



Trends that have influenced the Swedish radiography profession over the last four decades



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ABSTRACT

Introduction: The expansion of the radiography profession in recent decades has widened the scope of radiographic practice. This has raised questions about which trends have had an impact on the profession over the years. The study aim was to explore trends that have influenced the radiography profession over the last four decades.

Methods: A qualitative design was used. Eleven focus group interviews inspired by the Scenario Planning Method were conducted at 11 diagnostic radiology departments in public hospitals in Sweden. The target group consisted of 48 registered radiographers. To analyse the data, qualitative content analysis was used.

Results: Thematic data analysis revealed three broad categories; technological development and radiation doses, current status of the radiography profession and specialisation leading to expert knowledge. Each category derived from two or three sub-categories.

Conclusion: The results demonstrate significant trends of influences on the radiography profession in Sweden over the last four decades. New methods and technology and control of radiation doses have had a favourable effect on the development of the radiography profession. Nevertheless, current status such as shortage of radiographers has had an adverse way. Specialisation leading to expert knowledge has an influence on career advancement and a specialist education regulated by the law, might be a prerequisite for the development of the radiography profession.

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Introduction

The significant growth and expansion of the radiography profession in recent decades has raised questions about what has influenced the profession over the years and where it is heading.¹ Members of the radiography profession need to explore its present status and outline a vision of the future by generating scenarios that could be described as a roadmap to the future.² Scenario Planning is a tool that enables long-term planning, especially in cases when the circumstances are uncertain.³ The method provides an opportunity to plan for the future by presenting an overall picture of the current situation as well as the background that might elucidate the underlying conditions and driving forces. Identifying trends by tracking changes and discovering patterns, threats and opportunities in the current situation is involved in the

Scenario Planning Method. When tracking trends, one must start with the historical context in order to explore the changes that have influenced the profession over the years.³ Tracking trends may create an awareness of the status of the radiography profession and radiographers as well as promote the ability to formulate different strategies, thereby enabling the profession to be guided in the desired direction.²

Due to the shortage of radiologists, which has been reported since at least the 1970s, radiographers now perform tasks and assume roles that were previously preserve of radiologists.⁴ Development of the professional role and the subsequent emergence of new duties can be considered an expansion of practice and has cleared the way for new positions such as advanced practitioner and consultant radiographer, common in countries in Europa but not yet established in Sweden.^{5,6} Studies have shown that these positions may result in a higher level of practice with increased responsibility and personal development opportunities.^{7–9}

There is a lack of knowledge about trends that previously shaped the profession and might influence it in the future. Such

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trends need to be explored. Present study is the first part of a project consisting of two studies. The overall aim was to explore trends that have influenced the profession over the years and to predict what the Swedish radiography profession will be like in 2025.

Aim

The aim was to explore trends that have influenced the radiography profession over the last four decades.

Design

The study design was qualitative with an inductive approach based on focus group interviews.¹⁰ In order to explore the trends that radiographers are exposed to or experience in their everyday work, the interviews adhered to a process inspired by the Scenario Planning Method.¹¹ Data collection by means of focus groups is deemed a fruitful research method that benefits from group dynamics, thus allowing researchers to access rich information in an effective manner, especially when studying previously unexplored issues.¹² The method facilitates a natural conversation and social interaction in the group when discussing the issue at hand.¹⁰

Participants

The target group consisted of radiographers working in diagnostic radiology departments in public hospitals in Sweden. Participating departments were selected on a geographical basis from the southern to the northern part of the country and included urban, regional and rural areas. After obtaining approval from the radiology department administrators, the head nurse at the diagnostic radiology department informed the staff about the study and radiographers were invited to participate (Table 1). Written information including the aim and objectives of the study was distributed to the participants. Those who volunteered to take part in the study had different positions and qualifications. The majority of the participants were employed in general areas (n = 21), 17 had management positions or modality responsibilities, while five had educational positions and another five were studying at master or doctoral level. The interviews were performed during spring 2016.

