Radiographers’ Professional Competence
Development of a context-specific instrument

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Akademisk avhandling
För avläggnade av doktorsexamen i Omvårdnad som med tillstånd av Nämnnden för utbildning och forskarutbildning vid Högskolan i Jönköping framläggs till offentlig granskning fredag den 9 november 2012 kl.13.00 i Forum Humanum, Hälsohögskolan i Jönköping.

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Abstract

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Aims: The overall aim of this thesis was to explore and describe radiographers’ professional competence based on patients’ and radiographers’ experiences and to develop a context-specific instrument to assess the level and frequency of use of radiographers’ professional competence.

Methods: The design was inductive and deductive. Both qualitative and quantitative methods were used. The data collection methods comprised interviews (Studies I-II) and questionnaires (Studies III-IV). The subjects were patients in study I and radiographers in studies II-IV. In study I, 17 patients were interviewed about their experiences of the encounter during radiographic examinations and treatment. The interviews were analysed using qualitative content analysis. In study II, 14 radiographers were interviewed to identify radiographers’ areas of competence. The critical incident technique was chosen to analyse the interviews. Studies III and IV were based on a national cross-sectional survey of 406 randomly selected radiographers. Study III consisted of two phases; designing the Radiographer Competence Scale (RCS) and evaluation of its psychometric properties. A 42-item questionnaire was developed and validated by a pilot test (n=16) resulting in the addition of 12 items. Thus the final RCS comprised a 54-item questionnaire, which after psychometric tests was reduced to 28 items. In study IV, the 28-item questionnaire served as data. The level of competencies was rated on a 10-point scale, while their use was rated on a six-point scale.

Results: In study I, the female patients’ comprehensive understanding was expressed as feelings of vulnerability. The encounters were described as empowering, empathetic, mechanical and neglectful, depending on the radiographers’ skills and attitudes. Study II revealed two main areas of professional competence, direct patient-related and indirect patient-related. The first focused on competencies in the care provided in close proximity to the patient and the second on competencies used in the activities of the surrounding environment. Each of the two main areas was divided into four categories and 31 sub-categories that either facilitated or hindered good nursing care. In study III the analysis condensed the 54-item questionnaire in two steps, firstly by removing 12 items and secondly a further 14 items, resulting in the final 28-item RCS questionnaire. Several factor analyses were performed and a two factor-solution emerged, labelled; “Nurse initiated care” and “Technical and radiographic processes”. The psychometric tests had good construct validity and homogeneity. The result of study IV demonstrated that most competencies in the RCS received high ratings both in terms of level and frequency of use. Competencies e.g. ‘Adequately informing the patient’, ‘Adapting the examination to the patient’s prerequisites and needs’ and ‘Producing accurate and correct images’ were rated the highest while ‘Identifying and encountering the patient in a state of shock’ and ‘Participating in quality improvement regarding patient safety and care’ received the lowest ratings. The total score of each of the two dimensions had a low but significant correlation with age and years in present position. The competence level correlated with age and years in present position in both dimensions but not with the use of competencies in the “Nurse initiated care” dimension.

Conclusion: This thesis has shown that professional competence is important in the encounter between patient and radiographer. It has also demonstrated that radiographers’ self-rated professional competence is based on nursing, technological and radiographic knowledge. From a radiographer’s perspective, ‘Nurse initiated care’ and ‘Technical and Radiographic processes’ are two core dimensions of Radiographer Competence Scale. The 28-item questionnaire regarding level and frequency of use of competence is feasible to use to measure radiographers’ professional competence.
**Original papers**

This thesis is based on the following papers, which are referred to by their roman numerals in the text:

**Paper I**
Andersson BT, Fridlund B, Elgán C & Axelsson ÅB. Female patients’ encounters with the radiographer in the course of recurrent radiographic examinations – a qualitative study. Submitted for publication.

**Paper II**

**Paper III**

**Paper IV**

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Introduction

The patient arrives at the diagnostic radiology department to undergo a radiographic examination and/or radiological intervention expecting to be cared for and encountered as a human being by a professional radiographer with appropriate competence. The radiographer plays a central role, as she/he cares for the patient before, during and after the radiographic examination and/or radiological intervention. It is of paramount importance that the radiographer is familiar with the problems involved and can support the patient during the radiographic procedure.\textsuperscript{1} Patients, especially those who are chronically ill, are vulnerable and in need of caring when in hospital.\textsuperscript{2, 3} Hence, the radiographer requires knowledge of nursing care in addition to specialised radiography competence. Radiography is the area of professional knowledge, research and responsibility.\textsuperscript{4} Caring encompasses someone who cares, a relationship of caring and someone who is cared for and rests upon understanding human thoughts and feelings.\textsuperscript{5-7} Nursing care in a diagnostic radiology context includes interacting with patients while respecting their privacy and personal space, focusing on patients' safety, comfort and dignity in addition to dealing with their fear and anxiety.\textsuperscript{8, 9} The professional radiology healthcare team; radiographer, radiologist and assistant nurse, plays a vital role in assisting the patient physically and psychologically as well as helping her/him to understand her/his feelings and reactions related to the examination. Although nursing care is one of the primary functions of a radiographer, the time available for the performance of a complete radiographic examination is limited.

The work of radiographers in Sweden differs from that of their peers in some other countries. In Sweden, registered radiographers are responsible for performing the entire radiographic examination, thus they have to take care of the patient as well as dealing with the medical technology, e.g. injections, catheterizing and medical technical equipment.\textsuperscript{4} In most countries, registered nurses are responsible for patient care, while the radiographer or corresponding professional is in charge of the radiological equipment.
Diagnostic radiology departments are characterised by high-technology comprising medical technical equipment, radiographic examination and radiological interventions. A profession such as that of radiographer is situated in a field of great tension; encountering the patient, performing a radiographic examination or intervention, achieving internal and external goals and strategies while simultaneously providing nursing care. There is a need to develop tools to measure professional competence in the radiographers’ profession in order to ensure patient safety and high quality care. A questionnaire adapted to a high-technological environment such as diagnostic radiology could contribute to the development of radiographers’ areas of professional competence. Furthermore, deeper knowledge of and insights into these areas are significant in terms of their responsibility for the patient in the diagnostic radiology department. There is an increasing need for evidence-based research and evidence-based practice (EBP) related to clinical radiographer practice in order to ensure patient safety and to analyse ingrained habitus. A prerequisite for patient safety and effective health care practice is professional competence and knowledge.

Background

The diagnostic radiology context

A high technological environment

The culture of a diagnostic radiology department is characterized by advanced high technology, which was developed to help patients in their striving for health and recovery but also to make radiological work safer and easier to handle. The purpose of a radiology department is to provide a service to the health care system for in- and out patients as well as the patients of general practitioners and can be organised into conventional and specialised radiology. The most common conventional examinations comprise the skeleton, chest, gastrointestinal and urinary tracts, while computed tomography (CT), magnetic resonance imaging (MRI), mammography, ultrasound, vascular examinations
and radiological interventions are considered specialized radiological examinations.

The high-technological environment has evolved due to the implementation of digital systems, which have totally changed the radiology department. The rapid growth of technical and scientific knowledge has changed not only the environment but also the requirements on competence for many professional categories and the health care system as a whole. High technology has transformed the physical appearance of the diagnostic radiology department and influenced its social structure. This technical development process has impacted on the radiographers’ work in that it allows little human control in the organisation. Traditionally, knowledge and skills were often developed by trial and error and learnt from colleagues through habitus. Today, there is a great demand for evidence.

All parts of a radiological examination or intervention involve advanced high technology and today, many patients go directly from e.g. the emergency ward, to the radiology department. Historically, technological advances have been considered a major indicator of human progress, especially in the areas of medical science and health care. Technology can distance the personnel from the patient, e.g. monitoring machines instead of using sensitivity and reflection. Although technology can facilitate health care and enhance professional development, there is a need to understand the humanistic interaction involved.

High technology is very much a natural part of radiographers’ work and the importance they attribute to the technical equipment plays a vital role in their competence. At the same time as radiographers have had to assume a more demanding role and higher level of responsibility due to the technical evolution, they are also required to take care of patients. Technology is not neutral in radiography or nursing practice, but a pervasive reality.

**The patient**

When a patient attends the hospital to undergo a radiographic examination, she/he is in need of professional competence. Most patients have been referred and do not require advanced medical support. However, this situation will
probably change in the future due to the critically ill trauma patients as well as the increasing number of elderly patients suffering from chronic conditions. Despite advances in medical technology, cancer remains one of the leading causes of death globally. Approximately one third of the population in the developed world will experience cancer in their lives. Cancer diagnosis is central to the radiography profession, as radiographers assist in the diagnostic process and follow up examinations. Furthermore, patients require physical and psychological support when undergoing a radiographic examination or complex radiological intervention.

Vulnerability of patients in today’s health care system has been described by several theorists. Armstrong pointed out that the vulnerable patient can lose control and enter into a state of powerlessness, which may influence her/his participation in the radiographic examination. The relationship between feelings of vulnerability and mammography examinations has been studied by Lupton. A follow-up examination is very frequently associated with fear of recurrence and in such stressful circumstances a person is sensitive to what is happening around her/him. Andersson and von Post highlighted the patient’s vulnerability and total dependence upon the professionals. The patient’s integrity may be violated in the encounter with professionals who treat her/his body in a non ethical way or who intrude upon her/his personal space. The experience of dignity influences a person’s well-being. A situation that threatens to violate dignity can be transformed into a non-violating action through e.g. sensitivity, involvement and attention. Irrespective of how difficult the circumstances may be, respect for dignity and knowledge of the nature of true dignity are essential.

**Caring**

Caring is the human mode of being in every relationship. Professional competence in caring is a prerequisite in the patient-radiographer interaction. Caring for the patient is a fundamental aspect of diagnostic radiology and also a part of radiographers’ education. In radiography, caring is derived from and comparable with the nursing profession, although the context is quite different. Caring is a rich concept reflecting genuine concern for another person, attentiveness and respect. The radiographer has a unique position in terms of
encountering, supporting and protecting the patient and next of kin and is responsible for the patient during the entire radiographic examination and stay at the radiology department. Caring also involves acting as an advocate for patients exposed to poor practice as well as facilitating contact between the patient and the radiologist. Stolberg et al. pointed out that the patient more often dares to approach the radiographer than the doctor. When positioning the patient and assisting during radiological interventions there is a need for physical closeness in the form of touching for examination purposes. However, touch, eye contact and standing close to her/him as well as avoiding technical language are important caring behaviours, as well as being aware of the importance of mutuality in the caring of the patient.

The core of good nursing care is human, interactive action comprising the following categories: the actor, her/his characteristics, task and human oriented activities and ways of acting, preconditions and aims. Leino-Kilpi described the most important and frequent elements of good nursing care as interaction, comprehensiveness, need-centredness, initiative, technical procedures and knowledge-base. In other words, good nursing care takes place in interaction that demands initiative on the part of the radiographer and collaboration with colleagues in technical procedures as well as being comprehensive, need-centred and requiring a knowledge-base. Good nursing care has also been described as decisions about correct or appropriate care, sensitive listening and consideration of the different ways in which the patient’s condition can manifest itself. As the medical technology requires a great deal of a radiographer’s time, it should be borne in mind that good care is necessary to ensure patient safety in the encounter.

**Encounters**

Despite the fact that the main purpose of the encounter is a radiographic examination or radiological intervention, it is essential to treat the patient in a professional caring way, taking account of her/his circumstances and psychological needs. Encounters between the patient and the radiographer in the course of radiographic examinations are short and intensive. Information about the patient is sparse and usually she/he is unknown to the radiographer. Croona has shown that despite an heavy workload it is necessary to allow time to encounter the patient in a caring way.
Encounters in settings other than diagnostic radiology have been described from the perspective of both patients and nurses. Wiman et al. found that high quality encounters take place when caregivers are capable of shifting their way of being with the patient between the instrumental and attentive mode in accordance with the demands of the situation. Travelbee described the encounter as a process made up of five phases where rapport constitutes the genuine encounter. A good care encounter was described by Attre as patient-focused, individualised and related to the patient’s needs. Halldórsdóttir defined the essential structure of a caring and an uncaring encounter from the perspective of people who had been diagnosed with and treated for cancer. Later, Halldórsdóttir and Hamrin and Halldórsdóttir and Karlsdóttir identified the concept of competence within nursing and health care, which they labelled professional caring. In the latter study the participants emphasised the need for professional competence as well as a genuine encounter. Competence in professional caring is significant and lack of professional caring affects the encounter in a negative way.

Patients are usually provided with written information before a radiographic examination. Such information contains knowledge, but does not necessarily create trust or provide consolation. Thus, there is a need for a face to face encounter. The language used and mode of speaking are of great importance to the patient. There is a gap between medical jargon and everyday speech, which can be difficult for a patient to understand. Two of the most important issues in health care are ensuring that medical information is understandable and not hindering patient participation during examinations and interventional. Cancer or chronic illness influences daily life and the patient’s total context. Such information is important for the radiographer and has to be taken into account when caring for a patient in the course of a radiographic examination. It is necessary to ensure that professional competence in the encounter benefits all patients. A radiographer has an ethical responsibility to invite the patient into a caring relationship and create confidence in the encounter.
The radiographer

Radiographers have different national titles in almost all European countries, but documents in English usually refer to them under the collective noun ‘radiographer’. This term covers health care workers throughout Europe with comparable tasks in the professional fields of Diagnostic Radiology, Nuclear medicine and Radiotherapy. In documents presented by international organizations; the International Society of Radiographers and Radiological Technologies (ISRRT) and the European Federation of Radiographers’ Societies (EFRS), patients’ physical and psychosocial well-being prior to, during and following examinations or treatment is highlighted. Outside Europe, members of the profession are mainly called Radiological technologists because of the profession’s primarily technological nature. Radiographers work in both therapeutic and diagnostic settings. A therapeutic radiographer performs radiation therapy, while a diagnostic radiographer is responsible for diagnostic radiography. This thesis focuses on the latter. Diagnostic radiographers work independently, with responsibility for nursing care as well as for performing safe and accurate radiographic examinations and assist in radiological interventions. They use a wide range of sophisticated equipment and techniques and are responsible for radiation safety and diagnostic image quality. In most European countries these techniques not only include the use of X-rays, but also high frequency sound (Ultrasound), strong magnetic fields (Magnetic Resonance Imaging, MRI) and radioactive tracers (Nuclear Medicine).

