AND DISEASE: RESULTS FROM A POPULATION SURVEY.

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124. Torstein Vik: GROWTH, MORBIDITY, AND PSYCHOMOTOR DEVELOPMENT IN INFANTS WHO WERE GROWTH RETARDED *IN UTERO*.
125. Siri Forsmo: ASPECTS AND CONSEQUENCES OF OPPORTUNISTIC SCREENING FOR CERVICAL CANCER. Results based on data from three Norwegian counties.
126. Jon S. Skranes: CEREBRAL MRI AND NEURODEVELOPMENTAL OUTCOME IN VERY LOW BIRTH WEIGHT (VLBW) CHILDREN. A follow-up study of a geographically based year cohort of VLBW children at ages one and six years.
127. Knut Bjørnstad: COMPUTERIZED ECHOCARDIOGRAPHY FOR EVALUTION OF CORONARY ARTERY DISEASE.
128. Grethe Elisabeth Borchgrevink: DIAGNOSIS AND TREATMENT OF WHIPLASH/NECK SPRAIN INJURIES CAUSED BY CAR ACCIDENTS.
129. Tor Elsås: NEUROPEPTIDES AND NITRIC OXIDE SYNTHASE IN OCULAR AUTONOMIC AND SENSORY NERVES.
130. Rolf W. Gråwe: EPIDEMIOLOGICAL AND NEUROPSYCHOLOGICAL PERSPECTIVES ON SCHIZOPHRENIA.
131. Tonje Strømholm: CEREBRAL HAEMODYNAMICS DURING THORACIC AORTIC CROSSCLAMPING. An experimental study in pigs.

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132. Martinus Bråten: STUDIES ON SOME PROBLEMS REALTED TO INTRAMEDULLARY NAILING OF FEMORAL FRACTURES.
133. Ståle Nordgård: PROLIFERATIVE ACTIVITY AND DNA CONTENT AS PROGNOSTIC INDICATORS IN ADENOID CYSTIC CARCINOMA OF THE HEAD AND NECK.
134. Egil Lien: SOLUBLE RECEPTORS FOR **TNF** AND **LPS**: RELEASE PATTERN AND POSSIBLE SIGNIFICANCE IN DISEASE.

135. Marit Bjørgaas: HYPOGLYCAEMIA IN CHILDREN WITH DIABETES MELLITUS
136. Frank Skorpen: GENETIC AND FUNCTIONAL ANALYSES OF DNA REPAIR IN HUMAN CELLS.
137. Juan A. Pareja: SUNCT SYNDROME. ON THE CLINICAL PICTURE. ITS DISTINCTION FROM OTHER, SIMILAR HEADACHES.
138. Anders Angelsen: NEUROENDOCRINE CELLS IN HUMAN PROSTATIC CARCINOMAS AND THE PROSTATIC COMPLEX OF RAT, GUINEA PIG, CAT AND DOG.
139. Fabio Antonaci: CHRONIC PAROXYSMAL HEMICRANIA AND HEMICRANIA CONTINUA: TWO DIFFERENT ENTITIES?
140. Sven M. Carlsen: ENDOCRINE AND METABOLIC EFFECTS OF METFORMIN WITH SPECIAL EMPHASIS ON CARDIOVASCULAR RISK FACTORES.