Data collection

Eleven focus groups were formed, each comprising four to five radiographers. The three authors, all of whom have a PhD and are

clinical researchers and radiographers, were involved in the interviews. Nine of the eleven focus groups were chaired by one of the authors, assisted by an observer, who made notes and helped to capture and summarise points of particular relevance to the aim of the study. One of the authors, without any assisted observer, chaired the remaining two groups. However, there was no impact on the data collecting or the quality of the interviews. The initial open-ended question was “*What trends have influenced the radiography profession over the years?*” A semi-structured interview guide based on the steps of the Scenario Planning Method was employed.^{3,13} The interviews were audio recorded and conducted in the participants' work place during working hours or immediately before or after work.

Data analysis

Inductive thematic analysis was used to identify and categorise the findings. This is a systematic method that makes the analysis a visual and tangible process.¹⁴ The audio-recorded interviews were transcribed verbatim by the authors. Nevertheless, when a conversation is translated into text, some changes are inevitable to ensure confidentiality, such as the paraphrasing of local expressions.¹² The first five steps of the Scenario Planning Method³ were performed to describe the trends that influence the radiography profession today (Table 2).

Initially, the authors read the interviews several times to gain a general sense of the whole, followed by a reading to identify meaning units guided by the aim of the study. The text units were condensed, compared and organised into trends according to content. Seven subcategories (contemporary trends) were condensed into three categories. Each step of the analysis was discussed by the authors until consensus was achieved.

Ethical aspects

Swedish legislation requires no formal approval from an ethics committee when the study participants are staff members. However, ethical aspects were taken into consideration with reference to the Helsinki Declaration¹⁵ as well as the principles of autonomy, justice, non-maleficence and beneficence.¹⁶ At the start of each focus group interview, the participants were given detailed information about the study and informed consent was obtained. The voluntary nature of participation, the right to withdraw at any time and the anonymous reporting of the result were underlined. Confidentiality was maintained by restricted, secure access to the data.

Trustworthiness

The credibility of the study was enhanced by a detailed description of the data collection and analysis process.¹⁷ All authors independently analysed and categorised the interview transcripts, which ensured confirmability. The final interpretation of the data was based on the views of all authors which, together with ensuring that the findings were grounded in the text and illustrated by quotations from the original interviews, strengthens trustworthiness. The inclusion of rich descriptions in the findings allows the reader to evaluate and transfer the findings to similar contexts.

Findings

Analysis of the interview texts revealed three categories and seven subcategories (Table 3).

Table 1
Socio-demographic characteristics of participants (n = 48).

Work experience	
Max	41 years
Min	9 month
Mean	14.6 years
Gender	
Female	34
Male	14
Total	48
Working areas (n)	
General	21
MRI, CT, Nuclear	17
Clinical teacher	5
Master-/PhD student	5
Interview duration (min)	
Max	112
Min	74
Average	95

Table 2

The seven steps of the Scenario Planning Method.

1. Description of trends that have influenced current radiography practice.
2. Of these, description of the trends that will continue to shape the future of the radiography profession.
3. Overview of emerging trends that may influence the future of the radiography profession.
4. Summary of the described trends.
5. Evaluation of trends based on their plausible impact on the radiography profession.
6. Selection of the two trends considered the most "uncertain", but which, if realized, will have a major impact on the radiography profession in the future.
7. Creating the Scenario cross to describe four plausible scenarios

Table 3

Overview of the subcategories and categories from the analysis of the interviews.

Subcategories	Categories
New methods and technology	Technological development and radiation doses
Meticulous control of radiation	
Shortage of radiographers	
Work-shifting	
Impoverishing the professional role	Specialisation leading to expert knowledge
Opportunities for career advancement	
Call for specialist education regulated by law	

Technological development and radiation doses

New methods and technology

Technology has had an impact on radiographers' professional knowledge and skill in creating optimal plain images. Current technology determines the appearance of the image more or less automatically. The introduction of the digital Picture Archive Communication System (PACS) has led to greater demands on radiographers during the diagnostic part of the examination. Advances in e.g., Magnetic Resonance Imaging (MRI), Positron Emissions Tomography/Computed Tomography (PET/CT), Ultrasound (US), functional examinations, postprocessing, justification and optimisation, have been challenging and demanding, leading to greater pressure on radiographers to master new areas of competence in order to use this technology. New technology and modalities have made deeper and broader knowledge of the underlying methods and techniques essential. The development of non-ionising methods, e.g., MRI and US, is evident and new technology will continue to be developed. Carrying out too many examinations was described as negative for the profession. In order to further develop radiographic methods, radiographers need time and opportunities to acquire high technological competence.

