



European Medical Physics News

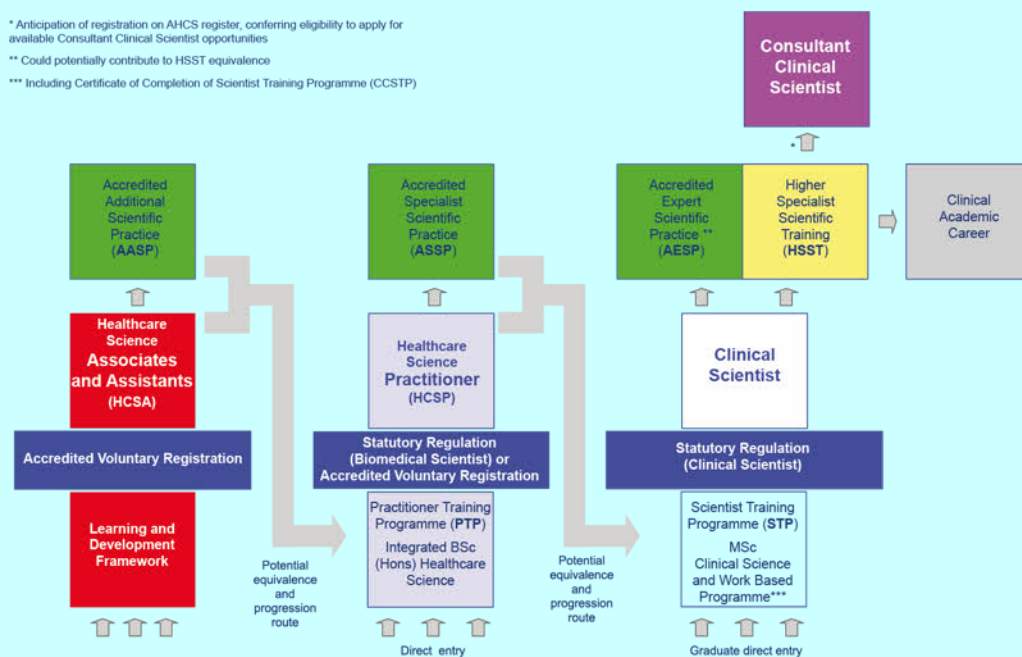
Summer 2014

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Modernising scientific careers in Medical Physics: See the UK way!

* Anticipation of registration on AHCS register, conferring eligibility to apply for available Consultant Clinical Scientist opportunities
 ** Could potentially contribute to HSST equivalence
 *** Including Certificate of Completion of Scientist Training Programme (CCSTP)



Revised Sep 2013

And across the channel:

A new era of Medical Physics starts in France!



Editorial

Dear Readers

Welcome to the summer addition of the EFOMP newsletter. In this issue we have two articles giving an insight into the UK's Modernizing the Scientific Careers (MSC) agenda. In 2011, the NHS in England introduced new training arrangements for the entire healthcare science workforce, including those working in life sciences and physiological sciences as well as medical physicists and clinical engineers. It resulted in major changes to training which will affect the NHS and many universities. It is an attempt to unify the training of clinical scientists across a range of disciplines, and it is fair to say it is still a work in progress. We hope it gives an insight into the UK system and would be interested in hearing how it compares to other EU training approaches.

We have a key report on Epinal radiotherapy accidents discovered in 2006, which highlights the difficult situation that medical physicists have in France.

This issue contains a number of other interesting articles and reports, including the full report from the meeting of in Budapest, Hungary, of the 6th Alpe-Adria Medical Physics Meeting (AAMP) was held on May 29–31, 2014. This meeting was organised by the Hungarian Society of Medical Physicists (HSMP) in cooperation with the Austrian Society for Medical Physics (OGMO), the Croatian Medical & Biological Engineering Society (CROMBIES), the Italian Association of Medical Physics (AIFM), the Slovakian Society of

Medical Physics and Biophysics (SKMA) and the Slovenian Biophysical Society (SBS).

The ECMP this year will be held in Athens (www.efomp-2014.gr) and many of you will be making your way to the meeting. There will be a meeting point set up at the conference for EFOMP publications and communications, which will give attendees an opportunity to meet and discuss any aspect of the work that is undertaken by this committee.

I hope you are or have enjoyed your summer holidays and, if you find the time to put pen to paper or these days use the keyboard, we are always on the lookout for news items or other contributions and would encourage authors to contact myself or one of the editorial team.

Prof Richard Bayford
Chair of publication and communication

Your editorial team



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EFOMP officers meeting at Budapest

The Board meets face-to-face twice a year, once in the Spring and once in the Autumn together with the European Conference of Medical Physics. At the latter meeting Council also meets. On this occasion we were very grateful to the Hungarian Association of Medical Physics for their generosity in hosting us.

The Board meeting was held at the same time as the 6th Alpe-Adria Medical Physics Meeting (see following report by Csilla Pesznyak) and we took the opportunity of contributing a session on the work of EFOMP covering topics such as Horizon 2020 and MELODI, the state of the EUTEMPE project, EFOMP educational activities and the developing role of scientific working groups.

The Board discussed a proposal coming from Dr Christofides on behalf of the EUTEMPE-RX project concerned with the sustainability of the project's work once the formal funding period was over. He suggested that EFOMP take on the role of course accreditation and assessment. While the Board was happy for EFOMP to do this, it did have concerns as to whether there would be a conflict of interest if the same body also provided educational courses for MPEs. Prof. Damilakis was tasked with drawing up a paper on how other professional bodies tackle this issue and it will be discussed further by the Board before being put to Council in Athens.

A draft of the report drawn up by a working group of Scientific Committee on Quality Control in Digital mammography was presented to the Board. After it has been examined by the Board it will go to NMOs for comments.

The Board was asked to comment on a draft proposal from Elsevier, the publishers of EJMP, on how NMOs might be encouraged to develop a closer relationship with the journal. Elsevier has suggested that there be a class of Supporting Society. Societies agreeing to this would be offered a discount on the journal purchase price and have their name listed in the journal as a Supporting Society. This suggestion will be discussed further at Council.

The Board had a long discussion on the future of the European Conference of Medical Physics. At

the moment this is held annually in conjunction with the national meeting of an NMO. Later this year it is being supported by the Hellenic Association in Athens. It was felt that EFOMP might organise a biennial congress covering a wider range of topics. Rather than most of the work falling on the shoulders of an NMO, EFOMP would have a standing committee tasked with the conference organisation. There are a number of issues to be considered, such as the frequency of such a congress and whether it is always held in the same location. The chair of the scientific committee was asked to prepare a paper setting out the issues which would be discussed at Council.

As the EC had now published guidelines on the knowledge, skills and competencies for the MPE, it was agreed that a working group should be set up under the Education and Training Committee to develop a suitable curriculum for EQF levels 7 and 8. It would aim to complete its work for the Spring 2015 Board meeting.

Prof. Padovani, chair of the EU Matters Committee brought to the attention of the meeting provisions in the new BSS relating to the MPE and RPE for which he had concerns. A working group was set up under the EU Matters Committee to look at these concerns and draft a report for comments by the NMOs.



Peter Sharp
EFOMP President

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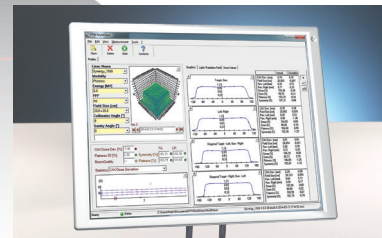
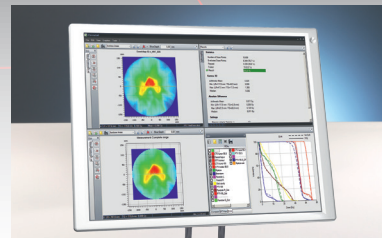
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THE 6th ALPE-ADRIA MEDICAL PHYSICS MEETING



Figure 1: Cover page of Conference Program

The 6th Alpe-Adria Medical Physics Meeting (AAMP) was held on May 29–31, 2014 in Budapest, Hungary. The meeting was organised by the Hungarian Society of Medical Physicists (HSMP) in cooperation with: Austrian Society for Medical Physics (OGMO), Croatian Medical & Biological Engineering Society (CROMBIES), Italian Association of Medical Physics (AIFM), Slovakian Society of Medical Physics and Biophysics (SKMA), Slovenian Biophysical Society (SBS). The advantage of sharing working experience drove medical physicists of the Alpe-Adria area to the promotion of a conference that was first organized in Udine (2004). Due to the success of the conference, a biennial meeting came to existence - named Austrian, Italian, Slovenian and Croatian Medical Physics (AISCMP) that

continued in 2006 (Opatija), 2008 (Graz) and 2010 (Ljubljana). In 2012 (Trieste) two new countries: Hungary and Slovakia joined.