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141. Terje A. Murberg: DEPRESSIVE SYMPTOMS AND COPING AMONG PATIENTS WITH CONGESTIVE HEART FAILURE.
142. Harm-Gerd Karl Blaas: THE EMBRYONIC EXAMINATION. Ultrasound studies on the development of the human embryo.
143. Noèmi Becser Andersen:THE CEPHALIC SENSORY NERVES IN UNILATERAL HEADACHES. Anatomical background and neurophysiological evaluation.
144. Eli-Janne Fiskerstrand: LASER TREATMENT OF PORT WINE STAINS. A study of the efficacy and limitations of the pulsed dye laser. Clinical and morfological analyses aimed at improving the therapeutic outcome.
145. Bård Kulseng: A STUDY OF ALGINATE CAPSULE PROPERTIES AND CYTOKINES IN RELATION TO INSULIN DEPENDENT DIABETES MELLITUS.
146. Terje Haug: STRUCTURE AND REGULATION OF THE HUMAN UNG GENE ENCODING URACIL-DNA GLYCOSYLASE.
147. Heidi Brurok: MANGANESE AND THE HEART. A Magic Metal with Diagnostic and Therapeutic Possibilites.
148. Agnes Kathrine Lie: DIAGNOSIS AND PREVALENCE OF HUMAN PAPILLOMAVIRUS INFECTION IN CERVICAL INTRAEPITELIAL NEOPLASIA. Relationship to Cell Cycle Regulatory Proteins and HLA DQBI Genes.
149. Ronald Mårvik: PHARMACOLOGICAL, PHYSIOLOGICAL AND PATHOPHYSIOLOGICAL STUDIES ON ISOLATED STOMACS.
150. Ketil Jarl Holen: THE ROLE OF ULTRASONOGRAPHY IN THE DIAGNOSIS AND TREATMENT OF HIP DYSPLASIA IN NEWBORNS.
151. Irene Hetlevik: THE ROLE OF CLINICAL GUIDELINES IN CARDIOVASCULAR RISK INTERVENTION IN GENERAL PRACTICE.
152. Katarina Tunòn: ULTRASOUND AND PREDICTION OF GESTATIONAL AGE.
153. Johannes Soma: INTERACTION BETWEEN THE LEFT VENTRICLE AND THE SYSTEMIC ARTERIES.
154. Arild Aamodt: DEVELOPMENT AND PRE-CLINICAL EVALUATION OF A CUSTOM-MADE FEMORAL STEM.
155. Agnar Tegnander: DIAGNOSIS AND FOLLOW-UP OF CHILDREN WITH SUSPECTED OR KNOWN HIP DYSPLASIA.
156. Bent Indredavik: STROKE UNIT TREATMENT: SHORT AND LONG-TERM EFFECTS
157. Jolanta Vanagaite Vingen: PHOTOPHOBIA AND PHONOPHOBIA IN PRIMARY HEADACHES

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158. Ola Dalsegg Sæther: PATHOPHYSIOLOGY DURING PROXIMAL AORTIC CROSS-CLAMPING CLINICAL AND EXPERIMENTAL STUDIES
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160. Christina Vogt Isaksen: PRENATAL ULTRASOUND AND POSTMORTEM FINDINGS – A TEN YEAR CORRELATIVE STUDY OF FETUSES AND INFANTS WITH DEVELOPMENTAL ANOMALIES.
161. Holger Seidel: HIGH-DOSE METHOTREXATE THERAPY IN CHILDREN WITH ACUTE LYMPHOCYTIC LEUKEMIA: DOSE, CONCENTRATION, AND EFFECT CONSIDERATIONS.
162. Stein Hallan: IMPLEMENTATION OF MODERN MEDICAL DECISION ANALYSIS INTO CLINICAL DIAGNOSIS AND TREATMENT.
163. Malcolm Sue-Chu: INVASIVE AND NON-INVASIVE STUDIES IN CROSS-COUNTRY SKIERS WITH ASTHMA-LIKE SYMPTOMS.

