



Final Report

WP leader
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European Medical ALARA Network (EMAN)

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Introduction

This document is a summary of the European Medical ALARA Network (EMAN) project (Contract No. TREN/09/NUCL/SI2.542127) and constitutes the final report to the European Commission.

The document begins with an executive summary outlining the project and presenting some general conclusions from the project. The following sections present more specific results of the work performed in the different working groups of the project and the text is therefore presented in accordance with the project plan. The project has experienced some specific challenges. These challenges are summarized in a specific section.

One of the overarching objectives of the project is also to give specific advice and suggestions to the EC. One section is therefore dedicated to this and presents some of the more important issues.

The last section is a description of the administrative work undertaken.

This final report should be seen as a complementary summary of the project. Other reports from the EMAN project give more information about the work performed and specific results. Synthesis reports constitute the basis for the three main working groups and the content of the synthesis report is elaborated into conclusions, suggestions and recommendations given in the final reports from these working groups.

Recommendation to the European Commission

One special task of the project is to give a recommendation to the EC. Many of the issues discussed throughout the reports comprise issues useful for the EC. Five specific topics are presented here.

- Support European guidelines on the optimisation of radiological protection of X-rays outside radiology departments.
Rationale: Several questions still remain about radiation doses to patients and staff, but it is evident that some procedures performed involve the highest doses to patients and staff. It is in many cases technically more difficult to collect radiation doses and diagnostic reference levels are not easy to neither set nor apply. The professionals working with these activities can be assumed to have little knowledge about radiological protection. The equipment is in some cases not optimised for its purposes.
- Support the harmonization of data collection of patient doses and reporting including key related data from all types of radiological equipment.
Rationale: One key issue in radiological protection and optimization of radiological protection is to know the exposure level and the variation of the level to different patients. Different medical devices today register different quantities and units, and different technical devices are necessary for extracting and analysing data. This issue is considered to be very difficult for the end user, although some end users have spent considerable resources to design systems that are not applicable to other systems. In the future, we can foresee a demand for more specific registration of radiation doses to patients.
- Support the implementation of a methodology for creating up-to-date diagnostic reference levels for up-to-date procedures on a European level.

Rationale: Diagnostic reference levels, if existing, are sometimes outdated. Different methods are applied for different diagnostic procedures and the purpose of the examinations changes. Therefore the need for setting appropriate DRLs frequently is foreseen. It is inefficient to only use the third quartile for a set of departments and for procedures with unspecified indications. A more refined strategy is needed that takes into account new methods and new indications.

- Support the implementation of a methodology for clinical audits
Rationale: Only a few countries have a national strategy and methods for running clinical audits. There is still no methodology for setting up a national/European audit procedure that takes into account the different health care systems and other national prerequisites.
- Support the implementation of a comprehensive approach to medical radiation protection. EMAN is centred on optimisation whereas the professionals in European member countries are looking for a single point of contact for all aspects (including e.g. justification with a clinical decision support system, clinical audits).

Main results of the project

The three main topics: CT, interventional radiology and X-rays performed outside the radiology departments, have been investigated in three working groups. One realizes that all these three are very important from a radiation protection point of view but that the work does not involve other important issues in radiology or the fields of nuclear medicine nor radiation therapy. This approach is in line with the project directives.

The project consortium successfully created the working groups. The relevant stakeholders, experts in the fields, radiologists, medical physicists, radiographers, regulators and researchers, have worked together with cardiovascular and interventional radiologists, cardiologists and neurologists and associated group members representing manufacturers and physicians specialised in endoscopy. This work has involved national competent authorities, hospitals and other medical institutions, educational institutions, manufacturers of medical equipment and European professional associations. This is a broad spectrum of stakeholders in the medical sector.

During the whole project period, networking activities were performed in order to inform organisations and other networks about EMAN activities. For example, HERCA was informed throughout the whole study period about the progress of the project. Visibility activities were performed in order to obtain advice and influence the work in the project from other stakeholders.

All three working groups have specific tasks from the project directives, but one common task was to disseminate up-to-date information about the literature, studies and good practices. All working groups have published literature on the EMAN website.