A profession is characterised by being sanctioned by society, having its own culture and authority, ethical code and systematic theory. The radiography profession is concerned with serving people in order to meet their individual needs and has its own code of ethics. In Sweden, the ethical code is set out in laws and guidelines pertaining to health care in general. The radiographer is registered, i.e. fully qualified, to assume responsibility and make use of her/his knowledge.

Professional identity is a vital part of the radiography profession and has been reported by nurses as important for patient care. It defines values and guides health care professionals in their thoughts, actions and interaction with a patient. Building a strong professional identity helps to develop mastery of the
profession. In a study by Niemi and Paasivaara, technical, safety and professional have been highlighted as three different types of discourse describing radiographers’ professional identity. The radiographer has a dual professional identity; scientific-mechanical and mastery of the humane in humanistic nursing. Nursing care is a significant dimension of radiographers’ work, which cannot be carried out by other nursing staff.

Nevertheless, the radiography profession is young (recognised in approx. 1960) and the number of professionals as well as the level of scientific activity in the educational institutions is limited. However, in Sweden, the academic field of radiography has grown stronger since 2001. This can be related to a more “innovative” education at a number of universities, including both a professional radiographer degree and an academic degree with the opportunity to pursue higher academic studies in radiography. The academic status of the profession today implies greater social authority and possibilities to influence related social issues.

**Radiography**

Diagnostic radiography covers all imaging modalities and the integration of these with the best quality and the most appropriate diagnostic examination(s) in a person-centred way, whilst minimising harm to and maximising the safety of patients, staff and others; and assisting referring doctors to make the best possible use of imaging for patient management and treatment. Furthermore, radiography comprises the peri-radiographic process, i.e. pre-, intra- and post-procedural care, which is contingent on proficiency in the nursing process and reflection skills.

The Swedish Society of Radiographers has defined radiography as an interdisciplinary field of competencies that draws knowledge from nursing, imaging and functional medicine, radiation physics and medicine. In a study by Ahonen, radiography in relation to the health sciences, has been defined as the radiographers’ expertise in the use of radiation, which is dual, dynamic, social, situation-related and typically based on versatile synthesis.
The radiographic knowledge base was developed through research activities in medicine and natural science and still employs knowledge generated by other disciplines. Radiography research-based knowledge has above all been generated in and inspired by the field of nursing. This process is part of “the new generations of a professionalized process” and involves the need to achieve status for the profession and influence society. Openness to and collaboration with other professions in sharing good practice and evaluating research and education are necessary in order to increase professionalism and develop a true radiography profession. Today, it is of great interest as well as a high priority to increase knowledge through research networking and specific radiography research in addition to building arenas where theoretical and clinical practice and research can meet. However, as a health science, radiography has been described as a new field and during the past decade has been introduced into many universities in the Nordic countries.

**Measuring competence**

Measuring radiographers’ competence is a professional matter and fundamental to patient outcomes. In many countries, professional bodies regulate practice and in Sweden this process is based on the Competency Standards for Registered Radiographers. To date, no instrument is available for assessing clinical radiographers’ professional competence. On the other hand, instruments have been developed in the nursing area and the value of competence assessment is universally recognised in the nursing literature. Instruments can be generic, measuring competence by focusing on general competence or domain-related measuring competence by focusing on a specific aspect. Examples of instruments used in nursing, is showed in Table 1 below. Examples of areas measuring competence include planning, patient care, assessment, evaluation, decision making, social participation and research awareness. The Six-Dimension Scale (6-D) measures leadership, teaching/collaboration, planning/evaluation, interpersonal relations/communication and professional development and has been used by several researchers to demonstrate concurrent validity. Another scale, the Scale Nurse Evaluating Form (SNEF), was developed for measuring clinical performance in practice, administration, education, research and professional responsibilities. The most used and well-known instrument is the Nurse Competence Scale (NCS) developed by Meretoja et al. for measuring e.g. work and helping roles,
teaching-coaching, diagnostic functions, ensuring quality and managing situations. The International Council of Nurses (ICN) developed the Competence Inventory for Registered Nurses (CIRN).\textsuperscript{81, 82} Self-assessment tools pertaining to competence have also been developed in specific contexts e.g. oncology,\textsuperscript{83} the operating theatre\textsuperscript{84} and critical care specialist.\textsuperscript{85}

Despite the fact that there is a fairly large number of instruments for self-assessment of competence in the area of nursing, none are applicable in the area of diagnostic radiology. There is an extensive limitation in using generic tools or those developed for other specific nursing areas because of their inability to capture the very specific contextual nuances that characterise clinical practice in specialist areas. Instruments such as a self-assessment tool are essential for facilitating clinical radiographers, managers and researchers to better understand and improve their professional competence and can also contribute to creating a culture of patient safety and quality nursing care in diagnostic radiology departments.
Table 1. Examples of instruments used to measure generic and domain-related nursing competence.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Author</th>
<th>Items</th>
<th>Assessment aim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six-Dimension Scale (6-D)</td>
<td>Schwirian PM, McClosney JC &amp; McCain B</td>
<td>52</td>
<td>to assess nursing competence in different client care settings</td>
</tr>
<tr>
<td>Staff Nurse Evaluation Form (SNEF)</td>
<td>McClosney JC &amp; McCain B, Gardner DI</td>
<td>49</td>
<td>to assess the performance of practicing nurse competence</td>
</tr>
<tr>
<td>Nurse Competence Scale (NCS)</td>
<td>Meretoja R., Isoaho H, Leino-Kilpi</td>
<td>73</td>
<td>to assess the level of nurse competence in different hospital environments</td>
</tr>
<tr>
<td>Competence Inventory for Registered Nurses (CIRN)</td>
<td>Liu M, Kunaikitkul W, Senaratana W, Tonmukayakul O, Eriksen L</td>
<td>59</td>
<td>to assess clinical competence</td>
</tr>
<tr>
<td>Focused on Oncology Nursing Care</td>
<td>Brixey MJ, Mahon SM</td>
<td>139</td>
<td>to identify knowledge deficits in fundamental oncology concepts and assess competence</td>
</tr>
<tr>
<td>Perceived Perioperative Competence Scale-Revised (PPCS-R)</td>
<td>Gillespie BM, Polit DF, Hamlin L, Chaboyer W</td>
<td>40</td>
<td>to assess nurses’ perceived perioperative competence</td>
</tr>
</tbody>
</table>
Conceptual standpoints

Evidence-based practice (EBP)

Evidence-based practice (EBP) means the use of best available evidence when making clinical decisions about individual patient care. EBP is derived from evidence-based medicine (EBM), a definition of which was first presented by Sackett. Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient’.

Sackett’s definition has been adjusted for the health care sciences and allied professions. “The Sicily statement on evidence-based practice” covering all health care professionals, was adopted by delegates at an international conference in Sicily in September 2003 (Signposting the future of EBC”). Evidence-based care (EBC) is a key skill for all professional categories and cultures. However, good practice includes both explicit knowledge such as research evidence and non-research knowledge i.e. tacit knowledge and knowledge based on experience. Tacit knowledge is derived from the wisdom of experience and can be more difficult to share compared to research evidence. The way in which the information is applied by means of actions in a specific setting makes sense of the evidence.

In radiography it is necessary to actively search for new evidence in order to remain up to date in the profession and in a position to ensure high quality care, patient safety and an ethical stance. However, radiographers do not routinely use EBP and instead, reliance on tradition and subjective experience has often been the norm. Recently, a new concept based on EBP called Evidence-Based Radiography (EBR) has been presented, defined as “radiography informed and based on the combination of clinical expertise and the best available research-based evidence, patient preferences and available resources”. The use of evidence can form the foundation for professional competence in different radiography working fields and there is a clear and
obvious connection between them. EBP and EBR are prerequisites for professional competence and the safety of the patient in the radiology department.

**Patient safety**

Patient safety has been defined by the WHO as “the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum”. Competency in radiology departments has a direct influence on the health and safety of all patients. The competencies required to fully address patient safety go beyond educating health care professionals; a patient safety culture is also required. Patient safety and care do not rely solely on the competencies of the individual radiographer, but also on those of the team, made up of individuals from multiple disciplines. The lack of competency may lead to serious medical errors and consequences for the patient. Errors can be found in the active delivery of care when doing something wrong or failing to take the right course of action. This threat to patient safety increases when health care providers work in an organisational culture that might hinder the preconditions of professional competence. To resolve this problem it is necessary to bridge the gap between theory and practice by combining professional competence and improved knowledge.

The concept of clinical audit has been highlighted as an important part of patient safety, quality improvement and patient care outcomes. Clinical audit is “a systematic examination or review of medical radiological procedures”. The European Commission has published guidelines related to clinical audits for radiological practice, including all investigations and therapies involving ionizing radiation. These guidelines are in line with the European Atomic Energy Community’s (EURATOM) responsibility to establish uniform safety standards to protect workers and the general public from the dangers of ionizing radiation. The guidelines are aimed at improving the quality and outcome of patient care through structured review, whereby radiological practices, procedures and results are examined in the light of agreed standards. Modifications are implemented where indicated and new standards applied if necessary. Clinical audit is a multi-professional activity that is both scheduled and systematic. It should be able to identify the strengths of a radiology department as well as areas in need of improvement. The objectives of
clinical audit in diagnostic radiology are quality improvement of patient care, promotion of the effective use of resources, enhancement of the provision and organisation of clinical services and further education and training.

**Ethics**

Ethics and morality are two concepts often referred to in the literature. Ethics describes the motivation behind the activity or philosophical system of values, while morality is generally used in relation to concrete activities. Beauchamp and Childress identified four moral aspects as the main principles of health care work: autonomy, beneficence, non-maleficence and justice. Each of them are morally binding, equal and can be weighed against each other in a specific situation in order to decide which principle is the best to act upon. What patients want can be morally relevant in line with the principle of respect for autonomy. Respecting a person’s autonomy is morally good, while withdrawing from a situation in which a patient is being violated is morally bad, irrespective of the outcome. The presence of another person requires a relationship to her/him as a fellow human being. However, the principle of ethics and theoretical analysis are not always sufficient. Relational ethics, which focuses on the encounter and relationship with other human beings, could constitute a ‘bridge’ between ethics and health care practice and might facilitate the ongoing dialogue between patient and radiographer.

The essence of relational ethics is the encounter and interaction between people. Bergum and Dosseter described relational ethics as comprising four components: Mutual respect, Engagement, Embodiment and Environment. The ethical demand appears in the encounter, which is also characterised by inter-dependence, a mutual obligation and a changeable relationship of vulnerability and power. The radiographer can choose how to use the power, by taking or not taking care of the other person. The ethical demand is silent; it is invisible to the other person. The power in this inter-dependent encounter does not mean that one person can assume responsibility for the other. Each individual is responsible for her/his own life. In an encounter, trust also emerges. If trust is met by an attitude of rejection, it can become mistrust. As relational ethics is based on the ethical practice in the relationship, it is in the relationship that the caregivers determine how to be and
Act. Acting ethically does not only concern making the right decision in critical situations, but involves how the radiographer relates to patients in everyday practice and the commitment to them.

There are critical as well as non-critical situations in a radiology department. Critical situations can be challenging for all involved: patients, next of kin, radiographers and other staff. Reflecting on ethical issues related to critical situations could lead to a deeper understanding of the experiences of those involved and increase professional competence.

Clinical habitus

A habitus is based on experience and presupposes the active presence of previous experiences found in every human being in the form of perception, thought and behaviour patterns. Habitus is the product of history and subject to constant transition; new experiences are added to earlier ones and thus modify the habitus. Bourdieu described the way in which people experience and recognise the social structure of which they are a part, reproducing it again and again as habitus. As a social structure, behaviour depends on the linguistic 'cultural capital' and the habitual competencies involved in every encounter. Cultural capital can help the patient and radiographer to understand each other and how to build an encounter.

The meaning inherent in the words depends on the willingness to understand and accept the other person. These conditions of acceptability, which constitute the habitus, concern not only the linguistic capital but also our physical appearance and schema. Even if an experienced radiographer possesses theoretical knowledge, routines in the clinical situation are often based on unconscious habitual behaviours, which could influence newly qualified radiographers’ possibility to implement their theoretical knowledge in clinical practice, in turn impacting on the development and growth of professional competence. Individuals who have developed habitual behaviours become less willing to act on new information and may even avoid it if it challenges their present behaviour.

Habitual behaviours generally emerge in stable contexts, such as a radiology department, from conscious intention or routine repetitions of past activities.
without reflection. The latter can negatively influence patients’ experience of a radiographic examination. Shaping the optimal situation through good habitus is important for patient safety and nursing care.

Nilsson et al. found that all healthcare professionals tend to develop efficient and automatically activated habits, which are self-created. However, habitus can be a fluctuating entity. An awareness that social structure stimulates the habitus provides the opportunity for change. Radiographers who adopt a critical and reflective approach to clinical practice can be seen as key players in the future organisation staffed by co-workers with high and appropriate competence.