164. Ole-Lars Brekke: EFFECTS OF ANTIOXIDANTS AND FATTY ACIDS ON TUMOR NECROSIS FACTOR-INDUCED CYTOTOXICITY.
165. Jan Lundbom: AORTOCORONARY BYPASS SURGERY: CLINICAL ASPECTS, COST CONSIDERATIONS AND WORKING ABILITY.
166. John-Anker Zwart: LUMBAR NERVE ROOT COMPRESSION, BIOCHEMICAL AND NEUROPHYSIOLOGICAL ASPECTS.
167. Geir Falck: HYPEROSMOLALITY AND THE HEART.
168. Eirik Skogvoll: CARDIAC ARREST Incidence, Intervention and Outcome.
169. Dalius Bansevicius: SHOULDER-NECK REGION IN CERTAIN HEADACHES AND CHRONIC PAIN SYNDROMES.
170. Bettina Kinge: REFRACTIVE ERRORS AND BIOMETRIC CHANGES AMONG UNIVERSITY STUDENTS IN NORWAY.
171. Gunnar Qvigstad: CONSEQUENCES OF HYPERGASTRINEMIA IN MAN
172. Hanne Ellekjær: EPIDEMIOLOGICAL STUDIES OF STROKE IN A NORWEGIAN POPULATION. INCIDENCE, RISK FACTORS AND PROGNOSIS
173. Hilde Grimstad: VIOLENCE AGAINST WOMEN AND PREGNANCY OUTCOME.
174. Astrid Hjelde: SURFACE TENSION AND COMPLEMENT ACTIVATION: Factors influencing bubble formation and bubble effects after decompression.
175. Kjell A. Kvistad: MR IN BREAST CANCER – A CLINICAL STUDY.
176. Ivar Rossvoll: ELECTIVE ORTHOPAEDIC SURGERY IN A DEFINED POPULATION. Studies on demand, waiting time for treatment and incapacity for work.
177. Carina Seidel: PROGNOSTIC VALUE AND BIOLOGICAL EFFECTS OF HEPATOCYTE GROWTH FACTOR AND SYNDECAN-1 IN MULTIPLE MYELOMA.

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178. Alexander Wahba: THE INFLUENCE OF CARDIOPULMONARY BYPASS ON PLATELET FUNCTION AND BLOOD COAGULATION – DETERMINANTS AND CLINICAL CONSEQUENSES
179. Marcus Schmitt-Egenolf: THE RELEVANCE OF THE MAJOR hISTOCOMPATIBILITY COMPLEX FOR THE GENETICS OF PSORIASIS
180. Odrun Arna Gederaas: BIOLOGICAL MECHANISMS INVOLVED IN 5-AMINOLEVULINIC ACID BASED PHOTODYNAMIC THERAPY
181. Pål Richard Romundstad: CANCER INCIDENCE AMONG NORWEGIAN ALUMINIUM WORKERS
182. Henrik Hjorth-Hansen: NOVEL CYTOKINES IN GROWTH CONTROL AND BONE DISEASE OF MULTIPLE MYELOMA
183. Gunnar Morken: SEASONAL VARIATION OF HUMAN MOOD AND BEHAVIOUR
184. Bjørn Olav Haugen: MEASUREMENT OF CARDIAC OUTPUT AND STUDIES OF VELOCITY PROFILES IN AORTIC AND MITRAL FLOW USING TWO- AND THREE-DIMENSIONAL COLOUR FLOW IMAGING
185. Geir Bråthen: THE CLASSIFICATION AND CLINICAL DIAGNOSIS OF ALCOHOL-RELATED SEIZURES
186. Knut Ivar Aasarød: RENAL INVOLVEMENT IN INFLAMMATORY RHEUMATIC DISEASE. A Study of Renal Disease in Wegener's Granulomatosis and in Primary Sjögren's Syndrome
187. Trude Helen Flo: RESEPTORS INVOLVED IN CELL ACTIVATION BY DEFINED URONIC ACID POLYMERS AND BACTERIAL COMPONENTS
188. Bodil Kavli: HUMAN URACIL-DNA GLYCOSYLASES FROM THE UNG GENE: STRUCTRUAL BASIS FOR SUBSTRATE SPECIFICITY AND REPAIR
189. Liv Thommesen: MOLECULAR MECHANISMS INVOLVED IN TNF- AND GASTRIN-MEDIATED GENE REGULATION
190. Turid Lingaas Holmen: SMOKING AND HEALTH IN ADOLESCENCE; THE NORD-TRØNDELAG HEALTH STUDY, 1995-97
191. Øyvind Hjertner: MULTIPLE MYELOMA: INTERACTIONS BETWEEN MALIGNANT PLASMA CELLS AND THE BONE MICROENVIRONMENT
192. Asbjørn Støylen: STRAIN RATE IMAGING OF THE LEFT VENTRICLE BY ULTRASOUND. FEASIBILITY, CLINICAL VALIDATION AND PHYSIOLOGICAL ASPECTS
193. Kristian Midthjell: DIABETES IN ADULTS IN NORD-TRØNDELAG. PUBLIC HEALTH ASPECTS OF DIABETES MELLITUS IN A LARGE, NON-SELECTED NORWEGIAN POPULATION.

