Learning medical practice

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The origin of this study was an interest concerning my own profession and how new doctors were trained to become trustworthy colleagues. This interest – even a curiosity was born while working on a project concerning the learning process during medical internship (Akre et al. 1992; Vikanes et al. 1992). After concluding this project a number of questions remained unanswered. Could this transition from medical school to medical practice have been conducted in a smoother way, for example by tailored introduction courses structured according to the needs of the intern to master in his work, or by a greater overlap between the inexperienced intern and the second on call on the intern’s first call nights? And why was the pressure on “production” allowed to play such a negative role on the intern’s learning when medical internship was part of the physician’s basic education?

I am a medical doctor by training. Consequently I have been undertaking research in my own culture. As I see it my background may have had both positive and negative implications regarding the research process. On the positive side there is reason to believe that my identity as a physician, and therefore a colleague, made it easier to gain access to informants’ worlds and experiences. Further, because I was familiar with the hospital world it has been easier for me to comprehend what the physicians were talking about. This situation may have encouraged the informants to be more open; in any case this facilitated the analysis of the material.

Yet, social scientists warn against doing research in one’s own culture, probably because the culture equips its members with a set of self-evident truths that become blind spots in their view of reality. My solution to this problem has been to involve other researchers in the analyses. First, I have collaborated closely with Sten Ludvigsen, who at the time was a PhD student in educational science. One result of this teamwork is that Sten has co-authored two of the articles upon which this dissertation is built. Secondly, I have enjoyed membership in an international network for non-scholastic learning which has brought together researchers from the Nordic countries as well as England and the USA. This network has provided me with an opportunity to present my findings and obtain a feedback on my models for analysis.

Looking back on the entire research process, I previously had a far more negative impression of the learning traditions within the medical culture than at the conclusion of the project.
Acknowledgements

I have been engaged with this project for several years and feel indebted to a considerable number of people who have become involved at various stages of the research.

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Without the 20 physicians who took part in the present study this thesis would not have been possible. I want to thank them for their confidence and their openness which gave me insight into their work and the environment in the two hospital departments.

My close friend Åse Vikanes was the one who got me involved within research in the first place. For two years we worked together on a project about learning during medical internship, and it was in this connection that my interest for the field of learning was born. Per Hjortdahl was our invaluable mentor during this time, and Bjørn Oscar Holmvedt and Hans Asbjørn Holm were our inspiring colleagues in The Department of Professional Development and Education in the Norwegian Medical Association.

Sten Ludvigsen has been my midwife into the manifold field of learning theories. His creative mind and social abilities made academic writing a sole pleasure. Sten Ludvigsen has also been very helpful in reading through earlier versions of the thesis.

The network for non-scholastic learning has been a haven for inspiration and critical evaluation of my own attempts to apply the theories of learning as social practice to the field of medicine. Steinar Kvale, Klaus Nilsen and Carsten Østerlund have been my closest associates in this milieu. Special thanks to Steinar Kvale and Klaus Nilsen who edited the book *Mesterlære* (Apprenticeship: Learning as social practice) and thus initiated a closer and rewarding collaborative project, and to them both for commenting on drafts of this thesis.

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Annotations
In this thesis the physicians are referred to as males (he/him/his), with the exception of paper 2 where the doctor as a rule is referred to as female.

The researcher is referred to as female (she/her/hers).

The thesis is generally written in a neutral form. One exception is the sections describing the qualitative methods. Here the first person is applied. Compared to research based on surveys, the researcher is to a much larger extent a tool in the research process when qualitative methods are employed. This also means that the history of the researcher, her preconceptions and personal experiences, often referred as her fore-understanding, should be accounted for in the methodological descriptions. Accordingly in these sections first person felt most appropriate.

The following abbreviations are used:
NMA – The Norwegian Medical Association
ICAP – Instrument of perceived communication atmosphere between physicians
ER – Emergency room
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  II The interview guide
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Abstract

The main object of this dissertation has been to describe traditions for learning in medical practice and the conditions for learning and training in Norwegian hospitals.

The study involves both quantitative and qualitative methods. In the quantitative part, twenty statements describing communication, as perceived by the physicians themselves, were presented to a random sample of members of the Norwegian Medical Association (N = 2628). In the qualitative part, 20 in-depth interviews with physicians working in the surgical and the internal medicine department of a large general hospital in Norway were conducted in 1994. Each interview consisted of a description of the physician’s work and the physician’s perceptions of his own learning process and the learning environment. The culture of the department and how medical complications were handled were also explored in the interview.

The first paper deals with the data from the quantitative part of the study while the remaining three deal with the data from the qualitative part.

The 1993 Survey on Physicians’ Health and Welfare found that perceived stress (measured as perceived time pressure) was related to the physician’s perceived autonomy, and that both perceived stress and autonomy influenced the communication atmosphere in the workplace. Furthermore, physicians working in hospitals described the communication atmosphere as substantially more selfish and competitive than non-hospital physicians. The communication atmosphere may be regarded as a comprehensive measure of volume and quality in the dialogues connected with the daily activities in the workplace. Thus, in the quantitative study a general relation between the working conditions and the learning environment was established, as elaborated in Paper 1.

In the qualitative study the master–apprentice relationship emerged as a cornerstone of the traditional medical learning institutions. Here, the inexperienced physician learns the necessary practical skills, ways of reasoning and standards of diagnosis and treatment in the hospital. In interaction with a more experienced physician the novice transcends what she can do alone and develops as a professional. The physicians’ descriptions of their own learning processes change with experience and position in the hospital job hierarchy. The descriptions of the most inexperienced physicians are closely related to the daily activities in the department. The most experienced physicians however, see themselves as
participants in a national or international arena from which they bring knowledge home to the local community of practice (Paper 2).

The third paper looks into the learning environment of the two hospital departments included in the qualitative study and applies access to learning institutions as an analytical tool to explain the learning that takes place. Access to learning situations is created in a “zone of possibility” between the formal organisation and the more informal interpersonal networks in the hospital. The division of the department into sections is used as an example of how organisational factors determine those areas with which one becomes familiar. The notion of “the good apprentice” and the relationship between initiative and invitation illuminate the significance of the interpersonal factors for access to learning situations. Finally, it is illustrated how time is an important but scarce resource influencing the development of shared knowledge in the department.

The aim of Paper 4 is to explore how uncertainty and medical mistakes were handled in the two hospital departments in order to investigate how inexperienced physicians learn to master these complicated characteristics of clinical work. On duty in the hospital the inexperienced physician is in the front line. In this situation safety is dependent on well-developed routines, skilled nurses and a knowledge hierarchy in the form of more experienced colleagues to be consulted when needed. In the two departments the availability of consultants was relative for several reasons, and there seemed to be a limit to the social acceptance of uncertainty. Only major complications were brought up in the collective fora, and few of the less experienced physicians were able to recall any complications that had been discussed.

Practice is the main source for learning and professional development for the inexperienced physician. The organisation of the medical activity is at the same time an organisation of knowledge and thus influences what the physicians learn. Learning and training must be kept in mind in line with patient safety when the medical activity is organised. In the quality management of postgraduate and continuing medical education, practice has been taken for granted. Up to now there have been few attempts at in-depth descriptions of learning that takes place in medical practice and of medical practice per se. In this regard the present thesis represents an opening up of the black box of clinical work, and has provided a number of central concepts and ways of thinking about physicians’ learning and professionalisation.
List of papers

Paper 1
Victoria Akre, Erik Falkum, Bjørn O. Hoftvedt, Olaf G. Aasland
**The communication atmosphere between physician colleagues: competitive perfectionism or supportive dialogue? A Norwegian study**

Paper 2
Victoria Akre, Sten Ludvigsen
**Hvordan læres medisinsk praksis? En kvalitativ studie av legers oppfatning av egne læringsprosesser**
Tidsskrift for den norske lægeforening nr 19, 1997; 117: 2757–61
English title: Learning medical practice. How physicians perceive their own learning processes

Paper 3
Victoria Akre, Sten Ludvigsen
**Profesjonslæring og kollektiv kunnskap. Læringsmiljø i to norske sykehusavdelinger**
Tidsskrift for den norske lægeforening nr 1, 1998; 118: 4852
English title: Conditions for learning in two Norwegian hospital departments

Paper 4
Akre, Victoria
**Uncertainty, safety and medical mistakes: learning the profession of medicine**
Submitted Journal of Nordic Educational Research
1 Introduction

1.1 Aim of the study
The aim of this study is to increase the knowledge of how physicians learn their profession and to describe the conditions for learning in hospital departments. A closer understanding of how physicians learn medical practice is necessary in order to improve the conditions for learning in Norwegian hospital departments. Furthermore, new perspectives on learning and training in natural environments have evolved in recent years. It is now crucial to assess the reproduction of medical knowledge and the organisation of the postgraduate medical education in the light of this new understanding.

1.2 Background
Physicians practice their profession at an intersection between medicine, organisational framework and health policies. Public health services have been increasingly governed by production output. For instance, a significant portion of hospital income is derived from refunds based on the number of specific diagnoses treated (Diagnosis Related Group). At the same time increased attention is being made to quality and catch phrases like “the patient first” are gaining foothold. As a professional, the contemporary physician faces growing requirements to be continually up-dated in his field, a good communicator, and to be effective and steadily increase health care delivery.

There is an increasing focus on education and training both in society in general and in the medical profession in particular. From the time when the physician commences as an inexperienced intern to the time when he becomes a recognised expert in his field, the main professional development takes place through participation in the professional community, in dialogue with the other physicians at the work place. However, in recent years questions have been raised regarding the extent to which the learning environment at the medical work place facilitates the physician’s professional development. Studies have concluded that there is a substantial distance between the ideals depicted in the written objectives and the reality (Akre et al. 1992; Falck et al. 1995; Gaarder et al. 2000; Lycke et al. 1996; Statens helsetilsyn 1996).
A good and well-functioning postgraduate and continuing medical education, is a prerequisite for the coming generation of physicians to be able to meet the demands of the fast expanding medical domain.

1.3 Postgraduate and continuing medical education in Norwegian hospitals

Unless otherwise indicated, the focus here is the postgraduate and continuing medical education in the hospital-based specialities.

1.3.1 Structure and responsibility

The basic medical education in Norway comprises 6 – 6 ½ year of medical school and 1 ½ year of internship, one year in hospital medicine, and 6 months in general practice. After a valid internship the doctor receives an authorisation for practising medicine in Norway. In Norway there are thirty specialities and 13 branch specialities, a modest number compared to some of the other Nordic countries. Forty-one of the Norwegian specialities and branch specialities are accepted in the European Economic Area. To qualify in most specialities takes 5 – 6 years, but the average physician spends 8 years from graduation until becoming a qualified specialist, excluding time devoted to branch specialities (Gjerberg & Aasland 1999).

The Ministry of Health has the overall formal responsibility for postgraduate medical education in Norway, but certain tasks are delegated to the NMA and The Norwegian National Board of Health.¹ The approval of specialists is delegated to The Medical Association. The central board of The Medical Association has appointed a committee for each of the 43 specialities including branch specialities. These committees propose rules and regulations for speciality training which are then approved by The Norwegian National Board of Health. The speciality committees accredit the hospital departments as educational institutions and assesses the trainees’ applications to qualify as specialists.

Concerning medical internship, The Ministry of Health has the formal responsibility, while The Norwegian Registration Authority for Health Personnel² is delegated the

¹ Central government retains responsibility for post-graduate medical education, but some of the organisation have changed. See Section 1.5.
² Statens autorisasjonskontor for helsepersonell.
responsibility for obtaining enough internship places and for the approval of internship places in hospital. The Norwegian Registration Authority for Health Personnel also administers the distribution of interns.

The hospitals’ responsibility for creating a good learning environment is stipulated in The Specialist Health Care Act (1.1.2001), which states that the hospital should take part in the formal education and practical training of health personnel. This Act replaced The Hospitals Act (19.6.1969), but the content in this matter is principally the same.

Each medical practitioner’s responsibility to maintain a high professional standard and to stay updated in the medical domain in which he is practising is laid down in The Medical Association’s Ethical Guidelines for Physicians. Furthermore, The Ethical Guidelines state that the physician has a duty to address professional or ethical malfunction in the practice of colleagues. But more important here are the informal control mechanisms operating through the cultural norms and values of the medical profession. These canons for a high professional standard work both directly on the individual physician as internalised ideals for his medical practice as well as more collectively through collegial networking (Berg 1991).

In January 1999 a consultative National Board for the Education and Distribution of Specialists was founded. The Board has one member from the patients’ organisations and 20 members from the different parties involved in the implementation of postgraduate and continuing medical education. Its terms of reference are to consult the government, or the delegated department, in matters concerning the education and distribution of specialists. The founding of The Board was seen as a challenge to The Medical Association’s hegemony in the production of specialists. So far not many changes have been implemented, but in the board’s first report, which deals with the postgraduate medical education in hospitals, new directions are outlined (Nasjonalt råd for spesialistutdanning av leger og legefording 2001).

As stated in the report, the most important objective for the restructuring is to increase the efficiency of the education in order to produce more years as practising specialists for each physician. In order to accomplish this objective the compulsory one-year training in another relevant domain of medicine has already been excluded from the education programme. Other efficiency measures discussed in the report are regional training programmes, including rotation between different hospitals in the region as well as new appointment structures whereby qualified specialists are not assigned to training positions.
In order to strengthen the academic qualifications of the candidates, the board advocated a more prominent role for the universities in postgraduate medical education. Initiatives cited here include an obligatory thesis as well as to organise for research practice in a relevant domain. Other fields of responsibility for the universities mentioned in the report are skills laboratories and small-group educational counselling.

In accordance with these changes the board also suggested a financial restructuring of postgraduate medical education (see Section 1.3.5).

### 1.3.2 Medical internship in hospitals

The medical internship is the transition phase from the status of medical student to independent work as a professional physician. The intern works in a subordinate position although principally enjoying the same rights and obligations as other physicians.

The objectives of medical internship are that through work under special guidance, training and supervision, the physician shall obtain the necessary experience and understanding of practical routines in order to confidently carry out regular medical work in a defensible manner (Den norske lægeforening 2000b). Training as an intern should contribute to the development of skills in doctor–patient communication as well as skills in teamwork and co-operation with other personnel groups and with other parts of the health care system. The regulations also contain a list of specified practical procedures that the intern should master by the end of the period, ranging from diagnostic and therapeutic procedures to surgical procedures and the handling of emergency situations. Each intern should have a personal educational counsellor who follows up his progress and ensures that the regulations of the internship period are fulfilled.

The medical internship is part of the basic medical education, but takes place at hospitals located throughout the country and may thus occur at a considerable distance from the universities. In consequence, it is difficult to maintain regular control of the pedagogic quality. Furthermore, internship comprises only a limited period during the doctor’s professional development. Consequently at the time the physician becomes conscious that the training could have been more effective he is already on his way to face new challenges in other medical work places. Several reports and scientific projects have questioned the quality of medical internship (Aarseth et al. 1995; Akre et al. 1992; Akre & Vikanes 1991; Falck et al. 1995; Gaarder et al. 2000; Vikanes et al. 1992).
As a component of professional medical education, internship remains an underestimated element. It is during this period that the basic professional skills and ways of thinking are instituted and which will characterise the doctor for the rest of his professional life.

1.3.3 Specialist training in hospitals

The overall goal of specialist training is to ensure that a qualified specialist has the professional competence required to produce high quality health services. Senior appointments in hospital medicine require speciality qualifications.

Postgraduate medical education in Norway is a dual system comprising practical training under supervision and with formal educational counselling by specialists as well as theoretical courses. More than 90% of practising physicians in Norway today are specialists or undergoing specialist training.

In order to commence training as a specialist, Norwegian authorisation as a medical doctor is required. The training itself takes place in a hospital department approved as an educational institution. Participation in all aspects of the activities in the department is presupposed, including the formal educational programme and educational counselling. For a department to be approved as an educational institution a formal educational programme of a minimum of 90 minutes per week is required. Additionally, the department must have a system of formal educational counselling and is required to present an annual report of the educational activity to the speciality committee.

General and specific objectives for training are defined in the regulations of each speciality (see the NMA’s Internet pages on education; http://www.legeforeningen.no). For example, according to the general objectives for general surgery, training should first and foremost secure the mastery of surgical practice including specified skills in the different domains of surgery. Additionally the specialist must be able to make a thorough pre-surgical assessment of a patient as well as undertake any post-surgical measures necessary. The training should also include the administration of the daily activities in a surgical department.

Furthermore, the regulations of the speciality training contain lists of specified practical procedures that the trainee must master before he is approved as a specialist. These lists vary according to the particular medical domain of the speciality.
Apart from the practical training all specialities require certain obligatory courses. In most specialities courses total some 200 hours. According to information from the NMA the number of course hours required has increased dramatically since 1990. In general surgery for example, obligatory courses increased from 160 hours in 1990 to 250 hours in 1995.