**Professional competence**

Competence is a complex concept that has been frequently discussed internationally. In the literature, the definitions of the concept of competence vary; in particular the concepts of competence and performance give rise to confusion. Competence has been described as closely related to ‘being able to’ and ‘having the ability to’ do something, but there is no common agreement as to whether competence implies a greater level of ability or capacity. However, nursing studies have explored competence in different ways and there is general consensus that it is based on a combination of components that reflect knowledge, understanding and judgement, cognitive, technical and interpersonal skills and personal attitudes. Competence in general has been defined by Benner as “the ability to perform the task with desirable outcomes under the varied circumstances of the real world”.

Professional competence includes the way of acting in a specific context, in this case a diagnostic radiology department and its traditions. People do not possess the same knowledge although they may work in the same field. Knowledge can be so deeply embedded that a radiographer with vast experience intuitively carries out her/his duties. This is called “tacit knowledge” and seems to be nebulous and difficult to capture. A central premise of tacit knowledge is that “we know more than we can express”. Furthermore, tacit knowledge is in the background and not our primary focus. According to Benner and Dreyfus et al., five levels of professional pathways “from novice to expert” are described as the basis for achieving increased skills and competencies. The lower stage of
competence depends on rules and guidelines, while expert knowledge is apparent by intuition and a general grasp of a situation rather than being able to articulate the reasons for the response. However, a higher level of competence does not automatically result in expertise. Understanding and judging situations are the key skills in complex human activities. Benner described the nurse’s evidence-based knowledge as derived from actual nursing situations in an emergency context. The findings from Benner’s study were further developed by Benner et al., who emphasised a more holistic view of caring behaviour.
Rationale for the thesis

Radiographers’ professional competence has a direct influence on patient care and safety in the course of radiographic examinations and interventions. Lack of competence may lead to serious diagnostic mistakes, resulting in severe consequences for the patient. The safety of patients receiving medical care is clearly associated with the competence of the healthcare providers and quality care can only be achieved if the providers are considered competent to deliver the best possible standard of care. It is vital to approach patients’ as well as radiographers’ experiences of care when identifying areas of professional competence. Hence, the rationale behind this thesis was to explore and describe radiographers’ professional competence based on patients’ and radiographers’ experiences.

No available instruments related to radiographers’ professional competence were applicable and therefore a second rationale was to develop a context-specific instrument for radiographers’ self-assessment of professional competence, its level and frequency of use. It is vital to be able to measure competence in order to create a stable knowledge base for organisational and educational interventions aimed at optimising clinical practice. The lack of a systematic and structured measurement instrument also makes it difficult to compare different groups of radiographers in various contexts and evaluate the effects of level and frequency of use of competencies. In addition to developing a context-specific instrument for competence self-assessment it is essential to expand the existing understanding of and deepen the insights into the content of radiographers’ professional competence. A third rationale was to investigate the level and frequency of use of radiographers’ professional competence. The main reason for this thesis is to increase our knowledge of radiographers’ professional competence. Such knowledge can be useful in caring for the patient during radiographic examinations, for management and education of staff at radiological departments as well as serving as a basis for future longitudinal studies.
Overall and specific aims

The overall aim of this thesis was to explore and describe radiographers’ professional competence based on patients’ and radiographers’ experiences and to develop a context-specific instrument for radiographers’ self-assessment of competence.

The specific aims of the studies were to:

- explore experiences of encounters between female patients diagnosed with breast cancer and radiographers in the course of recurrent radiographic follow-up examinations (Study I).

- describe radiographers’ areas of professional competence related to good nursing care, based on critical incidents that occur in the course of radiological examinations and treatment (Study II).

- develop and psychometrically test a specially designed instrument, the Radiographer Competence Scale (RCS) (Study III).

- describe radiographers’ self-assessed level and use of competencies as well as how socio-demographic and situational factors are associated with these competencies, particularly in relation to work experience (Study IV).
Methodological framework

Qualitative explorative and descriptive methods were used in studies I and II, including qualitative content analysis and the critical incident technique (CIT). In studies III and IV, quantitative methods such as questionnaires were employed. A paradigm is a set of beliefs that define the researcher’s worldview and their ultimate truthfulness can never be established. Paradigm encompasses three elements: epistemology, ontology and methodology. Epistemology concerns how we know the world and the relationship between the questioner and the known, while ontology involves the nature of reality. Methodology focuses on how we gain knowledge of the world. Different research methodologies have been used in this thesis.

Epistemology and ontology

The diagnostic radiology setting is strongly influenced by the positivistic tradition. At one end of the continuum, natural science is deeply rooted in a positivistic epistemology that emphasises hard data, objectivity and unbiased findings. At the other, the human and social sciences are positioned in an interpretative framework where the emphasis is on context, description, soft data and understanding. In a dynamic profession such as radiology, technology has a major impact on the professionals’ competence, where their response to and responsibility for meeting the patient’s needs are important. The ontological perspective of this thesis is inspired by humanism and a holistic view of the human being, where all caring actions are grounded in the intention to ‘do good’.

The clinical work is focused upon the interaction between the radiographer and the patient with a range of methods and technologies designed to diagnose and/or treat disease. In everyday health care work, radiographers, their colleagues and patients collaborate in an environment driven by medical-technical orientation and best outcome. Radiographers are mostly occupied
with practical matters of great urgency related to the situation. They are expected to achieve the highest standards of image quality and the most appropriate diagnostic examinations in a limited period of time, whilst minimising harm to and maximising safety of patients and staff. An individualised perspective takes account of the feelings, behaviours and cultures of those involved and reveals the essence of the radiographic examination. This is an ontological question and ontology provides the foundation for the epistemology of the discipline, which is the basis of knowledge development.\textsuperscript{126}

As the purpose of studies I and II was to epistemologically explore and describe the social reality of the participants, an inductive process was used, while a deductive process was employed in studies III and IV to develop a questionnaire. Psychometric tests and amendments of the questionnaire to maximise its relevance to radiographers’ competence produced knowledge that can be used when approaching practitioners on an individual basis.

**Qualitative content analysis**

The patient perspective is crucial for understanding patients’ experience of the encounter with health care professionals. Content analysis has been defined as a research technique that employs a set of procedures to make valid inferences from a text.\textsuperscript{124} Based on communication and system theory, it can describe both the manifest and the latent message.\textsuperscript{127} Content analysis lacks a philosophical framework for the interpretation of texts. Although there is a distinction between descriptive and interpretative analysis of a text,\textsuperscript{128} content analysis makes use of both approaches. It initially dealt with objective systematic and quantitative descriptions of manifest communication, but over time expanded to include interpretations of latent content and has been applied to a variety of data, as well as various depths of interpretation.\textsuperscript{129} Manifest content analysis describes the visible components in the text. In contrast, latent content analysis concerns what the texts talk about and deals with relationships, as well as an interpretation of the underlying meaning.\textsuperscript{130} Burnard\textsuperscript{131} described content analysis as a coding and categorisation system containing a number of steps, briefly described as: (1) writing notes and memos after every interview, (2) reading verbatim and making notes on meaning units, (3) repeatedly reading and making notes about topics related to the aim of the study, (4) categorisation, which involves describing all aspects of the content, a stage
known as open coding. (5) Re-reading the text as a whole, (6) condensing based on the content, (7) coding, (8) grouping similar codes together, (9) naming and (10) listing categories and sub-categories.

**Critical incident technique**

The critical incident technique (CIT) was used in order to obtain a description of radiographer’s professional competence in relation to good nursing care. CIT is a systematic, inductive method employed in solving practical problems as well as a multifaceted and flexible approach to nursing research and teaching professionalism. It was developed by the United States Air Force Psychology Program in the early 1950s, where it was used to improve the selection of pilots and pilot training programmes. Flanagan described CIT as a method comprising five key steps; (1) establishing general aims, (2) working out plans and specifications for collecting incidents regarding the activity in question, (3), collecting data in different ways e.g. interviews, observations and written self-reports, (4) analysing the data in an objective way and (5) interpreting and reporting the requirements of the activity. An incident is defined as “any observable human activity that is sufficiently complete in itself to permit inferences and predictions to be made about the person performing the act” and, in order to be critical, “an incident must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects”. The number of incidents required varies and depends on the complexity of the problem. Generally, 100 critical incidents are sufficient for a classification. The limitation of the CIT is the participants’ inability to recall detailed information about previous situations in their working lives.

**Developing the RCS**

In study III the Radiographer Competence Scale (RCS), a questionnaire to measure the level and use of competence was developed. Developing and designing items for inclusion in the questionnaire is an important task, as statistical manipulations after the fact cannot compensate for a poorly chosen question. The development of this specific questionnaire involved seven
methodological aspects and was guided by Streiner and Norman, DeVellis, and Burns and Grove.

1) the concept of radiographer competence
2) the choice of items in the categories
3) the choice of items in the sub-categories
4) description of the categories
5) grouping of the categories
6) test of the face and content validity of the instrument
7) selecting an appropriate scale format for the competence assessment

The first aspect in the development process is to examine what others have done in order to obtain a proper theoretical knowledge base, in addition to which radiographer competence should be conceptualised. Then, the items in the categories and sub-categories must be selected on the basis of theoretical knowledge. Furthermore, the categories must be described and a statement made before the grouping of the categories can be decided. Face and content validation of an instrument is of great importance in order to collect accurate and relevant data. One of the most appropriate methods of achieving this is to use the criteria recommended by Lynn. These criteria include content, relevance, clarity, concreteness, understandability and readability of the scale. To judge the relevance of the items both individually and as a set, experts have to rate the content relevance of each item using a 4-point rating scale (from 1 “not relevant”, to 4 “very relevant”). In addition, experts must identify important areas not included in the instrument, items dealing with competencies and the association between the items and competencies. Finally, missing items or competencies and suggested additional items need to be identified.
Methods

Design of the thesis

In this thesis an inductive qualitative design was used in studies I and II and a deductive cross-sectional design in studies III and IV. The overall design comprises five steps. First, an exploration of female patients’ experiences of patient-radiographer encounters by means of individual interviews. Second, an investigation of radiographers’ areas of professional competence related to good nursing care was undertaken using individual interviews. Third, a questionnaire was designed and a pilot test carried out, after which validity was tested. Fourth, a web-based questionnaire aimed at measuring radiographers’ professional competence was developed. In the fifth and final step, a self-assessment of professional competence in terms of level and frequency of use took place. An overview of the study design, samples, data collection and analysis employed in the studies included in this thesis is presented in Table 2 below.
Table 2. Overview of the study design, samples, data collection and a data analysis in the four papers

<table>
<thead>
<tr>
<th>Study</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Inductive, qualitative</td>
<td>Inductive, qualitative</td>
<td>Deductive, cross-sectional</td>
<td>Deductive, cross-sectional</td>
</tr>
<tr>
<td>Sample</td>
<td>17 female patients, aged 33-80 years, diagnosed breast cancer, strategic sampling</td>
<td>14 registered radiographers, strategic sampling</td>
<td>406 registered radiographers, aged 22-66 years, randomly selected, national register data</td>
<td>406 registered radiographers, aged 22-66 years, randomly selected, national register data</td>
</tr>
<tr>
<td>Data collection</td>
<td>Open ended interviews</td>
<td>Semi-structured interviews</td>
<td>Questionnaire, 54 items</td>
<td>Questionnaire, RCS, 28 items</td>
</tr>
<tr>
<td>Data analysis</td>
<td>Qualitative Content Analysis</td>
<td>Qualitative, Critical Incident Technique</td>
<td>Descriptive statistics, Item-total correlation, Explorative factor analysis (Varimax type, Kaisers’ Normalization), Cronbach’s Alpha</td>
<td>Descriptive statistics, Chi-square test, One-way analysis of variance, Spearman’s rank order correlation, Linear regression analyses</td>
</tr>
</tbody>
</table>

Participants

A total of 17 female patients with varying degrees of breast cancer and at different stages of treatment were included in study I. They were selected from the same oncology department. The inclusion criterion was females who attended recurrent follow-up radiographic examinations, i.e. mammography, skeletal radiography, lungs, ultrasound, CT and MRI. The patients were selected in order to obtain a wide range of experiences (age, various stages of cancer and treatment, relapse, duration for diagnosis). The age of the participants ranged from 33 to 80 and the median was 56 years (Table 3).

In order to study professional competence related to good nursing care in study II, 14 registered radiographers based at different hospitals in Sweden were
recruited. The inclusion criterion was that, at the time of the study, the radiographer had worked in a radiology department for at least one year. The radiographers were selected in order to obtain a wide range of experiences (sex, age, educational background, number of years in the profession, size of the workplace). It was decided to limit the number of interviews to three per day. The number of years in the profession ranged from one to over 25. Four radiographers were men and 10 were women. Their age ranged from 23 to 54 years and the median was 39 (Table 3).