The 6th AAMP meeting in Budapest followed the traditions of the previous conferences. Sophisticated techniques and new developments demand a profound knowledge in various fields of medical physics. That is why we intended to invite not only colleagues from the six countries mentioned, but medical physicists from other countries, as well. The conference had more than 120 participants from 14 countries.

The oral and poster presentations were related to the physical aspects of: nuclear medicine, radiological imaging, radiation protection, radiation therapy and medical physics education.

Post-meeting events were organised by EFOMP as EFOMP Officers' Meeting.

The members of Scientific Committee were:

Austria: Werner Schmidt, Heinz Deutschmann, Uwe Wolff;

Croatia: Nenad Kovačević, Tomislav Bokulić, Srećko Lončarić;

Italy: Luisa Begnozzi, Paola Bregant, Mario De Denaro;

Hungary: Csilla Pesznyak, Tibor Major, József Varga;

Slovakia: Gabriel Kralik, Sona Kovacova, Matula Pavol;

Slovenia: Božidar Casar, Urban Zdešar, Attila Šarvari.

The Scientific Committee received more than 60 abstracts for review, and they selected 35 abstracts for oral presentations and 33 abstracts for



Figure 2: Prof. Peter Sharp during his presentation on future Perspectives of EFOMP

posters. The Meeting had 8 sessions: Physics in Radiation Therapy, Advanced Techniques in Radiation Therapy, Physics in Nuclear Medicine, Physics in Diagnostic Radiology, Advances in Medical Physics Research and Poster Session and two special sessions:

1. Medical Physicist Profession in the member countries. Every representative of the member countries gave a short overview about their education and training system, with the title: "How to become a medical physicist in...."
2. EFOMP session about: Future Perspectives of EFOMP (Peter Sharp), Horizon 2020 and EFOMP relationship with MELODI (John Damilakis), State of the art of EUTEMPE-RX Project (Renato Padovani), Education and Training activities of EFOMP (ESMP-School for MPE-ICTP) (Gunter Hartman, Marco Brambilla), The developing role of Working Groups in the scientific activities of EFOMP (Mammography-Cone Beam CT-DICOM) (Manuel Bardies, Alberto Torresin).

Conference abstracts can be accessed online from: www.alpeadriamp2014.eu

The Alpe-Adria Prize is reserved for a Medical Physicist presenting his or her excellent accomplishments in the field of Medical Physics, as a young scientist (who is under the age of 32 until the term of the conference). This year the Scientific Committee donated this award to two young medical physicists:

1. Jad Farah: Characterization of XR-RV3 GafChromic® films in standard laboratory and in clinical conditions: Means to reduce uncertainties.
2. Peter Kuess: Systematic analysis on the achievable precision of Particle Therapy-PET measurements for ^{12}C -beams by means of automated evaluation techniques

The representatives of member states during their meeting decided that the next Alpe-Adria Meeting would be organised in Croatia in 2016 by Croatian Medical & Biol. Engineering Society (CROMBIES). One more country would like to join our cooperation, and its application was accepted by the representatives, from 2014 Serbia has also become the member of the organisation.

We hope all participants of the conference returned home with a lot of valuable thoughts and are going to do their best to facilitate medical physicists to become more successful in contributing to the development of healthcare. As tech-



Figure 3: The representatives of member states (from left to right): Uwe Wolff (OGMO, Austria), Nenad Kovačević (CROMBIES, Croatia), Gabriel Kralik (SKMA, Slovakia), Božidar Casar (SBS, Slovenia), Mario De Denaro (AIFM, Italy).

nological solutions are becoming more complicated, responsible attitude and decisions are essential for any activity in connection to examinations and treatment, which also require a high level of theoretical and practical knowledge as well as skills development. This can only be ensured through continuous training and further education.

Thank you for all participants for their attention and effective and fruitful work.



Csilla Pesznyak
Head of Organizing Committee,
HSMP, Hungary

Whither EFOMP?

Many organisations with which I have been involved over the years decide to have a Strategic Plan. The idea is that it gives them a route map for the coming years. The standard approach is to have a brainstorming meeting at which ideas are proposed and scrutinised. If you are lucky this is done by what we in the UK call an Away Day, which means you take your team to some quiet hotel where suitably isolated from the world and fortified by good food, the ideas flow. Flip charts are filled with inspiration; perhaps a business consultant is employed at great cost to guide you through the process. At the end of the day some unfortunate person takes away lots of notes and the flip charts to convert it into a plan. This is circulated for comments, of which there are usually few if any, and a few months later the Plan is launched.

Perhaps I am cynical, but I have seen very few instances in which such a plan has made any difference. In fact if I was to be very cynical my advice to a new President would be either make it the aim of your presidency to develop a strategic plan or to modernise your society's IT system. Either way you will be able to avoid taking difficult decisions as your answer will be – we will deal with it in the Strategic Plan / the new IT system will solve the problem. Your successor then is left with the problems and, if you have opted for a new IT system, the bankruptcy of the society.

In the 2 ½ years that I have been president of EFOMP I have avoided taking either course, although developing a new website is as close as we got to introducing new IT. That is not to say

that we did not have “plans”. Thanks to the efforts of many of you we now have a new definition of the Medical Physics Expert and a new training and education scheme (particular thanks to the past chair of the Education and Training Committee), both of which have been published by the EC. Clearly one of the strands of our (non-existent) strategic plan is to capitalise on this.

One of the reasons why I am sceptical of detailed plans is that they can be completely upset by opportunities. One such was our success, largely through the efforts of the chair of the Projects Committee, in getting a large FP7 grant (EUTEMPE-RX) to develop training at MPE level in Diagnostic and Interventional Radiology. The strings attached to the funding call meant that it was limited to these areas but, of course, the system we put in place will service training in other areas and we are already looking at how best to do that. As part of that process the Board is developing proposals to set up a system of accreditation of training courses and examinations.

We are looking at defining standards for medical physics services. Our past President is chairing a working group aiming to produce standards that will be endorsed by CEN, the European committee for standardisation. As IPEM had embarked on a similar exercise for medical physics services in the UK, we have decided to work with them.

A few years ago we set up special interest groups and working parties looking at specific

issues. I am pleased that the working group on quality control in mammographic imaging has produced its draft report. Having seen it I am sure that the protocols they have developed will be of great value. We will be publishing them in the next few months.

We have recently revised the policy statement on education and training and this is now available on the website and will appear in EJMP.

Our annual conference, ECMP, continues to develop. Last year we held it in conjunction with the IOMP. This year it is being hosted by the Hellenic Association in Athens. They have put together an excellent programme and we hope people will support it. One of the items that the Board has to consider is how we best build on this success in future years. What sort of conference best serves the needs of medical physicists in Europe? We are aware that there are many conferences, most of them catering for specific areas of medical physics. Is there a need for a general medical physics conference? I think that the answer will be Yes, but how we organise and market it needs further consideration.

We have set up a number of Memorandum of Understanding with organisations such as ESTRO, EANM and ESMRMB, and are working on one with the American society, AAPM. We are fortunate that Europe is a reasonably well defined entity and that for many of our initiatives we can work under the auspices, and with financial

support, of the European Commission. But we have to ensure the medical physicists and their professional organisations work together.

The message that runs through this article is that EFOMP is working for medical physics in Europe. But EFOMP is not me or the officers, it is you. Our success depends on support from our National Member Organisations. We are all busy, but please when we ask for nominations for officers, or for people to work on projects such as EUTEMPE-RX, do give it careful consideration. Also make sure that your representative attends Council and that he/she has a clear idea of what your society would like EFOMP to do. We will do our best and while we don't have a strategic plan we are, I think, doing our best for European Medical Physics.