1.3.4 Continuing medical education in hospitals

At the moment there are no formal demands regarding recertification, except for specialists in general practice. But according to the Health Personnel Act (1.1.2001), the physician himself has a responsibility concerning continuing medical education. The law states that the physician is required to practice medicine in a justifiable way and this implies a duty to stay updated in the field (Søyland 1997). As already mentioned the responsibility of the hospital to create good conditions for continuing medical education is stipulated in the Specialist Health Care Act (1.1.2001).

Educational activities in connection to continuing medical education traditionally comprise courses. But the reading of medical literature, teaching practice in highly specialised departments and participation in international medical conventions are also important learning activities for this group (Akre & Ludvigsen 1997; Søyland 1997). Attending physicians have the right to leave with paid locum for four months every fifth year. It is required that a proper locum is provided and that the attending presents an educational program for the period.

1.3.5 Economy

The costs of postgraduate and continuing medical education are met by three funds negotiated annually by the NMA. The objective of Fund I is to provide funding for the structure and staffing needed to manage the training system for postgraduate and continuing medical education, but particularly to finance the comprehensive range of courses in medical education. Fund II provides individual support for physicians in general practice to attend courses; while Fund III supports individual hospital physicians.

For the duration of this project (since 1994) financing of the three funds has become increasingly problematic, especially with regard to Fund III. The reimbursement for hospital physicians has been subjected to major retrenchments and there has been talk of a
financial crisis in the postgraduate and continuing medical education in Norway. The Medical Association has been campaigning for a refinancing of the three funds, while physicians in the different hospitals throughout the country lobby for local funds from the hospital employer. Meanwhile, a natural consequence of the financial situation is that a greater responsibility for financing the postgraduate and continuing medical education is transferred to the employer (the hospital owner).

The first report from The National Board for the Education and Distribution of Physicians discusses new models for financing of postgraduate and continuing medical education (Nasjonalt råd for spesialistutdanning av leger og legeførdeling 2001). One of the main changes suggested in the report is that the hospital should be directly refunded for expenditures incurred in the training and education of specialists. Further, the Board recommends that the universities be given grants earmarked for postgraduate medical education. The Board has not formulated an opinion on the question of the future financing of the funds, nor the financing of those tasks which are currently delegated to The Medical Association.

1.4 Research problems

1.4.1 Problem background

During twenty years or so we have witnessed great changes in medicine and the production of health services in hospital departments. This study is concerned with what effects these changes have had on postgraduate and continuing medical education in hospitals.

The NMA’s quality assurance of the postgraduate medical education has first and foremost been concentrated on the formal learning institutions, while less attention has been given to the medical activity and whether the organisation of medical work is conducive for learning and professional development. There is reason to claim that the learning qualities of medical practice have been taken for granted. There are few attempts to evaluate learning which takes place through participation in a professional community. Concerning the hospital department as a learning environment, what has been monitored is whether the department fulfils the required 90 minutes formal educational weekly programme per week. Further, much effort has been put into establishing a formal educational counselling system for medical trainees. The compulsory courses in the postgraduate and continuing medical education are also largely organised in scholastic forms.
The perspective on learning and training presented in this thesis, argues for the necessity of transcending the individual and look into the social context to understand the learning that takes place. The transfer of knowledge between contexts, the very foundation of traditional learning theories, is also questioned. Considering these new perspectives on learning and professional development, it seems insufficient to assure the quality of the formal learning institutions.

Accordingly, an important motivation for this study was to improve knowledge of how physicians learn in natural situations such that this knowledge should be available both to those organising the postgraduate medical education and to those who have the responsibility of implementing the education. The second principal objective was to describe the learning conditions in hospital departments and to investigate the effects of recent changes in hospital medicine for the traditional medical learning institutions.

1.4.2 Research questions

Two research questions have been central in this study:
1. How is medical practice learnt?
2. How are the conditions for learning and training in hospital departments?

Both questions are rather general by nature. The object of this study has been to answer these through an in-depth exploration of the medical activity in two hospital departments (the qualitative study) and by examining the relation between the general working conditions in the different medical workplaces and the communication atmosphere among the physicians working there (the quantitative study).

To answer the first question, it is essential to identify and describe the most important learning institutions in medical practice. One method of doing this is to obtain the physicians’ own descriptions of how they learn and develop as professionals as well as how they train less experienced colleagues. This was the perspective chosen in the qualitative study. In line with the project’s theoretical background, special attention is given to the organisation of the medical activity in order to explore the task environment and identify important learning resources for the doctor.

In order to explore and describe conditions for learning in a complex natural work environment it is necessary to ask what is possible for the less experienced physicians to learn in practice in terms of task partitioning as well as access for observing others, their interactions and tools (Hutchins 1995; Lave 1993). Accordingly, to answer the second
question the learning environment and the general working conditions in the two hospital
departments included in the study are described and barriers to appropriate learning are
identified. Examples of such possible barriers include:

- inadequate access to learning situations
- lack of feedback on work performances
- whether the basis of clinical decisions are not discussed openly
- whether the learning potential of medical mistakes are not utilised

In the quantitative study the relation between the learning environment and the
general working conditions is explored on a wider scale among a representative section of
the population of physicians in Norway.

1.5 Research in a changing time
Since my data was collected in 1993 and 1994 many changes have taken place in and
around the field of research.

During the period three major health reforms have been adopted and which have had
considerable consequences for the organisation of the health services in Norway
(Hellandsvik 2001). First, a complete restructuring of the central health organisation has
taken place involving the establishment of a Directorate for Health and Social Affairs, an
Institute for Public Health, and reorganisation of the Norwegian Board of Health.
Secondly, the takeover of responsibility for all Norwegian hospitals by the state from the
first of January 2002 broke with a more than thirty years’ tradition of hospitals being
owned and managed by the counties. The third major health reform is the regular general
practitioner scheme, which was introduced on the first of June 2001.

During the spring of 1999 Parliament introduced four new acts concerning the
production of health services of which two are of particular interest for this study: the
Specialist Health Care Act and the Health Personnel Act. These new acts replaced the
Hospitals Act and all previous legislation covering professionals such as the Physicians
Act and the Dentists Act. The new Specialist Health Care Act is clearer in its wording in
placing responsibility for the education and training of health personnel on the owner of
the hospital. On the other hand the new Health Personnel Act clearly states the
professional’s responsibility concerning keeping a secure practice. This refers among other
things to the professional’s responsibility to adjust his practice according to his
competence and to refer the patient to a more qualified physician should that be deemed necessary or possible.

The curricula of the four medical schools in Norway vary both in content and teaching methods, but have all undergone major changes during the research period (Pettersen et al. 1997). In 1996, the medical school in Oslo went through a major reorganisation to include problem-based learning. The new medical school in Trondheim established in 1993 is also founded on the same teaching methods. With the exception of the medical school in Bergen there is a tendency towards a stronger integration of preclinical and clinical subjects. Terms with clerkships in local hospitals and in the primary health care system as well as a compulsory thesis are now included in all the four curricula.

However, there is no reason to believe that these reforms so far have resulted in any major changes in how the hospital departments train their inexperienced physicians, or likewise, how inexperienced physicians learn and develop as professionals. It could be claimed that this study deals with matters that are less subjected to change. We may therefore conclude that the perspectives and problems identified in this thesis will be relevant for the learning and professionalisation of physicians also in the years to come.
2 Theoretical perspectives

In this chapter a brief presentation is given of the different theoretical perspectives that have influenced and been applied in this thesis. The intention here is not to give a full account of the perspectives but to focus on some key concepts from these different traditions that become important when medical practice is the unit of analysis.

First, Argyris and Schön’s theory of action perspective and organisational learning which inspired the dissertation’s first paper are presented. Then the perspective of learning as social practice and the apprenticeship approach to learning and training, the main perspectives applied in the qualitative part of the study, are explored and clarified. Finally, the concept of uncertainty in medicine and the different perspectives concerning medical mistakes as is discussed in some key studies in the literature are outlined.

The sections presenting the different perspectives on learning are of a general nature. On the other hand, the parts concerning uncertainty and mistakes, although not exclusive to medicine, highlight some hallmarks of medical practice. These issues have strong bearings on the learning processes and a description of medical practice would not be meaningful without addressing these.

In choosing theoretical perspectives there is always an exclusion of other perspectives. Two important matters have to be mentioned in this regard. Firstly, two classical schools in medical sociology have applied a perspective of socialisation to the study of the education of physicians. Becker et al (1961) did this from a social interactionalist view, while Merton et al. (1957) did it from a perspective of social functionalism. These two classical studies each founded a school for subsequent works on medical culture and the education of physicians. In a perspective of socialisation the focus is on the individual acquiring a set of roles, values and norms. One reason for not going deeper into this perspective was that in this thesis the focus is more on becoming a medical practitioner, not the acquisition of knowledge or a set of roles per se. The second reason for excluding these two traditions is that they both concentrate on medical students and the culture of medical schools in the US.

The second delimitation is related to research on learning from the medical domain itself. Without disparaging this work, it has been found to be of little value to the present study because few of the reports relate to learning in practice and it is difficult to find in-depth descriptions of medical practice per se (Coles & Holm 1993; Davis & Fox 1995;
Fish & Coles 1998). Furthermore, the perspective chosen is often person-centred with less attention given to the social and cultural context in which the learning processes take place.

In relation to the choice of theories see also the presentation of the different perspectives and Section 2.2.6.

2.1 Organisational learning in a theory of action perspective

A new tradition in organisational psychology was established with Argyris and Schön’s “theory of action” perspective (1974; 1978). An underlying premise for this perspective is that all deliberate human action has a cognitive basis. A “theory of action” could, according to Argyris and Schön, be defined as follows: *In situation S, if you want to achieve consequence C, under assumptions a1…..an, do A. Thus, a theory of action is for the agent a theory of control, but which, when attributed to the agent, also serves to explain or predict his behaviour* (Argyris & Schön 1974) p.6.

Argyris and Schön transferred this perspective of individual theory of action to organisations and organisational learning. Within the context of organisations, as for individuals, learning can be understood as construction, testing and reconstruction of theories of action. By exploring the organisation’s theories of action we can evaluate the learning capacity.

Organisational learning is concerned with detection and correction of errors, a continuous adaptation to internal as well as external changes (Argyris & Schön 1978). Individual learning is a necessary, but insufficient prerequisite for organisational learning. Regarding organisational learning, the authors distinguished between single-loop and double-loop learning. Single-loop learning refers to the situation when an error is corrected by modifying strategies and assumptions, but within constant organisational norms. Double-loop learning takes place when an error is detected and corrected in a way that involves a restructuring of the organisation’s underlying norms, policies and objectives. Argyris and Schön referred to single-loop learning as a limited learning process and claim that single-loop learning is fairly unproblematic for most organisations, while they have more difficulties concerning double-loop learning. However, the authors emphasise that these two modes of learning should be regarded as parts of a continuum rather than a binary distinction. A third level was introduced by the concept *deutero-learning*, or “learning to learn” (Bateson 1972). Deutero-learning is to learn from previous contexts of
learning, in order to discover what was done such that the learning process was facilitated or hindered.

In this perspective professional practice is described and analysed with reference to two basic models of interpersonal interaction. The governing variables of Model I are goal-orientated to maximise gain and minimise loss. There is a strong emphasis on rationality and diplomacy with minimal open expression of negative feelings. The governing variables of Model II are valid information, free and informed choices and internal commitment. The norms are learning-orientated; interpersonal relations are experienced as minimally defensive and there is frequent public testing of theories.

Argyris and Schön referred to these models as “theories-in-use”, cognitive maps which, often tacitly, guide our interpersonal behaviour and influence both our long-term effectiveness and capacity for learning. Model I is associated with single-loop learning and limited learning processes since people in this kind of system tend to be unable to reflect and question their own governing theories of action. Thereby, conditions for error in such organisations may be reinforced instead of corrected. One of Argyris and Schön’s main assertions was that this is the prevailing theory since people and organisations alike tend to avoid questioning of their norms, objectives, and basic policies (Argyris & Schön 1978). Empirically, there may be a difference between these “theories-in-use” and “espoused theories”, between what people claim to do and what they actually do. Furthermore, people may or may not be aware of the incompatibility of the two theories (Argyris & Schön 1974).

The strength of this perspective is that it favours organisations with the ability of innovation (Morgan 1988). Another strength is that it contributes to an understanding of how strategic leadership can be used in order to facilitate the organisation’s ability to learn, and to learn to learn. An important drawback is, however, that it is easy to underestimate the hindrances to the development of a learning organisation. Any movement towards more self-government in organisations implies major changes in existing values and attitudes both among leadership and rank and file members. And the protecting forces are strong (Morgan 1988).

In the dissertation these theories were used to evaluate physicians’ communicative atmosphere as a learning environment and to explore the relation of between the physicians’ working conditions on the one hand, and individual as well as organisational learning on the other (see Paper 1).
2.2 Learning as social practice

In this section an outline of the perspectives on learning which have influenced this study of how physicians learn their profession is presented. Again, it is emphasised that the intention is not to give a full account of these theories; rather to point out the most important differences between the perspectives in order to clarify the situated approach to learning and how this differs from the more traditional perspectives.

2.2.1 A conventional approach to learning

Since the fifties the dominating perspective in Western theories of learning has been the cognitive. The introduction of this perspective was a reaction to the behaviouristic approach to psychology and learning, which study human behaviour as relations between stimuli in the environment and responses to these stimuli (Catania 1992). The behaviourists argue that human behaviour is the only available aspect which can be measured and thus studies learning as changes in behaviour. The cognitive perspective, on the other hand, was inspired by a rationalistic view of human activity and the dominating metaphor for human cognition was computer technology and cybernetics (Ludvigsen 1998; Nielsen 1998).

In the cognitive approach to psychology and learning, as opposed to the behaviouristic approach, the focus is on the internal subjective properties of the individual. Man is seen as an information processing system, and what is studied is the flow of information through the cognitive system. The flow begins with information input, a stimulus, either externally or from the person herself, and ends in a human action like behaviour, a decision or a verbal act. A condition for output is that the information is transformed into a mental representation which is stored in the long-term memory (Eysenck & Keane 1990).

Here, learning is seen as an internal process where mental representations change as the individual reflects on experiences. In the next step the person acts on the basis of these new representations. Learning therefore, is a question of internalising information. In the experiments the very object to be learnt is typically symbolic material such as texts or verbal material in the form of speech or instruction (Nielsen 1998).

In the information-processing perspective, studies of learning focus on the mental processes governing establishment, organising/storing and retrieval of knowledge. Generally, these studies were conducted in laboratories. This was not seen as a problem
since a premise in the cognitive perspective is that information processing is context free (Ludvigsen 1998). Rather, the context is seen as an independent variable and not integrated in the cognitive activity, like a “container” for social interaction (Lave 1993), the two phenomena interact at the borders but do not mutually change the character of the other (McDermott 1993). Thus, implicit in the cognitive perspective is a dualistic notion of the relation between the learner and the environment (Nielsen 1998). The environment produces the stimuli, while the information processing takes place inside the individual’s cognitive structures.

2.2.2 Limitations of the traditional perspective

At the end of the 1980s the assumptions that had traditionally been the basis of our understanding of learning as a phenomenon were challenged (Brown et al. 1989; Greeno et al. 1993; Greeno & Moore 1993; Lave 1988). The criticism was twofold: one had its basis in the research on learning itself, while the other came from an epistemological perspective.

From researchers in the field of learning it was claimed that the traditional cognitive perspective on learning had a tendency of placing too much focus on the individual without considering effects of the environment that may have had important bearings on the learning processes. Consequently the individual has been attributed properties which do not belong to the individual but which, rather, should be attributed to the relation between the individual and his or her surroundings (Hutchins 1993). Traditionally, the focus in the cognitive perspective on learning has been on the internal mental processes of the individual while little attention has been given to the social, cultural and historical conditions for these mental processes (Ludvigsen 1998; Østerlund 1996).

From an epistemological perspective the belief that the practice of experts is an activity based on formal and explicit rules was questioned (Dreyfus & Dreyfus 1986). This traditional view of expertise implies, for instance, that practice can be taught scholastically. Critics, on the other hand, claimed that expert knowledge in a professional field is built on tacit, pragmatic and local knowledge (Kvale 1993). This last criticism may

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3 In this thesis the term scholastic refers to the educational system found in schools. Here, the teacher stands in front of the class and the flow of information is predominately one-way, from the teacher to the class, the teacher being the active part.
also be linked to Donald Schön’s “reflection in action” as a primary resource in the development of professional knowledge (Schön 1983). Both the Dreyfus brothers and Schön include tacit and intuitive aspects into our understanding of learning and claim that practitioners’ reasoning and action are much more complex and improvising than the approaches which build on a rule-based approach to learning and cognition. The problem with Schön’s approach and the thinking Dreyfus and Dreyfus have developed is that the exaggerated focus on the individual is maintained so that the social aspects of the learning processes are not integrated (Østerlund 1996).