194. Guanglin Cui: FUNCTIONAL ASPECTS OF THE ECL CELL IN RODENTS
195. Ulrik Wisløff: CARDIAC EFFECTS OF AEROBIC ENDURANCE TRAINING: HYPERTROPHY, CONTRACTILITY AND CALCUIM HANDLING IN NORMAL AND FAILING HEART
196. Øyvind Halaas: MECHANISMS OF IMMUNOMODULATION AND CELL-MEDIATED CYTOTOXICITY INDUCED BY BACTERIAL PRODUCTS
197. Tore Amundsen: PERFUSION MR IMAGING IN THE DIAGNOSIS OF PULMONARY EMBOLISM
198. Nanna Kurtze: THE SIGNIFICANCE OF ANXIETY AND DEPRESSION IN FATIQUE AND PATTERNS OF PAIN AMONG INDIVIDUALS DIAGNOSED WITH FIBROMYALGIA: RELATIONS WITH QUALITY OF LIFE, FUNCTIONAL DISABILITY, LIFESTYLE, EMPLOYMENT STATUS, CO-MORBIDITY AND GENDER
199. Tom Ivar Lund Nilsen: PROSPECTIVE STUDIES OF CANCER RISK IN NORD-TRØNDELAG: THE HUNT STUDY. Associations with anthropometric, socioeconomic, and lifestyle risk factors
200. Asta Kristine Håberg: A NEW APPROACH TO THE STUDY OF MIDDLE CEREBRAL ARTERY OCCLUSION IN THE RAT USING MAGNETIC RESONANCE TECHNIQUES

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201. Knut Jørgen Arntzen: PREGNANCY AND CYTOKINES
202. Henrik Døllner: INFLAMMATORY MEDIATORS IN PERINATAL INFECTIONS
203. Asta Bye: LOW FAT, LOW LACTOSE DIET USED AS PROPHYLACTIC TREATMENT OF ACUTE INTESTINAL REACTIONS DURING PELVIC RADIOTHERAPY. A PROSPECTIVE RANDOMISED STUDY.
204. Sylvester Moyo: STUDIES ON STREPTOCOCCUS AGALACTIAE (GROUP B STREPTOCOCCUS) SURFACE-ANCHORED MARKERS WITH EMPHASIS ON STRAINS AND HUMAN SERA FROM ZIMBABWE.
205. Knut Hagen: HEAD-HUNT: THE EPIDEMIOLOGY OF HEADACHE IN NORD-TRØNDELAG
206. Li Lixin: ON THE REGULATION AND ROLE OF UNCOUPLING PROTEIN-2 IN INSULIN PRODUCING ß-CELLS
207. Anne Hildur Henriksen: SYMPTOMS OF ALLERGY AND ASTHMA VERSUS MARKERS OF LOWER AIRWAY INFLAMMATION AMONG ADOLESCENTS
208. Egil Andreas Fors: NON-MALIGNANT PAIN IN RELATION TO PSYCHOLOGICAL AND ENVIRONTENTAL FACTORS. EXPERIENTAL AND CLINICAL STUDES OF PAIN WITH FOCUS ON FIBROMYALGIA
209. Pål Klepstad: MORPHINE FOR CANCER PAIN
210. Ingunn Bakke: MECHANISMS AND CONSEQUENCES OF PEROXISOME PROLIFERATOR-INDUCED HYPERFUNCTION OF THE RAT GASTRIN PRODUCING CELL
211. Ingrid Susann Gribbestad: MAGNETIC RESONANCE IMAGING AND SPECTROSCOPY OF BREAST CANCER
212. Rønnaug Astri Ødegård: PREECLAMPSIA – MATERNAL RISK FACTORS AND FETAL GROWTH
213. Johan Haux: STUDIES ON CYTOTOXICITY INDUCED BY HUMAN NATURAL KILLER CELLS AND DIGITOXIN
214. Turid Suzanne Berg-Nielsen: PARENTING PRACTICES AND MENTALLY DISORDERED ADOLESCENTS
215. Astrid Rydning: BLOOD FLOW AS A PROTECTIVE FACTOR FOR THE STOMACH MUCOSA. AN EXPERIMENTAL STUDY ON THE ROLE OF MAST CELLS AND SENSORY AFFERENT NEURONS