Synthesis documents describing the current situation and to a certain extent a gap analysis were also produced by all three working groups. According to the project directives, the synthesis documents have been reported to the EC, but during the work in the group they have been continuously updated and developed and they are therefore part of this final report.

The work in the working groups has relied on face-to-face meetings. These have been very important in order to achieve progress in the work. However, between meetings, tasks must be performed and this has relied on sensible planning of the work and mainly contacts by e-mail, occasionally by teleconference.

Visibility actions of the project

In order to make the EMAN project known among the radiation protection community, the project was presented at a number of conferences and meetings. This is also an activity in order to establish contacts and co-operate with international organizations and other networks.

The table below shows a summary of activities performed (and the results from these activities) during the project with the aim of making the EMAN project visible.

Conference or meeting	When	Type
3rd European IRPA Congress – Helsinki (Finland)	2010	Poster
French symposium on optimisation of radiation protection – Saint-Malo (France)	2010	Poster
International Conference on Radiation Protection in Medicine - 2010 - Varna (Bulgaria)	2010	Oral
Swedish medical physicists' meeting – Stockholm (Sweden)	2010	Oral
ECR European Congress of Radiology, Vienna, Austria	2010	Oral
ORAMED Workshop – Barcelona (Spain)	2011	Poster
EAN Workshop on ALARA and the Medical Sector – Oscarsborg (Norway)	2011	Oral
European Workshop to introduce Radiation Protection 162 on “Suspension Levels and Acceptability Criteria for Medical Equipment” – Dublin (Ireland)	2011	Poster
13th international congress of the IRPA , Glasgow (UK)	2012	Poster

In addition to these activities, 2 articles on EMAN progress and workshop results were published in the ALARA Newsletter of the European ALARA Network (No. 27 (2011) and No. 31 (2012)).

The EMAN workshop also reached persons besides the consortium members. The website of EMAN is crucial for visibility purposes and must be developed further. The current website is sufficient for the project but needs for example to include additional means of communication.

It is also evident that EMAN must be present not only at radiological protection events but also at events such as conferences and courses of appropriate fields where the main target groups / stakeholders meet.

The main results from the three working groups are summarized in the following sections.

Computed tomography CT (WG1)

Optimisation of patient exposure for CT procedures has been elaborated. This work has been strategically divided into eight different topics giving different responsibilities within the group.

Identified actions to be performed and main conclusions:

CT Medical Exposures / CT Risk - Benefit Estimation

- Need to further enhance knowledge about the clinical benefit from the increasing use of CT versus radiation risks.
- Need to extend the ALARA approach by taking into account not only the principle of optimization, but also the principle of justification.
- Need to develop and implement harmonized referral guidelines on a European level.
- Need to develop standardised and optimised protocols and algorithms in individual health assessment by CT.

CT Dose Reduction Techniques with Regard to Equipment / Protocols

Need to provide reliable and easy-to-use dose reporting software.

Need to provide an automatic mode for generating a database for each individual scanner that records relevant patient-specific and exposure parameters. Dose recording (CTDI_{vol} /DLP) should be mandatory and include size information (height, weight).

Need to develop a standard set of protocols with clearly defined names depending on clinical indication and scan region. Manufacturers should provide a standard set of protocols for new scanners – optimized towards dose efficiency – at various image quality levels and well below the current DRLs.

A system for testing new standard protocols and for feedback to manufacturers should be created.

New scanners should issue a warning if the scanning range is outside the radiogram, the geometric efficiency is less than 70% or the DRL is exceeded.

CT Dose Efficiency Parameters

Need to implement a standard for CT systems characterizing the dose efficiency related to image quality of CT systems (“dose efficiency parameter”) and to declare this standardized dose efficiency parameter in the technical datasheet for each CT system on the market.

CT Dose Reporting

Need to harmonize nomenclature of dose-specific parameters where a greater role of radiologists and other practically involved health care professionals has to be ensured.

Need to consider the question of whether the concept of equivalent and absorbed dose, as compared to the effective dose, should have a stronger impact on the clinical practice.