In the field of medicine, the dominating concept in the discourse on learning during the last decade has been “Life long self-directed learning” (Coles & Holm 1993). Here it will be argued that the same objections brought up earlier in connection with Schön and the Dreyfus brothers also apply to this concept. Drawing on theoretical frameworks of Schön, Nowlen and Cervero the notion of “Life long self-directed learning” emphasises the interplay between a theoretical body of knowledge on the one hand and the experiential knowledge rooted in practice on the other (Jennett 1993; Jennett et al. 1994). Still, the individual is seen as the driving force in the learning process. Consequently, programmes to improve physicians’ learning based on this perspective are typically aimed at the individual physician, and the context of these programmes is separated from practice itself (e.g. simulated patients, peer and self review, the adaptation of medical informatics tools).

### 2.2.3 A situated approach to learning

As a critique directed towards the traditional individualistic approach to learning researchers have tried to establish a theory of learning integrating the social, political and historical conditions of the learning processes. Based on the argument that persons acting and the social world of activity cannot be separated, this situated perspective attempts to transgress the dualism of conventional learning theory (Lave 1993; Nielsen 1998). Instead, the focus is on the relational interdependencies between persons, their actions and the world where the activity takes place. Thus, this perspective is designated a relational approach to learning. In the situated perspective, knowledge and learning will be found distributed among human and non-human resources in the situation. It cannot be isolated to the head of individuals, but lies instead in the relation among persons, their actions and the social environment. It is the interaction in the situation that determines what is learnt (Vygotsky 1978).
A situated approach to learning originates from the school of thought referred to as theories of social practice (Chaiklin & Lave 1993). Here, social practice is viewed as the single encompassing theoretical entity where agent, activity and the social world mutually constitute each other. Learning is seen as an integral aspect of all forms of practice, and thus subsumed under practice (Lave & Wenger 1991). The term “situated” derives from the word situation and refers to the idea that in order to fully understand the learning processes, learning must be seen as integrated in social practice with all its human, technical and organisational aspects.

According to Lave and Wenger learning takes place as participation in historically produced communities of practice which they define a set of relations among persons, activity and world, over time and in relation to other tangential and overlapping communities of practice (Lave & Wenger 1991) p. 98. The participants in a community of practice share a common understanding of what it means to be a member of the community and are mutually dependent on each other. This distinguishes communities of practice from other parts of society such as membership in a political party or any organisation which does not involve any obligations. Further, cross-contextual structures relate a community of practice to other communities. Accordingly, what happens in one practice is part of practices elsewhere, and this enables individuals to move in and between communities of practice (Østerlund 1997).

Due to changes in the environment as well as on-going internal reproduction processes, a community of practice needs to be continuously negotiated and renegotiated. The processes of learning must be seen as part of this activity of maintaining and transforming the community (Lave & Wenger 1991; Nielsen 1998). Here, we arrive at a fundamental contradiction inherent in social practice: the successful reproduction of a community of practice involves both newcomers’ increasing participation towards full membership and the replacement of old-timers. This inevitably results in tensions and conflicts, especially concerning questions of power, meaning and value. Accordingly, there will be forces that support processes of learning as well as those that work against them (Lave & Wenger 1991). This question will be returned to when going deeper into issues of learning in apprenticeship in the next section.

Thus, from the narrow focus on the mental representations found in the traditional approach to learning, in the situated perspective the unit of analysis is the relations and the different learning situations in which the individual engages. When learning is seen as
inseparable from the social world where it takes place, apprenticeship becomes a historically organised institution for learning important to address.

2.2.4 Apprenticeship

In everyday language apprenticeship denotes a traditional form of education where apprentices learn while taking part in the production in a certain craft (Nielsen & Kvale 1997). The traditional European apprenticeships of the guilds were frequently based on written contracts stating the mutual obligations for both master and apprentice. When the relationship ended after several years the apprentice received an official accreditation by the guild. On the other hand there are less formalised apprenticeships based on verbal agreements or up to the point where the apprentice more or less grows up with the trade (Lave & Wenger 1991). While apprenticeship is traditionally associated with the crafts, it takes place in a variety of fields from the training of concert pianists (Nielsen 1998) to the cultivation of Nobel laureates (Kvale 1997).

There may be reason to ask to what extent this traditional form of education produces a relevant perspective for studying learning in a high-technological era. The strength of apprenticeship as a perspective for studying learning is that it captures learning as an aspect of any activity, not something practised separately from everyday life, for example in schools or while attending courses, or reading literature. Hence this perspective breaks down the distinction between learning and doing, between education and occupation (Lave 1997).

In this dissertation, the term apprenticeship is used in two ways. Firstly, as a theory of situated learning. Secondly, apprenticeship is used as a metaphor to describe the asymmetrical relationship between master, in this case an experienced medical practitioner, and apprentice – a less experienced physician.

2.2.4.1 Apprenticeship as a theory of situated learning

As a theory of situated learning, the apprenticeship perspective is applied in a decentred way (Nielsen & Kvale 1997). This means that learning is seen as participation in communities of practice as described by Lave and Wenger, accounted for above. The centre of attention is not the relation between the master and the apprentice but rather how knowledge and learning is embedded in the professional community with its human and technical resources of which the master is a part. A decentered approach to apprenticeship
takes the focus off the master as a source of expertise and focuses instead on the ongoing processes of knowledge transfer from the more experienced to the less experienced in the community.

Lave and Wenger (1991) introduce *legitimate peripheral participation* as an analytical viewpoint on learning, stressing that learning is inseparable from the process of becoming a member, a certain skilled “person-in-the-world”. The construction of an identity on the one hand and acquiring knowledge and skills on the other must be seen as two processes mutually constituting each other (Nielsen 1998). Learning in this perspective is about changing participation in the community. Thus the participants’ relation to the community varies from newcomers’ peripheral participation to old-timers’ full participation. When an apprentice has a legitimate peripheral position, he has the opportunity both to observe and participate in practice. It is by participating that the apprentice becomes part of the community of practice and thereby develops knowledge, skills and a professional identity.

When learning is seen as an aspect of the daily activity in a community of practice with its conflicts and tensions, forces facilitating learning as well as those working against them become important to address. Here, *access* to learning situations is a significant analytical tool focusing upon which of those daily activities in which the novice can participate. Being a legitimate peripheral participant implies that one is accepted as a learner, but this does not mean that one has access to all that membership entails (Lave & Wenger 1991). Access will depend on several factors ranging from the formal organisational to the more informal interpersonal relationships. Organisational conditions usually produce the same access for everyone at a given level. Informal relationships, however, differ between individuals. Access illuminates that both control and selection of newcomers take place.

During recent years, an increasing number of researchers in the tradition of situated learning have referred to learning in terms of *trajectories of participation* (Lave 1997; Nielsen 1997; Nielsen 1998; Østerlund 1997). Trajectories of participation make it possible to single out learning as a certain kind of participation (Nielsen 1998), a certain movement in practice. Trajectories are part of all changing communities of practice as social institutions arrange trajectories or channels for moving through them (Lave 1997). But, according to Lave *learning is possible only where possibilities for moving in trajectories with respect to existing practice exist in local practices for given participants* (p. 148). In other words, certain conditions have to be fulfilled in order for learning to take place.
Nielsen and Kvale (1999) distinguish between different kinds of trajectories. *Personal trajectories* refer to a person’s participation across different contexts and which the person constructs as his personal trajectory. The concept entails both a person’s practice in a particular period and the compounded practice in the person’s life. An example of a personal trajectory is a physician’s story of how he became a specialist in a certain medical field, a story which may include experiences in other medical specialities which he eventually chose to leave, delays in his training and so on. *Institutional or societal trajectories* are the institutionalised or societal organisation of one or more channels in a particular social practice that the participants are expected to follow in the construction of their own personal trajectories. An example of the latter is the organisation of physicians’ postgraduate medical education.

### 2.2.4.2 The master–apprentice relationship

A more person-centred approach to apprenticeship focuses the relation between the master and the apprentice and the transfer of knowledge in the relation (Nielsen & Kvale 1997). Whilst the master does not have to be the most senior professional in the community, the relation is characterised by an asymmetrical distribution of knowledge and skills. Below I will briefly mention some central concepts that allow us to further interpret the subtleties in the dialogue between the master and the apprentice.

The *proximal zone of development* designates the distance between the problem-solving abilities of a learner working alone, and the potential development the learner may reach when collaborating with more experienced colleagues (Bråten & Thurmann-Moe 1996; Vygotsky 1978). Initially the apprentice requires support to be able to carry out the tasks, but when the activities are repeated sufficiently under guidance the learner will be able to solve the problems alone. Through collaboration the learner is guided towards higher developmental levels. In this perspective transfer of knowledge is not something which is transmitted directly from “head to head”, but takes place in a social practice. The support provided by the more experienced person to the learner in the proximal zone of development is often referred to as *scaffolding* (Bråten & Thurmann-Moe 1996). Here, it is important that the novice himself is allowed to construct the knowledge. By way of suggestions the master should build a kind of cognitive support for the learner to develop in. Over time this scaffolding will gradually be integrated as the learners own ways of thinking.
Transparency is another useful concept introduced by Lave and Wenger (1991). When the master makes the underlying reasons for his decisions transparent, he makes it possible for the apprentice to understand the tasks in the same way as he does. Transparency has to do with access to understanding, and illuminates aspects of quality in the learning situation. The level of transparency varies with the degree of reflection over the activities taking place, the manner in which it is reflected, and the topic that is the subject of reflection. A learning situation which has a potential zone of development must be realised by the persons taking part in the situation: here transparency is an important hallmark.4

2.2.5 Distributed cognition

The idea of socially distributed cognition follows a decentred perspective on apprenticeship as well as a relational approach to learning. The idea is based on the fact that in complex work environments no one individual has enough information to solve the problem: knowledge sources must therefore cooperate to do the job (Cicourel 1990). Consequently, the knowledge necessary to carry out the tasks may be distributed over various personnel groups as well as procedures, technical equipment and architectural resources. The division of labour is a clue to the study of how knowledge is socially distributed (Hutchins 1995).

Health care delivery is characterised by both social and cognitive complexity and thus ideal for studying distributed cognition. Cicourel (1990) has described medical decision-making in terms of knowledge networks where physicians and other health care providers cooperate to solve medical problems. Physicians routinely consult other physicians concerning medical diagnosis and treatment. This collegial dialogue is shaped by organisational structures as well as the experiences and expectations the physicians have of each other. In the course of this social discourse, interpersonal networks are established which constitute important resources in the learning processes. Such a network may consist, for example, of an internist, a radiologist, and a pathologist, and is founded in the

4 In Lave and Wenger’s book Situated learning (1991) the meaning of transparency for the learning process is exemplified by the use of tools and technology in practice. Here the term “transparency” refers more to the decentred perspective on apprenticeship. In this thesis however, transparency is used first and foremost to illustrate how the learner’s access to understanding varies with the openness of the master’s reasoning, and further to illuminate the role of language in the learning process.
cognitive division of labour in the profession. The quality of health care delivery as well as the quality of the learning processes will depend on these networks which is embedded in the medical practice characterising the individual hospital.

From the notion of knowledge and cognition as being socially distributed, it follows that knowledge may have collective as well as individual properties. The sum of knowledge represented by people, tools, procedures and architecture constitute the community’s collective knowledge base to which individual learners may have or may not have access. In his descriptions of naturally situated systems of cooperative work Hutchins elaborates these aspects (Hutchins 1993; 1995).

Hutchins points to the fact that the organisation of the activity decides how novices go about learning their tasks. He describes how novices learn the skills of navigation in interaction with more competent colleagues in the navigation team by first mastering the simpler tasks before moving on to those of a more complicated nature. Consequently, an experienced officer knows not only how to perform his job, but also masters the simpler procedures in the system. Accordingly, a navigation team constitutes a system of overlapping expertise since it involves more knowledge than absolutely necessary to solve the tasks. The knowledge on the simpler levels will be more redundantly represented than that of the more complicated ones.

The overlapping expertise produces the possibilities of learning through the observation of more competent persons and through the detection and correction both of one’s own errors and those of others. In this way the overlapping expertise allows for learning without jeopardising the safety of the activity, which is particularly important in activities involving great risk, like the navigation of a large naval vessel, or in health care delivery.

The learner’s horizon of observation is another useful concept from Hutchins’ fieldwork on navigation. The horizon of observation refers to the proportion of the task environment that is available as a learning context and is defined as the outer boundaries of the portion of the task that can be seen or heard by the team member (Hutchins 1995) p. 268. Further, the perspective of distributed cognition allows for descriptions of knowledge being distributed in procedures and tools, and whether these are open or closed in relation to learning. The design of a tool may decide its suitability for joint use or demonstration and influence the possibilities for learning in the situations where it is in use. Consequently, for the learner the quality of the learning context is decided by the openness of tools, procedures and reasoning in relation to the ongoing activity.
2.2.6 Some critical remarks and the application of these theories in the dissertation

In the information processing perspective research typically took place in laboratories and the focus of analysis was what goes on inside the mind of the learner. With a situated approach to learning the focus is shifted to the social relations and the situations in which the individual is involved, and accordingly the study has to take place in or close to real life.

One of the advantages of the perspective of learning as socially situated practice is that it captures learning as participation in complex and changing social environments. When learning is seen as socially situated, identity, meaning and power are in focus because learning implies becoming a kind of person. This is a perspective suitable for analysing learning a professional practice and may be particularly suitable for analysing learning as an aspect of the on-going activity of a hospital department as is the situation for postgraduate medical learning.

But regarding learning as socially situated also presents us with some major questions. One criticism of the perspective of situated learning is that when learning is seen as an aspect of all social activity, and not a way of participation in its own right, there is a danger that everything becomes learning. As a result, we end up in a situation where learning as a phenomenon is erased by social practice (Lave 1997; Nielsen 1998).

Lave has addressed this problem in an article from 1997. The solution she suggests is to discuss learning in terms of trajectories of participation (see Section 2.2.4.1.). The new interest in learning trajectories in this tradition introduces a notion of movement in a direction of becoming more of something, and reduces the kind of changes in the learners on which the researcher should focus. Hence, trajectories of participation may at least be a partial solution to this problem.

In the dissertation, the perspective of learning as socially situated practice was used to identify important learning institutions in medical practice and describe how physicians go about knowing what they know. Further, central concepts from this tradition were applied to analyse the two hospital departments included in the study in terms of learning environments. The problem of dissolution of the concept of learning accounted for above was not experienced as a difficulty in this study as it is based on the physicians’ own descriptions of how they learn, or how they teach other physicians medical practice.
Accordingly, to a certain extent it was up to the physicians to define what was learning, and what was not.

2.3 Uncertainty in medicine

2.3.1 The inherent uncertainty of medical practice

Uncertainty permeates social life, but pertains especially to medicine where decisions may concern life and death. For the physician, the burden of uncertainty is a natural and inherent part of medical work (Gerrity et al. 1992; Hupert et al. 1996; Kalf & Spruijt-Metz 1996; Marjoribanks et al. 1996). Gorovitz and MacIntyre (1976) have attributed this uncertainty to the fact that medicine is a science of particulars. Accordingly, it is impossible to make conclusions about clinical situations based on general theory. This is in line with the theoretical perspective presented in this study which sees expert knowledge in a professional field as built on local and pragmatic knowledge and that practice is the main source of professional development (Dreyfus & Dreyfus 1986; Kvale 1993; Schön 1987).

The phenomenon of uncertainty borders the edges of scientific knowledge and thus paradoxically grows parallel with the rapid growth in technology and science (Gerrity et al. 1992). Hence, uncertainty in medicine seems to be more topical than ever before. During the last twenty years or so we have witnessed great scientific and technical accomplishments in the medical field. Consequently, medicine increasingly appears as a scientific domain (Wu 2000), and this easily veils the fact that a certain degree of uncertainty is always present in a clinical event. At the same time public access to medical information has increased and the status of physicians has declined somewhat in line with the changing character of authority in our society. As a result, the public’s demand for medical infallibility has increased and the burden of medical uncertainty seems to have grown correspondingly (Gerrity et al. 1992; Jain & Ogden 1999).

2.3.2 Learning in an uncertain field

The medical practitioner is dependent upon his patients believing in what he is doing and, most likely, he is dependent upon believing in it himself. Learning to master the uncertainty inherent in the field of medicine is a premise for functioning as a doctor in clinical work. Consequently, uncertainty, and more specifically, the handling of
uncertainty in practice, is a central part of learning the profession of medicine (Light 1979).

In their study of student physicians Fox et al. (1957) define three sources of medical uncertainty: imperfect mastery of available knowledge; limitations in current medical knowledge; and (deriving from the first two) a difficulty in distinguishing between personal ignorance or ineptitude and the limitations of current medical knowledge. All three sources of uncertainty have to do with indeterminacies of knowledge, the more social aspects of the practitioner’s activity are not incorporated into this analysis. However, both Fox and later researchers noted that as clinical responsibility grows, training for uncertainty becomes training for control. Accordingly, the different rituals and institutions involved in coping with clinical uncertainty became the focus of interest when studying doctors in clinical situations (Atkinson 1984; Bosk 1980; Light 1979).

