



**Karolinska  
Institutet**

**Department of Clinical Science, Intervention  
and Technology (CLINTEC),**  
Division of Medical Imaging and Technology  
Karolinska Institutet, Stockholm, Sweden

## **RADIOGRAPHIC QUALITY WORKFLOW**

**– In the Digitized Healthcare Environment**

**AKADEMISK AVHANDLING**

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av

**Kerstin Hillergård**  
**Leg. röntgensjuksköterska**

***Huvudhandledare:***

Docent Nina Lundberg Sellberg  
Karolinska Institutet  
Institutionen för klinisk vetenskap,  
intervention och teknik  
Enheten för medicinsk bild, funktion  
och teknologi

***Bihandledare:***

Professor Peter Aspelin  
Karolinska Institutet  
Institutionen för klinisk vetenskap,  
intervention och teknik  
Enheten för medicinsk bild, funktion  
och teknologi

***Betygsnämnd:***

Docent Agneta Ranerup  
Göteborgs universitet  
Institutionen för tillämpad IT  
Avdelningen för informatik

Docent Staffan Lindblad  
Karolinska Institutet  
Department of Learning, Informatics,  
Management and Ethics

MPH, Med Dr Johan Thor  
Hälsöhögskolan  
Jönköping Academy

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## Abstract

This thesis emphasizes two different aspects — how radiographers use knowledge in image production work and perceive a radiographic quality workflow in the digitized healthcare environment using PACS — both because these aspects are cornerstones in the delivery of radiographic work and because the two aspects are related to one another. The aim was to inform the field of radiography of changes related to digital imaging production work by understanding how radiographers use their knowledge in work and perceive a radiographic quality workflow in detail.

The study has been performed using a qualitative ethnographic approach with a combination of in-depth interviews and observations. In total 34 interviews and 15 observations were conducted at 5 different Swedish radiological departments. Analyses have been made by using content analysis. Six phases and aspects of work were identified in the analysis process of the studies: 1) the planning phase, 2) the performing phase 3) the evaluation phase, 4) image production, 5) communication in work and 6) feedback in work. To identify properties of radiographic knowledge and quality workflow Blackler's theory of knowledge components was applied.

The results illustrate that radiographic work is a complex activity, for which several different types of knowledge are needed to deliver quality workflow; embrained knowledge, encoded knowledge and embodied knowledge due to various situations in the examination process. The use of knowledge can also be a mixture of them. The results also show that the radiographers use their skills on two different levels, either routinely or reflective. In practice, the radiographer can be more reflective in one part of the image production and more routine-oriented in other parts. The study shows that when radiographers use their embrained knowledge, they are using their intelligence and their theoretical knowledge rather than their hands-on knowledge. When radiographers use encoded knowledge, they may use a range of different kinds of documentation. When radiographers use embodied knowledge, it is practical thinking and problem solving and often involves the handling of technological options for image production work, a "hands-on" approach.

This study also shows the need of new ways of informal learning in the radiographic quality workflow based on digital information. The change from an analogue to a digital workflow requires that the radiographer has new knowledge about diagnostic and image quality control work as well as "new knowledge" about information systems use. They also need knowledge about modalities, methods and protocols as well as radiation protection. It was also shown that the radiographers need to communicate more among themselves when challenges in work arose. Further on it was illustrated that there is a desire among radiographers to find new fruitful ways of communication with physicians, colleagues and radiologists using IT. Finally it was shown that informal learning is a key factor in the radiographer's digital workflow.

This study concludes that in the digitized management of radiology examinations, changes have taken place both in feedback at work and in the use of information systems. It also concludes that working in a PACS environment a more flexible and reflective approach is required in the image production process. In work you need to analyze images - it is not enough to "check them off". Documents cannot merely be read, but must also be interpreted to optimize work performance. Overall, radiographers need to have a reflective mind in practice, because work is full of problem-solving actions; it is not enough to perform repetitive automatic actions. Knowledge about the aspects of routine-focused and reflective radiographers has shown to be important for an understanding of radiographic quality workflow. In conclusion, having a profound ability to reflect, learn and transform in work is more important in the digitized management of radiology, as radiographers have new responsibilities in work using PACS and other information systems.

Radiographers are early adopters of new communication- and information systems. Digital information and PACS provide the opportunity for radiographers and other healthcare professionals to implement new improved ways of working. In such new ways of working the use of additional work-integrated learning, communication and information systems will be a key feature. New work-integrated learning and communication systems such as Skype, Feedback<sup>TM</sup>, Equalis<sup>TM</sup>, HAWA, MSN, Facebook, Twitter and App:s for smartphones has potential to become mature healthcare services and support reflective thinking and informal learning in work.

However, to further contribute to the radiographic professional knowledge and practice advancement more research need to be made within the areas of the implementation and use of; 1) think tanks such as collegial reviews, 2) reflection in groups at formal learning meetings with radiologists, 3) work-integrated learning tools in radiology, e.g. Feedback<sup>TM</sup> and Equalis<sup>TM</sup> and 4) communication systems, e.g. Skype, Twitter and MSN for online feedback among radiographers and radiologists locally, regionally, nationally and internationally.