Need to launch an EU research programme for calibration of dose-specific instruments.

A common database format for local dose monitoring should be suggested by scientific societies to enable yearly updates of DRLs and cross-country comparison.

CT Diagnostic Reference Levels

Need to initiate EU-wide actions to implement revised and extended CT-DRLs in adults (esp. for MSCT) and in children and young adults in additional European countries. Continuous updates of DRLs will gradually enforce lower doses.

Training and education

Need to ensure EU-wide identification of a radiological ‘core team’ (including radiographer/radiologist/medical physicist) for each CT facility, responsibility for the optimization of CT scanning protocols, the supervision of utilization of scanning protocols and the training of CT staff. Adequate training and education of the radiological ‘core team’ must be guaranteed.

Need for a web-based platform for dissemination of knowledge

Since no single web source on medical radiation doses is available, there is a need to provide a web-based platform to disseminate knowledge, to share best practices and to provide feedback. This requires effective peer reviews and continuous updates. A Wikipedia approach (with a fast peer review) could solve this issue (‘Dosepedia’). Webhosting could be managed directly by EMAN or under the umbrella of ESR.

Interventional radiology (WP2)

Medical procedures using ionising radiation constitute by far the largest contribution to the population by man-made sources. Moreover, the increasing use of ionising radiation in the medical sector also has an impact on occupational exposures, and there is a concern that practices such as interventional procedures may cause high individual doses. There are an increasing number of

different applications in a wide range of medical specialities using such techniques, which represent huge advantages for patients over invasive surgical procedures (lower risk of infection, shorter recovery time, etc.).

Identified actions to be performed and main conclusions:

The following key points summarise the main recommendations proposed by the working group to improve the optimisation of radiation protection for patient and staff in interventional radiology and cardiology (IR and IC).

The assessed skin dose should be registered for each patient

Radiation dose reports should be produced at the end of the procedures and archived for each patient. Absorbed dose in the skin at the site of maximum cumulative skin dose is a relevant quantity. A unique dose unit should be adopted by all manufacturers.

Diagnostic reference levels are needed for interventional procedures

Diagnostic Reference Levels (DRLs) should be developed for all types of procedures for interventional procedures and different types of standardized patients (children, adults, etc.). International recommendations should be produced and to include also calculation methods.

A system for detecting skin injuries following procedures needs to be in place

Patient follow-up should be organised to detect skin injuries (deterministic effects). Trigger levels must be set up in order to start the detection procedure. In case of high doses, radiologists and cardiologists are responsible for informing the patient to plan of the patient follow-up with a dermatologist.

European guidelines are needed for the harmonization of staff monitoring

European guidelines should be formulated for the number of dosimeters that should be worn by the staff, their position in IR and IC as well as the relevant algorithm to be used to calculate the total effective dose. Special attention should be given to the monitoring of the eye lens dose and its evaluation.

The purchasing procedure and installation procedures are important

Physicians and medical physicists should be involved when drawing up the list of specifications for the equipment to be purchased. Manufacturers of interventional procedure equipment should work with the medical physicists, radiographers and physicians to determine the optimised protocols in terms of dose rates and image quality adapted to the different IR procedures.

Standards for quality control should be improved

Quality control of X-ray units for radiation protection purposes should be mandatory. Even if protocols are integrated into European standards, some parameters are still missing (e.g. calibration of the ionisation chamber) and should be integrated into these standards.

Need to implement clinical audit

The implementation of the requirements described in EC Directive 97/43/Euratom concerning the quality audit should be enhanced within all EU Member States.

Education and training of all types of personnel need to be improved

Appropriate education and training in radiation protection should be required for all health care professionals performing interventional procedures. The level of education and training should be adapted to the radiation risk and to the specificities of the procedure. Training of the outside workers involved in the maintenance of facilities should also be taken into account. This data should be

entered in the related documents (passbook) and checked by the radiation protection officer of the operator's facility.

Accreditation of radiation protection training programmes should be established

Accreditation of radiation protection training programmes should be established by regulatory authorities at a national or regional level with the help of academic institutions and scientific and/or professional societies. Developing training materials, distance learning tools, posters, etc., can support this aim.