In study III and IV the sample was drawn from a nationwide register administered by the Swedish Association of Health Professionals (SAHP) set in 120 medical imaging departments at University (30 %), County (34 %) and District hospitals (36 %). The SAHP is a trade union and professional organization for radiographers, nurses, midwives and biomedical scientists. Based on the register, a computer randomly generated a list of 1,000 registered radiographers who were invited to participate. The inclusion criterion was that they should be clinically active as radiographers. Of the 3,592 Swedish registered radiographers and diagnostic radiology nurses listed in the SAHP register, 2,167 were members of the SAHP at the time of the study. Out of these, 1,772 (82 %) met the inclusion criterion (Table 3).
Table 3. Demographic and clinical data of patients and radiographers. n=number of participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Patients</th>
<th>Radiographers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Study I (n=17)</td>
<td>Study II (n=14)</td>
</tr>
<tr>
<td><strong>Age (m)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-49</td>
<td>56</td>
<td>39</td>
</tr>
<tr>
<td>50-69</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>&gt;70</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Working situation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fulltime</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Relapse</strong></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Duration of diagnosis (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4-6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>&gt;7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Profession</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reg. Radiographer</td>
<td>14</td>
<td>323</td>
</tr>
<tr>
<td>Reg. Radiographer with specialization</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Nurse</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Management position</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td><strong>Basic education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reg. Radiographer</td>
<td>6</td>
<td>291</td>
</tr>
<tr>
<td>Reg. Nurse in Diagnostic Radiology</td>
<td>8</td>
<td>104</td>
</tr>
<tr>
<td>Reg. Nurse</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Highest academic level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Six-year elementary school</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Nine-year compulsory school</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Higher education</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>Master degree</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Postgraduate level</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Years in present position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2-10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11-25</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td></td>
<td>111</td>
</tr>
<tr>
<td>6-15</td>
<td></td>
<td>110</td>
</tr>
<tr>
<td>16-25</td>
<td></td>
<td>61</td>
</tr>
<tr>
<td>26-</td>
<td>6</td>
<td>96</td>
</tr>
<tr>
<td><strong>Number of radiographers in the radiology department</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University hospital</td>
<td>1</td>
<td>111</td>
</tr>
<tr>
<td>County hospital</td>
<td>10</td>
<td>126</td>
</tr>
<tr>
<td>District hospital</td>
<td>3</td>
<td>136</td>
</tr>
</tbody>
</table>

39
Data collection

Interviews

In study I, open-ended interviews were conducted in order to explore experiences of encounters between female patients diagnosed with breast cancer and radiographers in the course of recurrent radiographic follow-up examinations in radiology departments. The patients were approached by the researcher in the waiting room of the radiology department before the examination. After the examination they received brief verbal information about the study as well as written information along with an informed consent form and gave the author permission to contact them by phone. An appointment for the interview was made when the author phoned them. The majority of the interviews were conducted in a quiet private room in the radiology department, while a few were held in the informant’s home or place of work and one took place over the telephone. Open-ended interviews focus on a specific topic but do not have a fixed sequence of questions formulated prior to the interview occasion. Such interviews encourage the informant to focus on and define what is important to her/him rather than being guided by the researcher’s idea of what is relevant. Adequate time must be provided to permit a full response. The interview began with a general question: “Could you please describe one negative or positive encounter in a radiology department that you remember especially well?” In order to gain a deeper understanding, follow up questions were posed: “What do you mean?” “Could you explain?” “How did you feel?”

In study II semi-structured interviews were used to explore radiographers’ professional competence in relation to good nursing care, as this method allows the informants to describe critical incidents in their own words. According to Polit and Beck, a semi-structured interview is used when the researchers want to ensure that a specific set of topics is covered. Prior to the interview, the radiographers were informed about the study, that it would focus on critical incidents that facilitated and/or hindered good nursing care and where the outcome was identifiable. All interviews took place in a quiet room close to the radiographers’ workplace. Informed consent was signed. The intention was to collect data on 100 or more critical incidents from different areas in the...
radiological setting. The CIT concerns a factual incident, which may be defined as an observable and integral episode of human behaviour. The technique thereafter concentrates on something specific about which respondents can be expected to testify as expert witnesses. The questions are presented in Table 4. Brief information concerning the data collection procedure was provided before the interview and a critical incident was defined as a major event of great importance to the radiographer. The data collection continued until a sufficient amount of material with rich descriptions of critical incidents related to good nursing care had been collected.

Table 4. Questions about critical incidents related to radiographic examinations and interventional.

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Could you please tell me about an ordinary day in your professional life?</td>
</tr>
<tr>
<td>Could you please describe a successful and positive work situation in as much detail as possible?</td>
</tr>
<tr>
<td>Could you please describe an incident in which you handled and/or did not handle a situation successfully?</td>
</tr>
<tr>
<td>Could you please describe in as much detail as possible a difficult, complex and hard-to-manage work situation?</td>
</tr>
<tr>
<td>Could you please describe an incident in which you handled and/or did not handle a difficult, complex and hard-to-manage situation successfully?</td>
</tr>
<tr>
<td>At what time of the day and/or night did the incident occur and how long ago?</td>
</tr>
<tr>
<td>Where did the incident occur?</td>
</tr>
<tr>
<td>What was it that made the incident critical for you?</td>
</tr>
<tr>
<td>What was it that made the incident positive?</td>
</tr>
<tr>
<td>What was it that made the incident negative?</td>
</tr>
</tbody>
</table>

Questionnaire

In late November 2010, a link to the web-based questionnaire, comprising of the RCS was e-mailed to 500 participants (Studies III and IV). This resulted in 200 responses, a response rate of 40%. A first reminder was sent after one week and a second after two weeks. As the number of responses was considered low, a new computer generated list of 500 participants was chosen from the SAHP register and a reminder sent after two weeks. In total, 1,000 questionnaires were distributed, resulting in 406 responses (40.6%). Background questions concerning age, sex, present position, basic education, highest academic level and work place were included in the questionnaire. An accompanying letter was distributed, containing information about the study
and ethical aspects. Informed consent was implied as the participant completed the questionnaire.

Data analysis

**Qualitative Content Analysis (Study I)**

Qualitative content analysis was performed in accordance with Burnard\textsuperscript{131} to explore experiences of encounters between female patients diagnosed with breast cancer and radiographers at recurrent radiographic follow-up examinations. The interviews were first read individually and then as a whole in order to identify words and phrases containing important meaning units in the statements by female patients with breast cancer about their experiences of encounters with radiographers. A naive reading was undertaken and notes were made about topics that emerged from the data. Then the texts were reread as a whole and questions such as “what is it about?”, “what does it mean?” and “what does it stand for?” were posed. After open coding of the text as a whole, it was condensed and rewritten into codes. Similar codes were grouped together and a sense of a structure with categories and sub-categories was developed. In this phase each subcategory was critically analysed, questioned, read and compared in order to arrive at a reasonable interpretation and, if possible, to identify categories. This part of the analysis process, which is concerned with interpreting the meaning of the text, guided the choice of category names. The analysis process was a movement between the whole and the parts of the text. Table 5 provides an example of the process in the data analysis process.
<table>
<thead>
<tr>
<th>Examples of quotations</th>
<th>What is it about/meaning</th>
<th>Sub-category</th>
<th>Principal Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;… uncertainty about the cancer … “</td>
<td>Feels of being out of control. Feelings of fear about having to face another unpleasant diagnosis.</td>
<td>Loneliness, isolation</td>
<td>Vulnerability</td>
</tr>
<tr>
<td>&quot;I met someone who dared to encounter me with a smile, gave me hope and a feeling that I was important … if somebody dares to meet me like that, I suppose it won’t be that bad.” (I 4)</td>
<td>Feelings of being confirmed. Feelings of self-reliance.</td>
<td>Strength</td>
<td>The empowering encounter</td>
</tr>
<tr>
<td>&quot;… the nurse held my hand the whole time …” (I 3)</td>
<td>Feelings of trust and confidence.</td>
<td>Trustfulness</td>
<td>The empathetic encounter</td>
</tr>
<tr>
<td>&quot;They informed me that I should just lie still and hold my breath, they told me … nothing else …” (I 10)</td>
<td>Feelings of being an object. Feelings of not being allowed to talk.</td>
<td>Objectified</td>
<td>The mechanical encounter</td>
</tr>
<tr>
<td>&quot;… I was very frightened and they were a bit indifferent and callous …” (I 5)</td>
<td>Feelings of not being confirmed. Feelings of loneliness and being invisible.</td>
<td>Marginalised</td>
<td>The neglectful encounter</td>
</tr>
</tbody>
</table>
Critical Incident Technique (Study II)

The analysis of the data was based upon the critical incident technique as described by Flanagan\textsuperscript{136} and aimed to identify radiographers’ professional areas related to good nursing care. The analysis process comprised four steps. First, a careful and repeated reading of the transcribed interviews took place in order to gain an overall understanding and become immersed in the data. The interviews were then processed by condensing the data, after which the incidents could be identified and considered critical if related to the aim of the study and the interview question. A total of 277 critical incidents were identified from the transcripts. The number of incidents varied between one and 23 per informant, i.e. each informant did not provide a critical incident for every item, while some informants reported more than one incident for some items. In the initial part of the categorisation, the incidents were extracted from the text, sorted, labelled according to their specific content and then classified into groups. The groups of incidents were reformulated into different kinds of behaviour, resulting in 31 subcategories that were allocated to eight categories and two main areas. The main areas describe the overall structure of the critical incidents. Table 6 provides an example of the process of the data analysis process.
Table 6. Example of data analysis process comprising quotations, subcategories, categories and main areas.

<table>
<thead>
<tr>
<th>Examples of quotations</th>
<th>Subcategory</th>
<th>Category</th>
<th>Main area</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;... having read the anamnesis, I asked the patient what had happened … then I informed the patient … told her that I would take two X-rays …”</td>
<td>Information</td>
<td>Guiding</td>
<td>Direct patient-related area of competence</td>
</tr>
<tr>
<td>&quot;... a lady with a dislocated hip who was sitting like this on a bed (the radiographer demonstrates), you don’t touch someone like that … she was in terrible agony … then you try to push the cassette under her … angle it and aim carefully …”</td>
<td>Adapting to the patient’s need</td>
<td>Performing the examination</td>
<td></td>
</tr>
<tr>
<td>&quot;... I had to say something to her (about diagnosis), that this is quite normal … you realise when they are worried …”</td>
<td>Reassurance</td>
<td>Providing support</td>
<td></td>
</tr>
<tr>
<td>&quot;... he scratched and scratched himself … does it itch, I asked … yes a bit … then I asked him to take off his shirt and I saw that he had a fair amount of spots all over his body … you follow up something like that … keep it under constant observation.”</td>
<td>Observing and monitoring</td>
<td>Being vigilant</td>
<td></td>
</tr>
<tr>
<td>&quot;... I checked up on all the tests, made sure that the patient had received premedication, took out all the stuff and arranged the instruments …”</td>
<td>Planing and preparing</td>
<td>Organisation</td>
<td></td>
</tr>
<tr>
<td>&quot;... a lady who had had a fall came for an X-ray of her forearm and hip during emergency hours … I took the referral, recorded it and hunted out old documentation …”</td>
<td>Responsibility for documentation</td>
<td>Ensuring quality</td>
<td>Indirect patient-related area of competence</td>
</tr>
<tr>
<td>&quot;... an image should be aesthetically appealing, which it is if taken in a straight as opposed to a diagonal angle and turned the right way around … it should be attractive …”</td>
<td>Accurate and correct images</td>
<td>Handling the image</td>
<td></td>
</tr>
<tr>
<td>&quot;... the examination of the patients was quick … you collaborate with them, anaesthetics, … there are links between the departments …”</td>
<td>Co-operation with colleagues</td>
<td>Collaboration</td>
<td></td>
</tr>
</tbody>
</table>
Questionnaire

Development and psychometric tests (Study III)

The questionnaire, the RCS, was developed and psychometric tested in study III. The questionnaires were in Swedish. The development involved seven methodological phases and was guided by Streiner and Norman,\textsuperscript{138} DeVellis,\textsuperscript{139} and Burns and Grove.\textsuperscript{140} A pilot test of the questionnaire was performed by an expert group. When developing a new instrument face and content validity are of importance. Face validity indicates whether, on the face of it, the instrument appears to be assessing the desired qualities. Content validity consist of a judgement whether the instrument samples all the relevant or important content or domains.\textsuperscript{138} Face and content validity was conducted in line with Lynn’s Criteria.\textsuperscript{141} Depending on the type of variable as well as on the distributional characteristics parametric or non-parametric methods were used in this thesis.\textsuperscript{143} Variables are categorized in four levels of measurements, nominal, ordinal, interval and ratio. Parametric methods are based on measures of means, standard deviation and differences among the means which can be interpreted from an interval and ratio scales such as age and years in present position. Non-parametric methods are based on measures of percentage or median on nominal and ordinal scales, regarded as frequencies in individual categories.

The item reduction was performed in two steps. Firstly, corrected item-total correlation and Cronbach’s alpha if item deleted was conducted on the initial 54-items. In this step all items in the questionnaire, one at a time, were correlated with the total number of points. Items with correlations below 0.5 were removed one at a time. The total number of points was adjusted so that the item that was correlated with the total number of points was not involved in the total number of points at the time when the analysis was performed.\textsuperscript{144} Secondly, several explorative factor analysis were conducted on the remaining 42-items. A principal components analysis providing preliminary information of the construct was performed before the final factoring. To decide the number of factors to be included in the construct, factors with an eigenvalue above 1.0 were included. The items factor loading was ≥0.50 and were considered sufficient, according to Field.\textsuperscript{145} Catell’s scree test\textsuperscript{139} was used to control the number of tentative factors to be retained. Data were examined with Bartlett’s
test of sphericity, and had to be significant (p<0.001). A factor rotation with Varimax type was used in order to simplify the factor structure. A two-factor solution was identified explaining 53.8% of the total variance. Homogeneity, was measured with Cronbach’s alpha and with regard to developing a new instrument, the lowest value for Cronbach’s alpha coefficient was set at 0.70.

**Comparisons between groups (Study IV)**

In study IV, four groups were created based on years of work experience: short (0-5 years), medium (5-15 years), long-term (15-25 years) and longest period of work experience (>25 years). The groups were then compared regarding the sample characteristics, namely level and use of competence.