Building on Fox’s work and other studies of professional training, Light (1979) focused on how the inexperienced physician seeks to assert his personal mastery by establishing a dominant relationship with patients, acquiring personal experience and focusing on technical expertise. Furthermore, taking refuge in specialising and adopting a school of thought are, according to Light, ways of mitigating the indeterminacies of medical knowledge. Bosk (1980) argued that occupational rituals to deal with uncertainty in patient management have an important function in allowing physicians to discuss their problems concerning medical work. Being more on the critical side in describing similar social phenomena, Mizrahi (1984) focused on the potential negative aspects of these coping mechanisms, both with regard to denying uncertainty present in the clinical situation and in denying responsibility for any mistakes committed.

Control can only be attained by reducing uncertainties. Thus, Light (1979) argued, fields in which uncertainties are greatest have ways of making their students less aware of them. Referring to Thomas Kuhn (Kuhn 1970), he employed the concepts of paradigm development and paradigm strength to account for the different manners by which uncertainty, and thus training for control, are expressed in the various medical domains. Paradigm development relates to the degree to which there is consensus among practitioners about the theory or paradigm underlying their work. Paradigm strength relates to the degree to which it is possible to explain the phenomena it addresses. The weaker and less developed the paradigm, the more rigorous the measures taken to reinstate the feeling of control in the students. Here, Light used psychiatry and surgery as two
examples contrasting in paradigm strength, but to a lesser degree contrasting in paradigm development.

In a critique of the idea of uncertainty in medical sociology, Atkinson (1984) claimed that the significance of uncertainty is over-emphasised in studies of medical education and argued that physicians’ professional learning was marked by a training for control. According to Atkinson certainty and uncertainty reflect two qualitatively different versions or approaches towards knowledge and action which may be adopted in different situations for different purposes. Rather than seeing certainty as the medical practitioner’s response to a difficult clinical situation, Atkinson claimed that uncertainty and certainty should be seen equally as features of the social construction and definition of medical discourse.

2.4 Error in medicine

In the literature, medical uncertainty and medical mistakes are largely treated separately. Here however, it will be argued that it is important to see the two phenomena together, as they are strongly interrelated. Medical mistakes, at least those concerning errors of judgement, can be seen as the manifestation of the negative potential hidden in the uncertainty in the situation. How medical mistakes are dealt with in the professional community says much about the extent to which the communication atmosphere in the department invites an open discussion of risk and uncertainty (see Paper 1 and 4).

In real life there will often exist a continuum in a situation of uncertainty between the right medical decision and a decision that results in a medical failure. Hence, only the experienced clinician has the knowledge and status to define what is an error and what is a matter of a personal approach or taste (Bosk 1979; Light 1979). This grey zone surrounding the concepts of medical uncertainty and medical mistakes, as well as the personal nature of clinical judgement, may give room for manipulation.

2.4.1 Technical and normative errors

From his fieldwork among the surgeons of a large teaching hospital, Bosk (1979) described the management of medical failure using the concepts technical and normative errors. Technical errors refer to failure to apply the body of theoretical and practical knowledge on which professional action rests. Normative errors are failure to follow codes of conduct – a violation of the often tacit working understandings governing the medical activity. This could be, for instance, failure to inform one’s attending of unexpected changes under his
jurisdiction, not showing interest or not doing one’s best. But Bosk also observed that technical errors may turn normative if the physician fails to learn from his mistakes.

According to Bosk, errors of conduct in the professional community are considered to be by far the most serious. To explain, he refers to the inherent uncertainty of medical practice. In case of failure, whatever the reason, the practitioner’s best defence is that he did everything possible, implying that he did everything any other physician could have done in the same situation and that error was due to the inherent uncertainty in the situation. But “doing everything possible” also implies recognising problems transgressing the individual doctor’s skills and to route these problems to a proper expert in the field. In this way, the primacy of moral behaviour becomes a guarantee for high-quality technical care.

2.4.2 Professional control versus professional denial

A part of the Harvard medical practice study highlighted the climate of malpractice in the US and the physicians’ responses to this climate (Hupert et al. 1996; Marjoribanks et al. 1996). The study consisted of interviews with 47 physicians from the fields of general surgery, obstetrics and internal medicine and a review of hospital case records to identify adverse events. The study is an interpretative analysis of the physicians’ discourse in relation to malpractice and the definition of medical mistakes and negligence.

The interviewed physicians defined medical mistakes by reference to the inherent uncertainty of medical practice and discriminated between a mistake on the one hand and negligence on the other. They regarded intent and moral culpability for patient harm as necessary conditions to identify an error as negligence. In line with Bosk’s findings, the moral conduct of their colleagues was decisive for whether they saw them as “bad” doctors or not. However, the authors argue, this very narrow definition of negligence easily results in a “no fault” system, in which the physician is very rarely seen as responsible for medical injury (Hupert et al. 1996).

The authors claim that professional hegemony in defining medical competence and malpractice is challenged both by the legal discourse on error and negligence and by the formation of specific practice standards formulated by parties outside the profession. One of the intentions of the medical malpractice tort trial system is to deter future negligent acts by physicians. But the Harvard medical practice study indicates that doctors do not see the
legal system as having the moral authority, and even less so, the medical understanding to guide medical practice.

**2.4.3 Safety – person failures versus system failures**

Influenced by perspectives on safety in risk-intensive enterprises, other studies of medical mistakes have focused more on situational aspects and the error being just a manifestation of a larger system problem (Cook & Woods 1994; Reason 1990). The basic premise in the system approach is that humans are fallible. Consequently error is inevitable no matter how well organised the activity. This differs from the more person centred approaches dealt with above where errors are treated as moral issues.

In the system approach it is argued that we tend to exaggerate the importance of active failures, i.e. unsafe acts committed by individuals directly involved in the situation (Reason 1990). These are the unlucky individuals operating at the sharp end (Cook & Woods 1994). The system failures, the latent conditions closer to the blunt end of the system, are often visible only when they are combined with an active failure. Therefore they are often ignored even though they need to be identified if the cause is to be eradicated.

An adverse event is usually a combination of an active failure and a latent condition as these two sets of factors act as holes in the defence system. Since it is impossible to eliminate human errors, a system approach to error management will seek to create systems that have a greater tolerance of error occurrence and which can contain their damaging effects. Accordingly, defence mechanisms such as procedures, alarms or physical barriers, are key issues (Reason 2000).

**2.4.4 Error in a distributed cognition perspective**

In a situated approach to learning, errors and learning from errors in a community of practice is not a central issue, or at least the issue is not often discussed explicitly by researchers in this tradition. However, from the perspective of distributed cognition, Hutchins’ work on learning to navigate on a large naval vessel gives us some interesting clues (1993; 1995).

Hutchins points to the fact that in natural systems of cooperative work recovery from error is not always instructional in intent or consequence. Sometimes, the correction is
simply necessary to fulfil the task. But, error-correcting strategies often involve detection of the source and an explicit demonstration of the correct performance, where the demonstration may be the performance required to get the job done. Nevertheless, in both cases, error detection and correction is part of the on-going activity.

Concerning individual learning, it is often said that we learn from our mistakes. But how does this really come about? Again according to Hutchins (1995), by detecting and correcting an error the person may gain new insight into the nature of the operation. In other words, the mistake elucidates the knowledge and skills which were required to solve the problem and which may not be apparent from the correct performance alone. Furthermore, we learn from exploration of the solution space or what is popularly referred to as learning by trying and error. Here, what is learnt is also error detecting and correcting skills. Last but not least, through the labelling of errors technical and moral standards in the community become transparent for the learner (Bosk 1979; Lave & Wenger 1991).

In collaborative work, people also learn through observing the mistakes of others. Where the task performance is inside the horizon of observation of several persons, an error and the processing of its consequences may provide a learning context for several people (Hutchins 1995). Here, in line with the system approach presented above, a mistake represents a precious possibility to correct latent errors in the organisation and may thereby become a source of collective knowledge and organisational learning (Argyris & Schön 1978; Cook & Woods 1994; Reason 2000). But a prerequisite is that the error is discussed in the collective fora of the organisation in all its aspects, a fact which for several reasons is difficult to fulfil in many systems.

As in the system approach, error management becomes an important issue in the distributed cognition perspective. Because error is inevitable, it is essential to create a learning environment where it is safe to err without jeopardising the activity. Accordingly, the activity should be organised to facilitate the discovery and correcting of errors, and learning from errors that occur should be facilitated in order to prevent them from reoccurring. The overlapping distribution of knowledge and the individual learner’s horizon of observation are important concepts in this regard (see Section 2.2.5).

2.4.5 Application of these theories in the dissertation

The perspectives on medical uncertainty described above were used to reflect upon the physicians’ descriptions of their work. In so doing, decisions concerning diagnosis and
treatment and the safety of the activity were put into focus. Further, the different perspectives on medical mistakes were applied to discuss the processing of adverse events in the two hospital departments. The question of whether medical mistakes were utilised as learning situations both on an individual and a collective basis was also raised.
3 The study

3.1 The evolution of the study

In this section the evolution of the study, the application of theory and the organisation of the results are briefly discussed in order to elucidate the motives for the main choices in the research process.

The planning of the quantitative part of the study and the collection of the quantitative data took place prior to the start of the qualitative part. Still, to a large extent the quantitative and the qualitative part of this study have been conducted parallel and thus have influenced and enriched each other.

Theoretical perspectives on organisational learning and organisational culture inspired the making of the ICAP inventory and the analysis of the quantitative data. In the first paper these perspectives were applied to explore the relation between general working conditions and the learning environment in various parts of the Norwegian health care system.

In the qualitative part of the study, working with the physicians’ descriptions of the medical activity in the hospital and how they learnt and developed as professionals, the theoretical perspective of the first paper no longer felt appropriate. A natural starting point was to describe the basic traditional learning institutions in medicine and to analyse the knowledge transfer that took place in the situations described. Here concepts from a social/relational approach to learning, especially concepts accounted for in section 2.2.4.2, the master–apprentice relationship, became helpful analytical tools.

In the second qualitative article (Paper 3) the focus is turned on the context for learning, the learning environment, and a description of the conditions for learning in Norwegian hospital departments. In this connection the decentred approach to apprenticeship and distributed cognition were perspectives which proved to illuminate this material well (see Sections 2.2.4.1 and 2.2.5).

The qualitative study produced a large quantity of both illustrative and revealing descriptions of the medical practice in two hospital departments. In the process of working with the data the primacy of the inherent uncertainty of medical activity and the inevitability of adverse outcomes stood out as hallmarks of medical practice which were important to address. Both characteristics evidently strongly influenced the learning
processes of the physicians taking part in the activity. These issues are examined in Paper 4 where a social/relational approach to learning again is chosen as the analytical perspective.

In the quantitative part of this study the aim was to reach at the respondents’ perception of the communication atmosphere among physician colleagues. Further, in the statistical analysis aspects of the working environment such as perceived stress and autonomy were included in order to estimate the effect on the communication atmosphere. It is possible to see this as a factorised idea of reality. In the qualitative part on the other hand, the aim was to collect information on the medical practice in the two departments and the relations between the participants in this practice in order to study the learning that took place. Thus, even though individual physicians were interviewed, this part of the study is based on a more holistic idea of reality.

3.2 The quantitative part

3.2.1 Material

3.2.1.1 The 1993 Survey on Physicians’ Health and Welfare

In 1992, the NMA started a comprehensive research programme on physicians’ health, sickness, working and living conditions. Similar, but more limited studies had recently been made in the other Nordic countries (Engsig et al. 1990; Hellström 1993; Kumpusalo et al. 1991; Neittaanmäki et al. 1993; Sveriges läkarförbund 1988; Vartiovaara 1988). The core of this programme was the 1993 survey in which 9266 practising physicians received extensive questionnaires about their health, sickness, working and living conditions (Aasland et al. 1997; Aasland & Falkum 1994). The survey contained one primary (questionnaire A) and 15 secondary questionnaires. The primary questionnaire included all necessary demographic and background information, plus retrospective information on sick leaves and some central psychometrical instruments. The remaining questionnaires were organised thematically. All physicians received the questionnaire A and three secondary, of which at least one should be questionnaire B, C or D, since these dealt specifically with work conditions, and not more than one should be F, G or I, since these questionnaires all contained personality inventories.
3.2.1.2 Sampling

The sample was randomly drawn from the register of the NMA which comprises more than 90% of the physicians in Norway. By March 1993 there were 11,367 active members of the NMA (excluding students and retired physicians). Two groups were further excluded, the 101 used for pilot trials, and a random sample of 2000 who were invited to take part in a prospective study.

3.2.1.3 Demographic characteristics

The overall response rate was 72%. Age of the respondents ranged from 24 to 70, with a mean of 42.5 years. The substantial gender difference in the population of physicians in Norway was reflected among the respondents, 29.1% were females and 70.9% males. There was an overrepresentation of women (response rate = 80%) and an under-representation of specialists in private practice (response rate = 50%). Apart from this bias the sociodemographic characteristics of the respondents were representative for the population of physicians in Norway.

The fraction of recipients that did not respond at all was 23.5%. In addition 4.4% wrote back and said they did not want to participate for various reasons, the most prevalent being lack of anonymity and lack of time. The item response rate ranged from 66.8% to 73.3%, with mean 70.5% and SD = 2.1.

Most of the data in the quantitative part of the study were included in questionnaire C, which covered organisation of work an work environment. 2628 physicians returned this questionnaire (response rate 72.8%).

3.2.2 Method

3.2.2.1 Questionnaire design

Questionnaire C included twenty statements about the communication atmosphere between colleagues (ICAP, Appendix 1). They described the prevalence of mutual acceptance and encouragement, openness and dialogue, ambition, competition, and generosity in the respondent’s working environment. The twenty statements were selected from a much larger pool of statements which was produced on the basis of core findings in organisational research (Argyris & Schön 1974; Argyris & Schön 1978; Schein 1985; Schein 1990), on findings in a survey of learning during internship (Akre et al. 1992;
Akre & Vikanes 1991; Vikanes et al. 1992), and on personal experience of members of the research team.

The total pool of statements was presented to a small number of experienced colleagues working in surgical and internal medicine departments, in general practice, and in health administration and research. Through discussions with these colleagues we agreed on the statements most suitable for the present project.

Doctors working daily with colleagues were asked to say whether they agreed or disagreed with the statements. The response categories were completely untrue (scored 1), mostly untrue (2), partly true (3), mostly true (4), and completely true (5). To avoid systematic error based on yea- and nay-saying (see next section), some statements in the ICAP describe the communication atmosphere in positive terms, whereas others are negatively phrased.

### 3.2.2.2 Statistical analysis

**Reliability and validity**

A reliable measure is a consistent and repeatable measure. Reliability is inversely related to the amount of random error in the measurement process. A measure may be consistent and repeatable although it does not concern what it is intended to, i.e. a reliable measure is not necessarily a relevant or valid measure. However, if items do not represent anything systematic, they cannot represent the concept they are intended to measure. Thus, reliability is a necessary, but not a sufficient condition for validity (Hellevik 1991).

Whereas the reliability of a measure is related only to the amount of random error, the validity is related to the amount of both random and non-random or systematic error, i.e. the difference between reliability and validity depends upon the systematic error element in the measurement process.

In a cross-sectional study like the present, reliability estimations focus on the internal consistency among the items. When a concept is measured by two or more indicators at a single point in time, each indicator is considered an equivalent measure of the concept. The early so-called “split half”-methods for estimation of reliability divided the indicators into two halves, and the correlation between the halves was considered a measure of the internal consistency among the items. Later, the arbitrariness of these methods led psychometricians to develop more refined procedures. The most widely used of these is Cronbach’s alpha, which equals the average of all possible split half correlations. The
coefficient varies between 0 and 1, and increases both by increasing correlations and number of items. Cronbach’s estimation of reliability has been applied in the present study.

An example of systematic error is *response sets*, that is when respondents answer in a particular manner, irrespective of item contents. Yea- and nay-saying are perhaps the simplest and most frequently occurring response sets. Others may be more complicated expressions of perceived social desirability. Systematic error also exists when a set of items measures a theoretical concept different from the intended one. Systematic or non-random error produces reliable, but invalid measures. Thus, detection of systematic error is a basic element in validity estimation.

*Factor analysis*

Factor analysis is a useful instrument for estimation of the systematic components of the observed variance, i.e. the variance accounted for by the true scores and the non-random errors. Factor analysis cannot differentiate between the factors representing theoretically meaningful concepts and those representing systematic error. Such differentiation is a theoretical task.

As a statistical instrument for the assessment of internal associations among indicators, factor analysis assumes that underlying dimensions (factors) can be used to explain complex phenomena. The identified factors are not directly observable, but are based on a set of observable variables. The number of factors is intended to be smaller than the number of observed variables. A variety of factor analysis models exist. In the present study a principal component analysis has been applied to assess internal consistency and content validity.

