

## STATEMENT CONCERNING THE INCREASED USE OF COMPUTED TOMOGRAPHY IN THE NORDIC COUNTRIES

### The Nordic Radiation Protection co-operation

The Nordic radiation protection authorities are concerned about the increased use of computed tomography (CT). They want to draw attention to the potential risks involved and avert unjustified CT examinations by implementing the “triple A” concept: Awareness, Appropriateness and Audit. The Nordic authorities have agreed to issue this joint statement directed to the professional societies and health authorities, notwithstanding the distinct recognition of the large benefits of CT as a diagnostic tool.

### Introduction

The background for this statement is the increased number of Computed Tomography (CT) scanners taken into use in radiology, which first of all is for the benefit of patients. However, the increase of the diagnostic capacities and capabilities has resulted in a considerable increase in the number of CT procedures (Figure 1).

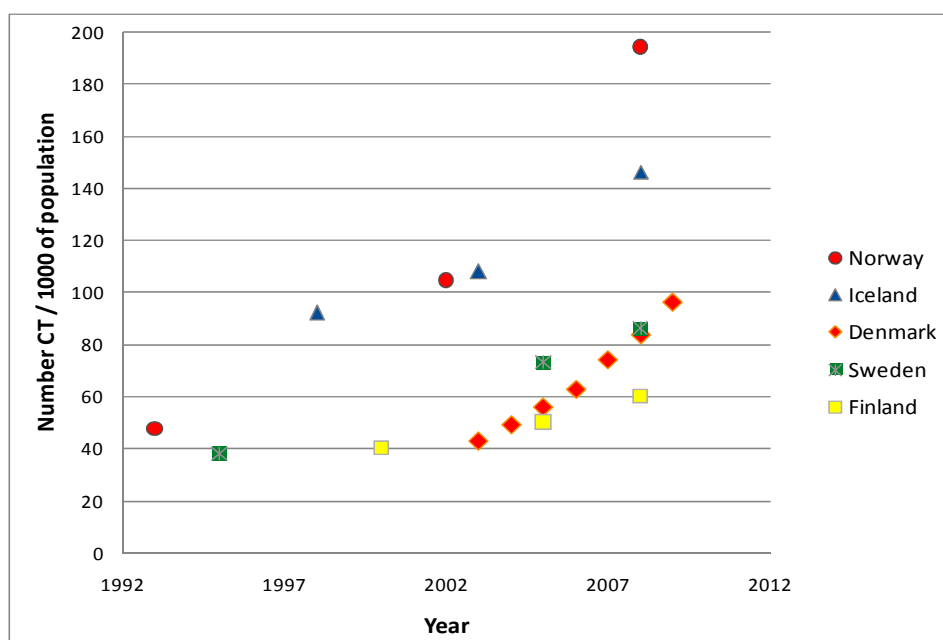
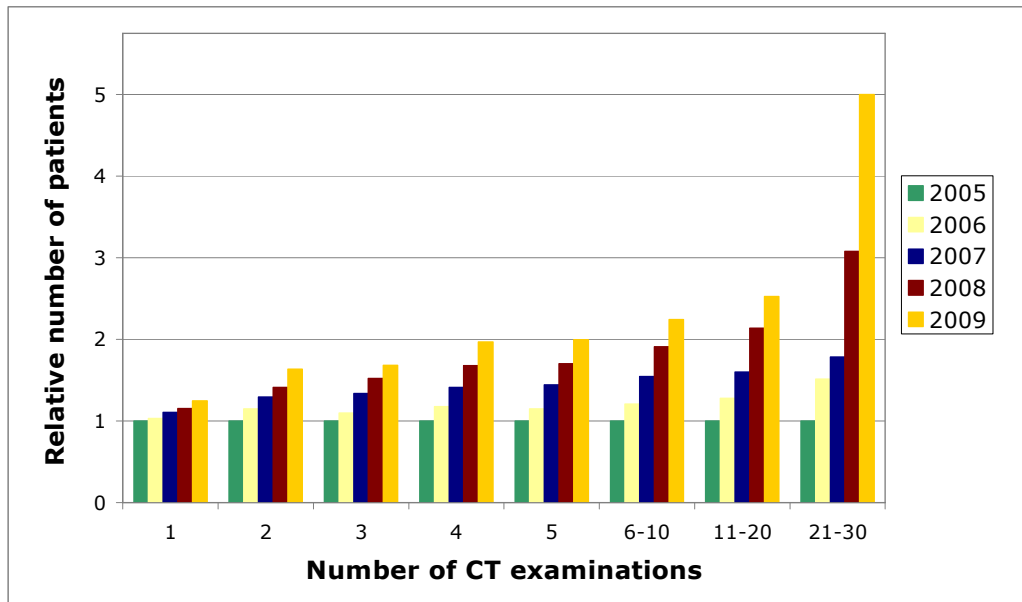


Figure 1. The trends in the number of computed tomography (CT) procedures, per 1000 inhabitants in the Nordic Countries during 1993 to 2010.

CT involves much higher radiation doses compared to conventional X-ray procedures, which has resulted in higher doses to the population from medical imaging. In the Nordic countries, CT procedures contribute currently to 50-80% of the total population dose from medical X-ray imaging, for the first time man-made radiation exposure to the population exceeds exposure from

natural sources in some countries [1]. It is also of concern that the use of CT for paediatric patients has increased, since children are more sensitive to radiation compared to adults. The obvious benefit to healthcare by CT is shadowed by reports concluding that between 20% and 75% of diagnostic procedures are judged as not justified, i.e. they do not have a positive influence on the patient's health [2, 3, 4]. There are also reports of individual patients undergoing multiple CT examinations which results in high cumulative doses. Figure 2 shows that in Denmark the number of patients undergoing multiple CT examinations have increased markedly over a four year period [5].