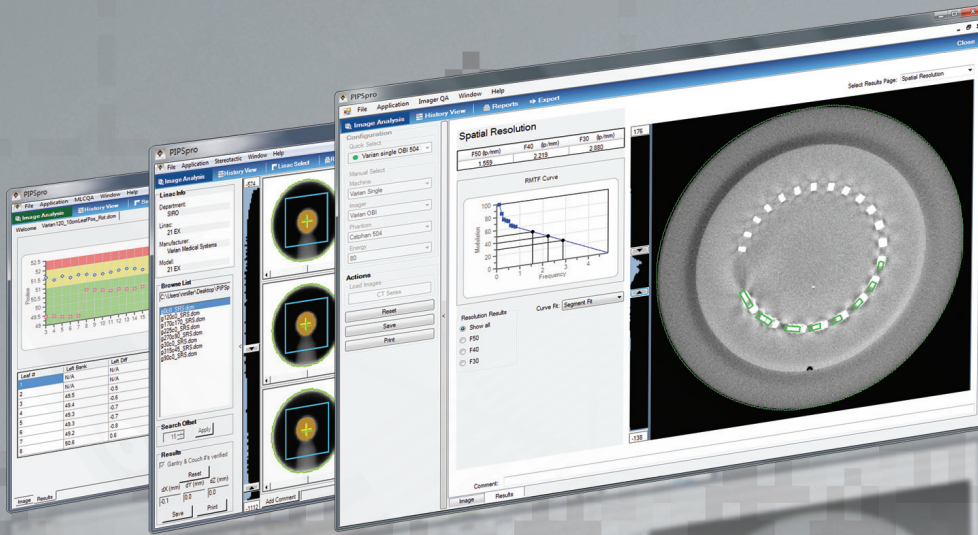
Peter Sharp
President, EFOMP

Modernising Scientific Careers: the new face of medical physics training in the UK

Historical introduction

The Institute of Physics and Engineering in Medicine (IPEM) and its predecessor organisations has a long history of involvement in the training and professional development of medical physicists and clinical engineers. The Hospital Physicists' Association (HPA) set up a Diploma Sub-committee as long ago as 1963, leading in 1979 to establishment of a training scheme for new entrants to the profession. Participation in the scheme was initially entirely voluntary, and although some National Health Service (NHS) employers offered supernumerary training positions, the majority of junior staff had to juggle training alongside the demands of full-time employment in established posts. But in 1990 the career structure for scientists in the NHS was

radically reformed, including establishment of a formal training grade ('Grade A') for the first time. This change brought with it recognition of the HPA scheme as the main training route for new entrants to medical physics and clinical engineering. Establishment of state registration for clinical scientists in 2000 further strengthened the position of the training scheme, which for over ten years provided medical physicists and clinical engineers with the main entry route to the Health Professions Council (HPC) register (now the Health and Care Professions Council, HCPC). In more recent years, IPEM also established formal training for clinical technologists, and although this was not backed by state registration it did provide a valuable means of training for this vital part of the workforce.



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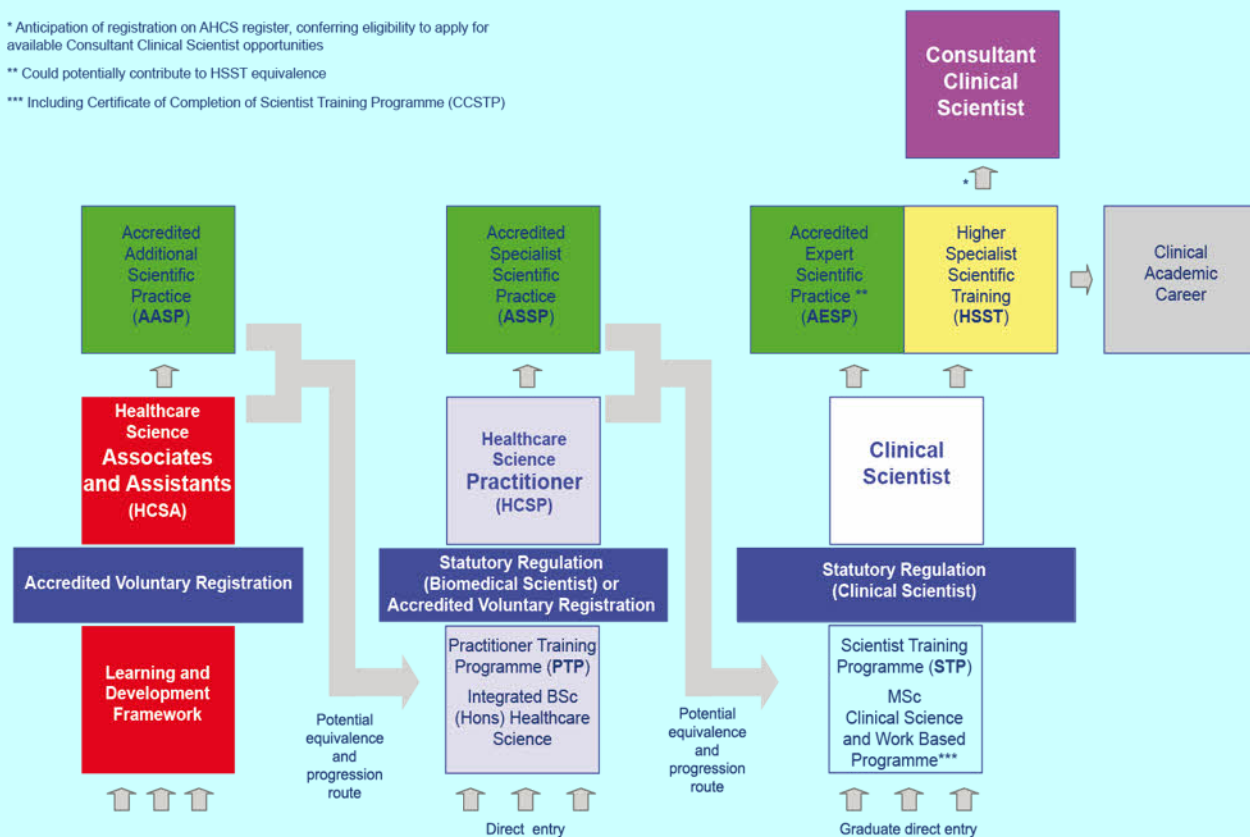
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* Anticipation of registration on AHCS register, conferring eligibility to apply for available Consultant Clinical Scientist opportunities

** Could potentially contribute to HSST equivalence

*** Including Certificate of Completion of Scientist Training Programme (CCSTP)



Revised Sep 2013

Figure 1: Structure of the Modernising Scientific Careers programme, from www.ahcs.ac.uk/useful-information/

The IPEM training schemes

By 2010, IPEM was operating two well-established training schemes for different parts of the workforce.

The **training scheme for medical physicists and clinical engineers** provided trainee clinical scientists with the opportunity to rotate through three different specialisms from a list of 13, including both physics and engineering disciplines, over a period of two years. This was followed by specialisation in one (or exceptionally two) areas for a further two years. Academic underpinning was provided through attendance at one of around 20 MSc programmes accredited for the purpose by IPEM. Final assessment by the Association of Clinical Scientists (ACS) allowed access to the HCPC register, and full membership of IPEM (MIPEM) could be achieved at the same stage.

The **training scheme for clinical technologists** offered training in the workplace, combined with a vocational degree programme (again accredited by IPEM), over a period of four years (shorter routes were open to entrants already holding appropriate academic qualifications and/or prac-

tical experience). Training was offered in seven different clinical technology specialisms. Successful completion led to registration with IPEM's Voluntary Register of Clinical Technologists (VRCT), and a further three years of continuing professional development (CPD) beyond this point qualified the technologist for MIPEM. In both schemes, trainees could also achieve appropriate Science Council and/or Engineering Council qualifications alongside registration and IPEM membership.

Modernising Scientific Careers

In 2011, the NHS in England introduced new training arrangements for the entire healthcare science workforce, including those working in life sciences and physiological sciences as well as medical physicists and clinical engineers. The Modernising Scientific Careers (MSC) programme encompasses four levels of training, summarised in Figure 1. Although this programme looks very complex, much of it is actually similar in concept to the IPEM schemes. This reflects the fact that IPEM members were heavily involved in the development of the programme and sought to build on past successes. However,

it is important to stress that MSC is not an IPEM programme and, from IPEM's point of view, has some weaknesses as well as notable strengths. Beginning at the right hand side of the diagram, the **Scientist Training Programme (STP)** is aimed at graduate scientists training for registration as clinical scientists. Similar to the IPEM scheme for scientists and engineers, it involves a period of rotation through a range of specialisms, followed by specialisation in a single area. The main differences are as follows.

