European Medical ALARA Network

NEWSLETTER

EDITION 2 ■ JUNE 2013

TABLE OF CONTENTS

After the successful conclusion of the EC-funded tender project to establish a European Medical ALARA Network, the three professional organisations involved – the European Society of Radiology (ESR), the European Federation of Radiographer Societies (EFRS) and the European Federation of Organisations of Medical Physics (EFOMP) – decided to ensure sustainability of the EMAN network and signed a relevant Letter of Intent, forming the new EMAN Network Steering Committee.

At the first meeting of the new Steering Committee it was agreed that a quarterly newsletter should be produced and sent to all members of ESR, EFRS and EFOMP. Each newsletter focuses on one topic, and the members of the EC-funded EMAN project are invited to contribute articles.

The first newsletter was issued in February this year. It provided an overview of EMAN, a summary of achievements of the EC-funded EMAN project, and looked ahead to the activities and outlook of the new network.

This second newsletter is dedicated to "imaging outside the radiology department" and the work which was carried out by Working Group 3 in the EC-funded EMAN project. Highlights include a summary of the developed recommendations to improve radiation protection levels in these practices, an article describing efforts to produce recommendations for the improvement of bedside radiography, efforts to improve radiation protection in gastroenterology imaging, a summary of the ICRP recommendations for these practices and the development of a radiation protection poster, instructing on the use of mobile C-arms, in 18 different languages.

Future newsletters will focus on the work of the other EMAN Working Groups, namely CT and and interventional radiology.

We hope you will enjoy reading this latest EMAN newsletter and find the articles informative.

The EMAN Steering Committee

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The EMAN Working Group on radiological safety for patients and personnel in activities using X-ray equipment outside the X-ray departments

The aim of the European Medical ALARA Network (EMAN) EC-funded Tender Project was to develop radiation protection optimisation strategies in three areas of diagnostic and interventional radiology: computed tomography, interventional radiology and cardiology and radiological practices performed outside the radiology department. Three working groups with representatives of the professionals involved, medical radiologists and cardiologists, radiographers, medical physicists and regulators, worked for two years identifying the needs and priorities for the implementation of elements to increase the level of protection both for patients and, when relevant, for the involved staff.

The experience gained by the three multidisciplinary groups provides a methodology which can be applied in other fields of diagnosis and therapy. EMAN recommends that the same methodology is applied at the hospital level by setting up multidisciplinary "core teams" which aim to implement exposure optimisation in the different areas. The role of the core team is to develop optimised procedure protocols, train the staff and supervise their practice. The knowledge, competence and skills of the core team members have to be defined together with training initiatives which have to be supported by EMAN and scientific societies.

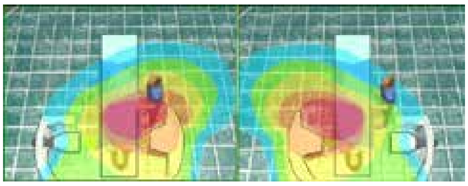
This paper summarises the main achievements of the working group (WG) on the Radiological Practice Performed outside the Radiology Department, together with recommendations addressed to the European Commission, standardisation and regulatory bodies, manufacturers and users. Complete information on the achievements of the working group can be found in the synthesis and final documents posted on the EMAN website (Synthesis Document: http://www.eman-network.eu/IMG/pdf/WG3_Synthesis_doc-2.pdf and Final Report: http://www.eman-network.eu/IMG/pdf/WG3_Final_report-2.pdf).

The WG focused specifically on the following tasks:

- The collection of up to date literature and current reports concerning X-ray practices outside the radiological departments and the development of a synthesis document on the impact on patient and staff dosimetry and exposure and the state of the art of optimisation.
- The development of the concept of Reference Levels in fluoroscopy practice in the most frequent fluoroscopy guided procedures according to the recent recommendations of the International Commission on Radiological Protection (ICRP).
- The promotion of radiation safety of staff and good practices of personal dosimetry for fluoroscopy guided procedures performed with mobile equipment.
- The proposal of education and training activities in Radiation Protection (RP) aimed at professionals performing fluoroscopy guided procedures.
- The development of recommendations on the optimisation for X-ray practices outside radiological departments which include the definition of cross-cutting issues and pillars in relation to the optimisation of patient and occupational exposures.