The choice of appropriate method of analysis was based on the number of the groups and sample, the type of data, the distribution of data and the objective of the analysis. To compare data from three groups or more One-way analysis of variance (ANOVA) was used when the data was continuous or normally distributed. Pearson’s chi-square test was used when the data was categorical or not normally distributed. Variations among the means of three or more groups increase the risk for Type I error. P-values at <0.05 were considered statistically significant, except when multiple comparisons were made, when a reduced p-value was used. Due to multiple comparisons, the Bonferroni correction, a reduced p-value was calculated (p<0.008) and used to control for the risk of mass-significance. The correction was made by dividing the P-value at 0.05 by six (the number of group comparisons).

Correlation is a method of analyses to study the possible linear association between variables and the Spearman’s rank-order correlation coefficient, a non-parametric calculation was used. The correlation coefficient indicates the strength of the association as a single number but does not describe the relation between the variables. There are differences between correlations and regression. Regression is a method for the prediction of one variable to another. In the analysis one of the variables is considered dependent (the outcome) and the other as independent (predictor). As independent variables, age, years in present position and work place were entered. Variables at nominal and ordinal level were made to dummy variables. To identify the linear
All data were computerized and analysed using SPSS 18.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Choice of appropriate method of analyses is shown in Table 2.

Ethical considerations

The studies in this thesis were conducted in accordance with the requirements pertaining to research on human beings as set out in the Helsinki declaration, Ethical guidelines for nursing research in the Nordic countries, as well as in the Swedish ethical approval legislation concerning research on humans. Ethical clinical research is based upon respect for autonomy, providing beneficence, ensuring non-maleficence, avoiding risk as well as promoting justice. Ethical considerations are basically a matter of finding a reasonable balance between different interests such as the search for knowledge, individual privacy and protection against various forms of harm or risk of harm. Ethical approval and permission to undertake the studies I and II were granted by the Ethics Committees at Örebro University, Sweden (No. 2002/135), and Lund University, Sweden (M:G 35, 42/05). In studies III and IV it was not considered necessary to apply for permission from the regional research ethics committee. According to the Swedish Act concerning the ethical review of research involving human beings, permission is not required when studies involve staff members.

Autonomy

The principle of autonomy is related to respect for the person, her/his right to know or not to know and the freedom to make decisions (to participate in, not participate in or withdraw from the research). Important ethical issues related to autonomy were found to be those concerning informed consent. A freely made decision to participate in the studies was significant. When requesting informed consent, the researcher was particularly careful to ensure that the
participants were not in a dependent relationship. The female patients (Study I) and radiographers (Studies II-IV) took part voluntarily and were not in a position of dependency on the researchers. In studies I and II the participants were informed of the aim, utility and confidentiality of the study, their right to integrity, the voluntary nature of participation and the possibility to withdraw at any time. Written informed consent was obtained from all female patients and radiographers. In study I the female patients were invited to participate and received oral and written information directly after the radiographic examination. They were requested to choose the time and place for the interview and given sufficient opportunity to reflect on whether or not to participate. They were assured that participation would not affect their care or treatment. In study II the radiographers were selected and contacted by the head of the radiology department on behalf of the researcher. An introductory letter containing information about the study was sent by post. They were given time to consider the question of participation and asked to choose the time and place for the interview during certain weeks. The researcher then phoned the participants to make the final arrangements. In studies III and IV, completing a questionnaire implied informed consent. A supplement, with information about the aim and utility of the study, confidentiality, the voluntary nature of participation and how to contact the researcher, was sent attached in an email to the participants.

**Beneficence and Non-Maleficence**

Every person attending healthcare and a radiology department is in a vulnerable situation, especially patients undergoing recurrent follow-up examinations. The principle of beneficence states the ethical obligation to maximise possible benefits, while the principle of non-maleficence sets out the ethical obligation to minimise possible harm. There is always a risk that participants can feel that their personal integrity is threatened. Conducting research involves ethical gains and costs. The risk of distress or violation of integrity was deemed significant in studies I and II, but negligible in studies III and IV.

A potential ethical cost was the risk of distress and harm if unpleasant memories were aroused during the interview. To minimise this risk, the interviewer ensured that there was sufficient time for the participants to talk about difficult and painful situations. Several of the participants expressed that
they found it beneficial to be in focus, have the opportunity to talk about themselves and their experiences and to know that somebody was actively listening to them. The introductory letter contained the interviewer’s telephone numbers, which afforded opportunities for contact after the interview. The interviewer also assured the female patients and the radiographers that there were other professionals and/or networks available to support them; almoner, psychologist and the occupational health service department. Permission to use a tape recorder and to transcribe the interviews verbatim was obtained (Studies I and II). The findings from this thesis could be of benefit to future patients by contributing to improved patient care at the radiology department. Furthermore, the research could also enhance the knowledge and development of the radiographers’ professional competence.

To protect the confidentiality of the female patients and the radiographers, no names were included in the stored recordings and transcribed interviews in studies I and II, thus no connection to any person could be made. In quotations in the transcriptions, any names mentioned were altered so that no connection can be made to specific persons. In studies III and IV the data were collected from a national register administered by the SAHP and the sample was randomised by an employee. A web-based questionnaire was linked to the participants. Web-based tools always imply a certain security risk such as hacking. To protect the participants no documentation contained the radiographers’ names, and coded numbers were used throughout the whole data collection. All material was kept safe, analysed and described in a way that makes it impossible to identify or link specific information to individual patients or radiographers. The research team reflected deeply on issues of security and integrity.

**Justice**

The principle of justice requires the sampling of participants in a non-discriminatory way with regard to age, sex and nationality. This implies that vulnerable groups should be protected from exposure as well as discrimination. The participants were selected regardless of sex, religion, race, political opinion, etc.
Summary of the results

The patient

The experiences of encounters between female patients diagnosed with breast cancer and radiographers at recurrent radiographic follow-up examinations were categorized into five groups; the women’s comprehensive understanding and four encounters.

Vulnerability (Study I)

Women’s comprehensive understanding was described as feelings of vulnerability. Their uncertainty about the cancer had an impact on the female patients’ experience of the encounter. Prior to an examination, they described feelings of anxiety, fear of pain and the risk of having to face another unpleasant diagnosis and being out of control. They described feelings of panic manifested in the form of palpitations, an icy sensation in the neck, a restless body or losing control of their emotions. During the examination, patients experienced pain and unpleasant feelings of being exposed when undressed. After the examination, patients who had to wait for the result experienced tension and stress. At times they objected to the recurrent radiographic follow-ups in order to cope with the situation, as they felt that they needed to protect themselves.

Encounters (Study I)

The empowering encounter optimised the patients’ own capacity and participation, as the radiographer viewed her as an expert on her own circumstances and listened attentively to her. There was a mutual information flow, which made it possible for the patient to take decisions and cope with different situations during the examination. The radiographer was a supportive resource, although treating the patient as an equal. The patient had a feeling of being strengthened, confidence in her own ability as well as being in control of her own life and circumstances. In the empathetic encounter concern about the patient’s diagnosis and illness was emphasised. She was the subject of the radiographer’s attention
and the communication had a comforting and caring character. The patient was listened to and treated with respect. The radiographer showed insight and understanding of the discomfort that the patient experienced throughout the radiographic examination. The patient was left with an experience of having her dignity and identity respected as well as a sense of well-being. In the mechanical encounter the patient was treated in a distanced manner and the radiographer was mainly concerned about the images and being as quick as possible. The patient was an object and the organ demanded the radiographer’s attention. It was a mechanical, routine based approach guided by the radiographer’s professional task of focusing on correct projections and positioning. The patient was not asked about possible discomfort or pain in the various positions and left with an experience of being treated in an impersonal manner during the entire encounter. In the neglectful encounter, the patient’s feelings were disregarded and ignored. She was invisible, abandoned and treated by the radiographer as being of no significance, a nobody. There was lack of respect for the patient as an autonomous human being and no social communication or physical contact, which left the patient with an experience of being invisible and marginalised.

The radiographer

Radiographers areas of professional competence (Study II)

In the radiographer study (Study II) the descriptions of competence were grouped into two main areas, each with four sub-groups. The direct patient-related area of competence focused on the closeness to the patient and The indirect-patient-related area of competence concerned the surroundings. In the first area the nursing perspective was more obvious while in the latter, the medical-technical dominated.

In the direct-patient-related area of competence, the competency termed guiding, was described as being with the patient and helping her/him to assume an active role in the examination. In addition to informing the patient, the radiographers needed to obtain information and asked relevant questions related to the referral. When performing the radiographic examination, the various descriptions involved acting in a safe and secure manner regarding radiation
protection and taking the individual patient’s condition and needs into account. Furthermore, physical touch was used to locate anatomical structures as well as the existence of any pain. Within providing support, the description reflected caring for both the patient and the next-of-kin. The radiographers encouraged the anxious patient to undergo the planned examination and at the same time showed respect for her/his integrity. The descriptions of being vigilant involved ensuring the safety of patients who developed an allergic reaction after the injection of contrast medium and sometimes from an unnecessarily high dose of radiation. The radiographers also prevented injuries when deciding to terminate examinations and saved lives by intervening at short notice in difficult and potentially fatal situations.

In the indirect patient-related area of competence, organizing was described as planning and preparing for the radiographic examination and treatment, which included administrative as well as practical matters. The radiographers took responsibility for ensuring that the results were communicated by a radiologist on conclusion of the radiographic examination. When ensuring quality, the participants reported that the identity of the patient as well as the correspondence between the referral and the patient’s symptom was confirmed. The technical equipment and documentation were also verified. The description of handling the medical images mainly focused on obtaining correct and accurate medical images, but also involved scrutinizing and assessing the images as well as transmitting them to other units and hospitals. In the competence Collaborating internally and externally, the radiographers supervised all staff categories and strived to work as a team, especially in critical situations. Their strive to become more efficient could support the patient by reducing the time at both the diagnostic radiology department and the hospital.

Designing an instrument – the RCS (Study III)

In study III, an instrument for measuring the level and frequency of use of competence was developed and by the use of factor analyses, two psychometrically sound factors were identified. These were labelled ‘Nurse initiated care’ and ‘Technical and radiographic processes’. ‘Nurse initiated care’ comprised 18 items and ‘Technical and radiographic processes’ 10 items (See Appendix 1).
The initial version of the RCS consisted of 42 items, each of which was described as a radiographer competency and distributed between eight categories. By means of a pilot test, the first set of experts (N=16) evaluated the logical consistency as well as the relevance of the items, assessing and quantifying their validity both individually and as a set. Some revisions were recommended e.g. the order and rewording of certain items and additional areas were suggested, thus after the pilot test, 12 items were added to the initial version of the RCS. A two part-scale was considered appropriate, one of which focused on the level of radiographer competence and the other on the frequency of its use. The level of competence was measured on a 10-point scale (1-10) where one was the lowest and 10 the highest grade. The frequency of using the competencies was measured by the following response alternatives: “never used”, “very seldom used”, “sometimes used”, “often used”, “very often used” and “always used”. No changes were made to the final 54-item RCS after the second set of experts (N=4) had evaluated the logical consistency of the competencies and the number of items to be included.

**Psychometric evaluation of the RCS (Study III)**

A total of 406 radiographers with clinical experience in diagnostic radiology departments in Sweden, completed the questionnaire, representing a response rate of 40.6 %. The mean age of the participants was 47 years, ranging between 22 and 66 years and 88 % were women (Table 3).

The number of items was reduced from 54 to 28 in two phases. First, a corrected item-total correlation and Cronbach’s alpha if item deleted, was conducted on the 54-item questionnaire. Items with low correlations, i.e. <0.5, were removed one at a time and new item-total statistics calculated on each occasion, resulting in a reduction of 12 items. Second, repeated explorative factor analyses were conducted on the remaining 42 items. Principal component analyses were conducted to obtain the solution with optimal scale variance. Items with correlations of <0.5 were removed from the factor one by one, which led to the removal of a further 14 items, resulting in a 28-item scale. As the factor structure decided by the Kaiser criteria was not simple and no clear factor solutions was obtained, the items were forced into a two factor solution. The items in the two identified factors had fairly good communality values of >0.40 with the
exception of one; ‘optimizing of radiation doses to patient and personnel’, which had 0.34. There were 18 items in factor 1 and 10 items in factor 2. Factor 1 was labelled ‘Nurse initiated care’ and factor 2 ‘Technical and radiographic processes’. The two factors appeared to be clearly defined and quite different from each other. Initially, data were examined by means of Bartlett’s test of sphericity as well as the measure of sample adequacy in each variable and overall. The number of factors extracted was based on the Kaiser criteria with an Eigenvalue of <1.0.

Homogeneity was assessed using Cronbach’s alpha coefficient in each of the two factors and the scale in its entirety. The value was 0.94 for the first factor, 0.89 for the second and 0.87 for the entire 28-item scale. The corrected item-total correlations varied between 0.52 and 0.78. In factor 1, the item with the highest correlation was; ‘Alleviating the patient’s anxiety’ while the item with the lowest correlation was; ‘Participating in quality improvement regarding patient safety and care’. In factor 2, the item with the highest correlation was; ‘Evaluating the quality of the medical image in relation to the referral and question stated therein’. The item with lowest correlation was; ‘Minimising radiation doses for patient and staff’.

Missing data and the proportion of floor and ceiling effects (people obtaining minimum and maximum scores respectively) among the items were also examined. The distribution of scores spanned the entire range (i.e. 1-10) with no floor and ceiling effect problems identified. The results indicated that the number of participants did not exceed 15% of the anticipated floor and ceiling effects. The response rate for each item in the 28-item instrument was high (range: 93.6% to 95.8%).

The level and frequency of use of professional competencies (Study IV)

In study IV the data from the 24-item questionnaire was used to measure the level and frequency of use of competence.