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216. Jan Pål Loennechen: HEART FAILURE AFTER MYOCARDIAL INFARCTION. Regional Differences, Myocyte Function, Gene Expression, and Response to Cariporide, Losartan, and Exercise Training.
217. Elisabeth Qvigstad: EFFECTS OF FATTY ACIDS AND OVER-STIMULATION ON INSULIN SECRETION IN MAN
218. Arne Åsberg: EPIDEMIOLOGICAL STUDIES IN HEREDITARY HEMOCHROMATOSIS: PREVALENCE, MORBIDITY AND BENEFIT OF SCREENING.

219. Johan Fredrik Skomsvoll: REPRODUCTIVE OUTCOME IN WOMEN WITH RHEUMATIC DISEASE. A population registry based study of the effects of inflammatory rheumatic disease and connective tissue disease on reproductive outcome in Norwegian women in 1967-1995.
220. Siv Mørkved: URINARY INCONTINENCE DURING PREGNANCY AND AFTER DELIVERY: EFFECT OF PELVIC FLOOR MUSCLE TRAINING IN PREVENTION AND TREATMENT
221. Marit S. Jordhøy: THE IMPACT OF COMPREHENSIVE PALLIATIVE CARE
222. Tom Christian Martinsen: HYPERGASTRINEMIA AND HYPOACIDITY IN RODENTS – CAUSES AND CONSEQUENCES
223. Solveig Tingulstad: CENTRALIZATION OF PRIMARY SURGERY FOR OVARAIN CANCER. FEASIBILITY AND IMPACT ON SURVIVAL
224. Haytham Eloqayli: METABOLIC CHANGES IN THE BRAIN CAUSED BY EPILEPTIC SEIZURES
225. Torunn Bruland: STUDIES OF EARLY RETROVIRUS-HOST INTERACTIONS – VIRAL DETERMINANTS FOR PATHOGENESIS AND THE INFLUENCE OF SEX ON THE SUSCEPTIBILITY TO FRIEND MURINE LEUKAEMIA VIRUS INFECTION
226. Torstein Hole: DOPPLER ECHOCARDIOGRAPHIC EVALUATION OF LEFT VENTRICULAR FUNCTION IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION
227. Vibeke Nossum: THE EFFECT OF VASCULAR BUBBLES ON ENDOTHELIAL FUNCTION
228. Sigurd Fasting: ROUTINE BASED RECORDING OF ADVERSE EVENTS DURING ANAESTHESIA – APPLICATION IN QUALITY IMPROVEMENT AND SAFETY
229. Solfrid Romundstad: EPIDEMIOLOGICAL STUDIES OF MICROALBUMINURIA. THE NORD-TRØNDELAG HEALTH STUDY 1995-97 (HUNT 2)
230. Geir Torheim: PROCESSING OF DYNAMIC DATA SETS IN MAGNETIC RESONANCE IMAGING
231. Catrine Ahlén: SKIN INFECTIONS IN OCCUPATIONAL SATURATION DIVERS IN THE NORTH SEA AND THE IMPACT OF THE ENVIRONMENT
232. Arnulf Langhammer: RESPIRATORY SYMPTOMS, LUNG FUNCTION AND BONE MINERAL DENSITY IN A COMPREHENSIVE POPULATION SURVEY. THE NORD-TRØNDELAG HEALTH STUDY 1995-97. THE BRONCHIAL OBSTRUCTION IN NORD-TRØNDELAG STUDY
233. Einar Kjelsås: EATING DISORDERS AND PHYSICAL ACTIVITY IN NON-CLINICAL SAMPLES
234. Arne Wibe: RECTAL CANCER TREATMENT IN NORWAY – STANDARDISATION OF SURGERY AND QUALITY ASSURANCE

