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Project partners

University of Manchester (UK), National and Kapodistrian University of Athens (Greece), "Iuliu Hategianu" University of Cluj-Napoca (Romania), Leeds Test Objects Ltd. (UK), Katholieke Universiteit Leuven (Belgium), Malmö University (Sweden), Vilnius University (Lithuania).

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The Seventh Framework Programme of the European Atomic Energy Community (Euratom) for nuclear research and training activities (2007 to 2011)

Newsletter

Editorial

Research is pointless without dissemination and engagement with the target "audience". In planning the SEDENTEXCT project, we identified two key groups with which we needed to engage during the timeline of our work: the European Academy of Dental and Maxillofacial Radiology (EADMFR) and the European Federation of Organisations of Medical Physics (EFOMP). I am delighted to report that we have made significant progress here. An article about SEDENTEXCT appeared in the recent (winter 2008) EFOMP publication "European Medical Physics News" (http://www.efomp.org/docs/EMPNewsWinter_2008_HQ.pdf). Other engagement here is reported under Work Package 6 in this issue. The most progress has, however, been achieved with EADMFR.

Work package 1 deals with guideline development. Part of the argument in favour of this project was that there were no recognised guidelines on CBCT use. As such,

there is a risk of inappropriate use, particularly where Cone Beam CT is used in primary dental care without the support and influence of specialists. In early 2008, it became clear to EADMFR that there was an urgent need to have some guidance in the public domain. While SEDENTEXCT Work package 1 is addressing this as part of its work plan, I made a decision to offer a novel collaboration with EADMFR to develop some "Basic Principles" of CBCT use. The early stages of this process were reported in Newsletter no.1 in July 2008. Since then, the collaboration has moved on and a set of 20 "Basic Principles" have been agreed by a consensus procedure within EADMFR. This process is reported in the following pages.

As I said at the start of this Editorial, research is pointless without dissemination, and the process of targeting these "Basic Principles" at important organisations and individuals has only just begun. The Principles, however, are wide-

ranging and we hope that they will have influence on national organisations in Europe and on equipment manufacturers.

One aspect highlighted in the Principles is "adequate theoretical and practical training" of users of Cone Beam CT. While EADMFR is working on this, I hope that in the years ahead, SEDENTEXCT will be able to contribute, through Work package 6, to delivering such training.

As SEDENTEXCT starts its second year, I look forward to results of the other Work packages entering the public domain through scientific publication and presentations at Congresses. This looks like being a busy year.

Keith Horner

SEDENTEXCT Project Co-ordinator



The SEDENTEXCT Annual Review meeting, held in Athens on 9th January 2009. The meeting included the European Commission's Scientific Officer responsible for SEDENTEXCT.



“Basic Principles” on the use of Cone Beam CT developed in collaboration between EADMFR and SEDENTEXCT

As reported in the June 2008 Newsletter, the final day of the 11th Congress of the European Academy of Dental and Maxillofacial Radiology (EADMFR) was dominated by a debate on Cone Beam CT use. At that meeting, chaired by Prof. Kostas Tsiklakis of Athens University (and SEDENTEXCT participant) and Mr. Eric Whaites of King's College London, draft “Basic Principles” of Cone Beam CT use were presented to the audience. Various suggestions were made and discussions ensued. After the Congress, a working group, made up of the two previously mentioned experts, along with the EADMFR President Lennart Flygare and Keith Horner (SEDENTEXCT Co-ordinator) worked on a revision of the draft Principles to prepare them for a wider consultation.

SEDENTEXCT was able to facilitate this consultation process by organizing and running an online survey to assess the agreement of the EADMFR membership on the draft Principles. This collaboration was feasible because it formed an integral part of Work package 1 of the project. The survey was available in eight languages, a major effort designed to improve response. The survey was available online during October/ November 2008.

Participants were asked to comment on the 20 draft statements using an agreement scale. An opportunity was also present to provide “free text” comments.

Over 200 responses were submitted to the survey, representing over 70% of EADMFR members. Data were collected automatically using software expertly managed by the University of Manchester expert Mohammed Islam.

