IMAGING
Management

Promoting Management and Leadership in Medical Imaging

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PATIENT ACCESS TO MEDICAL IMAGING

Key Barriers to Technology & Services

- Managing an Interdisciplinary Team
- Leading a Breast Cancer Screening Programme
- PET/CT: European Market Overview
- Country Focus: Finland

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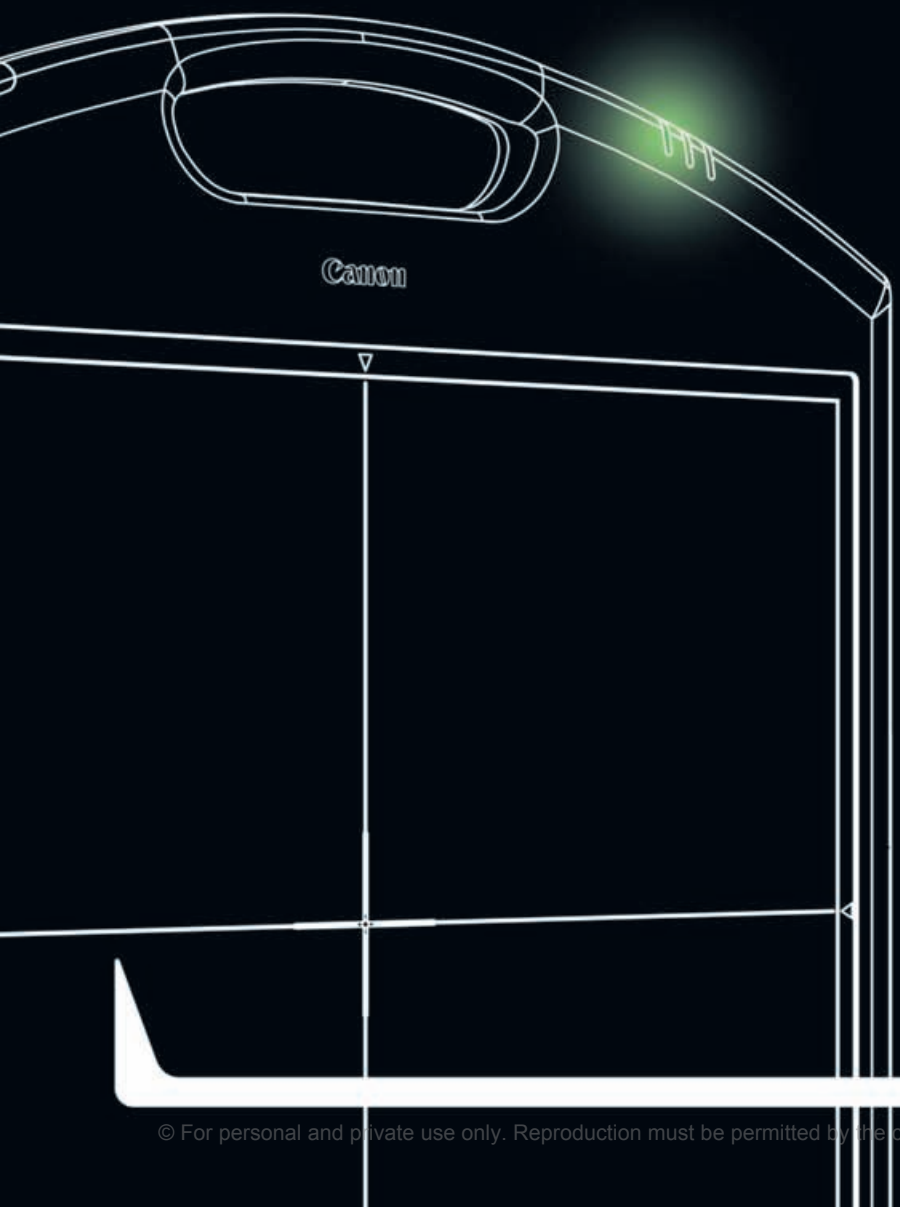

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Dear Readers,

This edition explores the theme of access to imaging in different health systems across the globe. Many issues, including geography, availability of technology, staffing levels, referral patterns, financial support and the clinical effectiveness of the procedures, affect access to medical imaging, and healthcare in general.

For example, in countries with a large land mass and a relatively small population, provision of imaging services poses a significant structural challenge in terms of technology and staff. In Europe, this has been a particular issue in Scandinavia, and has been partly resolved by teleradiology networks linked to a main imaging centre for more routine work. For more complex studies, the patient must still travel to the nearest main imaging centre. These systems can also require a relative underuse of more expensive imaging units and are thus less cost-effective. By contrast, in high population density areas, technology and staff tend to be immediately available and cost-effectively utilised. However, sheer volume of demand may limit access if sufficient staff and equipment is not available. This results in long waiting times for imaging and inevitably leads to a reduced quality of service, clinical outcome and increased expenditure in other areas of the system.

Access to imaging may be restricted by financial healthcare structures, if universal insurance schemes or national health systems do not provide care that is predominantly free at the point of delivery. The cost to the individual patient of high technology imaging is usually prohibitive unless it is externally funded and in many countries such arrangements may either not be in place or a proportion of the population do not have access to them. Where such funding does exist, the provision of high-quality imaging is enhanced by the use of a tariff or fee for service, which allows demand to be met by more investment in the service. In systems where there is no basis for service level costing or direct income, imaging services are seen as an expensive item and often not funded in a way that allows delivery of high quality and good access.

Many health economies are now using referral or appropriateness guidelines to manage access to imaging services, focusing on the right examination for the right clinical situation. This is an eminently sensible approach, which focuses on clinical effectiveness and uses all imaging systems to the best and most cost-effective advantage. It is, however, important that the referrers understand and use these guidelines and that the imaging departments ensure that inappropriate referrals are redirected to the correct imaging system or rejected.

This edition explores access to imaging services in different countries, all of which are affected by one or other of the limitations outlined. There is no individual simple solution, but a focus on clinical pathways and appropriateness of examinations supported by finance directly related to activity will go a long way to ensuring adequate access to imaging.

Please send your feedback to editorial@imagingmanagement.org.

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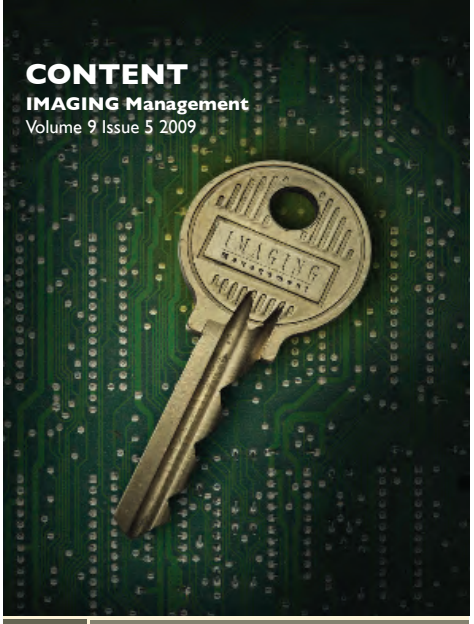

14 Patient Access to Medical Imaging Technology & Services

Every patient's right to equal and standardised care in medical imaging should be a given. However, commonly, a variety of economic, social and geographic factors bar access to radiological exams and treatments. Our cover story in this issue addresses these different barriers. Thus, we compare and contrast referral guidelines in the UK and the U.S., take a look at some rather unique geographic obstacles in Australia, New Zealand and the South Pacific, and examine the role that defensive medicine plays in excluding those without adequate healthcare coverage in the U.S. Finally, we look at how the huge leap in technologic advances in medical imaging could put certain treatments out of reach of patients.

37 Interdisciplinary Management in a Radiation Oncology Dept.

In this article, Dr. Legrand discusses the challenges unique to managing a radiation oncology department and gives her advice on, for example, leading a diverse group of employees. She also presents the three cardinal rules that any manager of an interdisciplinary team can use to improve synergies between the different groups in an interdisciplinary team. This article will inform on potential pitfalls for a radiation oncology department and provides a number of approaches to break down the barriers between the sections within the department.

Cover Story

Patient Access to Medical Imaging

Healthcare Economics

Features

Imaging Leaders

Country Focus

Finland

In Every Issue

40 Interview with Prof. Hedvig Hricak

Interview with Prof. Hedvig Hricak, Chairman of the Department of Radiology and Carroll and Milton Chair in Radiology at the Memorial Sloan-Kettering Cancer Centre in New York.

42 Country Focus: Radiology in Finland

Finland has an interesting, and very democratic healthcare system, that is largely reliant on public sector activities. Its private sector consists of small health centres and some specialised hospitals mainly concentrated in cities. This section provides a concise overview of the main health indicators in the country, and interviews leading Finnish radiologist and management enthusiast, Prof. Seppo Soimakallio, who shares his insights into life as a radiology Chairman at Tampere University in Finland. He also shares information about the education of radiologists in Finland and the high demand for MR and interventional procedures and how these are managed.

NETWORKING AWARDS 2009 REVIEW

On October 29-30 European healthcare IT professionals joined together at Square in Brussels for the first *IT @ Networking Awards (IT @ 2009)*, a unique event which shone a much needed spotlight on healthcare IT innovations and solutions. The stakes were high: An unrivalled cash prize of 5000 euros as well as the coveted *IT @ 2009* trophy and extensive press coverage in Europe's leading healthcare management journals for the winning project. With 78 submitted projects this event was a resounding success. The top 23 nominees were selected to present their MINDBYTE presentations on the first of this two day event.

The organisers- the European Association of Healthcare IT Managers (HITM) and the European Association of Hospital Managers (EAHM) created *IT @ 2009* on the basis that there was a lack of recognition of the innovators of healthcare IT on a pan-European level. They also believe that healthcare professionals who use IT solutions on a daily basis are best placed to judge the value of new projects.

EU Commissioner Viviane Reding

Unifying Healthcare IT Across Europe

The healthcare IT industry is not immune to the effects of rapid globalisation and emerging competition from China and India. The US is also reengaging itself in the industry despite current economic downturn. Christian Marolt, Secretary-General of HITM addressed this important issue in his opening address. He stressed the need for Europe to collaborate – to join together, not only to survive in healthcare IT for the years to follow – but to lead. Secretary-General of EAHM, Willy Heuschen stressed the core importance of healthcare IT and innovation for hospital managers.

Willy Heuschen, EAHM

EU Commissioner for Information Society and Media, Viviane Reding gave an inspiring e-address, in which she emphasised the importance of utilising IT in healthcare given the current financial crisis and issues of cross-border patient care throughout Europe. She applauded the efforts of the organisers and participants of *IT @ 2009* in furthering development and deployment of innovative e-health solutions.

Entertaining Networking Opportunities

Delegates gathered at the Grand Casino Brussels to celebrate the finalists from the first day of competition and to network with healthcare IT colleagues from across the continent. *IT @ 2009* participants, organisers and corporate sponsors were treated to drinks and canapés and a lively demonstration of black jack and roulette at the Casino's Cotton Club. The evening culminated in the draw for the order of presentations in the final WORKBENCH sessions.

Electronic Voting System

As *IT @ 2009* believes in peer to peer voting, the winning project was chosen not by the usual panel of expert judges, but by the audience of hospital CEOs, CIOs, CMIOs and hospital and healthcare IT managers. This was made possible thanks to a state-of-the-art electronic voting system. After each presentation the audience decided whether or not the presentation fulfilled the outlined criteria by pressing the relevant button on their personal keypads.

AND THE WINNERS ARE...


Winners: Kaarina Tanttu, Emile Knops, Dr. Pierre Biron and Bert Verdonck

The Winning Project

Dr. Biron from the Centre Léon Bérard in Lyon was awarded first prize. He and his team showcased the SISRA Health Information System and DPPR Shared and Distributed Patient Record, which have been implemented in the Rhône-Alpes region of France.

SISRA is a unique data capture and storage network built and reinforced with a strong identification access feature- allowing only patient and professional health ID cards clearance. Patient information is available securely and confidentially when and where needed –allowing patients to remain the gatekeepers of their own personal records.

Second Place

Digitisation of the Nationwide Breast Cancer Screening Programme in The Netherlands (presented by Bert Verdonck)

The National Institute for Public Health and the Environment (RIVM) provides a free nationwide breast cancer screening service for all women between 50 and 75 years of age. This programme is now digitised and referred to as DigiBOB. The service allows radiologists to access new and historical patient data, including multiple mammograms, in seconds. It claims to be the first digitised programme of its kind in the world.

Dr Pierre Biron receiving his prize

Third Place

From Free Text to Standardised Language – The National Development Project of Nursing Documentation in Finland" (presented by Kaarina Tanttu).

The Nursing Minimum Data Set (NMDS) is a part of the core data elements of national EHR. The national nursing documentation model and the Finnish Care Classification (FinnCC) were developed in the national nursing documentation project 2005-2008. NMDS and FinCC were integrated during 2005-2007 into 8 health recording systems in 33 healthcare organisations. As a result, the quality of nursing documentation is more uniform.

Looking Forward

Both HITM and the EAHM were overwhelmed by the positive response and look forward to an even more successful *IT @ Networking* next year. As HITM Secretary General, Christian Marolt stated, "It is clear that here in Europe, we also have outstanding healthcare IT jewels. As a non-profit body, we are doing whatever we can to get these innovations recognised globally. EU opinion leaders, politicians and policy makers also need to show their support, just like their counterparts in the US."

IT @ Networking 2010 promises to be bigger and better with more groundbreaking innovations and networking opportunities. See you in Brussels in October 2010! More details to follow.

EU News

European Partnership for Action Against Cancer

The European Commission is launching a European Partnership for Action Against Cancer, planned for 2009 - 2013 to support Member States and other stakeholders in their efforts to tackle cancer more efficiently by providing a framework for identifying and sharing information, capacity and expertise in cancer prevention and control. It aims to engage a wide range of stakeholders across the EU with a common commitment to addressing cancer and to avoid scattered actions and duplication of efforts, and contribute to better use of limited resources available. By the end of the partnership, the objective is for all Member States to have integrated cancer plans. The long-term aim set out by the communication is to reduce cancer by 15% by 2020.

Work of the Partnership

The adopted "Communication Action Against Cancer: European Partnership" broadly sets out the objectives for the European Partnership for Action Against Cancer. It is intended that the partnership will itself determine its own key areas and actions. Identified possible key areas and actions to be further taken forward by the partnership include:

- Prevention (health promotion and early detection);
- Identification and promotion of good practice in cancer-related healthcare;
- Priorities for cancer research, and
- Health information, collection and analysis of comparable data.

The work of the partnership is proposed to be undertaken in multi-stakeholder working groups (based on the four areas of action, identified above), which will either undertake the identified areas of work directly or monitor work to be conducted by outside actors, institutions or organisations, as appropriate. A steering group will coordinate the activities of the stakeholder working groups, which will report to the partnership secretariat and during an annual open forum.

In order to take forward these identified areas and actions, the partnership will be based on a specific joint action supported by the health programme. Joint action is a specific mechanism established under the health programme and refers to activities carried out by the Community and Member States or competent authorities. In addition, through the health programme, the Commission aims to provide additional technical support, including administrative and scientific support, to the stakeholder working groups.

Parliamentary Campaign to Safeguard Future Use of fMRI

Two leading MEPs, together with prominent healthcare professionals and leading European patient groups will launch a Parliamentary campaign to safeguard the future use of fMRI scanners. In early 2010 the European Parliament and Council will be sent a proposal from the European Commission to amend Directive 2004/40/EC on electromagnetic fields. This revision is as a result of the concerns raised by the Alliance for MRI and recognition by the EU institutions that the Directive severely curtails the use of MRI to the detriment of patients in Europe.

Founding members of the Alliance for MRI, the European Society of Radiology (ESR) and the European Federation of Neurological Associations (EFNA), will call on members of the newly elected European Parliament to support a derogation for all uses of MRI from the exposure limits set in the EU Physical Agents Directive 2004/40/EC (EMF).

The exposure limits in the Directive have now been proven to be detrimental to patient care, most notably restricting and limiting the use of MRI in interventional applications and in imaging vulnerable patients and children where closer patient contact is required. Furthermore, new research and developments in MRI will be severely restricted as will routine cleaning and maintenance of MRI equipment.

European Commission Tackles Health Inequalities

Despite increased prosperity and overall improvements in European health, differences between and within countries persist and in some cases are increasing. The European Commission has therefore announced a series of actions to help tackle gaps in health between and within countries in the EU. Differences in life expectancy at birth between Member States are up to eight years for women and 14 years for men.

The reasons are complex and involve a wide range of factors from income, education, living and working conditions, health behaviours to access to healthcare. A possible consequence of the current financial crisis is that this health gap will increase in the groups most hit by the recession such as the unemployed. The Commission initiative identifies action for improving knowledge on this issue, better monitoring and data collection and more assessment of how EU policies can tackle health inequalities and work with countries, regions and stakeholders.

"I want to see a Europe where everyone has the opportunity to enjoy a high level of health, regardless of where they live or their social or ethnic background. Today, we have recognised that health inequalities need to be tackled. This requires a cross-sectoral policy approach at EU, national, regional and local levels," said Androulla Vassiliou, EU Commissioner for Health. The EU Commissioner for Employment, Social Affairs and Equal Opportunities, Vladimir Spidla adds: "It is vital that the EU plays its role in protecting the health of the whole population, but particularly the most vulnerable".

Action on Health Inequalities

Closing health gaps means helping those regions and populations with less good health to make faster improvements in order catch up. This requires that more attention is given to the needs of less advantaged people - for example in the provision of health services, the design of health promotion and protection activities, or improvements in living and working conditions.

The EU will support Member States and stakeholders to identify what works best and how to put this into practice. It will produce regular statistics and reporting on the size of inequalities in the EU and on successful strategies to reduce them. It will strengthen its procedures to evaluate the impact of its policies on health inequalities and help reduce them where possible. It will help countries to use EU funds to improve the health of the worst off and narrow health gaps between regions – such as primary care facilities, water and sanitation and housing renewal. A first report on progress will be produced in 2012.

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Inequalities Found in all EU Countries

Inequalities in health are found in all EU countries, and between them. For example, infant mortality ranges from around three per 1000 live births to more than 10 per 1000. Huge differences in health also exist between social groups across the EU and within Member States. People with a lower level of education, a lower occupational class or a lower level of income, tend to die at a younger age and to have a higher prevalence of most types of health problems.