It has changed from conventional methods where one was more of a craftsman to being almost an engineer who uses technology. (I)

Meticulous control of radiation

The radiographers reported that digitalisation has influenced how they reflect on radiation doses. Digitalisation means that

radiographers may become less sensitive to certain parameters because repeated radiographic projections are all too easy to perform, especially in Conventional Radiography. Protocols, recommended pulse frequencies and patient positions are used in Interventional Radiology and CT. As radiation doses are automatically displayed, the radiographers experienced that they are more obvious today and therefore more frequently discussed. The demand for radiation reduction is high. Some of the new techniques are known to create greater demands for more examinations, thus highlighting the importance of further optimisation in order to reduce the radiation dose. The radiographers argued that there is a need for more interaction between radiographers, radiologists and clinical practitioners.

... yes it's radiation ... it's more controlled, it has decreased a lot, at the same time there are now techniques and demands for additional examinations that can cause a lot more cancers than before. (D)

Current status of the radiography profession

Shortage of radiographers

The participants perceived a decrease in the number of radiographers in Sweden, as many have retired and far too few are entering the profession. Moreover, the number of radiographic examinations as well as the number of modalities is increasing rapidly, which is problematic because all modalities cannot be filled. As the radiographer is responsible for both the technology and the care of patients, the shortage of radiographers was regarded as reducing their ability to care for patients, thus impoverishing the profession. In order to encourage more students to choose the profession, it has to be made more familiar to the public by dissemination of information about its content, possibilities and importance. The radiographers stated that their profession is never described or discussed in the media, despite the need for more radiographers and the vast technological developments.

... it is ignorance, they do not know what radiographers can do, they believe that it's just [telling the patient to] hold your breath and breathe again. They do not see the big picture, they do not know very much about us. (F)

Work-shifting

The professional role has changed and developed from being the radiologist's "assistant" to a greater degree of independence. The radiographers' responsibility increases when there are few radiologists in the clinic. Referrals are often poorly written in terms of the patients' symptoms. Requests for inappropriate examinations were described as common and radiographers are responsible for dealing with them. They also assess the suitability of the image material for diagnosis and send the patients to another ward or discharge them to their home. This expansion of their role and professional ability was deemed positive.

Radiologists delegate tasks associated with examinations such as prioritisation of incoming referrals for CT-colon as well as more advanced image processing. Several examinations require contrast agents and as a result, the range of pharmaceuticals at radiology departments has increased. As patients are often frail and suffer from multi-morbidity, caution is of the utmost importance for maintaining patient safety. In the area of breast care, the role of radiographers includes reporting, as mammograms are assessed by a radiographer and a radiologist, i.e., double reading. The radiographers' responsibility for interpreting images and writing reports was seen as enhancing and expanding the profession, leading to increased independence. This shift in work practices means that more advanced examinations are carried out by specialist radiographers. Although the radiography profession was described as independent, it has become even more so due to work-shifting. Overall, the radiographers were happy about the opportunity to develop new skills and knowledge. This was also something that might attract students to the profession.

... something that has changed is that doctors are moving more and more to the periphery, which change is driven by radiographers. You do not meet in the same physical location anymore. (G)

Impoverishing the professional role

The radiographers also described the opposite trend, where certain areas such as radiological interventions, mammography and emergency examinations have been taken over by other professions in small clinics in rural areas. Assistant nurses who have no formal competence have taken over the following tasks: forwarding information to other departments regarding preparations, checking patient identity, managing timetables for CT or MRI, assisting with Glomerular Filtration Rate (GFR) assessment and caring for the patient during contrast agent administration. However, if something goes wrong, the responsibility rests with the radiographer, which was described as impoverishing the profession and as a risk in terms of patient and radiation safety.

... the employer will solve the problem somehow, if there are not enough radiographers for the task, someone else will be taken on. (J)

The radiographers felt that their professional role was under threat from other healthcare professionals, who make strategic selections in taking over tasks and fields. These could include areas that the radiographers considered valuable for patient safety or as a path to career advancement. Another threat could come from radiologists who did not agree with further education in new areas such as reporting. However, radiologists could be supportive by allowing radiographers increased autonomy in their professional role.