- STP is a three year programme, as opposed to four years for the IPEM scheme.
- There are separate programmes in medical physics and in clinical engineering, and it is no longer possible to straddle the two.
- The number of distinct specialisms in which training can be undertaken has been reduced by consolidating disciplines into broad areas. In the case of medical physics, these are radiation safety physics, radiotherapy physics, imaging with ionising radiation, and imaging with non-ionising radiation. In clinical engineering, they are rehabilitation engineering, clinical measurement and development, and medical device risk management and governance.
- During the rotational component of training, all trainees rotate through all of the areas within their particular programme. During the specialist component, the whole of one programme area must be undertaken: it is no longer possible to focus on a more specific area such as MRI or nuclear medicine, nor to combine two areas for specialist training. This tends to produce scientists with broader knowledge and experience, but with less depth in a specific discipline.
- As before, the programme includes an MSc to provide academic underpinning. This is undertaken over the whole three year training period, alongside workplace training. MSc programmes are now accredited by the National School for Healthcare Science (NSHCS), not IPEM. There are only four accredited MScs in medical physics and

only one in clinical engineering, so trainees often have to travel some distance from their training bases to attend them.

- Final assessment is also conducted by the NSHCS, and another body known as the Academy for Healthcare Science (AHCS) awards a certificate giving access to the HCPC register.

Further details of STP can be found at

[www.nhscareers.nhs.uk/explore-by-career/healthcare-science/training/nhs-scientist-training-programme-\(stp\).](http://www.nhscareers.nhs.uk/explore-by-career/healthcare-science/training/nhs-scientist-training-programme-(stp).)

The **Practitioner Training Programme (PTP)** is intended to be the new main entry point to the clinical technologist workforce. Like the IPEM clinical technologists' training scheme it is based around a vocational degree programme, but there are some crucial differences.

- The programme is undertaken as a full-time three-year degree course, supported by clinical placements, so trainees are university students rather than NHS trainees: they do not receive a salary and are subject to course fees.
- Degree courses are available in seven medical physics and clinical engineering disciplines (radiotherapy physics, radiation physics, nuclear medicine; medical engineering, radiation engineering, renal technology, and rehabilitation engineering).
- Clinical technology remains a little-known career option: so far few universities have established courses, and uptake by students is poor. There is only one course available nationally in each of the engineering disciplines for example, in Bradford in the north of England.

For further details, see

[www.nhscareers.nhs.uk/explore-by-career/healthcare-science/training/nhs-practitioner-training-programme-\(ptp\)/](http://www.nhscareers.nhs.uk/explore-by-career/healthcare-science/training/nhs-practitioner-training-programme-(ptp)/).

The other components of the MSC programme are new, and still under development.

Training for **Associates and Assistants** will be delivered through workplace-based apprenticeships. These roles have not yet been widely established in medical physics and clinical engineering, and IPEM is exploring what role it might have in further development of this part of the workforce.

Higher Specialist Scientific Training (HSST) is intended to provide further training for registered clinical scientists in preparation for Consultant Clinical Scientist roles. It is the first training programme ever established for roles at this level within medical physics and clinical engineering. IPEM members have been heavily involved in the development of HSST curricula in these two areas, and the first entrants are being recruited at the moment. The curricula include advanced scientific and professional topics, but also generic material such as management and leadership. There is an emphasis throughout on the role of the medical physicist or clinical engineer as an innovator and leader of change. Academic underpinning will be provided through a new Doctor of Clinical Science (DClinSci) professional doctorate award. Updates will be available at

[www.nhs.uk/careers/nhs.uk/explore-by-career/healthcare-science/training/nhs-higher-specialist-scientific-training-\(hsst\)/](http://www.nhs.uk/careers/nhs.uk/explore-by-career/healthcare-science/training/nhs-higher-specialist-scientific-training-(hsst)/).

Staff at all levels will be able to undertake structured CPD beyond their basic training to achieve **Accredited Scientific Practice** awards. For scientists, the first such modules will provide Medical Physics Expert (MPE) training, which will also form a subset of the medical physics HSST programme for those working in ionising radiation specialisms.

IPEM in the new era of training

The advent of MSC has radically changed IPEM's role in training, but we remain strongly involved at all levels.

STP has now replaced the IPEM training scheme throughout the UK except in Scotland. The last cohort of Scottish trainees to undertake the IPEM scheme began their training in September 2013, and it is likely that in future Scotland will offer a new scheme that resembles STP. So IPEM no longer manages training for scientists and engineers. Instead, implementation and delivery of training are the responsibility of the National School for Healthcare Science (NSHCS), while quality assurance and the award of the Certificate of Attainment at the end of STP fall within the remit of the Academy for Healthcare Science (AHCS). However, many of the functions of these two organisations are in practice delivered through professional bodies such as IPEM, and IPEM members are prominent in their leadership and committee structures.

PTP is not yet well established, and the IPEM clinical technologists' training scheme continues to exist alongside it to meet workforce need. It is

likely that, as in the past, a range of entry routes will continue to be needed for this part of the workforce.

As mentioned above, IPEM is exploring possible roles in apprentice-level training, and also remains heavily involved in the further development of HSST. The Institute is of course also involved in provision of CPD through its annual programme of conferences and scientific meetings, and in many cases attendance at these could form part of HSST or other accredited programmes.

Changes to training have also impacted on IPEM as a membership organisation. The new training schemes are no longer intimately linked to IPEM membership, so the Institute has recently revised its membership rules to reflect this new reality and provide simpler and more flexible ways to join.

Similarly, our framework for degree course accreditation is being updated to reflect that fact that we are no longer the main accreditor of courses that form part of NHS training programmes. We are adopting a more flexible approach that encompasses courses developed to meet a wider range of student and employer needs.

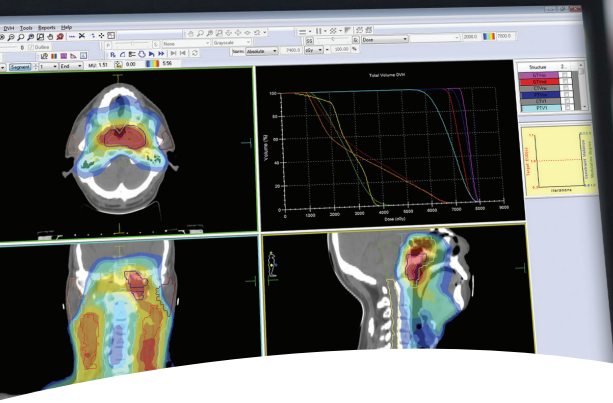
Conclusion

I hope that this overview of new medical physics and clinical engineering training arrangements in the UK has been of interest to colleagues elsewhere in Europe. We have been through some dramatic and rapid changes in the past few years, with more to come at apprenticeship and HSST levels in particular. Throughout all of this, IPEM is working to ensure that the workforce at all levels continues to be trained to appropriate levels of knowledge and competence to ensure the safety of our patients and the delivery of efficient and high quality services.

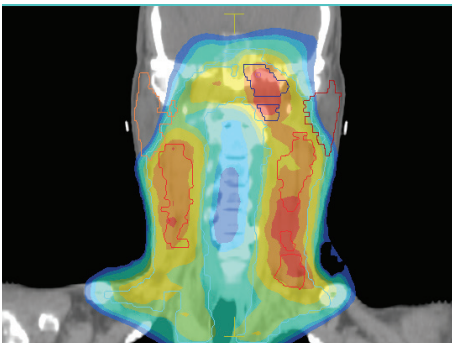


Stephen Keevilare,
IPEM President, UK and Head of MR Physics
(GSTT) & Professor of Medical Physics (KCL)

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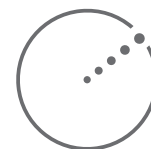


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Designing New Undergraduate Clinical and Biomedical Engineering Programmes

Currently, there are over 160 Higher Education Institutions in the United Kingdom of which only around 20 were offering Biomedical Engineering related degree programmes for 2013 intake. Up to this time, it has not been possible to establish the demand for such programmes in the UK as there has not been a unique classification system for the discipline. UCAS, the Universities and Colleges Admissions Service and HESA [1], the Higher Education Statistics Agency hold data for the number of applications to programmes. From these data there is an indication that applications could be somewhere between 15000 to 20000 with no more than around 8% acceptance rate. While these figures are a very rough estimation based on incomplete data, there is still a strong implication that demand significantly outstrips supply. In 2013, Bioengineering and Biomedical Engineering was assigned its own classification code by HESA, indicating that the specialism has matured such that Biomedical Engineering and Bioengineering is considered an engineering discipline in its own right. While some of the programmes delivered in the UK appear to be general engineering degrees with biomedical options in the final year, the majority are specifically designed as multi-disciplinary programmes covering the specialism in all years of study.