Based on this work, input was provided concerning:

- the development and update of an EC guidance on Diagnostic Reference Levels for Medical Exposure,
- the proposals on harmonisation issues, both for the patient and regarding staff exposure, and for the training of staff involved in the practice,
- the formulation of proposals to update standards for X-ray equipment.



Optimising staff exposure: isodose maps and x-ray tube position

OPTIMISATION IN X-RAY PRACTICES PERFORMED OUTSIDE RADIOLOGY DEPARTMENT

Radiation protection of patients and staff for practices performed outside radiological departments are of particular interest due to: the limited information on type, procedure frequencies and doses, the increased frequency of procedures in surgical theatres, and the fact that procedures are often performed by non-radiologists and nurses with poor or with no training on radiation protection or procedure optimisation. The EMAN working group on Radiological Practice Performed outside the Radiology Department identified vascular surgery, gastroenterology, urology, orthopaedics, neurosurgery, anaesthesiology and gynaecology as the practices to study. For these practices an extensive literature data analysis was carried out and data was also collected by WG members from various hospitals.

The recognised lack of optimisation allowed the identification of the following recommendations addressed to different institutions, societies, hospitals and individuals:

a. The European Commission can play an important role in addressing requirements and recommendations, with regulations and guidelines respectively, to promote harmonisation of optimised practices at the European level. In particular the European Commission should:
   - strengthen patient dose monitoring at the hospital level and the assessment of national data to fill the gap of knowledge;
   - revise the EC Guidance on Diagnostic Reference Levels for Medical Exposure (RP 109) including the reference levels assessed for these practices;
   - recommend harmonised staff exposure monitoring conveniently developed by HERCA (Association of Heads of European Radiological Protection Competent Authorities) and EMAN;
   - promote accreditation, clinical audits and inspections in these practices with methodologies that EMAN can help to develop;
   - develop a specific Radiation protection Guideline for the optimisation of radiological practices performed outside radiology departments, based on the content proposed by EMAN.

b. Education and training in radiation protection of professionals is seen as a priority to spread and implement the ALARA (As Low As Reasonably Achievable) principle in this area of use of X-rays. It is recognised that practitioners often have little or no education in radiation protection and optimisation methods and specific methodologies and syllabi have to be developed with the aim to reach the large number of practitioners, mainly medical specialists and nurses. The MEDRAPET project provides information for the development of proper training packages (www.medrapet.eu).

c. The working group on medical applications of HERCA and EURADOS (European Radiation Dosiemtry Group) should also play a role in developing and promoting harmonised staff dosimetry protocols and databases. In particular accurate eye lens dosimetry is of particular importance in high staff dose procedures due to the new recommended ICRP limits. For the national staff monitoring databases, the inclusion for each professional of specialisation type and radiological workload, together with monitoring results, will allow for the closer monitoring of specific groups of specialists and will also allow for the monitoring of developments and changes in this rapidly growing practice.

d. Most of the X-ray practice outside the radiology department is performed with mobile radiography and fluoroscopy equipment, and equipment which is designed to perform simple procedures is often used in surgical theatres to carry out complex high dose interventions. Conventional fluoroscopy equipment does not have the necessary features required to reduce and properly manage patient dose or the accessories needed to protect the operating staff. For this reason, EMAN recommends that COCIR (European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry) should promote the development of standards aiming to request sufficient performance characteristics and accessories in fluoroscopy mobile equipment, replicating features which are available on fixed angiography technology.

STAKEHOLDER'S INVOLVEMENT

In the views of the European Commission and of EAN (European Alara Network), EMAN should represent the environment where professionals involved in radiological practices and radiation protection authorities can meet, discuss and agree on necessary actions to undertake for improving the safe and optimal use of ionising radiation in medicine.