In a principle component analysis the number of extracted variables normally equals the total number of items in the analysis. The first few factors account for most of the common variance between the items. When a correlation matrix of the items has been prepared, the principal component analysis forms linear combinations of the observed variables, and the first principal component is the combination accounting for the largest amount of variance in the sample. The subsequent components explain progressively smaller amounts of variance.

A central problem in using this method is to decide on the number of factors which should be further analysed and interpreted. When standardised scores are applied (the default procedure in principal component analysis), a basic criterion is that to be interpreted, the factor variance must be greater than 1, since each variable has a variance of
1. The statistical association between a factor and a variable is expressed by the factor loading which can be interpreted as the correlation of the variable with the factor. If the factor variance (the sum of the squared loadings for all the items) is not greater than 1, the factor is not better than a single variable. Most often, the number of meaningful factors is smaller than the number of factors with variances above 1.

In our case the principal component analysis favoured a unidimensional description of the communication atmosphere among the respondents.

Multiple linear regression analysis

The hypothetical associations between the ICAP and a set of independent variables were examined by multiple, linear regression analysis.

Figure 1 illustrates the general meaning of the regression coefficient $B$. $B_1$ indicates the change in the dependent $Y$ for one unit change in the independent variable when there is only one independent variable, and determines the slope of the straight line.

![Figure 1 Graphical illustration of the meaning of the regression coefficient B in an equation with one predictor X (Y=B₀+B₁X+e)](image)

The variance of the dependent variable is assumed to be constant for all values of the independent, and the association between the dependent and the independent is assumed to be linear. $B_0$ is the theoretical estimate of the dependent when $X=0$, whereas the $e$ term is often called the error or disturbance. Since independent variables are measured in different
units, the B coefficients in equations with more than one independent cannot be taken as indicators of the relative importance of the independent variable.

In the present study, after reversing the coding of the items marked with a footnote in Table 1, the sum score of all items in the ICAP was used as the dependent variable in a multivariate linear regression analysis in order to estimate the predictive values of gender, age, workplace, medical speciality, perceived stress and autonomy. Perceived stress was measured by four questions about speed demands, pressure, number of tasks and concentration problems throughout the working day (Cronbach’s alpha=.83). Autonomy was measured by six questions about the extent to which the respondent could decide about his own working speed, order of tasks, work organisation, plans and taking days off (alpha=.83). The differences between hospital and non-hospital physicians in Norway are more profound than the differences between the various medical work settings outside hospital, we therefore chose to dichotomize workplace into hospital versus non-hospital physicians.

Ideally, the variables included in a linear regression analysis should be measured on the interval level, whereas the dependent ICAP variable and some of the independents in the present study are measured on the ordinal level. However, even though we cannot assume that the distance between neighbour categories on an ordinal scale is constant, there is agreement that linear regression analysis is quite robust and applicable even when slight violations of assumptions, like the present, occur. In such situations, the results of the linear regression analysis should be controlled, using non-parametric methods.

Furthermore, in the present study some independents are measured at the nominal level. These have been transformed because no assumptions can be made about relations between values. Each value defines a distinct category, and serves merely as a name. The transformation of these variables implies that one of the labels is used as a reference category, and the rest of the categories are represented by so-called dummy variables. The reference category is always scored 0, whereas the dummy variable is scored 1. Thus, the nominal variable is transformed to a set of interval variables with only one interval (0-1). When a dummy variable is included in a regression equation, it shows how much the value on the dependent variable for respondents in the dummy category deviates from the corresponding value for respondents in the reference category.
3.2.3 Ethics

The 1993 Survey on Physicians’ Health and Welfare was approved by The Data Inspectorate.  

3.3 The qualitative part

3.3.1 Designing the study

3.3.1.1 Own fore-understanding

My own fore-understanding derives from my own background as a physician and the personal experiences I have of medical practice and learning on the one hand, and my theoretical knowledge of learning and related issues on the other.

According to Gadamer, a certain number of preconceptions are always present and even necessary for the understanding of a text or a phenomenon. The process of interpretation is in essence a process where preconceptions are replaced by more suitable ones (Gadamer HG 1989). The responsibility of the researcher is to make an effort to become aware of these prejudices (Malterud 1996) and to be able to reflect on them.

My background as a physician has obviously influenced my own fore-understanding. At the same time, for me, it is just as obvious how these fore-concepts have been ground and changed while trying to reach at an understanding of the phenomena encountered in this material.

I started out on this venture with a political motivation. By this I mean that I aspired to change a system which I saw as anachronistic and dysfunctional regarding learning. However, these prejudices were slowly transformed as I moved between my growing theoretical knowledge of learning in practice and the insight I attained of the learning environment in the two hospital departments through the interviews. In this process I discovered that the medical culture is full of fine traditions with regard to learning, and found many of the prerequisites for good learning present in the medical activity which was described in the interviews. The hindrances seemed to be more a matter of working

5 The main task of The Data Inspectorate is official approval of all databases with personal information. The institution is financed by the state.
conditions and a changing medical environment where the professional medical community had failed to undertake appropriate adjustments in order to meet these changes.

Concerning my theoretical fore-understanding, I commenced with the idea that this project should be mainly based on a perspective of organisational culture and organisational learning. This perspective inspired the quantitative part of the dissertation. Before designing the interview guide, I was only faintly acquainted with the apprenticeship model and the situated approach to learning. The application of these perspectives was therefore done on an inductive basis, i.e. they became a natural choice as I experienced that many findings in my material were elucidated by the use of these theories.

3.3.1.2 Choice of method

How physicians learn in natural medical situations has received minor attention among researchers until today. In order to explore and describe the most important learning institutions in medical practice, the physicians’ own perceptions of their learning processes and their descriptions of the medical activity in which they participated, seemed like a natural starting point. Thus, the qualitative research interview was the appropriate method of choice.

The fact that physician’s learning in natural situations is an understudied issue warranted an explorative design. However, my own experiences as a learning physician in addition to having taken part in a study of interns’ learning – a study which also included interviews, made it natural to commence with a less open approach than what would otherwise have been required. Accordingly, based on my own fore-understanding of the field, and my theoretical knowledge of learning, I constructed a fairly detailed interview guide (see Section 3.3.2 and Appendix 2). At the same time I tried to keep an open and flexible attitude both in the interview situation and when analysing the data collected.

Even though the collected material gave rich illustrations of many central phenomena of learning medical practice, I see some disadvantages with my choice of method. The qualitative research interview gives only limited possibilities to study the context and the influences of various resources in the situation. With hindsight I would have included observation as a means to explore the surroundings and the dialogues between the participants taking part in the situation. If observations had been included, the descriptions of the situations had been richer, we would have had access to the dialogues between the participants, and could have better observed what resources were used and how they were used.
On the other hand, my background as a physician makes it more difficult to overcome the blind spots of the researcher while observing. The method of observing is more sensitive to the blind spots of the researcher, since she will naturally be selecting the aspects of the situation which are to be focused upon. This is different in the qualitative research interview where the tapes or the transcripts are “objective” records of the interaction that took place (if a tape recorder was used). And for these records it is possible to include other researchers in the process of analysis in order to control for haphazard or biased subjectivity in the analysis (Armstrong et al. 1997; Miles & Huberman 1994).

3.3.1.3 Sampling

Even though the focus was on the more inexperienced physicians in the professional community, the project aspired to explore the whole process of professionalisation, all the way from the inexperienced physician’s first months of internship, to that of the highly competent professional specialist. Accordingly, physicians from all levels of the job hierarchy had to be included.

Further, since from the outset I had ambitions to explain phenomena encountered through a perspective of organisational culture and organisational learning, I had to obtain detailed descriptions of each department involved in the study. Consequently, I had to renounce collecting information from several specialities, although it seemed tempting to compare the large specialities of internal medicine and surgery with the small medical domains like ophthalmology or otorhinolaryngology. Likewise, it would have been interesting to compare large and highly sectioned departments in the main hospitals with small departments in smaller and medium sized hospitals. However, this was not possible under the scope of this qualitative project.

Thus it was decided to concentrate on two departments in the same hospital and to include the internal medicine department and the surgical department of a large general hospital in the study.

3.3.1.4 Ethical considerations

Given the research questions of the project, to investigate traditions of learning in the medical culture and the current conditions for learning in hospital departments, it was not difficult to make the administrators or the informants see the value of the study (Kvale 1996; Miles & Huberman 1994). This probably was a great advantage in creating access to the field, as I will return to.
It was clear that a project concerning the collegial culture and traditions concerning learning and professional development would involve issues of a sensitive nature. In qualitative research interviews concrete examples are always aspired for and since, among many other things, the project explored the handling of adverse events in the department it was obvious that the information collected potentially could harm the informants. These are factors which require confidentiality.

At the same time it became clear that to promise confidentiality limited the possibilities of describing each department, each physician and especially specific events in detail. It even restricted the researcher from going into the macro-politics of this particular geographical region. These factors influenced the choices made during the analysis of the interview material. Nevertheless, it is difficult to see how it could have been done differently.

Consequently the informants were promised anonymity. Maybe some of the partaking physicians are able to recognise some of the other informants from their personal views or ways of expressing themselves. But to outsiders it should be difficult to trace persons or locations.

3.3.2 Interview guide

On the basis of my own fore-understanding, the theoretical considerations and the results from the quantitative study a fairly detailed interview guide was constructed (see Appendix 2).

The interview started by asking the interviewee to sketch an overview of his workweek in the hospital with the different locations where he spent his working hours. The physician was also asked to sketch an organisational chart including the superior and the subordinate physicians he related to. These two sketches were used as the point of departure for a detailed description of the physician’s work, how he moved around the hospital, interaction with colleagues and other health personnel on regular workdays as well as on duty. The daily clinical rounds and what meetings he took part in were also explored in this part of the interview.

The guide went on asking more specific questions about learning. First the formal educational programme was inquired into. Then, based upon his practice descriptions the interviewee was asked to point out where he learnt the most, and subsequently to describe a good, as well as a bad, learning situation. The physician was further asked how he went
about learning new skills and if he could remember any master-apprentice situations. Lastly, the physician was asked to describe the learning environment in more general terms. In this part of the interview the physician was also asked about the system of formal educational counselling and how it functioned in the department.

The next section contained questions intended to reveal information of the department’s culture such as the customs and conduct, the handling of conflicts as well as how complications and adverse outcomes were treated in the community. The relation to other specialties and to other personnel groups, especially nurses, was also explored.

The interview ended by encouraging the interviewee to reflect on the medical culture in general and the physician role in today’s society in particular.

Each question introducing a new theme was formulated openly, inviting the interviewee to answer in lengthy descriptions rather than a few words. If necessary several follow-up questions where given to ensure that central issues were touched upon or to encourage the informant to give concrete examples.

3.3.2.1 Pre-interviews

Before starting the actual interviewing, two pre-interviews were carried out. One was with an inexperienced resident in an internal medicine department. The other was with an attending physician in a surgical department. Both worked in a large general hospital comparable to the hospital of the main study. The pre-interviews proved the interview guide as an appropriate tool to collect data intended for this study and only a few corrections and additions were made. Together with the supervisor and one other person involved in the research process, one of the taped pre-interviews was listened to in order for the researcher to receive feedback on how she functioned in the interview situation.

3.3.3 Material and setting

3.3.3.1 Access

The first contact with the hospital was a brief inquiry with the heads of the two departments. This was to inform about the project and explore the possibilities of carrying out the study in this location. Both leaders seemed positive. After this sounding a letter was sent to the managing director of the hospital. The letter contained a description of the study and the motivation for carrying out such a study at the time. The researcher was also
introduced in this letter which was signed by the director of the Research Institute of the NMA.

The director of the hospital approved of the study and sent a list of the physicians employed in the two departments taking part.

Accordingly, there were no problems in obtaining access to the field of study. The main reasons were probably that The Research Institute and The Medical Association gave the necessary credibility. As I will get back to later on, there were also few problems involved in getting the physicians to agree to participate. In this case it probably helped that I was a fellow physician, someone they had reason to expect would meet them with insight, understanding and respect.

3.3.3.2 The internal medicine department

The internal medicine department was fairly stable in its organisational structure. All positions were occupied and the head of department had held the position for more than five years. The department consisted of six sections of which the sections for heart diseases and the section for lung diseases were the largest.

The roster

The interns and residents shared the duty as first on call (see Figure 2). The interns were on duty every fifth night, and the residents every seventh night. This irregular call system was introduced shortly before the project started and after the residents, for educational reasons, had pressured for more time to take part in daily activities in the ward. For the interns, the effect was that in a working week they had no more than 10–12 hours in the ward. The attending physicians and heads of section shared the second on-call function and were on duty every ninth night. The second on call was present in the hospital the whole night through and worked almost a full day following the night on call. Some of the old-timers were exempted from the roster, but were included in a system of “evening duties”, meaning they went clinical rounds and made evaluations of patients in other departments until 18.00.
From the organisation of the work team on duty it follows that the work load on the attending physician in the second line was much heavier with an intern in the front line than with an experienced resident as first on call. When an inexperienced intern was on duty in the emergency room (ER) the attending had to run between the ward and the ER to supervise his first on call. On the other hand, the overlap between the attending and an experienced resident in the front line was not very large. Thus, the popularity of the interns was not very high in this department. Besides, due to the limited time they had to follow the activity in the ward, they did not become part of the professional community in the department during the six months they worked there.

The meetings

The daily morning round with all doctors present commenced at 7.45. The meeting started with a 30 minute teaching programme in which the physicians took turns to present clinical topics. A very brief report on the events of the last 24 hours was given covering new admissions, problems arising, and similar information. The report was characterised by shortage of time and there was not much room for discussion or questions.
The radiological round took place immediately after the daily morning round (about 8.30). In this meeting all X-rays taken of patients during the last 24 hours were presented and it was possible for the internists to ask questions and discuss findings with the radiologist.

Informal meetings in the section. After the meeting in the radiological department, several sections had a more informal meeting. At this meeting the physicians had a cup of coffee and discussed both clinical as well as non-clinical issues before they started their daily tasks, the prerounds and the clinical rounds in the ward.

The Wednesday meeting. Every second Wednesday there was a meeting with all employees in the hospital where general medical problems were taken up.

The Pathological round. Once a week there was a presentation of microscopic samples and findings from autopsies in the pathological department. This meeting was for all physicians in the department and was described as a meeting of great educational value, although not very well attended.

The superior staff meeting. Every Friday there was a meeting with the attending physicians and The Medical Association’s staff representative of the subordinate physicians. At this meeting topical issues were raised by the head of department. The week’s mail was also presented. This was one of the most important fora in the running of the department.

3.3.3.3 The surgical department

In this hospital orthopaedics was a separate department and was therefore not included in the study.

Compared to the stability of the internal medicine department, the situation in the surgical department was radically different. First, staffing was a significant problem. Of about thirty positions, only twenty were occupied. There was also an unusually high percentage of residents compared to attending physicians. Consequently there was a shortage of specialists. Lastly, the department had had a large turnover of leaders in recent years.

The department consisted of three sections of which the section for thoracic surgery was the largest and most well-functioning.
The roster

During the spring of 1994 a new roster was introduced in the department (see Figure 3). Due to the heavy workload on duty, a third doctor was included in the work team. Until then only two doctors were present in the hospital during the night, an intern and a senior resident. The new work team consisted of an intern in the front line in the emergency room, and a junior and senior resident who together had responsibility for the ward, the operating activity and the supervision of the intern in the ER. In addition, an attending physician was on call and able to assist in the event of complicated surgical procedures having to be performed or if other problems should arise.

Figure 3: The work team on duty in the surgical department
The meetings

The radiological round. At 7.45 all physicians gathered in the radiological department to review all X-rays taken of surgical patients during the last 24 hours. From an educational point of view this meeting was of greater significance than the daily morning round since it was in this forum questions concerning clinical decision most frequently arose.

The daily morning round took place straight after the meeting in the radiological department and was for all physicians in the department. This lasted between ten minutes and half an hour. The meeting started with a brief report on new patients and special events or problems during the last 24 hours and ended with a general discussion of various topical issues.

The clinical round in the intensive care unit. After the daily morning round all physicians went to the intensive care unit in an old-fashioned hierarchical procession to look at the newly operated patients.

The meeting to set the programme for the operating room. Every day at 14.00 the programme for planned surgical procedures the following day was set. This meeting was for all physicians in the department. Here, priority, succession and anaesthetics were discussed, the most usual issues being: “which procedures could be postponed?”

Meetings in the sections. Before the two o’clock meeting each section gathered to prepare the list of patients they wanted to be on the programme for the next day’s planned surgery.

The educational programme. Every Friday after the daily morning round, from 8.30 until about 9 or 9.30, the physicians took turns to present clinical topics.