Many of these differences are due to avoidable factors such as negative impacts on health of social and economic conditions, quality of work, environment quality and quantity of social and health service provision, as well as health related behaviours such as smoking, drinking and poor or inadequate diet.

Together for Health Strategy

Reducing inequalities in health is a key action in the Commission's health strategy, called 'Together for Health'. An EU expert group on social determinants and health inequalities, established in 2006, has been examining the issue and provided important input into the development of today's Solidarity in Health initiative. From February to April 2009, an open consultation on tackling inequalities in health was carried out. The results of the consultation also contributed to this initiative. The Community health programme also co-funds several projects in the field of reducing inequalities in health. Through the Open Method of Coordination on Social Protection and Social Inclusion EU Member States have committed themselves to reducing inequalities in access to healthcare and health outcome.

Further Reading

- http://ec.europa.eu/health/ph_determinants/socio_economics/socio_economics_en.htm
- http://ec.europa.eu/health/ph_determinants/socio_economics/documents/com2009_background_en.pdf

EU Criticised Over Online Medicines

European politicians are criticising the EU's decision not to legislate against online pharmacies, claiming that it is a huge omission in the plans to combat counterfeit medicines. German MEP Jorgo Chatzimarkakis, said that the online trade in fake medicines is a growing illegal business that needs to be addressed.

The EU 'pharma package' of legislation unveiled in December 2008 in Brussels, focused on three priority areas including protecting the European market from counterfeit medicines, improving pharmacovigilance to reduce the adverse effects of medicine and improving information for patients on prescription medicines.

The World Health Organisation say that 80% of counterfeit medicines come from the internet but the directive failed to mention how to combat the sale of counterfeit drugs online.

For more information, please visit
http://ec.europa.eu/enterprise/pharmaceuticals/pharmacos/pharmpack_en.htm

Commission Launches Youth Health Initiative

The initiative, launched by European Commissioner for Health Androulla Vassiliou, encourages more young people to become actively involved in developing EU health policies. It was kick-started with a conference on youth health in Brussels in July allowing over 200 young people to meet with policymakers and health organisations and debate key health issues with them. Topics included alcohol, tobacco, drugs, mental health and physical activity and the financial crisis, inequalities in health, education and the role of the media.

Ms. Vassiliou said: "Even though the health of young people in Europe is better than it has ever been, there are worrying signs that far too many young people adopt behaviours which, in the long term, will reduce their ability to lead healthy and productive lives, thus endangering their future. My aim is to motivate the youth of today to care about their health, engage with policymakers and speak out on health matters."

The aims of the Youth Health Initiative are to involve young people more closely in EU health policies, strengthen youth partnership in the decision making process, involve other sectors across EU policy areas and at national level on the implementation of prevention programmes targeted at young people and support Member States' activities on the health of young people.

For more information, please visit
http://health.europa.eu/youth

Research Update

HYPERImage Project Advances Research on Hybrid PET/MR Scanner

Philips, one of eight partners in the European Union-funded HYPERImage research project, has announced that the project has achieved a major milestone in its plan to create hybrid PET/MR imaging. This new technique is based on the simultaneous acquisition of time-of-flight PET and MR images.

That milestone is the development of a functional gamma-ray detector that meets the performance requirements of the latest time-of-flight PET scanners. The new gamma-ray detectors have been designed to be compatible with the strong static and dynamic magnetic fields that would be present in a combined PET/MR scanner. Furthermore, the team has achieved major progress with respect to MRI-based static and dynamic PET attenuation correction.

The project involves eight partners from six European countries and has a total budget of around seven million euros. The ultimate goals of the project are to advance the accuracy of diagnostic imaging in cardiology and oncology and open up new fields in therapy planning, guidance and response monitoring.

A hybrid PET/MR scanner could simultaneously deliver the anatomical and functional information achievable using state-of-the-art MR scanners (e.g. soft tissue contrast and physiological processes in blood vessels) and the molecular imaging information provided by PET. As a result, it would combine the best of both worlds, which could ultimately help to pinpoint and characterise disease sites within the body more accurately than is currently possible.

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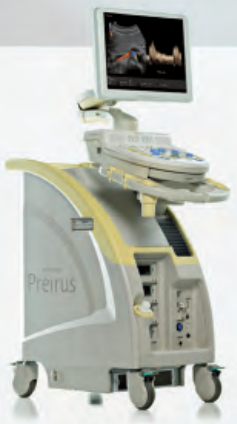

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CORPORATE UPDATE

Codonics Introduce New Server

Codonics has introduced a new line of medical image servers known as the Infinity Medical Image Server. It reports that all Infinity models provide flexibility for permanent and temporary storage of DICOM images, reports and raw data in a compact unit. The design grows as client's storage needs increase. Additionally, Infinity provides optional web viewing capabilities so medical images can be accessed over the network from any PC.

Baumgartner Joins Carestream Board Of Directors

Robert V. Baumgartner, Chief Executive Officer (CEO), Centre for Diagnostic Imaging, Inc., recently joined the Board of Directors of Carestream Health, Inc., and was elected to the Board's Audit & Compliance Committee. The Centre for Diagnostic Imaging (CDI), based in Minneapolis, Minn., is a national network of freestanding medical imaging centres that offers a full range of diagnostic imaging, diagnostic and therapeutic injections and interventional radiology services.

Prior to joining CDI in 2001, Baumgartner served in a range of executive positions, including CEO and Director of American Coating International; President and CEO of First Solar and President of Apogee Auto Glass Group. He holds a Bachelor of Business Administration degree from the University of Notre Dame and is a Certified Public Accountant.

Siemens Install MRI System

A new MRI suite has been developed from a disused ambulance bay at St. Margaret's Hospital, part of The Princess Alexandra Hospital NHS Trust in Essex. Siemens Healthcare managed the design and build of the suite to utilise limited space for a recently ordered MAGNETOM® ESSENZA MRI. This is the second UK installation of the ESSENZA system.

The design and construction of the building was overseen by Siemens, who worked closely throughout the development with specialist pre installation company Genesis Medical and surveyors McNaughts, to ensure it was completed within a 15 week time frame. The ESSENZA will complement an existing MRI system in place at the Trust, to help expand the Trust's MRI service capacity. It will be used for all routine non-contrast scanning to enable the acute hospital site to treat more complex and urgent cases.

Sectra Continues Middle Eastern Expansion

Sectra has signed a distribution agreement with Emitac Healthcare, a leading medical technology company in the United Arab Emirates and Qatar. The agreement is a continuation of the company's expansion in the Middle East, where a partnership was recently established in Saudi Arabia. Emitac Healthcare represents several recognised manufacturers of a broad range of technologically advanced medical and IT equipment. Through this partnership, Emitac Healthcare will become a distributor of Sectra's medical systems in the United Arab Emirates and Qatar. Together, the United Arab Emirates and Qatar have a population of approximately six million and the modernisation of the healthcare market is progressing rapidly.

Medtronic Launch New MRI Neuroimaging System

At the recent annual Congress of Neurological Surgeons (CNS), Medtronic announced the "Conformité Européen" (CE) mark and international launch of the PoleStar® N30 Surgical MRI system, the latest in neuro-oncology surgical solutions. The PoleStar N30 System has been submitted to the U.S. Food and Drug Administration for approval.

Providing real-time imaging in the operating room (OR), the PoleStar Surgical MRI provides surgeons with targeting and navigational accuracy despite the anatomy movement that may occur during a procedure. With intra-operative imaging information, neurosurgeons have more confidence to achieve maximum tumour resection, while avoiding critical areas of the brain. Use of the PoleStar system may also reduce the need for revision surgeries and the length of stay at the hospital for the patient.

ASSOCIATION NEWS

Winter Management Workshop – Scientific Programme Details Released

The planned agenda for the forthcoming Management in Radiology (MIR) Winter Course, taking place in Schladming, Austria from 14 - 16 January 2010, has been announced. The intensive workshop is coordinated with assistance from highly experienced leadership trainers from GE Healthcare who have worked with the MIR group over the last two years.

Training Approach

Three half-day sessions will be held with the following focus:

1. Influencing Skills in Healthcare Settings

From regular staff meetings to formal presentations to chance hallway encounters, healthcare leaders need the support of their teams, colleagues, and partners across all levels to successfully drive improvement. This session will focus on influence and persuasion techniques with a mix of theory, discussion and practice on topics including:

- Emotionally intelligent persuasion and interaction styles;
- Limbic messaging;
- Values-driven storytelling and elevator speeches;
- Building networks, and
- Mutual benefit business cases.

2. Working to Your Individual Strengths

Using a self-scored assessment, this session reviews and discusses key identified personal strengths and how you can maximise and develop them further. It also aims to examine strategies for unleashing further strengths and techniques for recognising and harnessing the strengths of your team or organisation.

Hitachi Launch OASIS Open MRI System in Europe

Revolutionary Design Offers Accessible & Accurate Exam Power

OASIS Marks First European Installation

Hitachi Medical Systems Europe/Hitachi Medical Corporation's OASIS scanner is well-established in the U.S. and Japanese markets, where its installations are already providing comfortable, accessible and powerfully clear scans of patients there. With the recent installation at a private radiology clinic in Paderborn, Germany, Hitachi brings its proprietary technology to Europe, where the company has been very active in assembling the support staff to execute installations and training.

Dr. Carsten Figge, a diagnostic radiologist working at the Paderborn imaging centre, explains why the OASIS system works for them. *"Patient comfort focus during the examination was a key requirement for us and patient positioning when doing exams of joints in open MRI is much easier and more comfortable in comparison to horizontal bore"*. As Dr. Figge states, the OASIS design recognises that *"A relaxed patient results in an easier examination and therefore less recalls due to motion artefacts during scanning."*

Revolutionary Technology is Unparalleled

Dr. Figge pinpoints a few main reasons why the OASIS system is unparalleled: *"We want to differentiate from other private clinics or surrounding hospitals by choosing an open system and going for patient comfort without compromising diagnostic image quality."*

He again lauds the ease with which any difficult to scan patient can benefit from the safe and accurate MRI exam: *"Being able to provide a good MRI experience to all patients referred to our clinic, the elderly, the adipose, children, and even claustrophobics, means that there are no exclusions"*.

Finally, the vertical field MRI technology and dedicated coil technology from Hitachi has a very good S/N ratio in comparison to horizontal bore systems. In combination with optimal positioning of the target organ in the iso-centre of the magnet, it provides excellent image quality.

What is "OASIS"?

OASIS is the most powerful patient-friendly whole-body high field open MRI system on the market. The unique two-pillar asymmetric gantry design provides the best patient experience in terms of MRI comfort. The vertical field magnet with iron core technology in combination with the newest gradient and RF technology guarantees unmatched image quality throughout all applications. The easy to use operating system and extremely fast image reconstruction engine ensures high patient throughput. The unique open architecture not only meets the current requirements of patients regarding comfort, but also gives access to patients previously not suitable for conventional MRI scans.

The Patient Experience

Says Dr. Figge, *"In my experience, patients prefer the open aspect of this MRI system in compare to a horizontal cylindrical bore system, especially the elderly and children who benefit most from the open structure of the OASIS. Both visual and eventually even physical contact can be maintained during the scanning procedure, reassuring them that caregivers or parents are close."*

"Recently, we were able to use our new scanner to perform an exam on a girl of four years old without any sedation - the fact that her mother could sit next to her and have eye contact was enough to reassure the child that no scary things would happen to her."

Other European sites are slated for installation in 2010, with the company's patient-focused machine set to attract greater numbers of customers – particularly those who have previously been put off by the restrictive nature of traditional, cylindrical MRI scanners.

Advantages of the OASIS

Hitachi`s OASIS is a unique product that combines high-field clinical capability, image quality and throughput with a superior patient experience, which only a truly open MRI environment enables. The key advantages include:

- **OASIS has the highest field strength in open MRI on the market:** Vertical 1.2 Tesla field strength provides comparable image quality with high-end 1.5T horizontal bore MRI technology.
- **The Hitachi OASIS system offers superior imaging capabilities:** Not only does it image difficult groups such as children or obese patients, but it facilitates certain interventions during the scan, such as catheterisation.
- **It covers the following applications:** Neurology, vascular, whole body, and orthopaedics.
- **Faster throughput:** The open system allows for the possibility of shortened exam times in traditionally challenging groups of patients. This is a major advantage for radiologists under pressure to perform greater numbers of MRI exams in shorter times.
- **This is novel Hitachi technology:** The OASIS open MRI system provides 1.2T of field strength. Image quality is increased – aside from its 1.2T magnetic strength, it offers a finely tuned software tool to filter out unwanted movement and noise artefacts.
- **Patient needs are at the heart of its design:** This MRI system is designed around the patient's needs – for example, for patients that do not fit comfortably, or who would otherwise not have access to a traditional, cylindrical MRI system, this vertical and open machine is accessible to large or particularly tall individuals.

Visit: **www.hitachi-medical-systems.eu** to learn more about OASIS.

3. Coaching, Mentoring, and Feedback
This session will introduce key concepts and approaches to these critical practices for leading and maximising team performance. It will explore how to identify and act on feedback opportunities, and provide models and guidelines for successful coaching conversations and mentoring relationships, including how to support other managers in handling difficult feedback situations. With a range of role-playing and interactive activities, participants will have the time to practice these techniques in a safe environment and consider how to apply them to their individual settings.

For more information or to register, please go to **www.mir-online.org.**

CARS Congress 2010 Announced

The CARS Congress Organising Committee invites you to be part of their congress which will be held in Geneva, Switzerland from 23 – 26 June, 2010. The congress is aimed at those who work in the fields of radiology, surgery, engineering, informatics and/or healthcare management and have an interest in topics, such as

- Image guided interventions;
- Medical imaging;
- Image processing and visualisation;
- Computer aided diagnosis;
- Surgical simulation;
- Surgical navigation and robotics;
- Model-guided therapy, and
- Personalised medicine.

New PACS applications, including IT infrastructures adapted for surgery as well as related results from the DICOM and IHE working groups are also within the scope of CARS. Recent successful CARS congresses have taken place in Berlin, Paris, Tokyo, San Francisco, London, Chicago, Osaka and Barcelona. The congress will be held in conjunction with the annual meetings of ISCAS, EuroPACS, CAR, CAD and CMI societies. Please note that the deadline for paper and abstract submissions for CARS 2010 in Geneva is January 11, 2010.

Further information is available at: **www.cars-int.org**

Interventional Oncology Congress Announced: Save the Date!

In order to cater to the growing number of interventionists involved in oncology, the CIRSE Foundation is organising its second European Conference on Interventional Oncology (ECIO): ECIO 2010 will thus take place on April 21 - 24, 2010 in Florence, Italy. The scientific programme has been further expanded with respect to the 2008 edition, in view of the growing number of novel clinical applications and the many innovative techniques that have been recently introduced. Conference attendees will have the opportunity to choose from several special focus sessions and workshops covering the entire spectrum of oncologic interventions.

Leading experts from around the world will present both well-established and new therapies within this exciting and rapidly evolving field. In response to the increasing role of imaging techniques in proper patient selection, tumour targeting and treatment monitoring, the conference will feature newly introduced special sessions focused on advances in cancer imaging.

Further information is available at: **www.cirse.org.**

ECRI Institute Release Forecast on Lung Cancer Vaccines

In one to three years, new therapeutic vaccines could change standard treatment regimens for the most commonly diagnosed lung cancer - nonsmall cell lung cancer. Therapeutic cancer vaccines (TCVs), currently in late-phase clinical trials, may be introduced as adjuvant therapy that reduces undesirable side effects caused by toxic radiation and chemotherapy, according to a recent Health Technology Forecast released by ECRI Institute®, an independent, nonprofit organisation that researches the best approaches to improving patient care.

The vaccines, which could be considered "personalised medicine," are designed to stimulate the body's natural defenses against cancer. By attacking proteins and molecules associated with cancer development, TCVs have the potential to shrink tumours and slow their growth. ECRI Institute reviewed preliminary results from ongoing trials released by four vaccine manufacturers in its report, "Therapeutic Vaccines for Lung Cancer©." If those preliminary results are upheld in ongoing phase III trials and eventually result in approval by the U.S. Food and Drug Administration, ECRI Institute researchers anticipate that TCVs will be widely implemented into lung cancer treatment programmes.

Further information is available at: **www.ecri.org**

IHE to Showcase at World of Health IT Conference

Creating an interoperable health information architecture enabling access by patients and authorised doctors to patient data at the point of care is a key focus for Europe. Integrating the Healthcare Enterprise (IHE) plays a major role in facilitating access to and sharing of patient information, thereby enhancing patient safety and eliminating the cost of modifying the connection between each system to share the data. At the World of Health IT Conference & Exhibition, taking place during eHealth week 2010 in Barcelona from 15 - 18 March 2010, the IHE interoperability showcase will demonstrate how IHE-based electronic patient records work in an ambulatory care setting.

IHE is a joint initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. Systems developed in accordance with IHE communicate with one another better, are easier to implement, and enable care providers to use information more effectively. The benefits for professionals of an easier access to patient-related information are enormous. Healthcare information on a particular patient can be accessed at any moment, no matter whether it was generated in a primary care centre, a hospital or a private physician's practice.

More information is available at: **www.ihe-europe.net.**

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Further information will be soon
available on **www.mir-online.org.**

MIR is a subcommittee of ESR.

THE IMPACT OF GEOGRAPHIC BARRIERS TO PATIENT ACCESS

Australia, New Zealand and the South Pacific

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Providing an effective, comprehensive radiology service to any given community means taking into consideration many factors, not the least of which are the geographical challenges involved. Within the Australia, New Zealand and Pacific Island area, these challenges are very significant and require creative and innovative solutions by the radiologists and technologists, but particularly by managers and department administrators.

Access to Medical Imaging: Australia

In considering the management of medical imaging services in Australia, it may be helpful to begin with an overview of how these services are structured within the Australian healthcare system, given that the country has a population of 21 million people, with most situated around the fringe of an island continent larger than the United States or Europe, with a largely uninhabited interior.