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235. Eivind Witsø: BONE GRAFT AS AN ANTIBIOTIC CARRIER
236. Anne Mari Sund: DEVELOPMENT OF DEPRESSIVE SYMPTOMS IN EARLY ADOLESCENCE
237. Hallvard Lærum: EVALUATION OF ELECTRONIC MEDICAL RECORDS – A CLINICAL TASK PERSPECTIVE
238. Gustav Mikkelsen: ACCESSIBILITY OF INFORMATION IN ELECTRONIC PATIENT RECORDS; AN EVALUATION OF THE ROLE OF DATA QUALITY
239. Steinar Krokstad: SOCIOECONOMIC INEQUALITIES IN HEALTH AND DISABILITY. SOCIAL EPIDEMIOLOGY IN THE NORD-TRØNDELAG HEALTH STUDY (HUNT), NORWAY
240. Arne Kristian Myhre: NORMAL VARIATION IN ANOGENITAL ANATOMY AND MICROBIOLOGY IN NON-ABUSED PRESCHOOL CHILDREN
241. Ingunn Dybedal: NEGATIVE REGULATORS OF HEMATOPOIETEC STEM AND PROGENITOR CELLS
242. Beate Sitter: TISSUE CHARACTERIZATION BY HIGH RESOLUTION MAGIC ANGLE SPINNING MR SPECTROSCOPY
243. Per Arne Aas: MACROMOLECULAR MAINTENANCE IN HUMAN CELLS – REPAIR OF URACIL IN DNA AND METHYLATIONS IN DNA AND RNA
244. Anna Bofin: FINE NEEDLE ASPIRATION CYTOLOGY IN THE PRIMARY INVESTIGATION OF BREAST TUMOURS AND IN THE DETERMINATION OF TREATMENT STRATEGIES
245. Jim Aage Nøttestad: DEINSTITUTIONALIZATION AND MENTAL HEALTH CHANGES AMONG PEOPLE WITH MENTAL RETARDATION
246. Reidar Fossmark: GASTRIC CANCER IN JAPANESE COTTON RATS

247. Wibeke Nordhøy: MANGANESE AND THE HEART, INTRACELLULAR MR RELAXATION AND WATER EXCHANGE ACROSS THE CARDIAC CELL MEMBRANE