The intention had been to perform up to three rounds of a Delphi process to achieve consensus, abandoning any statements for which agreement was not possible. In fact, consensus was easily achieved at the first round. Comments of respondents were carefully considered by the four members of the working group and the 20 “Basic Principles” established early in 2009.

The next stage is dissemination. In this effort, SEDENTEXCT will be an active player. The final

document will be sent to national organizations in Europe and we will try to break into the dental press. We will also contact the Article 31 group of experts of the Euratom treaty in an attempt to improve valorisation.

It is anticipated that the “Basic Principles” will be of interest and impact to all professionals involved in Cone Beam CT, They certainly represent the consensus view of an internationally important group.

Copies of the final document produced, containing the 20 “Basic Principles” are available from both the SEDENTEXCT and EADMFR websites as free, downloadable pdf. It is anticipated that translations of the “Basic Principles” into other European languages will become available over the weeks ahead.



Screen shot of web page used for the online survey.

The Basic Principles for Use of Dental Cone Beam CT

1. CBCT examinations must not be carried out unless a history and clinical examination have been performed
2. CBCT examinations must be justified for each patient to demonstrate that the benefits outweigh the risks
3. CBCT examinations should potentially add new information to aid the patient's management
4. CBCT should not be repeated 'routinely' on a patient without a new risk/benefit assessment having been performed
5. When accepting referrals from other dentists for CBCT examinations, the referring dentist must supply sufficient clinical information (results of a history and examination) to allow the CBCT Practitioner to perform the Justification process
6. CBCT should only be used when the question for which imaging is required cannot be answered adequately by lower dose conventional (traditional) radiography
7. CBCT images must undergo a thorough clinical evaluation ('radiological report') of the entire image dataset
8. Where it is likely that evaluation of soft tissues will be required as part of the patient's radiological assessment, the appropriate imaging should be conventional medical CT or MR, rather than CBCT
9. CBCT equipment should offer a choice of volume sizes and examinations must use the smallest that is compatible with the clinical situation if this provides less radiation dose to the patient
10. Where CBCT equipment offers a choice of resolution, the resolution compatible with adequate diagnosis and the lowest achievable dose should be used
11. A quality assurance programme must be established and implemented for each CBCT facility, including equipment, techniques and quality control procedures
12. Aids to accurate positioning (light beam markers) must always be used
13. All new installations of CBCT equipment should undergo a critical examination and detailed acceptance tests before use to ensure that radiation protection for staff, members of the public and patient are optimal
14. CBCT equipment should undergo regular routine tests to ensure that radiation protection, for both practice/facility users and patients, has not significantly deteriorated
15. For staff protection from CBCT equipment, the guidelines detailed in Section 6 of the European Commission document '*Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology*' should be followed
16. All those involved with CBCT must have received adequate theoretical and practical training for the purpose of radiological practices and relevant competence in radiation protection
17. Continuing education and training after qualification are required, particularly when new CBCT equipment or techniques are adopted
18. Dentists responsible for CBCT facilities who have not previously received 'adequate theoretical and practical training' should undergo a period of additional theoretical and practical training that has been validated by an academic institution (University or equivalent). Where national specialist qualifications in DMFR exist, the design and delivery of CBCT training programmes should involve a DMF Radiologist
19. For dento-alveolar CBCT images of the teeth, their supporting structures, the mandible and the maxilla up to the floor of the nose (eg 8cm x 8cm or smaller fields of view), clinical evaluation ('*radiological report*') should be made by a specially trained DMF Radiologist or, where this is impracticable, an adequately trained general dental practitioner
20. For non-dento-alveolar small fields of view (e.g. temporal bone) and all craniofacial CBCT images (fields of view extending beyond the teeth, their supporting structures, the mandible, including the TMJ, and the maxilla up to the floor of the nose), clinical evaluation ('*radiological report*') should be made by a specially trained DMF Radiologist or by a Clinical Radiologist (Medical Radiologist)

SEDENTEXCT at one year

A regular part of our Newsletter is an update on the activities of the scientists in the SEDENTEXCT project. At times, the reader may feel that we are being "opaque" in our descriptions of work; this is necessary because some of the work is not yet ready for placing in the public domain, particularly where this involves potential intellectual property issues. Nonetheless, we

hope that a useful idea of our work can be gained.

