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Aspects of Artificial Intelligence (AI) in radiography

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An insight into Danish radiography and the work with Artificial Intelligence (AI)

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THE Danish Healthcare System is one of the most developed in the world and with free hospital service to all citizens, we welcome AI as the technology which can make the best use of resources for the benefit of the patient, the diagnostics and treatment. Danish Council of Radiographers has asked two radiology departments in different part of Denmark to give their vision about AI in the future of radiology with focus on challenges and benefits.

Aspects of Artificial Intelligence (AI) in radiography

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New technologies are moving forward and we, Radiographers need to keep our focus on how these inventions can increase patient care or help us increase patient care.

As we speak, the population of citizens above the age of 80 is growing and by 2057, estimated one in ten citizens in Denmark will be 80 years + compared to today where 4.4 % of the population are above 80 years old. Currently the 4.4 % of 80 + years old’s use 10 % of the local GP’s capacity so this means we need to prepare our healthcare system to embrace the increased demands the future holds. In radiology, this will result in more scans and increased demand for interventional radiology, more requests for mobile radiology such as bedside ultrasound, X-rays performed in nursing homes and other time-consuming patient related tasks. With no increase in government funding, we must find ways to

improve our organizations and start working towards identifying areas where AI can help us create the necessary time and prevent radiographers and other professionals in radiology departments get ill from stress related symptoms.

So where and how can we start? We can for instance start by identifying which time-consuming tasks we perform today and continue by identifying which of these tasks new technologies/AI can manage. Here are a few examples of tasks we spend time doing and instead we can use this time to create excellent patient care:

- We spend time positioning the patients correctly in CT scanners. If the scanners can be built to identify the correct iso-center for the patient, the correct start and finish for the scout image and corrections for any abnormalities, the radiographers can concentrate on the patient.
- We spend time finding blood test results prior to patient examinations. If an AI system can identify which blood tests we need for a given examination, send a notification to the patient and the laboratory and place the results in the RIS system, the radiographer and the booking personal can save time.
- We spend time creating reconstructions of CT scans. This should be an easy task for AI.

The radiologists and radiographers spend time measuring vessels prior to interventional radiology. If AI can measure vessels from the CT/MRI scans and identify the equipment we need for the operation, this can free a lot of time.

Quality assurance is another area where AI can help us create a safer environment for our profession and our patients:

- Help guide to correct positioning when taking X-ray images.
- Help guide for the exact correct amount

of mA, time and kV for each patient examination according to the potential diagnosis asked for in the referral, meaning another image quality is required for scoliosis than for chest examination or between a first time image and a control image of a fracture.

- Automatic identification of right and left according to the patients anatomy, and prevent wrong side markers.
- Let the system report if the dose product for an examination changes according to the normal used protocols.

Also, in the booking process, AI can contribute:

- Ensure that patients needing reoccurring control scans get booked in the same scanner or x-ray room.
- Book certain patient studies such as children, dementia patients or other specialized patient categories on days where specially trained radiographers are at work.
- Ensure that patients needing reoccurring imaging are booked to meet the same radiographer each time they come.
- Overview and note on the screen for the radiographer if the patient has experience with the specific examination referred to, to optimize the radiographers communication and possibilities to help the patient through the examination.

We also need to think ethics into areas where AI can contribute and remember to think the patient experience into the equation. An example can be software in MRI that helps decide the amount of frequencies required for correct diagnosis. If the software detects any pathology in the first frequency it will decide for more frequencies, but if it finds no pathology the scan will end. This software will save time but can potentially give the patient an idea of the result according to the length of time spent in the scanner and cause the patient anxiety.

Elevating patient care with Artificial Intelligence

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Radiography is changing and it is changing very fast!

The development and use of Artificial Intelligence (AI) is growing rapidly these years and it is, without any doubt, here to stay. In the following, I will try to describe, how we work with AI at my department, and how we think it will elevate the Patient Care in the years to come. By Patient care I mean the quality of examinations, images and reports but also the possibilities that the technology gives radiographers to increase the quality of the specific way we treat and take care of patients.

As we all know, the imaging options are increasing, and to help us all manage the increasing numbers of examinations and images, not to mention the lack of radiologists, we need to find areas, where AI can help us save more time and, at the same time, increase quality of all we do.

In the Capital Region of Denmark, where I work, there are a lot of initiatives to develop and implement AI directly into clinical practice. Many of these initiatives are performed as private and public cooperation and many of the hospitals and radiology departments in the region is involved in the process. These initiatives are performed in the areas of neuro-, abdominal-, thoracic- and musculoskeletal radiology.

At my department, almost all of the work related to AI is handled by our Professor and his staff. He is a very broadly embracing and innovative radiologist, and therefore a lot of the work is handled as a fusion of the classic way of research and modern innovation. The benefit for our patients is obvious. We seek to implement AI on the fly and as soon as we trust the results. At the moment, most of our projects is performed in the area of musculoskeletal radiology and we work closely with private partners and developers. The professionalism of radiography is changing rapidly and the transition from 2D to 3D is going to change our profession even more, I think. We will still perform a certain amount of conventional images, but I think we will see a huge increase in 3D-images in both the musculoskeletal area as well as in the thoracic area. In this transition, AI will have a big impact. And we must not fear this transition – we need to embrace it!

AI will help us all optimize workflows and precision in the outcome. It will help radiologists so they can spend their time more wisely and put their efforts where it is

needed. But it will also help radiographers to be able to concentrate more efficient on the patient care itself, and thereby to focus even more on the humanity part of our job. In my point of view, AI will have the following value and effect:

It will promote the – quality, efficiency, patient safety, speed and precision.

It will reduce the – lack of radiologists, radiation doses, use of contrast agents, image noise, number of retakes and errors, costs and moral injury (burnout) of staff.

As radiographers in the ongoing transition, we must not forget the humanity part of our job and we need to secure, that we are up to speed with the upcoming technologies. Let us embrace AI.

And on top of the comments above, I have not even mentioned the arrival of robots in radiography/radiology. Who knows – we might even end up with a self-service CT-scanner? ■