Medical imaging services are provided either by public, hospital-based facilities (government-funded and managed) or by private providers. Australia spends 8.8% of GDP on healthcare compared with Germany (10.7%) and the UK (8.2%) (2005). Public hospitals generally provide high-level care including transplant services, in addition to Accident and Emergency (A&E) facilities, which can include air retrieval by helicopter or in association with the Royal Flying Doctor Service from more remote areas. Funding of public hospitals comes from the national government via state governments who manage the services and facilities locally, Australia having six states and two territories.

Patients undergoing imaging services in public facilities pay no fees, but gaining access other than in an emergency can be lengthy. Private radiology accounts for more than 60% of imaging services provided nationally, and whilst fees for these examinations are subsidised by the national Medicare rebate scheme, patients are usually required to make a co-payment, which can be significant in the case of CT or MRI examinations. The government is usually very reluctant to increase their rebates even in line with cost of living increases. It is anticipated that this situation will get worse with the current global financial crisis.

Private radiology is carried out at dedicated outpatient clinics as well as in private hospitals. The range of services /modalities in the private sector equals or even exceeds that in the public system with the latest technology readily available including multi-slice CT, 3T MRI, PET and SPECT/CT, coronary and general angiography, digital mammography, 4D ultrasound and DR and CR general radiography. PACS is now very commonplace in the larger private groups.

Trends Show Move Towards Corporate Radiology Services

Whilst private radiology in Australia was initially established by partnerships of radiologists, there has been a strong move since the mid 1990s to move towards corporatisation with the majority of private radiology services now in the hands of very large corporate groups including Sonic Healthcare, I-med and Primary Health Care. Some of these groups also include pathology and general practice and have international links. There has also recently been a trend for re-emergence of smaller radiologist-owned practices, which follows the U.S. practice model.

Access to Medical Imaging: *New Zealand*

Due to their geographical closeness and long history of working together, it is interesting to make some brief comparisons in the delivery of radiology services between Australia and New Zealand. Both spend a comparable proportion of GDP on healthcare and have a similar public/private sharing of the profession with New Zealand having a more 50:50 share of examinations. There is also less corporatisation of private practices in NZ. The Royal Australian and New Zealand College of Radiologists represents radiologists in both countries but NZ has its own very effective Institute of Medical Radiation Technologists. NZ has less issues relating to delivery of medical imaging services to rural areas as it is a smaller country, about the size of Italy, albeit spread across two islands. Teleradiology is well adopted to support communities in outlying areas.

Remote Operators & Flying Doctors Cover Remote Areas

Recruitment and retention of staff for remote areas is a challenge and some creativity and compromise is necessary to ensure a high level of access and care. Experienced nursing staff in outlying regions are often trained and formally recognised as "remote operators", enabling them to carry out simple radiographic procedures. In some areas these nurses are also trained locally in basic ultrasound and equipped with portable units so they can provide obstetric care to indigenous families in outback communities on their regular visits to local communities many hundreds of kilometres from larger rural towns.

Flying doctor services may be called upon to land in very remote areas on makeshift airstrips, cattle stations or on dirt roads. Indeed, some very large stations which cover areas larger than some small countries have their own x-ray and surgical equipment on site because of the distance from medical aid and difficulties of access when heavy rains and flooding occur. In these cases, x-ray images and patient photographs taken with digital cameras have even been sent by email to seek medical advice.

Access to Medical Imaging: *The South Pacific*

Whilst considering Australia and New Zealand, it is also worth a brief look at the South Pacific, as both countries provide significant medical support to this unique region, which is spread over hundreds of thousands of kilometres. The region is mainly centred around Fiji, which boasts the Fiji School of Medicine and the University of the South Pacific. They run degree programmes in medicine and radiography for the region. There are many small island nations spread across the Pacific, with a small number of doctors nurses and radiographers, and only very few radiologists. The radiologists are generally trained in New Zealand or Australia and supported by teaching hospitals and universities from these countries.

The International Society of Radiographers and Radiological Technologists (ISRRT) also supports this region and in conjunction with the Western Pacific Region of the World Health Organisation (WPRO) has run programmes on quality assurance and also film interpretation for radiographers, x-ray operators and nursing staff who work on the many outlying islands with minimal or no access to radiology facilities. Attempts at installing teleradiology systems to support these locations are limited due to poor telecommunications.

Case Study: Remote Services in Alice Springs

My own management experience includes providing trained staff, equipment maintenance and weekly radiologist attendance for over 20 years for the hospital in Alice Springs in the very centre of Australia over 1,300 kms from the nearest large city. In addition, we provided similar services to Broken Hill, a well-known outback mining town 500 kms from our city practices. Both locations had multi-slice CT, ultrasound and mammography modalities.

Alice Springs hospital supports a community of over 25,000 with a huge remote catchment area. A radiologist is flown in every Monday and out on Friday evenings and supported by high quality teleradiology which also provides support for weekend trauma cases, which in turn may require urgent air retrieval by the flying doctor service that has a large base with four aircraft at the local airport. These evacuations require a four-hour flight to major hospital facilities.

The hospital itself is very well equipped and the radiology department includes multi-slice CT, mammography, the latest ultrasound technology, and general CR rooms. Despite its remoteness, it has the busiest emergency department per capita in Australia. It sees over 120 patients per day with significant road trauma due to its remote location and the presence of road hazards such as kangaroos, emu, camels and wandering cattle. Covering on-leave staff and ongoing training, necessitates a regular locum supply. Radiologists with special skills such as paediatrics or intervention are rotated regularly or as needs dictate and they also provide educational talks and clinical review sessions during their week's stay. Many patients, including overseas tourists, have had their lives saved by the use of teleradiology and air ambulance retrieval.

Remote Teleradiology Reporting

Many rural sites now include teleradiology links to support sites that are usually provided by the practice/hospital supporting them or via a third party contract. There are now several dedicated teleradiology companies within Australia offering this service to cover times when no radiologist is in attendance or to sites with no visiting radiologist. Rural sites can ensure ongoing continuing education opportunities for their technologists by accessing programmes provided and accredited by the Australian Institute of Radiography and by their employing Practice Group. Video conferencing is also a very useful tool to ensure that staff are not disadvantaged by their relative isolation. ■

THE IMPACT OF DEFENSIVE MEDICINE ON PATIENT ACCESS

The United States

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The United States (U.S.) healthcare agenda is the major domestic debate of President Obama's presidency. He had made revamping of the U.S.' pluralistic medical delivery system a cornerstone of his campaign and at his inauguration he prompted both the House of Representatives and the Senate to design legislation to fix it by focusing simultaneously on its deficiencies in access, its high cost and its less than optimal quality.

And well he should. American healthcare is a mosaic of initiatives and regulations tied predominantly to private practitioners and non-governmental reimbursers (save for Medicare for the aged and Medicaid for the poor). It excludes nearly a sixth of the population who lack insurance or are not eligible for public assistance. Moreover, it consumes one sixth of the economy and nearly every year its share of all expenditures rises faster than the rate of inflation.

It is by far the most expensive system in the world, about 50% higher in percentage of GNP than in most other developed countries. Much of the added costs go to meet the anticipated rewards sought by stockholders of private insurance companies and to meet the expectations of procedurally-oriented medical specialists whose compensation depends on the volume of work they generate. At this juncture, a comprehensive health bill is still under debate. A plan to offer a public health insurance option to compete with private insurance in order to enroll those presently uninsured was initially a minor component of a sweeping array of proposals. But it has galvanised opinion not only among legislators but also in the populace itself.

Political Battle Lines are Drawn

While the Democrats favour enhancing access, the Republicans by and large object to any innovation that limits choice and adds cost. Any compromise legislation that accommodates itself to a resolution of these competing claims might represent a victory for Obama's desire to make social change. Yet it will fail, nonetheless, because the matter of quality will not be addressed in a meaningful way. That is because the various legislative initiatives fail to relate to the fact that utilisation is controlled by doctors. Their impetus to do more outflanks the insurance companies objective to reimburse less.

The incorporation into practice of outstanding advances in techniques, procedures and pharmaceuticals is an attraction in itself, made more compelling as a generator of activity by the spectre of malpractice risk. Technologic improvements have caused a sea change in medical education. Now the older techniques of the art of medicine including history and physical exam have been bypassed in favour of the objective measures afforded by imaging tests among other innovations. The notion that failing to obtain such tests constitutes a susceptibility to an eventual malpractice suit has established defensive medicine as a protective sensibility. The looming threat of malpractice and the altered physician behaviour it promotes have aligned patients and doctors together against the political allies of plaintiff lawyers, many of whom are prominent Democrats, who fret about changing a system that would lessen the contributions to their re-election campaigns from their benefactors.

Defensive Medicine Hikes up Costs

It is reckoned that the costs of care engendered by defensive medicine may approach a trillion dollars. But the costs to physicians of defensive medicine in no way counterbalance the benefits they receive, because they are paid by the "piece work" they do. The cost of all judgments per annum of settlements both out of court and court verdicts nationally for all physicians is only four billion dollars and the total cost of their collective malpractice premium is less than 50 billion dollars each year.

Convenient misconceptions about malpractice serve to legitimate defensive medicine. Yet, less than one third of physicians will ever be sued, and less than one third of those sued will lose the case. Among radiologists many, many more will be sued for a complication or a misdiagnosis of a test or procedure that was not indicated clinically than for not doing a test that was indicated. And the leading cause of malpractice suits for all specialists, not just radiologists, is a failure to diagnose breast cancer in a woman under fifty years of age, a group for which the limitations of mammography are well known among physicians but not generally appreciated by patients. Thus healthcare in the U.S. will continue to be expensive and wasteful, an aberrant manifestation of a social policy of misdirected aims and assumptions until quality incentives are redesigned in a meaningful way to serve common rather than selective interests. ■

THE DEVELOPMENT AND IMPACT OF REFERRAL GUIDELINES

Current Status in the United Kingdom and North America

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Referral guidelines for diagnostic and interventional radiology have been in existence for 20 years and have been published in the United Kingdom (the Royal College of Radiologists' "Making the best use of clinical radiology services"), United States (American College of Radiology's "Appropriateness Criteria"), Europe, Australia and New Zealand, Hong Kong, Canada and other countries. The intention is to provide guidance towards the correct choice of investigation by clinician and radiologist for an individual patient rather than to be prescriptive.

Referral criteria have also been used to produce referral pathways and protocols with algorithms designed and agreed by relevant stakeholders (clinician, radiologist and health organisation) for use within a defined community or health organisation. The value of referral guidelines in justification is to avoid unnecessary ionising exposures when an investigation without ionising radiation is of greater or equal diagnostic efficacy.

Checklist for Ensuring Appropriate Referral

The strategy for ensuring investigations are helpful to management can be summarised from the RCR guidelines mentioned above:

- *Avoid repeat investigations.* This important cause of unhelpful and unjustifiable radiology is not directly addressed by referral criteria and requires an additional strategy.
- *Avoid investigations when results are unlikely to affect patient management.* This applies to investigations that cannot discriminate disease for the particular clinical problem. Diagnostic efficacy and impact are prerequisites for an appropriate test.
- *Avoid investigating too early.* Some chronic conditions such as headache or lower back pain not associated with sinister features can be managed without imaging as most will improve within weeks. Investigation would be appropriate should symptoms persist.
- *Avoid the wrong investigation.* Evidence-based guidance as to the most effective investigation should ensure an appropriate test but choice is influenced by local availability and expertise, particularly in less well-resourced regions.
- *Ensure adequate and appropriate clinical information is available with a defined question to be answered by the investigation.* The value of an imaging report is proportional to the clinical information provided.
- *Avoid over-investigation.* Although some patients and referring medical practitioners are reassured by multiple examinations of dubious cumulative value, this practice is not helpful and may carry an unjustifiable radiation burden.

How are Referral Guidelines Developed?

Guideline development has evolved to incorporate a more evidence-based approach. For the published 6th edition of referral guidelines and the 7th edition in preparation, the methodology used by the RCR includes:

1. Centralised literature searches with inclusion and exclusion filters including an electronic "hand search" of seven journals with high impact factors;
2. Expert panels from special interest groups that are system-based, age-based (paediatrics) or modality-based (especially for nuclear medicine);
3. Delphi consensus to agree recommendations, comments and grading of evidence. These Delphi groups comprise approximately 10 experts and may have a mix of specialty and modality base. Consensus is reached with 75% participation and 75% agreement at five, six or seven on a seven-point Likert scale. Expert bias is avoided by anonymising data and geographical bias avoided by use of Delphi experts from different centres;
4. Wide consultation with colleges and organisations, and
5. Consideration of additional evidence through consultation.

Ordering of recommended investigations is based on:

- Evidence-based diagnostic impact. Selection of the best test is ensured for the clinical indication;
- Radiation effectiveness dose. Low or no dose investigations are promoted;
- Cost-effectiveness, and
- Particular consideration for guidance in the paediatric population.

The 6th edition of the RCR Referral Guidelines published in 2007 contains 315 guidelines, 43 of which are new. The evidence base has been strengthened with fewer than a quarter reliant on expert opinion alone.

Table 1. Similarities between the Royal College of Radiologists' (RCR) referral guidelines and the American College of Radiology's (ACR) Appropriateness Criteria

	RCR	ACR
Evidence-based	+	+
Based on common clinical problems	315 (647 var.)	159 (800 var.)
Cycle of review	4 years	1 year selective
Expert panels	16	18
Consensus technique	Delphi	Delphi
Level of agreement for consensus	75%	80%
Involvement of other organisations	100 through consultation	15 through consensus
Dose information	Effective dose (ED)	Rel. radiation level (= ED)
Publication	Paper and restricted web	Web

Referral Guidelines in North America

The American College of Radiology's imaging referral criteria are intended to offer guidance for common clinical problems, to radiologists and referring physicians and also to hospitals and payers. Guideline development is based on attributes from the Agency for Healthcare Research and Quality, such as: validity; reliability/reproducibility; clinical applicability; clinical flexibility; clarity; multidisciplinary process; scheduled review, and documentation.

It is recognised that data from scientific studies is frequently insufficient. Consensus for the ACR Appropriateness Criteria was reached using a Delphi technique with a maximum of three rounds, scoring one to nine for appropriateness of an examination. Consensus is reached with 80% agreement. Guidance for initial imaging is offered with caveats that the availability of equipment and personnel will influence choice and that the final decision will be reached by referring physician and radiologist together. The aim is for quality and cost-effectiveness. Development of referral criteria on both sides of the Atlantic have converged on a reasonably similar methodology, summarised in the table above.

Do Referral Guidelines Work?

Evidence suggests that justification is lacking for many radiological procedures. After the publication of the first edition of the RCR referral guidelines in 1989, the RCR showed a reduction in referrals for plain radiographs by 13%. The following year a randomised controlled study by GPs in the UK showed significantly fewer referrals for lumbar spine radiography and a higher proportion of requests conforming to guidelines in the group of GPs to whom guidelines were distributed.

This early success by simple distribution of guidelines was unfortunately not sustained in a longer study over four years. Additional strategies were clearly required. Feedback of audit data regarding unjustified referrals for lumbar spine and knee radiographs was ineffective at reducing referral rates but an educational reminder in reports for such incompletely justified investigations was helpful in producing a 20% reduction. This effect was sustained.

In North America, the application of ACR guidelines has been shown to reduce the number of radiological examinations performed by non-radiologists. For example, a study of computed tomography (CT) for trauma showed that there was potential for a 44% reduction in number of these high dose investigations if ACR guidelines were used to guide justification.

Challenges for the Future

The challenge for the future is to present the right guideline(s) at the right time possibly as part of a clinical decision support system. Such systems are under development in North America and in the UK. The concept in the UK, that a referral for imaging is a request for a radiological opinion, concords with such guidance. The way forward for justification will involve:

- A joint approach between referring and radiological practitioner supported by the relevant healthcare organisation;
- Promotion of the principle that an imaging referral is a request for a radiological opinion both for the type of investigation and the findings therein, and
- Use of referral guidelines to inform the decision to image and which investigation to choose possibly through a clinical decision support system. ■

Resources:

- RCR Referral Guidelines (ISBN 978-1-905034-24-6)
- ACR Appropriateness Criteria: **www.acr.org/ac**

A full set of references for this article is available via the Managing Editor at **editorial@imagingmanagement.org**

LARGE NETHERLANDS TEACHING HOSPITAL ADDS HOLOGIC TOMOSYNTHESIS SYSTEM TO ITS EFFORTS TO FIGHT BREAST CANCER

Medical Center Alkmaar uses Selenia Dimensions system for high-risk women including younger women with dense breasts

One of the top teaching hospitals in the Netherlands, the Medical Center Alkmaar (MCA), prides itself on its level of patient care. Trained specialists and ongoing investments in state-of-the-art technology enable MCA to make complex diagnoses and provide specialized treatment. One of three hospitals serving the Noord-Holland region, MCA boasts the largest radiology department in the region with 13 full-time radiologists.

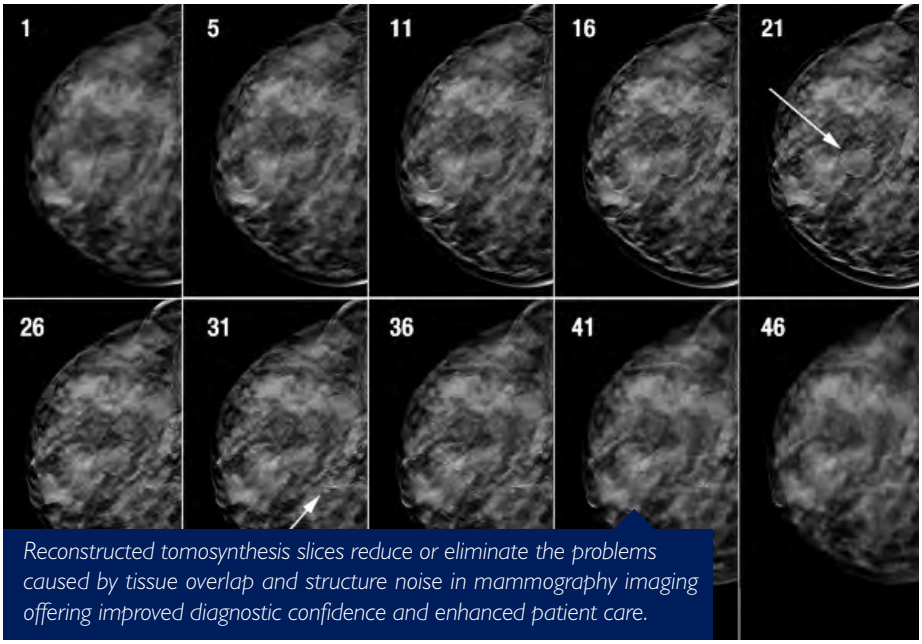
Five years ago, MCA took a major step forward in the fight against breast cancer by replacing its analog mammography systems with Hologic Selenia® digital mammography systems. Last year, it again led the way in the early diagnosis of breast cancer with the addition of a Hologic Selenia Dimensions™ breast tomosynthesis system to its women's imaging services; becoming the first hospital in the Netherlands to install the system.