... for a strong professional identity, one must continue to drive the car oneself based on the knowledge and expertise of our profession ... (E)

Specialisation leading to expert knowledge

Opportunities for career advancement

Career advancement was seen as a path to a higher salary as well as new, more interesting work content. Salary was closely related to position. Radiographers described career in terms of role development, which was often restricted by radiologists who maintained local control of practice boundaries. The radiographers also mentioned the importance of a career ladder. Career planning is individual and not always focused on the department's needs. Although much education took place in their free time, many radiographers felt it was worthwhile for personal development. Being a doctoral student was part of their career and would have a major impact on their professional role.

Advanced knowledge in a particular modality was seen as a career path, because it implied specialisation. However, the participants pointed out that in Sweden you need to have a specialist education regulated by law in order to call yourself a specialist. Change of employer or position was also considered to advance their career, i.e., becoming an application specialist, working in the private sector or in industry, or assuming the role of a manager or teacher. These pathways did not always contribute to a higher salary despite some of the above-mentioned positions requiring higher qualifications. In some cases, the position was associated with commitment or length of experience.

There are higher demands from the general public as the population grows older. More people are living longer and their diseases need to be investigated. New technology will be developed requiring deeper and broader knowledge. (A)

Call for a specialist education regulated by law

Regulated specialist education was discussed in relation to the advanced educational opportunities available to nurses. The radiography profession was considered exclusive and different from other professions. There was a clear barrier on different levels between other professionals and radiographers. Radiographers regarded themselves as specialists, knowledgeable about radiation safety and experts in their field. Today, specialisation within radiography is often linked to a variety of modalities. Radiation, magnetic imaging and nuclear medicine require a clear demarcation, thereby providing obvious practice boundaries. The need for a post graduate education leading to both a professional and an academic examination in the radiographers' own field, i.e., a specialist education within radiography regulated by law, was strongly stressed. Radiology departments urgently need to recruit specialist radiographers to fill positions due to the vast expansion of modalities. The shortage of radiographer students has been recognised by clinical department managers, who have understood the need to make the profession more attractive and increase formalised career ladders to attract students, as the latter frequently request an opportunity for further education at post graduate level.

... It may be that we will be involved in many more examinations ... our profession will widen a bit ... then we must have specialist

training because I think if there are so many different examinations there should be some kind of extension of the profession ... (K)

Discussion

The aim of this study was to identify trends that have influenced the radiography profession over the years. Technological development and radiation doses, the current status of the profession and specialisation leading to expert knowledge are three trends that predict the state of the radiography profession in 2025. Scenario Planning Method was considered appropriate for capturing a broad spectrum of trends that have influenced the radiography profession over the years. Use of the Scenario Planning Method is rare in the area of radiography but more common in the context of health and healthcare.^{2,18} A strategically selected sample was employed to present a national picture of radiographers' views on their profession. The focus groups consisted of 70% female and 30% male radiographers, which corresponds with the gender distribution of the profession.¹⁹ The groups included a sufficient number of participants to yield diversity in the data and were large enough to create an environment where participants could feel comfortable sharing their thoughts, opinions, beliefs and experiences.^{10,12} Participants and researchers were familiar with the research area, which enhances trustworthiness.

Technological development and radiation doses

One trend that has had a major impact on the profession is the rapid development of advanced, new imaging technology and equipment. This has been challenging and demanding for radiographers, who questioned whether existing technology is fully optimised.² As a consequence of the development of new methods and modalities, some conventional imaging technology, techniques and examinations have become outdated. The radiographers experienced the need to quickly adapt to the new techniques and technology, while at the same time taking account of the patients' opinion and making use of interprofessional collaboration to provide best possible care. Concerning optimisation and radiation control, the introduction of digital radiographic techniques has led to a risk of dose creep, i.e., a tendency to retake an image to improve the quality, despite being aware of the danger of increased patient dose.^{20,21} However, they believed that a follow-up control system for both staff and patients would reduce this problem. The participants also reported considerable variations between departments in protocols for the same condition and would welcome more standardised imaging protocols in order to optimise the radiation dose.^{22,23}