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248. Sturla Molden: QUANTITATIVE ANALYSES OF SINGLE UNITS RECORDED FROM THE HIPPOCAMPUS AND ENTORHINAL CORTEX OF BEHAVING RATS
249. Wenche Brenne Drøyvold: EPIDEMIOLOGICAL STUDIES ON WEIGHT CHANGE AND HEALTH IN A LARGE POPULATION. THE NORD-TRØNDELAG HEALTH STUDY (HUNT)
250. Ragnhild Støen: ENDOTHELIUM-DEPENDENT VASODILATION IN THE FEMORAL ARTERY OF DEVELOPING PIGLETS
251. Aslak Steinsbekk: HOMEOPATHY IN THE PREVENTION OF UPPER RESPIRATORY TRACT INFECTIONS IN CHILDREN
252. Hill-Aina Steffenach: MEMORY IN HIPPOCAMPAL AND CORTICO-HIPPOCAMPAL CIRCUITS
253. Eystein Stordal: ASPECTS OF THE EPIDEMIOLOGY OF DEPRESSIONS BASED ON SELF-RATING IN A LARGE GENERAL HEALTH STUDY (THE HUNT-2 STUDY)
254. Viggo Pettersen: FROM MUSCLES TO SINGING: THE ACTIVITY OF ACCESSORY BREATHING MUSCLES AND THORAX MOVEMENT IN CLASSICAL SINGING
255. Marianne Fyhn: SPATIAL MAPS IN THE HIPPOCAMPUS AND ENTORHINAL CORTEX
256. Robert Valderhaug: OBSESSIVE-COMPULSIVE DISORDER AMONG CHILDREN AND ADOLESCENTS: CHARACTERISTICS AND PSYCHOLOGICAL MANAGEMENT OF PATIENTS IN OUTPATIENT PSYCHIATRIC CLINICS
257. Erik Skaaheim Haug: INFRARENAL ABDOMINAL AORTIC ANEURYSMS – COMORBIDITY AND RESULTS FOLLOWING OPEN SURGERY
258. Daniel Kondziella: GLIAL-NEURONAL INTERACTIONS IN EXPERIMENTAL BRAIN DISORDERS
259. Vegard Heimly Brun: ROUTES TO SPATIAL MEMORY IN HIPPOCAMPAL PLACE CELLS
260. Kenneth McMillan: PHYSIOLOGICAL ASSESSMENT AND TRAINING OF ENDURANCE AND STRENGTH IN PROFESSIONAL YOUTH SOCCER PLAYERS
261. Marit Sæbø Indredavik: MENTAL HEALTH AND CEREBRAL MAGNETIC RESONANCE IMAGING IN ADOLESCENTS WITH LOW BIRTH WEIGHT
262. Ole Johan Kemi: ON THE CELLULAR BASIS OF AEROBIC FITNESS, INTENSITY-DEPENDENCE AND TIME-COURSE OF CARDIOMYOCYTE AND ENDOTHELIAL ADAPTATIONS TO EXERCISE TRAINING
263. Eszter Vanky: POLYCYSTIC OVARY SYNDROME – METFORMIN TREATMENT IN PREGNANCY
264. Hild Fjærtoft: EXTENDED STROKE UNIT SERVICE AND EARLY SUPPORTED DISCHARGE. SHORT AND LONG-TERM EFFECTS
265. Grete Dyb: POSTTRAUMATIC STRESS REACTIONS IN CHILDREN AND ADOLESCENTS
266. Vidar Fykse: SOMATOSTATIN AND THE STOMACH
267. Kirsti Berg: OXIDATIVE STRESS AND THE ISCHEMIC HEART: A STUDY IN PATIENTS UNDERGOING CORONARY REVASCULARIZATION
268. Björn Inge Gustafsson: THE SEROTONIN PRODUCING ENTEROCHROMAFFIN CELL, AND EFFECTS OF HYPERSEROTONINEMIA ON HEART AND BONE

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269. Torstein Baade Rø: EFFECTS OF BONE MORPHOGENETIC PROTEINS, HEPATOCYTE GROWTH FACTOR AND INTERLEUKIN-21 IN MULTIPLE MYELOMA
270. May-Britt Tessem: METABOLIC EFFECTS OF ULTRAVIOLET RADIATION ON THE ANTERIOR PART OF THE EYE
271. Anne-Sofie Helvik: COPING AND EVERYDAY LIFE IN A POPULATION OF ADULTS WITH HEARING IMPAIRMENT
272. Therese Standal: MULTIPLE MYELOMA: THE INTERPLAY BETWEEN MALIGNANT PLASMA CELLS AND THE BONE MARROW MICROENVIRONMENT
273. Ingvild Saltvedt: TREATMENT OF ACUTELY SICK, FRAIL ELDERLY PATIENTS IN A GERIATRIC EVALUATION AND MANAGEMENT UNIT – RESULTS FROM A PROSPECTIVE RANDOMISED TRIAL
274. Birger Henning Endreseth: STRATEGIES IN RECTAL CANCER TREATMENT – FOCUS ON EARLY RECTAL CANCER AND THE INFLUENCE OF AGE ON PROGNOSIS