Nurse initiated care. The radiographers rated ‘Adequately informing the patient’ as the highest competency and ‘Identifying and encountering the patient in a state of shock’ and ‘Participating in quality improvement regarding patient safety and care’ as the lowest.
Differences between those with short and medium-term experience and those with the longest period were seen in ‘Adequately informing the patient’. This competence was rated more highly by those with the longest period of work experience (p<0.001). Differences between those with a short period of work experience and those with the longest period were seen in ‘Alleviating the patient’s anxiety’ and ‘Judging the risk of leaving the patient unattended’. The level of the competencies was significantly lower in the group with a short period of work experience (p<0.001).

The most highly rated competency in terms of use was ‘Adequately informing the patient’, while the lowest was ‘Identifying and encountering the patient in a state of shock’. The competencies; ‘Participating in quality improvement regarding patient safety and care’ as well as ‘Reporting to internal as well as external colleagues and other professionals’ had low ratings in all four groups. Differences between those with a short period of work experience compared to those with long-term experience were seen in ‘Collaborating with other internal and external professionals’. This competency was significantly more used by those with short-term work experience (p<0.001). Those with long-term experience employed ‘Applying ethical guidelines’, ‘Guiding the patient’s relatives’, ‘Encouraging and supporting the patient’ and ‘Alleviating the patient’s anxiety’ more frequently compared to those with a short period of work experience (p<0.001).

**Technical and radiographic processes.** The radiographers rated the competency ‘Adapting the examination to the patient’s prerequisites and needs’ the highest whereas the lowest was ‘Preliminary assessment of images’. Differences between those with a short, medium and long-term period of work experience and those with the longest period of work experience were seen in the competencies; ‘Organising and planning taking account of the clinical situation’ and ‘Independently planning and preparing work on the basis of existing documentation’. A significantly higher level was reported by those with the longest period of work experience (p<0.001). The ratings were the same in ‘Prioritising patients in the work flow’, ‘Producing accurate and correct images’ and ‘Optimising the quality of the image’.

‘Producing accurate and correct images’ and ‘Adapting the examination to the patient’s prerequisites’ were rated as the most frequently used competencies. Differences between those with long and short-term experience were seen concerning the
competencies; ‘Organising and planning taking account of the clinical situation’, ‘Prioritising patients in the work flow’, ‘Minimising radiation doses for patient and staff’, ‘Optimising the quality of the image’ and ‘Preliminary assessment of images’. These competencies were significantly more used by those with long-term experience (p<0.001).

The total score for ‘Nurse initiated care’ had a low but significant correlation with age (r=0.265; p<0.001) and years in present position (r=0.217; p<0.001). The total score for ‘Technical and radiographic processes’ also had a low yet significant correlation with age (r=0.278; p<0.001) and years in present position (r=0.287; p<0.001). The competence level was significantly associated with age in ‘Nurse initiated care’ and ‘Technical and radiographic processes’ as well as with the total score of the RCS. The use of competence was significantly associated with years in present position in ‘Technical and radiographic processes’ and the total score of the RCS, but not in ‘Nurse initiated care’.
Discussion

Methodological considerations

**Trustworthiness (Studies I and II)**

Qualitative content analysis was the methodological choice for exploring patient perceptions of radiographic experiences (Study I), while the critical incident technique was chosen to describe radiographers’ areas of professional competence (Study II). The findings in the interview studies described the experiences of the patients and the radiographers, with no information about what really happened or how frequent or rare the experiences were. Lincoln and Guba\(^{152}\) suggested four concepts as for establishing trustworthiness in qualitative studies: credibility, dependability, transferability and confirmability.

**Credibility** refers to the confidence in the findings based on the data.\(^{124,152}\) Recommendations to establish credibility involve actions that make the emergence of credible data and interpretations more likely.\(^{124,152}\) In study I, the patients constituted a well-defined group of women living in the south of Sweden who attended regular follow-up radiographic examinations, i.e. mammography, skeletal radiography, lungs, ultrasound, CT and MRI. In order to obtain variation, strategic sampling was used for data collection in line with qualitative content analysis. The female patients were approached by the researcher in the waiting room before and after the radiographic examination. After the examination, information about the study was provided and a time for a phone call arranged. The patient was given time to reflect on her willingness to participate. As the female patients were interviewed a couple of days after the examination, it increased the chance of obtaining her reflected experience. To establish credibility two of the researchers read the interview texts and took part in the whole analysis process, while all four researchers independently reviewed the categories and sub-categories.
In study II the registered radiographers constituted a carefully chosen, well-defined group living in a specific area in Sweden with the latest technology in the radiology department. Choosing participants with different experiences increases the possibility of shedding light on the research questions from a variety of perspectives. In order to obtain variation, strategic sampling was used for the data collection in line with the critical incident technique. The critical incident technique, which employs semi-structured interviews as the data collection method, was chosen in order to describe how critical incidents influenced the radiographer in terms of either facilitating or hindering good nursing care. The categorisation of critical incidents is the most controversial part of the CIT and has been criticised for being both subjective and difficult. The objectivity of the method lies in the attempt to capture direct raw data that are free from assumptions. Although the data can be categorised in more than one way, it is always possible to refer back to the critical incidents themselves. The rich material in studies I and II also strengthen credibility. The interviewer tried to create a peaceful and positive atmosphere in order to encourage the participants to express their personal opinions, which is important in data collection.

**Dependability** refers to the stability of data over time and in relation to various conditions. There is a risk of inconsistency when dealing with a large amount of data and when the data collection takes place over a long period of time. It is important to ask all participants the same initial question. In this thesis the researchers remained close to the original meaning and context by referring back to the audio-tapes and transcripts of the interviews during the analysis and writing process. The informants and the main researcher were very familiar with the research area. To establish dependability in study I, one researcher in addition to the main researcher was involved in the analysis process, at first individually and then together, after which the third and fourth researchers also became involved. To establish dependability in study II, the main researcher conducted the analysis process while the second took part at the end of the analysis and the third and fourth researchers verified the plausibility of the findings.

**Transferability** refers to the degree to which the findings can be transferred to other settings or groups. A limitation of qualitative research is that it does
not permit the use of a large sample in order to obtain data. However, the reason for using a qualitative approach was to obtain as much meaningful information as possible with regard to the aim of the studies as opposed to generalising as in the quantitative approach.\(^{128}\) To facilitate transferability it is important to provide a clear description of the culture and context, selection and participant characteristics, data collection and analysis process. The findings of study I are not intended to be generalised but can be seen as useful information for clinical practice while, the findings of study II can be transferred to other radiological settings, as they pertain to critical incidents that influence the radiographer, either facilitating and/or hindering good nursing care.

*Confirmability* refers to the objectivity or neutrality of the data\(^{124}, 152\) and is concerned with ensuring that interpretations of the findings are clearly derived from the material. To strengthen confirmability, careful descriptions of the research process and the inclusion of quotations presented in studies I and II elucidate the interpretations of the original text. Negotiated consensus was employed to establish confirmability, which meant that the researchers continuously discussed the interpretations until consensus was reached.\(^{154}\)

**Validity and reliability (Studies III and IV)**

When considering the quality of studies III and IV, both validity and reliability need to be discussed. To evaluate a study’s strengths and weaknesses in quantitative research, Kazdin\(^{155}\) has outlined four types of validity that can be used to convey key aspects of the research: internal, external, construct and statistical conclusion validity. The reliability of an instrument can be evaluated in various ways by e.g. stability and homogeneity.\(^{124}, 152\)

*Internal validity* relates to the degree to which the findings can be explained by the independent variable rather than the observed effects being due to uncontrolled confounders.\(^{155}\) A threat to internal validity can be non-responders. In the present studies it was decided to use a random sample of at least 500 out of the 1,772 SAHP members who were radiographers. This was done in order to reduce systematic sampling bias, increase the validity of the study\(^{140}\) and ensure that all radiographers listed in the national register had an
equal chance of being selected. A total of 406 out of the 1,000 randomly selected radiographers completed the questionnaire. The external drop-out comprised 594 radiographers (59.4%) who declined to participate for unknown reasons. It is possible that the number of items in the questionnaire was too great or that they were difficult to understand. Another possibility is that the radiographers did not have time during their working day. A third suggestion is that only the most interested and perhaps experienced radiographers completed the questionnaire. A relevant issue is therefore whether the participants are representative of the population intended to be investigated. It is a weakness that no drop-out analyses can be made of those who declined participation. On the other hand, there was great variation with regard to the number of socio-demographic and clinical characteristics, indicating that the participants represented a wide range of radiographers in Sweden.

*External validity* refers to the extent to which findings can be generalised beyond the conditions of an experiment. Threats to external validity include various characteristics of the sample and context. The study population comprised adults with variation in terms of age, sex, education, years in present position and work place. Since the items in the RCS were selected from theoretical studies and pilot tested by an expert group, the sample chosen for the development of the RCS and the psychometric testing was representative of the target population and the results might therefore be generalised to both general and specific settings among the Radiographer population. Further proof of the validity of the findings with regard to the structure of the RCS and its construct validity require additional studies.

Another threat to validity concerns the way in which instructions and information about the study are given to the participants in the web-based questionnaire. It is important that the information provided is correct, well-structured and easy to understand. The invitation to participate should be open, friendly and hopefully promote willingness to take part. There was no state of dependence on the researchers or the SAHP official responsible for the national register. The same information and instructions were provided to all participants in the random sample. The SAHP official was informed both orally and in writing about how to invite participants, what information to give them
and also received a detailed written description of the study and its aims and objectives.

Examinations of validity and reliability also concern whether instruments used in the study actually measure what they are intended to measure. When the RCS was tested for internal validity, 28 out of 54 items fitted a two-factor structure. The face validity and content validity of the RCS were enhanced by using the results from theoretical studies including the qualitative study (Study II) as items on the scale. The content of the questionnaire should be representative of the phenomenon under investigation and be appropriate for the respondents. Pilot testing of the face and content validity was conducted in line with the well structured Lynn’s Criteria. To strengthen internal validity, a strategically selected group of experts was formed to judge the relevance of the items. Third, face and content validity were established based on agreement between the four authors (Study III).

Construct validity refers to the degree to which the measuring procedure actually measures what it is intended to measure. The key construct validity question with regard to measurement is “What is this instrument really measuring and does it validly measure the abstract concept of interest?”. In study III construct validity was measured by means of explorative factor analysis which is a factor analysis undertaken to explore the underlying dimensionality of a set of variables.

Validity is also related to the statistical power of the analyses. Based on estimated number of participants, no power analysis was performed in these studies. The sample size in studies III and IV was 406, which was considered sufficient to examine the psychometric properties of the initial 54-item questionnaire. Various recommendations defining the ratio between variables used in multivariate analysis and sample size have been discussed. Calculation of an adequate sample size for factor analysis is a complicated issue with no straightforward scientific answer. A number of alternatives have been presented. Nunnally recommended a 10 to 1 ratio, i.e. ten cases for each item included to be factor analysed. Others hold that five cases for each item are adequate in most analyses. In studies III and IV, the number of participants in relation to the number of questions was sufficient, a ratio of almost 10 to 1.
Statistical conclusion validity refers to the extent to which statistical relations and their influence on the conclusions can be detected. This type of validity is often viewed and interpreted from two standpoints: the risk of Type I (α) and Type II error (β). Type I error is the risk of rejecting the null hypothesis when it is true, i.e. the researcher concludes that a significant difference exists when in fact there is none. This type of risk is indicated by the p-value and often set at 5%. When multiple comparisons are made, a reduced p-value must be calculated to minimise the risk of mass significance. In study III a reduced p-value was used due to multiple comparisons across four groups to control for the risk of mass significance. Apart from that, the statistical significance was set at 0.05. Type II error is the risk of not rejecting the null hypothesis when it is false; i.e. concluding that no relationship exists when in fact there is one. Power analysis is a way to estimate the sample size so the risk of Type II error can be reduced but, as already mentioned, no power analysis was used in these studies.

The reliability of an instrument is the degree of stability and homogeneity with which it measures what it is supposed to measure. Assessment of reliability means determining that a scale or measurement yields reproducible and homogeneous results. Reliability testing examines the amount of random error associated with the measurement technique. Stability concerns repeated measures of the same attribute with the same instrument e.g. test-retest reliability. However, this was not used in these studies with consideration to the design and methods used for data collection. One way of measuring reliability is to use homogeneity, which refers to the extent to which the items are interrelated. A common method for measuring homogeneity is Cronbach’s alpha, which is a function of both the average inter-item correlation and the number of items in a scale, where the alpha increases if either of the above increases. Theoretically, Alpha=0 should be the result if the items are uncorrelated and Alpha=1 when all items are identical. However, Cronbach’s alpha can underestimate true reliability and is therefore a conservative measure. An Alpha above 0.7 is generally regarded as acceptable, although it is often recommended that values above 0.8 and sometimes even 0.9 should be used. A too high alpha (above 0.9) can indicate that some items are unnecessary. In this thesis (Study III) an Alpha >0.70 was used since the RCS is a newly developed instrument and considered acceptable. The results of
the item analysis were found to be homogeneous, and the RCS as a whole was satisfactory homogeneous. Cronbach’s alpha was considered high for the 28-item questionnaire, as well as for each of the two dimensions. The distribution of scores ranged over the whole span (i.e. 1-10) for all of the items.