The Wednesday meeting. Every second Wednesday there was a meeting for all employees in the hospital. At this meeting general medical problems were presented.

3.3.3.4 Sampling the interviewees

It was determined to interview twenty physicians, ten in each department. After it was determined how many should be interviewed at each level of the job hierarchy and how many women should be included, the choice of physicians was made by random selection.
Beforehand I was afraid that it would be difficult to get the appointments for the interviews, taking into account that fairly sensitive issues were involved and that I asked for two long hours of the physicians’ busy time. This concern proved to be baseless. Only two doctors declined to take part in the study.

After most of the interviews in the internal medicine department were completed, I decided to include an extra informant since several interviewees had pointed to this physician as an especially influential person in the department. This, plus the fact that one of the surgeons declined to take part in the study, is the reason why there are unequal number of informants in the two departments.

The process of interviewing started in May 1994 and ended in mid-October the same year.

Interviewees in the internal medical department (in chronological order):

<table>
<thead>
<tr>
<th>Interview</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>First interview</td>
<td>Intern</td>
</tr>
<tr>
<td>Second interview</td>
<td>Junior resident, new in the department, section for lung diseases</td>
</tr>
<tr>
<td>Third interview</td>
<td>Senior resident, section for heart diseases</td>
</tr>
<tr>
<td>Forth interview</td>
<td>Head of department</td>
</tr>
<tr>
<td>Fifth interview</td>
<td>Attending physician, section for geriatric diseases</td>
</tr>
<tr>
<td>Sixth interview</td>
<td>Intern</td>
</tr>
<tr>
<td>Seventh interview</td>
<td>Head of section for lung diseases</td>
</tr>
<tr>
<td>Eighth interview</td>
<td>Senior resident, section for heart diseases</td>
</tr>
<tr>
<td>Ninth interview</td>
<td>Attending physician, section for kidney diseases</td>
</tr>
<tr>
<td>Tenth interview</td>
<td>Head of section for heart diseases</td>
</tr>
<tr>
<td>Eleventh interview</td>
<td>Attending physician, section for gastrological diseases</td>
</tr>
</tbody>
</table>
Interviewees in the surgical department (in chronological order):

<table>
<thead>
<tr>
<th>Interview</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>First interview</td>
<td>Intern</td>
</tr>
<tr>
<td>Second interview</td>
<td>Junior resident, section for gastro-surgery</td>
</tr>
<tr>
<td>Third interview</td>
<td>Attending physician, section for thoracic-surgery</td>
</tr>
<tr>
<td>Forth interview</td>
<td>Intern</td>
</tr>
<tr>
<td>Fifth interview</td>
<td>Senior resident, section for gastro-surgery</td>
</tr>
<tr>
<td>Sixth interview</td>
<td>Senior resident, section for thoracic-surgery</td>
</tr>
<tr>
<td>Seventh interview</td>
<td>Intern</td>
</tr>
<tr>
<td>Eighth interview</td>
<td>Attending physician, section for thoracic-surgery</td>
</tr>
<tr>
<td>Ninth interview</td>
<td>Head of section for thoracic surgery</td>
</tr>
</tbody>
</table>

Only four of the informants were women. This illustrates the gender distribution in the material. In the two departments, none of the attending physicians were women.

The interns were physicians in their first year as practising physicians after completing medical school. As it is organised in most hospitals, they started their internship with six months in the surgical department, before moving on to the internal medicine department. Thus, the interns in the internal medicine department had more experience in the hospital than those in the surgical department.

The residents were physicians at various levels of competence. When writing in English the interviewed physicians have been divided into junior and senior residents to indicate the large span in competence that existed within this group. Junior residents were often quite inexperienced and new in the department and frequently had not decided whether they wanted to follow their speciality degree within the domain. One junior resident in the surgical department had her compulsory year of surgery as part of the specialisation in obstetrics and gynaecology. On the other hand the senior residents were fairly experienced physicians and speciality trainees in their field. Most of them had nearly completed their speciality education. The attending physicians were highly experienced physicians and usually branch specialists.
3.3.4 Interviewing

3.3.4.1 Before the interview

Before the tape recorder was switched on, the interviewer presented herself and the project (see Appendix 3). The interviewee was notified that all information given during the interview situation would be treated confidentially and in such a way that it would not be possible to identify the hospital or individuals. He was also informed that he would receive quotations selected for publication in order to have the possibility to correct any misunderstandings and be in control regarding what was published.

In the introduction it was emphasised that the interviewee was in decision of how deep he wanted to go in the interview and what information he would give. The researcher also commented upon the use of tape recorder.

3.3.4.2 The interviews

Even though the interview guide was fairly detailed, it was used in a flexible manner. The interviews were marked by dialogue: the interviewee spoke the most, but the interviewer directed the conversation. If it became evident that the interviewee had information of a particular nature or had a special history in the department, the opportunity was given for this to be explored in the interview, and accordingly other parts of the interview guide received less attention. For instance, one of the informants had headed the Quality Improvement Board of the hospital. Consequently in this interview a fair amount of time was spent on the routines for handling complications and adverse outcomes in the hospital.

Each question introducing a new theme was formulated openly, encouraging the interviewee to answer in lengthy descriptions rather than a few words. If necessary the researcher followed up by asking more concrete questions or by asking for examples to illustrate the physician’s descriptions.

At the end of each interview the researcher enquired whether the interviewee had any questions about the manner in which the interview had been conducted or if he had anything he wished to add.

3.3.4.3 Transcribing

The secretary of The Research Institute transcribed most of the interviews, the rest were done by the researcher. The researcher, has however, gone through all the interviews in detail, and while listening to the tapes added the final touch to the transcripts, trying to get
them as close to the verbatim form as possible. This means that most repetitions, oral wordings as well as dialects were included. Concerning the interviewer, some of the affirmative phrases like “mm”, “yes” and “no” were excluded. If the interviewee or the interviewer was interrupted this is marked by “…..”.

The process of transcribing and “correcting” made me intimately familiar with the material, a familiarity which proved to be very useful in the ensuing analytical work. It provided the necessary within-case knowledge of the medical world as it looked from the side of each individual physician. In the process of publication however, it was a wish from the editors that these details were dropped and accordingly the quotations were edited to be more in line with written language. These changes are accounted for in each paper.

Following each transcript is a copy of the sketches that the informant produced during the interview. If these are available while listening to the tapes or reading the transcripts, it becomes easier to follow the first part of the interview.

3.3.5 Analysis

The process of analysis starts in the planning of the interview guide, and continues in the interview situation when the interviewee describes the world as he sees it and discovers new connections, structures and meanings in his experiences (Kvale 1996). In the interview situation questions were frequently posed for clarification and conclusion – an ad hoc interpretation.

Here, without violating Kvale’s claim, the term “analysis” is reserved to the work that was done with the material after it was transcribed and transformed into verbatim form.

Levels of analysis:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structuring</td>
<td>Broad structuring of the material, using the interview guide as a basis</td>
</tr>
<tr>
<td>2. Categorisation</td>
<td>Further structuring. Going from the preformed categories of the interview guide to a more inductive categorisation as significant structures of meaning emerged in the material</td>
</tr>
<tr>
<td>3. Interpretation</td>
<td>Going beyond what is directly said by the interviewee, looking for deeper structures and relations of meaning in the material</td>
</tr>
</tbody>
</table>

3.3.5.1 Structuring

In this first level of analysis, the interview guide was used as the point of departure for a gross structuring of the interview material. With the help of the program Alpha Base, each
main theme of the interview guide was coded going through the whole material, and extracted as individual transcripts with all the informants represented. If quotations seemed relevant for several themes, they were copied under the respective headings.

These handy transcripts produced the basis for the second level of analysis: the categorisation of meaning units in the material. The transcripts made it also easier to obtain an overview of the material and possible themes for papers. Lastly, the transcripts made it possible for a co-interpreter to have a look into the material and take part in the process of analysis and interpretation.

3.3.5.2 Categorisation

As the process of analytical work progressed in depth a natural movement took place from the preformed categories of the interview guide to a more inductive categorisation, taking as point of departure the structures of meaning in the interviews.

To give an example: A dimension which proved to be an important analytical tool in the analysis was that of access to learning situations. A prerequisite for learning is that the learner not only is accepted as a member of the professional community, but that certain organisational and interpersonal factors also have to be fulfilled for access to learning situations to be granted. Quotations that in one way or another illustrated this was extracted and analysed further by identifying subcategories and sub-subcategories as is shown in the table.

<table>
<thead>
<tr>
<th>Main dimension</th>
<th>subcategory</th>
<th>Sub-subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to learning situations</td>
<td>Organisational factors</td>
<td>The roster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The dividing of the department into sections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Which meetings one has access to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The organisation of the postgraduate education</td>
</tr>
<tr>
<td></td>
<td>Interpersonal factors</td>
<td>Being a good apprentice/ a good master</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initiative versus invitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The resource situation in the department</td>
</tr>
<tr>
<td></td>
<td>Architectural/</td>
<td>The availability of more experienced colleagues</td>
</tr>
<tr>
<td></td>
<td>geographical factors</td>
<td>The collective processing of clinical problems</td>
</tr>
</tbody>
</table>

Given the material and the research questions, it was natural to conduct most of the analysis in a cross-case perspective, looking for differences of meaning between the
surgical and the internal medicine department on the one hand, and between the different
groups of physicians on the other.

3.3.5.3 Interpretation

Interpretation is an art of understanding (Gadamer HG 1989). More specifically, by
interpretation here is meant going beyond what is directly said by the interviewee in the
interview situation and looking for structures and relations of meaning in the material. Of
the main approaches to analysis, the only method which results in a text expansion, is that
of interpretation (Kvale 1996). The interpretation of meaning contained in the interviews
has been done within three different frames (Kvale 1996)\(^6\), the latter two being the most
apparent in the written reports.

The first frame is that of the individual interview. The aim here was to make clear the
interviewee’s self-understanding of his life and experiences in the hospital. A part of this
process was done in the interview situation when the interviewer put further questions to
the informant for clarification. If the interviewer became aware of inconsistencies, attempts
were made to clarify these. The process of interpretation within the frame of the
interviewee’s self-understanding was continued in the further work of transcribing and
analysing the interviews.

The second frame of interpretation is that of the whole data set. Here, the information
contained in each interview was looked upon as pieces in a big puzzle, which when seen as
a whole, made it possible to construct a picture of the life as a physician and the processes
of learning and professionalisation in the hospital. In case of inconsistencies between the
different informants, a picture of competing explanations could be pointed to. The
empirical references made in the written reports were made on the basis of this
interpretation within the frame of the whole data set. Thus, quotations were carefully
chosen in order to be representative for the group of physicians in question, and
divergences of meaning were accounted for.

The last – and in the written reports the most visible frame of interpretation, is that of
the theoretical framework of the study. At this level existing theoretical concepts is used to
illuminate what is going on in the situations the physicians described in the interviews. An

\(^6\) Steinar Kvale talks in this connection of contexts of interpretation. A critical commonsense understanding
is his second context while I use the whole data set as my second frame of interpretation. Even though a
critical commonsense understanding was central in the interpretative work of the study, our methods differ
slightly at this point.
example of this interpretative work is the physicians’ accounts of the master–apprentice situations. Here concepts from social learning theory such as the proximal zone of development (Vygotsky 1978) and transparency (Lave & Wenger 1991) are used for in-depth studies and to explain how knowledge is transferred between the master and the apprentice in the situation (see Paper 2).

Secondly, where the results from the study have made it natural to do so, existing theory and presented suggestions for further theoretical development have been commented. This is done, for example in the article on professional learning and collective knowledge where the concept of access to learning situations is nuanced and further developed (see Paper 3). Likewise, in the article on uncertainty and medical mistakes, from an individual learning perspective, the importance of maintaining the concepts of moral failures in medical practice is argued (see Paper 4).

Following the hermeneutical rules of interpretations, rather than treating these frames as separate processes, the whole material is worked with as an entity, going back and forth between the separate parts and the totality. Thus, when working within one frame, the findings within each of the other frames were considered, up to the point where no contradiction was left untreated (Gadamer HG 1989; Kvale 1996).

3.3.5.4 Presenting the data

In the written reports from the study an alternation is made between a condensation of meaning and a presentation of quotations to reproduce the data. By condensation of meaning is meant a condensed presentation of data without changing the content. Concerning the choice of quotations, these had to be particularly illustrative and representative for the group of physicians in question.

Between the empirical presentation on the one hand and the work of interpretation on the other, there is a continuum. The clear distinction between results and interpretation required in quantitative research is rarely possible when qualitative methods are used since the results here are, by definition, an interpretation of the data (Greenhalgh & Taylor 1997). Accordingly, in the papers the results are presented, analysed and discussed in the section labelled results and reflections.

3.3.5.5 Anonymity

To maintain anonymity, in the presented material the physicians are divided into three categories: interns, residents, and attending physicians. Accordingly, the promised
confidentiality restricted the possibility for analyses based on nationality or gender differences among the physicians. Anonymity considerations also limited the possibilities for taking structural factors into the analysis.

3.3.6 Verification

3.3.6.1 Reliability

In traditional quantitative scientific activity, by reliability is meant the extent to which data is collected in a precise and correct way (see Section 3.2.2.2). Reliability in this connection often pertains to whether the same results may be reproduced if data are collected in the same way at another time and by different researchers. This implies an underlying ideal of objectivity. In qualitative research on the other hand, subjectivity is not regarded as something one should necessarily minimise in the research process, but rather as something which is naturally present. The responsibility of the researcher is therefore to take account of this subjectivity. As a result the question of reliability becomes more a question of making one’s methodological considerations, motivations and decisions transparent (Malterud 1990; Malterud 1996).

More technical questions regarding reliability in the collecting of data are treated in connection with the discussion of validity in the next section.

3.3.6.2 Validity

According to Hellevik (1991) “validity” is a matter of two concerns. On the one hand there is the validity concerning the relation between the theoretical level and the empirical level of the study, i.e. how pertinent or suitable are the data to answer the study’s research questions. On the other hand, validity is dependent on the reliability of the research findings (p. 43). I find that Hellevik’s definition of validity also pertains to qualitative research, even though the actual methods for testing validity may be quite different in the two domains (see Section 3.2.2.2).

According to Kvale, the essence of validation is to question, and he goes on to suggest adequate questions for each step in the process of a qualitative research project (Kvale 1996). Thus the question of validity is not one to be asked at the end of the project, but a matter of continuous critical questioning in which to be engaged throughout the whole research process. The answers to the questions of validity cannot be given
independently of the purpose of the project. The following list is partly a summary of the methodological account given above.

**Thematising:** Here the question of validity relates to the soundness of the theoretical framework of the study and the relation between this framework and the research questions put to the empirical field (Kvale 1996). Basically, this material contains physicians’ descriptions of their complex work environment and how they go about becoming skilled medical practitioners or train others to become experts. The perspectives of situated learning and socially distributed cognition are produced precisely with the intention of capturing learning as an aspect of activity in multifaceted natural environments. Accordingly these perspectives seemed to be the best to elucidate this material. (See Chapter 2 for a more thorough discussion of the choice of theoretical perspectives).

**Designing:** Here the question of validity relates to whether the chosen research methods are suitable to collect data which will illuminate the research questions (Kvale 1996). The qualitative research interview seemed to be the best method to obtain the physicians’ own understandings of how they learn and develop as professionals. (See Sections 3.3.1.1 and 3.3.1.2 for a more thorough discussion of the choice of method).

**Interviewing:** Here the question of validity relates to the quality of the actual interviews themselves (Kvale 1996). Measures to ensure validity at this point are the two pre-interviews undertaken prior to commencing the interviewing. Furthermore, as already mentioned, during the interviews questions back to the interviewee were often posed in order to increase the intersubjectivity between the interviewer and the interviewee. The fact that the interviewer was a physician herself may have increased the subjects’ confidence in the researcher and thereby their trustworthiness (Miles & Huberman 1994).

**Transcribing:** The secretary who transcribed most of the interviews had detailed instructions as to how the transcription was to be made, and the researcher closely followed up on the process. After the first transcription the researcher went through all the typed interviews and while listening to the tapes edited and “corrected” the transcripts to make them as close as possible to the verbatim form. (See Section 3.3.4.3 for a more detailed description of the process of transcribing the interviews).
Analysing: According to Kvale the relevant question in this connection pertains to whether the questions put to an interview text are valid (Kvale 1996). During the process of analysis and interpretation qualified co-researchers were involved and read through the structured material and early drafts of the articles. In this way, researcher triangulation helped produce competing explanations of the findings, better and more valid discussions of the results and at the same time controlled for haphazard or biased subjectivity. Furthermore, the use of the different frames of interpretations accounted for in Section 3.3.5.3, is a way to account for variability and deviant cases in the material (Miles & Huberman 1994).

Preliminary findings have been presented in various research fora with the purpose of obtaining comments on the results and the following reflections. In addition, each paper contains a discussion of relevant research findings from other studies, a measure which in itself is a validation of the research findings.