275. Anne Mari Aukan Rokstad: ALGINATE CAPSULES AS BIOREACTORS FOR CELL THERAPY
276. Mansour Akbari: HUMAN BASE EXCISION REPAIR FOR PRESERVATION OF GENOMIC STABILITY
277. Stein Sundstrøm: IMPROVING TREATMENT IN PATIENTS WITH LUNG CANCER – RESULTS FROM TWO MULITCENTRE RANDOMISED STUDIES
278. Hilde Pleym: BLEEDING AFTER CORONARY ARTERY BYPASS SURGERY - STUDIES ON HEMOSTATIC MECHANISMS, PROPHYLACTIC DRUG TREATMENT AND EFFECTS OF AUTOTRANSFUSION
279. Line Merethe Oldervoll: PHYSICAL ACTIVITY AND EXERCISE INTERVENTIONS IN CANCER PATIENTS
280. Boye Welde: THE SIGNIFICANCE OF ENDURANCE TRAINING, RESISTANCE TRAINING AND MOTIVATIONAL STYLES IN ATHLETIC PERFORMANCE AMONG ELITE JUNIOR CROSS-COUNTRY SKIERS
281. Per Olav Vandvik: IRRITABLE BOWEL SYNDROME IN NORWAY, STUDIES OF PREVALENCE, DIAGNOSIS AND CHARACTERISTICS IN GENERAL PRACTICE AND IN THE POPULATION
282. Idar Kirkeby-Garstad: CLINICAL PHYSIOLOGY OF EARLY MOBILIZATION AFTER CARDIAC SURGERY
283. Linn Getz: SUSTAINABLE AND RESPONSIBLE PREVENTIVE MEDICINE. CONCEPTUALISING ETHICAL DILEMMAS ARISING FROM CLINICAL IMPLEMENTATION OF ADVANCING MEDICAL TECHNOLOGY
284. Eva Tegnander: DETECTION OF CONGENITAL HEART DEFECTS IN A NON-SELECTED POPULATION OF 42,381 FETUSES
285. Kristin Gabestad Nørsett: GENE EXPRESSION STUDIES IN GASTROINTESTINAL PATHOPHYSIOLOGY AND NEOPLASIA
286. Per Magnus Haram: GENETIC VS. AQUIRED FITNESS: METABOLIC, VASCULAR AND CARDIOMYOCYTE ADAPTATIONS
287. Agneta Johansson: GENERAL RISK FACTORS FOR GAMBLING PROBLEMS AND THE PREVALENCE OF PATHOLOGICAL GAMBLING IN NORWAY
288. Svein Artur Jensen: THE PREVALENCE OF SYMPTOMATIC ARTERIAL DISEASE OF THE LOWER LIMB
289. Charlotte Björk Ingul: QUANITIFICATION OF REGIONAL MYOCARDIAL FUNCTION BY STRAIN RATE AND STRAIN FOR EVALUATION OF CORONARY ARTERY DISEASE. AUTOMATED VERSUS MANUAL ANALYSIS DURING ACUTE MYOCARDIAL INFARCTION AND DOBUTAMINE STRESS ECHOCARDIOGRAPHY
290. Jakob Nakling: RESULTS AND CONSEQUENCES OF ROUTINE ULTRASOUND SCREENING IN PREGNANCY – A GEOGRAPHIC BASED POPULATION STUDY
291. Anne Engum: DEPRESSION AND ANXIETY – THEIR RELATIONS TO THYROID DYSFUNCTION AND DIABETES IN A LARGE EPIDEMIOLOGICAL STUDY
292. Ottar Bjerkeset: ANXIETY AND DEPRESSION IN THE GENERAL POPULATION: RISK FACTORS, INTERVENTION AND OUTCOME – THE NORD-TRØNDELAG HEALTH STUDY (HUNT)
293. Jon Olav Drogset: RESULTS AFTER SURGICAL TREATMENT OF ANTERIOR CRUCIATE LIGAMENT INJURIES – A CLINICAL STUDY
294. Lars Fosse: MECHANICAL BEHAVIOUR OF COMPACTED MORSELLISED BONE – AN EXPERIMENTAL IN VITRO STUDY
295. Gunilla Klensmeden Fosse: MENTAL HEALTH OF PSYCHIATRIC OUTPATIENTS BULLIED IN CHILDHOOD
296. Paul Jarle Mork: MUSCLE ACTIVITY IN WORK AND LEISURE AND ITS ASSOCIATION TO MUSCULOSKELETAL PAIN
297. Björn Stenström: LESSONS FROM RODENTS: I: MECHANISMS OF OBESITY SURGERY – ROLE OF STOMACH. II: CARCINOGENIC EFFECTS OF *HELICOBACTER PYLORI* AND SNUS IN THE STOMACH

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