EMAN, with the participation of radiologists, radiographers, medical physicists and radiation protection national organisations, has demonstrated that agreement can be reached in different areas of radiology, in this case CT and interventional radiology. The EMAN WG for radiological practices outside radiology departments, where other professionists are also involved, also reached a consensus when a medical specialist, appointed by the European Society of Gastrointestinal Endoscopy (ESGE), joined the WG. During the project work period, an ESGE radiation protection draft guideline was discussed and the recommendations provided were implemented in the guidelines.

Agreements on more extensive collaborations have been also planned and are reported on in other part of this newsletter.

Future activities will hopefully see the participation of other European professional societies covering the most important radiological practices performed outside the radiology department.

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Bedside Chest Radiography

BACKGROUND

The synthesis document [1] of Work Package 3 of the European Medical ALARA Network (EMAN) has reported on the use of mobile radiography with the conclusions that there is a need:

- *For standardisation of the bedside X-ray examination protocols.*
- *To use high kVp techniques together with the use of anti-scatter grids.*
- *For further and continuous education and training of all the healthcare professionals involved in such examinations, from the examination prescriber to the radiographer or other professional performing the examination, to the radiologists reporting on the examination.*

This article reports on the efforts currently being made to further investigate the above issues in order to produce recommendations for the improvement of bedside radiography with an emphasis on bedside chest radiography as the most common bedside procedure.

OPTIMISATION OF THE EXAMINATION PROCEDURE

One of the concerns identified by the synthesis document was the large range of patient doses. This appeared to be the result of the large variation in exposure techniques used. Also there appeared to be a large variation in image quality. It was necessary therefore to investigate this further to make sure that the initial findings of the synthesis document were correct, to identify the causes for these large variations and to make recommendations for improvement.

IMAGE QUALITY

Introduction

The ultimate goal of any type of medical imaging procedure is to obtain the best image quality while delivering the smallest radiation dose possible to the patient. The best image quality though does not necessarily give the correct diagnosis for a given medical condition at the lowest possible dose to the patient. It is therefore important to achieve an image quality that will offer the necessary diagnostic value for a given medical condition for the radiologist to make the correct diagnosis, whilst keeping the dose to the patient as the main constraint.

Image quality requisites for bedside chest radiography differ from those of routine upright chest examination.

In bedside chest radiography, contrast resolution is more important than high spatial resolution, especially in high attenuation areas such as the mediastinum and retro-cardiac region. Patients may have tubes and access lines of different materials which have to be accurately distinguished. The most common problems in bedside chest radiographs are positioning and technical errors [2].

In order to determine if the images obtained from bedside chest examinations were offering the radiologist the necessary diagnostic value, the image quality of bedside chest examinations was investigated.

Methodology

Since Norway has a high standard of record keeping and a high level of good and consistent radiological practice, it was decided to collect bedside chest x-ray examinations from a number of hospitals that use mainly CR and DR systems for such examinations from Norwegian hospitals.

The collected images were reviewed by three radiologists (in Finland, Norway and Cyprus) using the European guidelines on quality criteria for Diagnostic Radiographic Images [3], bearing in mind that these guidelines are for examinations performed in the Radiology Department for fixed modality installations, upright chest stands, and for film/screen techniques. It was considered that these guidelines would be a good benchmark against which the results of this study could be compared.

An evaluation form was produced based on the European Guidelines that included all 9 of its image criteria. This form was used by the three radiologists to independently and blindly evaluate the collected images from the Norwegian Hospitals. Each criterion that was met by an image was awarded 1 point and if not with 0 points. The maximum score possible was 11 points since criterion 7 is subdivided into 3 sub-criteria.

Results and Discussion

A total of 189 bedside chest examinations were collected from 13 Norwegian hospitals. These examinations were taken sequentially from the archives of each hospital without any pre-selection criteria.

Scanning through these images it was quite clear that, by far, most of them did not meet the criteria for a good diagnostic image. It was therefore decided to select the best examinations from each hospital that, to the judgment of the authors, would be acceptable for diagnostic purposes.

In total 29 such images were selected and were given a code that could be used to easily identify the images at any stage of the image analysis, if such identification was deemed to be required. This set of images was sent to the three radiologists for evaluation. The score from each radiologist for each image was summed up to arrive at the maximum score for each image (the maximum possible summed score for an image was 33). The total score of the 29 radiographs reached a mean of 21.93 (s.d. 4.38), a median of 22 and covered a range of 12 - 29.