The majority of the programmes delivered lead to the award of MEng or BEng, with just a few leading to a BSc degree. In the UK, an MEng (Master of Engineering) is an integrated Masters programme but is still considered as an undergraduate degree normally involving four years of study or five years in Scotland. The BEng degree is a standard three year undergraduate programme and is either an exit award after three years of a MEng degree or is stand-alone. Normally a student will not be able to progress onto a MEng degree unless they have performed to a suitable standard by the end of year two; those students who do not reach the standard will then complete a BEng degree. Most programmes of both types offer an optional professional or industrial placement between years two and three. The difference between the two awards are that the MEng can be accredited by any appropriate Professional Engineering body as completely fulfilling the academic requirements for Char-

tered Engineer (CEng) status. Accreditation for a BEng degree will only partially fulfil these requirements but completely fulfil those for Incorporated Engineer (IEng) status. The professional registers are maintained by the Engineering Council (www.engc.org.uk) who license the professional bodies to accredit degrees. The standard for accreditation [2] is very closely aligned to the engineering benchmark [3] published by the Quality Assurance Agency (QAA) who is the independent body that monitors and advises on standards and quality in UK higher education.

The main career paths for students undertaking MEng, BEng or BSc programmes in Biomedical Engineering or Bioengineering are industry and research or academic if they wish to pursue work in the discipline. There are a number of companies in the UK and the rest of Europe that could be destinations for graduates, though in the UK these are generally small to medium sized enterprises. The larger medical device companies tend not to have research and development facilities in the UK, though there are opportunities in support and sales.

For graduates hoping to pursue a career in the clinical environment, there are still some opportunities to do so, but this is becoming less straightforward with the advent of the Modernising Scientific Careers (MSC) initiative. This NHS England initiative, under the leadership of the Chief Scientific Officer Professor Sue Hill, involves the development of a whole new education system and career structure for healthcare science employees. The work began in 2011 and the ensuing education system is being phased in and this will continue over the next few years. One of the key professional groups created by the MSC team is the healthcare practitioner (HCP), who undertakes many of the duties currently performed by clinical physiologists, medical physicists and engineers. One of the outcomes is a three-year integrated BSc Healthcare Science degree known as the Practitioner Training Programme (PTP) to train HCPs. Unlike former clinical physiology degrees, which were Department of Health (DoH) funded, this degree accrues full fees from the student.

Year 1

Professional Practice (15 Credits)	Electronics and Computing Principles (30 Credits)	Mechanics and Mathematics (30 Credits)	Healthcare Science (45 Credits)	
Professional Practice (10)	Electronics (25)	Informatics Maths & Stats (10)	Basic Mechanics (15)	Scientific Basis of Healthcare Science (60)
10 week placement				

Year 2

Research Methods and Professional Practice 15 Week Placement (30 Credits)	Physiological Measurements (30 Credits)	Design of Medical Devices (30 Credits)	Medical Equipment Lifecycle (30 Credits)	
Research Methods (10) Professional Practice (10) 15 Week Placement (10)	Principles of Scientific Measurement (30)	Innovation and Medical Device Development (30)	Fluids, Biomechanics & Materials (10)	Medical Equipment Lifecycle

Year 3

Professional Practice 25 Week Placement (30 Credits)	Clinical Engineering Research Project (30 Credits)	Principles of Medical Engineering (30 Credits)	Medical Engineering in Practice (30 Credits)
Professional Practice (10) 25 Week Placement (20)	Medical Engineering Research Project (30)	Science & Principles Supporting Medical Engineering (30)	Medical Engineering in the Clinical Environment (30)

Key:

- Generic Modules: Common to all divisions of Healthcare Science
- Division/Theme Specific Modules: Clinical Engineering
- Specialist Modules: Specific to a specialism

Figure 1: Structure of Middlesex Medical Engineering PTP.

In 2013 there was only one PTP programme for clinical engineering, though more are being developed. Middlesex University launches its own Clinical Engineering PTP degrees in October 2014. The University, having been involved in Biomedical Engineering and Bioengineering activity for the last 15 years or more, has largely confined its activities to research and postgraduate work in a number of areas including Medical Electronics, Bioimpedance imaging, Neurophysiology, biomodelling and Rehabilitation Engineering; more recently joint prosthetic implant research has begun. Middlesex has also devel-

oped PTP Healthcare Science degrees in Life Sciences including Cardiac Physiology, Neurophysiology and Audiology and has taken the opportunity to add the Clinical Engineering theme to its portfolio of MSC based programmes as well as combining the new PTP curriculum with existing engineering expertise to develop a MEng / BEng in Biomedical Engineering.

Practitioner Training Programme

One of the main challenges for universities developing Healthcare Science PTPs is that the curriculum is already largely prescribed by the

Year 1

Human Sciences (30 Credits)	Design Practice for Biomedical Engineers (30 Credits)	Electronics and Computing Principles (30 Credits)	Mechanics and Mathematics (30 Credits)
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Year 2 exit with DipHE

Design Engineering Projects (30 Credits)	Physiological Measurements (30 Credits)	Design of Medical Devices (30 Credits)	Medical Equipment Lifecycle (30 Credits)
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Year 3 Optional Placement Year

Placement (120 Credits)

Year 3 or 4 Exit with BEng

Biomedical Engineering Major Project (60 Credits)	Principles of Medical Engineering (30 Credits)	Principles of Rehabilitation Engineering (30 Credits)
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Year 4 or 5 Exit with MEng

Team Project (60 Credits)	Modelling and Simulation in Biomedical Engineering (30 Credits)	Advanced Rehabilitation Engineering and Musculoskeletal Science (30 Credits)
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Key:

Unique to Programme	Shared with Healthcare Science (Clinical Engineering) PTP	Shared with Biomedical Science	Shared with MEng / BEng Design Engineering
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Figure 2: MEng / BEng Biomedical Engineering.

MSC team. UK universities have a long history of developing their own curricula with relatively open guidance from QAA and its benchmark statements. As well as curriculum content, UK universities also define their own curricular structures. Most degree programmes are modular and in each year of a full-time degree, a student will study 120 credits using the UK standard CATS (Credit Accumulation and Transfer Scheme), which is equivalent to 60 credits using ECTS (European Credit Transfer and Accumulation System). In general, UK universities will specify modules to have values ranging from 5 to 30 credits, or multiples thereof. The MSC team specifies sizes for each module that do not necessarily correspond to the specification of the university wishing to design a PTP.

The Clinical Engineering theme for MSC curriculum offers four specialisms: Medical Engineering, Radiation Engineering, Renal Technology and Rehabilitation Engineering. Middlesex University has developed programmes covering the Medical and Rehabilitation Engineering specialisms. Figure 1 shows the structure of the Medical Engineering PTP and how it relates to the MSC curriculum. The Rehabilitation Engineering specialism shares a common structure to Medical Engineering in years 1 and 2. The final year has two different specialist modules: Principles of Rehabilitation Engineering and Rehabilitation Engineering in Practice. The coloured areas depict the MSC modules defined in the curriculum [4] and these highlight the variation in credits, shown in parenthesis, assigned to them.

Like many UK universities, Middlesex specifies its curricular structure to be delivered in modules with credit values in multiples of 15, 30 credits being the preferred value.

In addition to the prescriptive nature of the MSC curriculum, the other challenges in the development are threefold. Firstly to deliver all the MSC learning outcomes for the theme and specialism modular elements within the university curriculum structure, secondly to integrate the programmes with the common elements that are also part of the existing Healthcare Science PTPs in the university's portfolio and finally to accommodate the clinical placement requirements for the programme.

The inclusion of integrated work placements in the clinical environment are a unique feature of the MSC PTP structure. Students attend a rotational placement in year 1 for ten weeks beginning around the end of December. In year two the placement is 15 weeks involving more specialised theme activity, five weeks of which are taken during normal semester time and the remainder after the end of year assessment period and into the summer vacation. The final year placement is 25 weeks of specialist work taken over vacation periods and normal semester time. The research project work is carried out largely whilst on placement and the other two specialist modules are delivered in block mode during five weeks spent at the university.

MEng / BEng Biomedical Engineering

Middlesex has been delivering MEng / BEng Design Engineering programmes for a number of years that focus on the specialisms of Robotics, Mechatronics and Electronics. The facilities and staff resources that deliver these programmes provide a strong engineering background that can feed into the PTP Healthcare Science degrees. With the curricular infrastructure of the PTP, the Design Engineering and additional input from Biomedical Science, the University has taken the opportunity to develop an additional undergraduate provision in Biomedical Engineering.