The working group notes that many of the above recommendations are the responsibility of national radiation protection authorities, certainly in cooperation with professional organizations. However, the European Commission has an important role in disseminating and supplementing the implementation of these recommendations through guidance, guidelines and even Directives.

X-ray procedures performed outside radiological departments (WP3)

The X-ray procedures performed outside radiological departments where patient and staff exposures require optimisation have been identified in the following clinical areas: vascular surgery, gastroenterology, urology, orthopaedics, neurosurgery, anaesthesiology, gynaecology and bedside X-rays. Information on criticalities in the optimisation levels is reported in a synthesis document.

Identified actions to be performed and main conclusions:

Lack of knowledge requires national data collection

The lack of information on these practices requires European scientific societies to promote national data collection. The EC should also strengthen the practice of hospital patient dose monitoring, as requested by MED for these 'special practices'.

Need to set up diagnostic reference levels

A methodology for assessing DRLs when a limited set of data is available has been proposed. The third quartile of the distribution of the mean values for fluoroscopy time and KAP from a sample of installation can pragmatically provide preliminary reference levels. European scientific societies must be involved in DRL assessment and use.

Monitoring of staff exposure needs harmonizing

Staff exposure monitoring requires harmonisation because many EU countries have different recommendations or some do not have any recommendations at all. EMAN should support HERCA to develop a European recommendation. The recommendation should also promote the use of additional active dosimeters for educational purposes, the identification of high dose procedures requiring hand and eye lens dosimetry and the adoption of ambient dosimetry as part of the radiological assessment.

National staff dosimetry databases need improvement

HERCA should also work on the harmonisation of national staff dosimetry databases where the inclusion of specialisation and radiological workload will allow for extraction of dose information for specific groups of specialists.

Need to further improve international technical standards for mobile fluoroscopy equipment

Inadequate mobile fluoroscopy equipment is frequently used to perform complex and lengthy

procedures in surgical theatres. International standards should require equipment functions aiming to reduce patient and staff doses, including provisions for staff shielding. Hospitals are invited to provide adequate shielding for high workload mobile fluoroscopy units and to acquire new pieces of equipment with KAP display, as required by the MED Directive.

Patient dose information systems are needed in the hospital

Hospitals should be encouraged to set up patient dose information systems to automatically register patient doses for better monitoring of the practices adopting existing standards, e.g. the IHE REM profile.

Education and training are needed; could address different specialities

Education and training of professionals involved in these practices is seen as a priority. Most practitioners have little or no education in radiation protection and optimisation methods. Specific methodologies are required to reach the large number of practitioners (medical specialists, nurses, radiographers and medical physicists). MEDRAPET recommendations will properly address the training methodology and content (KSC). Knowledge can be conveniently provided via the development of distance learning tools, while hospitals should provide skills via practical exercises. EMAN should offer learning sessions at the European congresses of the different specialities.

Methodology for setting up clinical audit could be promoted

Clinical audit of these practices, as requested by MED, has been performed in only two European countries (Finland, UK). Starting from this experience, EMAN can develop a proper methodology and set up multidisciplinary teams for this purpose.

Stakeholder involvement could be improved

The experience and the agreement with the European Society of Gastroenterology and Endoscopy (ESGE) can be used as a proposed model for other professional specialities.

Guideline for optimisation of X-ray applications outside radiology departments should be developed

It is recommended that hospitals set up a multidisciplinary 'core team' to support optimisation. For this purpose, EMAN has developed a list of contents and a structure for a guideline for optimisation. The guideline contents are addressed to the EC, which should consider the opportunity to develop a guideline for the optimisation of radiological practices performed outside radiology departments.

The website (WP4)

The project has created a website (www.eman-network.eu). The main objectives of the EMAN website are:

- To facilitate effective and efficient information exchange between the members of the network, and
- To provide information to the stakeholders on the activities of the network and on topics linked to ALARA in the medical field.