Radiologist Shirley Go, M.D, is responsible for reading screening mammograms for women in the region and is one of the directors of the MCA's breast imaging services. *"One out of eight women in the Netherlands will get breast cancer in their lifetime, so breast imaging is a major focus of our radiology department at MCA. Each day we provide diagnostic services for 30 to 35 women and we see approximately 300 to 350 new patients with breast cancer each year."*

A Focus on Early Diagnosis

The Netherlands Breast Cancer Screening Program provides almost one million women between the ages of 50 and 75 the opportunity to receive a screening mammogram every two years. Mobile screening units travel throughout each region of the country to ensure all women have access to mammography services. After screening, the images are sent to a radiologist in each region specifically certified to read screening mammograms. If the radiologist sees an abnormality, the woman is referred to a hospital for diagnostic testing.

"Women come to the MCA because the radiologist has identified an abnormality on their screening mammogram or their doctor has referred them because they are symptomatic," explains Dr. Go. *"It can be a very stressful experience. Unlike many other hospitals, the MCA sends women directly to the radiology department to complete all diagnostic tests before they see the surgeon. We do all the imaging, including mammograms, breast ultrasound, and breast biopsy if needed – all in one appointment – so women do not need to come back for additional testing or appointments. That saves women a lot of anxiety."*



Reconstructed tomosynthesis slices reduce or eliminate the problems caused by tissue overlap and structure noise in mammography imaging offering improved diagnostic confidence and enhanced patient care.

Tomosynthesis Is Like Taking a 3D Image of the Breast

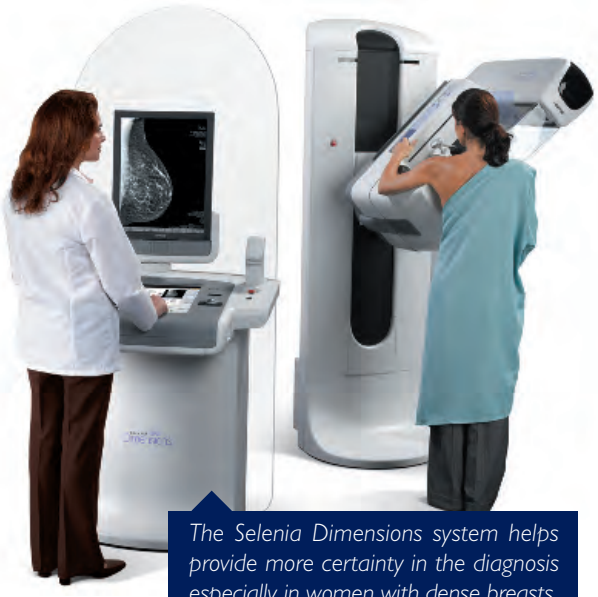
Dr. Go notes that the difference in the quality of images between analog and digital mammography is dramatic, and digital mammography is fast replacing analog as the preferred modality for detecting breast cancer earlier in most women. The recent addition of a Hologic Selenia Dimensions breast tomosynthesis system helps provide more certainty in the diagnosis especially in women with dense breasts.

Digital mammography systems take two-dimensional views of the breast. With tomosynthesis, an x-ray tube rotates around the breast taking multiple projections from numerous angles during a very brief exam, enabling

doctors to see much more of the breast and identify abnormalities that may be hidden by dense or overlapping tissue.

> *"With tomosynthesis I can't necessarily see more lesions, but, I can look at many different slices and see if it is normal tissue or a lesion. I believe tomosynthesis is very important, especially for women with a lot of breast tissue."*

"Tomosynthesis is particularly beneficial if we think we see an abnormality and we're not sure if it is just breast tissue. We can look at the breast slice by slice as if we can see inside the breast," **states Dr. Go.** *"If I don't see any lesions with tomosynthesis, I am more certain of my diagnosis excluding an abnormality; it's likely to be just breast tissue."*



The Selenia Dimensions system helps provide more certainty in the diagnosis especially in women with dense breasts.

"With tomosynthesis I can't necessarily see more lesions, but, I can look at many different slices and see if it is normal tissue or a lesion. I believe tomosynthesis is very important, especially for women with a lot of breast tissue," **concludes Dr. Go.** *"It is an additional and valuable modality to help us in correctly diagnosing women with breast cancer."*

THE IMPACT OF INNOVATION ON PATIENT ACCESS

How Rising Costs Affect Availability of Imaging

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Health policymakers have focused on cost containment, for the past several decades, to deal with the rapid rise in healthcare costs in the western world. All kinds of measures have been introduced in all kinds of healthcare systems. Virtually all of them have one thing in common – they failed to achieve cost containment. When trying to explain failure, health policy experts point to the spread of medical technology. The same innovations that save so many lives seem to be responsible for making our healthcare systems financially sick. The exact impact of new medical technology on long-term spending growth remains subject to some controversy. Most experts believe medical technology advances to account for one-half to two-thirds of annual spending increases. It is apparent that new medical technology is the dominant driver of increases in healthcare costs and hence insurance premiums.

Medical Technology & its Impact on Healthcare

The term "medical technology" refers to procedures, equipment and processes by which medical care is delivered. Hence medical technology innovations can relate to new medical and surgical procedures (e.g., angioplasty, joint replacements), the discovery of new drugs (e.g., biologic agents), the implementation of healthcare IT systems (e.g., electronic medical records and transmission of information, telemedicine), or the development of new medical devices.

How Does New Medical Technology Affect Healthcare Costs?

While some new technologies, e.g. vaccines, do result in lower short-term spending, research shows that, on balance, advances in medicine result in increased spending. Rettig* describes the mechanisms by which new medical technology affects healthcare costs:

- Development of new treatments for previously untreatable terminal conditions, including long-term maintenance therapy for treatment of such diseases as diabetes, end-stage renal disease, and AIDS;
- Major advances in clinical ability to treat previously untreatable acute conditions, such as coronary artery bypass graft;
- Development of new procedures for discovering and treating secondary diseases within a disease, such as erythropoietin to treat anaemia in dialysis patients;
- Expansion of the indications for a treatment over time, increasing the patient population to which the treatment is applied;
- Ongoing, incremental improvements in existing capabilities, which may improve quality;
- Clinical progress, through major advances or by the cumulative effect of incremental improvements, that extends the scope of medicine to conditions once regarded as beyond its boundaries, such as mental illness and substance abuse.

The effect of a particular new technology on healthcare expenditures depends on a variety of factors. Central to any calculation is the impact on the treatment cost per individual patient. Does the new technology supplement existing treatment? Is it a full or partial substitute for current approaches? Will the direct costs of the new technology affect the use or cost of other healthcare services such as hospital days or physician office visits?

A second factor relates to the level of use that a new technology achieves. Does the new technology extend treatment to a broader population? Greater availability of technologies such as MRI, CT, coronary artery bypass grafting, angioplasty, cardiac and neonatal intensive care units, as well as PET are associated with greater per capita use and higher spending on these services. The impact of this is dependent on the kind of healthcare delivery system in place. In non-budgeted 'open' healthcare systems, such as the U.S. and some EU countries, the unrestrained use of technologies result in their broad application, thereby incurring high healthcare costs. Nations with a greater degree of health system integration and regulation have relied on expenditure controls and global budgets to control costs. Although diffusion of technology takes place more slowly in more tightly budgeted systems, the use of innovative technologies in those systems tends to catch up over time.

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Diffusion of New Technologies in the U.S. & EU: The Case of PET/CT

The type of healthcare delivery system impacts on the diffusion of medical technology, as is well illustrated in the case of PET/CT. The rapid growth of PET/CT in the U.S. can be attributed to the highly competitive nature of the healthcare business. More than 40% of the approximately 2,000 PET/CT scanners worldwide are installed in the U.S. The culture of healthcare provision in Europe is very different, with central governments controlling expenditure rather than competing independent hospitals. This led to significant discrepancies in the availability of PET and PET/CT imaging throughout western Europe.

> "Innovations have saved many lives, but made our healthcare systems financially sick"

The applicability and recognition of PET/CT as an imaging modality in diagnostic oncology is affected by several factors in Germany. Reimbursement seems to be a major obstacle for the diffusion of PET/CT in Germany. Despite studies by Dietlein et al*, showing the cost-effectiveness for several PET indications, the Federal Joint Committee of Physicians and Health Insurance Funds in Germany issued a statement in 2002 refusing reimbursement for outpatient PET studies. This decision dramatically reduced funding of PET and PET/CT studies, limiting reimbursement for in-patients and self-financing private patients.

Additionally, excessive requirements for regulatory approval of radio-pharmaceuticals and fear of radiation levels are serious problems influencing the development of PET and PET/CT scanners. In Germany, approximately 55 PET/CT systems are in clinical use (April 2009) in university medical centres, community hospitals as well as private practices. Approximately 30% of the university medical centres still do not have access to PET/CT imaging seven years after introduction of this technique into clinical routine (personal communication with different vendors).

It is not possible to directly measure the impact of new medical technology on total healthcare spending; rather, innovation in the healthcare sector occurs continuously, and the impact of different changes interrelate. The size of the health sector (e.g., percentage of gross domestic product) and its diversity (numbers of procedures, products, and interventions) also renders direct measurement impractical.

Thus, economists have used indirect approaches to estimate the impact of new technology onto healthcare costs. In a landmark paper, Newhouse* determines the impact of medical technology on healthcare spending by first estimating the impact of factors that can reasonably be accounted for (e.g., spread of insurance, increasing per capita income, aging of the population, supplier-induced demand, etc.). He concludes that the factors listed above account for well under half of the growth in real medical spending, and that the bulk of the unexplained residual increase is to be attributed to technological change – what he calls "the enhanced capabilities of medicine."

Medical Technology Assessment/ Avoidable Cost Drivers

Medical Technology Assessment is a multidisciplinary field of policy analysis that evaluates the medical, social, ethical and economic implications of the introduction, development and diffusion of a technology. There are three main causes why medical technology is not being used cost-effectively.

First, patients do not pay directly for the healthcare they receive, so they sometimes make unreasonable demands on physicians regarding their diagnostic work-up or subsequent treatment.

Second, a new technology may be adopted because of its clinical superiority to existing technologies, but there is no market mechanism to ensure that it will be used where it is clinically most appropriate or where it offers highest value for a patient compared with other diagnostic or treatment options.

Third, because there is no market mechanism for determining the value of medical technology, there is currently no generally accepted screening process to assess its value. In the diagnostic imaging technology category, increases are largely driven by growth in the number of installed machines. This has led to overcapacities in many areas and created incentives for doctors to prescribe unnecessary procedures. Also, direct-to-consumer marketing fuels blind demand among consumers for advances in devices and drugs.

Factors Affecting the Growth of New Medical Technology

Many factors influence innovations in medical care. Consumer demand for better health is a prime factor. Research

shows that the use of medical care rises with income: A wealthy population provides a fertile market for these innovations. Consumer demand is affected by increased public awareness of medical technology through the media, the internet, and direct-to-consumer advertising.

Health insurance systems that provide payment for new innovations also encourage medical advances. Medical treatments can be very expensive. Their cost would be beyond the reach of most people unless their risk of needing healthcare could be pooled though insurance. The presence of health insurance provides some assurance to researchers and medical suppliers that patients will have the resources to pay for new medical products, thus encouraging research and development. Equally, the promise of better health through improvements in medicine increases demand for health insurance, as consumers look for ways to assure access to the highest level of medical care.

Other factors driving the continuing flow of new medical technology include the desire by professionals to find better ways to treat their patients. Like most other professionals, healthcare workers are also motivated by professional goals (e.g., peer recognition, tenure, prestige) to find ways to improve practice. Furthermore, direct providers of care may incorporate new technology because they feel the need to offer the "latest and best" to compete with other providers for patients. Commercial interests such as those inherent to pharmaceutical companies and medical device makers represent the dominant force driving medical innovation.

Its profound impact is easily visualised by examining medical innovation over a 40-year period in Germany. The difference is vast – commercially motivated innovations made in Germany saved many lives, while at the same time making healthcare considerably more expensive. Finally, public and private investments in basic science research lead directly and indirectly to improvements in medical practice - government-sponsored investments in basic science are increasingly regarded as programmes to assure economic prosperity. ■

*A full set of references are available upon request to the Managing Editor, Dervla Gleeson, editorial@imagingmanagement.org

ECRI Institute
The Discipline of Science. The Integrity of Independence.

PET/CT SYSTEMS

ECRI Institute, a non-profit organisation, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for nearly 40 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research.

ECRI Institute's focus is medical device technology, healthcare risk and quality management, and health technology assessment. It provides information services and technical assistance to more than 5,000 hospitals, healthcare organisations, ministries of health, government and planning agZencies, voluntary sector organisations and accrediting agencies worldwide. Its databases (over 30), publications, information services and technical assistance services set the standard for the healthcare community.

More than 5,000 healthcare organisations worldwide rely on ECRI Institute's expertise in patient safety improvement, risk and quality management, healthcare processes, devices, procedures and drug technology. ECRI Institute is one of only a handful of organisations designated as both a Collaborating Centre of the World Health Organisation and an evidence-based practice centre by the US Agency for healthcare research and quality.

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MODEL	PET Scanners using LSO/GSO/LYSO Crystals	Biograph 6 TruePoint PET/CT
WHERE MARKETED		Worldwide
FDA CLEARANCE		Yes
CE MARK (MDD)		Yes
DETECTOR PERFORMANCE		
System sensitivity	8 cps/kBq (3-D)	4.4 cps/kBq, optional 7.9 cps/kBq
Scatter fraction	<30% (3-D)	<36% @ 425 keV LLD
Maximum count rate, cps @ 50% dead time	100 kcps	System is linear until near peak count rate, 50% dead time not applicable; NECR: 96 kcps @ 35 kBq/cc (165 kcps @ 32 kBq/cc with TrueV option)
Energy resolution	<15%	<14%
CT SPECIFICATIONS		
Aquired simultaneously	16	6
Total detector width, z-axis, mm	30	18
Reconstructed slice width options, mm	0.5-10	1.0, 1.25, 2, 2.5, 3, 4, 5, 6, 8, 10 (0.63, 0.75 mm with optional high-resolution CT package)
Rotation times, sec, 360°	0.4	0.6, 0,8, 1.0, 1.5
Field of view	50 cm	51 cm, 70 cm extended FOV
CT PERFORMANCE		
High-contrast spatial resolution		Technique: 60 mA, 130 kV, 0.8 s, 1 mm
0% MTF, lp/cm	15	0% MTF ± 10%, 17.5 lp/cm 0.29 mm
50% MTF, lp/cm	10	2% MTF ± 10%, 15.1 lp/cm 0.33 mm
Low-contrast resolution, mm at % at ≤4 rads	v	5 mm at 3HU
Noise, % at ≤2.5 rads	0.25	±4 HU max
PET IMAGE ACQUISITION		
2-D		Not required, LSO and PICO-3D electronics noise reduction
3-D		Full 3-D acquisitions
Time of flight		No
Typical dwell time per bed position		2-3 min
DICOM 3.0 COMPLIANCE	Yes	Yes
PATIENT COUCH		
Vertical movement, cm	80-110	53-101
Horizontal movement, cm	150	264
Headrest	Yes	Low-attenuation carbon fiber
Armrests	Yes	Fixed
Maximum patient weight, kg (lb)	200 (450)	204 (450)
IMAGE RECONSTRUCTION		FBP, 2-D OSEM, 3-D OSEM, PSF
Image uniformity	<10%	<5%
Coincidence window, nsec	6	4.5
Reconstruction time, sec	60/frame	30 sec/bed (PET), 4 slice/sec (CT)
SOFTWARE PACKAGES		Triple timepoint oncology review with syngo TrueD, full cardiac PET and CT evaluation through syngo Circulation, neurology analysis and comparison through syngo Scenium suite offerings; >70 clinical PET, SPECT, CT, MR, and AX software applications
SITING REQUIREMENTS		
Minimum room size, m (ft)		5.03 x 7.9 (16.5 x 26)
ENVIRONMENTAL REQUIREMENTS		
Operating temp range, °C (°F)		20-24 (68-75)
Humidity, %		15% to 75% without condensation
Cooling, BTU/hr		27,331; air 8.01 kW
POWER REQUIREMENTS		PET: 200-240 VAC, 50/60 Hz, 3.8 kVa, or 400 VAC, single-phase, 50,60 Hz, 3.8 kVa (optional); CT: 380/480 VAC, 3-phase, 50, 60 Hz, 70 kVa
OPTIONAL ACCESSORIES		Full PET and CT, cardiac and respiratory gating options, HD PET and TrueV extended FOV, LAP lasers, injector printer, and storage devices available at purchase or as in-the-field upgrade
OTHER SPECIFICATIONS AND SUPPLIER FOOTNOTES	<1>These recommendations are the opinions of ECRI Institute's technology experts. ECRI Institute assumes no liability for decisions made based on this data	Point-spread function: yes; HD PET option; system: 70 cm continuous patient port, 190 cm co-scan field of view; PET: 81 (optional 109) image planes with a sensitivity of 96 kcps and 165 kcps.
UMDNS CODE(S)	16375, 20161	16375, 20161
LAST UPDATED		Jun-09