Figure 2 shows the structure for the programme, which is made up of new modules as well as some taken from the PTP Healthcare Science degree, the Design Engineering Programmes and Biomedical Science. There are logistical challenges in delivering the modules shared with

the PTP cohorts of students who leave the university for periods of integrated placement activity.

The structure of the programme accommodates these issues by longer teaching time during the university periods for all students for the PTP shared modules and delivering the Design Practice and all projects in block mode while the PTP students are on placement.

(30 Credits)

Conclusion

The degrees described in this article represent a strong collaboration between the departments of Natural Sciences and Design Engineering and Mathematics at Middlesex University. This has the potential to enhance student experience as they will benefit considerably from learning in a multi-disciplinary environment that supports the ethos of the subject specialism and its practice in industry. PTP students will gain a greater appreciation of the industrial and practical aspects of medical device design and the MEng students likewise for the issues faced in the clinical environment.



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References

- [1] www.hesa.ac.uk/dox/datacoll/jacs3/Bioengineering
- [2] www.engc.org.uk/engcdocuments/internet/Website/Accreditation of Higher Education Programmes third edition
- [3] www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering
- [4] www.networks.nhs.uk/nhs-networks/msc-framework-curricula/documents/BSc_HCS_Clinical_Engineering_2011-12.pdf

Eutempe-RX: European training and education for medical physics experts in radiology

Medical exposures for radiological examinations represent the highest and fastest growing contribution to man-made radiation exposure in the EU. New techniques and technologies make optimization and justification a challenging task. All this has to be seen in the context of an increasing awareness for the negative side effects of radiation. Following the BSS (ref 1), medical physics experts in radiology should get a role in this process. These experts should be highly trained, as stipulated in the 'Guidelines on the MPE' document (RP174, ref 2). The core of their activities are the optimal use of ionizing radiation in healthcare and the transfer of new knowledge and expertise from physics into healthcare. The level of required training has been defined as EQF level 8.

The highest level of training, at EQF level 8, is currently not organized in most of the EC member states, as all required expertise and (teaching) facilities don't exist in all member states. Present EC supported project fills this gap. Sharing would be more efficient, and this project is therefore cherry picking European expertise to provide the best possible European training program.

The EUTEMPE-RX project started in August 2013 and is scheduled to end 3 years later. Twelve course modules will be organized. The course modules will take place from January 2015 to April 2016. The exact dates are to be fixed, but module 1 will take place in Prague on 9 – 13 February 2015. More information can be found on our website: www.eutempe-RX.eu

Every course module will cover a series of knowledge-skills-competences (KSC) as listed in the RP174. The courses will be designed using a blended learning scheme, combining online with face-to-face teaching. Each course module will end with an assessment of achieved KSCs. A quality control system will ensure the quality of the course content, course design and course organization. The educational entrance level has been set as EQF level 7. This means the participants should have a masters in medical physics or equivalent. In addition, the participants must

have at least 2 years of experience with diagnostic or interventional radiology, either in a hospital, research institute, regulatory authority or in a company. Participants applying for the course modules will be asked for a CV and a letter of recommendation to aid in participant selection when the demand is greater than the supply. The project aims to train 20 participants per session. A business plan for sustainability will study the (economical) feasibility to repeat the modules beyond the current project duration.

Course modules will consist of an e-learning phase during which important parts of preparatory and new theoretical material will be provided to the participants. The use of a modern e-learning platform will ensure that this educational part of the module will be quality monitored and become a group experience with all participants taking active part in the learning process. This will allow for a shorter face-to-face phase, hence making the whole programme more sustainable in the long term. The course participants are expected to invest approximately 40 hours of active learning during the e-learning phase spread over several weeks and another 4 – 8 days in the face-to-face part.

The project consortium works at accreditation of the modules. Present course modules should also be a model for future courses for MPEs in radiology.

References

1. Council Directive 2013/59/EURATOM. Official Journal of the European Union, L 013, (2014)
2. Guidelines on Medical Physics Expert. European Commission. Radiation Protection 174, (2014)



Hilde Bosmans,
EFOMP Past-chair Projects
Committee

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Epinal radiotherapy accidents discovered in 2006

The realization of the difficult situation of medical physics in France.

Synthesis

The accidents that occurred at the Hospital of Epinal (France) represent one of the major radiation therapy delivery accidents observed in France. They are due to a succession of dysfunctions and human errors. Facing an unusual increase of complications observed in patients treated for a prostate cancer at hospital of Epinal, inquiries conducted during summer 2006 brought out an error in the delivered absorbed dose of more than 20% for 24 patients treated between May 2005 and August 2006. Further investigations conducted by experts and for all patients treated in the department unveiled two others incidents and led the Health Minister to withdraw the authorization of the radiotherapy department, i.e. stop the recruitment of new patients from March, 9th 2007. In total, reported incidents involved about 5000 patients over-exposed at different levels between 1987 and 2006.

The analysis of the dysfunctions that occurred in Epinal, but also those of others incidents in France (Toulouse, Lyon...) led the authorities to take measures in order to reinforce the security of radiation therapy delivery practices:

- increase of the number of Medical Physicist (MP) in radiotherapy departments,
- enforce the presence of a MP during patient treatment delivery hours,
- incite to modernize the material (MLC, EPID, etc...),
- implement the systematic use of in vivo dosimetry,
- require to dispose of a (homologated) record-and-verify system,
- implement and strengthen the culture of quality and security management,
- enforce (by law) the declaration of radiotherapy incidents to the national authority of Nuclear Safety (ASN),
- implement an annual inspection of radiotherapy department conducted by ASN, etc.

Following the complaint of 400 overexposed patients (or their family), the medical physicist, the two radiation oncologists, the hospital representatives, and direct authorities were sent before the correctional court in Paris for, in particular, homicide and involuntary injury, failure to assist a person in danger and proof subtraction. The trial took place from September 24th to October 29th 2012. At first instance, the medical physicist was sentenced to 3 years of imprisonment (with 18 months suspended) for homicide, involuntary injury and proof dissimulation. The radiation oncologists were sentenced to 4 years of imprisonment (with 30 months suspended) for homicide, involuntary injuries and failure to assist person in danger. Administrative representatives and Hospital moral person were not convicted. Condemned persons and patient's representatives appealed the decision of the court and a new trial will occur at the end of 2014.

Situation of the Epinal department before the incidents

Between 600 and 700 patients were treated every year until 2006. At that time, the department was equipped with:

- A high energy linac Clinac 2100C (Varian Medical Systems) installed in 1999, delivering 6 MV and 25 MV X-ray beams (corresponding to 23 MV elsewhere), 6 to 18 MeV electron beams. It was equipped with an 120 leaves MLC and a liquid-ion chamber based EPID
- A low energy linac Clinac 600 (Varian Medical Systems) installed in 1993 with a 6 MV X-ray beam without MLC or EPID
- A system of record and verify (R&V) developed in-house by the medical physicist. This system served also as patient's digital medical record (independent of that of the hospital) and activity report

- A Cadplan (Varian Medical Systems) treatment planning system until 2005, then replaced by the Eclipse TPS
- A classic Nucletron simulator and a 2 hours slot every week on the CT of the radiology department for treatment planning acquisitions

No brachytherapy activities were performed. The service of Epinal can be considered as representative of the majority of radiotherapy departments in France in 2006.

The staff was composed of two radiation oncologists, one medical physicist, one radiation oncologist student, eight radiation technologists, two secretaries and a technician. A second position of medical physicist had been requested for years to the hospital administration without success.

The accidents

Five events presenting degrees of different importance were identified during the investigations (see table). Until now, only event types 1 and 2 led to judiciary pursuits.

Event 1:

Error on the dynamic virtual wedge use

Until May 2004, only physical wedges were used. Then, after validation procedure with measurements performed by the physicist, Varian's dynamic wedges were used for 3D conformal treatments of prostate cancer. The error consisted in a wrong copy of the

parameter "wedge" in the R&V system compared to the wedge used in the treatment planning process. This error leads to an over-dosage between 20% and 30%: the calculations were made with conventional physical wedges, but treatment was performed with dynamic wedges. Not all the patients treated for a prostate cancer were affected by this error because some operators correctly copied the parameter in the R&V. A lack of understanding by some of the trained technologists about the new option to use dynamic wedges lead to incorrect information provided to users.