Conclusions and Recommendations

It is apparent that none of the images received the maximum score. A closer analysis of the individual evaluations revealed that only three images were judged as meeting all the criteria by one and the same radiologist. Furthermore only a few images were evaluated with the same score on each of the criteria by all three radiologists. The conclusions from the above study are:

1. The perception of the three radiologists as to the quality of a given image is not the same, although all three radiologists are highly experienced.
2. The examination procedure used is not consistent and appropriate to produce an image meeting all the criteria for a good chest examination.

It is therefore recommended that:

1. The image quality must meet the perception of the reporting radiologist with regards to the image criteria required for optimum diagnostic value.
   This is a very difficult task to achieve in large hospitals with a large number of reporting radiologists and an even larger number of persons performing the examination. It is therefore necessary to minimise these factors in order to arrive at an acceptable and consistent image quality that will offer the best possible diagnostic value at the lowest possible exposure to the patient irrespective of the person performing the examination and the reporting radiologist.
2. The examination protocol and especially the mobile X-ray unit positioning with respect to the patient position and inclination in the bed must be consistent and appropriate to produce an image satisfying the perception of the reporting radiologist.
   This is again a very difficult task to achieve since the persons performing the examination are not always trained radiographers and also usually a single person is involved in the positioning of the mobile unit with respect to the patient position and inclination in the bed, who also sets the exposure parameters, that are not optimised for the production of an image with the required diagnostic value.
   An additional major factor that was reported in the synthesis document and verified by the above study is the variation in the level of education and training of the persons performing the examination with respect to radiation protection and especially the health risks associated with the use of X-rays.

The conclusions and recommendations of the above image quality study were further investigated and are reported below.

CHEST EXAMINATION PROCEDURE

As reported in the WP3 synthesis document, mobile radiography involves difficulties not encountered in the radiology department and a combination of factors makes mobile radiography one of the most challenging assignments in diagnostic radiography.

The persons performing such examinations (usually radiographers) regard this task as a burden on them and it takes them away from their main job. The procedures are usually carried out by one individual who faces difficulties in aligning the mobile X-ray unit in relation to the position and inclination of the patient in the bed. Additionally, more often than not due to the lack of the necessary knowledge in radiation protection and the associated health risks, the exposure factors chosen are low KV with the impression that the dose to the patient and other persons close to the patient will be lower. This is often to the detriment of the image quality.

It is therefore recommended that the persons performing such examinations are appropriately educated and that they are assisted by a second person in the correct alignment of the mobile X-ray unit with the patient. It is also recommended that the existing film/screen or CR equipment technology be gradually replaced by direct digital detector technology that will also incorporate a tube and grid alignment system [4].

It is further recommended that specific bedside examination protocols are used which are appropriate to provide the diagnostic value necessary for the radiologist to make a correct diagnosis.

Some guidelines on chest radiography image quality exist in the literature [3, 5 and 6]. Combining these criteria, a bedside chest image should meet the following requirements:

Image Quality Criteria for Bedside Chest Images

1. *Radiography is appropriately collimated*
2. *Symmetrical reproduction of the thorax (processus spinosus between clavicles)*
3. *Imaging of the whole rib cage above the diaphragm and both hemidiaphragms at full inspiration, if possible*
4. *The mediastinum should be sufficiently penetrated to visualise trachea and major bronchi, retrocardiac vasculature and lower thoracic spine*
5. *Visually sharp reproduction of the vascular pattern in the whole lung*
6. *Visualisation of venous catheters, draining catheters etc including the tip.*

These criteria should be tested and discussed further by professional European societies.

EDUCATION AND TRAINING

Radiation protection education and the training of healthcare professionals was the task of the recently concluded European Commission MEDRAPET Project (http://www.medrapet.eu/). The final outcome of this project is a guideline document that specifies the knowledge, skills and competence of each healthcare professional involved in the use of ionising radiation in terms of learning outcomes. The European Commission is expected to publish this document before the end of 2013 in their Radiation Protection Series as Report 175 (RP 175) [7].