Reporting: The question here is whether the reports produced give a valid account of the main findings of the study (Kvale 1996). The three papers from this qualitative study, one about the traditions for learning in medical culture, one about the learning environment and the relation between the production and the resource situation on the one hand and learning and training on the other, and last the article about uncertainty and mistakes in medical practice, cover the main findings from the study and at the same time the most central aspects of learning medical practice.

Each paper was sent to the informants quoted in the article to control for misunderstandings and obvious mistakes. The informants were also encouraged to comment on the content of the paper. Even though only a few of the physicians used this opportunity, this was an important quality control of the reported findings.

3.3.6.3 Generality

In essence, the aim of a research process is to use the information gained from the individual informant to acquire knowledge which is valid for other persons and situations. This study was on a small scale. Only two hospital departments were presented, and in each department less than half of the physicians were interviewed. Thus the generality of
the study is limited and difficult to measure *a priori*. Rather it is argued for an *a posteriori* evaluation of the generality of the study in relation to specific situations and localities. This means that it is up to the person who is using these findings, whether it is the researcher herself or other competent persons, to look into the situation in question and judge whether the conclusions from this study are applicable or not. Kvale relates this way of looking at generality to legal and medical cases where it is the judge or the physician who decides whether an earlier case is sufficiently analogous to be used as a precedent for the present case (Kvale 1996).

Another way of looking at the problem of generality is to look at the qualitative part of this study as an explorative or even preliminary project. The aim of the research process in this perspective is that of generating enough knowledge of the field to be able to formulate the right questions in a questionnaire which could be sent to a sample of respondents large enough to warrant a statistical generality.

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7 *A priori* designates here what is logically independent from experience, as opposed to *a posteriori*, inductive or empirical (The Oxford English Reference Dictionary 1995).
4 Results (synopsis of papers)

4.1 Paper 1

Victoria Akre, Erik Falkum, Bjørn O. Hofvedt, Olaf G. Aasland

The communication atmosphere between physician colleagues: competitive perfectionism or supportive dialogue? A Norwegian study

Background and objectives. Open and supportive communication is probably one of the most important promoters of learning, coping and satisfaction at the workplace. The aim of this paper is to describe and predict the communication atmosphere between Norwegian physicians.

Methods. Twenty statements describing communication, as perceived by the physicians themselves, were presented to a random sample of the members of the NMA of which more than 90% of physicians in the country are members (N=2628).

Results. In general, this investigation indicates that the communication atmosphere among Norwegian physicians is characterised by support and mutual respect. More than half of the respondents fully agreed that communication between colleagues in the workplace is marked by solidarity, and that experienced colleagues show respect for the less experienced in both personal and professional matters. Physicians working in hospitals described the communication atmosphere as substantially more selfish and competitive than non-hospital physicians, whilst general practitioners considered the atmosphere between colleagues to be more supportive than non-specialists. In addition, high perceived stress was associated with the perception of a less supportive atmosphere. However, the strongest predictor of the communication atmosphere was clearly the physician’s perceived autonomy.

Conclusions. The comprehensive retrenchment programmes implemented in Norwegian hospitals during recent years have increased stress and restricted professional autonomy among both physicians and other occupational groups. Our findings indicate that the
communication atmosphere necessary to secure continuity of knowledge within the medical profession may have been jeopardised by this process. In the long term, this may prove hazardous to the quality of medical care.

Key words: communication atmosphere, physician, supportive dialogue, learning

4.2 Paper 2

Victoria Akre, Sten Ludvigsen

Hvordan læres medisinsk praksis? En kvalitativ studie av legers oppfatning av egne læringsprosesser
Tidsskrift for den norske lægeforening nr 19, 1997; 117: 2757–61

English title: Learning medical practice. How physicians perceive their own learning processes

Background and objectives. There is an increasing focus on continual education and lifelong learning, both in society in general and for physicians as a profession. In this article we explore how physicians develop professional knowledge in their everyday work.

Methods. 20 in-depth interviews with physicians working in the surgical and internal medicine departments of a Norwegian hospital were conducted in 1994. Explanatory models from situated learning theory were applied to analyse the recorded interview material.

Results. The master–apprentice relation emerges as the core of the traditional medical learning institutions. Here, the inexperienced physician learns the necessary practical skills, ways of reasoning and standards of diagnosis and treatment in the hospital. In interaction with a more experienced physician the novice transcends what she can do alone and develops as a professional. The physicians’ descriptions of their own learning processes change with experience and position in the hospital job hierarchy. The descriptions of the most inexperienced physicians are closely related to the daily activities
in the department. The most experienced physicians however, see themselves as participants in a national or international arena from which they bring knowledge home to the local community of practice.

Conclusions. The quality of learning depends on the dialogues connected with the daily activities in the department. It is important to bring attention to the master–apprentice relation as an important learning institution in medical practice.

4.3 Paper 3

Victoria Akre, Sten Ludvigsen

Profesjonslæring og kollektiv kunnskap. Læringsmiljø i to norske sykehusavdelinger
Tidsskrift for den norske lægeforening nr 1, 1998; 118: 48–52

English title: Conditions for learning in two Norwegian hospital departments

Background and objectives. Learning medicine is not an isolated activity but an integral part of practising medicine in the different health institutions. In this article we explore the conditions for learning in two Norwegian hospital departments.

Methods. 20 in-depth interviews with physicians working on the surgical and internal medicine departments of a large general hospital were carried out in 1994. We focus on the social aspects of learning and apply access to learning situations as an analytical perspective to explain how possibilities for learning are created in the daily activities of the two departments.

Results. Access to learning situations is created in a “zone of possibility” between the formal organisation and the more informal interpersonal networks in the hospital. The division of the department into sections is used as an example of how organisational factors determine which of those areas with which one becomes familiar. The notion of “the good apprentice” and the relationship between initiative and invitation illuminate the significance of the interpersonal factors for access to learning situations. Finally, we
illustrate how time is an important but scarce resource influencing the development of shared knowledge in the department.

Conclusions. The organisation of the activity is also an organisation of knowledge and thereby influences what the physicians learn. The informal interpersonal and the formal organisational factors are not independent, but interact dynamically with the more general working conditions and the resource situation in the health care system. There was a marked tension between production and training in the two departments. The production is prioritised, but learning by participation in the daily activities secures a minimum of training. If the pressure to produce gets to dominate for a longer period of time, this could lead to a drain of the collective knowledge of the department.

4.4 Paper 4

Akre, Victoria

Uncertainty, safety and medical mistakes: learning the profession of medicine
Submitted Journal of Nordic Educational Research

Background and objectives. As much as patient safety is a major concern for the health care institution, handling uncertainty in clinical situations and avoiding negative outcomes of medical decision-making lie close to the core identity of the medical doctor. Here, the discussion of risk and the handling of complications and mistakes in the professional community are important learning situations. The aim of this study was to explore how uncertainty and medical mistakes were handled in two hospital departments in order to investigate how inexperienced physicians learn to master these complicated characteristics of clinical work.

Methods. In 1994 twenty physicians in a large general hospital were interviewed, eleven from the internal medicine department and nine from the surgical department.

Results. On duty in the hospital the inexperienced physician is in the front line. In this situation safety is dependent on well-developed routines, skilled nurses and a knowledge
hierarchy in the form of more colleagues to be consulted when needed. The consultation is an expression of the uncertainty involved in the situation, a deliberately produced overlap of expertise promoting both learning and patient safety. In the two departments the availability of consultants was relative for several reasons and there seemed to be a limit to the social acceptance of uncertainty. Only major complications were brought up in the collective fora, and few of the less experienced physicians were able to recall any complications that had been discussed.

**Conclusions.** As the physician moves from being an inexperienced participant to being a more central participant in the professional community, the relation between the learner and the community changes. How it changes depends on how the physician solves the clinical problems encountered, especially those concerning uncertainty and risk. From the perspective of collective knowledge acquisition dealing with adverse outcomes as a system failure is highly useful. However, from the perspective of the individual learner it is important to maintain the concept of normative errors as this concept emphasises the moral standards in the community. An important challenge for the professional community is to create a robust and generous culture where it is safe to err without jeopardising the activity and where a role model for the fallible competent physician is viable.

Keywords: Hospitals; Learning; Physicians; Uncertainty; Safety; Medical mistakes
5 General discussion

In this section, in addition to reflecting on applied research methods, I attempt to raise a number of topics which I regard as being of great importance for medical practice in general and the learning of medical practice in particular. More specific findings from the study, which among other things means answering the two main research questions posed in section 1.4.2, are presented and discussed in the papers.

5.1 Methodological discussion

This study presents a triangulation of methods since both quantitative and qualitative methods are applied. Thus the object of study, learning medical practice, is looked upon from different angles, a fact which has probably produced a more precise and manifold description of the phenomenon. The quantitative perspective gives us data concerning distribution of a phenomenon and the relation between groups, while the qualitative perspective gives the possibility of going in depth, and of rich descriptions of the field. Furthermore, in all parts of the qualitative study, more than one researcher was involved in the analysis of the data. This researcher triangulation may also have improved the methodological validity of the study.

A combination of quantitative and qualitative methods allows for spirals of triangulations. In such research spirals it is possible for instance to explore the research field by observations or interviews prior to the construction of quantitative inventories, a method which may lead to more valid questionnaires. Alternatively, it is possible to validate more superficial quantifications by more in-depth qualitative methods. Qualitative data need to be quantified in order to be generalised, while to explain a statistical correlation it is necessary to lean on preceding quantifications or qualitative data. Thus, the two methods complement each other.

To a certain degree the possibilities of a spiral of triangulation was used in this project on learning medical practice. Based among other things on the results from the quantitative study the interview guide for the qualitative part was constructed. Further, the experiences of the qualitative study inspired a more applied research project on learning in hospital departments. The results of this project are, however, outside the frame of this thesis.

Even though the two methods do not answer the same questions, the method of triangulation opens up the possibility for comparing the results from the two parts of the
study. Are the results contradictory in any way, or do they mutually support each other? In this way the two methods validate each other. Here it is natural to take the results from the quantitative study as point of departure since the qualitative part is much more multifaceted in nature. The comparison is restricted to the situation in hospitals, and more specifically to the domains of surgery and internal medicine since these are the focus of the qualitative study.

The relation between general working conditions on the one hand and learning and training on the other – which was established in the survey – was confirmed in the interviews. For example, in Paper 3 it is discussed how the resource situation regulates access to important learning situations. Further, the quantitative study indicated autonomy as a central issue for the collegial culture in the department. In the interviews, this was reflected in the recurrent talk of time as a scarce resource and an overall feeling of loss of autonomy, especially among the physicians in the higher levels of the job hierarchy (see Paper 3). In addition, the inventory of communication atmosphere between physician colleagues identified conflicts and the handling of adverse events in the department as a weak point in the collegial culture. This finding was supported by the interview study. For example, in Paper 4 it is described how complications, though meticulously reported to the Quality Board, are seldom processed in a way that benefits the collective knowledge in the department.

In general, there are no apparent contradictions between the quantitative and the qualitative part of the study. On the contrary, the interviews enriched and nuanced the results from the survey, and thus have deepened our understanding of learning by participating in the daily activities of a hospital department. Some main implications of these findings are elaborated below.

5.2 Main findings and implications for practice

5.2.1 The potential contradiction between production and learning.

The 1993 Survey on Physicians’ Health and Welfare found that perceived stress (measured as perceived time pressure) was related to the physician’s perceived autonomy (Falkum et al. 1997), and that both perceived stress and autonomy influenced the communication atmosphere in the workplace (Paper 1). The communication atmosphere may be regarded as a comprehensive measure of volume and quality in the dialogues connected with the daily activities in the department. Thus, in the quantitative study a general relation between
the working conditions and the learning environment was established, as elaborated in Paper 1.

During the interviews in the qualitative study, time and time pressure was a constantly recurring issue. At all levels of the job hierarchy, the physicians referred to time as a scarce resource and an important limitation concerning learning during daily activities. It is reasonable to understand this as an expression of an underlying tension between the production of health services on the one hand and learning and training on the other. Demands for effectiveness resulted in a shortage of time that had a negative effect on the training of inexperienced physicians.

At the same time the qualitative study identified medical practice as the main source for learning and professionalisation for the inexperienced physician (Paper 2 and 3). It is by participating in the daily activities, which means taking part in the production of health services with the responsibilities of a professional, that the learner becomes a member of the professional community. But to make this learning by participating in the daily activities effective, some conditions have to be fulfilled.

Firstly, access to important learning situations and more competent colleagues is necessary otherwise learning by trial and error will dominate. As dealt with in Paper 3, access to learning situations takes place in a zone of possibility between the formal organisation and the informal interpersonal networks created in the hospital. But especially at the interpersonal level, the resource situation has a crucial effect: if resources are scarce the utilitarian value has to be greater for the master to invest in training which implies giving the trainee access to learning situations under his jurisdiction.

However, time pressure may have several other effects on the learning environment in the department. When time is a scarce resource the possibility for the master to explain the reasoning behind the medical decisions becomes less due, for instance, to recurrent interruptions in the situation. Here, transparency is an important characteristic (see Section 2.2.4.2 and Paper 2). It may also happen that when the less experienced physician feels the need to discuss a clinical problem, the master–apprentice situation does not materialise at

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8 For the inexperienced physician, learning by trial and error will to a certain extent be rooted in a body of theoretical knowledge and thus less random than what would otherwise have been the case. Still, in the situation of close collaboration with a more experienced colleague, the learning will be more directed and therefore more efficient.
all because the more experienced physician is occupied with something else and possibly at a distant location in the hospital (see Paper 3).

Lastly, another materialisation of the tension between learning and production occurs when trainees spend much of their time doing simple procedures that are valuable for the production of health services, but which after a while become uninteresting from the perspective of learning. When an inexperienced physician is learning a new skill, sufficient repetitions of tasks as well as only a short pause between repetitions create a good learning situation (see Paper 2). But here there is evidently a crucial point where the learning potential in the situation is exhausted and the procedures become routine. Thus the learner stagnates in his trajectory towards full participation in the community of practice (see Section 2.2.4.1). In the interviews in the internal medicine department, the work on call was referred to in this connection, but also in the surgical department being stuck with simple procedures was mentioned as a possible cause of not making professional progress as a surgeon.

In working life, time pressure is a universal phenomenon. In order to understand why the interviewed physicians attach such a great explanatory value to the problem of time as a scarce resource it is necessary to see this in connection with the physicians’ perceived loss of autonomy. In a situation characterised by little job decision latitude, the tolerance for time pressure may be small (Karasek & Theorell 1990). A certain amount of time pressure is a natural, and maybe also a necessary hallmark of the production of health services. Hence, learning to work under duress is an essential part of learning the profession of medicine. But at the same time, it is essential to be able to neutralise the time pressure to realise the learning potential in the situation.

5.2.2 The meaning of responsibility for learning and professionalisation

When learning is seen as changing participation in changing communities of practice, responsibility becomes an important characteristic. In the learning processes there is a strong connection between participation and responsibility as responsibility is the hallmark of full participation in the community and the sign of a true professional.

In discussing the concept of transparency in Paper 2 responsibility was mentioned as an important factor in the learning process. When the trainee knows that he will soon be the person in charge it encourages learning and the trainee becomes especially motivated to gain as much knowledge as possible from what is said and done. Furthermore, being
conscious of responsibility makes the tasks more clear and thus increases the motivation for achieving greater transparency in the situation.

Also from a social science perspective, the responsibility or accountability of a professional has a special place. According to Berg, the more the professional activity is marked by personal or situational judgement the more dependent the activity will be on internal collegial control (Berg 1991). In this situation the knowledge monopoly of the profession will apply to both the customers as well as the governing bodies. There are two ways in which the professional culture will regulate the professional’s activity, by telling the professional how to practice and by giving him standards for this practice (Berg 1991). Thus, in the professional community both technical and normative aspects of a professional’s practice are monitored. But in this regard a conscientious and responsible practice is the most important (Bosk 1979; Bosk 1986) (see Section 2.4.1 and Paper 4).

For the individual practitioner responsibility also entails a burden, especially in a field involving great risk (see Sections 2.3.1 – 2.3.2). Thus, in learning the medical profession the issue of responsibility has a special significance. Clinical decisions are always attended with a certain degree of uncertainty and the consequences of decisions taken may involve life or death for the patient. A physician under training, while working in a subordinate position, is first and foremost a practising physician. Principally this means that he has the same responsibilities for decisions taken alone as other doctors. Once the situation is reported to the senior physician in charge, the formal responsibility is transferred. Usually this will relieve the individual of some of the psychological burden, but inevitably some will always remain. In case of adverse outcome, the physician in the first line will often experience informal normative sanctions from the professional community regardless of where the formal responsibility lies.