Description of the website

To achieve these objectives, the EMAN website is divided into a 'members only' part dedicated to the participants of the EMAN project and a public part dedicated to all interested stakeholders. It also

includes a directory for persons interested in participating in the network and a newsletter for persons interested in receiving regular information from EMAN.

The 'members only' part allows the partners of the Consortium and the members of the Working Groups to exchange information and working documents (Steering Committee and Working Group meeting minutes, draft report, etc.). It is subdivided into different sections, which correspond to the different Working Packages. To access this part, each partner has a personal login.

The public website allows the dissemination of information on the work of EMAN, and more generally on ALARA in the medical field. It is divided into the following sections:

- About EMAN: general information on the objectives, organization and project participants
- One section for each of the three Working Groups: objectives, members and results of work of each Working Group
- Documents: possibility to download documents produced by EMAN, in particular by each of the Working Groups and more general documents linked to ALARA in the medical field. For instance, WG3 has produced a poster on the use of mobile C-arm in many languages; these posters are downloadable from the website in PDF format in 18 languages. A dedicated section with the proceedings of the EMAN workshop was also created.
- Links: lists of links to relevant websites (members of the consortium, international organisations, professional organisations, etc.). This section also provides information on upcoming events dealing with ALARA in the medical sector.

Statistics

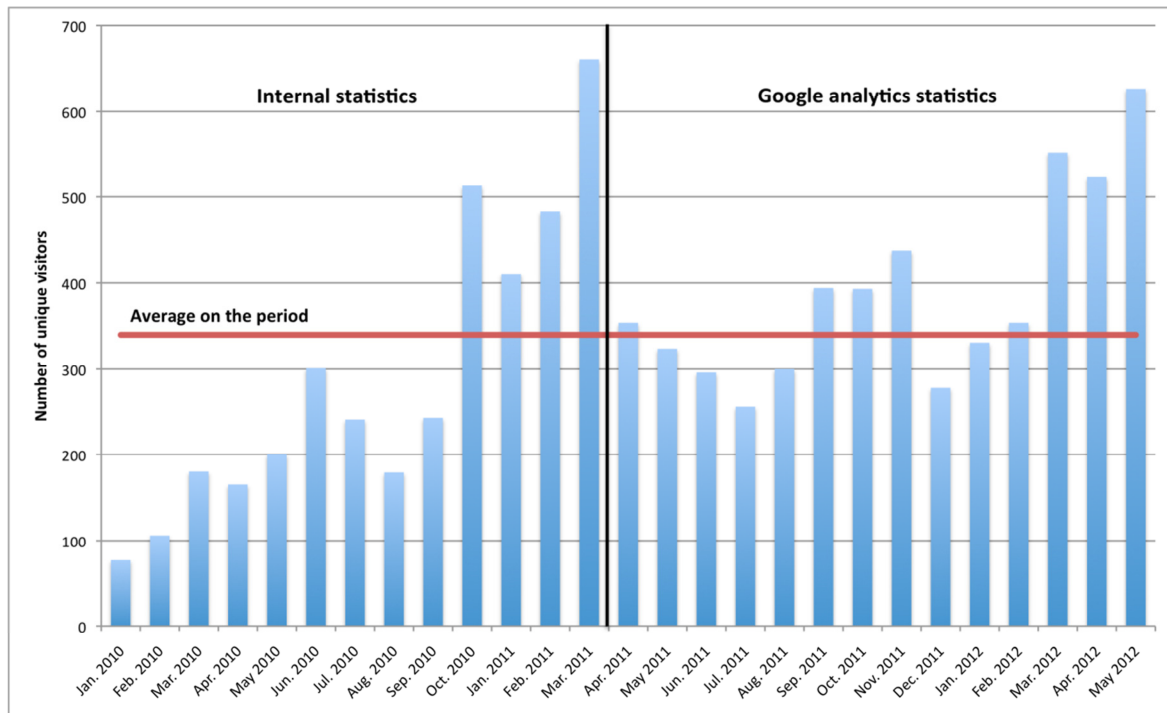
At the end of March 2011, a statistical follow-up of the EMAN website was launched using Google Analytics (www.google.com/analytics). This tool will make it possible to perform a detailed analysis of visits to the EMAN website.