Work package 1 (<http://www.sedentext.eu/wp1>)

This WP addresses guideline development through an "evidence-based" approach. After identifying an effective search strategy for publications on Cone Beam CT, we

have been collecting pdf versions and allocating them into specific subject areas (e.g. diagnostic accuracy, dosimetry). A Guideline Development Group (GDG) has been assembled, including clinicians and medical physicists, to perform systematic reviews by critical appraisal. The pdf files are uploaded onto the project intranet, allocated to GDG members. Each paper is being assessed

by two people. We realised early in the process that much of the literature on Cone Beam CT does not fall into an “easy” category for critical appraisal, being case reports rather than research. In these early days of an accumulating literature on Cone Beam CT, we recognise that the large case report and case series experience cannot be ignored, and we are reviewing these using a specially designed appraisal document.

The GDG has arranged to meet in Manchester in March of this year to have a tough meeting to assess the evidence and draft specific provisional guidelines. We hope that details on these will be reported in the next Newsletter.

Meanwhile, as reported in the Editorial and elsewhere in this Newsletter, much effort of this Work package has been expended in the development of the “Basic Principles” of Cone Beam CT in collaboration with EADMFR. We anticipate that the Basic Principles will be central to our full Guideline document.

Work package 2 (<http://www.sedentext.eu/wp2>)

The preparatory stages of the various sub-packages have largely been concluded. The focus has been on phantom dose measurements and scatter measurements. A crucial task is intercomparison of TLD measurements between centres. This has been carried out in Leuven and Manchester and is currently being extended to other partners.

Work on development of a standardised dose index (WP2.1) con-

tinues using various strategies. The final output will feed into WP3 in the design of the phantom (dosimetry).

In terms of anatomical phantom work, the team have been using both adult (ART) and paediatric (ATOM) phantoms. In vivo dosimetry has yet to start. Output from WP5 identified the most common uses of CBCT and five of these clinical uses have been selected for in vivo dosimetry. While emphasis has been placed on phantom dosimetry, we are also working on mathematical modelling methods, including Monte Carlo techniques.

We are in the early stages of scatter dose measurements with relevance to personnel protection.

Work package 3 (<http://www.sedentext.eu/wp3>)

This Work package involves the SME partner, Leeds Test Objects Ltd, and there are important IP issues that prevent detail entering the public domain. As such, this is a limited report.

Since the last report, there has been perfect progress in this Work package. A prototype phantom for quality assurance was delivered in August 2008. The prototype has been tested on equipment of various manufacturers and software development has already achieved first beta development stage.

In the next year, we will move towards a second prototype phantom and software. We have no concerns about progress.

Work package 4 (<http://www.sedentext.eu/wp4>)

This Work package deals with “diagnostic accuracy” in clinical applications. In fact, it is following a multi-strand approach using laboratory and clinical studies. The former include aspects such as linear and volumetric accuracy. The clinical studies are addressing some key clinical applications of CBCT and extend over many months of the project. Nonetheless, all ethical aspects have been addressed and subject recruitment is ongoing. In this respect, the Cluj team have been working extremely hard. Many of these clinical studies will involve multiple observers to assess images; the Leuven University Centre for Medical Physics in Radiology is contributing to this work.

Work package 5 (<http://www.sedentext.eu/wp5>)

This Work package is exploring the difficult and challenging area of economic evaluation of Cone Beam CT and collaborating with team members with international expertise in health economics. In many ways, this is pioneering work, not just for Cone Beam CT, but also for diagnostics in general. Much health economics research is focused on therapeutic interventions, so we are breaking new ground.

The Malmö team are leading this work, and have identified one clinical application of Cone Beam CT for which a “model” of economic evaluation is being devised. Currently, partners are working in the field to perform cost calculations for

“patient examination episodes”. In the future, we will move towards assessment of benefits. Once we are well advanced in the modelling process, we will move on to other clinical applications.