Finally 24 patients were affected by this error. At the end of 2013, 11 of these patients had died, and for 9 of them, a direct link with overexposure was evidenced. The major observed consequences were severe rectal and bladder injuries, going up to fistulae.

Event 2:

Daily positioning imaging procedure

In 2000, when starting conformal radiotherapy, weekly imaging control using EPID was used to verify patient positioning on the Clinac 2100 linac. In October 2000, daily controls were decided by radiation oncologists, consisting in a double exposure for two incidences (AP and LAT), and weekly, every beam shape was controlled.

Absorbed doses delivered by these additional controls were not deducted from daily

Table 1 : Classification of the different accidents in Epinal.

Event	Error	Patients	Period of the event	Number of death
1	Dynamic virtual wedge	24 (prostate cancer)	May 2004 to June 2005	9 direct causes, 1 indirect cause (suicide), 1 other cause
2	Daily positioning imaging procedure	409 (prostate cancer)	2000-2006	2 death
3	MU calc. error (calibration)	> 5000 (all diseases except breast)	1987 to July 2000	2 death
4	MU calc. Error (breast treatment)	8	July to August 1993	None
5	Change of practice for breast irradiation	37	February to June 1999	None

treatment doses. Due to the technology of the EPID system (liquid-filled ion chamber), 7 MU were necessary to produce double exposure images. Thus, additional absorbed doses ranged from 0.17 to 0.34 Gy per fraction (corresponding to 8% to 10% of the prescribed dose).

From April 2006, the dosimetric contribution of daily and weekly controls was taken into account and deduced at the end of the treatment by suppressing of one or two fractions. In November 2006, in order to respect radiobiologic fractionation, the contribution of absorbed doses from imaging procedures was taken into account for the calculation of monitor units, according to good practices of that time.

409 patients were concerned by this event. Some of them cumulated event types 1 and 2.

Event 3:

Monitor unit calculation error due to beam calibration procedure

Between 1987 and July 2000, for patients treated using an isocentric technique, a calculation error was introduced in the in-house MU calculations software due to the absence of a correction factor (inverse square-law) to consider the difference between the calibration distance (100 cm + D_{max}) and the treatment distance (100 cm). This error leads to an exceeding dose of 3% (1100 patients treated with 6 MV photon beams), 5.5% (3600 patients treated with 12 MV photon beams (from previous linac) and 7.1% (306 patients treated with 25 MV photon beams). Only over-dosages over 7% were considered as an accident.

Event 4:

Monitor unit calculation error in breast treatment

Eight women were treated for a breast cancer with an error in MU for the tangential beams with wedges (attenuation factor used two times) leading to over-dosages between 20% and 70%. Effects of this error were limited because irradiation concerned only the breast gland and no organ at risk were included in the beams.

Event 5:

Modification of the protocol for breast treatments

During the process of replacement of the linac with electron beams, 37 women patients had an exclusive irradiation with photons of the internal mammary node, thus leading to an increase of the dose delivered to the heart. This modification could have caused an increase in cardiac diseases in some particular cases.

Discovery of the accidents and immediate actions of public authorities for patient management

The investigations headed by the French Health Ministry and French Nuclear Safety Authority (www.french-nuclear-safety.fr) started, when facing the unusual increase of complications for patients treated for a prostate cancer at the hospital of Epinal as consequence of the errors of the delivered doses (superior up to 20% for 24 patients treated between May 2005 and August 2006)

(www.ladocumentationfrancaise.fr/var/storage/rapports-publics/074000198/0000.pdf, in French). This cohort is called Event 1 in table 1. Further investigations conducted by professional experts and on all the patients treated in the radiotherapy department by the Institute of Radioprotection and Nuclear Safety (IRSN, www.irsn.fr/EN) and the investigation service of Ministry of Health (IGAS) highlighted two new cohorts (called Event 2 and Event 3) (www.irsn.fr/FR/Actualites_presse/Communiqués_et_dossiers_de_presse/Documents/IRSN_synthese_mission_radiotherapie_epinal.pdf in French). Considering the extreme situation, the Minister of Health withdraw the permission for the radiotherapy department to treat new patients on March, 9th 2007. Patients whose treatment had started finished their treatment in Epinal, new patients were redirected to surrounding radiotherapy departments (mainly Nancy, Dijon, Colmar, ...). Radiation oncologists were suspended and the medical physicist was fired. The difference of treatment between these professionals was due to the lack of recognition of medical physicists in the French health legislation.

The hospitalization regional agency (local relay of Ministry of Health) authorized the Comprehensive Cancer Center of Nancy (Centre Alexis

Vautrin, today named Institut de Cancérologie de Lorraine) to manage the radiotherapy department of Epinal after upgrading material and practices thereby assuming the clinical operation of the service. During 10 months, medical physicists from Nancy worked to set the service according to the standard of that time (2007) with the objective to insure the highest level of security: full commissioning of the beam and material, new EPID based on amorphous silicon technology, new TPS (same as in Nancy in order to guaranty

radiation therapy department of Epinal for treatments in January 2008, first for one linac with medical physicists and radiation oncologists of Nancy (time share occupations). The second linac was replaced by a totally new one and treatments began in June 2009. In January 2013, IMRT started for prostate patients, and was then extended to intracranial, head and neck and pelvic localizations. The service is now fully operational and treats around 630 patients per year.

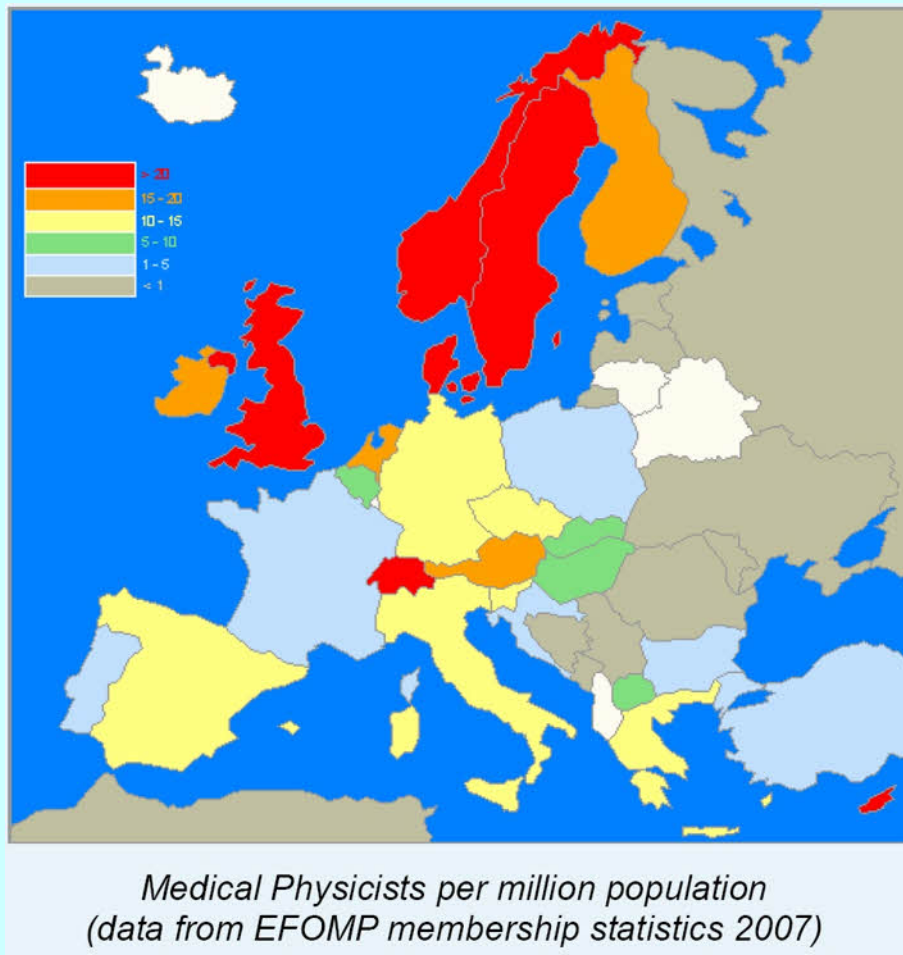


Figure 1 : Situation of Medical Physicists population in 2007 (EFOMP document)

a perfect knowledge of the team), installation of a commercial and normalized R&V totally connected to the linac, installation of a CBCT simulator (bought before the stop of the service). In order to avoid the past isolated situation of the service (as isolation had been identified as one of the causes of the accident), operational and organizational procedures were reproduced from Nancy (with slight adaptations when needed). Technologists from Epinal hospital came to Nancy to absorb the sudden increase of patients (400 over 2007) and mainly to be familiar with the new procedures they would have to reproduce in Epinal. These actions allowed the re-opening of the