Figure 1 presents the evolution of the monthly number of unique visitors to the website since the creation of the website in January 2010. Between January 2010 and March 2011, the statistics from the internal host were used to provide an evaluation of the number of visits to the website. From March 2011 to May 2012, statistics from Google Analytics were used because they are more reliable and precise. It is possible to identify the country of origin of the visitors to the EMAN website. As of the end of May 2012, the 10 main countries of origin are the following:

- 1 – Spain (644 visitors)
- 2 – United States (604 visitors)
- 3 – Poland (549 visitors)
- 4 – France (482 visitors)
- 5 – United Kingdom (455 visitors)
- 6 – Austria (362 visitors)
- 7 – Italy (347 visitors)
- 8 – Portugal (285 visitors)
- 9 – Japan (268 visitors)
- 10 – Germany (243 visitors)

Between March 2011 and May 2012, the following documents were the most downloaded (the number of downloads is provided in brackets):

1. WG1 – Synthesis report (169)
2. Poster on the use of mobile C-arms – English (74)
3. WG2 – Progress report (64)
4. Poster on the use of mobile C-arms – Finnish (39)
5. WG2 – Synthesis report (33)
6. WG3 – Synthesis report (28)
7. WP2 – Presentation poster (26)
8. WP3 – Presentation poster (21)
9. Poster on the use of mobile C-arms – Dutch (18)
10. Poster on the use of mobile C-arms – Czech (15)



NB. Data for November and December 2010 is not available.

Figure 1. Evolution of the monthly number of unique visitors

Finally, by the end of May 2012, 38 persons subscribed to the EMAN Directory (apart from the members of the Consortium and Working Groups) and 54 persons subscribed to the newsletter (apart from the members of the Consortium and Working Groups).

It is important to note that no specific newsletters were produced during the project. However, these registered subscribers were informed when new documents were posted on the internet, especially about the workshop announcement.

The EMAN workshop (WP6)

The first EMAN workshop, held 7-9 June 2012 in Vienna, was organised by the EMAN Consortium with local support from staff at the ESR office in Vienna. The workshop attracted 70 participants from various professional and stakeholder groups. In addition to the seven EMAN Consortium members, several international organisations and associations were present, such as the European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR), the

Association of the Heads of the European Radiological Protection Competent Authorities (HERCA), the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA), the European Society of Paediatric Radiology (ESPR), the European Association of Nuclear Medicine (EANM), the European Society for Radiotherapy and Oncology (ESTRO) and the European Society of Gastrointestinal Endoscopy (ESGE).

The workshop programme was developed by the EMAN consortium and was divided into six plenary sessions and three working group sessions. The plenary sessions were divided into themes: a) stakeholder involvement, b) present activities on optimisation, c) what can be improved and how can it be done, d) good examples of activities on optimisation, and e) the future EMAN network.

The working group sessions were divided into three parallel groups dealing with Computer Tomography (CT), interventional radiology and X-rays outside X-ray departments. In each group, current important issues concerning optimization of radiological protection were discussed, such as: What are the problems in the optimization of medical exposures? What are the solutions to these problems? How do we make the solutions happen and what communication activities are needed?

The workshop was summarized with a session presenting the conclusions from the working groups and a session discussing the future of the EMAN network.

In summary, the EMAN project has so far only been working with optimisation of radiological protection regarding X-rays. Therefore, the future EMAN network should include radiation protection issues in other areas such as nuclear medicine and radiation therapy. Since children face higher risks from ionising radiation because they are more sensitive and have a longer lifespan, and since there is often a lack of standard examination protocols for children and radiation protection aspects in radiotherapy are especially important for paediatric patients, the EMAN network should also put effort into stakeholder involvement in paediatric radiation protection. It was suggested that a future EMAN network should put effort into the involvement of other important stakeholders, not only those involved directly in the optimisation process but also stakeholders working in special practices outside X-ray departments. Several speakers suggested that the future EMAN network should be involved in the development of clinical audit since it is poorly implemented in many EU Member States. Medical radiation protection is a multidisciplinary area. For this reason, the EMAN network should promote the implementation of core teams consisting of radiologists, radiographers and medical physicists. As regards nuclear medicine and radiotherapy, the core teams should include equivalent professionals. There are many good examples of optimisation activities, but they are sometimes hard to find for the end users. EMAN should evaluate and disseminate results, bring tools together and serve as a bridge between science and hospitals as well as between societies.