ECRI
Ecri Institute's Recommended Specifications <1>

SIEMENS

SIEMENS

SIEMENS

	Biograph 64 TruePoint PET/CT	Biograph mCT
	Worldwide	Worldwide
	Yes	Yes
	Yes	Yes
	4.4 cps/kBq, optional 7.9 cps/kBq	4.8 cps/kBq, optional 8.5 cps/kBq
	<36% @ 425 keV LLD	<36% @ 425 keV LLD
	System is linear until near peak count rate, 50% dead time is not applicable; NECR: 96 kcps @ 35 kBq/cc (165 kcps @ 32 kBq/cc with TrueV option)	System is linear until near peak count rate, 50% dead time is not applicable; NECR: 100 kcps@42 kBq/cc 170 kcps@42 kBq/cc with TrueV option)
	<14%	<12%
	64	40 (mCT S), 64 (mCT S), 128 (mCT X)
	28.8	≤38.4
	0.4, 0.5 (with z-UHR option), 0.6, 0.75, 1.0, 1.5, 2, 3, 4, 5, 6, 7, 8, 10	0.4, 0.5,0.6,0.75, 1.0, 1.5, 2, 3, 4, 5, 6, 7,8, 10
	0.33 (with optional CT high-speed rotation package), 0.37, 0.5, 1	0.30 (mCT X), 0.33, 0.5, 1.0
	53 cm, 70 cm extended FOV	(50 cm diagnostic) standard, 78 cm extended FOV
	Technique: 160 mA, 120 kV, 1.0 s, 0.6 mm	Technique:160 mA,/120 kV,/0.5 s,/4.8 mm/(12 x 1.2 mm)/UHR/Kernel H70h
	0% MTF ± 10%, 30 lp/cm 0.17 mm	Plane 0% MTF (±10%)17.4 lp/cm
	2% MTF ± 10%, 24 lp/cm 0.21 mm	Plane 2% MTF (±10%)16.4 lp/cm
	24 lp/cm 0.21 mm	5 mm at 3HU
	±4 HU max	±4 HU max
	Not required, LSO and PICO-3D electronics noise reduction	Not required, LSO and PICO-3D electronics noise reduction
	Full 3-D acquisitions	Available with ultraHD PET
	No	555 ps
	2-3 min	1-3 min
	Yes	Yes
	53-101	53-101
	264	264
	Low-attenuation carbon fiber	Low-attenuation carbon fiber
	None	None
	204 (450)	227 (500)
	FBP, 2-D OSEM, 3-D OSEM, PSF	FBP, 2-D OSEM, 3-D OSEM, PSF, PSF+TOF
	<5%	<5%
	4.5	4.5
	30 sec/bed (PET), 20 slice/sec (CT)	30 sec/bed (PET), 20 slice/sec (CT)
	Triple timepoint oncology review with syngo TrueD, full cardiac PET and CT evaluation through syngo Circulation, neurology analysis and comparison through syngo Scenium suite offerings; >70 clinical PET, SPECT, CT, MR, and AX software applications	Triple timepoint oncology review with syngo TrueD, full cardiac PET and CT evaluation through syngo Circulation, neurology analysis and comparison through syngo Scenium suite offerings; >70 clinical PET, SPECT, CT, MR, and AX software applications
	4.6 x 7.3 (15 x 24)	4.6 x 7.3 (15 x 24)
	20-24 (68-75)	20-26 (68-79)
	15% to 75% without condensation	15% to 75% without condensation
	16,650; air/water 4.4 kW	16,650; air/water 4.4 kW
	PET: 230 VAC, 50/60 Hz, 1.75 kVa; optional 400 VAC, 3-phase, 50 Hz, 1.75 kVa; CT: 400/480 VAC, 3-phase, 50/60 Hz, 104 kVa	PET: 230 VAC, 50/60 Hz, 1.75 kVa; optional 400 VAC, 3-phase, 50 Hz, 1.75 kVa; CT: 400/480 VAC, 3-phase, 50/60 Hz, 104 kVa
	Full PET and CT, cardiac and respiratory gating options, HD PET and TrueV extended FOV, LAP lasers, injector printer, and storage devices available with the system at purchase or as in-the-field upgrade	Full PET and CT, cardiac and respiratory gating options, HD PET and TrueV extended FOV, LAP lasers, injectors, printer, and storage devices available with the system at purchase or as in-the-field upgrade
	Point-spread function: yes; HD PET option; system: 70 cm continuous patient port, 190 cm co-scan field of view; PET: 81 (optional 109) image planes with a sensitivity of 96 kcps and 165 kcps; CT: 0.33 sec rotational speed, image resolution of 0.33 mm (optional 0.24 mm) maintained regardless of pitch, CARE Dose 4D for 66% reduction in CT dose, 30 lp/cm high contrast resolution.	Point-spread function: yes; HD PET option; system: 78 cm continuous patient port, 190 cm co-scan field of view; PET: 81 (optional 109) image planes with a sensitivity of 100 kcps and 170 kcps; CT: 0.33 sec rotational speed, image resolution of 0.30 mm (optional 0.24 mm) maintained regardless of pitch, CARE Dose 4D for 66% reduction in CT dose, 30 lp/cm high contrast resolution.
	16375, 20161	16375, 20161
	Jun-09	Jun-09

Product Comparison Chart

MODEL	PET Scanners using LSO/GSO/LYSO Crystals	Discovery ST 4	Discovery STE 8 : Discovery STE 16 PET CT
	ECRI Ecri Institute's Recommended Specifications <1>	GE Healthcare	GE Healthcare
WHERE MARKETED		Worldwide	Worldwide
FDA CLEARANCE		Yes	Yes
CE MARK (MDD)		Yes	Yes
DETECTOR PERFORMANCE			
System sensitivity	8 cps/kBq (3-D)	2.0 cps/kBq (2-D), 9.3 cps/kBq (3-D)	2.0 cps/kBq (2-D), 8.5 cps/kBq (3-D)
Scatter fraction	<30% (3-D)	19% (2-D), 44% (3-D)<1>	19% (2-D), 35% (3-D)<1>
Maximum count rate, cps @ 50% dead time	100 kcps	84 kcps @ 49 kBq/cc (2-D), 63 kcps @ 12 kBq/mL (3-D); NECR<1>	84 kcps @ 49 kBq/ml (2-D), 75 kcps @ 12 kBq/ml (3-D); NECR<1>
Energy resolution	<15%	375 keV	Energy threshold of 425 keV (3-D), 375 keV (2-D)
CT SPECIFICATIONS			
Aquired simultaneously	16	4	8:16
Total detector width, z-axis, mm	30	20	20
Reconstructed slice width options, mm	0.5-10	0.625, 1.25, 2.5, 3.75, 5, 7.5, 10	0.625, 1.25, 2.5, 3.75, 5, 7.5, 10
Rotation times, sec, 360°	0.4	Full 360° rotational scans in 0.5, 0.6, 0.7, 0.8, 0.9, 1.0	Full 360° rotational scans in 0.5, 0.6, 0.7, 0.8, 0.9, 1.0
Field of view	50 cm	70 cm diameter with CT based attenuation correction and CT wide-FOV display	70 cm diameter with CT based attenuation correction and CT wide-FOV display
CT PERFORMANCE			
High-contrast spatial resolution		Not specified	Not specified
0% MTF, lp/cm	15	15.4	15.4
50% MTF, lp/cm	10	8.5	8.5
Low-contrast resolution, mm at % at ≤4 rads		5 mm @ .3% at 13.3 mGy, 3 mm @ .3% at 37.2 mGy	5 mm @ .3% at 13.3 mGy, 3 mm @ .3% at 37.2 mGy
Noise, % at ≤2.5 rads	0.25	0.32% ± 0.03% at 28.5 mGy (2.85 rads)	0.32% ± 0.03% at 28.5 mGy (2.85 rads)
PET IMAGE ACQUISITION			
2-D		Yes	Yes
3-D		Yes	Yes
Time of flight		No	No
Typical dwell time per bed position		Customer dependent	Customer dependent
DICOM 3.0 COMPLIANCE	Yes	Yes	Yes
PATIENT COUCH			
Vertical movement, cm	80-110	55-102.5	55-102.5
Horizontal movement, cm	150	160	160
Headrest	Yes	Fixed offset headholder	Fixed offset headholder
Armrests	Yes	Yes	Yes
Maximum patient weight, kg (lb)	200 (450)	180 (400) with 0.25 mm positional accuracy	180 (400) with 0.25 mm positional accuracy
IMAGE RECONSTRUCTION			
Image uniformity	<10%	Not specified	Not specified
Coincidence window, nsec	6	11.7	11.05 (2-D), 9.75 (3-D)
Reconstruction time, sec	60/frame	CT ≤16 fps	CT ≤16 fps
SOFTWARE PACKAGES		PET VCAR for treatment monitoring, CT/PET fusion, Advantage4D for CT gating, SimMD for multimodality simulation, CardIQ Fusion for CTA and PET perfusion display and analysis, 5-Beat Cardiac, Lung VCAR, Cortex ID for neurology studies and perfusion	PET VCAR for treatment monitoring, CT/PET fusion, Advantage4D for CT gating, SimMD for multimodality simulation, CardIQ Fusion for CTA and PET perfusion display and analysis, 5-Beat Cardiac, Lung VCAR, Cortex ID for neurology studies and perfusion
SITING REQUIREMENTS			
Minimum room size, m (ft)		4.42 x 7.62 (14.5 x 25) exam room; 4.42 x 2.46 (14.5 x 8.1) control room	4.42 x 7.62 (14.5 x 25) exam room; 4.42 x 2.46 (14.5 x 8.1) control room
ENVIRONMENTAL REQUIREMENTS			
Operating temp range, °C (°F)		15-29 (60-84)	15-29 (60-84)
Humidity, %		30-60	30-60
Cooling, BTU/hr		31,000 (minimum); no water chilling required	No water chilling required
POWER REQUIREMENTS		380-480 VAC nominal, 3-phase, 50/60 Hz	380-480 VAC nominal, 3-phase, 50/60 Hz, 100 kVa service, 30 kVa average
OPTIONAL ACCESSORIES		AW analysis and review workstations, respiratory and cardiac gating hardware, lasers, injectors, printers	AW analysis and review workstations, respiratory and cardiac gating hardware, lasers, injectors, printers
OTHER SPECIFICATIONS AND FOOTNOTES	<1>These recommendations are the opinions of ECRI Institute's technology experts. ECRI Institute assumes no liability for decisions made based on this data	None specified.	None specified.
UMDNS CODE(S)	16375, 20161	16375, 20161	16375, 20161
LAST UPDATED		Jun-09	Jun-09

GE Healthcare	PHILIPS sense and simplicity	PHILIPS sense and simplicity	PHILIPS sense and simplicity
Discovery VCT<1>	**GEMINI GXL**	**GEMINI TF**	**GEMINI TF Big Bore**
Worldwide	Worldwide	Worldwide	Worldwide
Yes	Yes	Yes	Yes
Yes	Yes	Yes	Expected early 2009
2.0 cps/kBq (2-D), 8.5 cps/kBq (3-D)	8,000 cps/MBq @ 10 cm	7,200 cps/MBq @ 10 cm (>14,400 cps/MBq @ 10 cm with TOF)	7,200 cps/MBq @ 10 cm (>14,400 cps/MBq @ 10 cm with TOF)
19% (2-D), 35% (3-D)<1>	37%	30%	31%
84 kcps @ 49 kBq/ml (2-D), 75 kcps @ 12 kBq/ml (3-D); NECR<1>	700,000 cps	700,000 cps	700,000 cps
Energy threshold of 375 keV with axial septa, 425 keV without axial septa	15.80%	11.70%	12.00%
64	6 or 16	16 or 64	16
40	24	24 or 40 (64)	24
0.625, 1.25, 2.5, 3.75, 5, 7.5, 10	0.6-12	0.6-12 or 0.5-12 (64)	0.65-12
0.35, 0.37, 0.40, 0.42, 0.45, 0.47, 0.50, 0.60, 0.70, 0.80, 0.90, 1.0, and 2.0	0.4-2	0.4-2	0.44-2
70 cm diameter with CT based attenuation correction and CT wide-FOV display	25 cm and 50 cm (up to 60 cm for CTAC)	25 cm and 50 cm (up to 70 cm for CTAC)	25 cm, 35 cm, 50 cm and 60 cm (up to 70 cm for CTAC)
Not specified	Not specified	Not specified	Not specified
15.4	≤24	≤24	≤15
8.5	24	≤24	≤15
5 mm @ .32% at 7.5 mGy CTDIvol, 3 mm @ .32% at 21.3 mGy CTDIvol	2 mm @ 0.3% contrast - 40 mGy (120 kVp, 350 mAs, 10 mm slice thickness; 4 mm @ 03% contrast - 27 mGy (120 kVp, 250 mAs, 10 mm slice thickness;5 mm @ 0.3% contrast - 19 mGy (120 kVp, 200 mAs, 10 mm slice thickness)	2 mm @ 0.3% contrast - 40 mGy (120 kVp, 350 mAs, 10 mm slice thickness 4 mm @ 03% contrast - 27 mGy (120 kVp, 250 mAs, 10 mm slice thickness 5 mm @ 0.3% contrast - 19 mGy (120 kVp, 200 mAs, 10 mm slice thickness)	2 mm @ 0.3% contrast - 40 mGy (120 kVp, 350 mAs, 10 mm slice thickness 4 mm @ 03% contrast - 27 mGy (120 kVp, 250 mAs, 10 mm slice thickness 5 mm @ 0.3% contrast - 19 mGy (120 kVp, 200 mAs, 10 mm slice thickness)
0.32% ± 0.03% at 19.2 mGy CTDIvol	0.27% - measured on 21.6 cm water equivalent phantom; parameters - 120 kVp, 200 mAs, 6 mm slice, FOV 250 mm/350 mm	0.27% - measured on a 21.6 cm water equivalent phantom; parameters - 120 kVp, 200 mAs, 6 mm slice, FOV 250 mm / 350 mm	0.27% - measured on a 21.6 cm water equivalent phantom; parameters - 120 kVp, 200 mAs, 6 mm slice, FOV 250 mm/350 mm
Yes	No	No	No
Yes	3-D RAMLA with LOR	3-D OSEM with LOR	3-D OSEM with LOR
No	No	Yes	Yes
Customer dependent	1.5-2.5 min	1 min	1.3 min
Yes	Yes	Yes	Yes
57-103	35.5	35.5	47.1
170-200, depending on table selected	190	190	190
Fixed offset headholder	Yes	Yes	Yes
Yes	Yes	Yes	Yes
204 (450) with 0.25 mm positional accuracy	195 (430)	195 (430)	227 (500)
Not specified	±10% volume nonuniformity	±10% volume nonuniformity	±10% volume nonuniformity
11.05 (2-D), 9.75 (3-D)	8	3.8	3.8
CT up to 16 fps	2 min/bed with LOR RAMLA, concurrent	1 min/bed with list mode TOF, concurrent	1 min/bed with list mode TOF, concurrent
PET VCAR for treatment monitoring, CT/PET fusion, Advantage4D for CT gating, SimMD for multimodality simulation, CardIQ Fusion for CTA and PET perfusion display and analysis, 5-Beat Cardiac, Lung VCAR, Cortex ID for neurology studies and perfusion	Brilliance Workspace (PET/CT), multimodality image registration, QC, DICOM 3.0, optional PET/CT viewer, optional CT clinical applications, optional PET cardiac, optional PET neurology, optional Tumor LOC	Brilliance Workspace (PET/CT), multimodality image registration, QC, DICOM 3.0, PET/CT viewer, optional CT clinical applications, optional PET cardiac, optional PET neurology, optional Tumor LOC	Brilliance Workspace (PET/CT), multimodality image registration, QC, DICOM 3.0, PET/CT viewer, optional CT clinical applications, optional PET cardiac, optional PET neurology, Tumor LOC
4.42 x 7.62 (14.5 x 25) exam room; 4.42 x 2.46 (14.5 x 8.1) control room	7.28 x 3.81 (23.9 x 12.5)	7.28 x 3.81 (23.9 x 12.5)	7.24 x 4.12 (23.9 x 13.5)
15-29 (59-84)	15-24 (59-75)	15-24 (59-75)	15-24 (59-75)
30-60	35-70	35-70	35-70
No water chilling required	33,250; no water chiller required	38,550; no water chiller required	37,750; no water chiller required
380-480 VAC nominal, 3-phase, 50/60 Hz, 100 kVa service, 30 kVa average	480 VAC, 50/60 Hz, 100 kVa maximum	480 VAC, 50/60 Hz, 100 kVa maximum	480 VAC, 50/60 Hz, 100 kVa maximum
AW analysis and review workstations, respiratory and cardiac gating hardware, lasers, injectors, printers	Cardiac gating, respiratory gating, CD-R, DVD-RAM, EOD drive, printers, RTP flat table, laser positioning systems, remote image review workstations (EBW)	Cardiac gating, respiratory gating, CD-R, DVD-RAM, EOD drive, printers, RTP flat table, laser positioning systems, remote image review workstations (EBW)	Cardiac gating, printers, curved patient table, laser positioning systems, remote image review workstations (EBW)
None specified.	Available with 6- or 16-slice CT; open PET/CT system; fully 3-D LOR RAMLA reconstruction; 190 cm scan length; air cooled.	Available with 16-slice or 64-channel CT; exclusive TruFlight,TOF PET technology; open PET/CT system, 190 cm scan length; air cooled.	Exclusive TruFlight,TOF PET technology; open PET/CT system; 190 cm scan length; air cooled.
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CALCULATING YOUR COSTS

Principals of Economic Evaluations

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Clinical trials measure healthcare outcomes to determine the efficacy of healthcare interventions. Economic evaluations provide valuable information to help decision-makers allocate scarce resources more efficiently and to see whether the intervention represents good value for money. Two methods can be used to determine cost-effectiveness: An economic evaluation alongside a clinical trial, which estimates the costs and outcomes during the trial period; and a modelling approach extrapolating costs beyond the trial duration. This article will describe what an economic evaluation is and how to conduct one

What is Economic Evaluation?

Economic evaluation is concerned with minimising opportunity costs (the value of the next best alternative foregone as a result of the decision made) so that the best use is made of scarce resources. Therefore, we have to make choices, by comparing costs and outcomes of alternative treatments. The basic tasks of any economic evaluation are to identify, measure, value and compare the costs and consequences of the alternatives being considered. There are five types of economic evaluation (see table 1, p. 31) and each measures costs in monetary units. However, they differ in the way consequences are included.

At the start of any economic evaluation, you need to specify the following:

- Research question (i.e. the cost-effectiveness of interventions);
- Study perspective (i.e. healthcare);
- Time frame of analysis (i.e. lifetime of patients);
- Analytical approach (i.e. decision model);
- Options for comparison (i.e. treatment A compared with treatment B), and
- Approach to costs and outcomes (see fig. 1, p. 31).