Evolution of the regulation and practices

National regulation for the practice of medical physics in France was developed quite recently. Thus, before the discovery of Epinal's accident, and to a lesser extent, the Toulouse incident (error on delivered dose for radiosurgery treatments), the first regulatory action defining the mission and the training of medical physicists was a ministerial order published in November 2004. Before that date, medical physicists were facing a gap in the law regarding their missions and their responsibilities. The ministerial order defined the missions of the medical physicist as:

"The person specialized in medical physics makes sure that equipment, data and processes of calculation used to determine and deliver doses and administered activities to the patient in any procedure of exposure in ionizing radiations are suited [...]; in particular, in radiation therapy, he/she guarantees that the dose of radiation received by tissues being the object of the exposure corresponds to that prescribed by the doctor applicant. Furthermore, he/she contributes to the estimation of the dose received by the patient during the diagnostic procedures [...]". This notion of guarantee of the received dose, and not the delivered (or to be delivered) is strong and is still subject to debate in the profession. Nevertheless it has the merit to place the medical physicist at the heart of the process of the patient treatment in radiotherapy. In article #6 of the order, is mentioned: "In external radiotherapy services, a person specialized in medical physics must be present during the delivery of radiation dose to patients". In the absence of staffing regulation, this allowed to increase the number of MP in the clinical services and then fill the huge lack of specialists (less than five MP per million population in 2007, see figure 1).

A second text exists since 2007 to impose the validation of every preparation of treatment (including internal radiotherapy) by the medical physicist and the radiation oncologist.

Following the Epinal and Toulouse accidents, who both had a major impact on the public opinion, public authorities took initiatives concerning the practices of the radiotherapy in particular on the conditions of exercise of the medical physicists in radiotherapy.

A national committee (CNS) was created with the mission to decide and conduct actions for radiotherapy. The CNS was in charge to set a road map of priority actions to be conducted to reinforce security and safety of practices for radiotherapy in France. In the CNS represented French institutional actors, independent vigilance institutions (ASN, IRSN ...), national federations of public and private hospitals, patient representatives and, of course, scientific societies (SFPM for medical physicists). Working themes were grouped in four topics: radiotherapy related professions, quality and security, cooperation between centers, research and development. Here are some of the most representatives actions conducted:

- **Radiotherapy related professions:** regarding the medical physics situation, based on the statement of SFPM for many years (a first alert was published in 2001) (www.sfpm.asso.fr/download/index.php?act=view&id=4), public authorities wished to increase the number of medical physicists for external radiotherapy from 380 FTE (full time equivalent) to 600 FTE on the horizon 2011 (corresponding to 10 FTE/million inhabitants). This quota was estimated to guarantee minimal conditions of security in all radiotherapy departments. But the notion of quota per machine or per technique has never been officially accepted in France until now. Efforts on dosimetry professionals were also identified
- **Quality and security:** the culture of quality management and security risk was strengthened by developing the use of a structured quality system, experience feedback... The establishments must declare every deviation that can occur during the treatment if it can't be compensated for. A guide was published by ASN for application. A dedicated website was created to publish radiation protection events involving patients (www.vigie-radiotherapie.fr/)
- **Cooperation:** Services that can't satisfy the criteria (see below) must sign a protocol of cooperation to guarantee the necessary conditions for patients treated

A system of authorization for the practice of radiotherapy based on 18 qualitative and quantitative criteria was established. Among these 18 criteria, the ones concerning medical physics are: obligation to perform *in vivo* dosimetry when technically appropriate (notion of appropriate is let to user's discretion), obligation to perform independent MU check, systematic use of a normalized R&V system for treatment delivery and recording, use of a CT scan for treatment planning, elaboration of a multi-annual training program for professionals dealing with the use of radiation therapy equipment. Furthermore, the compulsory presence of a radiation oncologist during treatment delivery was added to that of a medical physicist. From a quantitative point of view, authorization is subordinated to a minimal activity level of 600 patient treated by year in a

department, and the obligation to have a minimum of two treatment machines.

The committee started in March 2008 and was dissolved in April 2013 but some of the sub-committees are still active.

Future evolution for medical physics in France

The accident at Epinal and other places finally had a limited impact on medical physicists conditions of exercise so far, until only recently a great step was made by the announcement of the third "Plan Cancer" by the French Republic President (www.e-cancer.fr/en/le-plan-cancer). The "Plan Cancer 2014-2019" is a multi-annual multi-objective plan to govern the politics of cancer care. After many years of lobbying, and several accidents, the recognition of the profession of medical physicist has started, as the Action #4.2 specifies: *"Fully recognize the profession of medical physicist as a health profession by taking regulatory measures in the national Health Code. [...] A better definition of the roles and missions of the medical physicist will clarify their responsibilities in a multidisciplinary team and better define its direct involvement in acts of*

care. This action also follows the instructions contained in the new directive EURATOM Basic Safety Standards for Radiation Protection." The Action 4.3 is similar for recognition (and creation) of the profession of dosimetrists. The elaboration of these recognitions by law started in spring 2014 by the Ministry of Health together with professional representatives.



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MEDICAL IMAGING • PHYSIOLOGICAL MEASUREMENTS • MOLECULAR IMAGING
RADIATION PROTECTION • EDUCATION AND TRAINING IN MEDICAL PHYSICS

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HOSTED BY
THE HELLENIC ASSOCIATION
OF MEDICAL PHYSICISTS
(HAMP)



Scientific Meetings

31st August – 2nd September

Medical Physics & Engineering Conference and Biennial Radiotherapy Physics Conference 2014
Scottish Exhibition & Conference Centre,
Glasgow, UK

31 Aug - 3 Sep 2014

EPI2k14 - 13th Int'l Conference on Electronic Patient Imaging
Aarhus, Denmark

3 September 2014

ROSiS Workshop: Introduction to Patient Safety in Radiation Oncology and Radiology
Melbourne, Australia

4-5 September 2014

Annual Scientific Meeting of the British Chapter of the ISMRM
Int'l Society for Magnetic Resonance in Medicine
Edinburgh, Scotland

4-6 September 2014

Monte Carlo Methods in Radiation Therapy;
Oxford, UK

4-7 September 2014

8th Int'l Conference on 3D Radiation Dosimetry
Ystad, Sweden

7-10 September 2014

Joint Conference of the Swiss Society of Radiobiology and Medical Physics (SGSMP), the German Society of Medical Physics (DGMP) and the Austrian Society for Medical Physics
Zurich, Switzerland

9-12 September 2014

28th Int'l Congress of Radiology
Dubai, UAE

11-13 September 2014

European Conference on Medical Physics (ECMP2014); Athens, Greece Hosted by the Hellenic Association of Medical Physics (HAMP) and the European Federation of Organizations for Medical Physics (EFOMP)
Athens, Greece

14-17 September 2014

ASTRO 56th Annual Meeting
San Francisco, CA USA

21-24 September 2014

Symposium on Positron Emission Tomography;
Kraków, Poland

22-23 October 2014

British Institute of Radiology Annual Congress
London, UK

8-15 November 2014

2014 IEEE Nuclear Science Symposium and Medical Imaging Conference
Seattle (WA), USA

30 Nov- 5 Dec 2014

RSNA Annual Meeting
Chicago USA
Info: rsna.org/

21-26 February 2015

SPIE Medical Imaging Conference
Orlando, FL USA

25-29 May 2015

15th Int'l Congress of Radiation Research (ICRR 2015)
Kyoto, Japan

28-30 May 2015

SIIM Annual Meeting
Society for Imaging Informatics in Medicine (SIIM)
Washington DC USA

7-12 June 2015

World Congress on Medical Physics & Biomedical Engineering
Int'l Union for Physical & Engineering Sciences in Medicine (IUPESM)
Toronto, Canada

12-16 July 2015

AAPM 57th Annual Meeting
Anaheim, CA USA

28 June - 3 July 2015

Information Processing in Medical Imaging (IPMI 2015)
24th biennial int'l conference
Isle of Skye, Scotland, UK

9-16 May 2016

4th International Congress of IRPA
Int'l Radiation Protection Association
Cape Town, South Africa

31 July - 4 Aug 2016

AAPM 58th Annual Meeting
Washington, DC USA