Work package 6 (<http://www.sedentext.eu/wp6>)

This element of the project deals with “Training and valorisation”. This has been the slowest of the project elements to “take off”, largely due to staff recruitment issues. In addition, the hard work involved in the WPI Basic Princi-

ples collaboration has significantly impacted on our Work Programme.

An early requirement of SEDENTEXCT WP6 was a “Needs analysis” of users of a training website for CBCT. This is being addressed by online surveys. There are three surveys: one for each of: “dentists”, “physicists” and “manufacturers”. The dentist survey has been addressed through the membership of EADMFR, while the physicist survey is being facilitated by EFOMP and by direct emails of national organisations.

Surveys cover website content, user assessment and validation. Please contribute to the survey that best suits your role! If you have not been contacted by any of the means described above, please let us know so that we can direct you to the web link. Contact Gillian.armitt@manchester.ac.uk in the first instance.

We are currently recruiting a web technologist to start the process of developing the training website. It is dangerous to predict, but look forward to an exciting new project output in the coming year!

Profile: young scientists in SEDENTEXCT

Deimante Ivanauskaite



Deimante Ivanauskaite graduated from the Faculty of Dentistry, Kaunas Medical Academy, Lithuania in 1996. After postgraduate studies in Vilnius University in 1998 she was certificated as Specialist in Periodontology. In 1999 - 2000 she studied in Department of Oral Radiology, Faculty of Odontology, Malmö University, Sweden and obtained the degree of Master of Dental Science.

Since 2000 she has been working

in Vilnius University in the field of Oral Radiology and teaches undergraduate and postgraduate students. She is also involved in continuing education for dentists and dental specialists of Lithuania. Since 2005 she has worked with CBCT in Zalgirio Clinic of the Hospital of Vilnius University. In the SEDENTEXCT project she is working in the Management team and the Diagnostic group.

“It is big pleasure for me and Vilnius University to work in SEDENTEXCT project together with my colleagues from other countries of Europe. know that all of us will share our knowledge and experience with each other, and I hope that we will find something new for each other too. I strongly believe that SEDENTEXCT is important for all of dentists, dentist specialists, teachers, researchers and for society too..

Helena Christell



I obtained the degree of DDS in 2003 in Malmö University in Sweden and have since then worked as a dentist in both a public dental clinic in Smaland in Sweden and in a private dental clinic in French-speaking Fribourg in Switzerland. Now I am working part time as dentist in Malmö, and since October 2008 also in the SEDENTEXCT project. The Swedish team in work-package 5 will do a cost-effectiveness analysis, and are at the moment doing cost-analysis





of all thinkable costs involving imaging with CBCT in the case of impacted canines. The health-economical aspect is very interesting, and it seems that not a lot of research has been done in dentistry when it comes to this field. I hope to learn a lot about science by working with SEDENTEXCT, and that it will result in a thesis and a dissertation.

Christie Theodorakou

I work as a full-time postdoctoral research associate for the SEDENTEXCT project and I am based at the North Western Medical Physics at Christie Hospital, Manchester, UK. My research topic for the SEDENTEXCT project is the measurement and

modelling of the radiation doses in dental cone beam CT. Other



research interests include radiation dosimetry, image quality and image quality assessment in diagnostic radiology and tissue classification using x-ray techniques. I have a BSc in physics, a postgraduate certificate in Learning and Teaching, an MSc in Medical Physics and a PhD in

Medical Physics. Prior to my current post, I have worked as a lecturer at the University of Hertfordshire, UK and as a post-doctoral research associate at the City University, UK. Being part of the SEDENTEXCT team is a great opportunity for me to expand my theoretical and practical skills in Cone Beam CT, to improve my communication and management skills and to collaborate with physicists and dentists from other European countries.

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<http://cordis.europa.eu/fp7/euratom/> .



“Basic Principles on the use of Cone Beam CT” can be downloaded at:

www.sedentexct.eu/basicprinciples

Contacts:

Project Co-ordinator:

Professor Keith Horner, keith.horner@manchester.ac.uk

Project Manager:

Dr. Gillian Armitt, gillian.armitt@manchester.ac.uk

SEDENTEXCT Newsletter No. 2, January 2009, edited by Keith Horner, University of Manchester, UK, Tel + (44) 161 275 6726,

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