Each of these issues will determine the scope of costs and outcomes; which are included, how they are measured and valued, and how they are reported and interpreted.

Determine Which Costs are Relevant

The study perspective will determine which costs are considered relevant for the evaluation. For any economic evaluation, you need to identify categories of key resource use (i.e. inpatient stays) and then measure them in their physical units (i.e. number of bed days). There are various sources that we can use to measure resource use, such as randomised trials, clinical databases, medical records, patient questionnaires and literature. Ideally for any economic evaluation, resources should be valued by their opportunity cost. However, this is not always practical and market prices are usually used to value resources in units of local currency (i.e. average cost per bed day).

Valuing Health Outcomes

The outcomes used in economic evaluations depend on the research question and the type of evaluation being conducted (see table 1, p. 31). These include:

- Clinical measures which use natural units (i.e. number of cases detected);
- Disease specific instruments (i.e. hospital anxiety and depression scale);
- Mortality measures which look at life years gained;
- Generic measures which use instruments to measure overall health-related quality of life (HRQoL), etc.);
- Utility measures, a special kind of generic measure that give an indication of value placed upon the HRQoL (i.e. EQ-5D), and
- Monetary measures which value benefits in terms of currency.

There are two main approaches to valuing health outcomes: Monetary and non-monetary. Non-monetary valuations include scales that ask participants to rank health outcomes or place outcomes on a scale such as the visual analogue scale. Also, the standard gamble approach is based on the axioms of expected utility theory and asks respondents to make choices that weigh improvements in health against mortality risks. Finally there is the time trade-off approach, a method for valuing health states that asks respondents to make hypothetical choices that weigh improvements in health against reduced longevity. Monetary valuations include revealed preferences where individuals assess the benefits in accordance with their preferences; and stated preferences are where valuations are derived from surveys such as willingness-to-pay studies.

The Role of "Modelling" in Evaluation

Modelling is used in economic evaluations when trial data does not exist, and can be used to extrapolate existing data beyond a certain time period. Decision analytical modelling represents the various clinical pathways for alternative treatments and quantifies the probability of a patient following each pathway. For each pathway, the range of possible costs and health-related outcomes can be calculated.

The aim of the decision model is to calculate the expected (i.e. the mean) costs and outcomes of the alternatives together with the uncertainty in those estimates. Decision modelling looks at a process in which a fixed sequence of events leads to an outcome, but does not take into account the time dimension. On the other hand, Markov modelling is useful in analysing the evolution of health states over time for a particular illness.

Handling Uncertainty

Every economic evaluation will contain some degree of uncertainty: Parameter uncertainty is where you are unsure about the true numerical values of the parameters used as inputs; and model uncertainty is where you are unsure about the correct method for combining parameters, and/or the analysis which may have been completed.

There are several methods for handling uncertainty, the simplest being a one-way sensitivity analysis, where each parameter is varied one at a time in order to investigate the impact on study results, through to more sophisticated methods such as probabilistic sensitivity analysis where one can incorporate the uncertainty of all the parameters in the model simultaneously.

Presentation and Interpretation of Results

If the study period in question is greater than a year, then costs and outcomes should be discounted. Discounting allows future costs to be converted into present values, thereby allowing comparisons between costs and outcomes that occur at different times. The incremental cost-effectiveness ratio (ICER) is the difference in costs between one intervention and an alternative, divided by the difference in outcomes. This ratio represents the extra amount one would pay for an additional unit of health outcome. Cost-effectiveness planes are used to present results (see fig. 1).

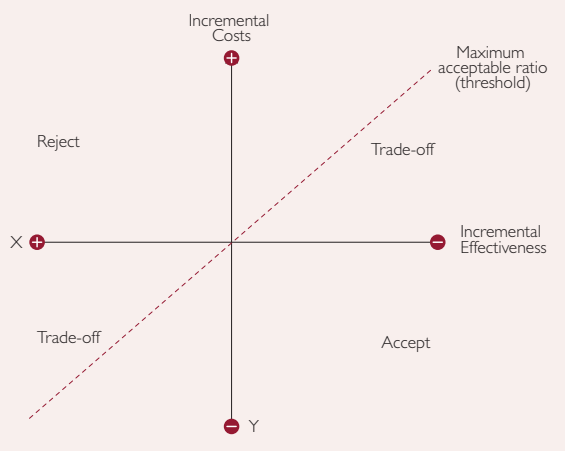

Figure 1: Cost-effectiveness plane

In this figure, the x axis represents the differences in effects for two interventions and the y axis represents the difference in costs for the two interventions. The slope of the line is known as the maximum acceptable ICER. If the costs and benefits for the intervention fall below that threshold you would probably choose to adopt it. The uncertainty in economic evaluations are presented as cost-effectiveness acceptability curves (CEACs) which are used to indicate the probability that an intervention is more cost-effective than the alternative for a range of potential maximum amounts (ceiling ratio) that a decision maker is willing to pay.

Conclusions

Economic evaluations are increasingly being used to inform decision-making about which healthcare interventions should be used/adopted. For any economic evaluation, the following need to be considered: The research question, the study perspective, the time horizon, the analytical approach, the options for comparison, the approach to costs and outcomes and dealing with uncertainty. ■

Table 1: Different types of economic evaluations

Type of analysis	Measurement of costs	Measurement of outcomes
Cost-minimisation (CMA)	Monetary	External evidence of equivalence
Cost-consequences (CCA)	Monetary	Array or profile of different measures
Cost-effectiveness (CEA)	Monetary	Single natural or clinical units
Cost-utility (CUA)	Monetary	Quality-adjusted life years
Cost-benefit (CBA)	Monetary	Monetary valuation

IMPLEMENTING A NATIONAL BREAST CANCER SCREENING PROGRAMME

The Norwegian Example

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According to Maja Primic-Zakelj, at the Epidemiology and Cancer Registry Unit, Institute of Oncology, Ljubljana, Slovenia, "Population-based cancer screening using evidence-based tests has considerable potential to improve the health of the population, provided that programmes are implemented cost-effectively and with high quality". In this article, I will present information concerning the national Norwegian Breast Cancer Screening Programme (NBCSP) as an example that highlights how good organisation and continuous quality assurance can bring real results in terms of preventive healthcare.

Background & Origins

The NBCSP started as a pilot project in one of the 19 counties in November 1995, and became a nationwide programme in February 2004. Close to 550,000 women are currently in the target group, which is identified by a unique eleven-digit personal identification number given to all inhabitants in Norway by the population registry. The programme invites all women born in age cohorts corresponding to 50 - 69 years during the two-year screening period to a two-view mammography screening examination.

A personally addressed letter provides the exact time and place for the screening exam, which takes place at 26 stationary and four mobile mammography facilities. Twelve women can be examined each hour per mammography machine. Attendance is registered at the screening unit and automatically transferred to the cancer registry by an internal secure network (ISBN-based IP network). The attendance rate is about 77%, varying from 62% to 89% by county and screening round.

A leaflet about the programme and a self-administered questionnaire covering known risk factors for breast cancer are included with the invitation letter. The questionnaire is filled in by the women and is handed over to the radiographers when they show up for screening. The outcome of the questionnaire is used in the evaluation of the screening programme.

If women do not show up for screening, they are sent a reminder three to eight weeks after their scheduled examination. If an invitation is not desired, the women can notify the cancer registry, and they will not receive invitations unless that notification is canceled. The fee is approximately 30 euros, which covers the screening examination, diagnostic work-up and treatment.

Managing Recalls

Women recalled for diagnostic work-up receive a personal letter or a phonecall with the location and time for the work-up, which takes place at an average of 15 days after the screening examination at 17 breast imaging centres at university or county hospitals. A work-up includes additional mammographic imaging and ultrasound, and a biopsy if needed. Most diagnostic work-up procedures are performed in one session. The NBCSP does not recommend short-term follow up.

During 10 years of performance, 4.6% of prevalent screened and 2.6% of the subsequent screened women were recalled due to mammographic findings. Some women are called back due to technical difficulties (0.7%) or due to symptoms reported when they show up for screening (0.4%). The cumulative risk of having a false positive recall during 20 years and 10 screening sessions is estimated to be 20%, while the risk of a false positive recall with biopsy is 4%.

The standard independent double reading with consensus is probably the main reason for the acceptable proportion of recalls in Norway. A consensus meeting dismisses about 50% of cases with a positive score given by one or both radiologists, but still the screening detection and interval cancer rates are acceptable.

Key Figures from the Programme

About 38% of the women who were recalled due to mammographic findings had a biopsy, in which 41% of the biopsies stated ductal carcinoma in situ (17%) and invasive breast cancer (83%). The numbers correspond to a positive predictive value (breast cancer among those recalled) of 16%.

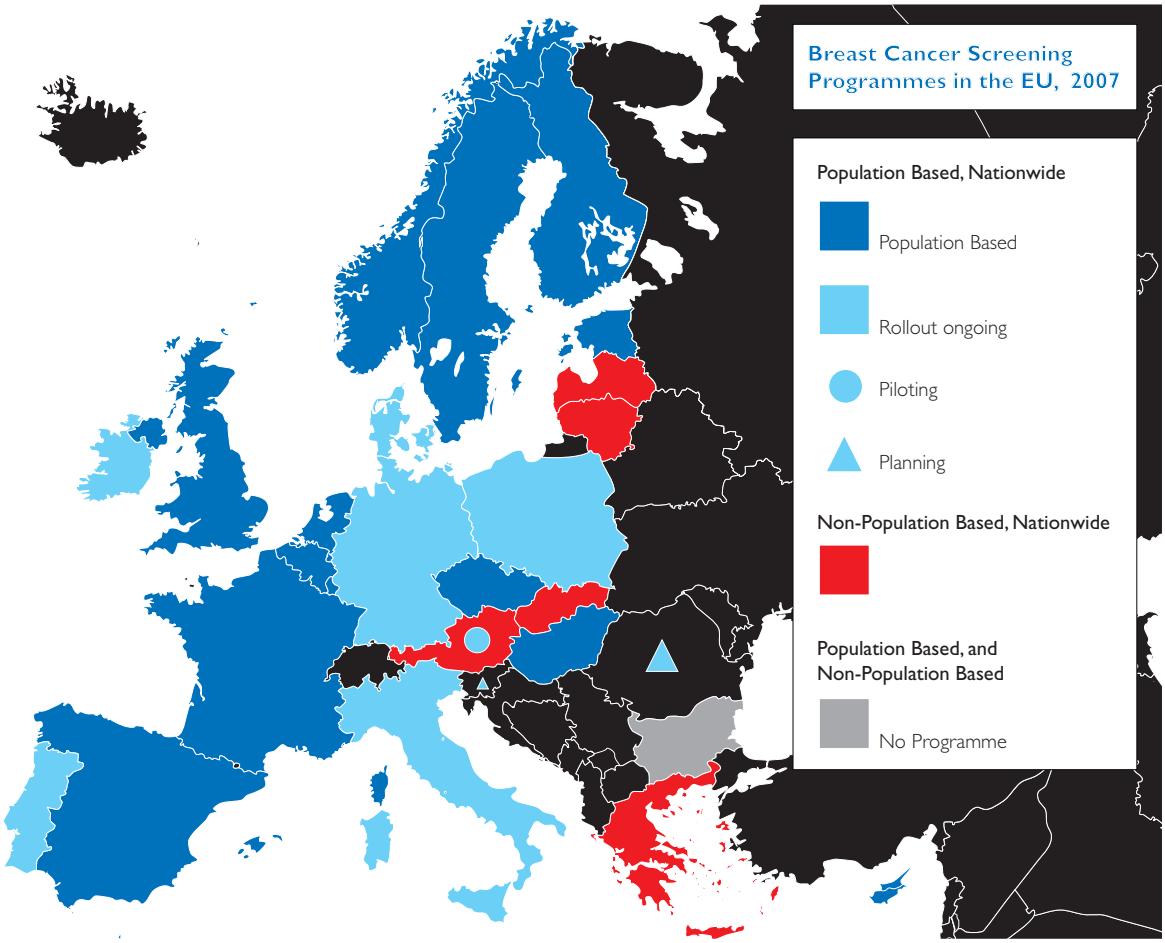
The proportion of biopsies among the recalled women increased by age, and was lower among subsequent screened compared with prevalent screened, while the proportion of cancers among all biopsies was higher among subsequent

compared to prevalent screened. The detection rate during the first ten years of performance was six cancers (DCIS and invasive) per 1,000 prevalent screens and five per 1,000 subsequent screens. The rate increased by age. In addition to the screen-detected cancers, 18 cancers (8% DCIS and 92% invasive) per 10,000 screens were diagnosed in the period between two screening sessions in women with negative screening outcome. The screen detected tumours had an average tumour size of 15mm. while the interval cancers were 21mm. Positive lymph node involvements were seen in 25% and 44% of the screen-detected and interval cancers, respectively.

Treatment & Follow-Up

Women diagnosed with breast cancer as a result of participation in the screening programme are treated and followed according to the guidelines of the Norwegian Breast Cancer Group. The treatment takes place at hospitals associated with the breast clinics. Establishment of the breast clinics, which include multidisciplinary teams, was one of the major issues in the implementation of the NBCSP. Prior to the screening programme, breast surgery was performed at about 60 hospitals. Today, all women with breast cancer are taken care of at 17 breast clinics, regardless of their age and detection mode. A recent study from Norway concludes that 33% of the improved survival from breast cancer after nine years follow-up is attributable to improved breast cancer management through multidisciplinary medical care.

A quality assurance manual was created contemporaneously with the start up of the pilot project in 1995/96. The manual was based on the recommendations given in the European guidelines and results from the randomised controlled trials, particularly in Sweden. Two revisions have been performed so far and it's about time for further revision. Based on the quality assurance manual, data are collected from the screening units and the breast clinics: The results of the radiological interpretation of the mammograms and subsequent imaging work-up results are reported electronically to the cancer registry, while the results of the biopsy and surgical treatments are reported on paper forms.



All information collected from the programme is entered into a database and distributed in files and programmes to the breast clinics. Data and results of early indicators are thus available for each county. The quality assurance manual is recommending regular site visits aimed at discussing these results. The Cancer Registry of Norway was established in 1951, and cancer has been a reportable disease by law since 1953. Consequently, the database of the registry is essentially complete with 99.6% of solid tumours reported.

Early Indicators & Performance Measurement

Several studies have been performed based on data from the NBCSP. The majority of the studies are related to early indicators and performance measures. All the studies are showing promising outcome according to a future mortality reduction from the disease as a result of the implementation of the screening programme, but several challenges will appear in the estimations because the treatment of the disease has changed with time and because information about opportunistic screening is not available. In 2008, the government allocated about 15 million euros for external research groups to evaluate the screening programme. Different aspects will be explored and results are expected during 2012.

Contemporary, further programmes aimed at improved quality, in addition to research, are performed. Several research projects have arisen as a result of the outcome of the quality assurance and comparisons of results of early indictors. Attention has been on radiological performance, but future research will also include the aspects of pathology, treatment and follow-up. ■

*A full set of references are available upon request to the Managing Editor, Dervla Gleeson, editorial@imagingmanagement.org

PET/CT GAINING GROUND

Demand for Exams Fuels Installations in Western Europe

Positron Emission Tomography (PET) is now an established technique for cancer diagnosis and is increasingly being used to follow-up cancer therapies. As a mature modality, the challenge now is for the molecular imaging community to increase patient numbers through a wider adoption of 18FDG scanning and the introduction of new tracers.

Scanner Numbers in the EU Growing

There are now more than 500 PET/CT scanners installed in Western Europe, a number that provides more than one scanner per million of the population, and a level that has been suggested as suitable to meet demand. It seems likely that this target will be raised in future. One PET/CT per 500,000 patients seems perfectly attainable based on current applications and types of service provision. One would, for example, expect a higher number of scanners in countries where there is a traditional insufficiency in supply of general healthcare or where private medicine is important.

In 2008, approximately 660,000 patients received PET scans in Europe, the majority of these cancer studies using 18FDG. The annual growth in procedures, while slowing, exceeds 20%. The installed base of PET/CT continues to shift from larger institutions and into settings such as general hospitals and private practice. Today, universities comprise less than one third of those centres offering PET or PET/CT examinations.

Last Two Years Show Increased Patient Numbers

In the past two years, Scandinavia, the Netherlands, Ireland and the UK have shown a major upsurge in patient numbers as an increasing number of clinical systems have been installed. Mobile PET/CT scanning has been an important contributor to growth in these countries. Italy heads the table as the country with most scans per head of population. Statistics in the table are propped up by Germany, where the restrictive reimbursement regime has kept patient numbers low. It hasn't stopped investment in technology, and over 100 PET and PET/CT scanners are installed.

Centres are retiring scanners, cynical as to whether the reimbursement regime will improve. Others are investing, optimistically believing a widening franchise is just around the corner.

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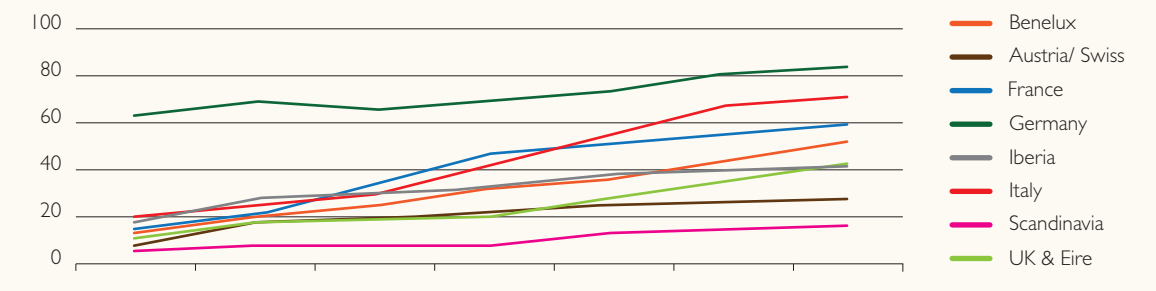
Fig. 1: PET and PET/CT centres - Europe, 2008 *(Source: Medical Options - PET 2008 survey)*



PET/CT Reducing Imaging Times, Becoming Routine

In recent years, the most noticeable development has been the reduction in imaging times driven by hybrid PET/CT and improved detector geometries along with technologies, which have improved image quality. Today, all of the major manufacturers offer Time of Flight (TOF) data capture with detectors based on Lutetium Orthosilicate (LSO).Examination times of less than 20 minutes following uptake of tracer are now within reach.