In connection with vocational education the term practice shock constantly recurs, referring to the often tumultuous transition from formal schooling to occupational life. Here, apprenticeship is described as a way out (Nielsen & Kvale 1997). In a community of practice the quality of the learners’ work is of interest to the whole community as its reputation depends on this. Ideally, in an apprenticeship way of learning, the learner gradually takes on more responsibility as the more experienced practitioners in the community evaluate the results of his work. Thus, the movement from being a peripheral legitimate practitioner to a full member of the professional community is a qualified progress.
For the inexperienced intern the meeting with clinical practice is often a disturbing experience. At times the responsibility, both concerning workload and decisions involving great risk, may feel overwhelming. But also among the somewhat more experienced trainees the responsibility for decisions taken under uncertainty may sometimes be tough. On duty in the emergency room, the inexperienced physician is in the front line. In this situation safety rests on the hierarchy of competence behind him: routines, protocols and trained nurses to support him, and the second on call to assist him when medical problems exceed the inexperienced physician’s capability. Still, although the activity may be safe, from the intern or the trainee’s perspective the burden of responsibility may feel unduly high. In the two departments included in this qualitative study the availability of consultants was relative for several reasons and a subtle borderline existed between the necessary consulting activity and consultations seen as evidence of incompetence (see Paper 4).

However, at all levels of competence, physicians vary in psychological vulnerability. Some researchers have attributed this vulnerability to individual characteristics such as personality variables and/or early family experiences (Firth-Cozens 1997; Firth-Cozens 1992; Vaglum & Falkum 1999; Vaillant et al. 1972), while others have focused more on organisational perspectives (Karasek & Theorell 1990; Stevens et al. 1992). Nevertheless, without regard to causes, some physicians may be so concerned about committing a mistake that the responsibility is almost unbearable, while others may be more robust or even repress the risks involved in the practice they participate in. These individual differences may affect both the practice profile of the physician, how he relates to patients and colleagues as well as how he is looked upon in the professional community, and may consequently influence his learning trajectory (see Section 2.2.4.1).

Nonetheless, responsibility is an important prerequisite for learning. Without responsibility the work as a doctor is not for real and therefore without much value for the learning processes. A considerable increase in the number of newly graduated interns is expected in the years to come. In 1996, 325 inexperienced physicians started their internship; by 2006 the expected number is 590. At present there is already a problem in accommodating all newly graduated interns (Den norske lægeforening 2000a; Ebbing & Taraldset 2000). As mentioned in the introduction, the quality of Norwegian internship has already been questioned in several studies. With a rapidly increasing number of postgraduate candidates there is a chance that the intern will become a redundant participant. To use the terminology of Lave and Wenger, he will still be a legal participant,
but without access to the important learning situations in the community (Lave & Wenger 1991) (see Section 2.2.4.1 and Paper 3).

In a few years the learning situation for speciality trainees may also be affected by this problem. The proportions of inexperienced physicians in a community of practice are decisive for the learning environment in the department. With too many inexperienced physicians the access to the masters of the community may eventually become insufficient.

5.2.3 Changing conditions for medical practice – implications for learning and training

Medical practice in hospitals has been subject to comprehensive structural changes during the last twenty to thirty years. The question is whether the implications for learning and training have been considered.

Traditionally, the activity was organised according to a principle of overlapping expertise. In the interviews the most experienced physicians, the old boys in the professional community, spoke of the traditional undivided department. At that time – in the 1970s and 1980s – several doctors would examine each patient admitted to the department during the first 24 hours; first the inexperienced physician on duty in the emergency unit and later his on-call senior. The next morning the head of department saw all new patients before the start of the regular working day. Lastly, a clinical round was made to all these new patients to discuss clinical symptoms, diagnosis and treatment.

This is a description of the collective problem solving in an undivided department. There was perhaps an unnecessary overlap of expertise, but as elaborated in Section 2.2.5 the overlap and the fact that more than one professional is responsible for the product, is of great importance for the quality. Due to the technological and economic developments of recent years it is no longer possible to maintain such an organisation. The development has compelled increasing specialisation (Berg 1987) and the time pressure is something completely different. Further, due to the reduction of working hours the average physician spends less time in the department compared to the situation some decades ago (Petersen et al. 1993). There is reason to ask: what effects have this development had on the learning environment in hospital departments?

In Paper 3 the sectioning of the department was identified as an organisational factor influencing access to learning situations. Another example of these structural changes is the routine of rounds in the department. The daily clinical round and preround have
traditionally been important learning institutions. Prerounds provide the opportunity to discuss diagnosis and treatment with colleagues, while a clinical round with more than one doctor produces master–apprentice situations with the patient present and consequently the possibility both to observe the master and to get feedback on one’s own clinical skills. However, anecdotal stories about the traditional clinical round with the head of department in front, followed by a hierarchical procession of physicians and nurses may indicate that the learning potential was not always realised to the best, neither for the inexperienced physician nor the patient.

This interview study indicates that clinical rounds today involving more than one physician are a rarity. This development in hospital clinical practice may be explained by the fact that during recent years the significance of laboratory data in the diagnostic process has increased to the detriment of clinical data. Nevertheless, learning to interpret technical results and to integrate the results in the diagnostic processes is just as much a social phenomenon as traditional bedside teaching. Here, the clinical rounds represent an important learning potential, but there are also other arenas. In the interviews the physicians often referred to the radiological rounds or the cardiological laboratory as important social arenas for learning clinical skills. Yet, during a tough working day the traditional daily rounds provide possibilities to create structure and space in the master–apprentice situations.

When the physicians in the interviews were asked to describe important learning situations, they usually referred to the department’s daytime activities, not the on-call duties. After a while, the work on call evidently became routine and therefore involved little challenge with regard to learning new things. There is reason to believe that due to the roster and the reduction of working hours the average trainee spends less time in the department compared to the situation some twenty years ago (Petersen et al. 1993). Further, when prerounds and rounds are largely history, there is reason to ask whether the social processes connected to diagnosis and treatment, the natural basis for learning medical practice, are about to crumble away. Earlier, the conditions for the master–apprentice situations to manifest itself were much more conducive. The activity was organised differently and with much more overlap than the situation today (Akre & Ludvigsen 1998). With regard to learning and training it is essential to protect these social processes in order to secure the necessary dialogue between specialist and newcomer.
Learning and training have to be taken into consideration when organising the activity. The organisation of the activity is at the same time an organisation of knowledge and has implications for what the participants learn.

5.2.4 Changing conditions for medical practice – implications for risk and safety

Of the issues discussed above, several are also relevant from a safety perspective.

The continuing reduction in the extent of overlapping expertise as well as less collective handling of clinical problems in medical practice also have important consequences from a safety perspective. Overlapping expertise allows for learning without jeopardising the activity because the participants can observe each other’s activities and thereby detect and correct each other’s mistakes while learning (see Section 2.2.5 and Papers 3 and 4).

There is evidently a relation between the resource situation in the organisation and the safety of the activity. The individual workload should be adjusted to allow mutual supervision and assistance (Hutchins 1995). In Paper 3, the issue of whether time pressure had resulted in an insufficient supervision of inexperienced physicians in the two departments was discussed. According to the quoted master, the activity was still safe, but the boundary with what can be defined as unsafe practice was not absolute. Inside a substantial grey zone the learner, on his trajectory towards expert competence, may be responsible for different procedures with varying experience. This will relate both to the number of times he has carried out a special procedure and the number of procedures mastered. Consequently, in addition to the overlapping expertise in the community on the whole, the abundance of knowledge held by each practitioner is an important hallmark of safety. If the calculated tolerance is consistently underestimated in this regard, the collective knowledge base in the department may suffer and in time one may arrive at a deadlock from which retreat is difficult.

In Paper 1 the discussion of adverse events was identified as one area of the communication atmosphere in the department which the physicians perceived as problematic. However, to design for safety also implies taking advantage of mistakes for both collective and individual knowledge development. In this perspective adverse events represent precious possibilities to correct latent failures in the organisation and to facilitate organisational learning (see Sections 2.4.3 and 2.4.4). But for an error to turn into a source
of collective knowledge it must become known and be discussed in the professional community in all its aspects as elaborated on in Paper 4.

Mistakes, both personal and others, give ample possibility to learn, also on an individual basis. As dealt with in Section 2.4.4, mistakes may give the learner new insight about the nature of the operation, insight that was not accessible from carrying out the correct procedure alone (Hutchins 1995). For instance, by detecting and correcting a mistake the individual learns error detecting and correcting strategies that may save the system from future errors. But again, the organisation of the activity here may be a modifying factor, and in this regard the horizon of observation is an illuminating analytical tool (see Section 2.2.5). In Paper 3 dividing the department into sections is used as an example of an organisational change influencing the learners’ horizon of observation, and as a result the possibilities of learning from mistakes are also affected.

This project does not have the explanatory power to draw conclusions concerning safety. The objective here is rather to point to the most important problems regarding risk and safety and to offer some useful concepts and ways of thinking about these problems.

5.3 Main findings and implications for the postgraduate and continuing medical education

In the following sections the discussion focuses on that part of medical education concerned with practical training in the hospital department.

5.3.1 The organisation of postgraduate medical education

A renewal of the postgraduate medical education is due. In the discussion above an account was given of some of the most important changes in hospital medicine with the subsequent implications for learning and training. Additionally, we have a new financial situation for postgraduate medical education. Together, these factors compel a new thinking regarding how education should be organised to secure the best results. The findings of this study hopefully offer some useful ideas for such a renewal.

The most important source of learning and professionalisation for the inexperienced physician is the clinical practice in the department. It is therefore natural and necessary to take practice as point of departure in a revision of postgraduate medical education. Practice is too important to be taken for granted. Hence, a quality assurance of the daily activities as a learning environment should be the cornerstone of postgraduate medical education.
means not only that time is set aside for an educational programme, counselling or self study, but that the organisers are conscious of learning as an aspect of all activity in the department. Such a quality assurance could, for instance, include securing a necessary overlap between inexperienced and experienced physicians both during regular daytime activities, in the outpatient clinic as well as on call.

The dual system of postgraduate medical education with an interaction between clinical practice and theoretical courses has come to stay. But it is important to facilitate that knowledge acquired during courses is applicable to the learners’ working day practice. One way of doing this is to minimise the transfer gap between the course situation and the clinical practice. Usually this would mean that what is presented at the courses should be as firmly rooted in clinical practice as possible (Ludvigsen 1998). In the course of the physician’s learning trajectory it will become easier to transfer knowledge from a more scholastic situation to the practice situation as the learner is trained in communicating verbally about clinical activities (see Paper 2). Besides, courses have their own learning logic. Here, physicians under training meet fellow journeymen as well as expert physicians from the most advanced hospitals and start exploring membership in medical communities outside the working place. In this way the courses may inspire a healthy critical perspective on the local professional community and the way medicine is practised there. A course also represents a natural source of new knowledge in the particular domain it deals with and is thus an arena for learning how to keep up-dated in a rapidly expanding medical world. On the other hand, the department should have a system for reports from courses, conventions and so on, in order for this new knowledge to benefit the collective knowledge in the department.

A positive project in postgraduate medical education has been visits by appraisal delegations from parallel departments in other hospitals. The object of these visits has been to evaluate the department as a learning environment and to learn from each other’s experiences. Two physicians from each department have visited the other for 2–3 days and followed all activities in the department. At the end of the visit an evaluation focused on the learning environment, the organisation of the activity and the educational activities takes place. So far only a few departments have tried this system out, but the experiences have been positive. The system of appraisal delegations may facilitate a focus on learning being maintained, and hence promote a well-functioning learning environment.

During the 1980s and 1990s much effort was put into introducing a system of formal educational counselling in postgraduate medical education. An important premise for this
system is that the counsellor and the trainee meet at regular intervals. In the two hospital departments included in this qualitative study almost all physicians under training had an educational counsellor, but only a few claimed to have meetings at regular intervals. The physicians, both counsellors and trainees described the system as malfunctioning and that they did not see much use in it as currently organised. That the system of formal educational counselling is not functioning according to intentions has also been supported by other research projects (Aarseth et al. 1995; Lycke et al. 1996).

A system of formal educational counselling is a new learning institution in medical culture. That the reform so far has not been a success may have several explanations. Firstly, in the daily turmoil, marked by a tension between production on the one hand and learning and training on the other (see Section 5.2.1), the physicians may be self-sufficient and not have the time to meet. Learning during daily activities is given priority as it is vital for the production of health services. Counselling is a far more long-term investment and it is therefore uncertain whether it will benefit the community. Another reason why the reform has not been fully accepted may be that those involved have not experienced any positive effects of the new learning institution. Finally, the slow reception may be due to a general resistance to anything new. A reservation is necessary here. Some years have elapsed since these data were collected, and according to recent reports from the NMA, the situation is slowly improving (Den norske lægeforening 2001). But more research is needed. Educational counselling could play an important role in the learning and professionalisation of physicians. Nevertheless, it must be concluded that the reform hitherto has not produced the expected results and that it probably should be revised to improve the immediate utilitarian value.

5.3.2 Continuing medical education: The educational needs of the expert physician

During the last ten years, the role of the hospital as a knowledge institution has become an increasingly topical issue. Society in general, and the fund-giving bodies in particular, have become aware of the commercial potential of expert knowledge and accordingly the demands on professional communities to be in the forefront of their domain increase. The specialists have a crucial role in this regard. Apart from representing this knowledge themselves they are masters for the inexperienced physicians in the hospital and hence irreplaceable for the reproduction of the professional community. But in order to make the
specialists able to fill this role as a knowledge reservoir their special learning needs must be respected.

In the interview study the special learning needs of the expert physicians were identified as accounted for in Paper 2. The experienced specialist learns from other experts, but has to leave the department – the local professional community – to meet them. This comes about, for instance, by undertaking teaching practice in highly specialised departments or taking part in medical conventions. The experienced physicians see themselves as participants in an international arena where they can assemble knowledge and bring it home to the local community of practice.

Earlier the special learning needs of the expert physicians were met by the educational funds allocated through The National Insurance. Today, with the new financial situation for postgraduate medical education which especially befalls the specialists, the responsibility for financing these educational needs is left to the hospital employer. In other words, financing depends on the employer’s understanding of the special learning needs of the expert physicians and that they recognise the importance of investing in these professionals for the reproduction of medical knowledge in the department.

5.3.3 The Norwegian Medical Association and the responsibility for monitoring the postgraduate medical education

The natural objective for the NMA is to be a prime mover for the quality of postgraduate medical education. This accounts both for being an initiator for the renewal of postgraduate medical education (as was the case in the introduction of educational counselling in postgraduate medical education) as well as for securing the quality of the programmes already taking place.

Today, the focus of quality management of postgraduate medical education is on the formal learning institutions like the formal educational program and the educational counselling. However, this study of learning in a medical culture identifies practice as the main source of learning for the inexperienced medical trainee. Accordingly, the main purpose of monitoring should be clinical practice itself. But practice is a difficult field to monitor. The current study has presented a number of central concepts and issues which provide a basis for the reconsideration of instruments for quality management in postgraduate training.
Basically, these instruments should be designed to measure whether the organisation of the medical activity is conducive for learning and professional development. For example, this implies a reappraisal of the overlap between inexperienced and experienced physicians during both daily activities and on call, and whether the circumstances of these overlaps allow for proper supervision and transparency with regards to clinical reasoning. Further, it is crucial that the department has a system for checking clinical decisions taken by inexperienced physicians on their own. In addition to providing important feedback possibilities for inexperienced physicians such routines are important for the quality assurance of the activity.

Finally, a pivot in quality management of the learning environment in hospital departments is a system for handling adverse or unexpected events, which makes full use of the learning potential in such situations, concerning both individual and collective learning.

On the basis of the theoretical framework and the conclusions from this study, a questionnaire designed to explore the learning environment in hospital departments was made. In 1997–1998 this questionnaire was presented to five departments in a large hospital, the surgical department, the department of orthopaedics, the internal medicine department, the department of paediatrics and the department of obstetrics and gynaecology. After the survey the results were presented and discussed in each department in order to place learning on the agenda and start a process of improving conditions for learning in the department (a report from this project is published on the Research Institute’s Internet pages – http://www.legeforeningen.no).

5.4 Implications for further research
The practice of clinical work represents a “black box” in the research on medical learning. This present study is a start in the opening up of this black box and offers concepts and ways of thinking about practice. Nevertheless, there is still a great need for more knowledge of how doctors learn in natural clinical situations. New research in this field should preferably include observation of physicians’ task solving activities in real situations. This would allow studies of the dialogues between the different participants in the situation as well as interaction with technology and other resources.

There is a need to look into ways of monitoring practice as a learning environment. This is a complex field and it is not easy to find simple instruments by which the learning
quality of the activity in a hospital department may be measured. This present study offers some central concepts as stepping stones for such a project.

There is today a growing interest in the hospital as a knowledge institution. At the same time the situation regarding the financing of continuing medical education is somewhat uncertain with the drying up of the educational funds administered by the NMA. It is therefore of special interest to acquire more knowledge about how expert physicians keep up-dated in their field, and especially how they participate in the development of their own domain.
References