*Figure 2. The distributions of individual patients having one or more CT examinations in a year in Denmark.*

## Justification and Optimisation

The basic principles of radiation protection are justification and optimization. Justification strives to ensure that the benefit of using radiation outweighs the possibility of radiation induced harm. Optimization implies that every effort is taken to optimize the exposure for each procedure, according to the “As low as reasonably achievable” – the ALARA principle [6]. The Nordic Authorities on Radiation Safety urge all radiology departments in the Nordic countries to focus on these two basic principles and especially on justification. It has been recognized for a long time that the main factor in reducing radiation doses from CT examinations is to avert unnecessary and unjustified examinations.

Both the referrer and the radiologist should contribute to improve the application of justification and optimization in daily practice. Decision making tools should be developed further, such as referral criteria for radiological examinations based on experts' judgement. Discussions between referrer and radiologist, on the conduct and outcome of radiological examinations, will lead to an increased mutual understanding of when the different radiological procedures are adequate for use.

## Triple “A” Approach

Nordic authorities emphasize the importance of **Awareness** about radiation risks; **Appropriateness** to ensure that patients referred for radiological examinations really need them; and **Audit** to check the quality of the referral and the effectiveness of the related processes [4]. Renewed focus on these three key factors in Nordic countries should include the following items:

### **Awareness**

1. The referrer and the radiologist should have adequate knowledge in theoretical and practical radiation protection, especially with regard to justification.
2. The universities and professional societies should work continuously to include basic radiation protection knowledge in the basic education and further training of health professionals.
3. The referrer and the radiologist should have knowledge about the referral criteria available for the practice of radiology.
4. The referrer and the radiologist are encouraged to ensure communication of benefits, doses and risks to the patients and relatives in a balanced way; not to frighten the patients but put benefits and risks into perspective.
5. Particular care should be given to patients undergoing multiple CT examinations, it should be checked whether the previous examinations provide already the necessary information. The establishment of systems that store electronically the CT protocols and doses involved is encouraged to gain information about the *cumulative* dose to patients.
6. Justification of CT for paediatric patients, younger patients with chronic diseases and follow-up patients should be performed with special care.

### **Appropriateness**

1. A radiological examination should only be performed to answer a certain clinical question, and only when the answer will influence the further decision making process and treatment of the patient.
2. The health authorities and professional societies should collaborate to develop evidence based state of the art referral criteria. The medical societies in the Nordic countries are encouraged to collaborate in the development and review of referral guidelines.
3. In general, CT-examinations of asymptomatic individuals are considered unjustified, unless as part of an approved systematic screening programme or health assessments of a certain group of individuals acknowledged by the health authorities.
4. Modalities based on non-ionising radiation (magnetic resonance, ultrasound) should be preferred whenever appropriate, taking into account the benefits and risks of the respective methods.
5. The referrer should present a comprehensive referral including the clinical question. It is considered to be the responsibility of the radiologist to make up further judgements about the appropriate modality. Whenever CT is chosen, the procedure should be optimised to the individual patient and clinical indication, to ensure that the dose is kept as low as reasonably achievable.
6. All referrals should be reviewed by a radiologist before the examination is carried out to ensure the appropriateness and the choice of modality and imaging protocol/procedure.
7. The radiologist is encouraged to co-operate more with the referrers in the justification of the examination and for choosing the most appropriate modality and procedure for the individual patient.

## **Audit**

1. Clinical audits are valued as an essential tool in the assurance of appropriate radiation protection of the patient, including the implementation of the justification principle. Clinical audits are addressed in the radiation protection regulations in most of the Nordic countries to support the regulatory actions.
2. The health entities are encouraged to arrange periodically internal and external audits as well as self-assessments, dedicated to the use of CT. In particular, people and resources should be allocated in setting up external audit teams to review and exchange experience in the implementation of referral criteria.
3. Nordic cooperation is advocated concerning auditing, exchange of information and experiences, and also setting up external auditing teams involving professionals from other countries.

## **References and further reading**

- [1] Olerud H.M. et.al. (2010) Collective doses from medical exposures: an inter-comparison of the "TOP 20" radiological examinations based on the EC guidelines RP 154. [Proceedings of the Third European IRPA congress](#), 14 – 18 June 2010, Helsinki: STUK
- [2] Almén A, Leitz W and Richter S. National survey on justification of CT-examinations in Sweden. Swedish Radiation Safety Authority [report SSM 2009:3](#) (2009)
- [3] Image gently, The Alliance for Radiation Safety in Pediatric Imaging. (Accessed on 20<sup>th</sup> September 2011) (<http://www.pedrad.org/associations/5364/ig/>)
- [4] Triple-A Investment in Patients Health, IAEA Promotes Awareness, Appropriateness, Audit of Ionizing Radiation in Medicine. (Accessed on 20<sup>th</sup> September 2011) <http://www.iaea.org/newscenter/news/2010/tripleinvestment.html>
- [5] National Registry of patients (Landspatientregisteret), National Board of Health, Denmark. (<http://www.sst.dk/Indberetning%20og%20statistik/Landspatientregisteret.aspx>)
- [6] Malone J., et al. Justification of diagnostic medical exposures, some practical issues: report of an International Atomic Energy Agency Consultation. [The British Journal of Radiology](#), doi: 1259/bjr/42893576. Published online before print February 22, 2011.