Structural equation modelling could be another statistical method for assessing associations between different variables and competencies.
General discussions of the findings

Patients’ experiences

Vulnerability (Study I)

For most female patients diagnosed with breast cancer, diagnosis starts at the radiology department. In this study, the comprehensive understanding of the patient-radiographer encounter was that the female patients who had been diagnosed with breast cancer experienced vulnerability before, during and after the radiographic examination. Vulnerability before the examination due to uncertainty about the diagnosis threatened patients’ self-control and influenced their way of handling the situation. Lindop and Cannon\textsuperscript{157} stated that the stages of diagnosis and pre-diagnosis can be similar to a post-traumatic stress reaction associated with a sense of loss and insecurity about the future. Feelings of being vulnerable due to fear of cancer recurrence (FCR) related to follow-up examinations have been described by Allen.\textsuperscript{30} Thewes et al.\textsuperscript{158} found that younger women are more vulnerable to FCR than their older counterparts. Another study indicated that only a small number of patients attending the radiology department could identify what kind of examination they were going to have, as they placed more attention on the diagnosis.\textsuperscript{159} The radiographic examination was considered routine and would come to an end unlike the cancer. Patients suffering from cancer can be extremely sensitive to every gesture or sign that indicates a change in their diagnosis.\textsuperscript{26} During the examination, the female patients’ vulnerability was obvious in the pain caused by the examination and being, which was also found by Poulus and Llewellyn.\textsuperscript{160} After the examination, vulnerability was experienced as being lonely, isolated and a feeling of strain due to having to wait for the result. According to Thorne et al.,\textsuperscript{161} to handle this situation, they focused on getting through their day. One negative coping strategy was to object to the recurrent radiographic examinations, which can be related to earlier experiences of vulnerability in connection with such examinations.\textsuperscript{162} Healthcare providers can assist the patient by suggesting coping strategies, as well as providing necessary information and promoting a positive interpretation of events through reframing.
Encounters (Study I)

Four different types of encounter emerged in study I; Empowering, Empathetic, Mechanical and Neglectful. The Empowering and the Empathetic encounters gave rise to positive feelings in the female patients and were interpreted as caring encounters, while the Mechanical and the Neglectful encounters engendered negative feelings and were thus interpreted as uncaring encounters.

The caring encounter was achieved through empowering the patient, thus strengthening and providing her with a sense of being in control of her life and circumstances. The findings revealed that in this encounter the patient is seen as a person who is actively listened to and acknowledged during the examination. The prerequisites have been described in other studies. Being encountered as an equal was achieved through mutual respect and responsibility. Mutual respect involves respecting differences and allows the care provider to work with people, even those about whom she/he has a negative attitude, because everyone is deserving of respect. Together with the patient, the radiographers created a caring encounter in which they assumed responsibility for the former’s well-being. Self-determination is a key concept in the empowerment process. In the caring encounter, the radiographers consciously strove to encourage the patients to participate and understand the course of the examination. Patients need to be heard and listened to as well as being active participants in the discourse. The encounter was characterised by purposefulness in addition to a mutual understanding between the patients and radiographers, as both parties were involved in what was happening in the examination room, where the radiographers encouraged the patients to play an active part in the examination. It is vital that professional caregivers are knowledgeable about all aspects of integrity and that interaction with patients is characterised by dignity and confidentiality. Involvement in caring as well as patients’ participation in the care has been discussed in nursing research and reported to be fundamental for understanding the patient. In study I the caring and the uncaring encounters in the course of radiographic examinations can be compared to Halldorsdottir et al.

The caring encounter was also characterised by empathy made visible by connectedness and concern for the patient. Empathy has been described as the
central ‘helping component’ in nurse-patient interactions. In the caring encounter it was significant to be present for the patient. The radiographers remained close to the women, waited and were prepared to intervene if necessary. The radiographers’ personal qualities had a major influence on the caring, which is in line with Bassett. The radiographers’ communication was based on mutuality, which made the patients feel respected as human beings. This confirms that dialogue is important and that one-way communication should be avoided. The caring encounter was person-centred. In this study it meant that the radiographers focused on the persons as individuals and did not reduce the patients to diseases or organs. It also implied that patients play an active part in their own care and decision-making process.

The uncaring encounter was understood as mechanical and emotionless, which made the female patients feel objectified and invisible. The women were not treated as individuals but as objects or an organ, e.g. a lung, breast or stomach. The radiographers responded in a mechanical way that focused on the equipment and the need to obtain optimal images. Caregivers who act in this manner may appear uncaring; at best their behaviour can be deemed absentminded kindness and at worst callousness. In this study, it meant that the radiographers did not engage with the female patients and that feelings were blocked or ignored. According to Wiman and Wikblad, communication was poor or non-existent.

The uncaring encounter was also interpreted as neglectful due to the total indifference on the part of the radiographers who failed to show emotional insight, which led to lack of ability to respond to the patients’ needs. According to Morse et al., some feelings are so intense that radiographers would be unable to function if they permitted themselves to experience them. However, uncaring encounters can have a devastating effect on patients. The patients experienced powerlessness and stress in the course of the radiographic examination. This occurred in situations when personal contact was blocked and the patients’ needs were totally ignored. Gadow stressed that involvement allows nurses to attend to the patient without reducing them to the level of an object, while at the same time allowing them to remain at the centre of their experience.
The caring and uncaring encounters in the course of radiographic examinations in this study are in line with Hallldorsdottir's theory, which consists of two major metaphors: the bridge and the wall, where the patient is in between. The bridge symbolises professional caring while the wall is non-professional. There is a need for further research from the patient perspective to develop a theory related to the person-radiographer encounter in the course of radiography examinations in order to make such examinations and treatment as pleasant as possible.

Radiographers’ perspectives

Radiographers’ areas of professional competence (Study II)

There was an apparent awareness of the importance of knowledge and competence related to good nursing care. The radiographers’ competence was two-fold; that of a nurse and that of a medical technologist, both of which are significant. This was visible in the direct as well as in the indirect patient-related areas of competence described by the radiographers, where the first area focused on closeness to the patient while the second was concerned with the surroundings. In the first, humanistic values were more obvious, while in the second, the natural sciences had a more prominent place.

Guiding, including the provision of information, was one of the radiographers’ areas of professional competence. Providing basic information about the examination was central and concerned transferring information in one direction, from the radiographers to the patients. However, to achieve the goal of the radiographic examination, radiographers need to request information from the patients. Radiographers play a major role in helping patients obtain and understand information pertinent to the examination or IR. The radiographers’ most important role is to ensure that the information provided is accurate and complete and that the patient has understood it. Each patient should be carefully informed. Communication helped the patients to be involved and participate in the examination. Detailed information about what is going to happen next can be of great value to patients experiencing fear and panic. Information built on rapport can calm and support patients, even in a short space of time. How the radiographer-patient interaction develops is influenced by the characteristics of both parties.
The radiographers’ competence in providing support ensured patient safety and security in the radiology department. When a patient arrives at the department, feelings of fear, anxiety and insecurity may be difficult to handle, thus one radiographer competency is assisting patients to assume command in situations in which they feel out of control. The patient can experience reassurance when respected, understood and supported to recognise and develop an inner strength that can facilitate the restoration of self-confidence. Reassurance can help patients to understand the consequences of a critical illness and resolve doubts and fears. When undergoing a radiographic examination, patients could still be in a state of shock due to the diagnosis of e.g. cancer and might not be receptive to the information provided by the radiographer, a situation that should be faced by providing reassurance. Patients are totally dependent on the radiographer and entrust their body into her/his hands. When providing support, protection concerned respecting the patients’ integrity and dignity, both of which guide radiography practice. However, maintaining integrity, can be difficult, as it requires upholding values and principles during both calm and turbulent times. Powerful forces determine our actions, thus considerable courage is required to act according to our beliefs in everyday work.

When performing examinations, radiation protection was described as important. Radiation dose measurement in diagnostic radiology is considered a critical factor for optimising radiation protection for patients as well as health care practitioners and the general public. The reduction of patient radiation doses is a very important area of radiographers’ competence. Furthermore, being responsive to the patients’ needs and trying to relieve the pain is essential. The radiographers endeavoured to use their competence to gain a deep understanding of the overall situation. An important competency was being vigilant. Patients rely on radiographers’ competence both from a caring perspective and with regard to handling the technological equipment. Being vigilant in complex and emergency situations by means of observation and surveillance ensures patient security. Intervening at short notice in difficult and potentially fatal situations was remarkable proof of radiographers’ competence. Although patients are monitored and observed, they often have the impression of being invisible due to the high-tech environment in which patients and machines form a unit. Radiographers were vigilant in emergency situations and when confronted with the risk of the patient dying, acted to save
lives or in some cases refrained from action by the doctor who had referred the patient. It was challenging for radiographers to care for patients who had no chance of survival, as they wished to help such patients die with dignity. This constitutes an ethical dilemma, as the patient needs a quiet place with her/his relatives close by.\textsuperscript{183}

Planning and preparing for the radiological examination and treatment is one of the radiographers’ areas of competence. It includes organisational ability and highlights the importance of anticipating the administrative, practical and technical preparation required before the patient’s arrival. Being well prepared implies optimal planning for taking care of patients and performing radiological examinations in a professional manner.\textsuperscript{66} Ensuring quality was related to professional competence in the technical and administrative area, which at the same time ensured patient safety. One extremely important task was establishing that the patient information contained in the referral was correct and agreed with the patients’ own account. The radiographers’ area of responsibility includes confirming patients’ identity based on the referral as well as correct documentation of the medical images.\textsuperscript{184} Lack of attention on the part of the radiographer can result in incorrect patient identification and incomplete radiological examinations. Correcting mistakes requires time, and the problems are often due to the fact that there is insufficient time available for performing examinations. Although an organisation can appear structured and well-functioning, there is always the human factor, and one way of reducing human error is by means of clinical audit.\textsuperscript{96}

Handling the medical image comprised a specialist competency. A clear difference in relation to other professionals is skills in the production of medical images, identifying patterns, making comparisons with previous images and performing assessments.\textsuperscript{11, 66, 185} In line with Reeves,\textsuperscript{186} radiographers’ competence in the area of image production was described as an art form, mainly created under difficult conditions. Collaboration illuminated professional competence related to co-operation, education and a well-functioning care chain. It was characterised by team work, support from colleagues as well as distinct and clear communication channels. Knowledge of supervision and education of different staff categories constituted an integral part of radiographers’ work.\textsuperscript{11, 185} The importance of collaboration in the context of healthcare has been underlined in
several studies.\textsuperscript{187-189} Radiographers’ skill in clinically assessing patients’ acute nursing needs resulted in shorter and more efficient care. The willingness to cooperate across professional boundaries and between departments demonstrates respect for and understanding of each other’s knowledge.\textsuperscript{190} Common understanding through teamwork and collaboration can facilitate communication in clinical settings and is vital for patient care.\textsuperscript{191} Teamwork is an essential component of reliability, particularly in health care organisations.\textsuperscript{192} These areas of competence are necessary in an often stressful environment with special demands, thus highlighting the need to keep abreast of the rapid advances in technology and to work towards increased efficiency and patient safety.

Development of the RCS for measuring professional competence (Study III)

The RCS was developed in order to identify the level and frequency of use of radiographers’ professional competencies. Developing a new questionnaire is a challenging process where consideration must be given to methodological issues and psychometric testing.\textsuperscript{138}

The level and frequency of use of professional competencies (Study IV)

The development of the RCS resulted in a questionnaire that measures two competence areas; nurse initiated care as well as technical and radiographic processes. The radiographers considered that they had high competence in providing patient information and the item ‘Adequately informing the patient’ had a high mean score, irrespective of work experience. The importance of this competence is confirmed by other studies.\textsuperscript{79, 122} The patients are unknown to the radiographers, who rarely encounter the same patients a second time, which makes the encounter particularly transitory and the provision of information significant.\textsuperscript{193, 194} Studies focusing on nursing in general have emphasised adequate information as an important competence\textsuperscript{79, 116} and a requirement for increased patient participation.\textsuperscript{195} However, others have found teaching-coaching to be a poorly rated competency among operating room nurses, who in the same way as radiographers encounter the patient for a short period of time, compared to other nurses.\textsuperscript{196}
The radiographers rated ‘Identifying and encountering the patient in a state of shock’ low, which may demonstrate that this complex clinical situation requires relevant education, clinical training and many years of experience. Furthermore, the radiographers considered that they had low competence in ‘Identifying pain and pain reactions’. Many patients experience pain during their hospital stay, and departments often have inadequate pain assessment routines.\textsuperscript{197} Caring for patients in pain can be a challenge, as the patient is unknown to the radiographer. To minimise pain, patients with e.g. a hip fracture are given higher priority at the medical imaging department.\textsuperscript{198} Being vigilant with regard to pain and in emergency situations can be of vital importance and involves competencies and requirements based on skill and flexibility. The lowest level was found among those with short experience, which indicates that the length of work experience may play a crucial role in relation to this competency.

Management of different situations is a vital competence.\textsuperscript{199-201} The radiographers considered themselves highly competent in ‘Adapting the examination to the patient’s prerequisites and needs’. Radiographers often have to perform examinations on patients who are unable to play an active part in the procedure (e.g. critically injured patients, those suffering from dementia or orthopaedic patients in plaster). The competency ‘to adapt’ can, however, be seen as contradictory in relation to the self-assessed low competencies pertaining to ‘Identifying and encountering the patient in a state of shock’ and ‘Identifying pain and pain reactions’. Radiographers often face anaphylactic reactions in relation to contrast medium and should therefore be confident about managing patients in a state of shock. However, the low score on both of these competencies can be interpreted as a lack of knowledge related to other medical causes of shock (e.g. severe internal bleeding leading to haemodynamic reactions) as well as the absence of assessment and pharmacological treatment of pain. Proper professional training from the beginning of radiographers’ education in relation to these topics is essential. Bearing this in mind, the education system, both on basic and advanced levels, as well as quality improvement projects in clinical practice should place more emphasis on these important aspects.