Current status of the radiography profession

Shortage of radiographers and the increasing demand for radiography examinations lead to pressure from the general public. As a result, nurses and assistant nurses who possess no radiographic knowledge are filling the gap, which may compromise patient safety. The significant growth and expansion of the radiography profession in combination with vast technological development and greater demand for more and new radiological examinations have resulted in an increasing need for more radiographers. This occurs at a time when many experienced radiographers are retiring, yet patients want their referral dealt with quickly in order to obtain a diagnosis and appropriate treatment. The radiographers' work has expanded immensely and today includes justification of radiological examinations, interpreting images and taking over

tasks previously performed by radiologists.^{4,7,24} Increasing demand for more complex examinations and advanced modalities puts pressure on the radiographer to become even more efficient, despite the fact that opportunities for further education are limited and there is little time available to gain deeper knowledge. This can jeopardise patient safety and cause concerns about the work situation and professional development. Radiographers expose the patient to ionising radiation and although each examination is optimised in terms of radiation dose, the vast number of examinations increases the amount of radiation received by the public, leading to an even greater necessity to justify the examinations performed.

All of the above underlines the need for more radiographers and greater opportunities for further education and specialisation at post graduate level. Newly qualified radiographers ask about career opportunities and further regulated education.⁷ This is an important aspect when trying to encourage young people to become a radiographer.

The radiography profession is more or less invisible to the public and radiographers are considered anonymous allied healthcare professionals. Radiographers are often regarded as members of the collective of nurses, even though their education and profession have few similarities. The professional qualities and key skills required to handle sophisticated diagnostic equipment and provide continuity as well as advanced care of patients of all ages and from different medical areas are often underestimated. When the profession is presented to the public, the emphasis is usually on the technology, thus disregarding radiographers' specialised expertise and radiography knowledge.²⁵ The omission of these qualities and skills when describing the profession makes it less familiar to the public and future students.

Specialisation leading to expert knowledge

When discussing opportunities for career advancement, the participants highlighted the importance of earning a salary commensurate with the radiographers' work, education and specialist knowledge. According to Milbery et al., salary is not always proportionate to the level of education or academic achievement.²⁶ The radiographers were disappointed that colleagues with longer work experience but no formal qualifications were assigned more advanced work and awarded a higher salary. This indicates the need for a career ladder with a clear and structured path for advancement combined with salary.

Radiographers' basic radiography education together with clinical experience was considered the ideal background for continuing studies to become a specialist in radiography, which involves gaining expert knowledge in specific areas. The radiographers wished for a post graduate education to obtain a deeper knowledge of radiography with the aim of meeting service users' needs. However, there seemed to be a lack of post graduate courses and, where available, radiographers were not always given the opportunity to attend during working hours. It is essential that all radiographers support new developments in the field, thereby improving patient services as well as enhancing the status and reputation of radiography as a profession.²⁷

Over the years, education and training of students and other staff members as well as improving patient safety have been a significant part of the clinical radiographers' career path to higher positions, while on a personal level they lead to increased self-esteem. The only opportunities available were internal courses supported by managers and a few day courses, such as Continuing Professional Development (CPD) courses, the aim of which is to encourage a continuous learning process required to further develop and improve one's knowledge, skills and competence.²⁸

In line with a study by Ferris, specialisation was mainly described as linked to new areas of practice in diagnostic radiology, modalities and procedures.²⁹ The radiographers had a sense of pride, wished to become more visible and not be overshadowed by other professions. The present study reveals that radiographers want to expand and deepen their understanding of the scientific knowledge acquired in their work in order to meet the professional demands made on them. They felt prepared to take on new tasks and become more involved in a multidisciplinary team in which they contributed their own specialised competence. Several studies confirm the necessity of a specialist education to meet health service demands.^{29–31} It should be emphasised that a specialist post graduate radiography programme is necessary for creating a clear pathway to career advancement. This would also guarantee the level of competence required in a modern radiology department and lead to development within the profession.^{2,4}

Conclusion

The results indicate significant trends and major challenges that have influenced the radiography profession in Sweden over the last four decades. The technological developments, control of radiation doses, work-shifting and opportunities for career advancement have had a positive influence on the radiography profession, while shortage of radiographers has affected it in a negative way in that there has been limited time to engage in activities that promote such advancement. This might jeopardise radiographers' ability to provide the best possible safe care for patients. Specialisation in practise leads to expert knowledge, which may have an influence on career advancement, however, a specialist education regulated by the law can be a prerequisite for further development of the radiography profession. Radiographers must step forward, become more visible as a profession and not remain in the shadow of other professionals.

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Conflict of interest

There is no conflict of interest to be declared.

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