This report is very comprehensive and as such it is not necessary to further discuss here the education and training of the persons performing bedside chest examination. It is recommended that EMAN uses this comprehensive report to prepare and deliver courses for the radiation protection education and training of all the healthcare professionals using ionising radiation.

ACKNOWLEDGEMENTS

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It is also acknowledged that during the EMAN workshop, a lot of constructive feedback was received from the wide range participants that included regulators, representatives of professional societies, equipment manufacturers' associations and individuals.

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Competence in radiation protection – Findings during inspections and a survey amongst educational institutions

A new radiation protection regulation was introduced in Norway in 2004 (later revised in 2011) [1]. The new regulation was significantly influenced by the European Medical Exposure Directive and the European Basic Safety Standard, even though Norway is not a member of the European Union. In the new regulation all advanced use of X-ray equipment needs an authorisation from the Norwegian Radiation Protection Authority (NRPA). A more practical guidance in how to implement the regulation was also published [2]. In practice, the authorisation means that the different Health Care Enterprises (HCEs) have to implement the regulation and fulfill all its requirements. At that time the HCEs consisted of approximately 72 public hospitals organised in 26 local hospital trusts (HT). In addition were there nine private hospitals and six X-ray institutes.

Among many requirements the HCEs need to have an organisation that ensures radiation protection, have a system for quality control, education and equipment specific training for staff involved in the use of X-ray equipment, a radiation protection officer and knowledge to their own local diagnostic reference levels. The authorisation process consisted of a self-declared compliance made by the different HCEs. A total of 41 HCEs were authorised with reservation that all non-conformities were implemented before the end of 2007.

During 2008-2009 follow-up inspections were performed by the NRPA to verify that all requirements in the regulation were fully implemented by the HCEs. HCEs were picked systematically from all four regional health authorities, consisting of 11 HT and three private X-ray institutes, covering 34% of all HCEs. The main focus areas for inspection were those requirements which were identified as being the most difficult to implement during the authorisation process.

During the follow-up inspections a total of 64 non-conformities were issued [3]. Five main problems were identified, three of them representing requirements known to be challenging to implement, and the remaining two were quite easily implementable requirements. The latter were the establishment of local diagnostic reference levels for use in optimisation of procedures and the use of personal dosimetry. As many as 86% of the inspected HCEs had non-conformities with the requirement for education and training in radiation protection (RP) of staff involved in X-ray procedures, and this seems to be the most difficult requirement to implement. Lack of skills in RP was mainly associated with staff operating mobile C-arms outside radiological departments.

Use of a C-arm during a nailing of an elbow in an operation theatre

The poor compliance with the requirement for education and training in RP, gave the NRPA the incentive to undertake a survey on the amount and level of RP in the curriculum for the different health professionals involved in X-ray procedures [4]. In Norway all educational institutions have to implement the European Qualifications Framework for lifelong learning, based on learning outcomes defined in Knowledge, Skills and Competence (KSC). A questionnaire about education and training in RP was sent to 56 educational institutions, covering 13 different health professionals. Information was collected about the provided theoretical topics within RP, practical training, number of educational hours, defined learning outcomes and information about any exams to evaluate the obtained KSC in RP.

A total of 47 educational institutions responded to the survey. The mean response rate was 94% and it varied from 61 to 100% for the different study programmes. For the physicians, all groups except the nuclear medicine specialists have less training hours and KSC for RP in their curriculum than recommended by ICRP [5]. Interventional cardiologists and gastroenterologists don't have any training in RP at all and orthopaedists have only one hour, compared with the ICRP recommendation of 15-20 hours. Radiologists have less than half of the recommended amount of training (20-30 hours). All the 9 educational institutions for surgical nurses have less education and training in RP than suggested. For most of the training topics in RP, the education of radiographers has the same level and knowledge as ICRP recommends. The nuclear medicine specialists and radiographers were the only hospital based staff that had learning outcomes in RP, followed by an exam in RP, in their syllabus. A significant variation in skill, level and training hours between educational institutions was observed in this study for some professions. For example, educational institutions for surgical nurses show a substantial variation in the amount of training hours in RP, varying from 1 to 6 hours.