Networking challenges

The networking mechanisms were explored (WP5) in the first half of the project. The final report from this working group was delivered in accordance with the project directives. This report summarizes experience from other networks, different types of networks and communication strategies and has identified success factors for a network. The final conclusions from the WP5 final report and experience from the project are summarized below.

A network must be able to reach beyond the group of people involved. This is a well-known challenge and many other networks struggle with this. For a new network, this also includes the fact that it is

very hard to advertise its existence and benefits when these are neither determined nor clear. For EMAN, it is evident that it is very difficult to include stakeholders dealing with (for example) nuclear medicine or radiotherapy when no working group within the project deals with this area.

Improving optimisation of radiological protection in the medical sector, the overall goal of EMAN, is a large area and it has been a challenge to prioritise the work. Criticism in terms of not including issues outside radiology has been forwarded and the reason for not doing this is very clear: the planned project work does not include this. However, at the end of the project, contacts were also made in these areas. It is an opportunity but also a challenge to have this vast scope. It is evident that it takes time to identify the appropriate forms of cooperation.

Communication activities are an important issue. EMAN has relied on the website for these areas. For the steering committee, it was a clear first priority to have a high level of quality in terms of the products published. The challenge is to be able to create a fast process for publication when several persons need to approve the material. A discussion forum on the EMAN website was also explored. This section had to be shut down due to security reasons. A discussion forum on the website will also have to be monitored so that no unwanted messages are shown. There is a danger that the statements displayed are interpreted as statements from the network.

One of the main challenges of communication is to have a common language and to understand one another. One of the points of the network is to reach end users. For example, recommendations include producing guidelines: the network must take into account the language barrier and try to find a solution for this, e.g. by supporting translation of guidelines into different languages. Different target groups have different needs; a strategy is needed for when stakeholders outside the radiological protection specialists' group are to be reached. For example, knowledge of radiological protection is necessary in order to understand many of the reports produced within this project. Concerted action for reaching end users is needed.

Working conditions for the people involved is an important issue. It is still very efficient to meet in person, although the time and money spent on travelling to meetings impose a limit. In order to save time and money, project meetings have been held using IT-based communication. However, the project had some difficulties in holding e-meetings due to local IT security rules.

All types of networks rely to some extent on voluntary work and one can assume that the work, e.g. performed in EMAN, also supports local activities, but when more specific work for EMAN is to be done in the future, the costs must be covered by the network.

The consortium has indicated a preference for a formal organisational structure of the network. This is a structure including a board, personnel elected to key positions, and the members should be organisations. It is easy to establish this kind of organisation, but it needs initial resources.

Administrative summary

The steering committee has met in accordance with the project directives. SSM has undertaken the administrative tasks as the project coordinator and administrated all meetings with a local host on site. The steering committee has held five face-to-face meetings in Luxembourg, Sweden, Austria, Cyprus and Portugal and that have been chaired by SSM. With a few exceptions, the consortium members have attended all meetings. In addition, three e-meetings have been held with the steering committee (Nov. 2011, April 2012 and May 2012).

Project reports:

In July 2010 the project members delivered an interim report for WG5 to the EC.

In October 2010 the project members delivered synthesis reports for WG1-3 to the EC.

In April 2011 the project members delivered an interim report, a final report for WG5 and a progress report for WG1-3.

In addition to this final report, July 2012:

The final report of WP1, WP2, WP3, WP4 and WP6.

The report from WP6 is of special interest as it includes tasks for the future EMAN.

Attached to this final report

Synthesis documents: WP1, WP2 and WP3

Final report WP5

Minutes from the meetings