PET is no longer the bespoke exam of ten years ago, but now lends itself to routine high throughput environments. Higher patient throughput is increasingly important in pushing up scan volumes (see figure 1). While the average throughput per scanner is ~1,600 patients per year, around one third of sites exceed 2,000 patients; the average workload of a gamma camera.

This places challenges on departments not geared up for large patient numbers. Whereas five patients per day could easily be handled with a single uptake room, three patients per hour demands four rooms if patients are not expected to share facilities. Moreover the radiation dose to staff primarily from patient handling is also an issue. Products that improve the handling of radiotracers within the PET/CT suite have been launched in the past twelve months.

Major Challenges for PET/CT

Today the major challenge for PET/CT is garnering referrals. Even in the most permissive financial environments, persuading clinicians to refer can be an issue. It is a problem facing imaging in general. More modalities are chasing the same patient. PET/CT imaging studies are more accurate, mitigate against follow-up procedures and reinforce payers' reticence to countenance duplicated studies. The future for imaging departments is to manage the diagnostic algorithm, for example shifting from conventional angiography to CT or MR. Nuclear medicine now faces similar choices. Nuclear medicine practitioners are the first to observe that its demise has been talked about for the last 30 years but it is still going strong. The impact of CT and MR has been minimal. PET/CT presents a new challenge to procedures based around gamma imaging; a threat from within nuclear medicine. PET/CT was the stimulus for discussions between the EANM and ESR in 2007 over the future of the disciplines. But it also raises the dilemma for nuclear physicians of whether to shift studies from the gamma camera to PET/CT.

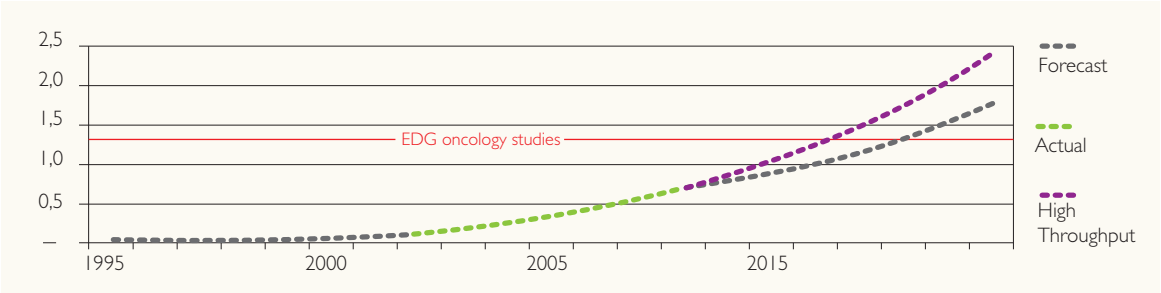
Cost of PET/CT Studies Versus Alternatives

To date, the cost of PET/CT studies versus examinations performed on a gamma camera is far higher, and is driven by equipment and radiotracer costs. In 2010 the availability of molybdenum generators will continue to be an issue, although the situation should be an improvement on 2009. Any threat to technetium (99Tc) supply challenges nuclear medicine practitioners to defend their referral base and PET/CT is the obvious solution. A number of European countries have relaxed reimbursement on NaF for bone examinations due to issues with 99Tc supply.

The quality of images is excellent, however, current thinking is that PET/CT will only replace a small proportion of the 2.5 million bone scans performed using 99TcMDP. However other agents may displace current nuclear studies. 68Ga chelates linked to octrotide or 18FDOPA are alternatives to image endocrine tumours. 18FDOPA is also a potential agent to confirm Parkinson's. Rubidium can be used to measure cardiac viability.

Oncology will continue as the mainstay of PET/CT in the medium term with 18FDG as the universal tracer. Indications such as treatment and therapy planning with 'follow-up' alongside a broadening of the tumour indications will fuel growth. Other applications will wait for the wider availability of other tracers. The present trends point to increased availability of PET/CT to undertake new studies if new installations of PET/CT continue at the current level of 40 - 50 per year. Even with throughput growing at the current rate there should be spare capaci-

Fig. 2: Projections of patient care



ty in the next five years (see figure 2). Capacity may be far greater if sites deliver the higher throughputs, which are achievable. This all depends on a permissive funding regime and remembering that in provision of diagnostic imaging in Europe is a three lane highway and not all countries travel in the fast lane. ■

BEST PRACTICE IN INTERDISCIPLINARY TEAM MANAGEMENT

Inside the Radiation Oncology Department

Managing a radiation oncology department brings its own unique challenges. There are a multitude of work processes to consider and such a diverse group of employees to lead, that some days the word "challenge" is a distinct understatement. In this article, I discuss the three cardinal rules that any manager of an interdisciplinary team can use to improve synergies between the different groups in an interdisciplinary team. These are:

I. Be open-minded;
II. Be fair, and
III. Be ready for anything.

The Role of "Manager" in the Radiation Oncology Department

In a typical radiation oncology department in the U.S., a manager is called upon to oversee and coordinate the work of clerical staff, nursing staff, treatment delivery personnel (radiation therapists), physicians (radiation oncologists), physicists, dosimetrists, social workers and dieticians. Though the number of employees varies from facility to facility, this core group is frequently involved in the day-to-day care of cancer patients. Some employees have high school diplomas, others two-year college degrees, and so on, up to the PhD and MD levels of education. This wide range of educational backgrounds gives a well-rounded perspective to the department and each employee makes a unique contribution.

Potential Pitfalls in the Department

A potential pitfall for a radiation oncology department is to function in "silos". Each area is likely to have its own immediate supervisor to oversee day-to-day operations and each focuses on the management of the professionals working in each section. This approach puts up barriers between the sections of a department. Functioning in this manner will inevitably result in hearing "that's not my job" from one employee after another. Team members need to be encouraged to step out of their professional comfort zones and pick up on whatever task needs to be accomplished for the benefit of the patient. Obviously, a social worker will not be able to deliver an external beam treatment to a patient, but she can facilitate the experience for the patient and ensure that the radiation therapists are aware of the patient's specific needs and expectations.

The Three Cardinal Rules

I. Be open-minded

This brings us to the first cardinal rule of managing an interdisciplinary team; "Be open-minded." Seeing all the employees of a department as equal members of a team, there are opportunities to shake things up a bit and make changes that might not be possible if the silo theory is followed. For example, a secretary is on medical leave. In the silo theory, a

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Are You an Effective Interdisciplinary Team Leader? *Ask Yourself "Did I…."*

Ask representatives from each area for their input before making global decisions?	Yes	No
Consider the strengths of all team members before implementing new processes?	Yes	No
Have fair expectations of all team members?	Yes	No
Consider options "outside the box" before filling vacancies?	Yes	No
Routinely provide employees with opportunities to learn and grow?	Yes	No
Work side-by-side with employees when they needed me?	Yes	No
Enable staff to do their best by giving them the tools and support they needed?	Yes	No
Ensure that all patients received the best possible healthcare experience?	Yes	No

If you answered "yes" to all of the questions, then you are an exemplary leader!
If you answered "no" to all of the questions, seek out a mentor!

temporary staff member may be hired or the other office employees will have to pick up extra duties. Within an interdisciplinary team, those extra duties can be spread throughout the department. Why can't a radiation therapist file patient notes for the patients that they treat every day?

An open position gives the manager the timely opportunity to assess the team – not just the area with the vacancy – to determine how to best fill the position. Why hire a new person to come in and perform job functions that were most likely created many years ago? The new person does not know the status quo. Take advantage of this and determine if a person with different credentials may be able to take on the tasks of the previous employee plus additional functions in the department. As the department grows, job functions, employees, and administrators need to change and grow as well. The manager's goal is not to merely fill a position, but to ensure continuous optimal functioning of the team as a whole.

II. Be fair

Be fair… two words that sound simple in theory but can be challenging to put into practice. This is especially true when managing people with a variety of job functions in the department. For example, a nurse is scheduled to be at work at 7:30 AM to get the exam rooms and nursing areas ready for the day. The first patient is not scheduled to arrive in the department until 8:00 AM. The nurse arrives at 7:34 AM, but gets all of her tasks completed before 8:00 AM. A radiation therapist arrives at 8:04AM for his 8:00 AM shift and does not get his 8:00 AM patient in the treatment room until 8:10 AM. Even though it seems as if the therapist's tardiness had a more negative impact on the department, it is important to treat all employees fairly. An effective manager of this interdisciplinary team, will coach both employees and make expectations clear to staff throughout the department.

The concept of fairness can be very subjective. One method of getting feedback from staff is to create a Shared Governance Committee (SGC) comprised of the department's top performers, to routinely meet and discuss staff concerns and oversee employee satisfaction. This committee needs to include representatives from each area of the department and they need to be empowered to solicit and act on feedback. Managerial involvement with the SGC is minimal and is intended to offer administrative support and oversight only. When the SGC takes up an agenda item, they need to come up with a resolution that can be put into practice fairly and consistently throughout the department. Since it includes representatives from each area, they have a vested interest in coming up with solutions that are reasonable. In general, the SGC can help monitor employee satisfaction and comments regarding leadership.

III. Be ready for anything

Be ready for anything…it has been said that the only constant is change. As a leader of a radiation oncology department, one needs to be prepared for upgrades in technology, ebbs and flows of the economy and reimbursements, staffing challenges, and so on. Of course, the day-to-day "fires" need to be put out as well. Some days, managers need to put everything aside and just sit in the trenches until the battle is over.

The day will end and the staff will see that their leader will be there to support them when the going gets tough. There is no substitution for a manager who is willing to get his or her hands dirty. In the end, this attribute may truly define an "effective" leader.

There is no handbook or class to give us a recipe for leading every type of person in every type of situation. So much of our leadership style is learned from those leaders that have made an impression on us - positive and negative. Managers are in a position to model positive behaviours that foster cooperation, respect and responsibility. The interdisciplinary team will function most effectively with the guidance of someone who leads the way they would want to be led. ■

THE EUROPEAN WORKING TIME DIRECTIVE

Will it Negatively Impact Radiology Service Delivery?

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The European Working Time Directive (EWTD) was designed to enhance the wellbeing of European workers to ensure that they are protected from being obliged by employers to carry out excessive hours, healthcare workers included. However, it has had a profound effect on the structures of the working life of healthcare employees, with a knock-on impact on service delivery for patients. Primarily, compliance with the Directive will necessitate shift working patterns, rather than the present on-call structure.

This has generated concern that it may result in deterioration of service delivery and in the quality of training, and in an inconsistent chain of patient care with cases being handed over more frequently and more medical errors as a result. Specialists fear that with a shift-work rota system in place in the radiology department, the resultant inadequate staffing levels may increase waiting lists and cause a backlog of patients.

What is the European Working Time Directive?

The European Working Time Directive is a directive from the Council of Europe (93/104/EC) that lays down minimum requirements in relation to working hours, rest periods, annual leave and working arrangements for night workers. Under the directive, each Member State must ensure that every worker is entitled to:

- A limit to weekly working time, which must not exceed 48 hours on average, including any overtime;
- A minimum daily rest period, of 11 consecutive hours in every 24;
- A rest break during working time, if the worker is on duty for longer than six hours;
- A minimum weekly rest period of 24 uninterrupted hours for each seven-day period, which is added to the 11 hours' daily rest;
- Paid annual leave, of at least four weeks per year, and
- Extra protection for night workers (e.g., average working hours must not exceed 8 hours per 24-hour period; night workers must not perform heavy or dangerous work for longer than 8 hours in any 24-hour period; there should be a right to free health assessments and in certain situations, to transfer to day work).

How Could This Harm Patient Care?

There is concern that EWTD implementation may:

- Unbalance the continuity of care of patients and individual responsibility of doctors for their patients;
- Reduce outpatient clinic staffing levels, with increased waiting times;
- Exacerbate overcrowding in emergency services;
- Increase waiting times for diagnostic procedures, at the top of which, medical imaging;
- Increase the strain on primary care;
- Worsen the perceived quality of care amongst the general public should increased delays occur;
- Make present on-call working rotas impossible to work to, especially for smaller hospitals, which cannot keep up with service provision under a 48 hour limit;
- Increase the deficit in manpower;
- Reduce the quality of training, including a loss of contact time with trainers and loss of training experience during daytime hours, and
- Inhibit service provision. Radiologists who work on-call are not allowed to work the following day after performing their on-call duty. This may lead to shortages of available radiologists to handle daytime cases. This may generate a backlog and greater waiting times for imaging exams or even radiotherapy and other critical procedures.

Will the EWTD Adversely Impact Patients?

Across Europe, radiologists and medical professionals across the spectrum have voiced their concern that the Directive is detrimental to patient access and standards of care. A commentary from the Royal College of Physicians of Ireland (RCPI) says the following: "Implementation of EWTD as currently envisaged does not benefit patients, but serves to undermine medical care standards and to compromise quality of professional education and training of specialists. EWTD poses a very significant threat to continued provision of quality healthcare". » *continues on page 47*

INTERVIEW WITH **PROF. HEDVIG HRICAK**

Prof. Hedvig Hricak is a noted innovator in the field of oncologic imaging. she has helped develop new modes of imaging for different GU and GYN types of cancer, engaged in interdisciplinary research exploring minimally invasive methods for improving cancer detection and treatment, and been recognised with awards from multiple internationally-renowned organisations, including the Marie Curie Award from the Society of Women in Radiology, gold medal from the International Society For Magnetic Resonance In Medicine, Beclere medal from the International Society Of Radiology and gold medal from the Association Of University Radiologists. Here, she tells IMAGING management why there is a strong need for leadership in radiology research and how she learned to be an effective leader. Prof. Hricak has over 500 pubmed citations, is author or co-author of 19 books and 131 book chapters, and has over 14,000 scientific citations.

Interviewee
Prof. Hedvig Hricak

Chairman
Department of Radiology
Carroll and Milton Chair in Radiology
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Also,
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Professional Highlights

1970	M.D. University of Zagreb, Yugoslavia
1989	Fellow, American College of Radiology
1992	Dr.Med.Sc (Ph.D) Karolinska Institute, Stockholm, Sweden
1996	Fellow, Society of Uroradiology
1998	Fellow, International Society for Magnetic Resonance in Medicine
2002	Member, Institute of Medicine of the National Academies
2002	Marie Curie Award, American Association of Women Radiologists
2003	Gold Medalist, International Society for Magnetic Resonance in Medicine
2004	Member, Croatian Academy of Sciences and Arts
2004	Honourary Member, British Institute of Radiology
2005	Honourary Member, German Radiological Society
2005	Doctoris Medicinae Gradum Honoris Causa (Dr.h.c) Ludwig Maximilians Universität, Munich
2005	Honourary Fellow of the Royal College of Radiologists
2006	Honourary Member of the Austrian Roentgen Society
2006	Beclere Medal, International Society of Radiology
2006	Honourary Member, Croatian Society of Radiology
2007	Honourary Member, Journées Françaises de Radiologie
2007	Gold Medal, Association of University Radiologists (AUR)
2008	Honourary Member, Swedish Society of Medical Radiology
2008	Moroccan Merit Medal, International Society of Radiology

Please tell us, what does your typical daily working schedule consist of?

I have meetings with my vice chairmen and with chairmen of other departments, interview applicants for positions, meet with administration, look at images of patients referred to me and after hours enjoy doing research with my associates. My workdays usually start before 8 AM and end around 8:30 PM.

What are the most enjoyable aspects of your professional life, and which are most challenging?

Some of the most enjoyable aspects of my professional life are working with young clinical and research associates, watching them mature and become successful and, in many instances, famous. The most challenging aspects of my work are administrative, such as dealing with work distribution and financial prospects in a challenging economic climate.

With imaging is becoming more important daily, the workload is continually increasing; it is very difficult to provide sufficient workspace and a large enough workforce to keep up with growth. One always needs to be flexible

and adapt to change, while never losing sight of the key goals: Excellence in clinical care and continuous progress in medicine.

How did you learn how to manage and lead?

The secret of learning how to manage and lead is to grow with increasingly demanding jobs. I took business courses at Wharton, and as a base it was very helpful. However, there is a difference between theory and practice.

One learns through being promoted and assuming greater responsibilities. One has to continuously evolve and look for new opportunities; furthermore, all politics is local, and one's style has to be adaptable. Management unfortunately takes increasing amounts of my time, with both the faculty and administration growing constantly.

How strong is the need for good leadership in medical imaging?

In my opinion, good leadership is particularly important in academic imaging departments, as many competing concerns need to be addressed. Patient care is the basic framework on which collaborative, investigator-initiated research is built, and maintaining a balance in the department is crucial.

One also has to align priorities and strategies with the institutional mission and the available resources. Supporting research is extremely important, yet at times it can be very difficult because of the ever-increasing need for resources and continuous growth in the demand for clinical services.

Do women work harder to achieve the same professional goals as men, or is it a non-subject these days?

This was more of an issue about a decade ago. Today women have almost reached parity in many fields, particularly in universities, research institutions and medicine in general. The gains continue every year. However, women often have more complex responsibilities and multiple competing priorities.

What has been the greatest professional honour of your career, thus far?

It is difficult to answer that question, as every honour, acknowledgment, patient 'thank you' or faculty member's success is a great source of satisfaction. Very recently, my faculty gave me an elegant dinner celebrating 10 years of my tenure as Chair. It was emotional, and the way I felt listening to their stories, which were full of humour and sincere gratitude, is difficult to describe.

> "Molecular imaging will provide essential biomarkers and will add to the most important paradigms in personalised medicine"

On the other hand, if I consider entering new arenas as the most important marker of professional success, I would have to say being the first woman to receive an honorary doctorate from the Ludwig Maximilian University in Munich in its more than 500-year history.

What is your opinion on the situation that is presently unfolding, with regards to public versus private healthcare in the U.S?

There are strong arguments for both sides and the debate is ongoing. There will probably be a compromise solution, most likely unsatisfactory to both sides, but somehow workable. One point is clear: The continuous increases in healthcare expenditures must be contained, but without affecting progress in medicine.

I am a big believer in personalised medicine, also referred to as predictive healthcare. Not only are we going to achieve better patient outcomes, but we will spend less money on unnecessary or ineffective procedures and treatments.

You are a noted pioneer in the field of molecular imaging - how do you see your role here?