Both age and years in present position had a low but significant correlation with the competencies in the areas of ‘Nurse initiated care’ and ‘Technical and
radiographic processes’ as well as with the RCS as a whole. However, the R² values in the linear regressions were considered very low, and years in present position and work place were not significant in the two dimensions or in relation to the RCS as a whole. When examining the literature, no previous studies regarding factors associated with radiographers’ self-assessed competence were found. According to Benner and Dreyfus et al., five levels of the professional pathway ‘from novice to expert’ form the basis for gaining increased skills and competencies. The progress from a novice to an expert is almost always combined with many years of experience. However, the number of years of experience does not automatically mean that the individual will reach the competent, proficient or expert level.

The low significance between self-assessed competence and age, years in present position and work place indicates that there are several other variables that should be taken into consideration, such as the radiographers’ level of knowledge and/or competence as well as the use of evidence-based knowledge in the department. An experienced radiographer working at a university hospital (i.e. using evidence-based knowledge) who has in-depth knowledge of both ‘Nurse initiated care’ and ‘Technical and radiographic processes’ might be better able to evaluate lack of competence compared to a newly qualified radiographer with little experience working at a district hospital. A multi-rater feedback (i.e. 360 degree feedback) could be used as an additional description of radiographers’ competencies.

The variation regarding years in present position was good, despite the fact that one of the four groups of years in present position contained a smaller number of participants. This might reflect the situation in Sweden where there is ambivalence between different educational organisations and a decreasing number of qualified radiographers. Most participants had a university/high school education. However, no comparisons were made between participants with different levels and types of education or frequencies of use since so few had a higher education (i.e. master or doctoral degree). The predominance of female participants, 88 %, in the present study reflects the sex distribution among Swedish radiographers.
Effects of the education system or the individual radiographer’s habitual behaviour in clinical practice might be other possible factors of importance. Despite the fact that radiographers have theoretical knowledge, routines in the clinical situation are often based on unconscious habitual behaviours, which might influence newly qualified radiographers’ opportunity to implement theoretical knowledge in clinical practice, thus affecting the self-assessed level and use of competence. However, a habitus can also be used consciously towards a specific goal to encourage improvement.
Comprehensive understanding

Radiographers’ professional competence is of vital importance for patients at the radiology department as well as for the entire health care process, as the outcome of radiographic examinations contributes to patient management and treatment. In clinical practice, radiographers encounter patients in different conditions and various stages of disease. The encounter occurs before the diagnosis, during radiographic and follow-up examinations related to curative treatment as well as after treatment when a radiographic examination confirms recovery or relapse. The radiographer should make the examination or intervention more understandable and manageable by providing patients with information, thus facilitating them to assist in the procedure. While this approach could strengthen patients, it also places demands on the radiographers to reflect on ethical issues in order to increase their professional competence. Interacting with patients should receive as much focus as the technology. Radiographers’ professional competence is two-fold; nursing care as well as technical and radiographic processes. Radiographers’ clinical practice comprises advanced technology, where it is essential to deliver optimal images and interventions in addition to maximising the safety of patients and staff in a responsible way. Radiographers have to change between a medical and a humanistic perspective. Patient care is holistic and radiographic examinations are adjusted to the patients’ needs and requirements on the basis of the intention to do what is best, i.e. person-centred care. Hence, the performance of radiographic examinations and treatment in a high-tech environment combined with nursing care is challenging for the radiographer due to the ethical demands involved in combining advanced medical technology and good nursing care. In the course of a radiographic examination, the medical technology is always present. However, nursing care can be an active choice. The approach the radiographer takes regarding nursing care, technique and radiography needs to be simultaneous and interactive within the frame of the short encounter. An instrument for evaluating radiographers’ professional competence must capture both the nursing care and the technical radiographic aspects. The RCS developed in this thesis includes two dimensions comprising
these aspects and can serve as a self-assessment instrument to measure the level and frequency of use of competencies. This is the first instrument aimed at measuring radiographers’ self-assessed competence. The reason for the lack of a previous instrument may be the radiographers’ dual and extended role in an advanced technical environment. The two dimensions in the RCS successfully cover the core of radiographers’ competence.

Radiographers must rely on EBP and not be trapped by clinical habitus. However, EBP combined with long work experience including well-developed intuition can be extremely important. There is a need to develop evidence-based guidelines for radiography practice. Multi- and interdisciplinary teamwork is necessary in order to manage the various factors related to patients’ health status during radiographic examinations in general and interventional radiography, trauma and emergency situations in particular. Nevertheless, radiographers frequently work alone when on duty and therefore have to rely on their own competencies and resources. In such situations, the RCS can be a useful tool for facilitating reflection as well as the development and improvement of various competencies.

It is not advisable to force patients to fit into the high-tech environment and specialised examinations or interventions. Instead, radiographers and all health care professionals should strive to offer person-centred care adapted to the specific context in question. Furthermore, it is necessary for radiographers to consider ongoing professional development as a natural part of their work, which requires transparency in the organisation as well as evidence-based guidelines.
Conclusions

Conclusions from this thesis are:

- The encounter between the patient and radiographer vary, with some variations being more acceptable than others (Study I).
- Short encounters, related to radiographic examinations and interventions, demand specific competence (Studies I and II).
- Radiographers’ competence is two-fold, with emphasise on the care in the close proximity to the patient and activities in the surrounding environment (Study II).
- A 28-item self-assessment questionnaire regarding level and frequency of use of competence was shown to be feasible to measure radiographers’ professional competence (Study III).
- The two dimensions: ‘nurse initiated care’ and ‘technical and radiographic processes’ were proved useful in the 28-item self-assessment questionnaire named Radiographers Competence Scale (RCS) (Study III).
- A big sample of Swedish radiographers has self-assessed their professional competence on a generally high level (Study IV).
- Long-term experience as a radiographer is one factor of importance for self-assessed level of competence in several of the studied areas (Study IV).
Clinical implications

Clinical implications from this thesis are as following:

- to have knowledge and understanding of patient’s experiences; before, during and after a radiographic examination and/or interventional radiography is of importance in order to plan, perform, assess and evaluate the radiographic processes
- it is important to approach the patient with a care in a person-centered way
- the RCS is a short and time-saving instrument with a well-arranged number of questions in two distinct dimensions that can be useful for radiographers when reflecting over self-assessed competence and the role of radiographer and possibilities to develop different parts of competencies
- the RCS can be useful for managers and administrators to plan for improvement and increasing professional competence
- the RCS can be used as a baseline assessment when evaluating the work of the radiographer
- during supervision, it is of importance to initiate a dialogue among radiographers to illuminate issues such as encountering, ethics, relations, patient safety, habits and communication skills
Research implications

Research implications should address the following areas:

- Continued analysis of the two-fold concept of radiographers’ competence as well as the dimensions of nurse initiated care and technical and radiographic processes.
- Further tests of the psychometric properties of the RCS among radiographers in different radiology work settings.
- Tests of the psychometric properties of the RCS among radiographers internationally to identify cultural differences in the level and use of competencies.
- A study on comparisons between self and third party assessment of clinical competence among radiographers based on health-care personnel and/or patients.
- A national study of clinical radiographers, their managers and head of the department to identify similarities and differences.
- A longitudinal study to measure changes over time, regarding the level and frequency of use of competence among students after one, two and three years of studies, as well as after one, three and five years of work experience.
- A longitudinal study to measure changes over time regarding the level and use of competence among newly registered radiographers with follow-up after one year, three and five years.
Röntgensjuksköterskans professionella kompetens, utveckling av ett kontextspecifikt instrument för att mäta kompetens.


Det övergripande syftet med denna avhandling var att kvalitativt och kvantitativt undersöka och beskriva röntgensjuksköterskans professionella kompetens baserad på kvinnliga patienters och röntgensjuksköterskors upplevelser och erfarenheter i samband med olika röntgenundersökningar och behandlingar. Vidare syfte var att utveckla och psykometriskt testa ett kontextspecifikt frågeformulär, Röntgensjuksköterskans Kompetens Skala (RCS), för självskattning av kompetens avseende nivå och användning.

Datainsamlingen skedde både induktivt med intervjuer och deduktivt med frågeformulär för att söka det unika i varje enskilt fall, samt för att kunna studera gruppkorrelationer. Intervjuerna analyserades med Critical Incident Technique (CIT) (Delstudie I) och kvalitativ innehållsanalys (Delstudie II). Det instrument som användes för samlar in data till studierna III-IV var ett nyutvecklat frågeformulär (RCS), som utvecklades för syftet i denna avhandling.
Studiernas deltagare bestod av kvinnor: studie I, n=17, röntgensjuksköterskor: studie II, n=14, studierna III IV, n= 406.

Delstudie I hade en kvalitativ ansats och en deskriptiv, tolkande design. Med syfte att undersöka och belysa kvinnors upplevelser av mötet med röntgensjuksköterskan genomfördes kvalitativa intervjuer med kvinnor med diagnostiserad bröstcancer. För att få en bred variation av erfarenheter gjordes ett strategiskt urval (ålder, varierande stadier av cancer och behandling, hur lång tid kvinnorna levit med bröstcancer, samt antal upprepade kontrollröntgenundersökningar). Deltagarnas ålder varierade mellan 33 och 80 år och medianen var 56 år. Intervjuerna analyserades med kvalitativ innehållsanalys och fem kategorier identifierades; kvinnornas övergripande förståelse av sårbarhet före, under och efter en röntgenundersökning och fyra olika möten; det kraftgivande, det empatiska, det mekaniska och det försumliga mötet.


objektifiering och distansering. Kvinnan blev bemött som ”ett organ”, där organet fick all uppmärksamhet. När hon lämnade röntgenavdelningen var det med en känsla av ha blivit opersonligt behandlad och reducerad till ett objekt. 

Det församliga mötet karakteriserades av känsla av övergivenhet och brist på fysisk och mental kontakt. När kvinnan avvisades upplevdes osäkerhet och känsla av isolering. När hon lämnade röntgenavdelningen var det med en känsla av att blivit marginaliserad.

Delstudie II hade en kvalitativ ansats och en deskriptiv design. Med syfte att undersöka och belysa röntgensjuksköterskans professionella kompetensområden genomfördes kvalitativa intervjuer med röntgensjuksköterskor, 10 kvinnor och 4 män. Ett strategiskt urval av röntgensjuksköterskor ingick i studien (kön, ålder, utbildningsbakgrund, antal yrkesverksamma år och arbetsplatsens storlek) för att få en bred variation av erfarenheter. Deltagarnas ålder varierade mellan 23 och 54 år med en median på 39 år. Fokus i intervjuerna var inriktade mot betydelsefulla situationer som påverkade röntgensjuksköterskans kompetens på ett sätt som antingen gynnsamt eller hindrade god vård. Intervjuerna analyserades med CIT och två huvudområden identifierades; direkt patientrelaterade och indirekt patientrelaterade kompetensområden.


Delstudie III och IV hade en deduktiv och tvärsnittlig design. Deltagarna valdes slumpmässigt utifrån ett nationellt register administrerat av Vårdförbundet. Deltagarnas medelålder var 47 år (354 kvinnor och 48 män) med arbetslivserfarenhet som varierade från 2 till >26 år. Den valda gruppen var kliniskt verksamma röntgensjuksköterskor (n=406) på någon av de cirka 120 bild- och funktionsmedicinska avdelningarna (diagnostisk radiologi) i Sverige, fördelade mellan universitetssjukhus (30 %), länssjukhus (34 %) och länsdelsjukhus (36 %).


I delstudie IV användes data utifrån de 28-frågorna i RCS. Frågorna omfattade två dimensioner av röntgensjukskötterskans kompetens, 'Sjuksköterskeinitierad vård' och 'Tekniska och radiografiska processer'. Syftet med studien var att beskriva röntgensjukskötterskans självskattning av kompetens avseende nivå och användning samt om det var några skillnader i kompetens mellan olika åldersgrupper (0-5 år; 5-15 år; 15-25 år; >25 år) avseende ålder, antal år i nuvarande befattning och arbetsplats. De flesta av de 28 kompetenserna skattades högt inom båda dimensionerna. Inom 'Sjuksköterskeinitierad vård' skattades 'Att informera patienten på ett korrekt sätt' högst, medan den lägst skattade kompetensen var 'Att identifiera och bemöta patienter i chock'. I dimensionen ”Tekniska och radiografiska processer” skattades 'Att anpassa undersökningen efter patientens tillstånd och behov' högst medan 'Att preliminärgranska bilder' skattades lägst. Ålder, år i nuvarande befattning samt arbetsplats förklarade endast en liten del av röntgensjukskötterskans kompetens, vilket betyder att det kan finnas andra faktorer som anses viktiga att undersöka.

Sammanfattningsvis:

- Mötet mellan patient och röntgensjukskötterska upplevdes variera på olika sätt där vissa variationer är mer accepterade än andra (Studie I).
- Korta möten som är relaterade till röntgenundersökningar och behandlingar kräver specifik kompetens. (Studierna I och II)
- Röntgensjukskötterskans kompetens beskrivs som tvåfaldig, dels med tonvikt på aktiviteter i patients omedelbara närhet och dels till aktiviteter i den omgivande miljön (Studie II).
- Det är möjligt att mäta röntgensjukskötterskans professionella kompetens utifrån en 28-gradig skala dels utifrån nivå och dels användning av kompetens (Studie III).
- De båda dimensionerna; 'Sjuksköterskeinitierad vård' och 'Tekniska och radiografiska processer' var användbara utgångspunkter i ett
självskattat frågeformulär med 28 frågor, Röntgensjuksköterskans Kompetens Skala (RCS) (Studie III).

- Ett stort antal svenska röntgensjuksköterskor skattar sin professionella kompetensnivå högt (Studie IV).
- Lång yrkeserfarenhet som röntgensjuksköterska är en viktig faktor som kan bidra till en självskattad ökad kompetensnivå inom många områden (Studie IV).
References