Education and training in RP is considered to be a crucial factor in optimising medical use of radiation. It has also been the most challenging topic to implement in the HCEs, despite the requirement in the regulation. The inspections at the HCEs revealed a significant lack of implementation. When the HCEs in general don't have a system for education and training in RP, it's important to assess the amount of training they have from their specialist training. Only nuclear medicine specialists and radiographers have sufficient education when compared with ICRP recommendations. Interventional cardiologists have surprisingly no formal education, despite the fact that this is the healthcare profession with the highest staff doses in Norway. A reasonable explanation and a concern is that interventional cardiology is not recognised as a separate discipline in Norway. The Norwegian Radiation Protection

Authority will initiate a discussion with the different professional organisations, educational institutions and authorities in an attempt to improve the amount and level of education in RP in the different specialties of healthcare professions. Many of the HCEs have taken the education problem seriously and have started up education and training courses for their employees, but the NRPA will continue to have a focus on education and equipment specific training in RP during inspections of the HCEs.

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EMAN WG3: Optimisation in gastroenterology

Radiation protection of patients and staff for fluoroscopically-guided procedures performed by gastroenterologists such as ERCP and PTC are of particular interest due to the frequency of procedures, the relatively high patient doses, the limited information on patient and occupational radiation doses and associated risks and the fact that these procedures are often carried out by specialists with limited education and training on radiation protection. The EMAN working group 3 (WG3) collected information on patient and staff dosimetry, dose optimisation of procedures, and radiation protection means available for gastroenterologists and supportive staff. Specifically, the topics studied and discussed during WG3 meetings included:

1. frequency of procedures
2. X-ray equipment used
3. entrance air kerma and patient effective doses
4. average kerma area product values
5. dose reference levels (DRLs)
6. scattered dose rates
7. positioning of the staff
8. radiation protection tools for the staff
9. dose monitoring of personnel
10. radiation risks for patients and personnel
11. quality assurance
12. educational aspects of personnel

The literature shows the existence of large variation of patient doses, mainly due to differences in examination protocols. Information on staff doses is limited and doses are measured in different ways (over or under the protective apron) and are reported in different quantities. European member states have been required to establish DRLs. However, very limited information is available. The establishment of DRLs would be very useful in view of the large range of dose values reported in the literature.

Collaboration between the European Society for Gastrointestinal Endoscopy (ESGE) and EMAN was established and a draft manuscript on radiation protection for ERCP procedures prepared by ESGE was circulated in EMAN for remarks and comments. ESGE and the EMAN WG3 agreed to collaborate on important radiation protection issues of common interest, for example for the development of guidelines concerning PTC and other fluoroscopically-guided procedures performed by gastroenterologists.

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The ICRP Recommendation 117 – Radiological Protection in Fluoroscopically Guided Procedures Performed Outside the Imaging Department

The ICRP (International Commission for Radiological Protection) has recently published the recommendation 117 on "Radiological Protection in Fluoroscopically Guided Procedures Performed Outside the Imaging Department" underlying that an increasing number of medical specialists are using fluoroscopy outside imaging departments, but there has been general neglect of radiological protection coverage of fluoroscopy machines used outside imaging departments.

The main points and recommendations given in the publication are reported here.