Thank you for the compliment – but I am not a pioneer. I am lucky to be surrounded by brilliant minds in our department and institution. I support their work and provide the infrastructure in which they can flourish and break new ground. I also contribute to and support translational research to bridge basic science and clinical medicine.

What elements do you find most exciting about molecular imaging?

Working in a leading oncology research institution, it becomes obvious that the future of oncology and of medicine as a whole lies in personalised medicine. Molecular imaging will contribute in providing essential biomarkers and will add to the most important paradigms in personalised medicine. Cooperating with gifted colleagues to advance molecular imaging and personalised medicine is exciting and most inviting.

Finally, please share with us your favorite memory from your days as a medical resident.

My favourite memories are of getting involved in developing approaches for the study of renal disease and renal transplant rejection during the early days of ultrasonography. ■

HEALTH SERVICES **IN FINLAND**

An Overview of Key Issues

Facts & Figures

Population:
5.3 million

Capital:
Helsinki

Area:
338,000km²

Major Languages:
Finnish, Swedish

Major Religion:
Lutheran

Life Expectancy:
76.09 (men)
and 83.24 (women)
(2007)

Monetary Unit:
Euros

GDP Per Capita:
24,211 euros

Expenditure on Healthcare:
2,255 euros per capita

(source: http:euro.who.int)

Finnish healthcare is divided into the public and private sectors. The public sector is significantly larger than the private sector in Finland. The private sector consists of small health centres and some specialised hospitals (e.g. for heart surgery, orthopaedics, ophthalmology, etc.) mainly concentrated in cities. Citizens can choose freely between the private and the public sector. While the private sector is primarily more expensive, the patient is reimbursed up to 40% of the costs from public health insurance (financed by government taxes). Finland has about 330 municipalities that collect taxes and get additional financial support from the government (Ministry of Finance) in accordance with the status of municipality. Status parameters include size and age distribution of the population, location of the municipality, industry, agriculture, etc. Every employed individual pays taxes to municipalities and the government.

Access and Prevention

Everyone residing in Finland is entitled to receive good quality healthcare within set timeframes. The primary goal of Finnish health policy is disease prevention. Preventive services are provided by health centres, child health clinics, school healthcare, student healthcare and occupational healthcare. A prime aim of the Finnish Ministry of Social Affairs and Health (MSAH) is to narrow the appreciable health inequalities between different sections of the population in different parts of Finland. The MSAH "Action Plan to Reduce Health Inequalities: 2008 – 2011" outlines proposals for strategic policy definitions and the most important measures to reduce socioeconomic health inequalities in Finland.

Primary & Specialised Healthcare

Municipal health centre services include physical examinations, oral health, medical care, ambulance services, maternity and child health clinics, school and student healthcare and other basic services. Specialised outpatient and institutional treatment is provided by hospital districts. Diseases requiring highly demanding treatment are handled by regional arrangements or centrally, according to a specific decree. Each hospital district contains a central hospital and other specialised units. There are five university hospitals in Finland.

Healthcare Reform and Development

The Ministry of Social Affairs and Health defines the course of social and health policy in Finland in its strategy and it implements these policy lines by legislation, quality recommendations, programmes and projects. Every four years, the Ministry compiles a development programme for social and healthcare, which sets out the main points of emphasis of policy aims, activity and oversight, as well as reforms and legislative programmes, guidelines and necessary recommendations to support their implementation.

Financing and Expenditure

Social and healthcare in Finland is mainly financed by taxation. The state pays social and healthcare subsidies to municipalities. The size of the subsidies depends on the size of the populations of the municipalities, and on their age structure, unemployment rate and other factors. Municipal, social and health expenditure was 16.1 billion euros in 2007, or 53.4% of total municipal spending.

The main outlays were for:
- Specialised medical care - 4.5 billion euros
- Primary healthcare - 3.3 billion euros
- Services for older people and people with disabilities - 2.7 billion euros
- Child day-care and care allowance - 2.3 billion euros

State subsidies for operating costs in 2007 absorbed about 34% of statutory municipal spending. Client fees covered about 7% of expenditure. The remainder was paid for by the municipalities themselves. Healthcare expenditure for 2006 was about 13.6 billion euros, or 8.2% of GDP. This has remained below the OECD average.

The main expenditures were for:
- Specialised medical care: 34%
- Primary healthcare: 19%
- Dental care: 5%
- Occupational and student healthcare: 4%
- Pharmaceuticals: 15%
- Health insurance reimbursements for private healthcare: 6%
- Institutional care for older people: 5%

European Society of Radiology

ECR 2010

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Health Promotion

The Finnish government sets a targeted appropriation for measures aimed at health promotion. The MSAH is responsible for the use of the appropriation. The government's "Resolution on the Health 2015" public health programme outlines the targets for Finland's national health policy for the next fifteen years. The main focus of the strategy is on health promotion, rather than on developing the health service system. The foundation for the strategy is provided by the "Health for All" programme organised by the World Health Organisation (WHO).

The Health 2015 Project

Health 2015 is a cooperation programme that provides a broad framework for health promotion in various component areas of society. It reaches across different sectors of administration, since public health is largely determined by factors outside healthcare, such as lifestyles, living environment, quality of products, factors promoting and factors endangering community health. The concepts 'settings of everyday life' and 'course of life' play a key role in the programme. The strategy presents eight targets for public health, which focus on important problems requiring concerted action by various bodies. They indicate the outcome aimed at in different phases of life. In addition, there are 36 statements concerning the lines of action underlined by the Government, incorporating challenges and guidelines related to citizens' everyday environments and various actors in society. ■

Further reading on healthcare in Finland:
- www.stm.fi/en/social_and_health_services/health_services
- www.thl.fi/en_US/web/en

HIGHLIGHTS ON **MEDICAL IMAGING IN FINLAND**

The Chairman's Perspective

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How is medical imaging organised in Finland?

Finland is divided into 20 hospital districts, each containing either a central hospital or a university hospital, with a total of five of those in the country, located in Helsinki, Tampere, Turku, Kuopio and Oulu. Every hospital district also contains one to three regional hospitals per district. In addition, almost all the municipalities have their own primary healthcare centre (GP). With regards to radiology, these centres have about 200 small x-ray units. Almost all specialties are represented in the university hospitals, whereas about 10 - 15 specialties are available in central hospitals and some six - seven in regional hospitals. Hospitals are financed by patient contributions and by the municipalities that own the hospitals.

Patients pay 11 euros at primary healthcare centres, 25 euros for outpatient fees to hospitals, and staying in the department ward costs 30 euro per day. These fees cover everything, including laboratory tests, radiology, surgery, etc. University hospitals also get money directly from the Ministry of Social and Health Affairs for teaching and research. The total sum is about 100 million euros per hospital, per year. The ministry is responsible for practice, regulations and controls. Universities are financed by Ministry of Education.

Please provide some general information on the department of radiology at Tampere University Hospital.

The department consists of two separate departments in the main building, a small unit in the first aid section, and a unit of dental radiology. » *Continues on p. 46*

AUTHOR **GUIDELINES**

Content

IMAGING Management welcomes submissions from qualified, experienced professionals active in the imaging industry, related technology companies and medical healthcare professionals with an interest in imaging-related topics and themes. We are particularly interested in articles focusing on management or practice issues and therefore accept scientific papers with a clear connection to these areas. Articles must be written by independent authorities, and any sponsors for research named. Our editorial policy means that articles must present an unbiased view, and avoid 'promotional' or biased content from manufacturers.

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Structure

Article texts must contain:

- Names of authors with abbreviations for the highest academic degree;
- Affiliation: department and institution, city and country;
- Main authors are requested to supply a portrait photo (see specifications below);
- One contact name for correspondence and an e-mail address which may be published with the article;
- Acknowledgements of any connections with a company or financial sponsor;
- Authors are encouraged to include checklists, tables and/or guidelines, which summarise findings or recommendations, and
- References or sources, if appropriate, as specified below.

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The format for listing references in submitted articles should follow the Harvard reference system. Example of standard journal reference: Sydow Campbell, K. (1999) "Collecting information; qualitative research methods for solving workplace problems", Technical communication, 46 (4) 532-544. Readers will be provided with an e-mail contact for references, which will be kept on file and supplied on request. Authors are responsible for the accuracy of the references they cite.

Acceptance

It is at the discretion of our editorial board to accept or refuse submissions. We will respond to submissions within four weeks of receipt. We reserve the right to revise the article or request the author to edit the contents, and to publish all texts in any EMC Consulting Group journal or related website, and to list them in online literature databases.

For further details or to request a copy of the 2010 editorial planner, with topics and focus areas included, please email **editorial@imagingmanagement.org**.

Thank you,
The IMAGING Management Editorial Team

» *Continues from p. 44.* In addition, we incorporate the radiological departments of three regional hospitals within a 90 km radius of Tampere. We currently have three MRIs (1.5T, 1.5T, 3T), four CTs (64, 64, 16, and four-slice), a micro-CT, a PET/CT, three angio labs, 10 ultrasound units, three fluoroscopy units, fully digitised plain imaging systems, PACS, RIS, and a speech recognition system in the Finnish language. We are a filmless and paperless unit.

Our budget for this year is 21.5 million euros. Last year, we performed 196,000 examinations and the expected number for this year is 203,000. Today we have a staff of 208, comprising 50 doctors including nine residents and four physicists, and 145 radiographers and secretaries. There are 1,100 beds in the main building and 50 - 235 in each regional hospital, 1,515 in total. The university hospital is the second largest hospital in Finland, only second to Helsinki. We offer all specialties except organ transplantation, which is concentrated in Helsinki.

What imaging exams are in the highest demand in your department?

The highest demand is for MRI exams and interventional procedures. Waiting lists exist; for example, the waiting time for elective patients to receive an MRI in our hospital is four to six weeks. Also, the waiting time is five weeks for examinations of children, because of the need for anaesthesia. Ultrasound has a waiting time of three weeks. All other services are available in one - three days. In urgent cases, immediate access is naturally given to all services.

We carefully monitor waiting times and if needed, extra work outside normal working time with additional pay is allowed, to manage waiting times.

Are migrant employees common in medical imaging departments in Finland?

At the moment we only have a small number of non-Finnish employees, because of the strict language requirements. Finnish is very difficult to learn and only Estonians commonly understand and speak it. Swedish is the other official language in Finland. People who come from other countries must first learn Finnish and then serve as a trainee for almost a year in different healthcare units.

During that time their skills are assessed. After the trainee period, they take written exams in Finnish law, pharmacology, and clinical matters before they are licensed to work as a doctor. A governmental office grants licenses. Non-Finnish radiographers are very rare in Finland.

Has medical imaging in Finland experienced understaffing?

The question of personnel is very important. There is currently a sufficient number of radiologists and radiographers in the cities that have university hospitals due to the fact that these cities are also educational centres for staff. People therefore stay longer in the same region. However, outside the university hospital cities, some units are experiencing shortages of doctors and radiographers, for reasons including understaffing, sickness, workload, salary, no work in the region for spouses, etc.

How do we manage the situation? There are currently five - ten private companies that sell radiological services around the country by visiting the department or by using teleradiology. The costs associated with these services are obviously much higher than with normal staff. All in all, we have enough radiologists and radiographers in Finland, but there is a constant competition between the private and public sectors for them.

What is the process for educating residents to become radiologists in Finland?

The education of a radiologist begins just after graduation as an MD at the university. Nine months of general practice (GP) service and three months of service in one other specialty than radiology is required. This 12-month period is followed by four years in radiology, including between one-and-a-half to two years' service in the department of a central hospital. The time depends on the size of the unit, equipment, and education as well as on the experience of the chief doctor of the department in question. After this, the doctor will work in a department of a university hospital for two – two-and-a-half years. The total training time is five years. Residents have their own logbooks during their specialisation. In addition to normal service (work, meetings, own lectures), they must accumulate 150 hours of theoretical education, of which 30 hours must be administrative. The residents' education is carefully monitored and in addition, they work together with senior radiologists. The required exams are quite demanding, ensuring that their skill level remains high.

Please describe the examination process for radiology residents in Finland.

Residents have three written exams, which they must pass during their specialisation period. They have an exam on medical physics and radiation protection (five

questions) during the first year, a normal written exam (six questions concerning the whole field of radiology) during the fourth year, and finally an imaging exam (six cases) during the last year. Our requirements are closely aligned with EU guidelines.

Is interventional radiology (IR) well established in Finland?

Yes, IR is well established in Finland. I have personally been a pioneer in this field and made the first PTA in 1979. I also introduced laser angioplasty to Finland. TV, newspapers and also Finnish medical journals have actively published our achievements. The number of interventional procedures is increasing every year, and Tampere and Kuopio University Hospitals are well known for their expertise in all kinds of interventional procedures. Our interventions mainly concentrate on vessels, because of the high incidence of cardiovascular disease in Finland.

How widespread is teleradiology in Finland?

Teleradiology is widely used in Finland due to the long distances between hospitals, especially in eastern and northern Finland. Almost all radiological units are digitised now and we have comprehensive coverage. In our university's response area (1.2 million people), there are four central hospitals and eight regional hospitals. They can all send images to the university hospital PACS system and vice versa.

Also, our primary healthcare centres are equipped with radiological machines (plain images) that use our PACS. Thus, we can see their images and, with the permission of the patient, doctors there can see the patient's images taken at the university hospital. In the near future, we will introduce a national PACS for long-term archiving in Finland. Even in small villages where there is only a department for plain images, the patient can be sent to the nearest hospital after images have been sent via teleradiology. ■

» *Continues from page 39* Patients may be shunted from doctor to doctor in a new shift-oriented system. The danger is that high frequency handovers and harried doctors on exhausting shift patterns may present real risks to patient safety — far more than the total number of hours worked. In the U.S. they have debated the same issue, with a consensus on 80 hours per week. In the case of Europe, it is thought that for certain specialists, a 60 - 65 hour working week, including time spent on-call, is more workable with fewer handovers and greater safety for patients.

The Faculty of Radiologists in Ireland specifically points to radiology as a vulnerable sector: "Demand for on-call radiology services has grown massively in recent years. In most departments, at least 10 - 15% of radiology activity is now provided out of normal working hours." Obviously, the change to a new shift-based system will likely be a blow to these services.

Conclusions

The argument is that working excessively, the fundamental reason for the EWTD, is bad for doctors' health, whether it will demand Herculean efforts to enact required changes in the current service delivery structures or not. The Directive has had a major impact on hospitals, where junior doctors traditionally endured 80- to 100-hour working weeks and medical errors were frequently attributed to staff exhaustion. Workers perform better when not exhausted – doctors are no different in this case.

The Directive also protects junior doctors from being pressurised by senior executives into performing unrealistic hours, and those overlong hours may not deliver better training or experience. Instead of interpreting the Directive to mean that greater numbers of doctors must be employed to cover shift-rota gaps, it may be better to delegate non-critical tasks to lower grade employees, with some additional training. Additionally, proper supervision of handovers is a must, whether they take place every eight or every 13 hours. Moreover, it should be noted that the 48-hour week is averaged out over six months – thus, there is some flexibility in service provision. Finally, these health and safety rules are for all workers – doctors included. The changeover, which has been taking place in gradual stages across Europe since the Directive became a legal obligation, must be closely managed to ensure that patients do not lose out in the new system. ■

AGENDA

Key Conferences & Events

JANUARY

7 – 9 **4th Leuven Course on Ear Imaging**
Leuven, Belgium
www.headandneckimaging.be

14 – 16 **Management in Radiology Winter Course**
Schladming, Austria
www.mironline.org

17 – 22 **EIBIR Winter School on Intedisciplinary Biomedical Imaging**
Viladrau, Spain
www.eibir.org

27 – 30 **CT 2010 International Symposium**
Garmisch Partenkirchen, Germany
www.ct2010.org

FEBRUARY

1 – 5 **ERASMUS Course on Head & Neck MRI**
Bruges, Belgium
www.emricourse.org

21 – 26 **2010 Abdominal Radiology Course**
Orlando, US
www.sgr.org

MARCH

4 – 8 **22nd European Congress of Radiology (ECR)**
Vienna, Austria
www.myesr.org

21 – 26 **42nd International Diagnostic Course Davos**
Davos, Switzerland
www.idkd.org

APRIL

12 – 16 **ESOR Advanced Imaging Multimodality Seminars for Radiologists from China**
Shanghai, China
www.myesr.org/esor

14 – 16 **12th ESGAR CT Colonography Hands-On Workshop**
Amsterdam, The Netherlands
www.esgar.org

29 – 30 **6th ESGAR Liver Imaging Workshop**
Barcelona, Spain
www.esgar.org

MAY

1 – 7 **ESMRMB/ISMRM Joint Meeting**
Stockholm, Switzerland
www.esmrmb.org

6 – 8 **ESOR GALEN Foundation Course – Abdominal Radiology**
Novi Sad, Serbia & Montenegro
www.myesr.org/esor

10 – 14 **25th Leeds Gastroenterology Course for Radiologists**
Leeds, United Kingdom
www.leedsgicourse.com

13 – 15 **7th Annual Sports Medicine Imaging Conference**
New York, US
www.med.nyu.edu/courses/cme/sports10

21 – 23 **ESOR GALEN Advanced Course – Cardiac Imaging**
Paris, France
www.myesr.org/esor

28 – 30 **18th Annual Meeting of the European Society of Thoracic Imaging**
Berne, Switzerland
www.esti-society.org

JUNE

2 – 5 **ESGAR 2010: 21st Annual Meeting and Postgraduate Course**
Dresden, Germany
www.esgar.org

7 – 11 **47th Annual Meeting & 33rd Postgraduate Course of the ESPR**
Bordeaux, France
www.espr2010.org

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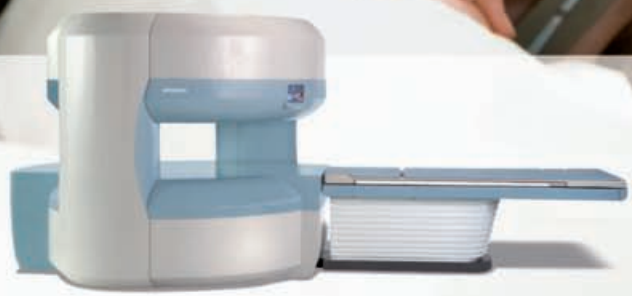

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