- An increasing number of medical specialists are using fluoroscopy outside imaging departments, and expansion of its use is much greater today than at any time in the past.
- There has been general neglect of radiological protection coverage of fluoroscopy machines used outside imaging departments.
- Lack of radiological protection training of workers using fluoroscopy outside imaging departments can increase the radiation risk to workers and patients.
- Although tissue reactions among patients and workers from fluoroscopy procedures have, to date, only been reported in interventional radiology and cardiology, the level of fluoroscopy use outside imaging departments creates potential for such injuries.
- Procedures such as endovascular aneurysm repair, renal angioplasty, iliac angioplasty, ureteric stent placement, therapeutic endoscopic retrograde cholangio-pancreatography, and bile duct stenting and drainage have the potential to impart skin doses exceeding 1 Gy.
- Radiation dose management for patients and workers is a challenge that can only be met through an effective radiological protection programme.
- Patient dose monitoring is essential whenever fluoroscopy is used.
- Medical radiation applications on pregnant patients should be justified and tailored to reduce fetal dose.
- Termination of pregnancy at fetal doses of <100 mGy is not justified based upon radiation risk.
- The restriction of a dose of 1 mSv to the embryo/fetus of a pregnant worker after declaration of pregnancy does not mean that it is necessary for a pregnant woman to avoid work with radiation completely, or that she must be prevented from entering or working in designated radiation areas.
- Pregnant medical workers may work in a radiation environment provided that there is reasonable assurance that the fetal dose can be kept below 1 mSv during the course of pregnancy. It does, however, imply that the employer should review the exposure conditions of pregnant women carefully
- Every action to reduce patient dose will have a corresponding impact on occupational dose, but the reverse is not true.
- Recent reports of opacities in the eyes of workers who use fluoroscopy have drawn attention to the need to strengthen radiological protection measures for the eyes.
- The use of radiation shielding screens for protection of workers using X-ray machines in operating theatres is recommended, wherever feasible.
- A training programme in radiological protection for healthcare professionals has to be oriented towards the type of practice in which the target audience is involved.
- A worker's competency to carry out a particular function should be assessed by individuals who are suitably competent themselves.
- Periodic quality control testing of fluoroscopy equipment can provide confidence in equipment safety.
- Manufacturers should develop systems to indicate patient dose indices with the possibility of producing patient dose reports that can be transferred to the hospital network.
- Manufacturers should develop shielding screens that can be effectively used for the protection of workers using fluoroscopy machines in operating theatres without hindering the clinical task.

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NEWSLETTER

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Radiation protection poster in 18 different languages

During the past few years the Norwegian Radiation Protection Authority (NRPA) has performed inspections with an emphasis on competence in radiation protection outside radiological departments. The inspections are mainly performed via an audit, which means that interviews are performed with different health professionals on different levels in a department. The interviews are usually complemented with hands-on inspections, for example on operation theatres.

During the hands-on inspections staff involved in medical exposures were asked different questions about the practical use of the mobiles and the principles of radiation protection. Typical findings during these inspections were:

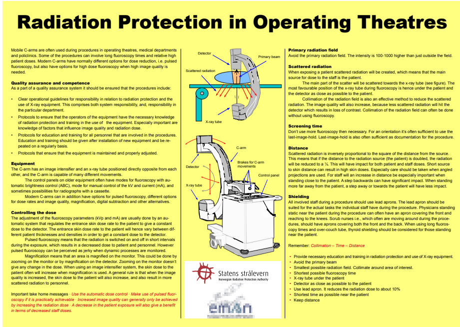
- Staff were unable to identify X-ray tube and detector.
- Staff were unable to explain the different buttons and their influence on dose and image quality.
- There was a general lack of knowledge of the default settings on the equipment when it starts up.
- Some departments had shielded the patients on the detector side.

The lack of knowledge in the use of mobile C-arms outside radiological departments initiated the NRPA to produce a poster about radiation protection and basic use of mobile C-arms. The poster is summarised with ten pearls. The poster was produced in A3 size and laminated with plastic foil, which made it easy to wash and desinfectate. A total of 500 posters were printed and given away for free, and the stock was exhausted after a few months.

10 Pearls: Radiation Protection of Patient and Staff using Fluoroscopy Mobile X-ray Equipment

1. *Provide necessary education and training in radiation protection and use of X-ray equipment*
2. *Avoid the primary beam*
3. *Smallest possible radiation field. Collimate around area of interest*
4. *Shortest possible fluoroscopy time*
5. *X-ray tube under the patient*
6. *Detector as close as possible to the patient*
7. *Use lead apron. It reduces the radiation dose to about 10%*
8. *Shortest time as possible near the patient*
9. *Keep distance*
10. *Stay away if you are pregnant*

WP3 in the EMAN project decided to translate the poster into common European languages. The poster is now translated into 18 different languages and can be downloaded for free from the EMAN website.



http://www.eman-network.eu/spip.php?article242

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